

# Chicanery at the canal

Changing practice in irrigation management in Western Mexico

Pieter van der Zaag

NN08201 . 1495

## Stellingen

1. Het kanaalonderhoud is een betere indikator voor de wijze waarop een irrigatiesysteem wordt beheerd dan de waterverdeling. (Dit proef-schrift.)
2. Het overdragen van kanaalonderhoud aan de watergebruikers moet niet gezien worden als het opzadelen van boeren met een last maar als een mogelijkheid voor boeren zich het kanaalstelsel toe te eigenen. (Dit proefschrift.)
3. De produktie in Mexico van hoogwaardige exportgewassen voor de Noordamerikaanse markt vervuult het milieu, verzwakt boerenorganisaties die de export-risiko's dragen, en speelt de tussenhandel en de Amerikaanse konsument in de kaart. (Dit proefschrift; zie ook Heijdra, 1988.)
4. Een irrigatiesysteem dat boeren relatief vrij laat, zal een complex distributiesysteem hebben. Toch kan in een dergelijk systeem een hoge efficiëntie bereikt worden. (Dit proefschrift; vgl. Horst, 1983, 1984, 1990.)
5. Een waterverdeler (*canalero*) denkt voor drie. (Dit proefschrift; van der Klei, 1989, stelling 11.)
6. Instituties die er zijn om boeren-organisaties te versterken moeten zelf goed georganiseerd zijn.
7. Een spread-sheet computerprogramma is maar iets minder analytisch dan Uphoff's drie-dimensionele raamwerk. (Zie Uphoff et al., 1985; vgl. Chambers, 1988:46.)

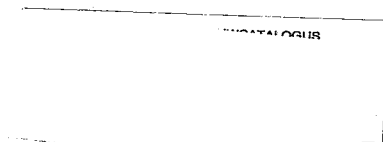
8. Het op-de-kop houden van organogrammen is een manier om de verhoudingen in een organisatie beter te begrijpen.
9. In de sociologie is er een wet die lijkt op Heisenberg's onzekerheidsrelatie uit de quantummechanica: als je de mens in beeld hebt vervaagt zijn structuurgebondenheid, en zodra je een structuur beschrijft raakt de mens uit het zicht.
10. Studies van praktijken van mensen die betrokken zijn bij rurale ontwikkeling verklaren meer dan veel ontwikkelingstheorieën.
11. Als interdisciplinair onderzoeker heb je de mazzel in het veld van twee walletjes te mogen eten. Ondertussen dreig je op de universiteit tussen wal en schip te raken.
12. Het falen van rijstprojecten op katteklei-gronden in de Casamance, Senegal (1967-1985) heeft te maken met de geringe kennis die westerse landbouwkundigen hebben van lokale concepten voor zout en zuur.
13. De technologie van waterpompen is niet de zwakke schakel in drinkwaterprojecten op het Ugandese platteland.
14. Als een Mexicaan zegt dat hij zich 'gesandwiched' voelt, is dat niet omdat er aan de Mexicaanse keuken geen metafoor te ontlenen zou zijn.

Stellingen behorende bij het proefschrift van Pieter van der Zaag: 'Chicanery at the canal; changing practice in irrigation management in Western Mexico'

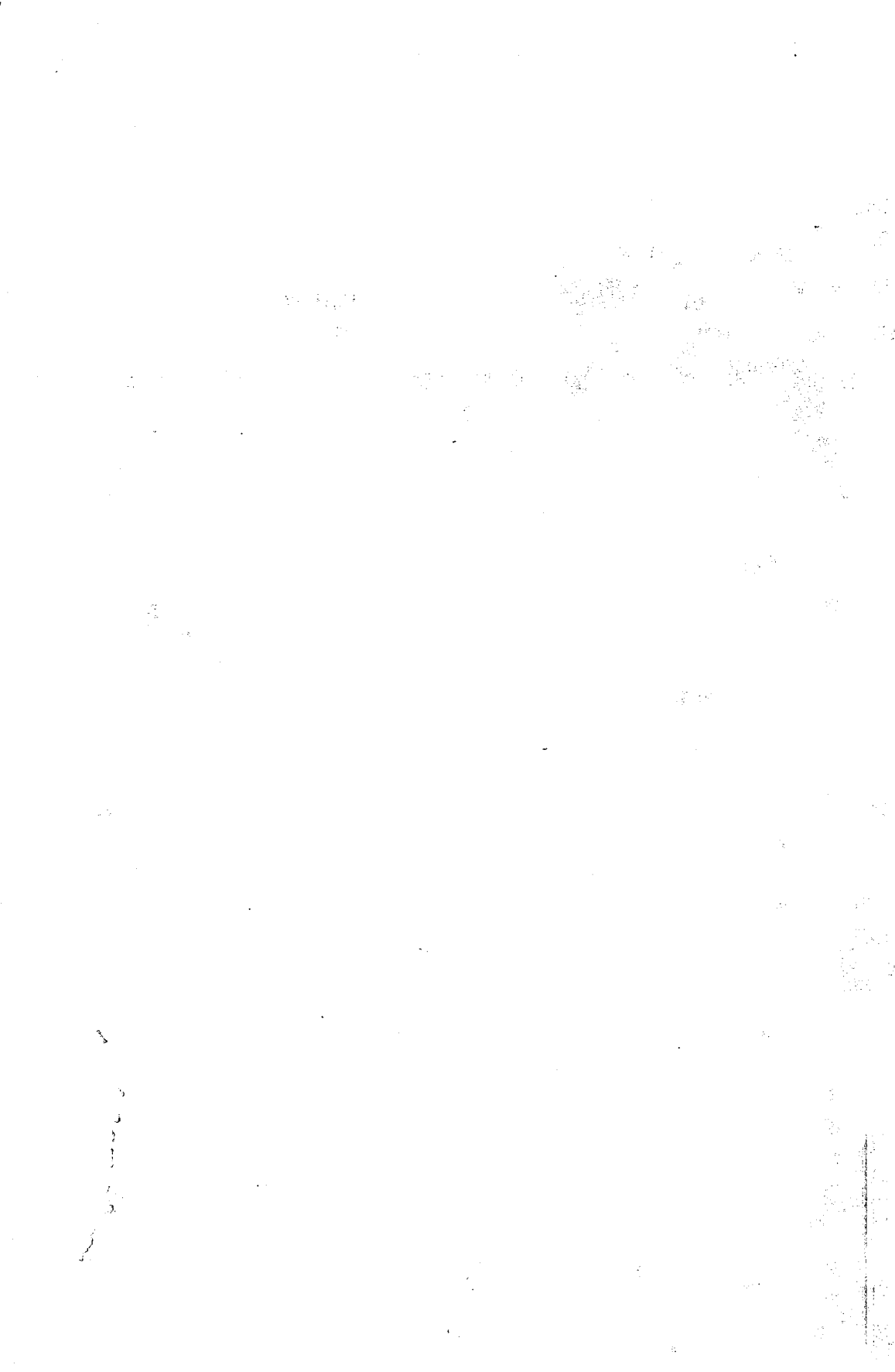
Wageningen, 6 mei 1992

# Chicanery at the canal

Changing practice in irrigation management in Western Mexico



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Pieter van der Zaag

## **Chicanery at the canal**

**Changing practice in irrigation management in Western Mexico**

### **PROEFSCHRIFT**

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**Promotoren: dr. N. Long, hoogleraar in de rurale ontwikkelingssociologie  
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*hoy en pleno siglo veinte  
nos siguen llegando rubios  
y les abrimos la casa  
y los llamamos amigos*

**amparo ochoa**



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## Preface

How is the social dynamic surrounding an irrigation system intertwined with its physical infrastructure? This question has intrigued me ever since I read Edmund Leach's (1961) study of Pul Eliya. The present study tries to tackle this question on the basis of empirical research conducted in a 'modern', medium-scale, government-managed irrigation system, called El Operado, in El Grullo, Western Mexico. The study sets out to assess how the infrastructural context directs the action of people, and vice versa, how the actions of people make the irrigation system work. El Operado lends itself to such a study, since it is a comparatively successful system. Hence it is not yet another 'disaster' story on irrigation. The research, of course, is critical on the subject. Wherever in the present text I point to weaknesses in irrigation organisation, it is because I think that organisation could be improved. But on the whole, the El Operado system could be an example for other irrigation systems in the world.

The present study was potentially able to address the technical, social and organisational dimensions in one irrigation system, for it formed part of a wider research project of Wageningen Agricultural University and the Colegio de Jalisco, Guadalajara, entitled 'Contrasting patterns of irrigation organisation, peasant strategies and planned intervention: comparative studies in Western Mexico', directed by Norman Long and funded by the Ford Foundation and the Netherlands Foundation for the Advancement of Tropical Research (WOTRO). The research team included six social scientists who looked at different topics in the same subregion, namely households, women's organisations, agricultural labourers, agricultural export companies, government agencies and sugar cane growers' organisations. All these investigations shed new light on different aspects of the irrigation system under study. I myself am an irrigation engineer, who received an 'on the job' training in sociology.

During the fieldwork in Mexico, from February 1987 to April 1989, and later during the writing up phase at the Department of Irrigation and Soil and Water Conservation, Wageningen Agricultural University, I received support from many sides.

First and foremost, I wish to express my gratitude for the hospitality with which the people of the Autlán-El Grullo valley welcomed me. I feel, and my Mexican friends surely know that I am, privileged to have had the opportunity to work in Mexico, which made it possible to become acquainted with people whom I now may call friends. A few I would like to single out here. I thank Oscar and Raquel Martínez for their generous hospitality, Don Chico Díaz and Cesareo Dueñas for teaching me farming, and the latter for many things besides, and Jesús Lomelí, Salvador Buenrostro, and Alejandro Salazar for inspiring me during fieldwork. I thank Teresa Gervacio for the meticulous work she did, and express my admiration for the way she pursues her own project. I am indebted to Everard and Gloria van Zoelen, for friendship, for the weekends in Guadalajara, but also for valuable discussions and new insights.

Then come all the farmers who agreed to be interviewed, which cost them much of their time. These talks I much enjoyed, and they thoroughly influenced my thinking. I am grateful to the farmer representatives of the *Asociación de Usuarios*, who gave me access to their meetings, and with whom I had many fruitful discussions. I wish their organisation all the best. I owe much to the personnel of the El Grullo Rural Development District, who were extremely helpful. I wish to thank Engineer Gómez Dfáz and Engineer Cobian for their kind cooperation. The group of *canaleros* are a special lot. Engineers may have overlooked them, but they did not overlook me, and they plunged me into the valley's reality. I thank them for that and for their generosity, patience and wit.

The discussions in the research team were often inspiring. I thank the team members for it: Dorien Brunt, Humberto González, Elsa Guzmán, Magda Villarreal, Gabriel Torres, and Alberto Arce. This was only the core. Others, who during longer or shorter periods participated in the team effort, were Mili Figueroa, Pedro Silva, Lex Hoefsloot, Hans Heijdra, Jikke Verhulst, Horacia Fajardo, Monique Nuijten, Gregorio Rivera, and Gerard Verschoor. I experienced Ann Long's critical thinking, warmth and support as essential contributions to the project, and to my work, for which I am grateful. I furthermore enjoyed the inspiring presence of M.Sc. students who worked specifically on irrigation and shed new light: Angel Baltazar, Michael de Bont, Wilma van Esch, Michiel Kuijk, Piet Sijbrandij, and Annemieke Vos.

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I am grateful to my supervisors at Wageningen Agricultural University, Professor Norman Long of the Department of Sociology of Rural Development and Professor Lucas Horst of the Department of Irrigation and Soil and Water Conservation, for their enthusiasm, their valuable suggestions and critique. I wish to thank Norman Long also for the new horizons he helped me to explore. I must admit that it was not always easy for me to effectively 'interface' with both professors, who represent two different disciplines. At times, they must have thought I was neither meat nor fish. The person who assisted me in this interdisciplinary endeavour was Jan Ubels, who stood at the conception of the project and who was also there at the birth of this thesis. He knows how much I owe to him.

I would also like to mention those five persons who, prior to the Mexican experience, have influenced my thinking on irrigation most: Jan van der Laan, Piet Jan Zijlstra, Jacques Slabbers, Jos van der Klei and Jan Douwe van der Ploeg.

Andrew Long had a tough job in editing the text. I also value the suggestions he gave for improving its content. Elias Michel and Frans van Ernst drew most of the figures.

My parents critically followed my work, for which I am grateful. They have actively contributed to the final shape of this thesis.

Without Marlou Bijlsma, the whole effort would have been fruitless. Together, we thank Pedro, Mili, Ahui and Naxi. Because of them, Mexico is always in our minds.

Wageningen, December 1991

## Chapter 1

### Irrigation and interaction: an introduction

It was hot, and the crops were in need of water, when a fellow researcher and I made our first field trip to the El Operado irrigation system in April, 1987. Surprisingly, we came across a pump along the main canal, something you do not expect to find in a gravity irrigated scheme. We decided to follow the pumped water and 200 metres from the pump met Flavio busy irrigating his maize crop. He saw us walking towards his plot, and, leaning on his spade, put his *sombrero* straight to await us. He did not show any surprise to see strangers getting their feet muddy, in the heat of the day. We exchanged greetings and told him we were visiting the valley and were interested in irrigated agriculture. He began simply by telling us his name was Flavio, that he was an *ejidatario*, and that he did not own the plot he was working but share-cropped it with a fellow *ejidatario*. When asked about the pump in the main canal, Flavio explained that it was 'legal', since this part of the system had been irrigated before its construction in the 1950s. The new canal infrastructure had disrupted the old canals and now water had to be pumped out of the main canal. We asked what, according to him, were the main problems water users faced in El Operado. On this rented plot there were no problems, he answered, but on his own two hectare *ejido* plot, a kilometre away, he experienced problems obtaining water for his maize. The plot is surrounded by sugar cane fields which are soon to be cut, he explained. Sugar cane has to be left dry for 6 weeks before cutting, denying his maize water. Flavio had applied for an 'irrigation turn' several times, but the water guard (*canalero*) had turned down his requests, arguing that irrigating his plot would also mean the adjoining plots would get wet, as the irrigation ditches leaked. Despite this, and seeing his maize crop wilt, Flavio decided to simply take the water. Unfortunately the water guard caught him and he was fined 5,000 pesos (US\$ 5). He had not yet presented himself at the Rural Development District's office to pay the fine, and was worried that if he didn't pay they would deny him any future allocations of water.

There is little special about the story of Flavio. Any irrigation system of scale entails people facing similar situations. Why then start a thesis with such an insignificant meeting between a farmer and two researchers? The story highlights the different aspects intertwined in irrigation situations. Firstly, Flavio explains an historical aspect relating to why he is allowed to use a pump in the main canal. Secondly, the problems he faces in his own *ejido* plot uncover a technical dimension; if the field ditches had been properly constructed and field drains existed then he would have no problems with water distribution. The story also reveals an organisational reality: the important roles of both the *canalero* (a low-placed field officer), and a farmer who has to report directly to an engineer at the District headquarters. Apparently, no farmers' organisation, such as an irrigator group, exists at canal level to which Flavio could have appealed. The story also raises an agricultural issue, of differing irrigation requirements for different crops (here maize as against sugar cane), in addition to which there is also



an economic antagonism between sugar cane growers and maize farmers. If we would take a closer look, underlying this antagonism is a power issue at stake; it appears that District officers give preference to specific crops, such as sugar cane, and to specific groups of producers.

Practitioners in the field, farmers and functionaries alike, by experience are well-acquainted with the multifaceted reality of irrigation situations. For planners, but also design engineers and social scientists concerned with irrigation development, however, this is not always the case: their specific skills make them value some aspects more than others. The present thesis is concerned with such a multifaceted reality, a medium-size government managed irrigation system in western Mexico, known as El Operado. It addresses a particularly 'hot' issue, that of water users' involvement in management and of turn-over to the users by the government of considerable responsibilities with respect to the operation and the maintenance of this 8,700 hectares irrigation system.

By means of a detailed case study, a particular way of looking at irrigation organisation will be developed: one that starts from the idea that people's practices make an irrigation system work, and that focuses on the interactional patterns between social actors. The case will show that this focus provides a way of depicting how, for instance, water distribution and canal maintenance is implemented through an interplay of actors and canal structures, and thus highlights how in concrete situations the material reality and the social processes that emerge influence each other. It will be argued that such an interactional approach accounts for the different aspects of organisation (economic, historical, formal-juridical, power issues etc.), and helps to understand the irrigation organisation in terms of the formal and informal organising processes present. Since the organisation of El Operado was in a process of change during the research, the present thesis also provides an analysis of recent outside interventions, and how local actors responded to them. The analysis throws up a number of ideas concerning more effective ways of intervening in the management of irrigation systems. It is believed that a case-study, which combines technical and social aspects within one analysis, might appeal to both design engineers, social scientists and managers, as well as to practitioners in the field.

## 1.1 Irrigation and its social dimension

From the existing body of literature on irrigation, we learn that irrigation studies have many faces. Research findings seem to be heavily influenced by the disciplines of the various scholars, and thus apparently by the *a priori* suppositions these scholars have. Irrigation engineers predominantly focus on operational and technical problems in irrigation systems (Palacios Vélez 1981, Boman and Hill 1989). Organisation consultants stress the inadequacy of institutional arrangements (Bottrall 1981, Sagardoy et al. 1982, Huppert 1989), identify a huge gap between farmers and functionaries, and

propose ways to bridge it (Freeman and Lowdermilk 1985, Groenfeldt 1988). Political scientists find that access to irrigation water and land is differentially distributed, and show a growing differentiation among farmers (e.g. Finkler 1974, Konings 1981, Scott 1985, Weigand and Siordia 1987). Some study in detail meetings between farmers and functionaries (Adams 1978, Murray-Rust and Moore 1983), and critically analyse irrigation bureaucracies (e.g. Székely 1977, Mares 1980, Wade 1982, Cruz Majluf 1984, Hewitt de Alcántara 1985, and Chambers 1988). Developmentalists will emphasise the need to implement new, and better, irrigation projects (Esman and Uphoff 1984), or to transform the bureaucracy (Korten and Siy 1989). Economists may find that investments in rain-fed agriculture give higher returns. Anthropologists are fascinated by the social and cultural content of irrigation (e.g. Leach 1961, Fleuret 1985).

It is probably true that these different faces of irrigation are present at any one time in a given system. There are after all many issues to consider simultaneously. Few irrigation studies, however, have focused on more than one aspect. Still fewer have studied the interconnectedness of such issues. Interesting attempts have been made by Barnett (1975), Hunt and Hunt (1976), ter Hofstede and van Santbrink (1979), Henao (1980), Eilander et al. (1986), Martin (1986), Merrey (1986), Enge and Whiteford (1989), and Diemer (1990). One major difficulty with studying irrigation is posed by the relationship between its physical infrastructure and its important social dimensions. Studies that pair technical insights with social analysis, however, are sparse.

Large to medium irrigation systems have two basic characteristics which give rise to particular social processes. The first is that large scale irrigation normally requires huge investments, and that once these are made agricultural productivity rises, and thus, those who have access to irrigated land reap extra benefits. The other is that operating irrigation systems, encompassing two or more farmers, requires co-ordination. Both characteristics come together when the system is in operation, and work simultaneously. Below both characteristics are briefly discussed, starting with the latter.

The physical infrastructure of an irrigation system, including the system of canals, drains, dams, and division structures, places certain demands on the farmers and government functionaries involved. The synchronisation and coordination of activities is required through an institution responsible for water distribution, canal maintenance and strategic decision-making. In many cases producers (water users) and nearly always non-producers (for example landlords, and the government) will delegate responsibility or decision-making powers to individuals in that institution. With the presence of such an institution a division of (and thus specialisation of) tasks will exist, often arranged along hierarchical lines.

Constructing irrigation systems normally requires a vast investment, in terms of labour, materials, and/or capital. Often it is beyond the capacity of an individual farmer to make investments in developing irrigation schemes. The person or institution who makes the investment will often control access to the irrigation infrastructure. Consequently, it is not normally the farmers (those who till the land) who control direct access to the infrastructure and irrigation water. Hence, irrigation in some way or other implies the existence of inequalities of power, and different groups of users can be

distinguished according to their differential access to resources. These groups relate to each other in specific ways, for example through renting contracts, share-cropping, wage labour, and water distribution.

Thus, the need to coordinate activities, and the issue of who made the investment and who reaps the benefit from it, implies that in an irrigation system different positions and actors can be identified, who will establish particular patterns of interaction. In this way an irrigation system influences various social relationships. In a general way then, a particular physical infrastructure makes certain authority positions and specific forms of representation possible, and inversely, different groups and positions will shape the way the irrigation system is used and adapted. The question to address is how to empirically study this interplay.

It is not enough to identify different groups and positions of authority. These categories are by no means consistent, but are made up of people who may act differently in varying situations. To appreciate fully the dynamic nature of irrigation situations, it is necessary to view people as actors, that is as knowledgeable and consciously acting beings (Long 1984, 1989), and to analyse their actions vis-à-vis the material world and vis-à-vis each other. To study people's actions, I will use four basic concepts: practice, social interaction, organisation and intervention, which I discuss in the following section.

### *Practice*

People's actions have a relationship to both their intentions and to the material and physical conditions in which such action takes place. The concept of practice (Bourdieu 1977:96-97) refers to the visible undertakings of people which can be studied empirically through observation. The actions of people take place, and become relevant in the context of time and space. 'Time' refers to the fact that the practices of an actor are historical in the sense that they relate to former practice and experience. 'Space' is understood as the material-physical environment (including irrigation infrastructure) in which action takes place. Both these contexts are important because they shape the practices of people.

Compare for example the irrigation practices of a tail-end farmer with those of a head-end farmer. It will appear that their differing spatial position in the irrigation system results in different practices. The tail-end farmer will need to mobilise labour to control feeder canals and division-structures when s/he irrigates, or when s/he also chooses other crops. With respect to time, the practices of the tail-end farmer will be the result of his/her former experiences with upstream farmers who may 'steal' irrigation water. Hence, practice implies a history of experiences and cannot be fully understood without an appreciation of the spatial and temporal context in which it takes place.

The concept of practice enables us to assess how a particular type of irrigation infrastructure is related to particular actions of people. It also enables us to root our analysis in the problems and constructs utilised by the people we study (Bourdieu 1977:91). In this way we can better understand the irrigation situation not only from the perspective of formal concepts, but also in relation to the 'folk' concepts used by the

actors themselves. For instance, according to Flavio's own account, he did not steal the irrigation water, he simply took it. Through observation, the concept of practice gives us an initial focus on how human activities shape the functioning of irrigation systems and how the irrigation system provokes particular activities.

### *Social interaction*

Social interaction is a particular case of practice. By the concept of 'social interaction' we mean the processes which ensue when people come together and exchange goods, words, or share experiences. Social interaction, more than practice, is a dynamic concept since it acknowledges that when people come together a middle-ground emerges which cannot be wholly reduced to the constituent parts of the interaction. Social interactions thus have an emergent nature (Long 1989; cf. Sayer 1984:113). Outcomes of interactions consequently may be unexpected.

A related concept, that of 'interface', is used in those situations where contacts and negotiations between social actors who differ in terms of access to resources, social relationships and cultural background, take place (Long 1989).<sup>1</sup> In irrigation systems different social groups are involved, such as head- and tail-end farmers, bureaucrats, tenants, agricultural labourers etc. Such an irrigation system would not function without these different actors' interactions. Irrigation systems, then, engender many interface situations.

Studying social interaction may reveal patterns or structures underlying the social relationships around irrigation situations without the researcher having postulated beforehand what the characteristics of that structure are.<sup>2</sup> Furthermore, the study of social interaction may help to uncover the dynamic of these patterns. If one, for instance were to study 'the structure of water distribution' in a particular irrigation system, it is possible to gather much quantitative data on water flows at different points in the irrigation system, out of which patterns would emerge. Yet such an analysis would say little about why people deal with the physical system in this way, and why these structural features exist, how they emerge and why they are perpetuated. Studying a handful of key-actors in the water distribution process, and their social interactions associated with that process, would generate further essential information that helps to reveal why the distribution pattern is as it is. One important methodological implication of taking social interactions seriously is that my own research activity became part of the research, since most research material was generated through my interacting with people.

As the following chapters will show, the study of people's practices and social interactions in El Operado revealed that particular practices and interactions emerged in particular physical settings which I have labelled 'domains', in the practical sense of territory. Yet from the material presented it emerges that domains are more than simply spatial or physical settings. In a particular domain, people behave in particular ways, and also expect particular attitudes of others, and value particular things that in other domains might be quite irrelevant. Actors may also derive part of their identity and self-esteem from the domain to which they feel they belong (cf. Karp 1978:155). Farmers in the field, then, behave differently from farmers' leaders in an *ejido* meeting, and

engineers in their offices have developed yet other practices. Engineers control much of what is going on in their offices, but on a field trip they often are not capable of exerting control over, say, farmers. Reversely, farmers lose confidence when visiting an engineer in his office. Moreover, the moment farmers interact with their leaders in an *ejido* meeting, or farmer leaders with engineers, a link is established between different domains, which is in fact an interface situation. Such interface situations are important for understanding irrigation organisation.

### *Organisation*

Organisation is a widely used concept, and can be understood in many different ways (Morgan 1986). The concept suggests that an organisation is a clearly bounded entity, which it often is not (Long and van der Ploeg 1989). Irrigation organisation in particular poses some problems. First, irrigation does not involve a homogenous group of interested persons, but rather the organisation of groups of actors who differ markedly from each other. This is compounded by the fact that groups normally are not exclusively involved in one organisation, but often in other (formal and informal) organisations as well. Second, it seems that especially in irrigation systems organisational problems abound. This must partly be attributed to the fact that a gap exists between the formal organisation and the actual way in which the system is managed. I choose to take the field situation as a point of departure. I prefer to speak of organising processes, which include those actions and interactions of people that actively contribute to the way in which the system is operated. In this thesis, three types of activities are studied: water distribution; maintenance of infrastructure; and activities concerned with management issues<sup>3</sup>. These activities can be studied with the concepts introduced above.

Organising processes in irrigation systems often involve power issues. The government agency in charge of the system's management tries to control the water users, but the latter devise strategies to attain certain goals and may evade certain duties. Here also knowledge comes in: actors learn, acquire skills and produce knowledge while they cope with situations in which power differences abound. In particular, in a situation where the formal organisation is turned up-side down, and negotiations between water users' representatives and government functionaries develop in order to define new formal arrangements, power issues are at stake. In the concluding chapter I will re-examine the way in which power in irrigation organisations can best be understood.

### *Intervention*

Irrigation development implies outside intervention. The concept of intervention is problematic, as it suggests a marked distinction between inside and outside (or local and national), and a distinction between pre- and post-project situations. In concrete situations such distinctions are not clear cut, if found at all (Long and Van der Ploeg 1989:4; see also Elwert and Bierschenk 1988). Nevertheless engineers and experts continue to make interventions that assume such dichotomised distinctions. Not surprisingly, then, our efforts often fall short of expected benefits.

In my view, projects and organisations exist through people's practices and their interactions. In order to reveal which organisational problems are present and how they evolve, it is necessary to shift our focus to concrete processes of social interaction which occur in the irrigation system. Intervention should then be understood as a process which purposely introduces new criteria around which interactions take place, and which may eventually lead to a breach with existing patterns of interaction. Interventions, then, involve processes of negotiation and accommodation. Since interventions are often aimed at a change in the existing social order, it is important to analyse whether these pretensions are met. This can be done through the examination of people's practices, since, as Giddens has argued, social change should 'involve alterations in the character of day-to-day social practices' (Giddens 1987:139).

### *The research question*

This thesis, then, provides a case study of one irrigation system, in which a particular way of describing and analysing organising processes is adopted, by using the concepts of practice and social interaction. In this way one attempts to analyse how people's practices and their interactions relate to the physical infrastructure and the formal organisation of El Operado. This research question thus includes formal and informal ways of managing the irrigation system, and also accounts for the ways in which both the technical and the social aspects influence these processes. Finally, the thesis provides an analysis of a series of interventions concerned with handing over part of the management tasks of a government agency to a water users' organisation. I will examine how the organising processes change over time in face of these interventions. This way of viewing irrigation organisation will generate a number of findings, which point to a new way of diagnosing irrigation organisations, and provides a number of suggestions for how interventions in irrigation organisations can be implemented.

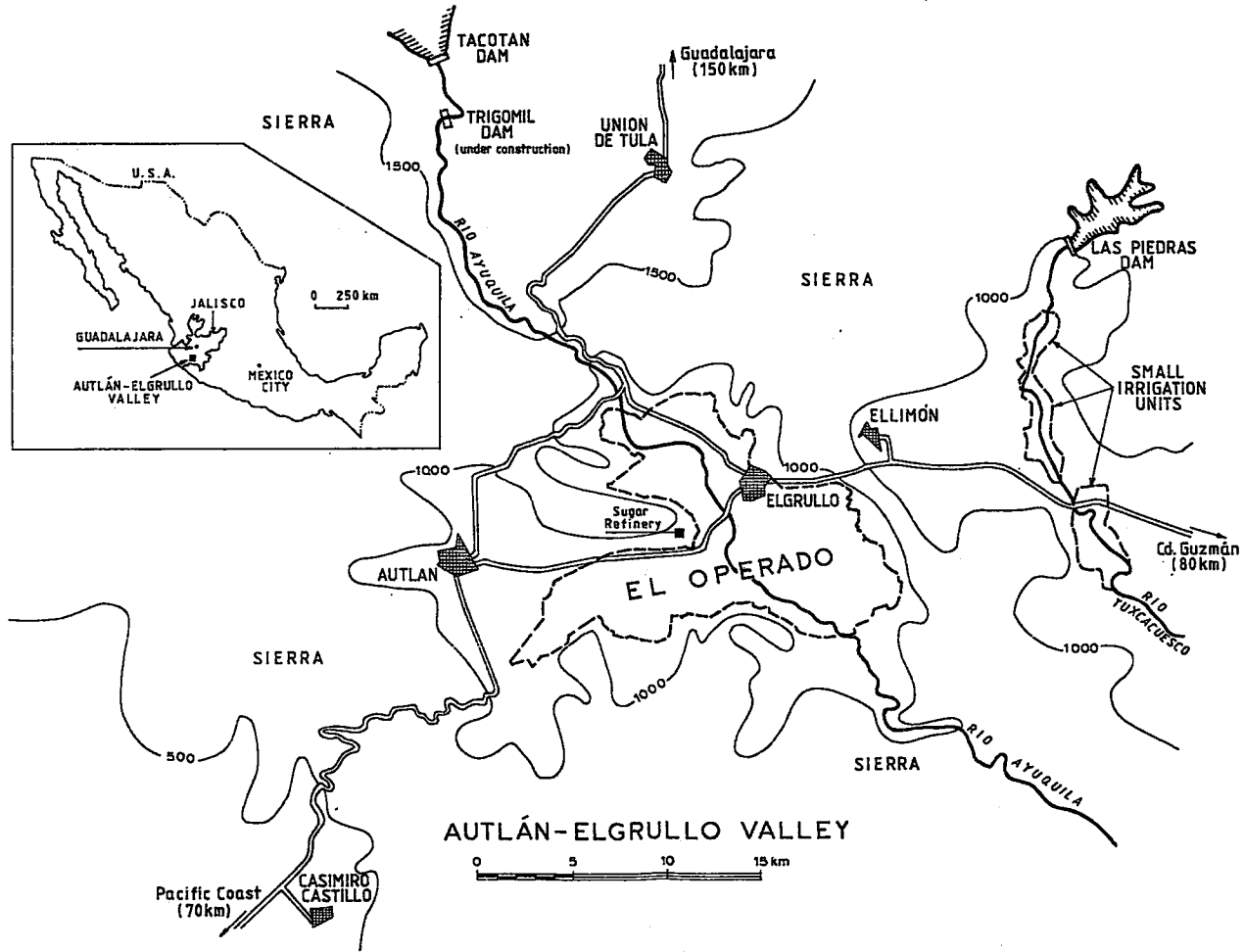
## 1.2 The El Operado irrigation system

It is rewarding, on a day, say in April, to make the trip to the Autlán-El Grullo valley, cross the plain, follow some canals and just look around. Travelling to the valley from Guadalajara (a three-hour drive by car) means first to experience the beauty of the rough, dry and grey landscape of the Sierra Madre Occidental, then to take the many sharp bends, decorated with white crosses of remembrance, that the road traverses in its descent of the ravine, below which the Río Ayuquila meanders, and then to have a panoramic view of the lush green valley with the towns of El Grullo and Autlán. Once having touched down, you might decide to cross the entire valley taking the 18 kilometre road that connects Autlán with El Grullo, the main urban centres, situated respectively at the western and eastern extremes of the plain (figure 1.1).

Looking to the hills reveals little; on their dried up slopes you can discern the many

Figure 1.1

The Autlán-El Grullo valley with El Operado



cactus trees which will soon blossom with their delicious *pitaya*. Here and there you may see fires; the *coamil* farmers have started to burn their fields, and with the first rains (in two months time, in June) will sow their maize. Along the road from Autlán to El Grullo, you cross a lined canal. This canal marks the beginning of the El Operado irrigation system. You cannot escape the sight of sugar cane. There are recently cut empty fields with scruffy roots left to shoot again, and elsewhere unharvested cane that grows three meters high, obscuring your view. The road, in fact, is in pretty bad shape and all around you see cane stalks littered on and along the road, the explanation for which becomes obvious when you overtake an overloaded trailer, every pothole causing the loss of some of its load.

In some places you will see a huge black column of smoke, and if close-by, you would be amazed by the noise with which the fire eats the sugar cane leaves. The heat being unbearable you prefer to go on, where you will see the cane cutters, all black from the burnt cane, cutting their way through the fields. Some funny looking machines are scraping the canes from the ground and loading the trucks which, groaning under the heavy load, have difficulty getting out of the uneven fields. The sugar factory you will probably smell before you see it. The factory and the numerous trucks parked in front waiting to be unloaded, makes an impressive, industrial sight. You will not hang around long because of the smell, so you will probably miss both buildings flanking the factory, on the right the building of the sugar cane growers organisation affiliated to the national peasant union, the *Confederación Nacional Campesina* (CNC), consisting mainly of *ejidatarios*, and on the left, of course, as a counterweight (although much smaller), the CNPP building (mainly consisting of the bigger private landowners, affiliated to the *Confederación Nacional de la Pequeña Propiedad*). Across the clumsy bridge over the Río Ayuquila you will discern the town of El Grullo. If you branch off the main road and take a dirt-road, you can see many other crops interspersed between the dominating cane: maize, beans, green tomatoes, alfalfa, egg plants, courgettes.

There are many irrigation canals in sight. They have been properly constructed and are lined. In fact they seem quite new. Many canals, however, are overgrown by weeds, and are partly silted. Very probably, along one such canal you may see a small group of farmers, easy to distinguish by their *sombreros*, gathered around a water division structure. You may see some bicycles scattered around, and perhaps one or two 'pick-ups'. Their owners are waiting for the water guard to come, and will request an irrigation turn. Going on, you pass a small hamlet, and at a beautiful spot again you cross the river. Nearer to the hills now, a few more kilometres down the road you cross the main canal. You are now at the very tail end of the right bank main canal. There is a nice view of the valley, in the distance you see the sugar refinery, and beyond, El Grullo lying against the slopes of the hills. With some imagination you can also make out stretches of the main canal. The concrete canal is skilfully laid out in the landscape, as it follows the contours of the lower flanks of the hills in order to embrace as much as possible of the valley's plain. So you decide to follow the canal. Its height and curves provide unexpected panoramas. If you keep on following the main canal (60 kilometres long) you end up not far from where you first entered the valley. Here you find the head works of the irrigation system. The diversion dam in the riverbank leads the water



into intake structures on both sides of the river, and feeds both main canals. Knowing now where the water comes from, you have completed your '*tour del operado*'.

This impressionistic description may serve as a first introduction to the research area. I here want to give some additional background information. The Autlán-El Grullo irrigation system was constructed in the 1950s, covers some 9,000 hectares or nearly half of the valley plain, and is managed by a government agency. Therefore, everybody knows the system as El Operado: that which is being operated, i.e. by the government. The relatively high crop yields (sugar cane 90 tons/ha; maize 4-8 tons/ha etc.) make El Operado a successful irrigation system. These high yields are in part made possible because in most years there is sufficient irrigation water available. In addition, the canal infrastructure is presently in good shape, since the primary and secondary canals were lined under a rehabilitation project during 1980-1984. The government agency managing El Operado is the El Grullo Rural Development District (*Distrito de Desarrollo Rural*). The District is responsible for the water distribution from storage dam to individual farm plots, for canal maintenance up to and including the tertiary canals, and for decisions concerning water prices, crops to be grown, conflict resolution etc. El Operado is a typical centrally-managed irrigation system. However, in 1988 a water users' association was formed, which in 1989 took over responsibility for canal maintenance and in 1990 gradually became involved in water distribution as well.

The situation I encountered when conducting field research (February 1987 to April 1989, completed with a visit to the area in April-May 1990) enabled me to study how the formal set-up of El Operado's management contrasted with actual organising patterns. Moreover, during field work, relationships between water users and government officers gradually changed because of the process of 'handing over' management responsibilities to farmers. In conclusion, the field work situation was quite appropriate for the research project which I outlined above.

### 1.3 The research methodology

Let us, for a moment, return to Flavio and the small story presented at the outset of this chapter. Apart from it telling something about Flavio and the irrigation system, it also tells something about the two researchers who are eager to believe what the farmer tells them, although they lack any knowledge about the context of that particular situation. The way we strangers rush to 'the small farmer' sets one thinking, as does also the way Flavio awaited us calmly, with ample time to judge these two foreigners and to think over which story he would make us believe. The case shows some of the limitations of field material. As researchers we actively helped to shape the story which was told, by the way we initially approached Flavio, and by the things we wanted to hear. Moreover, the presentation of the story was highly dependant on the way we wrote up our day's report. At the time we noted things that we later did not bother to write down; many

of the details we did not appreciate until later during the field work. Finally, the small story reveals how our positions as researchers differed markedly from that of Flavio. He has a problem; we are interested to record it. With him we review briefly some possible actions Flavio can take. But in the end we are off again, leaving Flavio with his problem.

In any research considerable attention should be given to the presence and place of the researcher (Callon and Latour 1981:301). When studying interactions, this is almost automatically accounted for, as any interview or other form of communication between researcher and researched population already belongs to the interactional domain. I do not, therefore, in the following chapters write myself out of the story. Not because of some sort of vanity, but rather to give the reader an extra means by which to assess the quality and status of the field material presented.

I myself took part in interface situations (see Long 1984). It is because 'people become aware of their culture when they stand at its boundaries' (Cohen 1985:69) that I am able to do research in unfamiliar societies in the first place. And this can only be a two-way process, since it is equally valid for the people I study. In the dialogues I engaged in with the people I studied, both parties changed a bit. Our horizons merged slightly (Markus 1986:29), and thus widened. This 'transformation into something common' is the emergent quality of social interaction (Gadamer cited in Markus 1986:29). In our effort to understand each other, we are in fact trying to overcome the structural constraints that underlie our thoughts. When I ask my Mexican friend why certain things are as they are, in his answer he is trying to externalise the implicit, explicate the taken-for-granted state of affairs. In some way, this process comes down to a self-investigation of the (im)possibilities for changing that state of affairs. It is like a test, like a pilot project of possible ways for change.

When I ask him why there is such a widespread distrust among *compañeros*, he cannot answer other than through local folk sayings, invariably metaphors of the animal world. In the dialogue, we can explore each other's boundaries, and thus the 'impossible' or 'unthinkable' takes shape. I become aware of the structural constraints present in that society, and in my own. Hence the dialogue is a forceful tool, not only in research but also, and especially, in evaluating possible interventions. Devising intervention, therefore, is necessarily a social activity, in which those involved have to participate.

The researcher, then, is also an actor. The subjectivity of the researcher, however, is not to be understood as a 'weakness' of the research. On the contrary, all research uses subjective observations, even when it is claimed to be as objective as possible. If consciously accounted for, subjectivity may thus become a strength of the research (cf. Sayer 1984:223). Monitoring of one's own actions emerges as important. This requires that the researcher opens up himself for a critique. This provides yet another perspective: if I open up, then I may also question the role my discussion partners play. Then, dialogues are likely to ensue, and these are the most satisfying for the researcher.

The study of social interaction and intervention implies that as a researcher you have to work with a variety of people, who live in different social worlds. For instance, the study of water distribution makes little sense if the combined presence of water users,

field officers and engineers is excluded. I had to act strategically therefore, in order to create a sufficiently broad social base, and to get accepted not only in the field (among farmers), but also in the engineer's office, and among the field personnel. I of course only partly succeeded. I think, however, that by the end of the research period I had established sufficient contact with a number of people from various social worlds within my field of study. My fellow researchers, and the Masters students who undertook their own research under my supervision, greatly added to broadening my scope, since they created their social bases quite separately from mine.

Despite the warmth I received from the friends I made, maintaining relationships with a wide variety of people was sometimes troublesome. In the quite polarised society I plunged into, this meant that I had frequent contact with persons who among themselves would never mix. Sometimes, then, I found myself confronted with conflicting loyalties. In addition, mixing with certain people stigmatised myself before others. Anyway, I tried my best to steer a course in between and act strategically. I also tried carefully not to compromise those who had become friends, and never to let my research work take precedence over my loyalties to friends. It remains to be said, however, that with this kind of actor-centred fieldwork it is sometimes difficult to assess where the work ends and one's private life begins.

I want to mention one major limitation of the social base I enjoyed, and thus of the present study: It was clearly male-biased. I attribute this partly to being male, in that it is easier for a man to mix with men than with women in the region where we worked, and partly by the fact that irrigated agriculture in that region is simply dominated by men. Consequently, this thesis does not address explicitly the issue of gender in irrigation systems.

### The manufacture of data

I of course indulged in the usual scramble for 'objective' data, like statistics, water discharges, cropping patterns, and also data on projects and programmes.<sup>4</sup> However, this did not take very much of my time. More important were field trips: observing crops, canals, water flows etc. For the chapter on history, I also consulted written sources, but most of my time was spent on developing the life histories of a few well-informed and aged *ejidatarios*. Obviously, the interviews carried out with these fascinating people were unstructured, in order to leave them as much space as possible to talk. The interviews were recorded on tape. The *ejidatarios* did not object. On the contrary, they agreed with me that these historic facts should be carefully recorded or else would get lost, 'since the younger generations did not bother any more'.

For the chapters on irrigation activities I used different mixes of the following methods. First, observing events in which I could participate, such as canal cleaning, formal meetings, informal gatherings etc. Second, unstructured interviews with involved people, both in the field, in my car, in a social place, perhaps in my house or in the house of the interviewed. Third, with people whom I had gradually established a relationship of trust and with whom I could hold dialogues rather than interviews. In

these discussions my discussion partner knew that I might use the material for research purposes. On a few occasions small group discussions were held with two to five people, most of which emerged spontaneously. Twice, however, I purposely organised them. In one situation I was allowed to record the lengthy discussion on tape. It should be recognised that the mere presence of the researcher often produced interesting events, interactions and discussions. I tried always to record carefully such circumstances.

With some persons whom I considered especially crucial informants, or crucial actors in El Operado's dynamic, and only if we both liked each other, I held interviews and we had discussions at regular intervals over a greater span of time. I joined them in their work at various times. With some I conducted over a dozen interviews spread over the research period (two and a half years). With these, I not only hoped to capture some aspects of an often complex sequence of events, but also to record developments in the actors themselves. I wrote a chapter based on one of these friends (the water guard). I explained this to him, and gave him a draft version in Spanish. He wholeheartedly gave me permission to publish it.

For another chapter, that on canal maintenance, a survey was conducted by a Masters student. The only other 'survey' conducted was on sugar cane distribution. This was done mainly on the computer (material came from an archive), and analyses were discussed with some extremely well-informed farmers. So, it was not a survey in the strict sense of the word. In my view this manner of generating data was time-efficient, and more importantly, did not create a row for me with big sugar cane growers, who easily could have made my life difficult.

For yet another chapter I modestly participated in the stream of events. Here I refer to the water users association when it was in its formation process. I participated in a formally appointed committee of water users, and thus influenced slightly its outcome. More important, I think, were discussions with some of the farmers and functionaries in informal meetings, where we brainstormed about this new organisation, and reviewed possible set-ups and ways to overcome obstacles. In one other way I was a participant in these events, in that I gave certain actors information to which they did not have access, in much the same way as they provided me with information I did not have access to. One report came out of the irrigation research which was purposely written for the benefit of the 'research population'. This report was written by Piet Sijbrandij, the M.Sc. student studying canal maintenance (Sijbrandij 1989a). It described the actual problems of canal maintenance, and gave some suggestions to the newly formed Water Users' Association on how to tackle maintenance once it was in place.

Additional information, and a crucial aid to contextualising my understanding of the valley, came from my research colleagues through the many discussions and seminars we held. They provided me with certain realities I did not know of: at household level, the world of the agricultural labourers and the sugar cane proletariat, and most contrastingly, of the opulent horticultural entrepreneurs of the region. In addition, several students did field work for their Masters thesis while I was in the research area. They performed independent studies, which I merely tried to facilitate. Their findings were important sources of information for me, and provided me with new windows on

the valley's reality.

## 1.4 The structure of the thesis

The thesis has the following structure. First, the temporal and spatial contours of El Operado are examined in two chapters. Then, three chapters are dedicated to the practice concerned with water distribution, with canal maintenance and with management issues. Subsequently, two chapters deal with three interventions concerned with decentralising El Operado's management, and assess how these interventions, in the end, resulted in a change of irrigation practice. This structure enables me to build an argument on how social practice and the physical irrigation infrastructure are related and how social practice changes over time.

Chapter 2 gives an historical account of the development of the irrigation infrastructure. The chapter shows how projects concerning water and land have influenced the relationships between three sets of actors; namely, entrepreneurs, peasants and government functionaries. This chapter also shows how, in turn, these three groups of people have played their part in developing the infrastructural works. The chapter reveals three basic themes which will again crop up in the following chapters. The first is the tense relationship between insiders (those from the valley) and outsiders. The second is the contradiction that exists between small farmers and the local elite. The third theme highlights the difficult position that intermediary actors, especially farmer organisations, are faced with, because of the awkward, mediatory role they play between the farmers and elite.

In chapter 3, the El Operado irrigation system is introduced through an analysis of how the specific lay-out of the canal infrastructure has influenced the way the system is being operated, with special emphasis on the access to irrigation water; and how the irrigation system relates to access to land. This chapter thus highlights the left-hand side of the equation physical infrastructure - social dimension. Chapters 2 and 3 provide the necessary contextual information for the subsequent chapters, which describe in more detail different irrigation situations.

Then follow three chapters concerning practices of water distribution, canal maintenance and the making of the annual irrigation plan. These chapters provide detailed empirical material on how these three types of activities are undertaken. The research methods are different from chapter to chapter. Water distribution is described in chapter 4 through the case study of the crucial actor in water distribution matters, the water guard (*canalero*). The focal point is the social actor. The specific knowledge the water guard has with respect to the canal system is described, as well as the relationships he maintains both with water users and his superiors in the District. I also describe the strategies he devises to comply with his task. I conclude that the water guard forms a crucial link between District functionaries and farmers, and that he is

more than simply subordinate; he actively shapes water distribution.

Chapter 5 starts with problematic situations which emerged because of canals silting up. An attempt is made to analyse the actions and interactions which unfold around these situations: actions of water users directed at the canals, interactions among water users, and interactions between water users and the maintenance department of the District. The internal relationships of the department are also examined. A major organisational gap is detected between the 'field' and the 'office', which is partly filled by the initiative of informal water user groups.

Chapter 6 concerns the making of the irrigation plan by the operation department of the El Grullo District. This chapter gives an institutional chronology of decision-making, which falls into two parts. The first part follows some District officers in their efforts to formulate the annual irrigation plan that defines the crops to be grown during the irrigation season, the volumes of irrigation water distributed and the level of water fees to be paid by the farmers. The second part deals with how District engineers 'sell' the plan to the water users in a meeting of the water users commission. In this chapter the various settings of social interaction receive attention, which helps us to appreciate certain social situations as arenas of negotiation and struggle.

The following two chapters are about intervention and change. Chapter 7 analyses interventions undertaken with regard to the water users organisation. It starts with an intervention by local actors (District engineers) who decided to create a water users commission in 1980. The second intervention includes regional actors at State level who in 1988 ordered the head engineer of the El Grullo District to form a new water users organisation to take charge of canal maintenance. The third intervention concerns a new policy of the Ministry of Agriculture and Hydraulic Resources (SARH) to re-organise the Districts, which had quite unexpected and negative implications for the El Grullo association. The chapter relates policy measures devised in the political centre to local initiatives. It tries to understand the outcome (the water users association) in terms of negotiations and institutional networks, both local and extra-local.

Chapter 8 concentrates on the internal dynamic of the Water Users' Association. Crucial was that its organisational set-up was adapted in such a way that the association became better articulated with existing (informal) practices of the ordinary farmers. Chapters 7 and 8 lead me to conclude that interventions in irrigation organisation, especially those aimed at decentralising management, are likely to succeed only if they also involve change in social practice.

Chapter 9, the final chapter, tries to answer how people's practices and their social interactions are related to the physical infrastructure of El Operado and its formal organisation, and how these practices change over time. It also outlines an intervention perspective, while identifying some factors important for the diagnosis of existing irrigation organisations.

## Chapter 2

### **Crops and commerce, water and works; the valley's agricultural development, 1850-1985**

In this chapter I want to relate how the use of two crucial resources, land and water, developed in the Autlán-El Grullo valley during the period 1850-1985. The chapter will show how struggles over land and water, and struggles over projects<sup>1</sup> aimed at developing these resources, helped to shape the relations between three groups of actors: peasants, entrepreneurs and state functionaries. One of the conclusions is that certain patterns of relationships that emerged around 19th century projects, recur in more recent projects. This chapter, then, aims to present both the continuities and discontinuities in the development of resources. In this way the 'ethnographic present' is not seen as unique, but in continuity with the past. Furthermore, part of the material presented in this chapter comes from people still living, which helps us understand how they make sense of the contemporary through their interpretations of the past.

I break down the following chronological account into four periods. The first is the period between 1850 and 1940, where we see a shift from *hacienda* to *ejido*. The second period runs until 1968, during which old and new local elites searched for new agricultural opportunities. From 1968 until 1975, horticultural production for export begins to emerge and dominate the valley's economy. During the last period, from 1975 to 1985, the valley experiences a demise of horticulture and the new fashionable crop becomes sugar cane.

In the concluding section of this chapter, I briefly discuss how these agricultural developments have helped to shape relationships between actors from the valley with outsiders, especially state officials; and within the valley's arena, between entrepreneurs and peasant farmers. This provides a useful background in which to situate the subject of this thesis; namely the El Operado irrigation system (covering nearly half of the valley's plain) and the social dynamics that surround it. As an introduction, I first want to briefly highlight some of the changes that have occurred in the valley during the last 100 years.

The Autlán-El Grullo valley experienced rapid change during this century. Its population has quadrupled since 1900,<sup>2</sup> and agricultural production has grown even faster. The valley's landscape has been transformed; most of the trees that Kelly admired during the 1940s have all but disappeared, as farmers have levelled their fields and cut them down (cf. Kelly 1945:2-3). More people have access to land now than compared to the situation in 1900. This is the direct result of the land reforms which

took place during the 1930s and 1940s. By then the bulk of agricultural production was rain-fed. During the 1960s and 1970s this situation changed quite sharply, with the introduction of El Operado irrigation system in the 1960s, and later the deep-wells developed in the vicinity of Autlán during the 1970s. From 1970, production within the irrigated areas gradually became more important, not only because more than half of all arable land was under irrigation (with two harvests per year), but also since yields obtained in these irrigated areas were much higher than in rain-fed areas.

## 2.1 From *hacienda* to *ejido* (1850-1940)

As in other parts of rural Mexico, in the 19th century the Autlán-El Grullo valley had a dual agricultural system: food production for home consumption by the 'indian' population, and commercial agricultural production on the *haciendas*. The *indígena* population was engaged in the rain-fed production of food crops, mainly maize, beans, chili peppers and pumpkin. Production was on their communally held lands, partly situated in the valley, but mainly in the surrounding hills. The gathering of fruits and herbs, and hunting hill animals complemented their diet. The indians also produced indigo and in particular *grana* (cochineal, a crimson dye obtained from the crushed bodies of the cochineal insects, which are found on cacti). During colonial rule the Spanish exacted tribute from the indians in the form of this crimson dye, which was very cumbersome to produce.<sup>3</sup>

The *hacienda* lands covered a great portion of the flat alluvial lands of the valley and extended into the hills. On average, the 33 *haciendas* in the Autlán region covered 2,544 hectares each (Historia de Jalisco, vol.4:108,110). Since normally the owner (*hacendado*) resided in Guadalajara, the man in charge of a *hacienda* was the *administrador* or *mayordomo*. Agricultural activities included the production of food crops, normally through share-crop arrangements; the production of commercial crops, like rice, sugar cane and fruits, directly supervised by the *mayordomo*; the processing of these commercial crops, especially sugar cane; and finally the production of animal products, like meat and cheese.<sup>4</sup>

This system gave rise to the emergence of two different classes of peasants working for the *hacienda*. One group actually lived on the *hacienda*, in houses owned by it, and were forced to provide labour to the *hacienda* or else they were thrown out. These labourers worked mainly on the commercial crops and in the sugar cane refinery; activities directly supervised by the *hacienda*. During the rainy season, however, they also share-cropped produce for consumption. Women participated in agriculture, but also had to wash linen and carry out other household work for the *mayordomo*. This group, then, formed the *hacienda* proletariat. The *haciendas* generally owned much more land than could be worked by the people resident there. Therefore, to meet its



demands, the *hacienda* engaged in share-crop arrangements with other peasants. These lived in nearby villages, often *comunidades indigenas*. These peasants frequently chose to engage in share-crop arrangements with the *hacendado* because they lacked ox drawn ploughs, sometimes land, or were short of food. The *hacienda* provided the seeds, the oxen, the land and an advance in kind (often something like 2 hectolitres of maize for consumption and also feed for the oxen). In return, the share-croppers provided labour. Although the share-cropper was solely responsible for his field, harvesting was often carried out jointly by a group of share-croppers. They would go collectively from one field to another. The harvest was then divided into two equal parts, one for the share-cropper and one for the *hacienda* (often this created rows, because the *mayordomo* used to cheat), and a harvest feast was held, *el acabo* (the completion).

Some data suggest that the two groups of peasants developed different 'skills' or attitudes, due to their different positions. The *hacienda* peasants, not being 'free' had only one option, to cooperate. They necessarily developed, therefore, a more submissive attitude. They also had to endure a continuous ideological harassment by the *padre de pie*, the priest who also lived permanently on the *hacienda* whose salary was paid by the *hacendado*. In return, the resident peasants enjoyed some social security: guaranteed employment, and perhaps some assistance from the *mayordomo* in the case of an illness. The share-croppers, by contrast, enjoyed more freedom, as they had at least two options; to work for the *hacienda* or not. When they chose to do so, they became engaged in a commercial agreement, with the effect, according to some, of improved entrepreneurial skills. Furthermore, they had less difficulty in openly expressing their thoughts among fellowmen. Much later, in the 1920s and onwards, this differentiation between both groups of peasants had consequences for the way land reforms took shape.

One of the pillars of the *hacienda* system was repression. The system could not function without an elaborate system of vigilance. Especially with regards to the lands that were share-cropped, the *hacendado* had to ensure that peasants did not take any produce. For this reason, the landscape was adapted. A number of adjoining fields (each measuring one *yunta* or approx. 4 hectares) were enclosed by stone walls, trees and cacti, called a *potrero*. (The fact that to date all farmers still use this concept indicates the important impact this ordering of the landscape had and still has.) Their size varied greatly, from 20 to as much as 200 hectares. Each *potrero* had its own name.<sup>5</sup> This type of taxonomic classification helped people to make sense of the world around them, and became references often used in everyday conversations. This taxonomy of the landscape was especially important to the functioning of the *hacienda* administration, who supervised and coordinated activities in a dozen of these *potreros*.

The *potrero* often had only one entrance with a gate (some names of *potreros* still refer to this gate: *Puertas Cuatas*; *El Golpe*; *Puerta con Don Chon*) which was guarded by someone who was appointed by the *mayordomo*, the *velador*. Anyone entering or leaving the *potrero* was thus scrutinised, by a fellow peasant. To share-crop, then, did not mean you had free access to the plot you cultivated. At the beginning you could freely enter in order to plough the land, sow, cultivate and weed. But soon afterwards, the *potrero* was closed. If you wanted to pick some fresh *elotes* (corncoobs) from your field, you had to ask permission from the *mayordomo*, who would give you a piece of

paper with the number of *elotes* you were allowed to take. At the gate of the *potrero* you had to give this paper to the guard who checked your cache (informants say that if you had picked a few too many, he would report you and take the extra *elotes* for himself). The *mayordomo* would take note of the number of *elotes* picked, and would settle the account at harvest time.

The *veladores* formed part of a group of workers who held intermediate positions in the *hacienda* administration. The *mayordomo* conceded to them certain privileges and responsibilities. This situation created discord among the peasants. The *hacendado*, through the creation of these intermediary positions, was able to exploit those interface situations in which people of similar social backgrounds found themselves placed in antagonistic roles with each other; like the *velador* and the share-cropper. These intermediate positions, of course, gave rise to abuse and corruption. The bosses had no interest in combatting these, and peasants lacked the physical and organisational means to do so.

#### Competing over water: irrigation and domestic use

During the 19th century, there were at least six irrigation systems in the Autlán-El Grullo valley. All six were in the hands of various *hacendados*, and invariably used for raising commercial crops, particularly sugar cane (table 2.1). Such infrastructure involved large investments for the construction of diversion dams and canals, and it was common place to find small sugar refineries (*trapiches*) linked to such structures. In some cases, like the Ahuacapán irrigation system, the irrigation canal ran through the refinery, where it provided hydropower for the mill (*ingenio*). Later in this chapter we will have a closer look at the irrigation system owned by two *haciendas* near Ayuquila, not far from El Grullo. This was the biggest system, irrigating at least 300 hectares. At two points water from the Ayuquila river was diverted into two canals (1800 and 1100

Table 2.1 19th century irrigation systems in the valley of Autlán-El Grullo

site	hacendado	area irrigated	crops grown	installations
Ahuacapán	Valencia	c. 70 ha.	sugar cane, fruit trees	<i>ingenio</i>
Ayuquila	La Laja	c. 50 ha.	sugar cane, fruit trees	<i>trapiche</i>
Ayuquila	Rivera	c. 250 ha.	cane, rice, fruit trees	<i>trapiche</i>
Ayutita	various	c. 50 ha.	plantains, vegetables	-
Chacaltepec	Arias	c. 50 ha.	rice, sugar cane	<i>trapiche</i>
El Chante	García	c. 50 ha.	fruit trees, maize	-

Source: own field data

metres long, respectively), each with a discharge capacity of 200 litres per second.<sup>6</sup>

*The Autlán town water supply: a case of historical continuity*

Apart from its agricultural use, water was crucial for domestic use. Often, conflicts emerged between farmers and villagers. The town water supply of Autlán is a case in point. Near the town runs a small river, the Arroyo Ayutita. This river was dammed to supply drinking water to Autlán. The intake structure in the Ayutita river for drinking water dates back to as early as 1775 (Colección., VI, 1882:337). Since then, the town council started several projects to secure enough drinking water, but with little success.<sup>7</sup> As late as 1979, a new project involving a storage dam was formulated but due to insufficient funds was not implemented.

Ayutita water was not only used by the town, farmers also used it, for irrigation. In the 19th century, irrigation water was diverted from the river by 5 *hacendados*. By the second half of the 20th century it was mainly the *ejido* Ayutita who used the water for vegetable production. During the 19th century, various conflicts between the town council and these entrepreneurs developed.

In 1851, the Jalisco Congress issued a decree defining the 'exclusive role of the town councils in the administration of the waters' (Colección, II, 234). This decree stimulated the Autlán town council to take a stand against the use of water by the agricultural entrepreneurs, and safeguard the village's water supply. They elaborated, in 1866, the regulations on the controlled use of Ayutita water.<sup>8</sup> The farmers opposed to the central role that the town council tried to secure for itself, referred to their inalienable rights to the use of that water. According to Aldana, the effort of the Jalisco Congress to put in some order the 'chaos of water rights', actually had the opposite effect, resulting in a fever of claims (*denuncias*) which enhanced unrest in rural Jalisco (Aldana 1986:45).

Although it seemed that the use of Ayutita water was properly framed by administrative rule, in April 1876 a major conflict arose between some farmers of the Ayutita valley and the town council of Autlán. The conflict centred around who had the right to decide on the use of the water: those private persons holding rights to it, or a government authority. The water supply commissioner (*comisionado de fuentes*) of the council with the help of a gang of 10 armed men, put at his disposition by the mayor (*jefe político*), destroyed some diversion structures in the Ayutita river. This affected the farmers' ability to irrigate their crops. One farmer, Sr. Alcaraz, was put in jail for opposing the action of the council. Some days later, he wrote a letter containing 7 points formally accusing the town council of abusing their power and of practising double standards. The council's president also owned land along the Ayutita stream, and he had been left free to do what he pleased with the water.

The council gave a lengthy reply, defending the adopted measures with fervour, and fiercely attacked the accusations of Sr. Alcaraz. (Colección., VI, p.309) Alcaraz did not accept this, and took the matter to Guadalajara, where the Supreme Government of Jalisco decided that the Autlán town council should stop their destructive acts against the irrigation infrastructure of the Ayutita landowners (p.325), advising the council to take the matter to court, if they thought they had the right to fully dispose of the water.

The case was closed, but the Autlán town water supply remained a problem.

A century later, in April 1979, the *ejidatarios* of Ayutita wrote a letter to the state governor, complaining about the president of the Autlán town council:

The present town council (...) has taken from us the ENTIRE water right we are entitled to (*dotación*), leaving the *ejido* without water, and our families, the ones who need this liquid most, have been forced to carry the water up to one and a half kilometre for their necessities; moreover, the lands lay idle because of lacking irrigation water, and worse off are our cattle which are dying of thirst (cited in Rivera 1989:5-6).

This letter put some pressure on the town council, who finally promised to build a dam for the *ejido*. The dam, however, was never constructed. Although the municipality of Autlán took most of the Ayutita water for domestic use, the town has still felt severe water shortage in recent years.<sup>9</sup>

The Ayutita story, then, provides some insights into the often problematic relationship between (groups of) private citizens and the local government. Although in external affairs the town council and *hacendados* were united and would defend common interests (see the following story on land repartition), in a local dispute over water tensions ran high. Individual citizens, especially rich landowners, have difficulty in accepting a higher authority; an authority which may lawfully limit their freedom of action. Local government seems to think that since it is the authority, it is the one who decides. Consequently, it does not feel the need to convince landowners of its decisions. Instead, it acts in an authoritarian manner.

The case also shows continuity in history. For two centuries the Autlán town supply problem has cropped up again and again. Compare for instance what in 1987 the president of the Autlán town council has to say about the problem with what his predecessor in 1828 wrote.

We want to have this old problem finished, in order that Autlán has the opportunity to grow and develop (...); water is the crucial basis for the economic take off (*despegüe*) of our town. (Noticias Regionales, 15/2/87)

stated the mayor in his 1987 annual address. The Autlán mayor of 1828 wrote:

If it were possible for the town council to appropriate the Ayutita ravine (...), the water will abound in this village, and will be one of the greatest and busiest villages. (Colección., VI, 1882:336)

### The repartition of communal lands, 1850-1880

Although access to water created conflicts in the 19th century, access to land was also the object of struggle. The independent Mexican state (1820) inherited from the Spaniards the *hacienda* system and the laws defining the place of the Indians in society. This changed in the second half of the 19th century. In 1849, the Jalisco Congress accepted decree no.121, which ordered the town councils to distribute the communal

lands to the individual Indian community members. The new law affected many *haciendas*, which had encroached on much of the Indian lands.<sup>10</sup> Although the programme of land repartition did not work out the way some had hoped, the case is nevertheless interesting, because it involved a struggle between State policy and local policy, and thus, perhaps for the first time, the discretionary power of the local elite was questioned by an outside force. The local elite, probably, felt appalled by the fact that an outside bureaucrat, seated behind his desk in Guadalajara, could influence local affairs in 'their' valley. Both parties had to define their attitudes towards the other since neither exactly knew what the rules were of the new game; called government intervention. In the 20th century, government programmes would become more and more important in the valley's development, however, experiences gained in the repartition of communal land influenced future interventions.

In Autlán, the problem was that the 'repartition commission' (functioning on behalf of the so-called indigenous population of Autlán) claimed lands that had been administered by the town council, which were to be redistributed among the Indian community. The town council did everything to prevent this from happening. The Governor of Jalisco and his staff, however, insisted, and the paper war that ensued lasted from 1849 till 1870. When these problems were finally resolved, conflicts within the Indian community started to fester. It is surprising to see that during this period, functionaries of the Jalisco State seemed to take an interest in the case of land repartition, despite important national crises. Mexico and Jalisco lived from one disaster to another, resulting from the struggles between conservatives and liberals (1853-1861), followed by the French invasion (1862-1867).

Already in 1851, two members of the repartition commission, Indians themselves, had complained about the attitude of the town council. The latter had threatened to accuse the former of inciting villagers to disturb public order (Colección., II, p.380). The commission complained of the inability to successfully carry out studies related to the land question (on colonial land titles, and the extent of village property), of the opposition of some villagers who saw their own interests threatened by the land distribution, and of lack of cooperation by others who feared to make themselves hated (*odiosos*) by the town council. Moreover, the commission expressed surprise that since the first demands were put forward (in 1848) the town council had been renewed three times, but their attitude had been the same throughout. During some 17 years the town council continued to deploy retarding tactics. In 1868, the Jalisco government asked a legal expert on land litigations to study the problems in Autlán and to advise the government on how to proceed.<sup>11</sup>

On the basis of the lawyer's report, the secretary to the Jalisco governor concluded that the town council

is mixing up the properties of the municipality, which they only administer, with private and communal (properties), both of the villagers and of the Indians; and being in collusion with the former. (Colección., III, p.303)

Around 1870 we see that the context of land repartition changed. State government officers seemed to have lost interest in the case. Several members of the Indian

community of Autlán now accused the repartition commission itself of delaying the distribution of lands, of using inappropriate data for the calculation of acreage each community member was entitled to (including assessing the value of each plot), and of dubious financial management. The complaints were brought before court. As a result, in 1882, the Jalisco government ordered the repartition commission to be dissolved, accusing them of robbing from the indigenous population. A new commission was installed, but a year later the common people again complained that the new commission had sold and rented out vast areas of community land to private persons (Aldana 1986:37).<sup>12</sup>

By the end of the century, many people were convinced that the whole project of land repartition had failed. A Jalisco newspaper wrote in 1897:

Who does not know of the eternal legal struggles (*contiendas jurídicas*) which the Indian communities in vain try to win in the civil courts.

The article continues with the observation that four major actors had frustrated the programme: the lawyers (who themselves claim land), the *hacendados* (who have used the opportunity to grab more land from the Indians), the municipal authorities (who in fact are composed of *hacendados*), and even the leaders or representatives of the indians, who

are sometimes their worst enemies, since they have played the game with those charged with the implementation of the laws, and having arranged their own business at the expense of their brothers, never will speak in favour of them, as by now they have become afraid to lose what they probably had taken. (Cited in Aldana 1986:13)

As a result, the *haciendas* managed to grow rapidly between 1870 and 1910. Thus, decree no.121 took away a major obstacle (communally held lands) to the reckless capitalist development seen during the rule of Porfirio Díaz (1877-1911), later followed by the Colonisation Law in 1883. This development was detrimental to the peasant population, who became increasingly landless. Disillusioned and impoverished they were to become the protagonists of the Mexican revolution.

In the mean time, the local elite had learned that the higher government authorities had little power in enforcing programmes conceived in the capital. The town council and the *hacendados* had in fact succeeded in delaying the repartition project for 20 years, and when it was finally implemented they successfully redefined its contents to their own benefit. The town council, reinforced by such experiences believed that they had enough discretionary power in the region to mix up private affairs with local government affairs. Furthermore, the identity of the region, as a political arena in which the local elite enjoyed maximum degrees of freedom to the exclusion of other sectors of society, had been underscored. This jeopardised relations with outside actors in future events, and to date such relationships continue to be problematic.

### The 1910-1940 period: the formation of the *ejidos*

During the period of 'the revolutions' (1910-1929),<sup>13</sup> some *haciendas* were completely destroyed, including their irrigation infrastructure, resulting in the decline of agricultural production. The major land reforms of this period began in the 1920s, and were at their height in the 1930s, although there was some land distribution in subsequent decades. Of the estimated 23,000 hectares of arable land in the Autlán-El Grullo valley, some 14,600 hectares (63%) were expropriated and handed over to some 2,800 families organised in 24 *ejidos* (SARH, 1978:33).<sup>14</sup>

The formation of the *ejidos* was not a straightforward process. The first *solicitudes*, official requests to the government for the creation of *ejidos*, date from before 1920; other *ejidos* were formed much later. Opposition by landlords and especially the church was vehement, land lords simply hanging those peasants they suspected of being *agraristas* (peasant revolutionaries), and the clergy consecrated such acts, initiating a strong ideological attack against the *agraristas*. A further strategy of landlords and clergy concerned the creation of a local organisation, *Obreros Católicos* (Catholic Workers), and all peasants were urged to become members. Peasants were recruited and trained to make home visits to those *compañeros* who had become *agraristas*, in an attempt to convert them.

One major obstacle in forming an *ejido*, was that once the request was formally accepted by the government, any land claims put forward in this request were announced in the official bulletin (*Periódico Oficial*) of the Jalisco government. Such announcements were meant to warn the present owners of those lands that selling them off had become illegal since publication. The publication included all the names of the people who had signed the request. The *Periódico Oficial* was of course closely read by all *hacendados*, and those who had signed it faced some strained years ahead; they were stigmatised in the village, and especially by the church. Many peasants wanted to get land but were afraid or lacked faith in the federal government enforcing the reform. From experience, they knew that little could be expected from a local government which was dominated by the landowners. They thus decided to wait and see, and so doing avoided taking unnecessary risks. Only after they saw that the more courageous peasants had actually got hold of land did they dare to join.

I have already pointed to the existence of two different classes of peasants: the *hacienda* proletariat and the share-croppers. The former were subject to more ideological and physical control, and perhaps also identified themselves more with the *hacienda*, than was the case with the share-croppers (Silva 1987). The latter having a more open attitude, and having been engaged in a more entrepreneurial way of farming, were the first to organise themselves and make the formal request, or *solicitud*, claiming the best *hacienda* lands. These were often concentrated near the *casco* of the *hacienda* (its central buildings), to the effect that the peasants living in villages some kilometres away from the *hacienda* got lands under the noses of those peasants who lived on the *hacienda*. The latter only later dared to make the *solicitud* and obtained lands of worse quality further away. The share-croppers gradually moved to the former *hacienda*. And so the stage was set for many conflicts between *ejidos* to develop. Some of these

conflicts have taken many lives and are known to have persisted until today.

For peasants living on the *hacienda*, to choose to immediately participate in land reform meant only one thing: to flee from the *hacienda* to another region where they could take part in the formation of an *ejido*. Many people did so, and the result was that there were lots of people on the move: many fled from the valley, and many others moved into the valley. Since any newcomers to the valley had few ties and were more or less anonymous in this society, they were often among the most active participants in the formation of *ejidos*.

Despite the fact that land reforms redistributed much land and gave many households access to their own plots, such reforms did not help to quickly restore agricultural production; most *ejidatarios* had no capital nor the tools to make their newly acquired lands productive. They again made deals with their former bosses in order to borrow oxen for ploughing the soil, and to borrow food during the growing season. At the end of the growing season, maize prices fell and the *ejidatarios* were obliged to sell their harvest at a cut price, because of their debts. During the dry season they gradually had to buy back the maize they had sold, at an inflated price.

There were several responses to this situation. Quite a few *ejidatarios* did not hold out, having no other choice than to sell their *ejido* land to a *compañero* and return to working as agricultural labourers.<sup>15</sup> Migration during the dry season was another way to make ends meet, at first towards the Pacific coast, where peasants worked in coconut palm plantations, banana groves and in horticulture. Later, starting during the 2nd World War, new opportunities emerged in the U.S.A., where peasants also worked in the agricultural sector. These migrations were facilitated, in part, by better roads connecting the valley with wider Mexico.<sup>16</sup>

There was also an organisational response to the difficulties faced. For instance, the borrowing of oxen and ploughs from the rich landlords was risky, because if something happened to the animals the *ejido* had to pay. Thus the position of *jefe de potrero* was instituted. This leader of the *ejidatarios* with lands in that *potrero* was given responsibility over the well-being of the hired oxen. The *ejidos* also tried to control the adverse effects of maize price manipulation by the rich entrepreneurs. In the *ejido* Autlán the *ejidatarios* handed over 5% of the maize harvest to the *ejido* board. The board stored the maize, and sold it back cheaply to the *compañeros* when they had run out of food. In this manner they circumvented the usury practices of the landlords, and at the same time the *ejido* was able to build up a small fund.

Most agricultural practices survived the revolutions. In many *ejidos*, it was common practice to arrange work parties at harvest time, as they had done while working for the *hacendado*. Probably the *acabo* harvest feast was now more lavish and more enjoyable. The *ejidos* faced huge problems. Accounts of board members often corrupt, and the sale of *ejido* lands to former landowners or neighbouring *ejidos* abound.<sup>17</sup> To date these problems still exist. The most common response to these problems on the part of many *ejidatarios* has been: 'not to bother', 'to mind your own business', 'quietly to work your own plot', and 'once a month to attend the *ejido* meeting without ever uttering a word'.

In summary, the 1910-1940 period is important with respect to nominal changes in



access to land. During this period conditions were created which would set the scene for subsequent developments in the valley. At that time, however, agricultural production in the *ejidos* stagnated. A government initiative, started in the 1940s to provide *ejidatarios* with cheap agricultural credit, did not improve production. There is ample evidence that for the Autlán-El Grullo situation the actual costs (in both monetary and social terms, and in its low reliability) of this 'cheap' credit were so high that many *ejidatarios* preferred, although reluctantly, the usury credit provided by the old power holders and new entrepreneurs (Brunt 1990). With respect to infrastructure, the linking of Autlán with wider Mexico through roads did however create the first conditions which enabled, in subsequent years, new markets to be opened up, and agriculture to become more commercially oriented.<sup>18</sup>

## 2.2 New opportunities: the 1940-1968 period

During the 1940s there was a steady increase in agricultural production (Pérez, 1948). Not only food production increased, but also the production of commercial crops. In fact, sugar cane now reached a peak, some decades after the *hacienda* system had collapsed. In the El Grullo area alone there were 7 *trapiches* or sugar refineries for the production of *piloncillo* (sugar sweets). The introduction of the fuel engine water pump helped to make this development possible. In 1943, in the El Grullo area some 500 hectares were irrigated, partly with pumped river water. Most of the owners of these works were the heirs of the former *hacendados*. A new class of entrepreneurs also emerged, many of whom had formerly been employed as *mayordomos* on the *haciendas* and had acquired lands from their former landlords. Of these new entrepreneurs some were lawyers who had helped the *hacendados* during the land reforms to secure as much *hacienda* land as possible, and who in return had received some of these lands. In addition a handful of army generals became landowners, apparently they had served the right factions during the revolutions and had been able to acquire lands during the land reforms.

From the data collected, a picture emerges of these entrepreneurs as being all too eager to invest in commercially oriented agriculture, and especially in *piloncillo* production. The consumption of *piloncillo* in the urban centres like Guadalajara, however, began to decline, there was a glut on the market as this traditional sweet was produced in nearly all regions of Jalisco. An example of a typical investment for this period was that by Nacho Díaz in 1943. Nacho Díaz was to become one of the most influential characters of the valley. Of humble descent, he married the only daughter of Don Francisco Rosas, one of the major *hacendados* of El Grullo. Being a young ambitious man, he initiated a most daring project: the construction of an aqueduct (*arquería*) of 1,300 metres in order to irrigate over 50 hectares of sugar cane with water

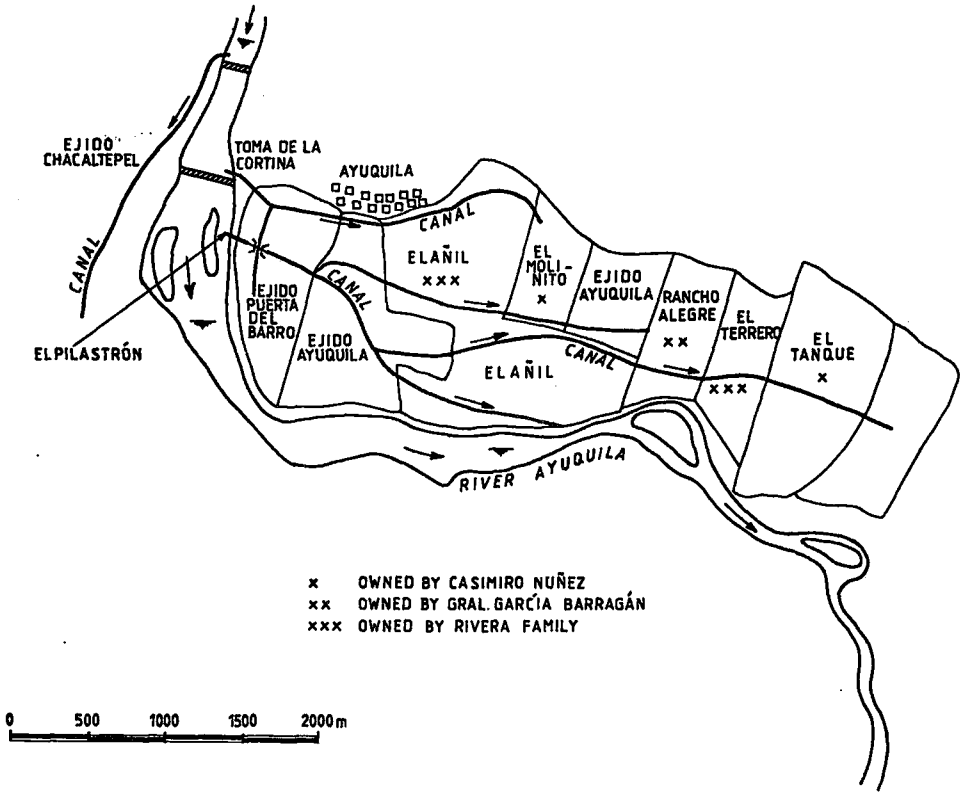


Figure 2.1 The irrigation system of Ayuquila and its surroundings (around 1940)

pumped from the Río Ayuquila by a 12 inch motor pump. He furthermore bought a second hand *trapiche* with a steam engine, in order to produce *piloncillo*. From 1943 to 1955 Nacho Díaz cultivated sugar cane. Then he turned to another crop, cotton. According to his own version of this sugar cane enterprise:

"It was not good business. We had problems, because we had to store the *piloncillo* which was problematic. On top of this, it fetched a bad price. Later, I decided to clear the land of sugar cane, and I knocked down part of the aqueduct. I did not use it any more. With this sugar cane business I lost 85,000 pesos (in 1955 c. US\$ 8,500), despite the fact that I sold the *trapiche* for 11,000."

Another of the important actors who would in subsequent years influence the destiny of the valley was undoubtedly General García Barragán. Although not born in the valley, the General lived most of his further life in Autlán. Shortly after becoming governor of Jalisco (1943), he acquired, under suspicious circumstances, 40 hectares of land which officially belonged to the *ejido* of Ayuquila. General García Barragán

bought a *trapiche* and let some of his soldiers work the land and cultivate sugar cane. This *potrero* was watered by the Ayuquila irrigation system.

### The Ayuquila irrigation system

The Ayuquila irrigation system was constructed in the 19th century by two *hacendados*. By 1950, it was partly used by *ejidatarios* coming from two *ejidos*, Ayuquila and Puerta del Barro, and partly by a handful of entrepreneurs at the tail end of the system. The *ejidatarios*, situated at the head-end, preferred to cultivate irrigated beans during the dry season, whereas in the rainy season they mostly cultivated maize. The entrepreneurs grew cash crops, especially sugar cane, also some fruit trees, alfalfa, and sweet potatoes, beans and some vegetables which they share-cropped. The irrigation system was used intensively, consequently at the end of the rainy season when river discharges decreased but crop water demand increased, there were severe water shortages. Also, the Ayuquila irrigation system had to compete for water with the smaller irrigation system of Chacaltepec, used by the *ejido* La Noria, on the other bank of the river Ayuquila (figure 2.1). Chacaltepec was in a favourable position, since it diverted water from the river a hundred metres upstream of both river intakes of the Ayuquila system. Naturally this meant a potentially conflictive situation.

To begin with, the tail-end landowners dominated the Ayuquila system which had been 'theirs' until the land reforms, and directed sufficient flows of irrigation water to their fields at the expense of the *ejidatarios*. Some *ejidatarios* recall Don Casimiro Nuñez, who had acquired sugar cane land from the Rivera *hacienda*, as a very brave person (*demasiado valiente*). They were afraid of him, and appeared to have accepted his hegemony in the system, which gave rise to a kind of apathy, but also to particular strategies to access water. As Don Martin, one of the elder *ejidatarios* of Ayuquila (born in 1902) recalls:

"You were irrigating only a small corner of your field, and then the water flow would run dry. Then you had to wait until the next day, and see whether there was some water left. So, normally we irrigated at night because they did not approve of us irrigating during the day. Sometimes, I simply robbed water at night. But I was afraid of Casimiro because he had money. One night I had taken water and there he came, and I heard him swear when he saw the diverted water. I took off all my clothes, and I put myself into the irrigation ditch, and with a bamboo I breathed."

At the end of the dry season, when the river discharge had diminished considerably, sugar cane growers in particular were in need of water. So, Casimiro Nuñez together with some agricultural labourers used to go at night to the river intake of the upstream Chacaltepec irrigation system, and destroy it so that more water would reach the Ayuquila system intakes. The La Noria *ejidatarios* resisted and formed an armed force (*la armada*) to guard their diversion dam at night. But Casimiro was a tenacious man, and he contracted someone from El Grullo who had relatives among the *ejidatarios* of La Noria. This man reached an agreement with his relatives and in this manner Casimiro continued to steal water.

Most conflicts, however, were not between the large landowners and the *ejidatarios*, but between *ejidatarios*, and also between *ejidatarios* and other peasants who share-cropped land with the large landowners to cultivate sweet potatoes (*camote*). Sweet potatoes needed light but frequent irrigation. Don Eulogio, an old *ejidatario* of Ayuquila, remembers that

"in those times you had to fight all people. Not only with the hacienda, but especially among the *compañeros*. If I went irrigating I always brought my *carabina*. I had it hidden in the *potrero*."

Alejandro Salazar, a much younger observer, tries to explain these struggles among fellowmen:

"The landowners used *medieros*, share-croppers. So, these share-croppers felt themselves backed by the rich, and thought themselves owners of the irrigation water. Then you had the tough *ejidatarios* who said: 'no, here we are going to be all equal (*aquí vamos a ser parejos*), the water belongs to all'."

This created conflicts. In the end, however, 'those who had most money, were the ones who irrigated'. Initially, then, the tail-end entrepreneurs succeeded in getting more than their proper share of the water, despite the fact that *ejidatarios* controlled the intake structures of the irrigation system, and had their fields at the head. The *ejidatarios* failed to secure a regular water supply because of the lack of solidarity and organisation between them. This can be explained partly by the fact that the *ejidos* were a recent creation. Discord among them was also fed, though, because the *ejidatarios* belonged to two different *ejidos* with adjoining lands.

The leaders of both *ejidos* were tired of all the troublesome conflicts and devised among them a rule over water distribution. This agreement not only took away many petty conflicts, but also united the *ejidatarios* vis-à-vis the downstream entrepreneurs. Don Felipe Silva, the then president of the *ejido* Ayuquila recalls:

"One day we had gathered to clean the irrigation canal, precisely because we wanted to get more water down here. We talked with some *ejidatarios* of Puerta del Barro, who have neighbouring lands upstream. We started quarrelling. At one moment, El Güero Santana who was the *jefe de potrero* of Puerta del Barro, took the word and said to all people present: 'Look, Felipe and I are going to discuss the problem and we will work out an agreement.' That afternoon we met and El Güero said to me: 'Felipe, I respect you despite your age. You have always been honest and straight (*derecho*). From now on nobody will destroy our division structure. Only you, or a boy you send, can come on the agreed time and that I will respect. But besides you I will not tolerate anybody who moves the structure.' The next day I called for an *ejido* meeting, and I explained to the *compañeros* what we had agreed, El Güero and I. They all agreed with it. In this way we decided to make irrigation turns (*turnar el agua*) between both *ejidos*: on these days the water was for them, and on those days it was for our *ejido*. So, between the *ejidos* we turned days, and within the *ejido* we turned hours. Look what a good result this gave. (...) We, El Güero and I managed the water distribution, and we, for example, informed Casimiro Nuñez when it was his turn. He had to respect it, and he did so."

This then was the first organised irrigation of a farmer managed system in the valley. It reflects a step towards a change in the relationship between *ejidatarios* and entrepreneurs.

### *The cotton project*

The decision of many farmer entrepreneurs to get rid of their sugar cane came when an alternative cash crop was found: cotton. Whereas most *ejidatarios* were caught in a debt cycle with the entrepreneurs, the latter prospered, and in the 1950s they founded a credit union, called '*Unión de Crédito del Valle del Grullo*'. The members who dominated this credit society were Nacho Díaz and Sergio Corona Blake. They succeeded in pooling resources in order to monopolise what was said to be 'modern agriculture'. This, at the time, meant a shift from sugar cane to cotton production.

The main stimulator of this shift was Sergio Corona Blake, yet another young, dynamic son of a *hacendado*, who had been a well-known bullfighter during the 1940s. He coordinated the private initiative of some El Grullo farmers to cultivate cotton on an unprecedented scale, for an unprecedented market: the USA. Corona Blake established contact with an American firm, securing the commercialisation of the product through a contract. He constructed a cotton ginnery in El Grullo in 1954. And even an airstrip was laid out. Sergio Corona Blake and Nacho Díaz were the first to grow cotton on a vast scale, but Corona Blake also established contacts with *ejidatarios* of the *ejido* El Grullo to join. Various groups of *ejidatarios* grew cotton (in adjoining fields) for some three consecutive years. In its peak period, it is believed that over 1,000 hectares of cotton was grown during the rainy season. This gave an impulse to the El Grullo economy: labour (for harvesting) was in high demand; a new organisation of transporters (*camioneros*) emerged, who took care of the shipment of the cotton to Guadalajara. 'All was happiness, but soon problems started', writes Gómez Zepeda (1988:93).

After a surprisingly rapid rise, cotton cultivation declined almost instantaneously. The decline was caused by a plague of bugs, locally remembered as the *picudo*. This plague was not properly handled in one season (probably 1957), since, according to various *ejidatarios*, the chemicals used to combat the plague that year consisted of 'pure milled white stone', with no effect on the devastating insects. The bad quality of the chemicals supposedly had something to do with the fact that Sergio Corona Blake had virtually a monopoly on both the supply of inputs to *ejidatarios* as well as the commercialisation of the cotton produce. The next year, when the plague was more severe, harsh measures were taken, and the plague was combatted through the spraying by airplane of one especially aggressive poison (according to some arsenic acid). Not only numerous cattle died, but also several agricultural labourers.

During the first two years cotton yields appear to have been satisfactory. In subsequent years production levels fell, and around 1960 it became unprofitable. The period between 1940-1960 is thus dominated by two commercial crops, initiated by a handful of entrepreneurial farmers; first the rise and fall of sugar cane, then cotton. Cotton set the stage for later developments: modern agriculture, with the use of chemicals and even airplanes, and an export-orientation. More than a decade later, melon would follow much the same pattern (see below). By 1960, both sugar cane and cotton had lost their importance in the valley. A new initiative announced in 1951, the construction of El Operado, was eagerly awaited for by commercial farmers:

### The construction of the El Operado irrigation system: 1950-1960

It is important to note that the construction of the El Operado irrigation system coincided with the implementation of other infrastructural works in the region. In 1957, Autlán was finally connected to the national telephone system, and in 1958 the valley was linked to the Jalisco electricity line. In the same year the Autlán-Pacific coast road was asphalted. These infrastructural works of the Jalisco State government were coordinated between 1953-1959 by Augustin Yañez.

#### *The Jalisco state government*

Governor Yañez had established a special planning commission for the Jalisco coast (*Comisión de Planeación de la Costa de Jalisco*), in order to 'open up the vast region to all kinds of economic activities' (Alvarez 1959:301). In his vision, which he partly borrowed from various of his predecessors (among them General García Barragán, see Torres 1990), the economic development of the coastal region was the only way for Jalisco to prosper, taking into account that:

in the coastal region the greatest volume of raw materials which can be industrialised are found and the greatest extension of virgin lands are located, whereas its average demographic density is 5.26 inhab./km<sup>2</sup>. In contrast, in *Los Altos* region [Northern Jalisco] this density ranges between 30 and 40. [...] To this imbalance between productive activity and territorial area one must add the contradiction which implies a habitat in decline in face of a promising internal expansion (*una promisoría expansión interior*) not yet achieved (id., p.304).

To infrastructurally connect the Autlán-El Grullo valley to the Jalisco centre (Guadalajara) was the first phase in finally conquering the entire coastal region. The valley served as a springboard. The commission's strategy consisted of appropriating federal budgets to projects which fitted into this developmental vision, and trying to let potential beneficiaries participate in the construction costs of the infrastructure. Yañez formulated this stance as follows:<sup>19</sup>

With respect to public works, turn the most humble member of a community into a shareholder, while making him contribute in financial efforts that exceeds by a million times his investment capacity. This constitutes the proper background facilitating the creation and expansion of a strong regional market of commodities. Underlying this mechanism [...] is the conviction that it is indispensable to transform Mexico, as soon as possible into a forthright capitalist country, that it becomes fully aware of its own resources, of savings, of credit, of investment (Alvarez 1959:319).

Yañez clearly was in favour of including private initiatives in his projects. So, when in December 1954 he personally inaugurated the El Grullo cotton ginnery constructed by Sergio Corona Blake (see above), Yañez stated that 'only private initiative can profitably make good use of the economic opportunities of the State' (*El Occidental* 26/12/1954, reproduced in Gómez Zepeda, 1988: facing p.95).

The presence of a transnational corporation which had started to exploit the San Francisco manganese mine near Autlán in 1952, suited Yañez well. He was all too eager to let this company contribute substantial sums for the infrastructural works

undertaken. Admittedly, though, most investments were directly beneficial to the mine.<sup>20</sup>

When Yañez became governor in 1953 he found the first plans of the construction of the El Operado irrigation systems ready. This project fitted into his development programme for the coastal region. There is some scant evidence that General García Barragán (State governor 1943-1947) played a role in directing this project to the valley. However, it is difficult to reconstruct why particularly the Autlán-El Grullo valley was to receive such considerable federal investment. According to one agronomist, who at the time held a position at the Guadalajara office of the Ministry of Hydraulic Resources (SRH), it was a highly political decision:

"The preliminary studies for the Autlán-El Grullo irrigation system were not properly conducted. Officially, any irrigation system requires 7 technical studies (including pedologic, hydrologic, agronomic, sociologic and economic studies) to be completed prior to any decision to implement the project. For El Operado, first the decision was made, then we had to conduct these studies very quickly. They were of doubtful quality, and we had to technically justify the political decision already taken. Implementation of El Operado, like any other irrigation system in Mexico, was a political decision."

#### *The federal government*

The first studies for irrigation development in the valley started in 1947. In 1950, the initial project documents spoke of the construction of the Tacotán storage dam with a capacity of 145 million m<sup>3</sup> water, a hydropower plant of 6,500 Kw, and an irrigation system covering 9,000 hectares (SRH: Informe Laboral 1950). The plans for El Operado were unfolded to the future beneficiaries by the Mexican president himself, Miguel Alemán (Mexican president, 1946-1952), in his visit to El Grullo in 1951. Between 1950 and 1955, although the engineers of SRH had elaborated detailed designs for the project, the overall dimensions of the project changed several times.<sup>21</sup>

In 1954, the Ruíz Cortínez administration (Mexican president, 1953-1958) decided to diminish the overall project dimensions. This aroused the rage of the Yañez Jalisco government, who in 1960 recalled that

the Tacotán project was on the point of being partially frustrated when in June 1954 the Minister of Hydraulic Resources (...) decided to reduce the height of the dam and, consequently, its capacity and the area irrigated, anxious as he apparently was to hasten the economic use of the inversion already made.

But Yañez, somewhat self-contentedly, went on to conclude that 'the difficulty could be saved and the construction adjusted to the original plans' (Alvarez, 1959:205). Here, Yañez solved the impasse through an agreement with the future beneficiaries of El Operado over the financial contribution they would make. Yañez speaks of 1,159 pesos/hectare (p.320), representing over 15% of total construction costs. In 1988, I could only find one farmer who could remember that they were supposed to make a contribution to construction costs. This farmer commented:

"How would we have paid? It was a handful of rich people from El Grullo who arranged that we had to pay that quantity. And yet a new president of the republic was elected, and a new governor came

in. So what was the problem?"

According to many *ejidatarios*, the only way in which they 'participated' in the construction works was as wage labourers for the *Morelos Constructores* company.

As late as 1955 the final dimensions of the project had still not been fixed, yet the construction of the main canals had started. In 1957, the Tacotán dam was near completion. Its gates were closed and the reservoir partly filled. With this water the first 700 hectares were irrigated in 1958, while in other parts of the valley construction firms completed the remaining canals. In December 1960, the Mexican president López Mateos inaugurated El Operado. The *Informe Laboral* in that year maintained that its command area amounted to 11,000 hectares, and an additional 3,000 hectares to be completed later when a system of pumping stations had been implemented (*Informe Laboral* 1961). The hydropower plant was never constructed, and the El Operado irrigation system actually only commands 8,700 hectares.<sup>22</sup> According to the SRH ministry, by 1960 the El Operado irrigation system had cost 88.7 million pesos, equivalent to slightly over 10,000 pesos per hectare (approx. US\$ 800 in 1960), which is surprisingly inexpensive.<sup>23</sup>

### The first years of El Operado

Only gradually did the majority of the *ejidatarios*, now with access to irrigation water, turn to growing crops during the dry season. There was little fit between their farming system and irrigated agriculture. Also, the lack of a capacity to invest (e.g. for the levelling of the fields) inhibited them to readily make use of the new infrastructure.

A second crop required a much tighter time table, especially quicker harvesting and ploughing of the land. It also jeopardised the place of livestock on the farm: *ejidatarios* were used to take their cattle into the hills after the first rains. Then the fields in the valley could be ploughed and cultivated. After the harvest (picking only the corncobs), the maize stalks were left standing on the fields and towards the end of the dry season when the pasture in the hills and the water sources became scarce, the cattle were brought into the valley again, where water was more easily available and they could graze on the maize stalks, and manure the fields. The moment the first rains came, the cattle were once again led into the hills. With an irrigated second crop, this cycle had to be broken up. Livestock had to take a secondary place on the farm. This was quite a change, since livestock traditionally had a high value, and many farmers derived from it their pride and self-esteem. Cattle still play an important role in village feasts.

The prevailing knowledge among farmers was not suited to unquestioningly accepting irrigation. Many farmers were convinced that irrigation water would harm the soil. During winter time (the dry season) the soil had to be left fallow in order to become cold, before it could get 'warm', or fertile again in the rainy season. Irrigation would 'warm' the land, and thus break this cycle of 'warm' and 'cold'. Many farmers nowadays observe that there used to be fewer weeds and less crop disease and pests. This is partly linked to the observed fallow periods in the rain-fed system.



Another factor inhibiting a ready shift towards irrigation, and beyond the direct influence of the individual farmers, was the lack of proper marketing channels towards urban centres like Guadalajara. This situation led to agricultural produce remaining in the region. The local market was easily saturated, and consequently prices for agricultural produce, especially maize and beans, fell. It was only after 1964 when the Autlán-Guadalajara road was completely asphalted that the accessibility of Guadalajara and markets further afield gradually improved.

In the mean time, the power holders in the valley tried to ascertain control over the new irrigation infrastructure. With the introduction of El Operado a government office was opened which managed the irrigation system. This was the Irrigation Unit (later called Irrigation District, still later Rural Development District), which fell under the Ministry of Hydraulic Resources (SRH). Those in charge of the local office were engineers recruited from outside the valley, and their interests, thus, did not necessarily coincide with the interests of the local elite. The mandate of the Irrigation Unit's office was to provide services, including irrigation water and technical assistance, to both *ejidatarios* and the private landowners (in Mexico euphemistically called *pequeños propietarios*). Indirectly, this threatened the entrenched position of the large landowners. According to them, this was not how things were arranged in this valley.

The struggle between the earlier mentioned Nacho Díaz and the head engineer is revealing in this respect. During the 10 years of design and construction of El Operado, Nacho Díaz had established a good relationship with engineers from SRH and from the construction firms.<sup>24</sup> It is told that the engineers in charge of the construction of El Operado would frequently call on Nacho Díaz, where they were cordially received. Nacho Díaz may have thought that this was enough to ensure a smooth working relationship with the SRH office when the irrigation system would finally start operating. But Engineer Arias, who became head of the irrigation unit, was a straightforward and stubborn person. He had his own ideas on how to run such a system, and did not give in to characters like Nacho Díaz. This culminated in what in fact was a minor dispute about the extension of a drainage canal. Nacho Díaz wanted it extended by some 10 metres, so that a small part of his huge farm could be better drained. Arias refused to give permission, because to extend this drain to within 3 metres of the irrigation canal obviously would imply seepage losses and could even be dangerous. But Nacho Díaz, even more obstinate than Arias, did not take it lying down. The conflict had become a matter of competence: who decides what happens in this valley, a young engineer from outside or one of the richest and most influential men from the valley? Nacho Díaz went to see the SRH representative in Guadalajara, who ordered Arias to extend the drainage canal. Engineer Arias then resigned. Nacho Díaz had thus succeeded in extending his influence over the El Operado irrigation system.

To conclude, the construction of El Operado was closely accompanied by interactions between three major groups: actors from SRH ministry in Mexico City; regional actors headed by the Jalisco governor; and some local entrepreneurs. The latter succeeded in ascertaining influence over how the irrigation system was managed after it was implemented. The majority of water users did not participate in this implementation process. Most farmers did not immediately turn to irrigated agriculture,

not only because of their lack of capital, and the lack of markets, but also because the prevailing farming system of the majority of users, the *ejidatarios*, was quite incompatible with a second, irrigated crop. Seven years after implementation, only 35% of the land commanded by El Operado had a second crop. Of these 3,000 hectares, 2,400 hectares were sown with 'traditional' crops like maize, sorghum and beans. However, this situation was to change rapidly.

### 2.3 Bonanza: the rise of export agriculture (1968-1980)<sup>25</sup>

In 1968, two Americans independently prospected the Autlán-El Grullo valley, and both were impressed by its agricultural potential.<sup>26</sup> One, José García, *El Cubano*, settled in Autlán and started experimenting with tomato production.<sup>27</sup> The other, Walter Holm, settled in El Grullo and initiated the cultivation of melon. Both readily started renting land, and cultivated the first export melons and tomatoes, to the effect that the area of horticultural crops quickly rose, doubling in four consecutive years from a mere 270 hectares during the 1967-68 irrigation season to 2,000 hectares for 1970-71. After both Americans had paved the way, other Americans and also various Spaniards arrived in the valley. The Spaniards set up shops selling fertilizer, agro-chemicals and seeds. As one El Grullo farmer observed, 'these Spaniards came to reconquer México'. Two social scientists who studied agricultural development in the valley agree with this view and have observed that these foreign entrepreneurs, together with a handful of Mexicans 'conquered' these 'new' agricultural areas (Gonzalez 1990) and their activities are described as a 'process of expansion' (Arce 1990:9). This, then, parallels what Governor Yañez had dreamt of more than a decade earlier.

#### The melon boom

The main difference between the Cuban and the American was that the former directly organised tomato production through a well-organised workforce he himself had contracted (Torres 1989). In contrast, Walter Holm organised melon production indirectly through crop-financing local farmers who agreed to sell him the melon harvest. During the first three years that he cultivated melons on a considerable scale (1969-1973), this production system worked rather well, and Holm constructed a packing plant near El Grullo. The share-cropping farmers also fared well. According to Gómez Zepeda (1973), farmers earned on average between 3,500 and 3,900 pesos/ha, during 1972-1973 (some 250 to 300 US dollars), which at the time were considerable sums. But in the 1973-74 season Walter Holm's company, Walter Co., went bankrupt, and the farmers who had contracts with him lost much money.<sup>28</sup> The bankruptcy of Walter Co., starts a story that would characterise horticultural production

in the valley to date, and which has affected nearly all farmers who have been growing melons or tomatoes for export.<sup>29</sup>

### *The formation of a growers association*

When Walter Co. started growing melons on a vast scale, farmers were urged by both the Ministry of Agriculture and Livestock (SAG) and by Walter Holm himself to establish a local vegetable grower's association, and together with similar associations of the region to form a regional growers' union. There were several reasons why farmers were urged to organise themselves. First of all, a new government policy; during the period 1975-1980 the Mexican presidents Echeverría and López-Portillo stimulated the formation of producers' associations, as part of a modernisation programme in the agricultural sector (Fox and Gordillo, 1989:142;146-47). But there were also practical reasons why farmers had to organise themselves. Transporting vegetables within Mexico, and exporting these, required particular documentation, declaring the fruits to be free of plant diseases and free of agro-chemical residues (the so-called *gutas de sanidad* or *manifiestos fito-sanitarios*). These were issued by SAG. But when in the northern state of Sinaloa a strong group of vegetable producers emerged, organised in the UNPH (*Unión Nacional de Productores de Hortalizas*), they negotiated with SAG that the growers rather than the ministry should issue these documents. UNPH were able to control the volume of different vegetables and fruits produced, and hence ensure a profitable price through a system of production quotas assigned to different regions. This became national policy. Furthermore, these manifests were only issued to Mexican nationals. This made U.S. companies establish contract-farming with local farmers.

So, melon and tomato growers in the Autlán-El Grullo valley had to create a so-called *Asociación Agrícola Local*, through which these documents were given to the individual growers. The experience of frauds committed by foreign companies was another argument used by SAG to convince growers to form an association. One government official working at the Guadalajara office of SAG had gained experience of U.S. company fraud concerning water melon production in the neighbouring Costa region (south-west of the valley) during earlier years of the 1960s.<sup>30</sup> A growers association, according to him, would make it easier for the growers to defend their common interests against the companies. In January 1970, the melon growers association of El Grullo was formed, but it offered few benefits for the farmers: it only issued the crop documents, which was nothing more than a mere bureaucratic act. Its board consisted of two entrepreneurs who, according to many people, lacked initiative.

In the same year of the break-down of Walter Holm (1974), various other U.S. companies, like Griffin & Brand, began operating in El Grullo. They all established packing plants in or near El Grullo, some took over the *empaques* of those companies who had left. Local producers received crop-credits from such companies. They would receive inputs like seed and agro-chemicals, but also irrigation syphons (on credit) and technical assistance. In return they were committed to sell (part of) the harvest to the company. Price wars regularly developed between the different buyers. At its peak, in El Grullo 1,940 hectares of melons were grown (1977/78 irrigation season). During the

harvest periods 'the sweet scent of melons could be smelt all over the valley', as many people from El Grullo recall. Labour and transport was in high demand. Women were contracted by the packing plants to select the fruits. They sometimes worked 18 hours a day in order to keep pace with the supply of melons. At the end of the busy harvest period, El Grullo would indulge in many a feast, where the successful farmers spent part of the (sometimes) huge profits made. It became possible for ordinary *ejidatarios* to buy a fancy *camioneta* (pick-up).

#### *The growers' organisation strengthens*

Not all the melons were sweet. Chivas, a Japanese American became well known (and loathed) in the valley. By 1976, Chivas' company had rented not less than 600 hectares, the majority of which was *ejido* land. Most farmers preferred Chivas to Griffin & Brand during 1973-1975, because Chivas paid a better price. But in 1975-76 (his third year in the valley), Chivas failed to pay the farmers a fair price, and he reportedly still owes many farmers money (some say 50 thousand dollars). A group of melon growing *ejidatarios* went to the state farmers organisation's office in Guadalajara (*Liga de Comunidades Agrarias*, linked to the CNC national peasant organisation) to complain. The farmers were headed by an *ejidatario*, Toño Zamora, who was a friend of the Liga president. A meeting was organised attended by the State governor, and other government institutions (SRA, SAG, Banco Ejidal). The meeting led to the creation of the *Unión de Ejidos*, a union of 6 *ejidos*, and Toño Zamora was elected president. Telésforo Zepeda, president of the *ejido* El Grullo, was elected secretary. The *Unión de Ejidos* sought ways of directly getting access to a packing plant, in order to pack and market the melons independently from the companies.

In May 1977, a coup was staged during the annual meeting of the 'dormant' El Grullo melon growers association, and Sergio Corona Blake was elected as the new president of this mixed (*ejidatarios* and *pequeños propietarios*) organisation. Corona Blake announced that he would only accept the post if he could designate the treasurer. This was accepted and he appointed his trustee, Telésforo Zepeda. With this meeting, both the *Unión de Ejidos* and the melon growers association *de facto* fused into one organisation, with a leading entrepreneur as its head. Now, Corona Blake had his hands free and could take initiatives. Together with the president of the *Unión de Ejidos* and with his treasurer he went to Texas to negotiate with Griffin & Brand a take over of the El Grullo packing plant, which happened to be built on *ejido* land. They hinted to Mr. Brand that it was quite possible that the packing plant would be invaded by angry *ejidatarios*. They furthermore suggested that he sell the plant to the melon growers association. Brand finally agreed, and it was decided that the melon growers association would pay for it in kind, that is, through packing the melons for Griffin & Brand, for a 5 year period. According to Telésforo Zepeda,

"the idea was to lower the costs of agriculture and find the best prices. Our packing plant helped to lower the cost of the handling of the fruit (the *maquila*) that the other companies would charge the farmers. When Griffin bought our melons at a certain price, other farmers who cultivated for different companies also wanted the same price. Our packing plant then served as a model so that other farmers began negotiations with their companies in order to get a better price."

From 1977, the *Unión de Ejidos*/Melon Growers Association packed and selected their own produce and sold it to Griffin & Brand for 7 consecutive years. In this way it became owner of the packing plant (in 1977 valued at US\$ 80,000).

In 1977-78, prices paid to farmers by the Association were reasonable, but in the following season a dispute arose over 10,000 melon boxes which were unaccounted for. In subsequent years, there were many other problems. Farmers started to blame the people on the board of the Association, and distrust among farmers grew.<sup>31</sup> When, on top of this crop diseases and pests started to affect the melons (investment costs rose, melon quality worsened and so the prices fell), many farmers decided to turn to a less risky crop. For many, sugar cane was the obvious substitute crop, although most farmers still say that sugar cane is not half as beautiful a crop as melon. For most farmers, few crops contrast so fundamentally from melons as sugar cane.<sup>32</sup> All they have in common is being sweet. But El Grullo farmers turned to sugar cane because melons had embittered them. Consequently, melon cultivation in El Operado dropped from 1,940 hectares for the 1977-78 season (representing 27% of the total irrigated area in that season) to 390 hectares for 1980-81. After slight increases in 1981-82 and 1983-84, it fell to 30 hectares in 1984-85, and to zero the following season.

In conclusion, melon production brought local farmers into contact with 'modern' agriculture, and foreign markets. More subtle irrigation methods, like the use of syphons, were introduced, and farmers learned to master these. They also got better acquainted with the use of different fertilizers. Inevitably they were confronted with new crop diseases and pests, with the confusing variety of different agro-chemicals to combat these, and with the agronomists who had set up shops to sell these chemicals and often gave contradictory advice to similar problems. Farmers became aware of the possibilities and impossibilities of marketing to the U.S.A., and of practices of U.S. companies and their local representatives. The melon boom, furthermore, fuelled the emergence of farmers organisations. At the end of the day, however, most farmers were tired of the politicking of these organisations as they were dominated by a handful of entrepreneurs, whom they came to distrust because of the many shadowy deals (*maniobras*) such leaders were involved in (cf. Fox and Gordillo, 1989:147).

Most farmers reaped considerable monetary profits during the years of melon production. Some became very rich, and remain so today, because they were able to productively invest their profits through acquiring more land, engaging in other businesses and so on. Many *ejidatarios* acquired t.v.-sets, or refrigerators, and some even 'pick-up' trucks from melon profits. Their entrepreneurial status, however, did not change fundamentally. Today, they are still small farmers who try to make both ends meet. Although most farmers gained money in some years, they also lost substantial sums in others. Most of those losses were attributed to mismanagement within the association, and to the lack of legal defence, by the Mexican state, of contracts which farmer organisations entered into with U.S. companies. Accounts abound of people who had to sell their recently bought assets to pay their debts, or worse, some even had to sell their houses, and work during various years as farm labourers (*braceros*) in the U.S.A. to pay off their debts. At the same time, companies and local representatives accumulated assets, which in part had been acquired through illegal means.

A picture emerges of the Mexican government investing heavily in irrigation infrastructure, and thereby getting into debt. This is followed by U.S. companies who discover and are keen to exploit this resource and the available human resources, while writing off any cultivation risks, marketing risks or environmental hazards to local farmers. U.S. consumers are then offered high quality fruits at relatively cheap prices, whilst the Mexican government is unable or unwilling to defend or give legal support to its own citizens (cf. Sanderson 1986:82-83).

### *The tomato story*

The melon boom in the El Grullo half of the valley is paralleled by a similar tomato boom in the Autlán region. Unlike melons, however, tomatoes are still produced for export in the valley on a considerable scale. During 1985-87 between 1,000 and 1,700 hectares, most of it outside El Operado, were grown in the area near Autlán irrigated by deep-wells. Five companies, partly U.S. owned, partly Mexican owned, dominate tomato production. As has been briefly pointed out before, they are directly engaged in the production process, since tomato production involves a much more complicated and technologically advanced production system compared to melons. The five companies rely for the greatest part of the labour force on work groups recruited from outside the valley. These groups stay for half the year in the valley, are housed in so-called *albergues*, which some people from the valley describe as *campos de concentración*, they are paid very low salaries, do not enjoy any kind of social security, and are denied the right to organise and affiliate themselves to labour unions, or risk being fired. Melon production, by comparison, involved labour by farmers and their families, and by agricultural labourers, all living in, or very near, the valley.

The companies were continuously in search of new lands, because after three consecutive years of production on the same plot, diseases (especially virus diseases) and pests (nematodes) increase and yields fall. After five years these plots are depleted and no longer suitable for tomato cultivation. This gives rise to 'shifting cultivation' practices, and the tomato companies roamed about the valley in search of 'new', 'virgin' lands. These companies clearly displayed a 'mining mentality' (*mentalidad minera*), in going for quick profits (Hewitt de Alcántara 1985:300).

Suitable lands gradually became more difficult to find. Not only was a secure water supply important, soil quality was also a crucial factor. This severely limited the available options. Moreover, the tomato production system as practised by the companies, required an area of at least 20-40 hectares for tomato mono-cropping. It was therefore often difficult to convince several small farmers to rent their adjoining plots simultaneously and for similar conditions. The companies were forced to choose plots which did not have a secure and regular water supply. Despite the formidable investment costs involved, they found it profitable to drill deep-wells within the irrigation system, as a supplementary and secure source of irrigation water. The adopted strategy, then, was to rent a number of neighbouring plots for a five year period, pay a nominal rent which was rather low, and to hand over the deep-well to the group of farmers at the end of the contract period. This, of course, was especially tempting for farmers outside El Operado irrigation system, i.e. near to Autlán (see Verhulst, 1988).

Farmers without irrigation facilities were easily convinced to rent out their fields for several years in return for which irrigation facilities were received.

In El Operado tomato has never become as important a crop as melon. Instead tomato production has been concentrated in the Autlán region which lies outside the system. During the period 1973-1978, the number of deep-wells increased from less than 10 to 68.<sup>33</sup> For the 1985-86 agricultural year, 1,800 hectares were serviced by deep-wells, and 1,300 ha of tomatoes were grown. In the same season, 380 ha of tomatoes were cultivated in El Operado irrigation system. At present, those groups of *ejidatarios* who finally took possession of deep-wells, have turned to traditional crops like maize, and increasingly to sugar cane (from 200 to 330 ha between 1984-1986). They did not start tomato production on their own. They lacked the capital, contacts and skills to do so.<sup>34</sup>

## 2.4 The reaction: the spread of sugar cane (1975-1985)

When in 1968 some Americans prospected the Autlán-El Grullo valley, an important Mexican also let his influence be felt in the valley: General García Barragán. At the height of his career, being minister of Defence, he is said to have decisively influenced the construction of a government owned sugar cane refinery in the valley (see Guzmán, 1989). This refinery, called *Ingenio Melchor Ocampo*, was built in the centre of the valley, exactly between El Grullo and Autlán, on lands the general 'donated' for this purpose.<sup>35</sup> The arrival of the government-owned sugar cane refinery was related to a move by the general to limit the power of the tomato and melon companies, and perhaps also, of the growers associations that emerged.<sup>36</sup>

The arrival of the sugar cane refinery was not welcomed by all farmers. Some large landowners based in El Grullo, in particular, opposed the initial ideas to build the factory near El Grullo town. One of these landowners was Nacho Díaz, who was convinced that re-introducing sugar cane was not viable in the valley, his own sugar cane failure some 15 years earlier apparently still fresh in his mind. But he may have had other considerations as well. As Brunt (1990) has shown, the sugar refinery would provide farmers with cheap credit, and thus offered an alternative to the usury loans provided by men like Nacho Díaz to small farmers. Consequently, many *ejidatarios* were in favour of the refinery coming to the valley. Many of them had been growing maize and other food crops, and had not dared to engage in more capital-intensive melon production. Several of those early *ejidatarios* still remembered the time when they had worked as agricultural labourers in the cane cutting and in the *trapiches* of the region, and they were confident of the viability of sugar cane production. Also, sugar cane production involved relatively little labour on the part of the farmer, since the harvest was entirely organised by the refinery. (Later, from 1975 onwards, this was organised by the sugar cane growers' associations.) On top of all this, the refinery

offered some special 'perks' to farmers, like free medical services, and a small pension. This all made sugar cane especially attractive for the older *ejidatarios* and, more significantly, for the female *ejidatarias*.<sup>37</sup>

Around 1970, some parts of the *El Operado* irrigation system had still never been cultivated during the irrigation season because of adverse soil conditions. These being heavy clay soils and difficult to plough, in addition to which most crops did not grow well on them. Sugar cane meant an opportunity for farmers burdened with such heavy soils. Thus, the increase in the area of sugar cane cultivated at first went hand-in-hand with an increase in the over-all area irrigated in *El Operado* (figure 2.2). In 1977, sugar cane started to replace other crops, and it reached an all-time high in 1988/89 season, with 6,100 hectares planted, whereas non-cane crops decreased to 2,400 ha.

Quite a few farmers who had so far grown horticultural crops, in the end also shifted to sugar cane. Many of these farmers had been growing melons during the seventies, and later cultivated other vegetable crops, like the green tomato (*tomate de cáscara*), for the Mexican market, so avoiding the interference of intermediary

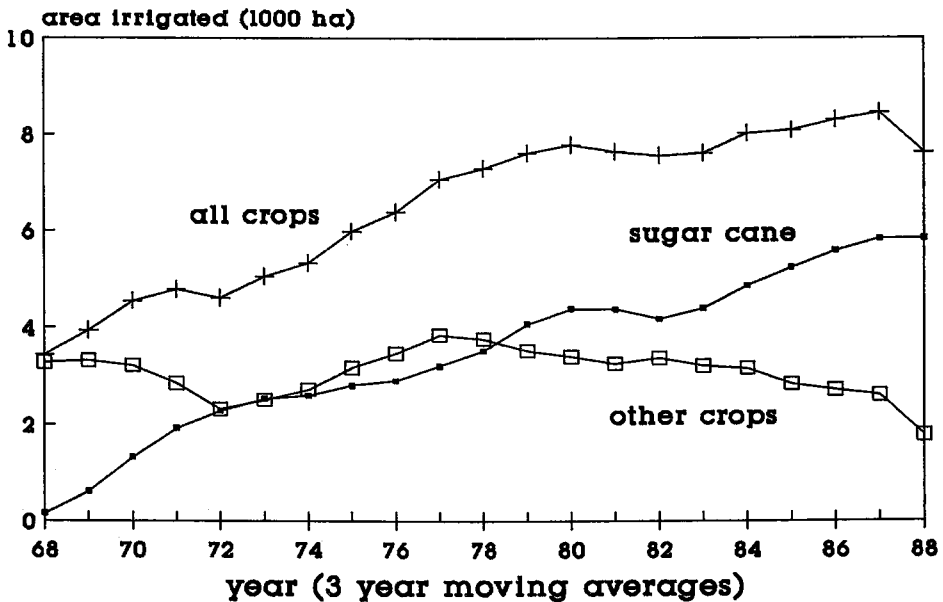


Figure 2.2 Trends in sugar cane cultivated in El Operado, 1968-1988.  
Source: data from Distrito de Desarrollo Rural, El Grullo.



companies. Invariably, these farmers looked down upon the sugar cane crop, which was viewed as a dull (you only plant it once in six or seven years) or 'a lazy-man's' crop. Also, when pests and crop diseases started to abound in horticulture, the horticulturalists blamed this on the sugar cane, a perennial crop which provided a suitable habitat for many pests and carriers of crop diseases during the off-season. When in the midst of the eighties the inflation rates rose rapidly, sugar cane became the only crop to follow the price index, guaranteed by the government, whereas prices for other crops lagged behind. On top of this, the management of the refinery, which had built up a bad name during the 1970s (which was reflected by relatively low prices paid to farmers), became more efficient during the eighties, with resulting higher prices paid. Reluctantly, many vegetable growers finally decided to make the shift to sugar cane.

### *Sugar cane growers and the refinery*

As with melon and tomato, the sugar cane production process gave rise to the formation of farmers organisations. Like both horticultural crops, the first sugar cane growers' association was not created on the initiative of sugar cane growers, but because any government owned sugar cane refinery forcefully requires the presence of a sugar cane growers organisation. In the valley there are now two sugar cane growers' associations, locally known as 'the CNC' and 'the CNPP'. The former is the oldest and is affiliated to the national CNC farmers union of *ejidatarios*. The latter was created on initiative of some large landowners at the end of 1982, and affiliated itself to the national CNPP farmers union of private landowners (*pequeños propietarios*).<sup>38</sup>

The main task of these organisations is to ensure the prompt and regular delivery of the harvested sugar cane to the refinery. To this end, these organisations organise all harvest activities, including the labour force which mainly consists of cane cutters. Like the tomato proletariat, cane cutters and some of their relatives are seasonally recruited from remote, poorer areas of Mexico. They are housed in camps, and a system of (often village or region-based) work-gangs with their overseers ensures that competition among sugar cane cutters prevails (Figuroa, 1988). This system of 'divide and rule' checks any attempts from within the group of cane cutters to organise themselves and defend their common interests against the sugar cane growers.<sup>39</sup>

The growers' associations are also responsible for the transportation of the harvested cane from the plots to the refinery, which involves the presence in the valley of over 100 heavy trucks, most of which are owned by the wealthier sugar cane growers. In all, both associations handle an immense annual budget, a fact which further enhances the prestige and power these organisations enjoy. Furthermore, these associations form the intermediate body between the refinery's administration, the (irrigation) District, and the sugar cane growers. Weekly meetings are held between the refinery and the boards of both associations in order to plan and synchronise the complex harvest activities (see Guzmán, 1989). Both organisations have become strong platforms where sugar cane farmers succeed in defending their interests. The organisations have served for various farmer leaders to become politically important, and to prosper economically.

Historically, the relationship between sugar cane growers and the refinery's administration is strained, since both parties try to impose their will on the other. When,

in the early 1980s, the power of some refinery officials had grown beyond acceptable limits<sup>40</sup>, and the first stories came out of *ejidatarios* (and especially *ejidatarías*) being blackmailed by these employees, the CNC association and especially its incoming new leader, Jesús Corrales, acted decisively. After a lengthy struggle he succeeded in pressing (through strikes) the refinery's executive to throw them out (Guzmán 1989).<sup>41</sup>

#### *The sugar refinery, the District and the water users*

Around 1980, the irrigation District was involved in a struggle with these same refinery employees. The latter, together with some large landowners (among them some who would form the CNPP sugar cane growers association in 1982) and some employees from a local bank succeeded in organising a strong lobby in favour of sugar cane. In 1976, one government agency in Mexico City granted the refinery permission to expand its milling capacity (to an equivalent of over 5,300 ha. sugar cane). However, at the same time a study of the ministry of agriculture and hydraulic resources (SARH) concluded that for hydrological reasons the maximum area of sugar cane cultivation should be 4,000 ha. By 1978, the then head of the irrigation District opposed the continuing increase of this perennial crop.

An outright struggle between the District and the lobby developed during 1978-1980. The lobby had its network of influence extended to the capital city, and the head of the irrigation District stood on the point of collapse when he made an intelligent move in proposing the creation of yet another farmer organisation; the Water Users Commission, in which every *ejido* and *pequeña propiedad* organisation was to be represented. This commission would advise the District on all matters involved in the management of El Operado. Then, the head of the District presented the elected farmer representatives with the sugar cane dilemma, enrolling them in the struggle, and diverting attention from his own person. The Water Users Commission, however, only partly succeeded in enforcing a compromise: The cane area was expanded to 4,600 hectares, and the number of irrigation turns received by sugar cane was reduced.

Some years later, the head of the District was transferred to elsewhere. A new head came in, with little interest in letting water users participate in management matters, and so the commission fell into apathy. The water users themselves were unable to defend their platform. By that time, in 1985, sugar cane had become a very attractive crop indeed, especially because of its profitable and guaranteed price. Many farmers who still had not done so were interested in turning to sugar cane. The right to sow sugar cane had become a scarce resource. The new District head succeeded in setting himself at the centre of the negotiations on the expansion of sugar cane area, which annually recurred. These covert negotiations were held between the leaders of both sugar cane growers associations, the refinery's director, and the head of the District himself. Ordinary farmers were left out, and they tried to win the sympathy of one of the negotiators. Each year, the outcome was awaited for like an oracle. (For a further discussion on the Water Users Commission, see chapters 7 and 8.)

Sugar cane has provided new opportunities to a category of farmers which did not participate in the melon boom, both because of lack of entrepreneurship, lack of capital, and lack of suitable soils. Furthermore, it was a viable alternative crop when vegetable

production became less and less profitable. The sugar cane development, especially during the 1980s, fits neatly into a pattern identified earlier. As was the case with the former sugar cane expansion (during the 1940s), the short-lived cotton initiative (during the 1950s), and melon and tomato production (during the 1970s and early 1980s), this pattern is characterised by one dominant crop, introduced by a limited group of entrepreneurs, after which it becomes the only fashionable crop and the majority of farmers try to gain access to it. Crop diseases and pests on the one hand, and marketing problems on the other, make for the subsequent decline of the crop trend. As yet, sugar cane has not reached this final stage. But the overall effect of its popularity is that some 70% of El Operado is now covered with sugar cane, which thus has become virtually a mono-crop. Since 1986, more and more pests and diseases have been reported, and yields which had been climbing during 1968-1985 (from 45 to 100 tons/ha), started to fall in the 1985/86 season (in 1988/89 it stood at 89 ton/ha).<sup>42</sup> Furthermore, its profitable price is likely to fall, since its inflation corrected pricing system had been negotiated by the powerful national sugar cane lobby with the Mexican political elite in power from 1983-1988, under the presidency of Miguel de la Madrid. With a new government in place, it seems quite unlikely that this policy which favours a few (who are already blessed with access to irrigation water) and affects many (since it is a burden for the government's budget) will be continued. In all, a sharp decline in sugar cane may happen within the foreseeable future. Perhaps the only element lacking is a suitable alternative crop.

Finally, it is necessary to turn again to one of the actors who helped to shape the sugar cane story: General García Barragán. He retained a strong foothold in the valley through the presence of the refinery. Being able to offer services, he succeeded in expanding and consolidating his following in the valley. This group was mainly restricted to *ejidatarios* who have displayed unconditional loyalty towards the group around Barragán throughout the years. The General has strongly influenced local politics from 1960 to at least 1980. According to many people, the General decided who would be the PRI candidate for the presidency of the many villages and towns, not only in the valley, but in the entire *Costa* region.<sup>43</sup> Although his power was strongest in Autlán, the four mayors of El Grullo between 1968 and 1979 were also all said to have been appointed by García Barragán (Gómez Zepeda 1988:91). During the 1970s, however, the power and political influence of the General was contested by another character on the Jalisco political scene: José Guadalupe Zuno Arce. Again, the assertion of local political influence was directly related to the construction of infrastructural works in the valley, as it had been with García Barragán and his sugar refinery, and earlier, with the implementation of El Operado.

### The Manantlán drinking water system

In 1974, a project was completed whereby approximately 50% of the valley population, concentrated in the El Grullo half of the valley, got access to drinking water in their houses. The water was brought from the Sierra Manantlán. This project was directed

to El Grullo through a regional government body, which was called the *Comisión del Sur*. Because of the impact it has had on the lives of many people from the valley, and of some connections with other developments we have already mentioned, this project merits attention here.

In 1965, the Jalisco government created the *Comisión del Sur*, a regional office which would coordinate federal and state programs in the southern part of Jalisco. With its central office in Tuxpan (some 100 kms. from El Grullo), the *Comisión del Sur's* influence was limited in the Autlán-El Grullo valley. Curiously, it seems that the Río Ayuquila, which divides the valley into two, functions as a political divide, because most projects in the valley were concentrated in the El Grullo half.

The commission was headed by the son of a former Jalisco governor, the said José Guadalupe Zuno Arce. Until 1965, Zuno Arce had been personal secretary to general Lázaro Cárdenas, former Mexican president, when he headed the *Comisión del Río Balsas* in neighbouring Michoacán. In this capacity, Zuno Arce became acquainted with the harsh reality of rural Mexico. In December 1970, when Luis Echeverría became Mexican president, the *Comisión del Sur* started to prosper. This was so because José Guadalupe Zuno Arce was the son-in-law of the new president. During subsequent years, the commission became the only important government institution in the region. The Jalisco state government lost all control over it, since the commission directly negotiated federal programmes and its budget in Mexico City. The southern part of Jalisco had become a *de facto* state. Zuno Arce developed a strong ideology, mainly inspired by Mao (who visited the region), mixed with a kind of populism derived from his father-in-law, Echeverría. At the end of 1976, a new Mexican president was sworn in, and Zuno lost his privileged position and the *Comisión del Sur* died a slow death. The commission's main achievement is the establishment of numerous *industrias del pueblo* (industries of the people) in the various villages and hamlets in the region. Furthermore it succeeded in directing other infrastructure to the region, like the small irrigation units (*unidades de riego*) along the Río Tuxcacuesco (in 1977),<sup>44</sup> and the asphalt road El Grullo-Ciudad Guzmán, completed in 1978 (Gómez Zepeda 1988:104).

The drinking water system which the *Comisión del Sur* implemented in the Autlán-El Grullo valley was a daring project: water was taken from two sources in the Sierra de Manantlán, at an altitude of 1,700 and 1,600 metres above sea level, respectively, and brought to the valley (at 950-1,000 metres) through a pipe system with a length of 40 kilometres. In the hamlets and villages all houses were connected to the system. The project started in 1972 and was completed in 1974. All households to be connected to the system had to provide 20 labour days, or an equivalent amount of money, for the digging along the projected line. These work parties are remembered by many people as 'the good days', when men and women were digging way up in the *sierra*, and when groups of women were in charge of the catering of food up there. The project was a success: technically it was well designed and constructed, the water quality was superb, and for more than 10 years its capacity was enough to provide water to over 30,000 people. The person in charge of the project on behalf of the *Comisión del Sur* was Jesús Corrales, a young engineer from nearby Unión de Tula. He would later become the undisputed leader of the CNC sugar cane grower's association.

For its administration, a water committee was set up, with user representatives. During the first years, the committee was able to build up an impressive repair fund. In later years, the committee became the subject of local political disputes (this not wholly unconnected to its interesting funds). By 1982, the then mayor of El Grullo 'sold' the administration to a specialised state agency based in Guadalajara. Accounting for the fees paid by the users was discontinued, and major repairs were not undertaken. Thus, by 1985 the neglected infrastructure could not meet any more the demands for drinking water from a rapidly growing population. However, the repair fund had disappeared. From that year heated debates among *Grullenses* and between different villages ensued, and water supply had become the major political issue during village council elections in December 1988.

The story of the El Grullo town water supply to some extent broke the pattern whereby initiatives and new projects were dominated by the local elite. The Manantlán project was a project of the village, of the people. Most villagers conceived it as such. And yet, we see how, in the end the project works out quite congruently with the trend we found in earlier projects. Again, a new infrastructural development gives rise to a new local organisation, which initially does a good job. Within a few years, it is dragged into a political web, and becomes the subject of various struggles. After some time, most ordinary people are simply weary of all the trouble and become complacent. Most women, however, were active when in the 1987 and 1988 rainy seasons the drinking water system collapsed. Seven weeks without a regular water supply for a town of 25,000 people leaves nobody indifferent. Not even the men!<sup>45</sup>

#### Getting the unasked: the rehabilitation of El Operado (1978-1990)

The final section of this short history of agricultural development in the valley, and the role of infrastructural works in it, is about the rehabilitation and expansion project of the El Operado irrigation system. Already in 1960, it had been envisaged that El Operado would expand its canal system by installing a series of pumping stations. In 1970, the then head of the District in charge of El Operado, Engineer Montaña, completed his thesis at the Agricultural University Chapingo, entitled: 'Plan for the rehabilitation of the lands and infrastructure of the Irrigation District Autlán-El Grullo'. During 1973-74 detailed studies were undertaken by SRH, and by 1978 the project for rehabilitation and expansion had been formulated (by the ministry which in 1977 fused with SAG to become SARH). In the same year, a co-financier was found: the Interamerican Development Bank (IDB). In February 1979, the formal loan agreement between the bank and the Mexican government was signed (*Contrato de Garantía* 1979).

I found no evidence that people from the valley have pressed for this project. It seems that the entire project was conceived by SARH engineers, and that some SARH engineers lobbied and secured the project.<sup>46</sup> According to the feasibility study dated April 1978 (SARH, 1978), the project would rehabilitate existing infrastructure, and extend it so that in total 19,050 hectares could be irrigated. The project included the construction of a tunnel, and 4 major pumping stations with several minor re-pumping

Table 2.2 Projected costs of rehabilitation and expansion project, as per 1978

concept	area irrigated (ha)	cost (million US\$)	cost per ha (US\$)
rehabilitation of existing infrastructure	9,842	30.75	3,124
expansion of irrigated area in Autlán-El Grullo	2,012	6.56	3,260
expansion of irrigated area in El Limón valley	1,491	4.47	2,998
expansion by means of pump station no.1 (h=18 m.)	2,731	6.87	2,516
expansion by means of pump station no.2 (h=34 m.)	1,441	4.16	2,887
expansion by means of pump station no.3 (h=50 m.)	1,088	3.11	2,858
expansion by means of pump station no.4 (h=66 m.)	445	1.41	3,169
total	19,050	57.33	3,009

Source: SARH, 1978:52

plants. The project did not include an expansion of the storage capacity, since 'the abundant resource here is water' (p.43).<sup>47</sup>

The cost of the project was estimated at 717 million pesos (1975 prices) or US\$ 57 million, equivalent to 3,000 US\$/ha (table 2.2). The IDB loan would cover over 20 million US dollars.<sup>48</sup> Implementation of the project works would be rapid, taking only three years, starting in 1979. According to the loan agreement, farmers would start benefitting from the new works by 1983. All users would continue to pay the usual costs for operation and maintenance. In addition, the agreement speaks of the amortisation payments (up to 30% of federal investment, or 425 million pesos) that were supposed to be made by the water users, but it does not clearly define how this would be ensured.

By September 1983, only 8,400 of the 9,600 ha existing infrastructure was rehabilitated, and a mere 1,800 ha had received new irrigation infrastructure of a total of 8,700 ha (total project area had decreased to 18,300 ha). Activities then virtually came to a standstill. The new infrastructure constructed has been lying idle since then. When in 1983 the activities of the original project stopped, activities on a newly defined work started: the construction of a huge storage dam, Trigomil, which would supplement the existing Tacotán dam. This was not part of the original project, and no documents could be traced in which the addition to the project was laid out in detail, and technically justified. The first traces of this new 'sub-project' date from the end of 1982. A two-paged memorandum from the local Grande Irrigación Office in El Grullo, dated 8/8/83, dryly observed:

The fundamental modification of the project consists of adding the construction of another storage dam (Trigomil), because the hydrological study which was considered in the original project has the deficiency of assessing the storage capacity of the Tacotán dam as sufficient. Whereas that dam at the most can provide for only 50% of the water requirements of the project.

Such a technical blunder is quite astonishing, considering the widely acclaimed and high quality standards of hydraulic projects elaborated by SARH. According to officials, the Trigomil dam at completion will have a storage capacity of over 350 million m<sup>3</sup>. This storage capacity, together with the existing Tacotán dam (capacity 148 million m<sup>3</sup>), would be enough to irrigate much more than the 18,300 ha of the rehabilitation and expansion project. No data were obtained about the new dam's projected costs, nor how it is financed. Construction activities developed very rapidly starting in mid 1983, but by 1990, the dam still had not been completed. The new Mexican president promised in a speech (18/4/90) to release enough funds (30 billion pesos, US\$ 10 million) to complete the dam.

Why did work on the original project so abruptly come to a near standstill around 1983, and activities shifted to a completely new project? In December 1982, a new president, Miguel De la Madrid, came into power. He is from the state of Colima. The situation is such that the Rio Ayuquila, after it waters the Autlán-El Grullo valley, finally crosses Colima before flowing into the Pacific. It is a public secret that the Trigomil dam is mainly designed to provide Colima with irrigation water. People from the valley suggest that during his campaign as PRI candidate for the presidency (1982), Miguel de la Madrid had to respond to fellowmen from Colima who demanded irrigation. Due to its immense cost, De la Madrid had no choice but to use the existing budgets of the original project to get Trigomil started. To the effect that the on-going activities had to be cancelled. At the end of 'his' *sexénio*, De la Madrid must have felt sad that he did not succeed in completing the dam in his term of office. The deterioration of the economy during his 6 years apparently were so dramatic that finances for this project could not be secured.<sup>49</sup>

This final piece of the jigsaw is thus about a project that had entirely its own 'institutional' dynamic. At the start, no evidence exists of any farmer group requesting the rehabilitation and expansion project. The project probably owes its existence to the way certain SARH departments and/or their employees are linked to construction firms, and to the fact that an international financing institution was willing to invest in it millions of dollars. Half way into the project, it changed course, and the people of the valley were not involved in the decision to lay-off the works and start a new sub-project. It was directly linked to the fact that suddenly the project became a political one. This may be explained by the dynamics the PRI candidate for the Mexican presidency chooses to indulge in, or is forced to take part in when on election campaign. He then has to appease different, often antagonistic, power factions, in order to get them all in line behind the party.

## 2.5 Peasants, entrepreneurs and the state: a conclusion

In the above account of some events and projects which emerged during 1850-1985, it appears that the valley has experienced remarkable changes. A class of small farmers

emerged; the valley has been 'opened up' and is now tightly knit into the wider Mexican society and beyond, not only economically through commercial transactions, but also ideologically: ordinary citizens now are quite aware of national and international policies, they travel a lot, nearly all have been in the U.S.A., and are proud to be Mexican rather than Autlense or Jalisciense. There is now also the seasonal influx of hundreds of agricultural labourers from other (remote) areas of Mexico. Agricultural production has increased enormously, and the Autlán-El Grullo valley is prospering economically. In comparison with other areas of rural Mexico it is a privileged region, with respect to natural resources and to existing infrastructure, to the effect that the economic crisis which has swept Mexico during the last decade has affected the valley less than other regions.

And yet, despite these drastic changes, and despite its success story in terms of 'economic development', quite a few characteristics which typified the valley in former times have survived. The people of the valley are very conscious of history: of their own personal history, and of the succession of events and the changes that have occurred in the valley. They have their version of how these personal experiences and the big changes are intertwined. And they frequently call upon their version of history in order to make sense and interpret new events and projects, but especially to define what stand they should take over contemporary issues. The suspicion with which many *ejidatarios* regard efforts to create new organisations, like a fully-fledged water users association (see chapter 8), is a case in point.

For the analysis of El Operado irrigation system and for the social dynamic surrounding it, three recurring themes in the valley's history are especially relevant:

1. The issue of outside intervention, and more generally, the fact that many people from the valley interpret events in terms of a dialectic of local control-outside interference. We came across this issue when discussing the land repartition and land reform programmes, the conflict over sugar cane between some local entrepreneurs and some engineers at the irrigation District, and the rehabilitation project of El Operado.

2. The issue of the relationship between the politically influential of the valley and the common people; and more specifically, between entrepreneurs and small farmers. This relationship is characterised by inequality: economically, but also socially. Of course, through time this has changed somewhat. Land reform especially has helped to create a new class of small farmers who have been able to emancipate themselves. However, most *ejidatarios*, as well as most agricultural labourers still frequently use the classification of people in terms of 'the rich' as against 'the poor', just as they did, say, during the land reform.

The issue of the relationship between the elite and the poor is intertwined with the first issue, on the local - extra-local divide, since in the account of the various events we came across situations where outside actors formed a pact of convenience with the local elite (like with the construction of El Operado, or the boom of horticulture); but in other events, outside actors defended the interests of the small farmers (as during the first phase of the land repartition in the 19th century, through the land reforms and the drinking water system of El Grullo).

The above may give rise to the wrong idea of the existence of two separate worlds.



This is not the case, despite the huge inequalities between rich and poor, or rather, thanks to these inequalities, many ties have existed and continue to exist between both groups. The frequent occurrence of patron-client relationships has helped to shape the valley's history (see e.g. some patterns of relationships in the melon growers' association; and the relationships the General built up with his following). This was again related to struggles between different factions of the elite, in which the various factions sought the support of certain groups of the poorer people (as was the case in the struggle between Zuno and García Barragán).

3. This brings us to the third issue: the importance of intermediaries and intermediate positions throughout agricultural development of the valley. This refers to the fact that often infrastructural development, and innovations or changes in agriculture coincided with the setting up of users organisations (the *ejido*; the *jefe de potrero* in the *ejido*; the various growers' associations; the town water commission of El Grullo).

All three issues mentioned above are about relationships, and about forces trying to change them or keep them as they are. These forces emerged or at least became apparent when projects concerning infrastructural works were initiated. These projects focused on the resources of water and land. The three issues identified are still issues today. They continue to be present in the actual management and use of the El Operado irrigation system. In the contemporary account of the social dynamics of El Operado, which will follow, we will have to bear these issues in mind.

## Chapter 3

### **El Operado: characterising the irrigation system**

This chapter provides an introduction to the physical infrastructure of El Operado, emphasising its spatial setting, in contrast to the foregoing chapter which highlighted the temporal dimension. Both the natural conditions and the man-made infrastructure provide a setting which bears upon human behaviour, including the social relationships between groups of people. Such conditions constrain behaviour since they set limits to the options available to people. At the same time, they provide certain opportunities which enable people to develop new projects. Here we concentrate on how El Operado's infrastructure is tied to specific forms of access to both land and water. Access to land within the confines of El Operado automatically implies the formal rights of access to irrigation water. Thus, access to land defines the water rights. The first section of this chapter deals with access to land.

Access to water depends not only on the formal water rights one has, but also on the way irrigation water is distributed. The specific technical characteristics of the canal system make possible particular ways of distributing the water, which is the subject of section 3.2. Section 3.3 deals with the operational possibilities and constraints of El Operado. It will emerge that the District personnel in charge of operating the system actively shape water distribution. Their activities need to be coordinated. In El Operado, the coordinating institution is the (Rural Development) District. The fourth section of this chapter concentrates on the formal arrangements underlying the District's activities with respect to El Operado, and the water users.

This chapter, then, describes the interplay between irrigation infrastructure and social relationships from the perspective of the infrastructure. In subsequent chapters this interplay will be described from an actor perspective.

#### 3.1 Access to land: the use of El Operado

El Operado is intensively used by its 1,300 water users. Nearly all 2,500 plots which can receive irrigation water have irrigated crops. For plots without sugar cane, crop

intensity lies around 2, which is to say that on each plot two crops are being grown in one year, normally one rain-fed crop (June-November) and one irrigated crop (December-May). Very few plots raise two irrigated crops, since this is forbidden by the District.

During the 1987/88 irrigation season 8,700 hectares of land were irrigated. Furthermore, during the wet season 1987, 100 hectares received one or more auxiliary irrigation turns. The 8,700 ha of irrigated crops in that year consisted of 1,200 ha of cereals (maize and sorghum); 1,150 ha of vegetable crops (such as red and green tomatoes, melons, courgettes, egg plants etc.); 6,030 ha of sugar cane; 200 ha of other perennial crops (mainly fruit trees and pasture, and alfalfa); and finally 120 hectares of a variety of minor crops (figure 3.1). During this season average crop yields were the norm, for instance sugar cane with an average yield of 90 tons/ha.

These crops received on average an estimated 780 mm of net irrigation water at the field inlet (based on data provided by the irrigation District, not measured). Irrigation water was fairly evenly distributed over these crops. For instance, sugar cane occupies 69% of El Operado's lands, and received an estimated 68% of the irrigation water. Only the melons and export tomatoes (covering 4.8% of the irrigated area) used more water (6.1% of total volume irrigation water). This is an empirical manifestation of how water rights are defined. All plots which lie within the confines of El Operado, as defined by the detailed map which includes all plots and defines them by means of a number-code, have water rights; that is, rights to receive enough water to grow the crops. The Federal Water Law contains a clause which protects the water rights of a farmer owning lands within an irrigation system: the moment a crop is sown, and established, it may not be denied water if in need (Ley Federal de Aguas, 1987).

El Operado receives water from the river basin of the Rio Ayuquila, a tributary of the Rio Armería. Upstream of the head works of the system (approx.30 kms.) lies the

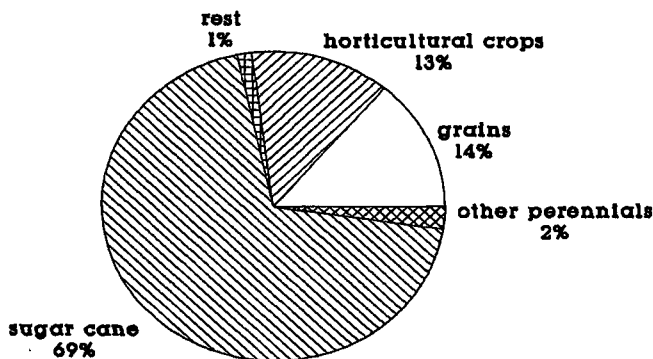


Figure 3.1

Crop distribution in El Operado, 1987/88 irrigation season.

Source: data from Distrito de Desarrollo Rural, El Grullo

Tacotán storage dam, which regulates the Río Ayuquila waters for El Operado. The dam captures water from a 1,170 km<sup>2</sup> drainage basin. With its effective storage capacity of 140 millions m<sup>3</sup>, the dam fills completely in 60% of years. The actual water need, 126 million m<sup>3</sup> in 1987/88 season, is met in 1 out of 4 years. Shortages are sometimes alleviated through rainfall and river discharges during December-March. (Appendix 1.)

#### *Land tenure*

In El Operado, two types of land ownership are found: *ejido* land and land privately owned by small holders (*pequeños propietarios*). Some 300 *pequeños propietarios* control the privately owned lands, with an average farm size of 12 ha. Over half of El Operado (some 59%) belongs to 1,000 *ejidatarios*, who are organised into 17 *ejidos*. An *ejido* is based in a village or town, but may have various lots of land dispersed over the valley. El Operado does not cover the entire valley, nor are the higher lands irrigated. This means that in many *ejidos* only part of the land is irrigated. Each *ejido* member holds the usufruct right to particular plots, which he or she works individually. Formally speaking *ejido* plots may not be sold, however, if an *ejidatario* dies, one of the legal heirs inherits the *ejido* rights. The *ejido* land endowment may not be subdivided. Distribution of *ejido* lands over its members is fairly even. In some *ejidos*, each member holds 4 ha, whereas in other *ejidos* land endowment is as high as 8 ha or more.

Renting land and share-cropping are common practices in El Operado.<sup>1</sup> A survey conducted by District personnel in the 1983/84 irrigation season, shows that one third of all lands were cultivated under a renting or share-crop arrangement (table 3.1).

#### *Access to land*

When attempting to assess actual land distribution, one is confronted with a multiplicity of data which are incompatible with each other. The analysis undertaken by the operation department of the irrigation District in 1982 seems the most reliable. The study found that El Operado had 1,279 water users with 8,790 hectares of land, or on average 6.9 ha per water user. Of these water users, 87% had access to less than 10 hectares, covering 60% of the area, with an average land size of 4.7 ha. The other

Table 3.1 Renting practices in El Operado; 1983/84 irrigation season (ha)

	total	cultivated	rented	share-cropped	total rented and share-cropped	percentage of cultivated
17 <i>ejidos</i>	5,072	4,583	1,254	299	1,553	34%
private owners	3,331	3,202	912	172	1,084	34%
all	8,403	7,785	2,166	471	2,637	34%

Source: data from Distrito de Desarrollo Rural, El Grullo

13% (or 164 water users) controlled the remaining 3,500 hectares (over 21 ha. average). At the top end of the scale were eighteen farmers controlling 880 hectares (nearly 50 hectares on average). At the other end were the 530 smallest water users (41%) with less than 4 hectares of land, covering only 16% of El Operado (figure 3.2).

Real access to land differs from the official figures. The study mentioned bases itself on the official land registration, which is not systematically updated, and reflects probably a situation of the 1970s. Also, as we have already observed, the renting of plots is a widespread practice. This makes it difficult to assess real access to land as against legal ownership. Furthermore, some larger land owners put some of their lands in the name of relatives and other trusted people (the so-called *prestanombres*) to obscure the real extent of their estate. They do this, because according to the federal water law (art.55), a person may not own more than 20 ha of irrigated land (cf. López Zamora 1977:255).

To approximate real access to farm land, we must use data provided by the sugar factory (*Ingenio Melchor Ocampo*), which maintains accurate and updated records of the cane plots and the people registered as the owners of the crop. Since the factory is not interested in the official owner of the plot but in the person controlling the crop, the factory data include some renting practices. Furthermore, some large landowners do not bother to use *prestanombres* to the factory's administration (others, however, do). Data on sugar cane thus preclude some of the pitfalls of the official land registration data, and cover 75% of all water users of El Operado.

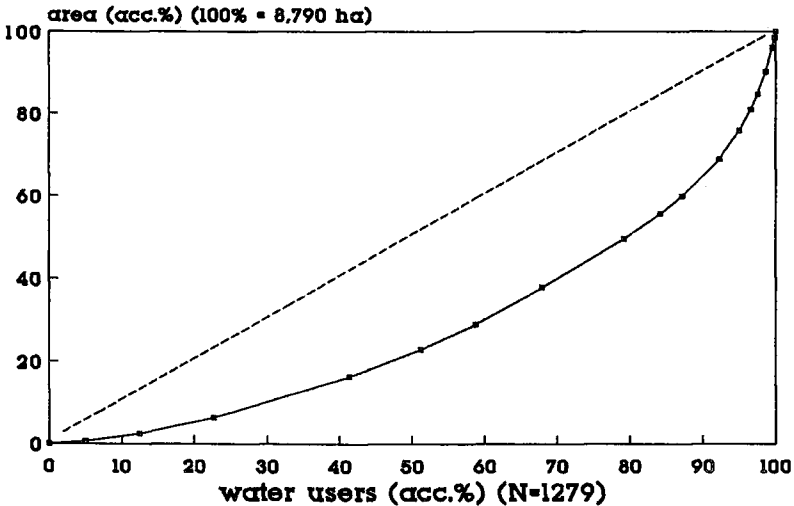


Figure 3.2 Distribution of irrigated land over El Operado's water users, 1982. Source: data from Distrito de Desarrollo Rural, El Grullo.

The factory data were computed, showing a skewed distribution pattern, including 1,087 sugar cane growers cultivating 6,270 hectares. Then the names of the sugar cane farmers were scrutinised in various sessions with two extremely well-informed farmers. They provided information on *prestanombres*, and finally the data were grouped according to actual enterprises growing sugar cane.<sup>2</sup> In total 932 different farm enterprises were identified of the 1,087 registered sugar cane growers. The distribution of sugar cane over these enterprises was even more distorted when compared to the distribution of official land ownership. Of all cane enterprises, 12 (1%) had extensions of over 50 ha. These control some 17% of all cane and of these, 5 had over 80 ha of cane each. At the bottom end, 91% of the enterprises had less than 10 ha, comprising 59% of all cane cultivated (figure 3.3). The data show that actual access to farm land, and especially sugar cane is more unequally distributed than official data reveal.

*Conclusion*

El Operado is being used quite intensively. Sugar cane is by far the most important crop, covering 69% of the command area, and attains acceptable yields. Land is unequally distributed. Access to water is defined in terms of access to land. Renting a plot thus also implies getting access to irrigation water. Since land is differentially distributed, also access to water is skewed. To have rights in water means to have access to enough water to raise the crop you cultivate. In theory, then, the amount of irrigation water used not only depends on the extent of ones land but also on the type

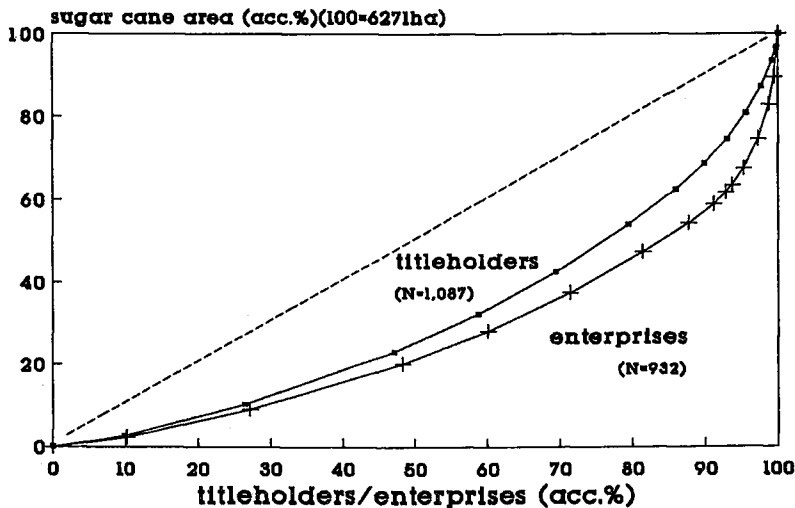


Figure 3.3 Distribution of sugar cane over titleholders and enterprises; 1987/88. Source: data from *Ingenio Melchor Ocampo*; own interpretation.

of crop sown. However, water use is fairly evenly distributed over the various crops grown, with the exception of melon and tomato which use significantly more water. Some water users benefit more from El Operado's infrastructure than others. For example, 140 sugar cane enterprises (15%) control half of the 6,300 ha. of sugar cane, and consume 35% of all irrigation water. We may infer that El Operado has two basic categories of users: a small economic elite, and a majority of small-scale farmers.

The dominance of sugar cane in El Operado has an important technical implication for water distribution. Four to six weeks before harvesting the cane, the irrigation service to the cane plots is suspended (*suspensión*). This makes water scheduling complex. (See chapter 4.)

### 3.2 The design of the canal system

Before being able to analyse how access to water is actualised through its distribution, it is necessary to give some attention to El Operado's infrastructure. In this section five basic features of the infrastructure will be identified, which in principle allows the water distribution to be flexible. The overall performance of water distribution will also be assessed through a discussion of any water loss that occurs.

The Ayuquila river divides the irrigated area into two parts: a right bank (lying in the municipality of Autlán) and a left bank (El Grullo). The right bank commands an area of some 4,600 ha, the left bank 4,100 ha. Each bank has its own intake structure in the river, and each has a main canal (*canal principal*) that provides water to secondary canals or *laterales*, to tertiary canals (*sublaterales*), to field canals (*ramales*), and to plots. Ideally, *laterales* and *sublaterales* feed the field canals, which distribute the water over a certain number of plots varying from one to five. It is the field ditches or *regaderas* that transport the water within the fields to the furrows. (Figure 3.4.)

Under the rehabilitation project, all main, lateral and most sublateral canals were reconstructed in concrete from 1979 onwards.<sup>3</sup> The concrete canals are equipped with approx. 100 control structures in the on-going canals (among others, radial gates in the main canal) with which upstream water levels can be manipulated, influencing the water level at the intake structures and field inlets (over 500). The intake structures are equipped with plates which are operated manually. In addition, the main canals cross numerous *barrancas*, or gullies, through 30 inverted syphons. This infrastructure has to ensure that all 2,500 plots are properly serviced with irrigation water.

The canal infrastructure has five specific characteristics, with implications for the use of the system. Firstly, the canal design lacks a hierarchical rigidity often found in irrigation systems. There are plots which receive water from sublaterals or field canals, but yet others may get water from a lateral canal or even directly from the main canal. The design thus easily responds to all sorts of topographical details, and has a relatively small secondary canal system in relation to the size of the main system. This feature,

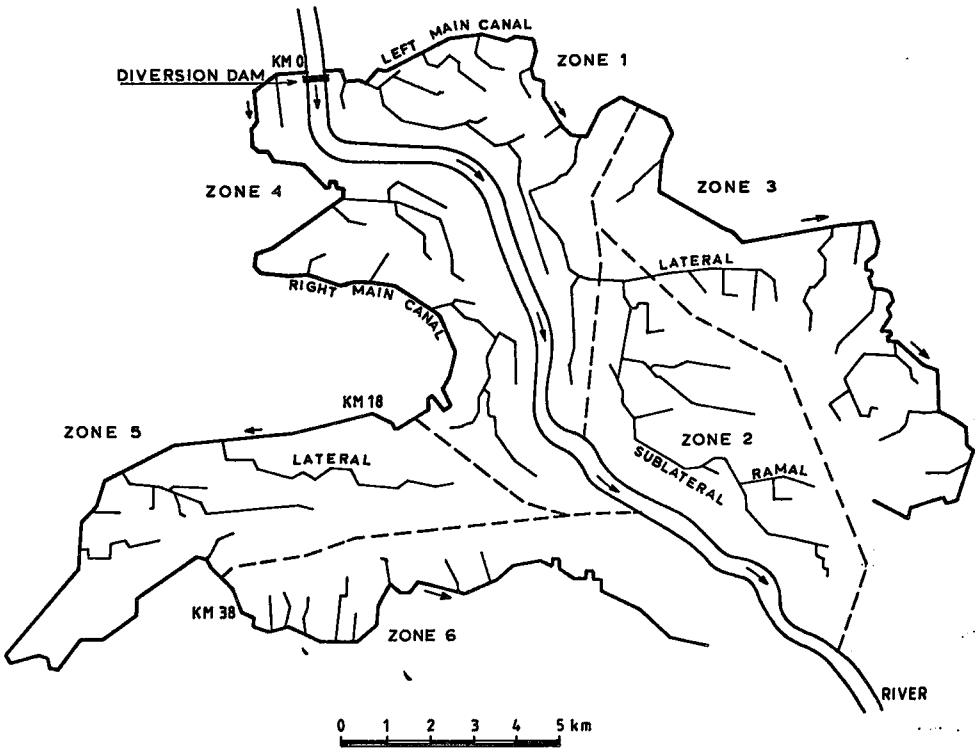


Figure 3.4 The canal system of El Operado

however, implies that the designers did not employ a clear-cut definition of tertiary irrigation blocks, or irrigation units, and did not seek to standardise the size of the hydraulic units of adjoining plots receiving irrigation water from one common source. In this irrigation system, people (both users and irrigation officers) do not use a concept similar to that of tertiary block. They simply use concepts such as 'lateral x', and 'sublateral y', which may serve an area varying in size from several tens of hectares to 500 hectares or more. The lack of clearly marked tertiary blocks is a striking feature of this irrigation system. Moreover, the canal design makes no allowance for the existing organisation of land tenure. Any canal may cross-cut *ejido* boundaries, and most lateral and sublateral canals feed plots belonging to different *ejidos* and landowners. The pattern of land tenure does not necessarily respect topographical or other landscape features, which of course would greatly complicate the canal design. Here it seems the designers did not even attempt to match hydraulic boundaries to the existing land tenure pattern, or community boundaries. This is another design feature



which has implications for the organisation of water users at canal level. (See following chapters.)

Secondly, no adequate provisions have been made to prevent siltation of canals, nor to remove silt from the canals through flushing. During the rainy season (June - September) and the first months of the dry season a considerable amount of silt enters the canal system. Between September and November the Ayuquila river may carry a lot of *aguas broncas* ('wild waters'), run-off from the drainage basin downstream of Tacotán dam. The silt laden water is brown in colour contrasting with the clear water released by Tacotán during the irrigation season. The water users of El Operado (especially those with either sandy soils, or who grow maize or sugar cane) use the *aguas broncas* in the first dry month to give their crops supplementary irrigation. The silt, then, not only enters the main system, but also the minor canals and fields, which is enhanced by the fact that the canal structures are of the undershot type which easily let through silt. The silt decreases the discharge capacity of the canals. Aquatic plants attach their roots to the silt and together this decreases the water flow velocity and more silt is deposited, followed by more aquatic plants. The circle is complete. In the main canals there are only two wash-outs which should in theory remove much of the silt from the mains through flushing. In practice, however, these wash-outs do not function. Therefore, the silt has to be removed mechanically or by hand. The maintenance department of the District is in charge of removing the silt in all canals above field canal level. To do this they have hydraulic excavators. In the minor canals silt is removed by hand. The department, however, only succeeds in cleaning some of the canals between August and November. The silted canals thus make water distribution difficult and in some instances impossible. (See chapter 5.)

Thirdly, the designers have not taken into account the other uses of canal water, in particular no provisions were made for taking cattle to water. Farmers have solved this problem themselves, in a rustic way. At places they have broken the concrete canal lining, enhancing seepage losses.

Fourthly, the control structures in the canals reveal a further feature of the system: they are all of the 'undershot' type (i.e. water is forced to flow through an orifice instead of flowing freely over a weir). This type of structure is strongly defended by the irrigation officers of El Operado, using the argument that such a system responds more rapidly to intended changes in supply flows, which is an advantage for the tail-reaches. Structures of the undershot type thus enable a more adequate and timely operation of the main system. The officers pointed out that in canals with structures of the overflow type (weirs) much 'dead water' (*agua muerta*) is stored. In the event of an increase in discharge, first a considerable time is needed to build up the new water level before the actual increase is being felt downstream of the weir. Although all officers expressed their undoubted preference for the undershot type of structures, their argument is only partly convincing, since in actual fact the main canals function far below design capacity, resulting in artificially high water levels in the main system. For this reason, there is a lot of 'dead water' stored, with the implication that in the main canals of El Operado it takes a while before changes in discharges are actually felt.

Fifthly, all control structures are adjustable. Irrigation officers anticipate flow

fluctuations, and intervene through manually adjusting the gates. These structures are adjusted with a handwheel which operates the gate opening by means of a screw thread, allowing each structure to have an indefinite number of settings. This type of design, then, enables a great degree of freedom in establishing water distribution schedules, and in responding to flow fluctuations.

#### *A flexible canal system*

This last point is probably the most important characteristic of El Operado. It shows that El Operado's infrastructure is flexible: it can respond to many variations in water demand. The designers had a fairly sound reason for devising such a versatile distribution system. One of the assumptions behind their design must have been (I do not know for sure) to allow water users to be free to grow the crop of their choice. The infrastructure does in fact provide the farmers with a good deal of freedom in farming.<sup>4</sup> When El Operado started operating, the designers did not hand-over to the management an elaborate set of operating procedures. The management simply received a flexible, but complex infrastructure which it learned to handle in subsequent years. Such a set-up is generally considered as complicated by irrigation engineers, who warn that complexity may result in low operational performance (see for example Horst 1983 and 1989). However, in El Operado, it works out quite well. In section 3.3 we will closely look at the complications this infrastructure poses for its operation.

Actual water distribution follows more or less the 'delivery upon request' model. When a farmer thinks the crop needs irrigating, he/she finds the officer in charge of water distribution (the water guard) and asks for an irrigation turn. Within a period of 10 days (normally shorter) a farmer may expect to receive his/her turn. This 'semi-demand' system is another feature which stresses the freedom of farmers with respect to irrigation.

#### Water losses

Before analysing in detail the operation of the main system, I first want to assess the quality of operation practices. A useful indicator is the occurrence of water losses.<sup>5</sup> As will be shown, water losses in El Operado amount to 45% of the irrigation water entering the head works. There are three main causes of these losses:

- (1) inadequate infrastructure, resulting in conveyance losses due to seepage through cracks etc. in the canals (see below);
- (2) improper operation resulting in losses which make certain sections receive too much water and others too little, giving rise to unnecessary discharge fluctuations (see section 3);
- (3) through seepage, or water losses occurring on the farm plots. Nearly all plots are irrigated by means of furrow irrigation. Furrow irrigation implies water losses through seepage, which are especially important on sandy soils, and water flowing directly into the drain, which occurs notably at night (see below).

Water distribution efficiency for the 1987/88 season, defined as the irrigation water

that actually enters the fields relative to the irrigation water entering the head works, was estimated by the District to amount to 55%. Assuming that this figure was correct, of the measured 124 million m<sup>3</sup> entering the system, only 68 million m<sup>3</sup> reached the fields. The question, therefore, is where does the lost water go? The answer is simple: the major part drains into the river. For instance, in April 1989, all water flowing in the Ayuquila river was entering both main canals, i.e. 7,100 litres per second. Thus, beyond the diversion dam the Ayuquila river bed was dry. Downstream of the entire irrigated zone (30 kms. below the head works), 3,300 lps were measured (figure 3.5). All this water eventually came from El Operado, implying an efficiency of 55%.<sup>6</sup> Since part of the drainage water measured in the river came from seepage losses occurring within the field, this figure includes both water distribution efficiency, and part of field application efficiency. Thus we may safely argue that actual water distribution efficiency in El Operado is higher than 55%. These water measurements in the Río Ayuquila represent the only existing hard data on actual water efficiency of the system. The figure used by the irrigation District is exactly the same as the figure we found. This is striking, because the District does not systematically monitor water losses.

#### *Conveyance losses*

A small survey of conveyance losses along the first 25 kms. of the right main canal concluded that some 250 lps or 10% of the water flowing through that stretch of canal (2,500 lps on average) seeped away, equivalent so some 10 lps/km, or 0.4%/km.<sup>7</sup> Since this stretch of canal is quite representative for the entire main system, total seepage losses in the main canals may only amount to approx. 500 lps, or 10% of the total volume entering the system.

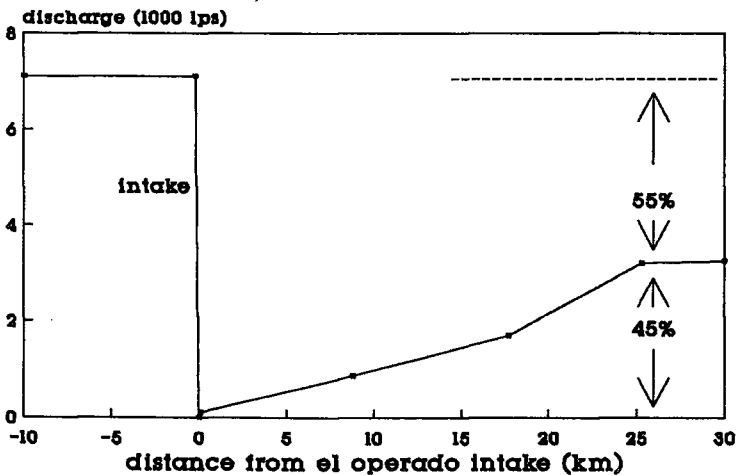


Figure 3.5 Drainage from El Operado into Río Ayuquila, April 2, 1989. Source: measurements by Distrito de Desarrollo Rural, El Grullo.

Water measurements for a period of one month were carried out in a lateral canal which serves an area of 480 ha. On average, 550 lps flowed into the lateral. In this 1,200 metres long lateral canal water losses varied between 30 and 100 lps, averaging some 10% of the entering flow. As a rough estimate, conveyance losses in the main canals and lateral canals together may be between 15-20% of the incoming flow.

*Practice at farm level: night irrigation*

At farm level, two major sources of water losses can be identified. One is over-irrigating crops grown on sandy soils (see below). The other refers to losses occurring during night irrigation. Nearly all farmers who irrigate their plots will also irrigate during the night. Irrigating one hectare takes some 6-8 hours, on average (with a *main d'eau* of 40-60 lps, this gives an irrigation application of 100-150 mm). Since most plots are around 4 ha in size, an irrigation turn will often take 24 hours, or slightly more. Irrigating at night is quite difficult, and in fact only by full moon is it possible to irrigate cautiously. Normal practice, is to lower the incoming water flow by 10-40%, in order to make irrigating easier and to forestall irrigation water flowing into the drain. This, of course, results in increasing discharges at the lower ends of the feeder canals, and frequently irrigation water gets lost to the drain. However, since lowering the flow running into the field at night is so widespread a practice, many tail-end farmers have learned to rely on the 'night-water'.

For instance, during a period of great water stress in the 1987/88 season, many farmers requested an irrigation turn, and most of them had to wait over 10 days. I suspected that tail-end farmers would be the most affected, and I interviewed several farmers with plots in the tail-ends of two long lateral canals. Most of them told me that their crops were doing reasonably well, although they said they had not applied for an irrigation turn. They had adopted the strategy of closely observing the water flows in their stretch of the feeder canals, especially late at night. In case of a gradual increase in flow, they would start irrigating. The following morning, by 10 o'clock or so, the canal would again run dry, and they would await for the next opportunity. Commenting on plots which were affected by water shortage, the farmers said that their owners were simply too lazy to frequently visit their fields. They reckoned that their tail-water strategy was indeed very time-consuming. Night irrigation thus gives rise to water losses, but only half of the 25% expected really gets lost, which on a 24 hour basis means a loss of 6% of the entering water.

*Practice at farm level: seepage losses on sandy soils*

At farm level, another major source of water losses occurs on sandy soils. These soils easily get over-irrigated, which results in water percolating to the subsoil, and finally seeping into the drains. Here, I provide some comparative data on the irrigation of sugar cane in two lateral canals: one with only clay soils, and the other with mainly sandy (*playa*) soils.<sup>8</sup> The sugar cane on clay soils received on average one irrigation turn in every 6 weeks, whereas the sugar cane on the *playas* received an irrigation turn every 3 weeks. One would expect that the irrigation turns on the sandy soils to be lighter, but this is in fact not so. Water measurements revealed that an average

irrigation turn on the heavy clays equalled 120 mm, which is considered adequate for these soils (Agricultural Compendium, 1981:358). On the *playas* irrigation turns averaged 150 mm, which inevitably results in percolation losses ranging from between 30 and 50 mm or more. According to many farmers, one of reasons for over-irrigating the *playas*, is that 'the water does not advance in the furrows', resulting in long application times.

In all, sugar cane on sandy soils received up to three times as much water as on clay soils. Sugar cane yields tended to be higher on the sandy soils when compared to the same crop on clay soils (103 tons/ha versus 93 tons). This frustrates clay farmers who will tell you that sugar cane grown on clay soils will render higher sugar percentages, and that sugar cane produced on *playa* soils is '*pura agua*' (mere water). Farmers are not paid according to the sugar content of their cane, but according to the gross weight of the harvested cane. Farmers with sandy soils are very conscious of seepage losses in the field canals. In the lateral surveyed, most field canals and field ditches had been lined, which in other laterals you would not see. Groups of farmers themselves constructed these canals, and paid for the investments. Of course, at sublateral level, other kinds of losses are also likely to occur. We did not measure these. It is estimated that in all, some 25% of the water entering sublateral canals gets lost. As was stated earlier, conveyance losses in the main and lateral canals range around 15-20% of the incoming flow. Losses due to poor operation are discussed in the next section.

### 3.3 Access to water: operating the system

Having discussed the most important physical features of the canal system, I will now analyse how these features structure the way in which the system is operated. For operation purposes, El Operado is subdivided into 6 zones, 3 on each bank of the river. The zones vary in extent between 1,000 and 2,000 ha, each zone including a part of a main canal, and various minor canals (figure 3.6). The division of El Operado does not automatically follow the hydraulic infrastructure itself. It is also possible to divide the system into 8 zones (as was the practice during the 1960s). So the division into zones reflects the management rather than the technical criteria of the infrastructure.

Water distribution within each zone is the responsibility of one *canalero* (water guard). The distribution of the irrigation water over the different zones along one main canal is in hands of an *aforador* (water gauger), who carries out the daily water readings. There is also an irrigation supervisor, who has to check whether a farmer is present at plots receiving water, and whether water is being spilled or is wetting a neighbouring plot. The supervisor will do the job of a *canalero* in case of illness. In all, the field personnel in charge of the operation of this 8,700 ha irrigation system total 9 persons. These persons are District personnel, and paid by the federal government.

The water guards receive requests for irrigation turns from the farmers, establish an

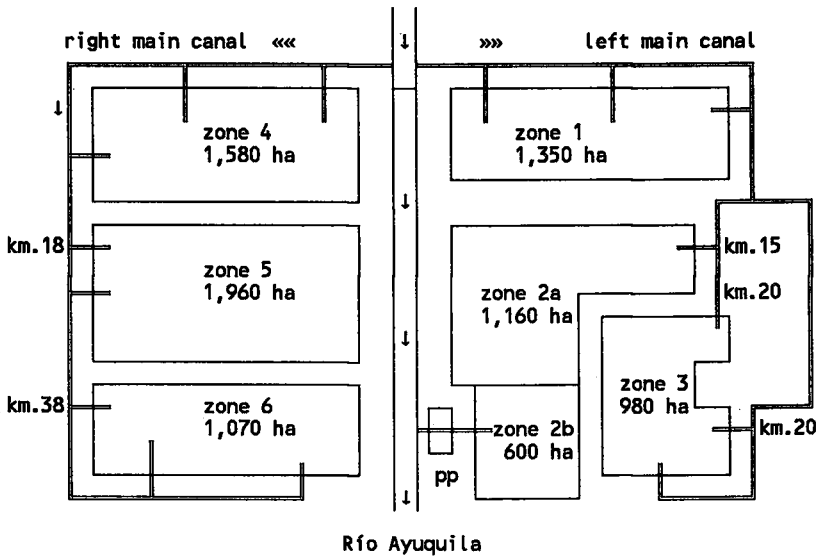


Figure 3.6 The 6 zones of El Operado (schematic) (pp = pumping plant)

irrigation programme, and then adjust the control structures in the canals accordingly. Most control structures lack reading gauges for up- and downstream water levels, so all radial gates and all intake structures are operated through rules of thumb, which are "calibrated" on the basis of experience. This is normally done in terms of number of screw threads of the gate mechanism, but actual up- and downstream water-levels are also taken into account. Comparing a number of water measurements with the *canaleros'* estimates indicates that these rules of thumb reflect quite accurately actual Q-h (discharge - water level) relationships of the different control structures.

The only quantified monitoring of performance is provided by the daily water measurements of the water flowing into the 6 zones (measured by the *aforadores*). With these data, the District personnel can evaluate expected and real discharges in the main system. However, no routine water measurements are taken in the off-taking minor canals, and thus there is no precise feed-back mechanism at this level. Moreover, the lack of data makes it difficult to assess losses due to the poor operation of control structures by personnel.

During the irrigation season, some 4,000 to 9,000 lps flows into the system, day and night. In April 1988, the right main canal took in nearly 4,200 lps and the left main canal slightly less than 3,000 lps. This is below the design capacity of the main canals, since only half of the eventual 18,300 hectares are now irrigated. (See Appendix 2.) Since minimum water levels have to be maintained in order for the canal intakes to function properly, the control structures in the main canals (radial gates) are normally partly lowered. This makes the water velocity in the mains lower than designed (0.5 m/s or less as against 0.9 to 1.2 m/s designed). On the one hand this complicates adequate

water distribution, as more time is required before changes in the settings of the control structures take effect. For example, extra water taken into the right main canal destined for the tail end of that canal (approx. 60 kms. down stream) will only reach its destination two or more days later.<sup>9</sup>

Operating the main system at less than half of design capacity also has an advantage: since the main canals partly store 'dead water', or *agua muerta*, sudden unforeseen changes in water use by the farmers are buffered somewhat. For example, with a discharge of 4,200 lps running into the right main canal, between 2 and 6 cubic metres of water per meter of canal length is stored along the first 30 km. of this canal. This represents a storage of approx. 100,000 m<sup>3</sup>, or equivalent to nearly 7 hours of a discharge of 4,200 lps.<sup>10</sup>

This situation has some implications for the proper operation of the main system, and especially with respect to changes in the water distribution pattern, which occur during the irrigation season. An intended change or *cambio* in the existing water flows implies that on numerous points along the main canals the settings of the radial gates need to be adjusted. This, then, may result in flow fluctuations which are not intended. One way to assess the performance of the main system's operation, is through analysing these intended and unintended changes in water flow. Poor operation is reflected in fluctuations in discharge in the canals, under normal conditions intake discharge at the head-works is fairly constant. Since data on daily discharges in the main canals are available, we may try to assess the importance of these daily fluctuations (table 3.2).

If we correct the occurring daily fluctuations taking into account the intended changes (or *cambios*), flow fluctuations only diminish at the head works of the main canal (from 5 to 2.5%). Sifting the daily fluctuations on intended changes at km.18 and km.38 in the main canal, and allowing for proper delay periods of one to three days, does in fact result in still higher fluctuations (from 8.7% to 10%, at km.18). These findings clearly imply that for the downstream zones, water availability is much less predictable and reliable than in the head reaches.

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Table 3.2 Fluctuation of discharge in the main system; January, 1 - June, 18, 1988

	system	right main canal; distance from intake		
		at km.0	at km.18	at km.38
mean discharge (lps)	5,980	3,480	1,880	770
mean daily fluctuation (lps)	280	170	160	104
as percentage of discharge	4.7%	5.0%	8.7%	13.5%
stand.dev. of fluctuations (N=146)	583	328	223	113

Source: data from Distrito de Desarrollo Rural, El Grullo; own elaboration

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Controlling fluctuations in the main system

As was observed above, water distribution patterns are actively shaped by the actions of the District's field personnel. Every working day the *canaleros* and water gaugers meet at the District office in El Grullo with their superiors. This meeting is normally presided over by the head of the operation department (an agricultural engineer). During the meeting the two water gaugers report their findings of the water flowing into each zone. Then, the *canaleros* inform their superiors whether or not they have sufficient water at their disposal, with respect to the requests made by water users. If necessary a *canalero* asks for a *cambio*, a change in the water discharge entering his zone. In case of such a *cambio*, the first consideration is whether redistribution of the irrigation water over the three zones in that margin will solve the problem. If so, the *aforador*, and/or the *canaleros* involved will reset the different radial gates in the main canal. If, however, this arrangement is not sufficient, re-allocation of the water over all six zones is considered. If this is possible, both *aforadores* have to re-set the gates at the river intake (normally early next morning), and (some of) the *canaleros* have to re-arrange their control structures. If this is not enough, the dam guard at Tacotán is informed by radio to change the release of water. Normally, *cambios* are discussed at the beginning of each week.

To see how these officers respond to intended changes, we turn to a practical

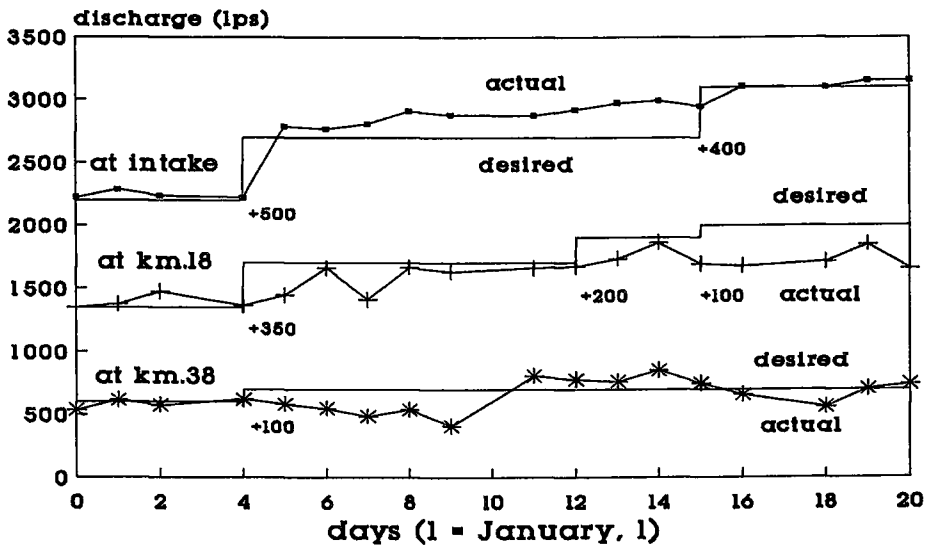


Figure 3.7 Daily flow fluctuations in right main canal, January 1-20, 1988. Source: Distrito de Desarrollo Rural, El Grullo; own elaboration.



situation which occurred in January, 1988. During the last 10 days of December, water flows in the main system had diminished considerably: most farmers opted for feasting rather than irrigating, and also the water guards preferred a peaceful Christmas. Only some 2,200 lps were flowing into the right main canal. Consequently, after the Christmas recess many farmers started requesting irrigation turns, and during the period January 4-16 discharge had to be built up again. At the head-works, intake in the right main canal increased to over 3,000 lps, nearly a 50% increase. How did the main system react to this change?

The resulting discharges at three points in the right main canal, at the intake (where zone 4 begins), at km.18 from the intake where the canal enters zone 5, and further downstream at km.38 (zone 6), are represented in figure 3.7. As can be seen from the graph, at two points in time a major *cambio* at the head work of the canal was implemented; the first *cambio* involved an increase of 500 lps, and was agreed upon on Monday, January 4. Of this extra water, 100 lps were destined for zone 6, 250 lps for zone 5, and 150 lps for zone 4. The same afternoon the Tacotán gate keeper was informed by radio and the water guards went back to their zones to put the radial gates in the main canal to the settings required to receive the increasing flow. Already the following morning the intended change had reached the head of the main canal (from 2,200 to 2,800 lps). At km.18, the increase was slightly felt (from 1,360 to 1,440 lps).

That afternoon, the *canalero* of zone 4 learned that not enough water was passing to the downstream zones, and that he had kept too much water in his stretch of the main canal. He had asked for an increase of 150 lps, but he had in fact received (or taken) nearly 500 lps. Therefore, still no increase was felt downstream. The *canalero* duly corrected the settings of his 6 radial gates in the main canal, and indeed, the next morning (Wednesday), at km.18 the water was flowing slightly below the intended discharge. When that afternoon's water readings for zone 4 and 5 were close to the intended discharges, the water guard of zone 4 apparently thought he could now re-set the radial gates, the water wave having passed to the downstream zones. However, the following day discharge at km.18 had fallen sharply, and zone 4 was attributed to have taken it. After some other adjustments, the water flow zone 4 used in subsequent days stabilised around 1,240 lps, still well above the requested 1,000 lps.

In the mean time, zone 5, which had requested an increase of 250 lps (from 750 to 1,000 lps), experienced some major fluctuations. On Wednesday, the zone used 1,080 lps, a day later discharge fell to 930; then again it increased on Friday and Saturday to as much as 1,200 lps. This took the water guard of the zone by surprise, but the *canalero* of zone 6 was disgusted by it. He had seen the amount of water flowing into his zone (at km.38) falling steadily from Monday to Saturday, from 600 lps to 400 lps. He had requested an increase of 100 lps. So, Saturday afternoon, the water guard of zone 5 re-adjusted his radial gates, and on Monday his flow had decreased again by 350 lps to 850 lps (as much as he had before the *cambio*), and 800 lps was now running into zone 6.

On Tuesday, January 12 (a week after the *cambio*), the water flows had still not stabilised. The state of affairs on January 12, in comparison with the pre-*cambio* situation, is presented in table 3.3. The table shows that zone 4 still was taking the water destined for zone 5. Thus, a minor *cambio* was asked for by zone 5 for an extra 200 lps, to be provided by zone 4. By Friday, January 15, yet another *cambio* was agreed upon, an increase of 400 lps at the intake, of which 300 lps was destined to zone

Table 3.3 Flows in right main canal, before and after *cambio* of January 4, 1988 (lps)

	before <i>cambio</i> (January, 4)	intended flow	after <i>cambio</i> (January, 12)
at intake	2,200 lps	2,700 (+500)	2,920 lps
used by zone 4	850 lps	1,000 (+150)	1,250 lps
at km.18	1,350 lps	1,700 (+350)	1,670 lps
used by zone 5	750 lps	1,000 (+250)	900 lps
at km.38 (= zone 6)	600 lps	700 (+100)	780 lps

Source: data from Distrito de Desarrollo Rural, El Grullo; own elaboration

5. It was again the most upstream zone that profited from this *cambio*. By January 26, zone 5 finally received the requested amount, but by then it was decided that zone 5 had to pass on 100 lps to zone 6, which was only receiving 500 lps.

In summary, then, it took three weeks before the major *cambio* was actualised. On the basis of daily water readings an iteration process of trial and error was practised by the water guards in order to reach the correct settings on the control structures and the off-takes. Thus, a *cambio* gives rise to waves in the main canal (see again figure 3.7). The Christmas case of course was special, since such big fluctuations in the water flows do not normally occur in the remainder of the season (only after heavy rainfall). Part of the sudden increases in discharge cannot be properly used by farmers and is wasted. I estimate that one third of the occurring daily fluctuations have to be considered as losses, which results in losses ranging from between 2 to 4% of the incoming flow. I make one final observation. From the data presented it appears that both downstream zones (5 and 6) are affected, whereas zone 4 reaps the benefits. It is simply using too much water. This seems to point to a tail-end problem.

#### *Control structures*

The increasing fluctuations downstream in the main canal are partly caused by field personnel manipulating the gates. The control structures in the main canal play also their role. The basic hydraulic module consists of an orifice which feeds a lateral canal, and a radial gate which acts as a cross-regulator ten metres downstream in the main canal. Both types of structure are of the undershot-type, but the level of the sill of the orifice is higher than that of the radial gate. Thus the flexibility of the entire module, as defined by Bos (1978:94), is smaller than unity. It is then to be expected that the physical infrastructure is not neutral to occurring fluctuations in the main and lateral canals. Discharge measurements were made for one module over a period of 40 days, and the results show that whereas discharge in the main canal fluctuated 3.25%, discharge in the off-taking lateral fluctuated only 2.55%. This is in accordance with the

Table 3.4 Correlation between distance to head works and water use, and between water use and soil quality, 1987/88 irrigation season

zone	distance from head works (km)	gross water use (mm)	presence of sandy soils (%)	presence of clay soils (%)	soil correction factor (-) (see footn.11)	corr. gross water use (mm water)
4	1	1,802	30	20	1.14	1580
1	1	1,435	10	30	1.06	1354
2	15	1,572	-	60	0.95	1655
5	19	1,084	-	70	0.92	1178
3	20	1,413	-	60	0.95	1487
6	39	1,470	-	50	0.97	1515
$r^2=0.13$		$r^2=0.67$		$r^2 = 0.0005$		

Source: data from Distrito de Desarrollo Rural, El Grullo; own elaboration

theoretical observation made above. Flexibility thus is smaller than one, which means that fluctuations in the main canal tend to be flattened in the off-taking canal, which inevitably results in bigger fluctuations in the on-going main canal. (Appendix 2.)

### The tail-end problem

The question which arises is: Do the tail-end zones receive consistently less water than the zones in the head reaches of the system? Gross water applications for the different zones (table 3.4) give some (soft) evidence that no clear tail-end problem occurs. The correlation coefficient between distance to head works and gross water use is low ( $r^2=0.13$ ). Data on gross water use per zone were not corrected for cropping patterns, since cropping patterns are fairly similar. Correcting the data for soil quality seems necessary, since water use on sandy soils is much higher than on clay soils, and as the table also shows, distribution of different soils is quite uneven. Correlation between the volume of water applied during the year and the percentage of clay in the various zones is  $r^2 = 0.67$ , signifying that soil type helps, in part, to explain the identified differences in volumes applied to the various zones. The water use in the different zones was corrected for the different soils (clay-loam-sand), taking into account the farmer practice to apply relatively more water on sandy soils.<sup>11</sup> The correlation coefficient between the corrected data and the distance to the head works of the system suggests that among the zones no severe tail-end problem occurred, and that the main differences in water use can be explained by the presence of different soil-types in the zones. However, there remain some inconsistencies. After correcting data, the relative water consumption for

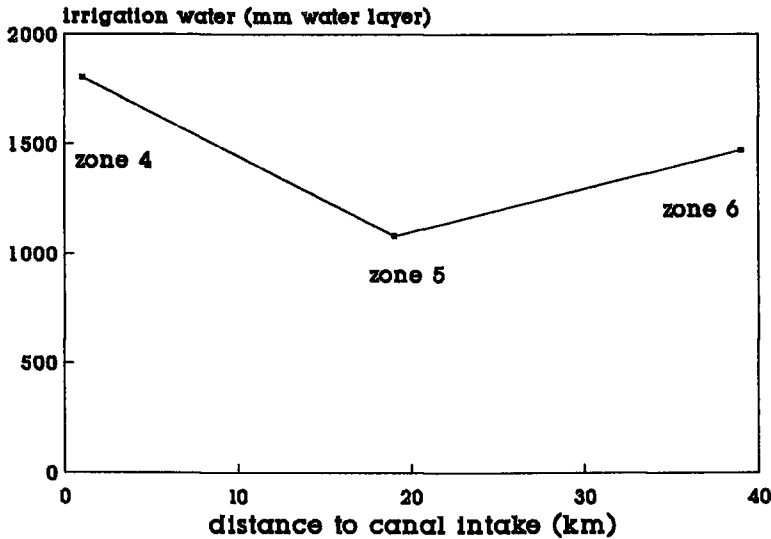


Figure 3.8 Gross water use in the three zones of right main canal; 1987/88 season. Source: data from Distrito de Desarrollo Rural, El Grullo.

zone 2 increases, and becomes the highest in El Operado. Also striking, is the difference in water use between zones 4 and 5 (1,802 as against 1,082 mm), which remains significant when corrected for soil quality (1580 versus 1178 mm). In part, these differences should be attributed to operational matters.

In the case of the right main canal, we presented graphically gross irrigation application against the distance of zone from the head works (figure 3.8). We see a U-type of relationship, indicating that the least amount of water is used by the zone in the middle reaches of the system. There are two explanations for the relative high water consumption of zone 6. One explanation is that a tail-end bias does exist but that these are partly off-set by unexpected flows due to wastes in the higher reaches, and during rainfall. Much of this water cannot be used by the farmers in zone 6, but it does enter the zone, and in the statistics it appears as water available to farmers. The other explanation becomes apparent when comparing, once more, the flow fluctuations in zones 5 and 6 (see figure 3.7 above). We see that in zone 5 fluctuations are capricious. The sudden extra discharges entering zone 5 cannot be used by the farmers, and flow unused into zone 6. In zone 6, these fluctuations have a longer wave-length, and are thus somewhat easier to anticipate. Perhaps it is such that in El Operado, the middle reaches are in a more difficult position than the tail-end. Both factors help to explain the U-form encountered in figure 3.8.

### *The actor as a factor*

We have encountered significant differences in water use in the zones of El Operado. So far, I have attempted to explain these differences in terms of natural or physical conditions. Crops appeared not to be a relevant factor, since crops are evenly spread over El Operado. Differences in soil quality, however, contributed to the observed disparity in water consumption. The implications that the physical lay-out, and especially the choice of control structures had on operating the system were also reviewed. We found that there was a tendency for flow fluctuations to increase at the tail-end of the main system, where water availability tends to become less secure. Operating the main system implies regular adjustments of the radial-gates and intake structures. In some cases relatively big changes in flows have to be implemented (in the range of 50% of the current flow pattern). These go along with unintended flow fluctuations or waves in the main canal. It takes some time for the situation to stabilise. The middle reaches of the main canals are confronted with fluctuations of a high amplitude, which are difficult to anticipate. Sudden increases in discharge are therefore difficult to use effectively. Both the top- and tail-ends are in favourable positions. The former for obvious reasons, the latter because flow fluctuations have a longer wave length and are thus more easy to anticipate.

And yet, despite the many explanatory factors reviewed, there is another crucial

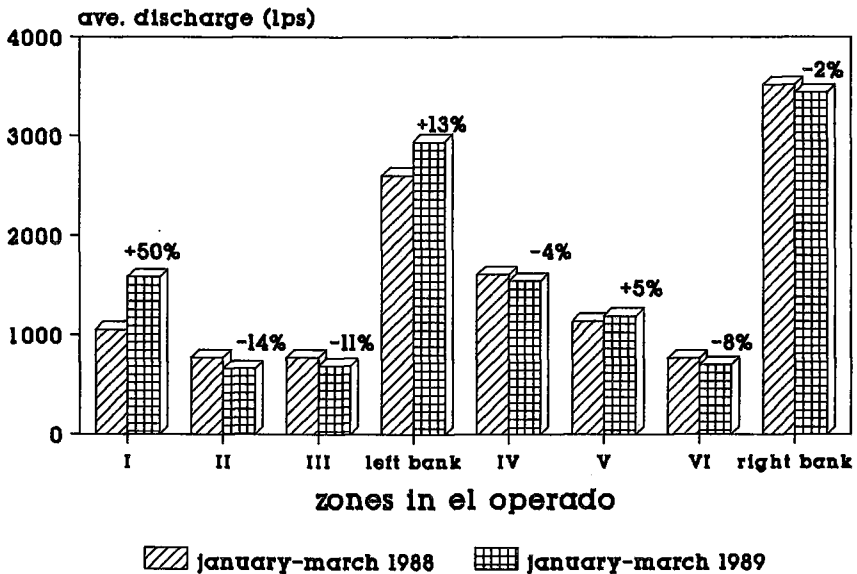


Figure 3.9

Comparing water consumption in two years; January-March 1988 and 1989. Source: data from Distrito de Desarrollo Rural, El Grullo.

factor influencing, or shaping the encountered disparities: the actor. In water distribution, the crucial actor is the *canalero*, who has a virtual monopoly on operating the control structures. To what extent do the *canaleros* influence water availability, and thus water consumption? Comparative data on water discharges during part of two irrigation seasons (January - March, both in 1987/88 and 1988/89) provide us with some circumstantial evidence that the water guard does indeed influence the observed pattern of water availability. Consider figure 3.9 where water use of the various zones in the two irrigation seasons are compared. The 50% increase in water consumption in zone 1 is striking, since the climatic conditions for both seasons were comparable, and the overall discharge flowing into El Operado between January-March, in both years, were nearly identical.<sup>12</sup> Thus, the observed dramatic increase in water use for zone 1 is difficult to explain by natural or physical conditions. The best explanation for the phenomenon is, that at the start of the 1988/89 irrigation season, the water guard for zone 2 moved to zone 1.

When still working in zone 2 in 1987/88 season, the water guard was able to direct relatively more water to his zone (see table 3.4 above). After the water guard was transferred to zone 1, he continued to secure enough water for his zone, which is reflected in figure 3.9. Whilst controlling the head reaches of the left main canal, he used too much water, which directly affected his two downstream colleagues (zones 2 and 3), who saw their water use decrease 14% and 11% respectively. Since they both complained, relatively more water was directed to the entire left main canal. And this slightly affected the right main canal, where water use decreased 2%.

On learning this, the relative importance of actors in the management process of El Operado became significant. In the following chapter, we will consider the important role of the water guard. It is necessary, first, to turn to El Operado's management, and briefly describe the formal set-up within which the actors of El Operado operate.

### 3.4 Managing El Operado

The infrastructure of El Operado is owned by the Mexican government, who have delegated management powers to the *Distrito de Desarrollo Rural*, El Grullo. Most people refer to this office as the (irrigation) District; I also. The District is the local branch of the Ministry of Agriculture and Hydraulic Resources (SARH). Farmers and the District have to deal with each other quite frequently, the former are expected to adhere to certain rules in both their dealings with the District, and in using El Operado's infrastructure.

Each farmer owning land in El Operado (either as a *pequeño propietario* or as an *ejidatario*) has access to irrigation water. Each year before the irrigation season starts, all water users (or better, those who own irrigated land) have to make a formal application to the District for the irrigated crop that they plan to cultivate (the *solicitud*

*de siembra*). This application is made to the operation department of the District. The farmer pays a lump sum for the irrigation service once per season (*cuota del servicio de riego*). This water fee varies according to the crop cultivated. During the 1986/87 irrigation season, the fee for maize and sorghum was 8,000 pesos/ha (8 US\$, at January 1987 rate); for horticultural crops 15,000; sugar cane 16,000; export tomatoes and alfalfa 28,000 pesos/ha. These fees are relatively low, since they represent only 1% or less of the gross return on these crops.<sup>13</sup> Maize always has had the lowest water fee, and export tomatoes the highest. Farmers pay their water fee to the irrigation District, receiving an official receipt. The total amount of money collected in water fees covers only half of the real running costs (operation and maintenance). El Operado is heavily subsidised by the federal government, and the investment costs of the system are not charged for at all.

The moment a farmer judges that his/her crop needs water, s/he can make a request to the water guard or *canalero* of the zone. Each water guard has one or two places where each day he is to be found at a given hour. The water guard decides when it will be possible to let the farmer have his turn. He fills in a small form, stating when the farmer can expect the water, and from whom he will take it over. This form is kept as evidence by the farmer, in case of disputes. Every other day the water guard reports on those who received irrigation water to the District's office (see chapter 4). As for canal maintenance, farmers have to keep their own field ditches and field canals clean and free of weeds. All the other infrastructure (lined canals, drains, roads, control structures, and the storage dam) is looked after by the maintenance department of the District. This chapter will not go into detail concerning maintenance, since this will be elaborated in chapter 5.

Farmers do not formally participate in operation matters. They are the clients of the irrigation District who should provide all operation and maintenance services. Farmers only have to pay their water fees on time, request their irrigation turns, and keep the field canals clean. From the farmer's point of view El Operado's management is characterised by two main features: (1) the farmers have a relatively high degree of freedom in farm decisions (which crop to grow; when to irrigate); (2) they have little or no say in issues on water management, despite the existence of a water users organisation which formally participates in management decisions (the *comisión de usuarios*, see chapter 7).

On the basis of the crop requests made by the water users, in August the office personnel of the operation department elaborate their irrigation plan for the coming season (see chapter 6). This *plan de riego* evaluates the need for irrigation water, and considers water availability at the storage dam. In the case of sufficient water being stored, all crop requests are accepted, and a monthly programme of water releases from the Tacotán dam is elaborated. In case the available water does not cover the estimated water needs of the requested crops, some crops are refused and replaced by less demanding crops. If water is still in short supply, the irrigated area is decreased, as happened during the 1982/83 and 1989/90 seasons.<sup>14</sup> For the past few years no requests for some crops with a high water demand have been accepted, such as alfalfa and rice. In addition a second irrigated crop is not permitted. As has been observed, the

District tries to limit the area under sugar cane, as this perennial crop may cause big problems if the dam does not fill completely. However, during the last few years this policy of limiting the sugar cane area has not been rigidly adhered to. The water fees are defined after the irrigation plan has been formulated.

*The District's organisational structure*

Only a small part of the activities of the 'Distrito de Desarrollo Rural', which has its main office in El Grullo, is concerned with the operation and maintenance of El Operado. El Operado is the only irrigation system within the District's service area that is operated by the District itself (hence the system's name of 'El Operado'). Here, functionaries of the District directly intervene in operation and maintenance. The District's other main activities include the supervision of the 34 independent small irrigation units that are found scattered over the District's area. These *unidades de riego* are managed by the water users themselves. The 34 units irrigate a total of 7,000 ha, involving some 1,700 water users. The District provides agricultural extension services for irrigated as well as rain-fed agriculture, but also for animal husbandry and agro-forestry.

The service area of the District comprises 5,500 sq.kms in 13 municipalities. This area is subdivided into 4 regions, each with its own area office, the *centro de apoyo*, from which all activities in that area are formally developed and coordinated. Under the leadership of each area office work the agricultural extension officers (*promotores* and

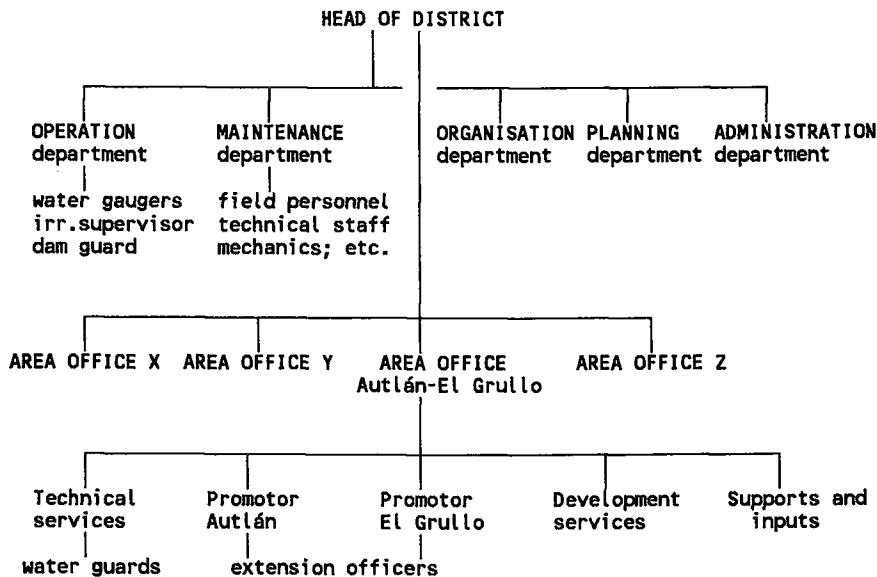


Figure 3.10 Organisation chart of Distrito de Desarrollo Rural No. V, El Grullo



*extensionistas*), who maintain direct contact with the producers. Each area office also has personnel in parallel to the line departments found in the District's central office in El Grullo. The central office in El Grullo has 5 line departments, of which the operation and maintenance departments are the most important for our purpose. The main activity of both departments is the management of El Operado. The staff are supposed to develop policies and norms for the activities of the area offices, and to provide specialised assistance (e.g. topographical surveys, soil analyses etc.). At the apex of the hierarchical organisation of the District stands the head of the District. The department heads are his deputies (figure 3.10).

One important feature of the organisation chart is that the field personnel involved in operating El Operado have partial independence at the Autlán-El Grullo area office, and are partly staff at the central office. This reflects the unclear relationship between the head of the area office and the department heads in the central office. Formally speaking, the field personnel involved in maintenance works of El Operado should report to the head of the area office. In practice they report directly to the maintenance head. Similarly, the water guards consider the head of the operation department their boss. Thirty-two people work in the Autlán-El Grullo area office (including the six water guards). The operation department, however, has only 8 people (the head, deputy head, irrigation supervisor, two water gaugers, the dam guard, and two engineers in charge of the irrigation units). At the maintenance department there are 64 persons working, of which 42 formally work under the Autlán-El Grullo area office.

## Conclusion

This chapter has highlighted some characteristics of the canal design of El Operado, and described how the irrigation infrastructure intersects with specific forms of access to land and water. Data on access to land lead us to conclude that there are two basic categories of users in El Operado, a relatively small number of entrepreneurs (some 180) having access to more than 10 hectares of land, and controlling 40% of El Operado, and a great number of small farmers (some 1,100) with less than 10 hectares. El Operado's infrastructure is formally owned by the Mexican government and not by its users. Thus, there is yet another category of important actors in El Operado: personnel from the irrigation District.

The canal infrastructure has some typical features. For instance, it unfortunately allows canals to get silted in the rainy season, which results in major problems at the beginning of each irrigation season. The most important feature of the canal system is that all the division structures are adjustable. The system can thus respond to many variations in the demand for water. This is necessary because farmers make their own decisions, within limits, and choose the crops they want to cultivate.

Adjusting the control structures in order to match the farmers' water demands gives rise to unintended flow fluctuations in the main system, which tend to increase towards the tail. This affects the tail-end zones, though the tail-ends do not systematically receive less water. The middle reaches of the main canals are most affected by high

amplitude flow fluctuations, which are difficult to anticipate and consequently some of the water that enters cannot be used and flows towards the downstream zones. Overall water distribution efficiency is higher than 55%. It was estimated that some 25% of the water entering sublateral canals gets lost. Conveyance losses in the main and lateral canals are around 20% of the incoming flow.

The six water guards actively shape how the water is distributed. Some seem more able to secure a sufficient water supply than others. We concluded, therefore, that in addition to the specific form of the infrastructure, it is necessary to look at the actor as a factor in water distribution. We do this in the following chapter. The activities of the water guards must be coordinated in an irrigation system that involves as many as 1,300 water users and 2,500 plots. In El Operado, the coordinating institution is the irrigation District, a government agency. This institution has a hierarchical organisation chart, which seems to suggest that officials at the apex of the institution are in complete control of El Operado's management.

Farmers of El Operado have a relatively high degree of freedom in farm decisions, which is made possible by the specific canal infrastructure. At the same time, farmers have little or no formal say in issues on water management. Rather they have to adhere to a number of formal rules defined by the irrigation District. Close analysis of water distribution (formally controlled by the operation department) and canal maintenance (under the maintenance department) will show that actual management practices are significantly shaped by the lower-level field personnel and by farmers (see chapters 4 and 5).

## Chapter 4

### Tender the waters; a case study of the *canalero*

After two months in the research area, the water guards or *canaleros* were the first ones to really involve me in the reality of El Operado. I was lucky, in that they were willing to show me their work, and I was impressed by their detailed knowledge of the plots, canals, and the water users of El Operado. The water guards have fascinated me because of their bravery and jovial manners. My vision of the valley has been profoundly influenced by them. The story that follows is the result of intensive field work, over a prolonged period of time.

The *canaleros* are the field personnel of the irrigation District who ensure that water is distributed from the main canal to the lateral canals, and from these finally to the individual farm plots. They physically move the weirs and sluices, and work out (in their heads, not on paper) the water distribution programmes. Water distribution is quite complex, since water users are free to choose the crop they want to cultivate, the date of sowing, and the time of irrigation. Furthermore, controlling water flows is generally considered a sensitive issue, associated with power and political influence. The *canaleros* form the frontline of the irrigation District, since they stand closest to its clients, i.e. the farmers. Despite the fact that this position exists in virtually all government managed irrigation systems of scale, relatively little attention is paid in the literature to them.

Central to this chapter is the understanding that the *canaleros* do not simply unthinkingly execute orders received from the engineers in the District's offices, as we would perhaps expect, since they occupy the lowest ranks in the District. *Canaleros* interpret the guidelines received from above and adapt them to the varying needs and constraints found at field level. They devise specific strategies to give form to their relationships with both District superiors and farmers. Moreover, in some instances they succeed in assisting farmers to develop strategies against the engineers.

I first examine the *canalero's* practice, concentrating on his daily routine and his proficient knowledge of the physical infrastructure (section 4.1). I will describe in some detail the relationships the *canalero* maintains with the water users (section 4.2) and the engineers of the District (section 4.3). Having outlined the activities of the *canalero*, I then explore how he actively shapes his work tasks (section 4.4). I also, briefly, compare the work styles of three different *canaleros* (section 4.5). In the concluding section I will review the most important aspects of the *canalero's* position, and try to

identify the factors which condition their attitudes in response to their position, and thus to what extent they consciously shape their working arrangements. The chapter takes an actor perspective. It focuses mainly on one *canalero*, Miguel. I choose Miguel for this case study for two reasons: the first and foremost is that of all 6 *canaleros*, I know Miguel best. He was also thought of by various people from the valley, engineers and farmers alike, to be 'the best *canalero*'. The scope of this chapter is necessarily limited, the main argument derives from a limited number of *canaleros* researched (three). However, what is gained with the actor-perspective is the depth of analysis. Let me first introduce Miguel, since he is the central character of this chapter,

### *Miguel*

Miguel is 41 years old. He was born in a small village in the valley of Autlán-El Grullo, the second child in a family of 12. The family was poor. His father did not own land. When the agrarian land reform started, he did not participate, as he was loyal to the old *hacienda* administrator for whom he worked. When Miguel's father finally got hold of *ejido* land, some years later, he lost it because the *ejido* board sold all *ejido* lands to a big landowner. Having followed 4 years of primary school, at 13 Miguel was sent by his parents to an aunt in Guadalajara to work in the shoe industry. At the age of 17 he returned, and lived for one year with his parents because his elder brother had left for the North (the USA). Occasionally he worked as a labourer.

Then, a water gauger of the District asked him to become his helper. Soon, Miguel was bored by the job. His father, who had worked as a labourer in the construction of the irrigation system during the 1950s and had good contacts with the District, arranged a permanent job for Miguel in the maintenance brigade of the District. He worked for two years with his *machete* cutting weeds in the canals. Then, in 1970, he was asked to become *canalero*. In 1972, he married Celia, who is from the neighbouring village, and now has three children. He bought a house from his brother-in-law, and with the 7 cows Miguel had accumulated over the years, he bought a small shop from his father-in-law. In 1981, Miguel was able to buy a second-hand pick-up from the melon profits produced on 4 ha of share-cropped land.

## 4.1 The *canalero*'s routine

We are like the *ildio*, a bird whose only concern is to follow the canals. It is a small bird, and walks fast, always in a hurry. They don't like standing water, they prefer flowing water. [Miguel, 13/11/87]

Miguel is responsible for an area of 1,700 hectares, divided into 500 fields, to which he has to allocate irrigation water. In total he deals with 350 water users. He controls the gates over 50 kilometres of lined canals. There are 30 gates and main intakes along his 18 km. stretch of main canal.<sup>1</sup> He is responsible not only for his own water flow

(700 to 2,000 litres per second), but also the flows destined for the downstream zones of Gabriel and Pedro. Normally 2-5,000 lps flow through his zone. This creates an extra burden to his task: his colleagues can easily accuse him of using part of 'their' water. This means he has to be very careful in adjusting the gates in the main channel. By the same token, it is also a great advantage: an upstream zone is never short of water (see chapter 3).

During the irrigation season, Miguel works for 60 hours per week. Each day he drives his motorbike between 50 and 80 kilometres through his zone. The major task of his work is to check that all the irrigation turns are running well, to adjust gates, and to talk to the farmers or their labourers.<sup>2</sup> (Figure 4.1)

When he is driving through his zone, observing cautiously all the fields, sluices, and gates, farmers have little difficulty in signalling to see him. Moreover, he is easy for farmers to locate, as his motorbike makes a lot of noise (he cannot afford a new silencer). Arriving at a plot where someone is irrigating, Miguel will pause. In seconds he can observe the situation, and judge whether it is to his expectations. He will often chat with the farmer or labourer irrigating. This chat is partly about irrigation matters, but invariably other subjects are also discussed. It is not unusual, for the *canalero*, to do his job properly, needs a lot of information: where is farmer so and so, what is happening on this or that plot, who is the new share-cropper of such and such a plot etc. In particular the *canalero* needs information about people, and farmers are usually very well informed about their neighbours' farms. Information exchange is a two way process. Farmers need information too: Information about current prices of agricultural products, the names of buyers, new varieties of crops, the chemical products and amounts of fertilizer to apply. This can all be obtained from the *canalero*.

One other recurring theme of conversations with farmers is the 'suspension' of sugar cane plots. Four to eight weeks before harvesting, sugar cane plots have to dry (this enhances sugar content, but it is also necessary because of the lorries entering the field), and irrigation services are suspended. Time and again Miguel urges farmers irrigating near to these suspended plots to irrigate with care and not to wet them.<sup>3</sup> Farmers sometimes complain when they are denied an irrigation turn until an adjoining sugar cane plot has been harvested, this is done in cases where the field canal leaks. This is a common source of irritation for farmers who grow crops other than sugar cane, such as maize which needs water more frequently. They themselves do not profit from the suspension. While doing his daily round, Miguel cannot take too much time to solve such grievances. He is under pressure to continue. At 2:30 pm he has to be present at the daily meeting of *canaleros* in the District. He must finish his round before then. In addition, he may have other things to do; his own crops to attend (most *canaleros* share-crop some land) or some other business, or to return home to have lunch.

Apart from the 15 to 25 water users irrigating, on his daily round Miguel will also encounter perhaps 10 to 20 farmers who request an irrigation turn. He is often called as he drives by. The moment he sees who the farmer is, he already knows the relevant information: that is farmer A, with plot number B lying at canal C, with crop D, which had its last irrigation turn on date E. When the farmer then asks for an irrigation turn, Miguel is already processing the data, and within seconds he will respond by saying:

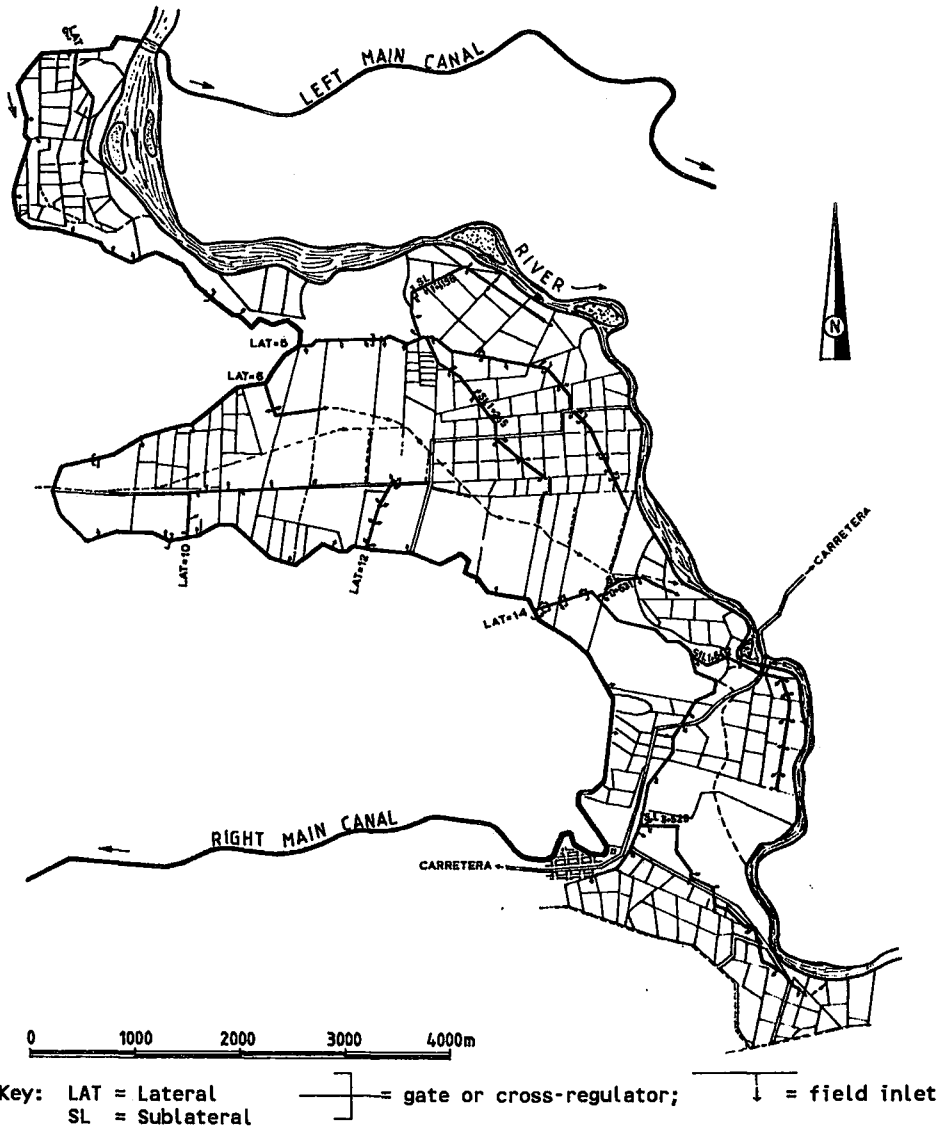


Figure 4.1 The zone of Miguel (zone 4), approx. 1,700 hectares

'no, you irrigated your plot two weeks ago, you have to wait another week'; or, 'you will have to wait until farmer F has finished, and F will start irrigating when G has finished, I think on Friday at 6 pm it will be your turn'. Sometimes he will take his notebook from his small rucksack, in which he writes the name of the farmer, the acreage, the crop and the dates of the irrigation turns received for each plot. When the farmer does not agree with a decision, Miguel refers to his book. He will look up the plot, and show the farmer the date of the last irrigation turn, and argue that he still has

to wait. Miguel, however, knows most of the necessary information by heart.

Often it is the *canalero* who looks for a particular farmer. Usually this happens when the *canalero* has worked out an irrigation schedule for a certain lateral canal. Perhaps, for example, farmer H has nearly finished his turn, farmer I has already applied for his, but Miguel judges that after H, it would be easier if farmer J followed. He will try to locate farmer J, and inform him to irrigate on a particular day. Sometimes he cannot find the farmer (especially those who grow sugar cane who often do not show up in the field for a week or more). This is one of the things that irritates Miguel. He thinks they are lazy and take little interest in their crop.

### Programming a canal

The *canalero* works out a water distribution schedule in any one canal on the basis of the differences in water demand field by field, dependent on crop and soil, on optimal distribution patterns, dependent on the canal system, and on farmers requests (figure 4.2). The pattern evolves during the irrigation season. Water demand gradually increases from November to March, because of climatic conditions and crop stage, and then decreases again. The *canalero* thus builds up a more and more complex water schedule in his zone, and along each canal.

Once a basic irrigation schedule has been established at the beginning of the irrigation season, the *canalero* can add an extra irrigation turn without reconsidering the whole irrigation plan. From a fairly simple core pattern, a complex schedule of irrigation turns evolves, which is well structured, and accounts for the differences in water need that exist from plot to plot.

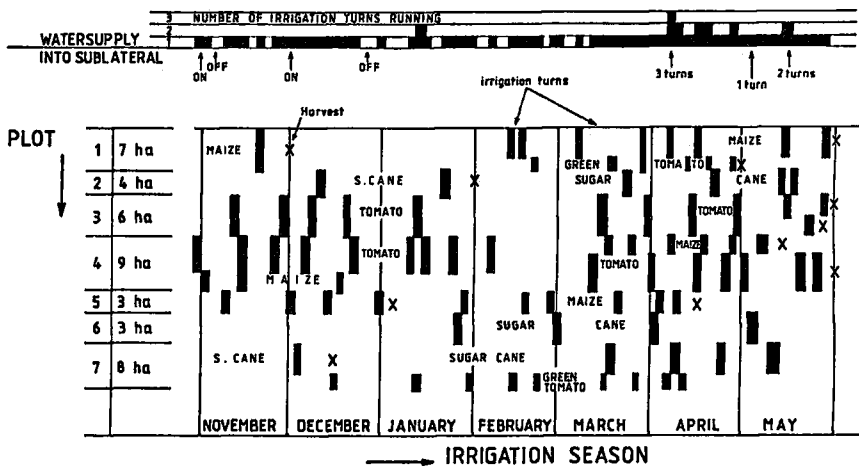


Figure 4.2 Irrigation turns along one sublateral serving 7 plots on 40 ha (1986/87 season). Note the variety of crops grown. The soils are coarse textured.

Take for instance a big lateral canal, irrigating 600 ha. At any one time, the *canalero* may have six irrigation turns 'working'. With an average plot size of 3.5 ha, and a water flow at field level of say 70 lps, a normal irrigation turn will take between 21 to 32 hours. This means that every day or so the *canalero* has to ensure that six other farmers are ready to take over these turns. When he sees he is falling 'behind schedule', that is, the six turns working are not enough to ensure that each plot gets its water in time, he will decide that extra water is needed in the lateral canal. At first, he may try to avoid this, as it needs considerable effort on his part. If the situation in the lateral gets worse, he will be forced to programme an extra turn.

First, he will have to consider whether it is possible to take an irrigation turn from another canal in his zone. If this is not possible, as in the months of January and March when water demand is on the increase, he will need more water entering his zone. So, at the daily meeting of *canaleros* he will inform the engineer that he needs extra water. When his request is granted, and the increase in discharge reaches the main canal, the *canaleros* cooperate in order to send this extra water to the right zone. The upstream *canalero* will at first receive the extra water, he has to pass it to the downstream *canalero*, which means adjusting all the gates in his part of the main canal. The downstream *canalero* will get his extra water two to four days after his request. He can now programme the extra irrigation turn, and has to adjust the inlet from the main to the lateral canal and other sluices in the laterals and sublaterals.

The *canalero* allows an extra irrigation turn (somewhere between 70 and 100 litres per second) to be superimposed upon existing water flows, which is not so difficult to implement. He does not reconsider the flow pattern. At each gate, he considers the extra water to be passed on, and assesses the adjustments he has to make (in terms of the number of screw threads or turns of the hand wheel operating the gate).

There are two situations which may severely disrupt the established water schedule: interference by a superior (see further) or sudden rains in the dry season. If enough rain has fallen (over 50 mm), the immediate result is that all water users stop irrigating. This may indeed be welcomed by the *canalero*. But he fears the consequences. Within three weeks, all water users will urgently want to irrigate, so within perhaps one week, he has to re-establish the complex irrigation order, without having a 'core' upon which to slowly reconstruct the schedule. For him, this will be the most critical week of the year.

The *canalero* has to work in a fairly systematic manner in order to cope with his task. He does not, however, make elaborate programmes before entering the field. He structures the water distribution pattern in a practical, immediate, way. It is a tough schedule he has to develop, and his freedom of action is indeed limited. But it is this domain of programming, adjusting gates and estimating water flows from which he derives his competence. He is the only one who has the proper knowledge and experience to be able to do the job. His demanding task, thus, produces specific knowledge, which in turn gives him a certain degree of authority, and this gives him some freedom in decision making. The *canalero* not only needs this freedom of action to be able to do his job properly, he may also use it for his own benefit. This may vary from favouring farmer friends, to irrigating his own share-cropped plot more frequently than is formally permitted. Before proceeding to discuss the relationship he maintains



with farmers, I first want to present an example which underscores the knowledge the *canaleros* have of the canal infrastructure.

The expert and the engineer

On the afternoon of the 6th of April 1988, Miguel invited David (the water gauger of the right main canal) and myself, to review a situation which bothered him badly. We arrived at the intake of lateral 5, which serves 500 hectares (figure 4.3). Here, Miguel had established a *reposito* in the main canal, that is, through lowering the radial gate immediately downstream of the off-take, he had backed up the water in the main canal. In fact, he had already used some of the freeboard of the main canal, the water stood some 15 centimetres below the board. Miguel confirmed that this was the maximum head possible, and thus no more water could possibly enter into the lateral canal (that morning David had measured 559 lps). 'But,' Miguel added, 'it is not enough. I am running behind schedule. Before finishing a complete round of irrigation turns farmers are already requesting the next turn.'

It was April, and the period of peak-water demand. The year before Miguel managed with intake 5, which has an 18 inch pipe. But at the beginning of the present irrigation season, some 30 hectares of land had been added, previously unirrigated (of which 20 hectares were sugar cane), and on lands already irrigated another 30 hectares had changed from annual crops like maize to sugar cane. In all, this meant that the water demand had increased by 10% compared to the previous year. Miguel was

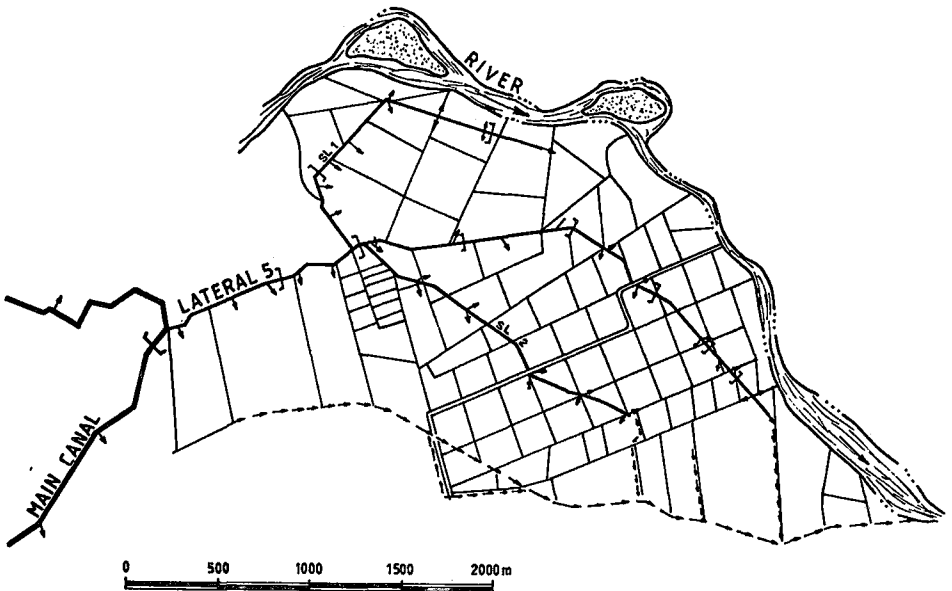


Figure 4.3 The 'lateral 5' canal with the irrigated fields.

running behind schedule. We discussed the possibilities for augmenting the discharge. I said the only way to augment the discharge was to back up the water in the main canal some more. This would only slightly increase the water flow into the lateral (perhaps a 5% increase, the inlet being a pipe), at any rate there would be somewhat more water. Miguel said this was impossible. The lateral canal would receive hardly any more water, while backing up the main canal at kilometre 5 would disturb the established discharge in the main system. An initial decrease in discharge passing the gate would also mean a decrease of the water flowing into the zone of another *canalero* (Gabriel) at kilometre 18. According to Miguel it would take a lot of time, more than 12 hours, before the water flow would stabilise again.

I roughly calculated that it would be possible to lower the gate to back up water in the main canal at six in the afternoon, and that the *rebajo* (decreased discharge) would be felt by Gabriel some hours later, when it would be night. The following morning the situation would be normalised, and because Gabriel would not visit his zone during the night, he would not even notice any change. I checked my estimations and explained them to Miguel and David. In principle they agreed, but Miguel did not accept the outcome. He insisted that when you lower the gate in the afternoon at kilometre 5, the next morning at 9 a.m. the water gauger would register a considerable decrease of discharge in Gabriel's zone, and this would cause problems. Miguel could not produce any argument for why an increase of 10 centimetres in the water level would take such a long time to normalise at kilometre 18. So the discussion ended and we all went home.

In the afternoon, however, Miguel decided to try out my suggestion. He lowered the gate at kilometre 5, so that the water in the main canal increased by another 10 centimetres, its very maximum level. Later, Miguel told me that the water stood level with the road alongside the canal. At nine that night he sat at home, but felt uneasy. Would too much water enter into the lateral, causing the lateral canal to overflow? So he went on his motorbike to check, but everything was OK. The next morning he was already waiting for the water gauger at the gate. He was now convinced that the backing up of the water in the main had decreased the discharge in Gabriel's zone considerably. He wanted badly to draw the gate up again; to undo the changes made. But he also wanted the water gauger to measure the discharge into the lateral, to see whether it had increased significantly. When the water gauger finished the measuring (with a propeller meter), Miguel quickly drew up the gate. The reading of the water gauger showed that there was no increase at all in the water running into the lateral (reading: 557 lps!), and my suggestion proved to be useless. Miguel felt uneasy, he expected trouble with Gabriel during the *canaleros* meeting that afternoon.

When the meeting started, Gabriel immediately accused Miguel of stealing water from him (200 litres per second). Then, the discharge readings were read, and Gabriel had been right. The discharge in his zone had decreased by 263 litres, whereas in Miguel's zone it had increased by 211 lps. The 'wave' (the decrease in discharge) had been exactly on the spot where the water gauger measured Gabriel's water, attributing the 'lost' water to Miguel's zone. The following day, April 8, the 'wave' had reached Pedro's zone, downstream of Gabriel. Therefore, the readings for Miguel had finally

Table 4.1 Consequences of slightly lowering a gate at Km.5 in the right main canal, at 6 p.m. on April 6, 1988. Discharge in lps, measured between 9 and 10 a.m.

day	zone 4 (Miguel)	zone 5 (Gabriel)	zone 6 (Pedro)	lateral 5 (zone 4)
April 6	2003	1367	908	559
April 7	2214	1104	919	557
April 8	1971	1568	754	569
April 9	1941	1528	812	n.a.

Source: data from Distrito de Desarrollo Rural, El Grullo

normalised. Now Gabriel in his turn had to bear the brunt. It now appeared that he had taken water from Pedro. On April 9 this situation still persisted (table 4.1).

For me it was an embarrassing experience, because now Engineer Corona, head of the operation department, also started to question Miguel. How could this have happened? Miguel then explained that it was an experiment to try to get more water into this lateral canal, because there was a severe water shortage, and this, in turn, was caused by the expansion of the area under sugar cane (implicitly criticising his superior for having allowed this). Although I felt guilty, I was surprised that Miguel did not say it had been me who had suggested the idea. He assumed full responsibility, backing me.

Thus, my calculations as an engineer appeared to be disastrously incorrect. I had severely overestimated the velocity of the water wave. My calculations were based on the assumption that the wave speed would be more or less equal to the water velocity (around 0.5 m/s). However, it appeared that the decrease in discharge moved much more slowly: initially around 0.25 m/s, and further down the main canal even more slowly. This is because water levels are maintained artificially high, since the main system is running below design capacity. This implies that it took far more time for the temporary change in water flow to normalise. Thus, according to the water readings, Miguel had taken 200 lps from Gabriel, although Miguel did not make use of that water since it remained stored in his part of the main canal.

I was impressed by the detailed and relevant knowledge that the *canalero* had about the canal infrastructure. Miguel simply 'knows' how the infrastructure reacts to certain manipulations of the gates. The fact that Miguel hesitated and finally adopted my suggestion, in my view does not run counter to this conclusion, but rather says something about the magnitude of the problems he was experiencing at that moment with farmers. Anything that could help diminish these problems was welcome to him. His knowledge about the infrastructure is both situation specific and implicit. He knows how the canals in his area react to particular manipulation, but may not know it for another situation. He could not convince me of his opinion with technical arguments.

Yet, his knowledge proved to be far more effective than my formulas and simple assumptions.

## 4.2 Interacting with farmers

How does a *canalero* cope with farmers during his work routine? I will focus here entirely on Miguel, firstly analysing his more routine contacts, i.e. communication without any real problems.<sup>4</sup> Secondly, I will describe briefly how he interacts with some 'special' farmers.

### *Routine encounters*

Normally, Miguel arrives on his motorbike. He stops, looks, tries to locate the farmer or the labourer, and then starts to whistle or yell ('fuuuuuuut', or 'heeeeeey'). Since it takes some time for the farmer and the *canalero* to come together, both have time to assess the situation. The *canalero* in seconds concludes whether the situation he encounters is as expected or not, and whether any measures have to be taken. The farmer will have time to work out some explanation for the situation. Then, when farmer and Miguel come together, a first conversation develops which often refers to something which the farmer is doing at that moment, or about something that is going on nearby. Miguel asks or comments on something rather obvious, and the farmer responds affirmatively, using almost the same words in repetition.

The function of this opening phase may be twofold. First, both participants implicitly reassure each other that they each recognise the other's position, but also that they know what brings them together. Second, it allows Miguel to create the opportunity for either of them to start talking business. Normally it is the *canalero* who takes the initiative for this. He evaluates the situation to see whether it is as he expected, but he passes his judgement in a conciliatory manner. He may say something like: *¿ya mero?*, indicating that the farmer, in his opinion, should finish his turn. Or, say, for example, "there is a lot of water now, isn't there?".

The farmer will invariably reply with an affirmation of the *canalero*'s opinion. Here, he will often repeat the words of the latter. ("Yeah, now we have a lot of water. It's running really fast.") But, when he does not agree, the farmer will subtly offer another opinion. It now depends entirely on the *canalero* as to whether he will accept the suggestion for discussion, or negate it. He is most likely to reject the farmers' suggestion when he is stressed.

Both the comments of the *canalero* and the response of the farmer are often difficult to understand. This is not only because of a language barrier (between myself and the Mexicans), but also because the mutual understanding between farmer and *canalero* in relation to the actual state of affairs is so subtle that often only half a word is needed

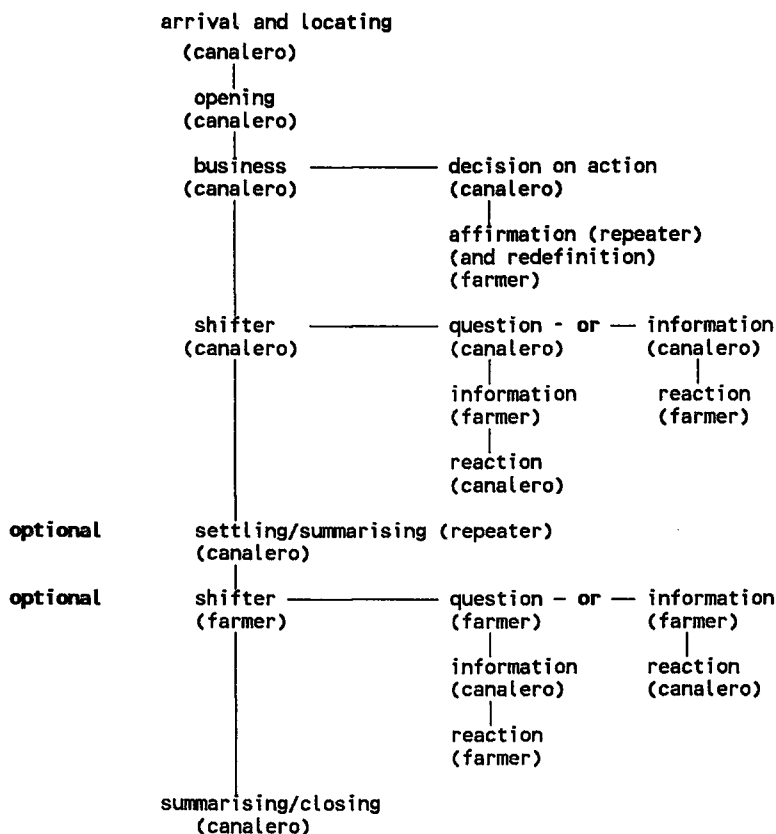


Figure 4.4 Structure of routine encounters between Miguel and farmers

for them to be able to communicate their meaning.

Sometimes Miguel may change tack and break off the first round of business talk, introducing a 'shifter' steering the conversation to another subject. Often, there are two reasons for Miguel to introduce such a 'shifter'. He may feel the need to temporarily shift the farmer's attention to another subject, for example, when there has emerged a difference of opinion between them. But a 'shifter' strategy may also emerge out of Miguel's need for specific information about neighbouring farmers, or perhaps involve subjects such as crop diseases, crop prices etc. This 'shifter' can be short-lived if the farmer does not pick it up. Normally, however, a shifter results in an interesting discussion and exchange of information.

After guiding the conversation, Miguel takes the initiative to make some conclusions and verify whether the farmer/labourer knows what he has to do, and whether he agrees. Miguel subtly indicates that that conversation has reached its end. Sometimes

at this point, the farmer will take the initiative, and introduce a completely new subject. Such an initiative nearly always results in meaningful communication, from which the *canalero* gets new information. The *canalero* will start a closing procedure, going over again the decisions reached and verifying whether the farmer agrees and understands them. He may say: "tomorrow I will pass by" or "don't forget to repair this field canal" or "take care not to water the neighbouring sugar cane plot" etc. These are usually repetitions of earlier statements. Then, the *canalero* will say something like "let's go" "goodbye", or something to close. The farmer will answer to this goodbye, sometimes raising a new question. Finally he gets on his motorbike and drives off. These contacts will normally only last between 5 and 15 minutes, but invariably they consist of most elements mentioned above, which is summarised in figure 4.4.

During his working day, Miguel communicates with perhaps 15 to 30 farmers or labourers. Most of these are purely routine: nothing special happens, no conflict emerges, nor is there much emotion put into them. The encounters Miguel has in the field are important, not only to him but also to farmers. In the routine encounters I have analysed, it is invariably Miguel who takes the lead, who initiates most in conversation. However, the farmer also actively participates, and talks at least as much as the *canalero*. Despite the fact that Miguel has the lead, he leaves farmers and irrigators enough space to contribute new points of view. The communications derive from a need that both actors have with respect to their different positions. The opening conversations have a lot to do with an explicit recognition of this and their mutual understanding of a concrete situation. There is a big overlap of shared experience, which is one reason why the very condensed discussions are sometimes hard to follow for outsiders. Miguel tries to avoid being paternalist or authoritarian in his attitude and instead tries to involve the farmer; a strategy which helps him to succeed in his tasks.<sup>5</sup> Here, I also wish to stress the elaborateness of such encounters, complete as they are with summaries, verifications, settling procedures, and with clear opening and closing procedures. In Miguel's work it is very important to know for sure whether the water user and he are 'together', that they understand each other, and that any agreements reached are transparently clear to both.<sup>6</sup>

In general, interactions with big, rich water users, develop differently from the interaction typified in this section. Miguel, for instance, maintains economic relationships with some water users. An employee of the agricultural bank who arranged cheap credit and insurance for Miguel's maize crop, expects in return some favours with respect to irrigation water. When this employee needs water, he will go to Miguel's house at night. Another example is Miguel's dealings with a big tomato producer, who rents vast areas of land. Miguel rarely interacts directly with this farmer. In daily affairs he deals with his employees, the administrators. When some special circumstance emerges, for example when the tomato producer urgently needs water, he will communicate directly with the head engineer at the District office, who in turn instructs Miguel.

On several occasions I observed how one particularly rich and influential farmer simply talked by radio to the *canaleros* involved in solving water distribution problems (this farmer has plots in 3 different zones, and thus has to communicate with 3 different

*canaleros*). If possible, the *canaleros* responded immediately to this farmer's requests. They explained their favouritism by saying: "if we don't attend him, he will immediately go to the head engineer, and then it will be our boss who gives us exactly the same instructions. So why bother?"

In contrast, Miguel sees his work with the small *ejidatarios* almost as social work. Indeed, the contrast with bigger farmers is great. "You have to be there, in the field," says Miguel:

"because you will always find water users there, if only to ask you a question. To me it may seem a stupid question, but for them it is very important. For instance: have you seen somebody who can buy my maize? ... or just to listen, or anything. For them, you are like a life-buoy (*tablita de salvación*), or a moment of distraction, and it also serves you well." [12/4/89]

### 4.3 The *canaleros* in the District office

Every afternoon, the *canaleros* meet with some of the engineers at the District office. The two water gaugers and the irrigation supervisor also attend the meeting. Of the engineers, it is usually Engineer Corona, the head of the operation department and/or his deputy who attend. Before the meeting starts, the *canaleros* meet each other under the big tree in front of the District offices, where they joke and gossip. The atmosphere among the *canaleros* is also relaxed during the meeting. It seems that this is one moment in the day when they can air tensions, built up during a hard day's work in the field, by joking. It is the only occasion when they are truly among equals and can share experiences.

During the meeting, discharge flows for the zones are evaluated, and each *canalero* has the opportunity to request changes in water quantity. They may also raise other problems that have come up. Each second day they have to write a report which lists those plots that have finished irrigation. Sometimes major conflicts arise. Miguel gives us an account of a situation that he considered highly problematic.

"Sometimes you have problems. I do not recall all the others I have had during the 20 years I have been *canalero*. But I have always had problems. One day during the meeting at the District, we had requested more water to be released from the dam. The engineers had approved it, and said that very early the following morning the extra water would arrive in the main canal. The following morning I did my round and I noticed that there was no increase of water. I got on my radio and told the engineer that the water hadn't arrived. He answered that they had forgotten to inform the gatekeeper at the dam. They had forgotten it! I followed my round in the field and came to the gate at kilometre 8 of the main canal, which I had 'working' (lowered, in order to back up the water). And in the afternoon, I later heard, two engineers went to check my zone and saw this gate with the water backed up completely. The next day, the extra water still had not arrived, but that was logical because they had not released any. Then the engineers started to accuse me of having lowered the gate, so the extra water could not pass on to the next zone. That made me wild, angry, because they wanted a thing to be true, when I knew perfectly well it was not. And they also said it was gate 10.

I said: "no, engineer, it is gate 8." "No, it was gate 10, because we saw it," they replied. Later I checked it and of course it was gate 8. It made me mad. So I decided: tomorrow I won't come. And I did not work the next day. And then I did not go to work the following day, this created big problems in lateral 5. So I had to go in the afternoon, to adjust everything. The result was, that the report I wrote the next day had many errors, because I had made up the data. Just imagine what happens if a *canalero* doesn't show up for a whole week!" [12/4/89]

### *Linking the refinery to the District*

One of the recurring topics of the meetings involves sugar cane. *Canaleros* are informed which sugar cane plots have received the order suspending irrigation. The operation department of the District receives this information every few days from the 'committee of sugar cane production' which coordinates the harvest activities (in this committee both the sugar cane refinery and the two sugar cane growers associations are represented). The operation department thus receives lists of suspended plots, but these data are unintelligible to the office personnel at the District, since the refinery's administration of plots does not coincide with the District's administration. The District denotes all the plots of El Operado by a 4-digit number, and this plot number, together with its official extension, and the name of official plot-owner features in its administration. This plot number is not used by the refinery, which bases its administration on the name of the farmer owning the crop (often not the one registered as the plot owner in the District's administration), who has a 6-digit identification number. To make things worse, the area under sugar cane as registered by the refinery concerns the net area planted, and thus is normally less than the area the District uses in its administration.

The *canaleros* are the only ones in the District able to decipher the refinery lists and translate them into terms intelligible to the District. They are thus the link between both administrations. It is amazing to see the speed with which they can do this: the engineer reads aloud the sugar cane growers' name and the cane acreage, and normally within seconds the *canalero* has produced a corresponding plot number which he writes down in his booklet. Hilarious situations may emerge when the list provided by the refinery's computerised administration appears to contain numerous faults, which are only immediately recognisable by the *canaleros*, especially cases in which the cane ready to be cut has already been harvested, sometimes months before, for planting material (this is an activity not administered by the refinery), and has been replanted again and needs water. When the *canaleros* are in a bad mood they say, "OK, they can have it, I'll cut the water."

In reality, the refinery cannot do without the *canaleros*. The refinery cannot enforce irrigation suspension, and thus the *canaleros* become the frontline of the refinery, acting as 'policemen', since normally the farmers first hear from the *canalero* that irrigation to their plots has been suspended, a decision farmers often disagree with (an extra irrigation before the harvest increases the gross weight of the cane). Of course, the *canaleros* are aware that they are indispensable, but this complicates their work. They feel especially bitter when, at the end of the year, they hear rumours about the refinery donating bags of sugar to all the personnel involved in El Operado, but they do not



receive any.

### *The silted canals*

Still focusing on the *canaleros* meetings, during a meeting that took place in November, when problems with the silted canals were most notorious, Juan, a tail end *canalero*, complained that he needed 800 lps, but that only 200 lps was running into his zone. The main canal had become severely silted and with only 200 lps the canal was now at peak capacity (whereas normally it can carry at least 1,000 lps). He again complained to the head engineer (the first time the problem had been mentioned was at least 4 weeks before, and this was perhaps the 10th time he had raised the issue) that the canal had to be cleaned by the hydraulic excavator, because the water users badly needed their first irrigation. The head engineer responded as usual: "yes, we are looking into this matter, but the problem is that the machine has broken down, and it is being repaired". But Juan insisted that the situation had become unbearable for the farmers. Then, Pedro, another *canalero*, exclaimed:

"Why. We seem to fool ourselves here completely. Juan, you need 800 litres for your farmers? Why then don't you ask for it? Why worry that the canal cannot carry it? If it flows over and the canal breaks down. That is not your problem, is it?" [9/10/88]

All the *canaleros* nodded. Juan looked up, helplessly. The head engineer continued to say that they were working hard on it. The next day, 4 tail-end farmers threatened to beat Juan up if they did not get water. After that Juan simply did not show up for one week in the tail-end part of his zone. Finally the machine was repaired and the main canal was cleaned. I give this example to show how *canaleros* assume total responsibility for their zones. The attitudes of *canaleros* during the meeting reflected this. It was Pedro who realised how they were caught in the web; taking on the problems created by others as their own concern. He expressed his thoughts, but that was all. Nothing would change.

## 4.4 The *canalero* shaping the outcome of his work

'The water is not waiting for you', the *canaleros* say. While they have a continuous water flow running down the canals, the *canaleros* are bridging both the farmers demands, and (infra)structural constraints and working to the rules. They have to have a good memory, an agile mind, and to act diplomatically with water users. That is the only way to solve this complex equation in a quick and simple way. As Miguel once put it:

"It's difficult. When I have problems in the irrigation season, I feel bad. At night I am thinking: what do I have to do the following day? How will I tackle that problem? I am always thinking. It

is usually these two things: not to have trouble with the District, nor trouble with the people. And when the District orders me to do something, then I have to do it. The moment it really becomes tough, is when I have to explain to the farmers: why this, why that, in order to keep me on good terms with the people." [17/8/87]

And 18 months later:

"The most important thing for me is to have the water user satisfied, to have the farmer contented. Unfortunately, sometimes it is not possible to solve this problem. There are two magnets and you stand in between them, that is, your bosses and the water user are dragging you in opposite directions. Thus, you have your fixed water flow, so if I should give in to the request of the water users, then I would not comply with the working norms, since I would have to take water from the downstream *canaleros*, and I would have trouble with them." [12/4/89]

The situation a *canalero* finds himself placed in, can be called the '*canalero's dilemma*'. It calls for constant choices, which are often mutually incompatible. How does Miguel handle such situations? We first consider a potentially conflictive situation with water users, which Miguel has to handle carefully.

*Seeing is understanding: the case of the incredulous farmers*

During one of the last days of March 1988 I visited the fields of lateral 5, where I knew there were problems with irrigation, because of the limited capacity of the inlet (see above). Miguel had told me he was fed up with the situation, because he could not meet the requests for water from water users.

I came across Miguel, and we stopped and chatted. He looked tired. Immediately he started to tell me of all the discussions he had had with the farmers of lateral 5. I realised I functioned as a kind of sounding board for him. He aired his frustration. He said he had expected problems, and that two years ago he had told his superior that he should press the maintenance department to construct a new inlet with a diameter of 24 inches (as against the actual 18" pipe), but nothing was done. At the beginning of this irrigation season, an additional 50 hectares of sugar cane was planted along the canal. Miguel had been angry with the engineer, and had said he would not be responsible for the problems this would cause. Miguel concluded: "now it is me who is facing the problems", adding "we are like bull fighters: we fight the bulls, and the bosses are way up in the stand, yelling *olé, olé*."

Miguel told me that that morning he came across two water users from the tail of the canal, and that they had accused him of purposely denying them irrigation water. He related how he had tried to explain the situation to them, that because of the small inlet no more water could enter the lateral. "But they did not believe me", he sighed, "because they had seen that the lateral canal upstream was completely filled with water and yet despite that, I did not give them water". They thought Miguel was favouring other water users. "I tried to explain to them that the lateral was indeed full of water because I had set the water level very high in order to feed sublateral 1 (see figures 4.1 and 4.5), but that all that water was 'dead water' (*agua muerta*), that it was only stored in the canal, without working (*sin que trabajaba*)." He could not convince them, so he decided that the only way they would understand was to show them in practice that

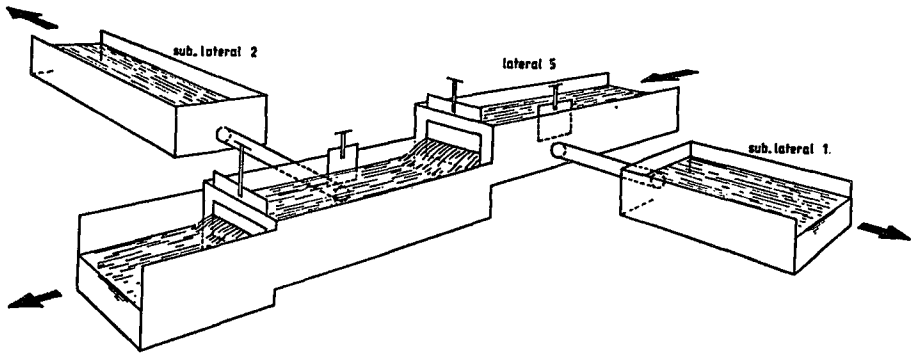


Figure 4.5 Sublateral 1 branching off from lateral 5

there was not much water, and why. So he had taken them to the spot where the sublateral branches off from the lateral.

"I said it indeed seemed a lot of water but that this was in fact not so. I opened the sluice that had backed up the water, and after a few minutes they could see that of all that water only a small stream was left. I finally convinced them, and they understood that there was in fact very little water, because of the intake of lateral 5." [12/4/89]

A few days later, when I was talking to some farmers of that canal, it appeared that the two water users had been able to explain to other farmers why there was insufficient water running into their area.

So despite a tough schedule that day Miguel had decided to take the time to explain carefully the situation to the two complaining water users. Miguel told me that he could also have adopted another attitude: "Notice the things you have to do! If I were a son-of-a-bitch, I would have said: don't make trouble, I am giving the orders here, and I don't care what you think." But Miguel has learned that involving farmers by explaining in detail is the best way to avoid clashes. And he also realises that it is precisely those two water users that are recognised as 'leaders' by the rest of the water users in that area. So, taking the time to explain the situation to them was an investment. He anticipated that they would explain the issues to their fellow farmers, and that they would have less trouble in convincing them than he. This attitude avoided an escalation of the problem.

One of the direct consequences of Miguel's attitude was that after the end of that irrigation season, the two 'leaders' of the lateral 5 area took the initiative to solve the problem of the reduced intake of that canal. To everybody's surprise, and without the support of the maintenance department, they managed to construct a completely new intake structure in less than a month (see chapter 5). Now, one season later, all

problems are solved, which makes Miguel's work a lot easier. Miguel now feels he has a special 'compromise' with the farmers of canal 5 as he explained:

"When they now ask me for water, do you think I can say to them, 'Sorry, I don't have enough water, the canal can't take more?' Or that I stick to the District's rule of one irrigation turn every 4 weeks, when they themselves constructed a whole intake structure in order to get enough water to the field? Am I to deny them water, or say to them there is not enough? Put yourself in my place."  
[12/4/89]

### *The photograph and the silted canal*

We have already noted the problems that silted canals bring to the *canaleros*, and that there seems little room to change the situation fundamentally. The silted canals put an extra burden on the *canalero's* dilemma. The maintenance problems can only be solved if farmers are willing to organise themselves, and exert pressure on the engineers. From Miguel's perspective, *canaleros* will never be able to solve the problems.

"I, to whom ought I to complain? I don't have anything in my hands, only the facts. What do I gain if I become angry with an engineer? It will make no difference. I am only a civil servant. But I have talked a lot with the water users. They are not organising themselves, because they are afraid that the finger will be pointed at them, that they will be criticised. Otherwise, they would have the power. They should do something, organise themselves, but it is as if they want to get on well with the engineer. And the bastard they fall back on is the bloody *canalero* who is in the field, he is the one to whom they complain. If they would only join together, then the problems could be solved. It's easy, simple. But they won't do it. They are lacking in civic values. They should go to the District, and say to the engineers that it is their obligation to clean the canals, but they won't go. Now they are starting to open their eyes. Yes, they are awakening! I hope so." [12/4/89]

Although he sees few practical possibilities for changing the situation with respect to the maintenance services, Miguel has on several occasions sided with the water users, in their struggle with the engineers. He recollects one situation which illustrates the *canalero's* degree of freedom; freedom to act that could have far-reaching consequences.

"On one occasion, there was this canal (the already mentioned sublateral 1, see figure 4.3) completely silted up. I knew that the District would never clean it, and the maize plants had started to flower and needed much water. But the canal couldn't be used. It was a mess, while the engineers had the hydraulic excavators of the District doing something which was not urgent. I even saw the cleaning brigade of the maintenance department cutting the grass along the main canal near the village, because a senior official from Guadalajara was coming to visit the District. So several times I urged the water users to go to the District, but nothing. I recall the day that I met Chico and another water user of that canal, and I told them they should get together, and really organise a working party (*faena*). So that afternoon at the *canaleros* meeting I got an idea and said to the engineer: "do you know that over there the water users have taken photographs of the silted canal and are planning to send them to the State office in Guadalajara." Haha. I think my invention succeeded, because the next day the bastards sent the brigade to clean the canal." [12/4/89]

This story of a small minor canal (only some 10 water users were involved) had some unexpected consequences. Gabriel, the *canalero* of the neighbouring zone, heard the

story and the next day he used it, when faced with complaining farmers in a silted lateral canal. He transformed the story of Miguel's canal and told it to the complaining farmers as a success story: of a group of farmers who had come together, and who, as a group, went to see the head engineer at the District and demanded that their canal be cleaned. The next day, the canal got readily cleaned. Gabriel, of course, left out the muddy part of the story (the farmers themselves cleaning the canal). So Gabriel told this story to his farmers, and urged them to learn from it. Indeed, they grasped the story and as a group they went to the District, and surprisingly, they managed to get the machine to attend to their canal. When, some days later, Gabriel faced another group of water users, from yet another silted canal, he could now use 'his' success story to press these farmers to organise as a group and go to the head engineer. So, a small event, that was Miguel's invention of the photographs, had considerable effects on a wider scale - for a hundred farmers, for the excavator and the cleaning brigade of the maintenance department, and also for the engineers. The engineers were really taken aback by the photograph story, and even investigated in the concerned village which of the farmers had taken the photographs. They had reportedly asked farmers: "who is organising this movement" (*¿Quién trae ese movimiento?*), thus trying to give it a subversive political connotation.

Both examples show that Miguel solves the *canalero's* dilemma in a particular way. In the case of the incredulous farmers, he involves those who accuse him of giving preference to others. In the case of the silted canal, he takes the side of the water users. Miguel chooses and thus actively gives direction to the outcome of his work.

## 4.5 Different work styles

Miguel has a particular work style, which is the result of the experiences gained over the years. Other *canaleros* have adopted styles which differ in some respect to Miguel's. Although they have different work styles, the *canaleros* do share a common basis of experience. This we can appreciate when considering the *canaleros* as a group. In this section, we will first examine the group, and then we will discuss some differences among *canaleros*.

### *The group*

The group of *canaleros*, as they see it, consists of 9 persons: the 6 *canaleros*, the two *aforadores* (water gaugers, normally ex-*canaleros*) and the supervisor (also an ex-*canalero*), who acts as a reserve and stands in for any *canalero* who falls ill. The group as such, becomes manifest most clearly when they gather before the District offices each afternoon. The rest of the District personnel (over 100 persons) recognise their existence as a 'closed' group. This is most marked when labour problems arise. The

*canaleros* then always get 'special treatment' from the head engineers, without the need for the presence of the union leader. This again underscores the indispensable position the *canaleros* occupy. The group also manifests itself at the occasional parties the District organises. If the *canaleros* are invited, they often do not show up as a group. But when they do attend they stick together, and merely talk among themselves. The *canaleros* also organise their annual party, the *cierre de la compuerta* (the closure of the gate), or also called the *acabo* (the completion), to which only their direct superiors are invited.

The group has a kind of 'culture' or shared understanding. When a stand has to be made, for example, vis-à-vis District policy concerning their wages, they will discuss among themselves what to do, and will try to come to a consensus. Also, the work situation of the *canaleros* requires numerous working rules and information, and this knowledge is shared to a great extent by all group members. This type of knowledge is transferred from the 'older generation' to newcomers. When a new *canalero* is appointed, he (invariably a man) will be initiated by one of the *canaleros*, and will follow this *canalero* for at least a month. The information may vary from technical rules of thumb (e.g. lowering this particular type of shutter-gate 10 *roscas* or screw-threads, leads to a reduction in discharge of 200 litres per second), to rules on how to treat farmers and engineers (often specifying certain farmers who are considered '*trabajosos*', troublesome), to inside information on certain relationships between, for example, the head engineer and certain water users, to more covert rules on the group solidarity, when one of the *canaleros* is in trouble (e.g. accused of corruption by a farmer), and how to proceed with prudence. One such rule says: if you don't want trouble, never accept money from water users, but rather ask it in kind (for example, tyres for motorbikes are 'safe' presents).

Miguel is the eldest of the group, and he says he has been most profoundly influenced in his work by Don Angel, who initiated him twenty years ago. Don Angel initiated nearly all the existing *canaleros*. He has now retired, but when one of the *canaleros* is in trouble, he will probably pay a visit to Don Angel, and ask for advice. The *canaleros* see him as their 'father figure' on working matters. So, there are some elements of the group culture that is rooted in tradition, or rather, past practice. But, in spite of the shared knowledge and shared secrets of the profession, and in spite of the same working situation, the *canaleros* vary greatly in the way they give form to their work.

#### *Contrasting Miguel with Gabriel*

I concluded earlier, that stuck in a tough working routine, the *canaleros* become caught and assume responsibility for things that, formally speaking, are beyond their control. Some *canaleros*, however, show more resistance to this than others. Miguel is a good example of a committed *canalero*. If we had analysed the case of Gabriel we would have got a different picture: he has experienced so many 'showdowns', and encountered so many problems in his work, that he has become cynical. He does not care any more. The engineers say that he is 'not a good *canalero*'. Miguel, in contrast, is considered to be 'the best'.

In trying to 'explain' this difference in work-interpretation, we have to consider that Gabriel has 'only' 6 years experience. Other factors contribute to the fact that Gabriel finds himself in an isolated social position. He is rather a stubborn character, and often does not participate in social events organised by the *canaleros*' group. He is from another state, and only a few years ago settled in El Grullo with his wife and 4 children. They consider themselves outsiders, also because of their protestant religion (which in this valley is viewed with a lot of suspicion). Gabriel is even seriously considering quitting the job and moving back to the state from where he comes. Miguel, on the other hand, is from the valley, has many family ties there, and has built up a fairly impressive social network in the village where he lives and is well respected. Last year he was asked to become president of the parents organisation of the primary school that his youngest son attends. Another difference is in their economic situation. Apart from the fact that Miguel owns his own house, he also cultivates some maize each year and draws some income from it. In addition, his wife has her own income (buying small chickens, fattening them, then slaughtering and preparing them for sale to villagers), of which Miguel says that she is earning as much as he is as a *canalero*, although it takes her only a few hours per day to earn it. In contrast, Gabriel rents a house, is not involved in agriculture, though he engages in some occasional trade (where he more often seems to lose money than earn it) and his wife does not work. In conclusion, Miguel is much more embedded in the local situation. This has been important for him in developing his attitudes towards work.

#### *Contrasting Miguel with Luis*

In comparing Miguel and Gabriel, we have been able to come a bit closer to Miguel's motivation in his work. Nevertheless, Gabriel probably is the least representative of all *canaleros*, because of his 'outsider' position. Let us contrast Miguel now with the *canalero* that stands closest to him, namely Luis. Of all the *canaleros*, Miguel considers only Luis a real friend. They have worked together now for ten years, and after Miguel, Luis has the longest experience. At the same time, they are such very different characters. Luis, is considered by nearly everyone (also by Miguel) to be the biggest 'son-of-a-bitch' (*cabrón*) of all the *canaleros*. Whereas Miguel is the naive do-gooder, Luis simply confronts farmers with problems, and solves them autocratically and thus brandishes his authority, through bluff, through a feeling of superiority and bluntness. The way Luis gives form to routine encounters with farmers differs markedly from Miguel's way of doing things. Luis' encounters are more of the one-way type: *canalero* instructs farmer. Another curious aspect of these encounters is that Luis frequently makes mention of Engineer Corona, the head of the operation department, referring to him by his first name. (Miguel hardly ever mentions the names of his superiors in routine encounters.) Luis is displaying in this way that he is close to the engineer, which gives him some extra authority.

Luis actively stimulates 'gratitude' from farmers by creating (unnecessary) 'water scarcity' in his zone. There are farmers who bring sodas or even alcohol to the field if they plan to ask Luis an irrigation turn. Luis has such a thick skin that he never suffers sleepless nights thinking about the problems his work style creates in his zone. He has

other reasons for sleepless nights since he is engaged in many trades and is always involved in various activities as a share-cropper. Furthermore, he is a kind of 'broker', putting those who want to rent land in contact with poor *ejidatarios* who want to share-crop, putting in touch those needing agricultural labourers (such as Engineer Corona) with the landless who need work, and seed companies in search of land with farmers who might have it. He thus not only manipulates water, but he also exploits the detailed knowledge of plots and farmers which he has acquired during his work.

The other *canaleros* are astonished by all the things Luis takes up. It seems impossible, but they say "Poor Luis, one day he will end up in the gutter", because Luis likes to take risks. In his 'normal' work as a *canalero*, his working style has created conflicts with many, mostly smaller, water users. These conflicts he solves by drawing upon his relationship with the head engineer, for which he now provides certain services, and on this point Miguel and he part company.<sup>8</sup> Miguel, like Luis, also likes to work hard. Taking high risks (in economic and social terms) is something that Miguel would simply not be able to do. But Miguel admires Luis. He is what Miguel will never become: a dynamic character, easy with his superiors, with women, etc. At the same time, however, he does not agree with his blunt and reckless working style (the '*cabrón*' side of him). Miguel is too serious a person for that.

### Miguel

What, then, are for Miguel the elements that structure his behaviour? One important element is that Miguel does not seem to betray his humble descent. This contrasts markedly with Luis (also stemming from a poor family), who has such a grudge against the way he was brought up that his goal is to make life better for his children. He recently bought a huge modern house, and tends to spoil his children (Miguel is much more demanding of his). For Miguel, the agricultural labourers and *ejidatarios* he meets in the field are people like his father or himself, and he believes he should serve them, or at least treat them respectfully. "Taking them seriously", he says,

"sets limits to the way you act in your work. I cannot say that a *canalero* is bad or good. The water user, the farmer, is the one who judges. He is the one you spend time with, with whom you always talk. All day you are with him. Not even with your own family do you live the time that you live with the water users, day after day. Very simple: they know when you are angry, and when you are not. The water users know you perfectly well. To the point that you get sick of it, the bastards!" [12/4/89]

A second element, as I see it, derives from Miguel's religious beliefs.

"I am a Catholic, but not too much. I go to mass every week. You have certain fears in your religion, because you have to have your proprieties, especially about honesty ... sometimes even with yourself. If you are not honest with yourself, then you are worth nothing." [12/4/89]

A third element is that being a *canalero* is extremely hard work. And you appreciate, therefore, the agricultural labourers and farmers who, like you, take farming seriously, and loath all those who do not.

We now may conclude that Miguel's dedication has to be attributed to his



socialisation and experiences and to the specific position he finds himself in. His high work load and awkward position make it difficult for him to detach himself from his work. The structuring process we see happening in his work (see for instance the elaborate structure of his routine encounters with farmers) takes place through working out practical strategies to solve the many problems with which he is continuously confronted in the field. His social personality arises from this process of accommodating the tasks and pressures he faces. Social practice, then, shapes social personality.

Miguel has developed a way of dealing with problems that is fairly consistent. We have seen how he tries to explain problems to farmers. His attempt to involve them is for him a survival strategy. If he did not do that, he would become slowly crushed between the meshes of the District and the farmers. This attitude towards farmers has succeeded in influencing their attitudes in return. We saw how, on various occasions, Miguel urged groups of farmers from one lateral canal to take initiatives which ran counter to normal farmer behaviour. Miguel has helped to shape farmer expectations and perceptions on what is going on in the irrigation system.

#### *Proximity and remote control*

Proximity is one of the characteristics of the relationship Miguel has with his work. When you ask Miguel general questions, such as, how is it to work in the District, how is your zone, is your work difficult, he will look somewhat helpless, and start to say something, anything it seems, and stammer. I now know that he would find it difficult to say: my zone is like this, and then review all plots, soils, crops, farmers, control structures. He lacks the distance to generalise, to summarise. He would not respect the variety of answer which would go: my zone is big and complex, as are my work tasks.

Miguel's stock of situationally specific knowledge inhibits the development of grand over-all pictures. He is caught by demanding tasks which immediately plunge him into the idiosyncrasy of harsh reality. He does not need such overviews. Engineer Corona, the head of the operation department, by contrast, however, is in the position to generalise, to compress data, to simplify. Data with which he is able to develop strategies, both for the institution and for his own personal projects. He need not be bothered with all the peculiarities of implementing water distribution at field level, this he effectively delegates to his field personnel. They are his eyes and hands in the field. Despite the fact that *canaleros* consciously filter the information that they channel to the District, and this information is only a fraction of all the information they have, it is enough for Engineer Corona.

The only graph hanging on the wall of his office, which serves as an example of the compressed data he uses, he daily updates carefully. The graph displays planned and actual volumes of irrigation water released at the Tacotán dam. To Corona, the graph represents hundreds of actions, decisions and conflicts in one stroke of a pencil. On the bases of this graph, Engineer Corona devises appropriate strategies and delegates work to *canaleros*, without having to leave his office. In this nerve centre he gathers information, summarises it and prepares the necessary documents for his superiors. He interprets them, devises new procedures if necessary, instructs and mobilises people.<sup>9</sup> While the engineer is sitting up there in his office on the first floor, overseeing the

arena, the field personnel get their boots muddy, their heads troubled and their nerves racked while facing the 'bulls'. Clearly, there is a huge divide separating the engineer and his field staff, not only culturally speaking, and regarding education, language etc., but also more practically: there is a discontinuity between what the engineer observes and how he interprets, and the way the *canaleros* observe and interpret. They see different things and therefore see things differently. Those at the bottom of the hierarchy see variety and reality's complexity. What the engineers in their superior positions see is that which can be articulated from facts in other realms.<sup>10</sup>

The *canaleros* emerge as 'victims' in cases where they have to cover up the personal projects of the engineers. They have nevertheless the possibility to counter act. This is most clearly shown when Miguel defines an old problem in a completely new way, as was the case of the silted canal partly cleaned by the water users themselves. The moment Miguel re-interprets the situation and re-defines it according to the farmers' perspective, he is able to manipulate that situation, in this case inventing the story of the photograph. So, also the humble field personnel devise their own summary documents (photographs), instruct people ('when the engineers come, then tell them that indeed a photograph was taken and sent to Guadalajara office'), and are able to practise some remote control over their superiors, without their knowledge of it.

#### 4.6 Working at the frontline, a conclusion

This chapter has shown the important role water guards play in the El Operado irrigation system. It is therefore surprising how little attention is given to this position in the existing body of irrigation literature. The literature mainly focuses on engineers and overseers rather than on field personnel. The only elaborate discussion of the position of the water guard I know of is provided by Hofstede and Van Santbrink (1979), who discuss the role of the *oeloe oeloe*, or water distributor, in irrigation systems in Indonesia during colonial rule. The *oeloe oeloe* originally formed part of the village council. Through interventions by the colonial power, the *oeloe oeloe* gradually became an employee of the government. The *oeloe oeloe* emerges as a key intermediary, cunningly used by the colonial government in order to extend control over irrigation affairs into the tertiary units. The *oeloe oeloe* in Indonesia must have found himself in a similar situation to the *canalero* in El Operado. They both faced the '*canalero's* dilemma'.

In the literature treating government managed irrigation systems in Mexico, various authors briefly refer to the people called *canalero* or *fontanero* (Hunt and Hunt 1974:143; Finkler 1974:115-16; Finkler 1978:66-69; Mares 1980:476-77; Martínez Vázquez 1980: 185-86). All authors suggest that *canaleros* usually take bribes. Finkler stresses that water users have to maintain a good relationship with the *canalero*,

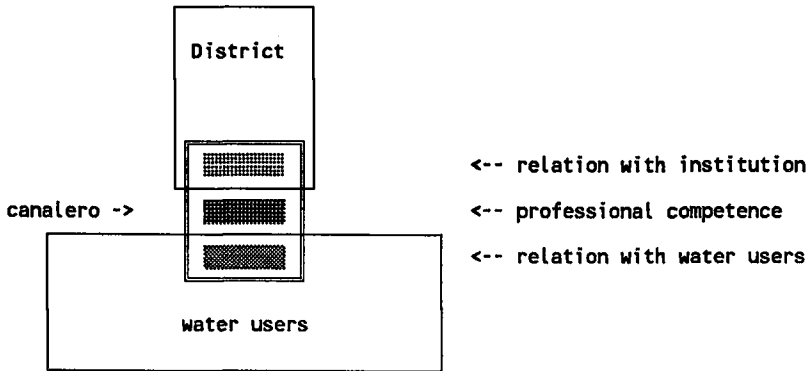


Figure 4.6 The position of the *canalero* (cf. Grindle 1980:205)

otherwise they might face water shortages. Many water users consciously 'invest' in this relationship. Martínez Vázquez is the only one who states that District engineers manipulate *canaleros* to their own benefit.<sup>11</sup> But none of these authors have remarked on the productive nature of the *canalero's* work, which emerges from the evidence presented in this chapter.

People like the *canalero* are frontline workers, who face three major preoccupations (figure 4.6):<sup>12</sup>

1. doing their specific tasks properly,
2. maintaining a working relationship with their employer, the District,
3. maintaining a working relationship with the water users.

The *canalero's* specific work task produces a linkage between water users and the government institution. His professional competence forms the middle ground upon which this linking is produced. In the foregoing we have paid attention to these three aspects. In concentrating on one actor, we saw how these three aspects overlap and are interwoven.

As far as the institutional aspect is concerned, the case of the water guard shows how low-ranked field personnel play an important role in scheduling and implementing water distribution. The water guard emerges as a key actor who makes the system work. It is not, then, as simple as the head of the operation department sees things regarding the *canalero*: "he distributes the water, and we do the rest". Miguel believes the *canaleros* are the movers of everything. Engineers in their offices have only a limited view of what actually happens in the field. *Canaleros* seem to have created their own autonomous field of action. Although there have been several administrative re-organisations in the District over the last 10 years, these changes have had little impact on the way in which water guards do their job. Engineers, farmers and field personnel alike, expressed the view that the water guards have been the only, constant factor in the District.

The *canalero's* technical competence is directly related to the type of infrastructure he has to work with. The typical canal infrastructure makes the position of the *canalero* crucial. As has been set out in chapter 3, the infrastructure of El Operado is characterised by the adjustable gates and intakes. It is flexible in so far as it can meet varying demands for irrigation water from water users. But it is only a potential flexibility: the structures have to be operated properly in order for the system to become flexible. What is flexible in El Operado thus is the *canalero*.

Their flexibility derives from the fact that they do not strictly conform to the organisation chart, and the simple technical guidelines of the District. The organisation chart suggests that the *canaleros* simply follow orders from superiors. In reality, *canaleros* are 'interfacers', linking farmers to the District, connecting the District with the sugar refinery, and also, as we have seen, creating linkages among farmers. As far as the technical guidelines received from the District engineers are concerned, these are far too broad to be operational. Were the *canalero* rigidly to adhere to these, he would face problems with those farmers finding themselves in 'exceptional' situations. Such as producing crops on sandy soils, or having flowering maize in urgent need of water, or being affected by the 'suspension' of a nearby sugar cane plot. The models used by the District are translated into the set of far more complex actions of *canaleros*, which acknowledge the diversity found in the field. Thus, flexibility implies complexity.

The *canalero's* work not only consists of moving gates and checking canals. It also involves interaction with numerous people: Farmers, big and small, labourers, engineers and colleagues. The *canalero*, in fact, stands at the centre of a field of forces where the rich farmers, peasants and labourers cope with each other, and where local actors and an intervening outside agency interact. He stands in the middle of a social dynamic which we already came across in chapter 2. It is why the *canalero* often finds himself on the horns of a dilemma of one sort or another.

We have identified 3 major aspects of the *canalero's* work, that is: the institutional environment, the technical system, and the social dynamics encountered. We concluded that this work is complex and difficult. Which factors contribute to the *canaleros* doing their job relatively effectively?

First of all, the *canaleros* receive adequate financial remuneration for their work. Their nominal salary as field officers of the District is augmented with extra allowances, so that the actual amount received is nearly double their salary. This makes the *canalero's* earnings nearly as much as the head of the operation department. *Canaleros* may receive other rewards. There are the social rewards, for example. For Miguel these are important. He likes to be respected in his village, and he is. This social reward is important for those coming from the region. Four of the six *canaleros* come from the valley. As we have shown, Gabriel comes from another state and does not seek social rewards, which in turn affects his dedication to the job. Other rewards are material: farmers frequently give presents to *canaleros*, as a token of gratitude for the received services. The most natural present is of course a small share of the harvest. It is commonplace for a farmer to say to his *canalero*: take tomatoes (or whatever) whenever you like. Other tokens may be a sack of fertilizer, a tyre for his motorbike, a bottle of liquor, or some present at Christmas. Also, I have observed how farmers sometimes

'lend' one of their agricultural labourers for a day or so to work on the plot of their *canalero*. It is also normal to lend him money, without charging interest. This is very attractive, as interest rates in 1987-88 reached levels of 15% per month. The *canaleros* are very cautious about accepting these presents (especially money) and try to keep it secret.

Accepting presents leads to favouritism. There is however a strong limitation to favouring practices of *canaleros* vis-à-vis certain water users: when some are favoured, other farmers are likely to be affected negatively, and the latter will show their anger, and may complain to the head engineer. Favouritism on the part of the *canalero* increases considerably the tensions he will encounter in his work. Some *canaleros* cope more easily with such tensions than others, and some *canaleros* find it less difficult to use their position to their own profit than others.<sup>13</sup> Farmers are keen to keep such practices within certain limits.

The fact that all *canaleros* are 'small boys', and have not received higher education, makes them observe a natural distance towards the engineers, and the District in general. The experiences with their superiors is such that this distance is reinforced. (The exception to this rule is Luis.) I think this affects their work performance positively. They keep to the middleground between farmers and the District, and therefore they are socially acceptable to farmers.

A final factor is, that the *canaleros* have created a group culture, with certain norms and values. Don Angel, among the first *canaleros* after El Operado's construction, has been very important in shaping these values. Now retired, Don Angel is the father figure in the back stage, whom the *canaleros* consult when facing really big problems. This group culture has been reproduced over the years and it serves to transmit experiences and technical skills. It also provides the *canaleros* some values concerning work ethics: how to treat superiors, farmers, and each other.

These factors are locally specific. In other irrigation systems in Mexico *canaleros* are likely to perform differently. In other countries this may differ even more. However, we can learn from this chapter that field staff are potentially able to contribute substantially to the performance of irrigation systems, if adequate conditions are created and if they are given real responsibilities.

We found that a flexible canal infrastructure (every structure movable) does not necessarily mean that operating it becomes too complex. It may be that the engineers who designed El Operado in the 1950s never realised what a burden the design would put on field staff. They may also have assumed a certain way of operating it which is quite different from the way it is now operated. Unfortunately we do not know. What we do know is that the *canaleros* have been able to make the infrastructure work. This finding suggests that the physical design is not so determining of its subsequent operation as is often assumed. I do not here want to suggest that the specific technical form of El Operado does not influence the way water is distributed, it clearly does. This actor-centred account of the practices of *canaleros*, however, has shown how the actor has internalised the physical properties of the system.

We can also learn from the *canalero*'s story that lower level field personnel in irrigation systems managed by a government agency are more than simply employees,

or subordinates. They are also implementors, consciously shaping broad guidelines into specific forms, and thereby producing water distribution. In some instances they even appear as organisers, stimulating farmers to join forces and take initiatives.

## Chapter 5

### **Cleaning canals and making up our minds; managing maintenance and farmer response**

The maintenance of an irrigation system's canals normally involves a substantial number of resources (in labour and/or money).<sup>1</sup> These costs can be regarded as an investment: a (small) part of the overall profits in irrigated agriculture is re-invested in the canal system in order to ensure that in the next season similar gains can be realised. In contrast to water distribution which is directly productive and oriented to short term goals, canal maintenance (and improvement works) involves the reproduction of the system, and thus has a longer term perspective, although the removal of silt from the canals has immediate gains. Analysing practices associated with canal maintenance can thus provide valuable insights into the long-term viability of an irrigation system, and may reveal both the strengths and weaknesses of a system's management. It is therefore surprising that in much of the literature on irrigation management, canal maintenance receives only secondary attention.<sup>2</sup> Canal maintenance has a direct bearing on a system's organisation and especially on cooperation among water users since it requires the mobilisation of resources. Water distribution often results in petty conflicts among water users along the same canal, but the need for cleaning a canal, on the other hand, brings people together in cooperation.<sup>3</sup> When compared to the analysis of water distribution, analysing canal maintenance may reveal another level to the relationships between the different groups involved.<sup>4</sup>

In the case of El Operado focusing on canal maintenance is highly relevant, since during the months of September, October and November this is by far the hottest issue, recognised as such by virtually all the water users and most of the irrigation officials at the District.<sup>5</sup> This chapter provides a 'trptych' of canal maintenance. It first analyses farmer initiatives in the field, concentrating on one canal (sublateral 1 of lateral 5, see also chapter 4). Section 5.2 focuses on how the maintenance department of the District manages canal maintenance, and in section 5.3 we return to the farmers and examine further initiatives taken by them in lateral 5.

#### *The silted canals*

As has been pointed out briefly in chapter 3, during the months of September to November the Ayuquila river may still carry a good deal of *aguas broncas* ('wild waters'). This silt laden water is brown in colour. Water users of El Operado (especially those with sandy soils, or growing maize or sugar cane) use the *aguas*

*brincas* in the first dry months to give their crops supplementary irrigation. The silt from this water not only enters the main system, but also the minor canals and fields. While the silt on the fields may be beneficial, in the canals it causes problems. The silt decreases the discharge capacity of the canals. Aquatic plants attach their roots to the silt and these aquatic plants further decrease the velocity of water flow and more silt is deposited.

The maintenance department of the District is in charge of removing the silt in all canals above field canal level. However, the department only succeeds in cleaning part of the canals during the period between August and November. The silted canals thus make water distribution difficult. This gives rise to what I prefer to call 'problematic situations'. In 1987, the sediments in 5 lateral canals created problems for water distribution amongst 300 water users (1,500 ha). The water users managed to solve these problems, however, in different ways. An unknown number of other canals were also silted up in that year. In autumn 1988, approximately 700 water users (2,900 ha) were confronted with poor water distribution caused by the silting of canals. The canals were not cleaned in time by the maintenance department, so there were many initiatives and joint actions undertaken by farmers to counter the problems posed. The silted canals resulted in many situations where we can actually see these organising processes at work.

### *Research strategy*

In 1987, several cases of canals in need of maintenance presented themselves (although, at that time I was not looking for them). I selected three canals and interviewed more than 40 water users with plots along them. In the next year, 1988, I decided to study canal maintenance in more detail. Gathering field data was not always easy; the number of events relating to canal maintenance during the period between September and November 1987, for example, was huge. It would have been physically impossible to cover even all major events.<sup>6</sup> Studying canal maintenance presented yet another practical problem. From February 1987, I had become engaged with two worlds: that of the water users in lateral 5, and that of the operation department of the District. This in itself was a risky affair, since my relations with one world could jeopardise my credibility in the other. It was when I felt that I had been accepted in both these realities (a year later), that I realised research would have to be done on maintenance as well. However, by that time I had lost all credit worthiness with the maintenance personnel, and felt uneasy each time I visited the office. I had given too much attention to the operation department, which apparently had offended the maintenance people.

As it became obvious that I was not going to be accepted by the maintenance people, I had to find someone else. After failing to enrol a Mexican researcher, I asked support from my department at Wageningen University. In August 1988, Piet Sijbrandij arrived, who undertook a study of the maintenance department. Sijbrandij furthermore identified four silted canals which he studied. One of these, the case of lateral 5, I had previously studied the year before and I helped him to follow this up. A considerable part of the material presented in this chapter (especially in sections 5.2 and 5.3) was collected by Piet Sijbrandij between August 1988 and April 1989 (Sijbrandij 1989b).<sup>7</sup>



## 5.1 Farmers cleaning their canal

The rains of 1987 were relatively good in the months of June and July (40% above average of the decade). However, half way through August the rains stopped, and in September only half of the 10 year average precipitation was recorded. In October it did not rain at all, whereas in the previous year October rains had been abundant (180 mm). In September, 10 plots of maize (52 ha) along sublateral 1, which is fed by lateral 5 (see figure 4.1, chapter 4), were in trouble. The farmers or the *rentistas* working the plots saw to their awe how the maize had started flowering but that the leaves were rolled, indicating water stress. The farmers ask Miguel, their canalero, for an auxiliary irrigation with *aguas broncas*. They received it, but due to silt in the canal bed, the minor canal could hardly carry a flow sufficient to satisfy one irrigation turn, whereas all 10 maize growers were equally in need of water. Normally, the canal, which I will call here the Limoncito canal, would have a discharge capacity of some 180 lps or three irrigation turns, but now no more than some 40 to 50 lps entered, hardly enough for one.

### *Cleaning the canal*

On September 17, 1987, Dionicio was struggling to finish the irrigation turn for the plot he rented and had planted with maize. In the mean time, Abraham, who also has a maize crop, had started to irrigate with the little water remaining. But the water did not flow properly in the sandy *playa* soils which so much characterise the *potrero* of El Limoncito, situated alongside the river. They certainly wanted to complete their turn quickly: they did not want trouble with their *compañeros*, who were looking on with envy and some with annoyance. Some words had already been exchanged. But Abraham and Dionicio wanted also to save their harvest: when flowering is hampered the corn cobs (*olotes*) will not fully fill with seeds, severely reducing the yields.

At 8:30 am, Miguel (the water guard, see chapter 4) arrived at the inlet of the Limoncito canal, which is part of his daily routine. Chico, who cultivates part of his father's 9.5 hectare land with maize, sat near the intake structure. The first part of the conversation which ensued was highly predictable, and wholly determined by both the actors' formal roles. Chico obviously asked Miguel for irrigation water, as he had done 5 days earlier. Miguel told him the canal could not take more than one irrigation turn, that he had to wait another four or five days since Dionicio still had not completed his turn, and that Abraham had started only the previous afternoon. "Wait until Abraham finishes", Miguel concluded. In fact, nothing really came from this conversation: both knew the outcome beforehand. They simply played the game as expected. Both Miguel and Chico acknowledged that what happened next was surprising. It was because Chico was desperate for water. As he told me: "It was a Thursday. Miguel had promised to give me water on Monday. I waited and waited. Then this Thursday arrived, and still he did not give me water. I was angry."

Then, spontaneously, Miguel and Chico together lifted the gate in the feeder canal, and cut off the water to the Limoncito canal.<sup>8</sup> Chico then immediately plunged into the

silted canal and started cleaning. Soon, seven other water users and two labourers had joined him. They now formed a work party or *faena*. The ten men worked for some four hours, removing silt from the canal bed with spades, until the worst part had been cleaned.

Some days later, I met Don Alonso, Chico's father, who is considered the *jefe de potrero* of El Limoncito. He told me they had taken photographs of the work party and told Miguel that they would complain to Guadalajara about the District.<sup>9</sup> A few days after the canal cleaning, the maintenance department sent the slashers' brigade (*brigada de macheteo*) but they only cut the weeds that grew along the canal banks. The water users had cleaned only about 200 metres, so problems persisted. Forty days later the brigade came again and then they really removed the mud with spades. Arturo, an old *ejidatario* who had rented part of his land to Dionicio and who dedicated most of his time to his enormous herd of cattle, watched the brigade:

"I was so amazed. One day I was in the *potrero*, and suddenly there were these guys from the District, starting to cut weeds along the canal bank. I thought: so that must be it. But then they entered the canal, and really, they were standing with their feet in the water!"

### The Limoncito canal

To put the spontaneous work party of cultivators in perspective, I first give the comments of two cultivators who did not participate in it. Salomé, working on his mother's sugar cane plot (#9, see figure 5.1), cynically commented: "They were cleaning the canals, but at the same time, over there nearby, the machine [the hydraulic excavator of the maintenance department] was working, making money from some private landowner." And Patricio, who rented plot #6 and grew maize, told me:

"The people of the District live off one. They sit there comfortably in their offices, while we sweat it out (*nos chingamos*) in the field. Each year the water fee goes up. I didn't cooperate because I am fed up with cooperating. To be the labourer (*mozo*) of the Secretaría [District], while they fill their pockets. Never!"

No doubt those who did participate in the cleaning party hold a similar view of the District, but it did not stop them taking action. Who were the participants? But first, let me discuss the Limoncito canal and its plots, before I introduce the users.

The Limoncito canal serves 85 hectares of land, owned by 10 *ejidatarios*. Nine are from one *ejido*, Mezquitán, and the plot at the tail of the canal (#10) belongs to the *ejido* Chacaltepec. Two *ejidatarios* cultivate the plots themselves and two others work part of their land and rent out the rest. The remaining plots are taken care of by non-*ejidatarios*: some are the sons of *ejidatarios*, others rent the land or share-crop it. In total, 14 people are involved in cultivating the 85 hectares, of which 46 are under maize, 35 under sugar cane and 4 are planted with green tomatoes (*tomate de cáscara*).

Irrigation water enters the intake through an orifice, but will only do so if the water level in the on-going feeder canal is sufficiently backed up. After some 250 metres, a

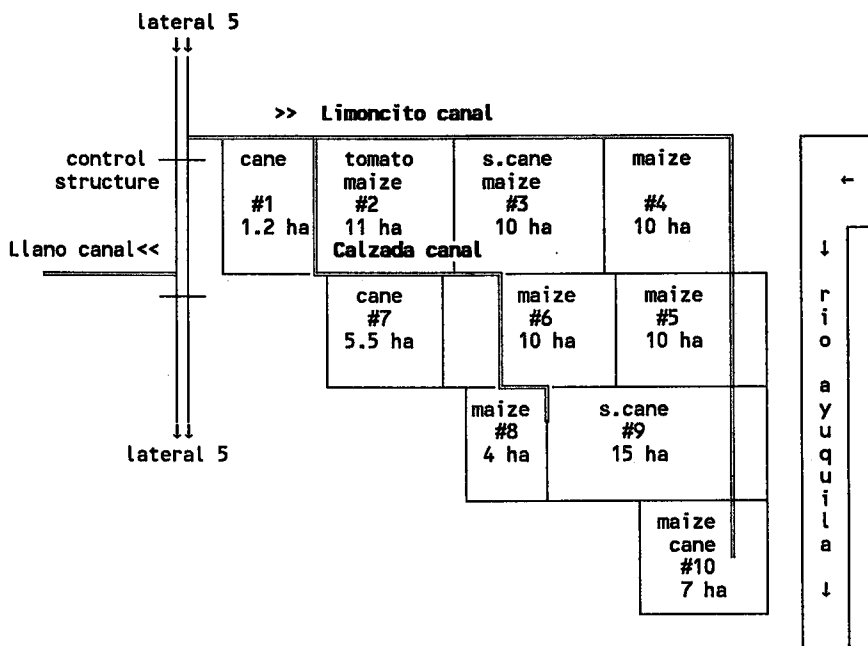


Figure 5.1 El Limoncito canal with its fields

small field canal branches off the Limoncito canal. This is an old canal, constructed by the farmers in the 1960s with bricks and is called 'La Calzada' (figure 5.1). After the Calzada canal, the Limoncito canal continues and serves the other fields. This canal was constructed of concrete in 1982, under the rehabilitation project. It looks perfectly alright, but the topographical surveyors probably made an error, because the first 500 metres of the canal has, in fact, a counter gradient; the canal bed slopes upwards instead of down. As one water user explained:

"When you open the intake of the Limoncito canal, the water does indeed enter the canal, but soon it is as if it returns. The water in the first stretch is dead, and the silt that the water carries with it, settles (*se asienta*). This is why the canal does not have sufficient capacity (*gasto*)."

So, nearly every year the canal becomes badly silted up. In former years, *Los Leon's*, the Autlán based tomato company, had grown about 40 ha of export tomatoes along this canal (renting various adjoining plots for several years), and they had kept it clean. Three years ago, Benito, owning plot #10 at the tail, had cleaned quite a stretch of the canal himself.

Table 5.1 sums up the plots served by the Limoncito canal, its water users (both owners and cultivators) and who joined the cleaning party. All six persons who with the help of four workers cleaned the canal, cultivated maize, and had not yet completed their first irrigation turn. Obviously, those with maize in flower were most interested in cleaning the canal. But the fact that all those who participated in the cleaning lived

Table 5.1 The water users (landowners and cultivators) of El Limoncito

plot (no.)	area (ha)	crop	land owner		cultivator			
			name	village	name	village	relation with owner	participated in <i>faena</i> ?
1	1.2	s. cane	Alejandra	Mezquit.	Carlos	Chacal.	-	no
2a	4.0	tomato	Arturo	Chacal.	Dionicio	Chacal.	-	yes
2b	7.0	maize	Arturo	Chacal.	Pedro	Chacal.	son	no
3a	4.0	s. cane	Alfredo	Chacal.	Alfredo	Chacal.	=	no
3b	4.0	s. cane	Alfredo	Chacal.	Felipe	Grullo	-	no
3c	2.2	maize	Alfredo	Chacal.	Dionicio	Chacal.	compadre	yes
4a	6.2	maize	Antonia	Grullo	Hector	Chacal.	-	yes
4b	4.0	maize	Antonia	Grullo	Leandro	Chacal.	brother	yes
5a	3.0	maize	Alonso	Chacal.	Chico	Chacal.	son	yes
5b	6.5	maize	Alonso	Chacal.	Nacho	Chacal.	son	yes
6	9.4	maize	Alberta	Autlán	Patricio	Chacal.	-	no
7a	5.4	s. cane	Adam	Chacal.	Quetzal	Chacal.	'grandson'	no
7b	1.8	maize	Adam	Chacal.	Quetzal	Chacal.	'grandson'	no
8	4.0	maize	Abraham	Chacal.	Abraham	Chacal.	=	yes
9	15.0	s. cane	Arcadia	Grullo	Salomé	Grullo	son	no
10a	5.0	s. cane	Benito	Ayuq.	Benito	Ayuq.	=	no
10b	2.0	maize	Benito	Ayuq.	Benito	Ayuq.	=	no

Source: own field data

in nearby El Chacalito, shows that the aspect of neighbourhood was also important. This is not surprising: the cleaning action was an *ad hoc* affair, and only those nearby could get information about it. Benito (growing maize, not having irrigated) for example, might have been interested in participating but lives in Ayuquila (some 4 km. from El Limoncito).

The issue I want to explore further in this section is how the people involved got mobilised. First I will consider the types of relationships that water users of the Limoncito canal maintain among each other; then how the cleaning party came into being.

### *The canal community*

Importantly, in El Limoncito, kin ties are intertwined with ownership of adjoining plots: of the 9 *ejidatarios* of Mezquitán (plots #1 to #9), five are related to each other by kin ties. Two others have ties with this group through marriage (they married before the *ejido* was founded in 1934). These 7 *ejidatarios* form a family group centred around Don Arturo Zapata. The overlap between landholding and kinship along this canal is the

result of a feud within the *ejido* of Mezquitan, which took place two years after its foundation, between the leaders of two factions: Carlos Villa, heading the Villa faction, and Don Arturo Zapata, heading the faction consisting of Zapata and Paz kin and their in-laws. Eight persons died in the fight (*matanza*) that ensued. After this, Don Arturo decided to leave Mezquitan, and took the Zapata and Paz families and settled in Chacalito (some 4 km. away). The *ejidatarios* of Mezquitan then decided to exchange plots of lands, and all but one owner of plots in the El Limoncito *potrero*, situated near Chacalito, swapped their lands with the Zapata and Paz *ejidatarios*. Of the 14 persons now working the lands in El Limoncito, 9 are related to either the Zapata or the Paz family. Arturo Zapata, the eldest son of Don Arturo, is now considered family head.

The water users of El Limoncito (both land owners and cultivators) are knitted to each other through a complex network of ties of friendship, kinship, affinity (through marriage) and *compadrazgo* (ritual kinship, co-parenthood). We also see that in 8 of the 10 plots, farmers and cultivators have some kind of renting or share-crop arrangement, showing that there also exist numerous economic relationships. They are closely knit neighbours, which appears to have greatly facilitated the emergence of their joint action to clean the canal. However, the fact that the Limoncito water users are so tightly knit, in some way also constrains them from organising a work party. The story of Chico, and how he initiated the work party, helps to explain this apparent paradox.

#### The attitude of Chico vis-à-vis the social group

The water guard and Chico had taken the initiative to clean the canal and thus they temporarily cut off the water to the Limoncito canal. Chico risked a conflict with the two water users who were irrigating: Dionicio and Abraham. Soon after they cut off the water, Dionicio came to him, Chico recalls, "angry with me (*bravo conmigo*). I told him: 'there is no water here, not for me, not for you.'" Creating a conflict with Dionicio was tricky for Chico. It could have more consequences than simply a dispute among two men, since Dionicio lived next-door to Chico and had a shop where Chico's wife bought all the necessary small stuff for the household. Chico had a running account with Dionicio, and he owed him quite a lot of money. In fact, with the proceeds of his share of the maize harvest Chico hoped to pay off the debt. But Chico felt he could count upon Abraham, the other one irrigating. Chico and Abraham were mates in the village football team, had a number of mutual friends and were related through remote kin.<sup>10</sup> Chico had talked to him the day before the cleaning:

"I had told Abraham the day before that I was going to cut the water, but he did not believe me. He thought it was mere talk (*pura plática*). I knew that he would not get annoyed with me. We are good friends and he knew that I needed water and he also needed it. After this, they all helped to clean the canal."

Abraham's reaction to Chico's suggestion is typical, I think. He did not say: 'I agree, I will help you'. He simply did not believe that Chico would dare to cut off the water. Apparently, you need guts to launch an initiative which will affect the social group of

whom you are a part.

This particular characteristic of social groups in the Autlán-El Grullo valley seems to have direct implications for group initiatives, such as canal cleaning. The characteristic can be summed up in the following way: it is unlikely that someone will launch an idea or initiate a project which is favourable to the community, and should it occur, everybody will seek for the private interests it may serve. People taking initiatives in community affairs are suspect. In sharp contrast, initiatives taken for personal business or enterprise (e.g. an innovation on a private plot, a new crop) are followed with interest, and if successful, people will acknowledge them. People tend to conform to rather than oppose the current state of affairs, and seem to expect each other not to 'stick out' (*sobresalir*), since why should one presume to be above or different from the rest?<sup>11</sup> This kind of attitude goes along with two other features which so much characterise village life. The first is widespread distrust (*desconfianza*), which exists between almost everyone, be they neighbours, close friends, *compadres* or even close relatives.<sup>12</sup> The second is the practice of gossiping, and people talking slander (*chismear*), which is a result of people distrusting each other, but which also fuels it.<sup>13</sup>

Thus, Chico was inhibited in taking action and cutting off the water by a more general, diffuse norm which appears to rule much of ordinary village life. Chico took the risk, which says something of the urgency of his need for water. Nevertheless, he had given it some thought since he had talked the day before with his friend Abraham.

#### *Abraham*

Chico counted on Abraham, and was convinced he would cooperate with the cleaning, despite the fact that he was irrigating. Abraham takes a special position among the water users of El Limoncito. He is widely considered a serious and hard-working bachelor, and his maize yields have always been among the highest of the *potrero*. This year, Abraham cultivated plot #8 for the first time as a landowner, though a dispute over the ownership of this plot was still going on in the *ejido*. Arturo, the respected family head, had proposed to make Abraham the new *ejidatario* and all landowners of El Limoncito had agreed. But a group in the *ejido* supported another candidate. With all the water users of El Limoncito supporting him, Abraham had to show that he merited the land. He cultivated it seriously (that year his maize yield was the highest in the *potrero*, 8 tons/ha) and was prepared to help neighbouring *ejidatarios*. As Abraham tells it "I was irrigating. You are right, I had not such urgent problems as the others. But I wanted to help the people. It is also because I only recently got my land. We are all friends here." The moment Abraham decided to join Chico in cleaning the canal, Dionicio had no other option than to join them as well. Thus Abraham's attitude greatly facilitated the initiating of the work party, since his cooperation precluded a potential conflict between Chico and Dionicio.

#### *Miguel and Chico*

The interaction between Chico and Miguel, the *canalero*, was crucial to the canal cleaning. Miguel had his own view on the silt problem, as he knew beforehand that the maintenance department of the District would be unable or unwilling to clean this canal

in the near future. Moreover, he had his own motives for supporting Chico in his project (this was shown in the foregoing chapter). Chico wanted to force his fellow water users to resolve the problem once and for all, and clean the canal. But to do this, he had first to enrol Miguel in his project. He wanted Miguel to share the responsibility. Otherwise, the risk he was taking ('sticking his neck out') was far too great.

Thus when Chico and Miguel had met at the intake and performed the obligatory part of their encounter, Chico obviously asked for an irrigation turn. When Miguel said he had to wait, Chico proposed to augment the water flow, although he knew only too well that this was hardly possible. "I first proposed," Chico claimed,

"that Miguel should lower the plate of the control structure [in the on-going canal], in order for [the water level to rise and] more water to enter our canal. But Miguel did not agree and said that no more water could possibly enter the canal, and that Abraham and Dionicio were irrigating with the little water that entered. I had wanted to irrigate before Abraham, but Miguel chose to first give the turn to him."

Chico then took action. He provoked the *canalero*, by lifting the gate somewhat. It was a tense moment, in which both actors weighed each other up, ascertaining each other's motives. Miguel considered the situation, and suddenly decided to support Chico.

"Then I walked to the control structure", said Chico, "I turned the wheel slightly and the gate was lifted some centimetres only. At first, Miguel disapproved, but while I was turning the wheel he shouted [the falling water made a lot of noise]: lift it completely! It was he who lifted the gate further. Or rather, we did it between the two of us."

At this moment, nothing reminds us of their role playing in the first act of their encounter. The positions fuse for a moment, and a new situation emerges, which has consequences far beyond the small Limoncito canal (see chapter 4). Chico then decides to take the consequence of what has happened. He immediately plunges into the canal. Found struggling with mud will give him some advantage. How could anyone say he is arrogant, when stuck in the mud?

"I jumped into the canal and started to remove the silt, and then came this Hector and joined me. Hector had irrigated before but had not completed his turn when Abraham started irrigating, and no water had arrived at his plot. Then, also Dionicio came, angry with me (*bravo conmigo*). I told him 'there is no water here, not for me, not for you.' [...] After this, they all helped to clean the canal. We were ten. My brother Nacho, Hector with a *mozo*, Abraham with his brother and his brother-in-law, Dionicio and his son, and Leandro. Salomé did not help us, but he has sugar cane and therefore had no preference for irrigating. At noon we had cleaned the worst parts of the canal, and then we started irrigating: first we irrigated Abraham, Dionicio and then me. After some 36 hours, when Abraham had finished, Hector started irrigating."

The intense contact that existed between Chico and Miguel has been broken. The two of them have now re-assumed their respective roles. Both worlds detach. But something had happened.

#### *A clean canal: analysing the faena*

The problematic situation which faced a handful of actors, resulted in a joint effort to

clean the canal. However, the work party was not a self-evident affair. The *faena* hung in the balance, and depended upon the active decision making, and the weighing of risks and benefits, of at least three actors. Gradually, we see as a trigger effect, how one move provokes another finally resulting in joint action. Only when different actors (with varying motives) are enrolled and cooperate, does the *faena* succeed. If the felt needs of the actors had not been so great, the whole project would probably have died an early death, since attitudes of people towards each other seem to inhibit such joint efforts.

The *faena* is of an emergent character: it had not been entirely planned that way by the actors involved, nor had they the same perception of the situation. The consequences of their response were not fully envisaged beforehand.<sup>14</sup> The group of people engaged in the work party could gradually become more strongly organised, should they in the future again take up similar activities.<sup>15</sup> The group could become the cornerstone of a more formally established canal organisation of farmers. Thus, the work party that emerged may have a lasting effect. This perspective will be elaborated in section 5.3.

Surprisingly, the water users of the Limoncito canal hardly made any reference to the maintenance department of the District, when I interviewed them about the *faena*. This department is supposed to solve the troubles caused by silted canals, but only two on-lookers made any sharp observations about it. It seems that the water users of El Limoncito never even considered going to the District to complain. What happened that 17th of September, was entirely an affair between farmers and fellowmen, where there was no place for the District. It was simply ignored. This is an important observation: through the work party, El Limoncito cultivators reaffirmed their ultimate ownership of the *potrero* as a whole, including the canal infrastructure. The work-party thus appeared a crucial effort at a critical time, of a group of people interacting with each other, and acting upon an artefact: the canal. The *faena* for them was an experience, and one which might be remembered, and influence their attitude towards the canal, each other, the *canalero* and the District engineers, and result in a future change of practice.<sup>16</sup> The Limoncito canal has the potential of becoming a symbol, associated with the successful 'domestication' of government property, but also to the work party which effectively bound some villagers together.<sup>17</sup>

#### Other organising patterns around silted canals

Farmers along other canals in El Operado were also affected by the silt, but unlike the Limoncito water users, they were able to get the maintenance department to clean their canals. Some of these experiences I will discuss here.

Lateral 23 was severely silted up in 1987 and 1988. In both years, water users from the Las Paredes *ejido* went several times to complain to the engineers of the District, and succeeded in getting the District to do the job. Apparently, the water users of this canal easily find their way to institutions, and have fewer problems demanding a right. The difference with the Limoncito canal perhaps can be explained in that El Chacalito is only a small hamlet in a corner of the valley which hardly benefits from government services. Las Paredes lies along the El Grullo-Autlán road, near the sugar cane refinery.



It has benefitted from several different government programmes.<sup>18</sup>

The case of lateral 23 is also important in another respect. From the analysis of a visit to the head of the District, it transpired that those who had gone to him, had been on account of four different issues: one related to the silted lateral 23, another concerning drainage problems at the tail of this lateral, another about a blockage (because of silt) in lateral 14, and about yet another canal, where problems were experienced at the tail end. Most of those who had gone were interested in more than one issue, since most farmers have plots along more than one canal. What for me seemed to be a complex situation was for the water users a daily reality: that of coping with a variety of problems emerging simultaneously, and which depended on government institutions for their solution.

The case of lateral 23 shows how water users do not define the problem of a severely silted canal in terms of a community responsibility, with all its inhibiting connotations, but in this case as a problem for which the maintenance department was wholly responsible. They acted accordingly, and apparently it was quite easy for them to mobilise visits to the District. The water users of lateral 23 thus were more externally oriented than the users of the Limoncito canal who appear to be more inward looking, since the latter did not call the maintenance people but defined the silt problem as their own personal affair.

Another case, that of lateral 14, which in September and October 1987 was severely silted, shows the importance of leadership. Rodolfo, a water user, is considered leader of this *potrero*. Rodolfo finds it relatively easy to go and talk with District engineers, because he has occupied several positions in farmer organisations. He knows most District engineers personally. According to Rodolfo, he went 7 times to the District to complain. The maintenance department cleaned only a part of the canal after a small group of water users had also visited the District. When the worst part of the canal had still not been cleaned, Rodolfo first had a stiff talk with the *canalero*, whom he accused of giving preference to upstream water users, and then went for the 8th time to the District, demanding the immediate cleaning of the canal from the head of the District. The head engineer communicated with his maintenance head, who said that since it was a Friday, Rodolfo would have to wait until Monday for the hydraulic excavator to arrive. Rodolfo was furious and proposed to pay the operator's salary during the weekend. This was accepted, and the problem was thus solved.

In the case of another canal, a sublateral, one actor was also decisive for the way the canal got cleaned. However, the situation was very different here: one big farmer virtually owns all the land. This farmer negotiated directly with the head of the maintenance department to give the sublateral priority. The farmer paid the salaries, the extra hours, and all the fuel and transport costs. For her, it was simply a matter of flipping on the radio in her pick-up, tuning to the District's frequency, and calling for one of the head engineers.

Small farmers along a lateral find it much more difficult to solve the silt problem in a straight-forward manner. A final example may show this. The last stretch of lateral 26 serves 15 water users from one *ejido*. At the end of September severe shortages of water began to occur, due to the limited capacity of the silted canal. On September 30,

I witnessed a very tough dispute between two farmers. Gabriel, the *canalero*, urged them to organise fellow users and go to the District. They did not do so. Two weeks later, Gabriel asked me to talk to the water users and convince them of the need to do something. I did, but it appeared that most water users were not on speaking terms with each other. At the end of October, four water users finally went to the District. For two days labourers of the maintenance department tried to clean the canal by hand, but in vain. They found that the canal was too severely invaded by silt and weeds, and complained about the working conditions to their superiors. As a result, lateral 26 was left as it was. Water users were arguing over the water, and Gabriel feared some of them. He insisted during the *canaleros* meetings of the importance of cleaning lateral 26. Finally, on November 18, 50 days after problems started to surface, the canal got cleaned by a hydraulic excavator from the maintenance department.

Along many silted canals, no effective solution is found by the water users. They complain to their *canalero* but seem unable to overcome the petty irritations that exist among them. It seems that before an initiative can be taken, the attitudes of people vis-à-vis each other have to change. The pattern characterised by mutual distrust and 'not sticking out' has to be broken.

In cases where farmers find a more effective solution to the maintenance problem, we see different organising principles at work: some opt for cleaning; in other cases they demand maintenance service; yet others directly negotiate with the District. Groups have devised different ways of coping with the situation. They all have in common the mobilising of contacts and networks. Such networks enable action to be taken.

The question arises, however, whether the emerging forms of farmer cooperation have a lasting character. In section 5.3 I will analyse incipient farmer organisation in the canal known best, lateral 5, and show how joint actions undertaken to solve the maintenance problems gradually do take on a lasting character. In the next section the maintenance department is examined, and I try to show how it organises its activities.

## 5.2 The District managing maintenance

*Field notes of Piet Sijbrandij* (Sijbrandij, 1989b; pp.35-36, 38-39, 40-41, 74-75)

"September 1988. I contact the operator of one of the two hydraulic excavators. His name is Pancho and he invites me to join him. The next morning we leave at 8 o'clock. We're not heading far but it takes us more than an hour to arrive at our goal. We sit down because we cannot start our work: lack of fuel. We wait for a truck from the District to arrive with fuel. They arrive and refuel the *Poclain*. Then we make a small fire and together with the two truck drivers we roast our *tortillas* and heat our beans. While we have our brunch I ask one of the truck drivers how they decide which canal to clean. He answers that "this is pure politics". After our brunch we start to clean the canal. It had taken us three hours from leaving the District offices, to begin. While

Pancho operates the machine I sit on it and watch what is happening. We're cleaning a small canal of about 150 meters long full of sand and aquatic plants. After two hours work, the mouth of the excavator shatters the concrete lining of the canal. We stop. The mouth of the machine is too big to clean the last 30 meters of the canal.

We sit down in the shade of a tree and Pancho starts filling out a report of the day. He explains to me that he has to do this every day and hand it over to the field supervisor of the maintenance department. I ask him why we are cleaning this particular canal. Pancho tells me that *Los Leon's*, an Autlán based tomato company, is going to grow tomatoes on the plot which it irrigates. Pancho adds: "yes, sometimes I ask the same question. Why here?" I notice the motor of the Poclair still running and ask why that is. Pancho says that it is because of the tachometer, and we must now make up for the time lost waiting for the fuel. We go back to the District offices. We arrive at 3 pm.

I chat with another operator. He tells me he likes doing double shifts to earn extra money. I ask him who pays him for extra shifts. He says this time it is the District who is paying him. However, at other times the District lends out the machine to others and they pay the operator, fuel and oil. Sometimes he also works during the weekends but this hasn't happened for the last two months. Three days later I hear the machine has broken down, been repaired and broken down again. The work is taken over by the tractor equipped with the small excavator.

A week later I go to check the situation and meet the group cleaning the canal by hand. They tell me the small tractor has also broken down and therefore the work has to be done by hand. They don't seem very happy about it. It is 1 o'clock and they stop when I arrive. We sit down under a tree and start playing cards. I ask them why they stopped. They tell me they work very hard in the early morning to be able to stop when it gets too hot to work. I ask them if they are content with their wages. The wages are low, only 170,000 pesos a fortnight (US\$ 75) and the work is hard and dirty. To sustain their families they try to earn money in the afternoons as well. They mention taxi driving, bricklaying or selling pork crackling (*chicharrón*).

October 25. At the daily meeting of the water guards, six water users drop by. They all demand water. The water guards tell them to wait until the meeting is finished or say it is impossible to give an irrigation turn because of the bad condition of the canals. The water guards complain to the assistant of the head of the operation department. Five of the six water users leave. They are quite disappointed. Only one water user insists. He says to the water guard of 'his' zone that he needs the water urgently for his recently planted sugar cane which will be lost if he doesn't get water. The assistant explains it is impossible because his lateral is completely silted. The water user argues that the District promised to give him water if he cleaned his field canal. The field canal has now been cleaned so now he wants his irrigation turn. The assistant again says it is impossible because the canal is silted. I ask the irrigation supervisor why there are so many problems. He points his finger in the direction of the maintenance department and says that the people over there don't work. The atmosphere at the *canaleros* meetings these days is very negative, the water guards are stressed and don't think their problems will be solved in the coming weeks. Instead of making their usual jokes they complain about their bosses and the maintenance department.

October 26. At the office of the maintenance department the senior personnel are becoming more and more tense. The number of people passing by with 'torn T-shirts and mud on their shoes', i.e. water users, is steadily increasing. Alone, or in groups of up to 5, they have to wait in the hall of the department. They look tired, nervous or angry. When Engineer Fuentes calls them into his office the doors are closed. It takes 10 to 30 minutes before the water users come out again. When I try to chat with them they walk away or tell me they are not willing to talk. Engineer Fuentes mentions that he has never before had such problems in the 8 years that he has worked at the department. According to him, the plans are well made but the lack of money makes it impossible to keep the machines functioning well. Oscar [the field officer and 2nd in charge] confirms this and states they are trying to solve the situation by working in double shifts. I talk with Engineer Llamas, the desk officer, who tells me the department is faced with problems because of the frequent breakdown of the heavy machinery. I ask him how the problems can be solved. He sighs, is silent for a moment and states in a somewhat hopeless tone that the only thing they can do is hope for help from the water users.

Half way through November. The problems are decreasing. Most water users have had their first irrigation turn. The requests for water are becoming more spread over time, the first plots of sugar cane are suspended from irrigation, and more and more canals have been cleaned. Daily water demand is decreasing. Less people with 'torn T-shirts and mud on their shoes' wait to talk with Engineer Fuentes. The crisis is over. At the office, two persons are organising photos of the maintenance and stick them into an album. The moment I see them doing this I realise that there is always a camera in the office of Engineer Fuentes. I become aware of the differences between the offices of the maintenance and the operation department. In the former the walls are full of technical drawings and tables, whereas the operation department is just bare and shabby. This contrasts with my impression that the people of the operation department always seem to be busy, and people of the maintenance department are frequently hanging about. I enter the office of Engineer Llamas and ask for the working programme of 1988. He gives me 13 pages and says that is all there is."

### The maintenance department

The above impressions of the maintenance department's activities show a reality which is quite distinct from the reality found in the field, among farmers. And this again differs from the formal institutional arrangements which underlie the maintenance department's activities.

### *Institutional arrangements*

Water users are responsible for maintaining field canals, while the District is responsible for the rest of the canal system. Maintenance works are programmed and executed by the maintenance department.<sup>19</sup> Thus, the main irrigation tasks (water distribution and canal maintenance) are separated into two different departments. The water guards, who

are important for data collection (for early warning), have no direct communication channel with the maintenance department. Nor is the Water Users' Commission, a platform where water user representatives of El Operado meet with District engineers, effective in establishing a link between water users and the maintenance department. (See following chapters.) The maintenance department (64 personnel) has three sections;

- 1) 'the workshop' (*maquinaria y taller*), responsible for the maintenance and repair of vehicles and heavy machinery;
- 2) 'the desk' (*gabinete*), responsible for planning, for control, for reporting and for the formulation of projects and contracts;
- 3) 'the field' (*campo*), responsible for data collection and the actual execution of the maintenance. The 'field' section is again sub-divided into 4 task forces: canal maintenance by hand, maintenance of canals, drains and roads by machinery, maintenance of structures, and topographical studies.

The three sections of the department are headed by qualified engineers or experienced men of practice. Most of the decisions are made by the head of the department (figure 5.2).

Each year a maintenance plan is formulated on the basis of the foregoing years and current field data collected by the field section. For each canal, drain and road the quantity of required maintenance is calculated in volume, surface and length, and costs for the execution are estimated. To the actual costs of the maintenance programme, the overhead costs, i.e. studies, supervision and control, are added. The maintenance plan is sent to the Jalisco department of SARH in Guadalajara which checks it, sends it on to SARH headquarters in Mexico City, which finally allocates the budget. If this is less than requested, a part of the planned maintenance will be postponed to the following

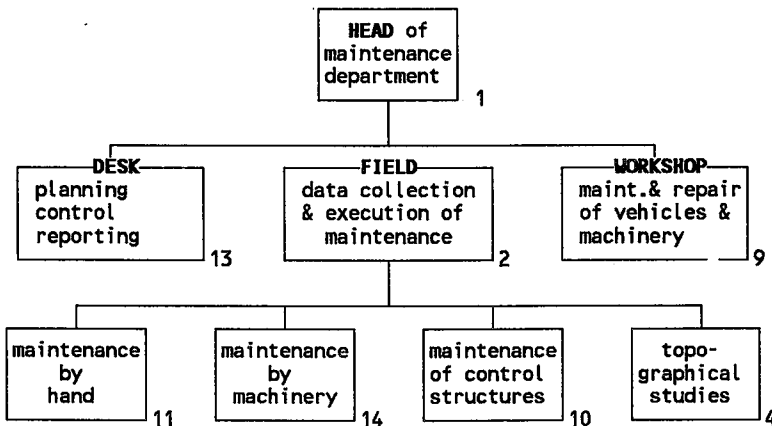


Figure 5.2 Organisation chart of the maintenance department. Source: *Distrito de Desarrollo Rural El Grullo*, as presented in Sijbrandij 1989b:16.

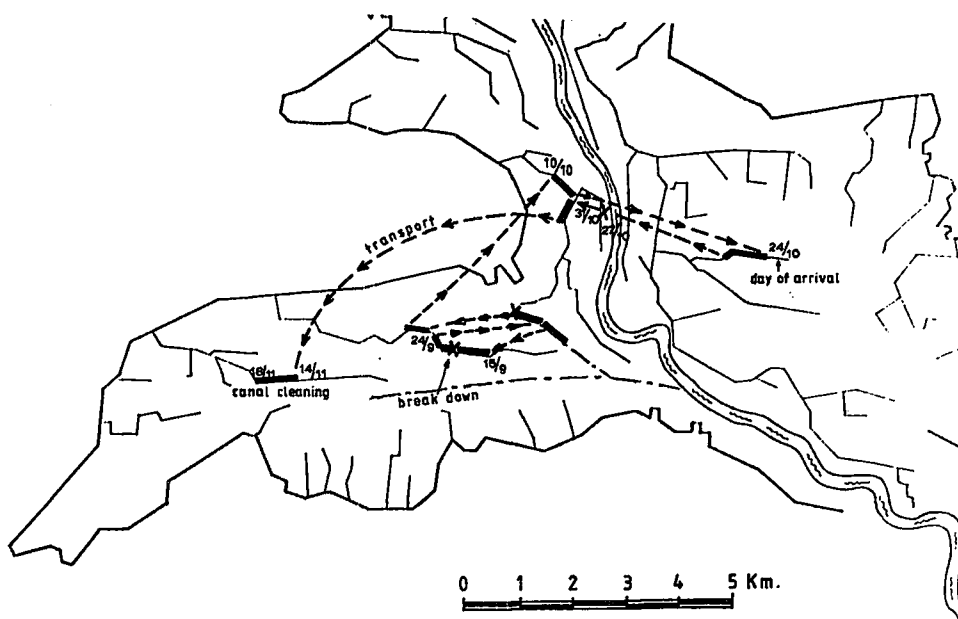


Figure 5.3 Movements of a *Poclair* hydraulic excavator during September-November 1987

year (*conservación diferida*). The budget for the maintenance is supposed to be covered by the fees paid by the water users. However, the amount of money collected in fees is not necessarily the same as the budget the District makes for operating and maintaining El Operado. Of the water fees, approximately 20% is for operation, and 80% for the maintenance of the system. The fees are collected by the District, which immediately transfers them to an account of the ministry of finance which redistributes them over the ministries at national level. Thus, the federal SARH ministry exerts a strong influence over the ability to execute the required maintenance.

There is no strict programme for the sequence of when, and which canals, roads and drains will be maintained. One criteria seems to be to execute the works per geographical area, preventing unnecessary transport of machinery. The other criteria is the urgency of the maintenance problem. The head of the maintenance department decides, should these two principles clash (which is quite often). This gives rise to crisis management. (Figure 5.3 shows how the hydraulic excavator is moved around during September-November 1987.)

Every day, the head engineer meets with his field officer (his right hand) to discuss the situation, before deciding which works have priority. Also, he maintains frequent contact with the head of the operation department. The field officer manages the actual execution of the maintenance task. For routine canal maintenance a group of 11 manual workers (the slashers' brigade or *brigada de macheteo*) and two hydraulic excavators

(*Poclains*) and their operators are available.<sup>20</sup> The slashers brigade mainly cleans the canal banks and smaller canals while the *Poclains* are used for the maintenance of the mains and laterals.

Each morning, work instructions are handed out to the slashers brigade and to the operators of the machinery. They execute the works and write day reports of the advances made. The field officer collects the day reports and accumulates every month the progress made on each task, which is handed to the office personnel. The office personnel keeps records about progress made on each canal, drain and road. The monthly report consists of works executed and money spent. This report is signed by the head of the District and sent to SARH in Guadalajara for monitoring purposes.

#### *Actual execution of the maintenance task*

It is difficult to assess exactly the budget available to the District for maintaining El Operado. No precise data on financial management could be obtained. All financial transactions of the District with higher authorities are controlled by four District officials: the head of the District, heads of the operation and maintenance department and the administrator (head of the administration department). The state of affairs with the finances of El Operado is highly complex because the financial years of the operation department (October-September) and the maintenance department (January-December) differ. This notwithstanding, farmers pay only one water fee, including operation and maintenance components. There seems to be hardly any direct relationship between the actual amount paid and the level of the budget of the maintenance department. The allocated budget is decided upon in Mexico City.<sup>21</sup> The figures given here are indicative only.

While for the year 1987 the water fees paid by the farmers covered some 60% of the allocated budget, for 1988 the amount it covered had diminished considerably: the District did not adjust the fees for the 1988/89 irrigation season, even though Mexico had experienced an inflation rate of around 140% in 1987. Consequently, the Mexican

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Table 5.2 Requested maintenance budget and allocated budget for 1987

maintenance activity	requested budget (million pesos)	allocated budget (million pesos)	percentage of of requested
dams	62.7	1.4	2%
canals	90.4	43.8	48%
drains	45.2	33.4	74%
roads	38.0	28.8	76%
other	12.1	2.8	23%
overhead	50.1	50.1	100%
total	298.5	160.3	53%

Source: Distrito de Desarrollo Rural El Grullo, as presented by Sijbrandij 1989b:18

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Table 5.3 Planned and realised canal maintenance for 1988

		planned	realised
clearance of water plants	by hand	12 km	12 km
	by machinery	66	66
removal of silt	by hand	6	6
	by machinery	83	87
clearance of canal banks	by hand	161	161
repair of canal banks		4	4
repair and maintenance of structures		218 pieces	218 pieces

Source: Distrito de Desarrollo Rural El Grullo, as presented by Sijbrandij 1989b:19

government subsidy to the management of El Operado increased from around 40%, to over 70% in 1988. The allocated budget for 1989 was four times higher than that of 1987. However, this increase was entirely offset by the increase in costs, which meant that still only half of the required maintenance could be executed. Table 5.2 presents the required maintenance works in 1987 as defined by the maintenance department (in the second half of 1986), and the budget finally allocated, which covers 53% of the amount requested. Remarkable are the low allocations for the Tacotán dam, and canal maintenance and the high budgeted overhead, which is fully covered. Table 5.3 shows the relation between planned and realised maintenance of the canals in 1988, according to data from the maintenance department. It shows that execution of works strictly followed the programme, which is surprising given the crisis situation encountered during the months September through November 1988. The data manufactured by the maintenance department mask the reality in the field. The department tries to uphold for the higher SARH authorities the image of an efficient institution.

The maintenance department is responsible for 232 km of canals, including main canals, laterals and sublaterals (field canals excluded). Of these canals, approximately 100 km needed to be cleaned during autumn 1988 in order to prevent problems with water distribution. The maintenance department cleaned only 19 km during the period September-December. The water users cleaned another 23 km, implying that the water users executed 55% of canal maintenance, and the District 45%. The water users along the remaining 58 km that were not cleaned at all, were confronted with delays in receiving their irrigation turns by up to a month or more. Some water users mentioned having suffered considerable crop production losses. In total 2,900 ha (involving 685 water users) were affected by poor water distribution caused by the lack of clean canals. This is one third of the total irrigated area. (Sijbrandij 1989b:21-22)

The maintenance department faces four major constraints against performing its task properly. The first is a severely restricted financial budget. The final allocation of money is beyond the control of the District, so that the maintenance department has to



try to comply with its task within the financial framework defined by higher authorities. In 1987 only 53% of the required amount was allocated. In 1988 the situation was worse. Secondly, the maintenance department seems unable to increase its execution capacity during the critical period between August and October. This has also to do with the tight bureaucratic rules which the department has to follow with respect to the purchase of spare parts. A third major constraint is inherent to the organisational set-up within which the department functions: responsibilities over operation and maintenance are separated into two different departments. Lack of performance by the maintenance department has little repercussion on the department itself, but it does affect the operation department. Both departments function independently to perform their tasks, and have developed different work styles, and set differing priorities. A fourth constraint is the lack of accountability of the maintenance department to its clients, i.e. the water users. Farmers cannot let their opinions be known to the maintenance department other than through complaining on an *ad hoc* basis. No formal contact is established to ensure that the maintenance department is confronted by its own good or bad performance.<sup>22</sup> As we have seen, the *canaleros* play an important role in voicing the problems farmers face with maintenance.

The above situation results in the maintenance department being quite autonomous. It appears to follow its own logic, as exemplified by the field notes with which this section opened. There is little place for farmers in the maintenance department. Alongside the maintenance department's domain, there is the farmer's domain. Among farmers there seems little place for the maintenance department.

### The head engineer

If we want to understand how the maintenance department's domain is produced and re-created, we have to consider that the department is autocratically managed by its head, Engineer Fuentes. The way in which this engineer operates, highly influences the department's internal dynamics. I want to analyse here the position of this engineer and his actions, by describing some of the relationships he maintains in his work. I start with how he treats farmers, then how he relates to his fellow engineers. A next important factor is the position he takes within the wider SARH institution. Finally, I will briefly describe how he relates to some trusted employees in his department, and how he treats other subordinates.

#### *How Engineer Fuentes approaches farmers*

Let us start with how Engineer Fuentes approaches farmers who come to pay him a visit in the office. Piet Sijbrandij discussed the matter with Fuentes.

I ask Engineer Fuentes how he reacts if water users come to talk with him. He tells me they sit down in the hall of the maintenance department. He lets them wait, in the meantime observing them, which is possible because the door of his room is open. When he calls them in he already knows how to treat them. First he lets them have their say. "I say to them, 'The truth is here. I don't have personal interests. Do you have other alternatives?'" I say it as a tactic, to put them in my place. I give them

the feeling they can make their point, that they participate in making the analysis of the problems and the alternatives. But the solution is already decided. Clearly!" According to him the water users only think about their own plot. He is able to have an overview of the whole situation, they can't. He explains to them the situation and together they check the alternatives. Alternative after alternative appears unsuitable. In this way only the planned solution remains. It has to be so because it has been decided already the day before together with Engineer Corona of the operation department. I ask him if the water users are angry when they come. Fuentes tells me they are sometimes very aggressive: "We are a public service but they should treat us with respect. We are the authority. But it is better to solve it by convincing them than by imposing the solution." (Sijbrandij, 1989b:75-76)

His way of approaching water users suggests that he does not seem concerned that those who come to his office are often desperate. He leaves little space for them to influence his policy.

### *The bosses*

In discussions on power relations within the District, various people (lower District personnel) used the word '*triangulación*' to explain to me where the locus of power is concentrated: in the triangular relationship between the head of the District, the head of the operation department and the head of maintenance.<sup>23</sup> The basis of this relationship seems to be that if the head of the District puts a demand on department heads, they comply whenever feasible. In return the chief engineer leaves them free to organise their own affairs, with only one restriction: that they do not create problems for him. In practice this means: ensure that reports to the higher authorities leave no room for question. These three engineers thus have some pact of convenience, and back each other. They form the back-bone of the District. Engineer Fuentes puts it this way:

"Take for example the situation of López García [head of the District] giving me the order to clean a specific canal. López García gives this order to help some friends whose support he needs. Sometimes, I will try to explain that it is impossible, and I may succeed in convincing him. But often I do not. Then I have no choice, López García after all is my boss." (Sijbrandij 1989b:41-42)

Apart from such specific orders, Engineer Fuentes has his own discretionary power to decide on which canals to clean, and which water users to please. The relationship between both department heads (Corona and Fuentes) is that of two equals, which is reflected in their being *compadres*.

From what I have seen of these three engineers interacting, their relationships do not appear to have any affective content. The triangle seems to be entirely functional, and I tend to believe that they may even harbour aversion for each other. The functionality of the relationship makes checks necessary: the one has to know for sure that the others are not breaching the pact of convenience. This is clear in the relationship that Corona and Fuentes maintain. Their working relationship is not entirely balanced: if Engineer Corona fails to perform his task (adequate water distribution), this does not affect Engineer Fuentes in any way, but the failure of Fuentes to comply with his job (keeping the canals clean) does affect Corona's ability to comply with water distribution. So, in critical situations such as the autumn period, Corona uses one of his faithfuls (the irrigation supervisor)<sup>24</sup> to check on the work performance of the maintenance

department, and to provide him with information. Fuentes knows this, and this is itself enough to ensure some minimum activity by the maintenance personnel. The head of the District also has a check system, which is very simple: when severe problems with water distribution or canal maintenance occur, acquainted and unacquainted farmers may come to his office and complain. Neither Fuentes nor Corona can prevent this from happening. Moreover, the District head has to counter-sign all the reports the departments elaborate and send to Guadalajara, which provide a further check on both departments heads.

#### *Department head within the institution*

Being a department head of an irrigation District implies a position of power. But what degree of freedom does Fuentes really have? The head of a department in the District not only has to report to the District head, but is also accountable to his superior in the homologous or 'mother' department of the SARH office at state level (here the Guadalajara *delegación*). It is common knowledge that the maintenance department, which manages a relatively large budget (nearly half of the entire budget of the District), is tightly bound to its 'mother' department at state level. Or to be more precise, the engineer heading the maintenance department is bound to his superior at the mother department. Engineer Fuentes is granted some latitude by his superior at state level only if he commits himself to him.<sup>25</sup> Without having committed himself to this superior, Fuentes would never have got the position, because the line superiors in Guadalajara finally appoint department heads, not the District head in El Grullo.<sup>26</sup>

The connections with officials of the 'mother' department at higher levels (state and federal level) gives the head of the maintenance department within the District some degree of freedom vis-à-vis the District head. This also makes it plausible that in the same District, differing working styles and dynamics in the departments are found, and can persist. Given this context, it is very difficult to assess the exact room for decision-making a head of the maintenance department really has, and the present research has not been able to explore this in any detail. The above seems to indicate that Fuentes is often forced to make certain decisions because of guidelines given by either the District head or a distant superior.<sup>27</sup>

#### *The unconditionals of Engineer Fuentes*

Within his department, Engineer Fuentes has established a strong bond with his field officer, Oscar. Oscar himself observed: "I am Engineer Fuentes' eyes in the field, the connection between the people in the field and the department. We discuss the situation, but Engineer Fuentes takes the decisions and gives the orders. Apart from him no one else gives me orders." (Sijbrandij 1989b:49) Oscar seems to follow Fuentes unconditionally. He owes his present position entirely to him, and Fuentes also frequently takes Oscar with him during his weekend missions as a private consultant, making topographical surveys.

Under the former head of the maintenance department, Oscar was the desk-officer and Engineer Llamas the field officer, who was then the head's right hand. When Fuentes took over, he promoted Oscar to right hand man, and demoted Llamas to desk-

officer. The field officer is crucial to the maintenance department head since he is the person controlling activities in the field. He processes the day reports and presents the data to the desk officer. The field officer is therefore able to cover up any activity which is not in accordance with the programmes and thus should not show up in the reports or bookkeeping sent to the state level SARH in Guadalajara. This post is therefore given by the head of the maintenance department to a trusted person. Having Oscar tied to him, Fuentes can control what is happening in the field, including all parallel activities that his department undertakes (the machinery is a scarce resource) and which generate profits. Obviously, the relationship between Llamas and Oscar is strained, and this serves Engineer Fuentes well: it effectively checks side activities that either one of them might undertake without his knowledge. Both officers are aware that their positions might weaken if Fuentes should be transferred and a new head appointed. Both have a common interest in supporting Fuentes.

#### *The rank and file*

Engineer Fuentes depends on his lower level personnel for the performance of his department. These rank and file officials take a subservient pose towards him, quite unlike the field personnel of the operation department towards their boss. This reflects the authoritarian manner in which Fuentes tends to treat them. He is intelligent enough, however, to leave them some spoils. Fuentes gives the example of the slashers' brigade: "They are willing to work, they come in the afternoons, on festivity days and even during the weekends to help me with the construction and modification of my house. In this way they have a double salary." (Sijbrandij 1989b:43) The manual work personnel seem pleased with this arrangement, and are loyal to their boss. Also most operators of the hydraulic excavators seem to blindly follow orders. Some, however, did fall out of line. They were subsequently transferred to other Districts.

#### Conclusion

The maintenance department controls access to a scarce resource: heavy machinery. This machinery can be used in different ways. Groups of farmers have been able to influence when and where the excavators will work, but they are not able to effectively control the way the machinery is used. The type of resource involved, the way in which the department head is bound to superiors, and the way he has organised his department, enables him to control entirely the use of these machines. The operation department also controls a scarce resource: water. However, the operation department's head does not have complete control over this resource for several reasons: one is that water is difficult to control, store and put into use when and where one desires. A second is that the *canaleros* have a more appropriate knowledge on how to distribute the water than the department head. Another reason is that water flows are easily detected by farmers, and since they perceive water more than machines as a public good, they do not easily accept misallocation. Water and machines thus give rise to two quite differing organising principles found in the operation and maintenance

departments.

The way farmers perceive the problems related to a maintenance service differs widely from how the personnel of the maintenance department see them. For the farmers, silted canals imply water shortage, wilting maize, arguments among fellow users, complaints to the *canalero* and finally mobilising networks to go to the District to demand a proper maintenance service or to organise work parties to remove the mud themselves. The maintenance department sees the silted canal as a problem which is difficult to solve within the existing institutional environment (the officially allocated budget is not enough, spare-parts of broken down machines are not readily available; workers unwilling to perform the filthy job by hand, etc.). But it appears that the head of the maintenance department is not really willing to solve the problem. The cunning way in which the machinery and the personnel of the department are used for private projects contrasts with the apparently insurmountable institutional obstacles when regular works have to be performed. The rewards for the first type of activity appears to outweigh the costs of the latter.

The way the head of the maintenance department behaves seems to be a good fit with the organisational structure in which he functions. He plays an obedient subordinate role towards his superior, the head of the District. In return, he is given relatively high discretionary power to pursue both his formal task and private projects. He pursues a parallel strategy with his superiors at the hydraulic resources department in Guadalajara. He tries to solve all emerging problems at his own level and to uphold the image of an able engineer running an efficient department. In this he partly succeeds: the impression the higher SARH authorities have of this department derives from the reports he sends them, and these reports mask any problem or conflict situation which, as we have seen, were many in autumn 1987 and 1988.<sup>28</sup> The many irritations that existed among water users and also among District personnel (especially the water guards) over the lack of canal maintenance had few repercussions for Engineer Fuentes. This can be partly explained by the attitude of the head of the operation department, Engineer Corona: he systematically avoided confrontations with Engineer Fuentes. Although Corona exerted pressure to ensure some bottom-line activity from the maintenance department, he had little interest in creating a row. First, the silted canals effectively reduced the volume of irrigation water used, and a reduction of water use at the beginning of the season would help to forestall an impending water shortage towards May and June.<sup>29</sup> Second, openly challenging his colleague and *compadre* would imply a breach in the pact of convenience to which they both were held. To be undisciplined is considered in 'political' Mexico as unacceptable, if not the worst crime possible.

The discontent among farmers could be partly dissipated through the initiatives they took themselves. Actions taken by some water guards, together with some water users, created some uneasiness at the District's top, but seem to have had little lasting effect. The hermetical structure of the department proved to be sufficient to preclude a serious threat from outside. The question which arises is: if the maintenance department simply continued with the same practices, did the farmers follow up any of the joint actions they had taken? It is time to return to the field, in particular to lateral 5.

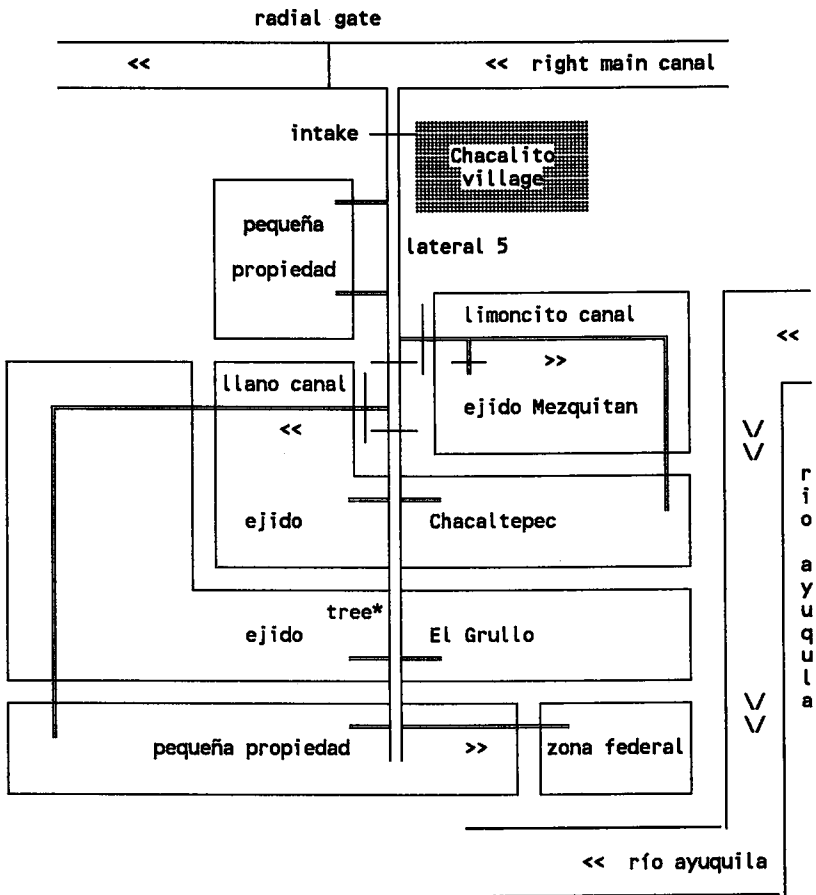


Figure 5.4 Lateral 5, its canals and the *ejido* lands served.

### 5.3 An emerging canal organisation

Apart from problems caused by the silt, lateral 5 has another pressing problem: its intake is too small. (See chapter 4, for the *canalero*'s point of view on this problem.) The *canalero* had informed the operation department various times of the problem over a period of three years. It was up to the maintenance department to enlarge the intake, since the department is also responsible for improvement (*ameliación*) of the infrastructure. Nothing happened. As was shown in chapter 4, water shortage resulting from the small intake created conflicts among water users, and finally Miguel (the

*canalero*) succeeded in convincing some water users of the exact cause of the problem. From that moment (during August-October 1988) things began to move. Miguel summarises the story:

"Let us see what happened in the area of canal lateral 5. They had this problem of the small intake ... I also had problems there. There was never enough water. What did the water users do? They assembled. They went to the District: Sirs, are you going to clean our canal? Errr, no. And repair the road? No. And the intake? No. Go to hell! So they went to the sugar cane organisation who lent them the money. They constructed a new intake, cleaned the canal, repaired the road. The problems were solved. In how many days? In two weeks!"

This is a case of water users along one canal decisively taking action, not only cleaning their canal, but also improving it through the investment of a considerable amount of money. The undertaking suggests that these water users had a longer term perspective, and planned their project quite well. Is this the response of farmers to a failing maintenance department, of farmers along one canal strengthening their informal cooperation which gradually develops into a coherent canal organisation? This section tackles this question.

Lateral 5 supplies water not only to the Limoncito canal, which irrigates 85 ha belonging to 9 *ejidatarios* from Mezquitan, and one from Chacaltepec. Lateral 5 also feeds the Llano canal, feeding approximately 90 ha belonging to 23 *ejidatarios* from Chacaltepec and El Grullo, and 130 ha upstream of these sublaterals belonging to a group of private landowners (*pequeños propietarios*). The on-going lateral serves other *ejidatarios* from El Grullo and Chacaltepec (120 ha). At its very tail, the lateral irrigates 30 ha of privately owned land (*pequeña propiedad*), and a small area near the river denominated a federal zone (*zona federal*).<sup>30</sup> (Figure 5.4.)

### The Llano canal organisation

The first section of this chapter indicated that water users of the Limoncito canal conceptualised themselves as a group, despite the petty conflicts and small irritations that crop up in every day life. This was important to understanding the work party these water users were able to organise to clean their canal. Water users along the Llano canal also seem to define themselves as a group with some common interests. In 1985, they also cleaned their canal, since the District did not show up to do it. Some 25 people (nearly all water users and some *mozos*) from both *ejidos* (Chacaltepec and El Grullo) participated when one farmer, Enrique Negro, called for the *faena*, and in 6 hours the job was done. This is a first indication that also in the Llano canal some farmer organisation is present. A second indication is given by the field canals, which are well-kept and which have been reconstructed in concrete by the water users themselves. In March 1988, I talked with Enrique Negro about their canal. I commended him on the nice field canals on his land, and said I had heard that they cleaned their canals themselves some years ago. He responded:

"We have an organisation here. Look, the fines of the District are useless. They are 2,000 or 5,000 pesos [1-2 US dollars]. So, you're better off robbing water and paying the fine! We have decided here among *ejidatarios* to fix our own fines: 20,000 for the first infringement, 50,000 for the second. For the third: suspension of irrigation. And the people respect this!" I asked where the water users have their meetings, and he replied, "Over there, under the tree."

Enrique Negro is one of the important actors in this organisation, in his capacity as *jefe de potrero* of the *ejidatarios* of El Grullo along this canal. His deputy is another El Grullo farmer called Navidad.

### *An extraordinary meeting*

As I drive my volkswagen into the *potrero* of El Llano, I pass by the tree marking the centre of the *potrero* and I see Miguel, the *canalero*, near the intake of some field canal, closely observing the water. I stop, get out of my car and greet him. He tells me he is checking whether the plot is taking too much water. While checking the canal, Miguel explains to me the problem which is surfacing at that moment in El Llano. Paco Paniagua is irrigating his 27 odd hectares of newly sown sugar cane at the tail of the lateral (he recently rented this *pequeña propiedad* for a 5 year period). He has blocked the canal with sand-bags in order to get all the water into his field. Now other farmers are annoyed.

While we are chatting near the tree, two youngsters in a gleaming white pick-up pass by. They stop because my car is blocking the way. They readily join our talk about Paco's sand-bags. Miguel tells us that yesterday Corona (head of the operation department) had called him by radio and ordered him to irrigate Paco's sugar cane. "I told my boss that I would give him the water if he would remove the sand-bags. Corona had responded something to the effect that he is the one who determines what has to be done. So now Paco Paniagua is getting his water, the sand-bags still in place, and now I am in trouble with Enrique." One of the youngsters dryly observes that it is no wonder, Corona and Paco are *compadres*. This is new for Miguel. I pull my car over, so the boys can pass.

At the same moment, the small yellow pick-up of Enrique Negro arrives. He stops, remains seated in his car, and we come nearer to him and the conversation resumes. It appears there is a body of collective knowledge here in this *potrero*, everybody being able to join the conversation at any moment. Enrique indignantly tells Miguel he has been to see Engineer Fuentes of the maintenance department, and in the name of all the water users of El Llano had asked permission to construct a new field-intake and control structure at the site where Paco Paniagua now has his sand-bags.<sup>31</sup> Enrique had told him that the water users themselves would finance the work and that they only wanted formal permission to execute the work and some technical assistance. Somewhat later in the talk he added, "and the Poclain excavator for a few hours". But Fuentes had refused. It was impossible, wait until July he had said. Enrique lets himself get carried away by his own story. By now he is furious. He says: "we have to go all of us, then they will listen. It is exactly as it was with the intake (*entrada*) of lateral 5. We requested for its enlargement three years ago! What planning!"

At this point a red *camioneta* arrives with Navidad. He stops and gets out.



Immediately he picks up the conversation. We stand around Enrique's pick-up, who still makes no attempt to get out of his car. Miguel, on the right side of the car, bends his head to talk to Enrique. Navidad and I on the left side, are doing the same. Enrique Negro comments he has talked to Don Alonso (father of Chico) of the Limoncito canal. "We have made up our minds. We are ready to take over, all the water users of lateral 5, to arrange affairs for ourselves, together with the *canalero*," he adds while nodding in the direction of Miguel. "We simply deal with that one from Chacalito, and with Sr. Meda of the *pequeña propiedad*. No problem. Then we arrange our affairs amongst ourselves, without those engineers in their offices (*escritorio*)." Navidad smiles: "We simply say that it is now our canal, and we do not allow them to enter."

In the meantime, another water user also passes by in his car, and since a traffic jam has now developed, he has no choice but to get out and join us. Miguel starts recalling the recent trial he performed with Enrique and Navidad the week before, showing them that the intake of lateral 5 really was too small. (See chapter 4.) Both men acknowledge that they first thought that Miguel was giving the Limoncito canal too much water, but that now they know better and that the intake should be enlarged. The gathering disperses, as suddenly as it emerged. It requires some manoeuvring for all the cars to get out. Later I realise that I had just attended an extraordinary meeting of the executive committee of the canal organisation of lateral 5, under the big tree.

Three months later, at the beginning of July, I attend a planned meeting with the water users of lateral 5. Again the venue is in the field, now where the Llano canal branches off the lateral. Some 30 water users are present. We wait for half an hour, because, as Enrique says, he has invited engineers from the District, and also the boss of *Grande Irrigación* (the local SARH office in charge of the rehabilitation project of El Operado). When finally two engineers from *Grande Irrigación* show up, it is decided to go to the intake of lateral 5. Enrique and Navidad discuss matters with the two engineers. The other water users chat among themselves. The engineers and Enrique discuss whether a bigger pipe should replace the current one, or that a rectangular concrete structure should be cast in place. The engineers promise to help the water users with a technical drawing. Most of what is discussed is not followed by the rest of the water users. Then the meeting is over, everybody is going his own way. No clear decisions have been reached. Enrique is angry with Engineer Fuentes who failed to attend. He tells me he can do the job without him. He looks determined.

At the beginning of September a construction firm started the work on the intake. Two weeks later it had been completed. The pipe had been replaced by quite a big rectangular concrete structure. I was pleased to see that the new construction looked professional. Not the botched job Fuentes perhaps expected from these farmers. On September 26, Miguel tested the new intake: more water entered the lateral without having to back up the water in the main canal. That same day water users from the Llano canal also cleaned their canal, organised in two working groups (one for each *ejido*).

Miguel was pleased. While in other parts in El Operado problems were mounting, with this new intake and the cleaned canal, water distribution here will be easy. And if this is not enough, two weeks later yet another problem is solved: on the initiative of

Don Alonso, head of the *potrero* of El Limoncito, the water users demolished the Limoncito intake, and enlarged it. Now more water enters the canal with the wrong gradient.<sup>32</sup>

Problems solved, and yet..

It all seemed to run quite smoothly, the construction of the new intake of lateral 5. It was, however, quite a complex project which involved different departments of the District (who eventually did not cooperate), *Grande Irrigación* (who provided the technical drawings), the CNC sugar cane grower's association (who provided through the sugar factory a loan of 19 million pesos or US\$ 8,000), a construction firm, the *canalero* and, of course, the water users. It was all organised by Enrique. He was satisfied: "Last year the *canalero* had little water. The farmers grabbed water to irrigate faster, but not now. We went about organising ourselves little by little. Now the problems are over." (Sijbrandij, 1989b:62)

Not all the water users were happy with Enrique's initiative. Some complained they had not been well informed, and that now they had been presented with the bill of 30,000 pesos/ha (US\$ 12), but the expenses were not clearly accounted for. Most people also disagreed that all the roads along the canals of lateral 5 had been repaired under the same project, which had cost an extra 9 million pesos (apart from the 10 million for the intake). The sugar cane growers had least difficulty with these costs: the sugar cane refinery had provided the loan, and the amount owed would simply be deducted from the net returns of the harvest. But the maize growers especially were reluctant. They had to pay in cash (which always hurt), and why did they need better roads? "If it is for the benefit of the sugar cane lorries, let them pay!", they complained. Apart from the water users, the villagers of Chacalito were also charged with paying their share for the repair of the road (which connected them with El Grullo). Those water users living in El Chacalito paid double, and this they saw as unfair. (Sijbrandij 1989b:61-70)

Few people openly acknowledged Enrique's ability to complete the project within such a short time. Perhaps he had proceeded too quickly and resolutely, and had failed to involve the water users and give them the feeling it was their joint project. Actually, it was not. It was clearly Enrique's project. This seemed to bother most people. Enrique is an entrepreneur and he is commercially the most successful of all the *ejidatarios* of El Llano. However, he does not belong to the original founders of the *ejido*. He bought his *ejido* plot only 10 years ago, and this causes him to be regarded with suspicion by his fellow *ejidatarios*. This did not change with his initiative to rehabilitate the lateral 5 intake. On the contrary, we again see how 'sticking out' in community affairs is little appreciated, distrust grows and the gossip network thrives. Since a huge amount of money was involved, most people feared being cheated.

The intake project succeeded because of the help Enrique got from his neighbour, Paco Paniagua, at his tail-end plot. Paco is secretary of the CNC sugar cane growers association and is steadily building up his sugar cane estate. Between them they worked

out the financing of the project. The maize growers now have to pay money to those who are far richer than themselves. This is the more painful because, as some of them realise, it was, among other things, because of Paco's newly sown sugar cane that water shortage in the lateral occurred.

This notwithstanding, the success of infrastructural improvement in lateral 5 by its water users is impressive. The maintenance department was simply set aside, and farmers moved themselves from the back to the front stage. They rightly say 'we arrange our affairs amongst ourselves, without those engineers in their offices', and 'we simply say that it is now our canal, and that we do not allow them to enter'. There is some continuity between the story of the Limoncito canal (section 5.1) and that of the entire lateral 5. Initiative after initiative is taken, like dominoes tumbling. The former experience of the Limoncito farmers of joint action (cleaning their canal in 1987), together with the important experiences of the rehabilitation of the intake of lateral 5, made it fairly easy for the Limoncito farmers to decide to rehabilitate their intake of the Limoncito canal. To the farmers of the Llano canal, cleaning their canal now seemed such a small thing to do, and they did it without much fuss and in a clearly defined way, each *ejido* doing their share, and each water user cleaning 5 *lozas* (canal segments 3 metres long) per hectare. All the water users profited from these initiatives, especially since the *canalero* was willing to give them irrigation turns once every 20 days. (See chapter 4. More frequent turns are important for part of the plots along lateral 5, which have course-textured soils.) Some profited more than others, however, and people remained suspicious.

The rehabilitation of the lateral 5 shows that in that area water users seem to have a fair degree of self management. The setting in which the farmers meet (their *potrero*) ensures that it is their project, defined by those concepts and words they prefer (and not of the District engineers). The majority of farmers, however, fail to press for proper decision-making procedures and to urge for an adequate account of expenditures. Enrique monopolised information, procedures were ill-defined, and the project itself was not well delineated (a road repair was later included). Too much was left to the discretion of the one who presented himself as leader.<sup>33</sup> It is not necessarily self-evident that the water users of lateral 5 will support the next initiative of a joint project. However, if they choose to do so, it may well be possible that among the farmers some will demand better formal arrangements. Smaller works, such as the cleaning of canals, already seem to be better organised. The various initiatives taken by farmers in lateral 5 have left their mark on the landscape, and have produced new points of reference, around which new initiatives may grow. In a sense, then, these initiatives have a lasting character. They are embodied not only in the tree under which farmers gather for discussion, but more especially in the new intake structures, clean canals and smooth roads. These artefacts are lasting symbols of the farmers' actions.

## 5.4 Canal maintenance and farmer cooperation, a conclusion

The study of problematic situations related to maintenance reveals characteristics of both farmers cooperating at field level, and of maintenance personnel performing their job. In the maintenance department we found several aspects which influence its functioning. One key feature to understanding the department are the personal bonds between people who occupy different positions in the District's hierarchy; the vertical alliances. Another key concept is discipline (*disciplina*), or obedience: those who fall out of line fear dismissal. Distrust amongst the maintenance department's personnel seems no less than among farmers. But the department is a closed institution, managed in an authoritarian manner by its head, and where there are no opportunities for farmers to check the use of its heavy machinery.

Farmers are careful to stick to their own plot and business. Only when problems become really serious do they attempt to organise a solution. Such initiatives, as we have seen, are facilitated by a multiplicity of networks through which farmers along one canal are tied to each other. Although farmers are sceptical about such joint undertakings. *Desconfianza*, distrust, is a key concept in understanding this attitude. Fear of social repercussions limit the easy launch of initiatives on behalf of a wider social group by farmers.

A striking element of many of the joint undertakings vis-à-vis the physical infrastructure (investing labour, money, social capital etc. in cleaning canals, rehabilitating an intake structure), is that the definition of ownership over that infrastructure, which has always been rather vague, changes. It shifts from being 'the government's' to 'ours', i.e. the farmers. This provides an important perspective for how the management of El Operado might develop in the future (cf. Coward 1986a).

Problems encountered with canal maintenance point out that the relationship between the District and the water users is strained. The gap that exists between the farmers and District personnel (a gap which with respect to water distribution is effectively bridged by the *canalero*) has gradually widened with respect to maintenance. The water users and the maintenance department prefer not to take each other seriously, and farmers try to avoid the department altogether. It is only because farmers take initiatives themselves that the long-term viability of El Operado is not at stake. Many people concerned with El Operado were well aware of this critical situation. The founding of a water users' association was one response to this situation (see chapter 7).

This chapter concentrated on the problematic situations which farmers faced. These situations did not come out of the blue.<sup>34</sup> Analysing these problematic situations highlighted the strong and weak points in the system's management. The weak point is the maintenance department, and its lack of accountability to both the operation department and the farmers. An organisational structure whereby one engineer is responsible for El Operado's management (the head of the Autlán-El Grullo area office), both for operation and maintenance would be a step forward.<sup>35</sup> Another perspective is formed by the many group mobilisations of farmers. These may be the potential basis for more formal farmer involvement in El Operado's management. When

groups regularly engage in joint activities, the cooperation between members of a group endures beyond the specific activity. This conclusion underscores the diagnostic value of analysing canal maintenance, which made us reach this conclusion.

What is lacking is a proper organisational structure which would enable canal groups to articulate their opinions and experiences, and to address joint conclusions to the District. This would help to ensure that when a group of farmers engaged in an undertaking, clear procedures were followed with the leaders being accountable to the other farmers. This points to the need for more formally established canal organisations, or 'canal arenas'. We must, however, be careful, since many formal farmer organisations in the Autlán-El Grullo valley have in the past collapsed (see chapter 2), and farmers tend to regard them with suspicion. We have to appreciate the contexts in which group mobilisations emerge; they were nearly always the *potrero*, the field. For farmers to meet in a setting which is entirely 'theirs' helps define projects in their concepts and words, and thus remain 'theirs'. A tree may thus become more than only a tree.

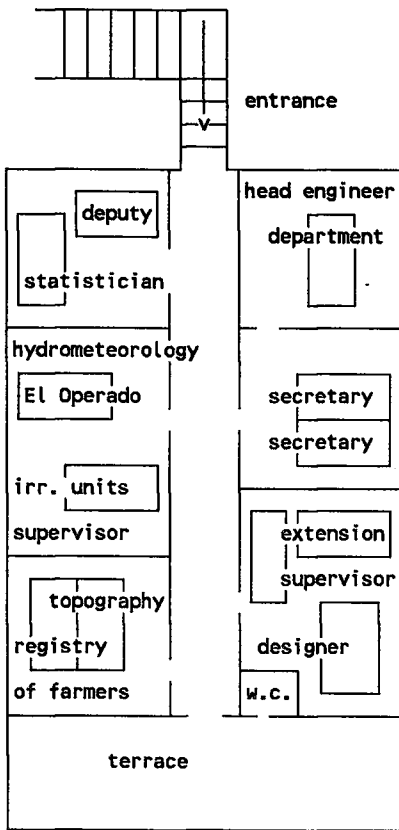
## Chapter 6

### **The making of the irrigation plan; an institutional chronology of decision-making**

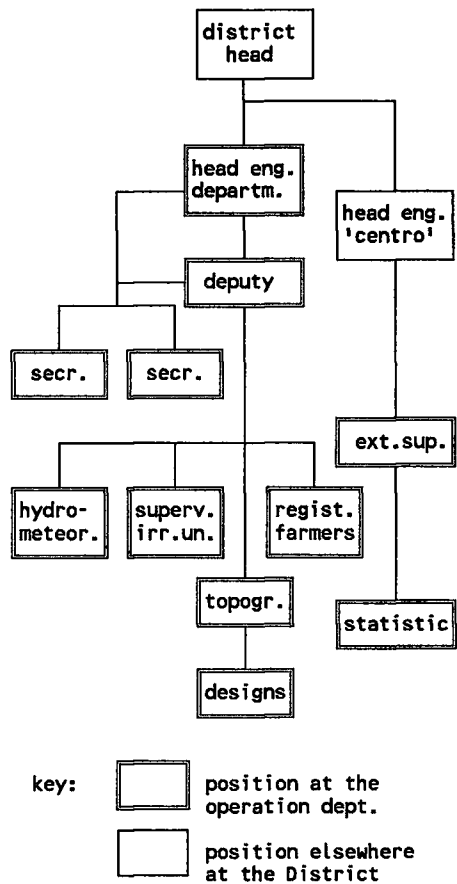
One day I gave Engineer Acosta, head of the Autlán area office, a preliminary version of the chapter on the *canaleros* (chapter 4 in this thesis). He was interested. I asked him to read it, and said I was eager to know his criticism and comments. A week or so later we made an appointment to discuss the *canaleros*' story. After the obligatory compliments, Engineer Acosta lost no time in commenting on what he saw as the major shortcoming of the story: the lack of any proper reference to the irrigation programmes (irrigation plan and maintenance programme) which the engineers in the District offices elaborate. He pointed out that water distribution and canal maintenance is carried out on the basis of these programmes. I agreed with his comment and said that this was something still to be worked on. I added, however, that the *canaleros* hardly ever made reference to the irrigation plan, and not one of them had told me that it was important in their work.

A variety of manuals and official publications state that operating a government managed irrigation system in Mexico is completely taken care of, and entirely controlled by the District (e.g. Zapata Faccuseh, 1977; Palacios Vélez, 1981; and the Federal Water Law). To that end, a set of procedures has been developed with respect to water distribution, and the roles attributed to District personnel and water users are defined in detail. From these 'recipes', a fairly mechanistic picture emerges of how an irrigation system is operated. In the foregoing two chapters I have tried to show that this is quite different in practice.

The question which now remains is: What is the importance of the plans elaborated in the District offices? How are they formulated, and to what extent are they used in operating El Operado. This chapter concentrates on the irrigation plan. This annual plan defines the crops entitled to irrigation, their expected water consumption and the level of the water fees to be paid by the farmers. In El Grullo, the irrigation plan is made during the months of August and September, before the irrigation season starts (October). The story of the irrigation plan examines how decisions over crops, water consumption and fees are arrived at. It is an 'institutional chronology' and has two stages. One is formed by the offices of the operation department at the District with two engineers as key actors elaborating the irrigation plan. The other stage is formed by a meeting between District staff who present the plan, and representatives of water users. I first introduce the District headquarters in El Grullo.



Plan of the operation department



Positions at the department's office

Figure 6.1 Contours of the operation department

*The District headquarters: an outsider's view*

The locus of El Operado's management is the District offices in El Grullo. There are three words people use to indicate the District: 'el distrito', the 'secretaría' or 'recursos'. The term 'el Distrito' came in fashion after the re-structuring in 1976, when the El Grullo offices were upgraded from *unidad de riego* (irrigation unit) to *distrito de riego* (irrigation district).<sup>1</sup> All three words refer to a set of buildings in one particular compound in the village of El Grullo. Here, over 100 functionaries work and pass the time for some 6 to 8 hours on working days. The compound (50 x 50 m.) has a patio, around which three buildings are located, of which one has a second floor. This is where the operation department is located.

Most small farmers, especially *ejidatarios*, are impressed by these offices, since it is all so different from the field. There are the two huge red-and-white painted radio masts, suggesting that the people inside have direct contact to higher spheres. Second, the compound has some large buildings, a big gate and a high fence. Third, the number of cars, pick-ups and trucks stationed on the patio is remarkable. Many farmers do not easily enter the offices, and prefer to wait at the fence, asking the guard or any passing bureaucrat whether a functionary is present or not. Farmers may also decide to wait on the other side of the road and settle beneath a tree, keeping a constant eye on the office's entrance. Here also, at around two o'clock, the *canaleros* park their greasy motorcycles, sit on a fallen tree, and gossip. Farmers feel more at ease with this type of bureaucrat, who differ markedly from the ones sitting behind their desks in the offices. Or farmers go to the coca-cola stand neighbouring the District office, and take some refreshment. Only when farmers have a pressing problem will they decide to visit the departments. There is, however, a distinct category of farmers, who have no hesitation in going in to see an engineer. They are normally the richer, private landowners, but also some are *ejido* leaders and farmers occupying positions in the various farmer organisations.

#### *Inside the offices of the operation department*

The building where the operation department is housed looks quite shabby. Little effort is made to make it a pleasant place, unless one counts the one and a half plants that are kept by the secretaries. The relative importance of this department with respect to the other 5 departments is reflected in the fact that a lot of people are always present (functionaries as well as water users), and that a lot of activity, *movimiento*, is going on. In short, it is a dynamic department. As a result, space has always been a problem. The office is rather small for the 12 persons permanently working there, as well as for the many visitors, most of them farmers hanging around in the corridor while waiting for an interview with the head engineer.

The lay-out of the office partly reflects the department's hierarchical organisation chart. (Figure 6.1.) After climbing the staircase we enter the building and find on our left the office of the engineer heading the department, Engineer Corona. To enter his office, we first have to pass through the room of both secretaries. Opposite Corona's office is the room of his deputy, who is in charge of all smaller irrigation units of the District (the *Unidades de Riego*). Here, also Chuf, the statistician of El Operado (formally residing under the area office of Autlán-El Grullo) has a desk. He processes all statistics, such as the monthly data on actual water use and on area irrigated. Next door, we find the office of Engineer Ramirez, who is the hydrometeorologist in charge of the irrigation plan of El Operado. Ramirez shares his office with the assistant to the deputy.

The biggest office is occupied by Mario, extension supervisor of El Grullo, who does not properly belong to the operation department but to the area office of Autlán-El Grullo. As his working area is El Grullo and he is the officer in charge of the *canaleros*, he is detached to this office. Mario's two agricultural extension officers and the design drawer also work in this office, behind a huge drawing table. Here also, the



*canaleros* have their daily 2:30 pm meetings. During the meeting, too many people are crammed into too little space. This has regularly led to irritations, with suggestions from the *canaleros* that the designer should seek another office. The designer gets his work from the topographical officer, who shares an office with the administrator of the official register of landowners in El Operado (*Padrón de Usuarios*). During the weeks that the irrigation plan is in the making, the head engineer of the Autlán area office, Engineer Acosta, is also frequently seen in the offices. His office is in Autlán and when he works at the operation department he simply looks for any desk which is free.

There are no fixed times for the department's personnel to get together, but they often do so at the small kiosk next to the District office. Instant coffee can be prepared in the offices and everyone guards his or her own pot of instant coffee. Only Ramirez and his office mate drank coffee together, but even so, they kept their own private coffee stocks in their desk drawers.

## 6.1 Manufacturing the irrigation plan

The making of the irrigation plan is an important activity for some of the personnel of the operation department. The plan is meant to help the department with the operation of El Operado. Before the proper irrigation plan can be made, exact data on which crops are to be cultivated have to be defined. These data are compiled in the so-called cultivation plan. The cultivation plan is calculated by the head of the Autlán-El Grullo area office, Engineer Acosta and by his right-hand man in El Operado affairs, Mario, the extension supervisor of the municipality of El Grullo.

### The making of the cultivation plan

On Monday, August 24 1987, I started a three week period at the operation department. I had been visiting these offices regularly, but had not yet stayed for a prolonged time. As agreed, Engineer Acosta and Mario allowed me to participate in the preparatory work for the irrigation plan. Acosta had found that the deputy's office was empty, so we established ourselves there. The work could begin.

All crop requests made by the water users of El Operado were reviewed, which is a lot of work, because it involves 1,300 water users with 2,500 plots. Moreover, many farmers had not filled in a request, but their crops nevertheless had to be included in the programme for the coming cycle. It was striking that it was mostly the private landowners (*pequeños propietarios*) who had failed to forward crop requests. For the *ejidatarios* such requests had been collected during *ejido* meetings, and had been brought to the department by their *ejido* presidents. These requests had even been stamped by their president. The private landowners, in contrast, simply do not bother

with this formality since nobody will stop them growing their crops. Quite a lot of crop requests therefore had to be invented. Engineer Acosta commented: "It is not inventing. It is based upon the requests and crops grown over the past year, and upon the knowledge we have."

Acosta sometimes consulted a shabby piece of paper with some names and numbers on it. He explained to me that they were requests from Vergeles, Los Leon's and Bonanza, the big tomato companies from Autlán. I concluded that therefore these companies had sent their applications to the District in due time. "No," said Acosta, "I simply phoned them and asked which crops they would plant that season." Since the Guadalajara SARH office urgently needed the irrigation plan, we had to quicken our progress, and Engineer Corona, head of the operation department, suggested that for the *ejido* of El Limón, whose crop requests were all missing, we would be better using the data of the previous season. We were surprised about the department boss' lack of concern for accurate figures.

The data on crops to be cultivated were noted down on long lists with plot numbers. The area cultivated had to be specified and whether the crop would be sown in the winter or spring cycle. To check the data we used for the cultivation plan, Acosta asked the *canaleros* during their meeting to make a list of all the plots already planted, specifying the crop (especially sugar cane). By the following day, the *canaleros* had brought their lists. Valuable information for us. When Acosta asks the *canaleros* to do something, they seem to respond without delay.

It was now Wednesday, we sat in Mario's office. We continued our work, while Chuf, the statistician, silently did his calculations on the past irrigation season. At one moment Acosta needed an eraser. Mario offered to find him one and borrowed Corona's for him. When Mario handed it over to Acosta, we observed that the rubber had been bitten on. Mario commented: "Every time Corona makes a telephone call, he is nervous. Especially today. He had to go to the interview with the audit commission and he was so nervous he nearly ate the whole thing!" The audit commission was currently visiting the El Grullo District and had created quite some uneasiness among the higher placed District officials. This was also the reason why, for example, all the water users who had failed to pay their water fees were now receiving a reminder by post.

This Wednesday we got the first results of our work: we had totalled all the sugar cane crops and had ended up with a figure of 6,000.72 hectares. Engineer Acosta was disturbed. It was an increase of over 600 ha compared with the foregoing irrigation season! Acosta went to the office of Ramirez and informed him. Ramirez reacted calmly enough saying that it was quite possible, it was only a few hundred hectares more than the previous year. However, Ramirez was not so calm as he appeared, since in a low voice he engaged in a discussion with Mario and Acosta, while keeping an eye on the door of Corona's office. They concluded that indeed a lot of friends of both the Head of the District and Engineer Corona had started growing sugar cane that rainy season, and that all these crops were now entitled to irrigation water. That might pose problems, especially at the end of the irrigation season, since there was not enough water. Apparently, Ramirez, Acosta and Mario did not discuss this matter with their

boss.

At that moment, I did not really understand their discussion: how could they fear a water shortage while Tacotán was completely full? I learned only the next day what the three engineers had in mind but did not want to say: a huge flood of water caused by the rains some days earlier, had completely filled Tacotán, causing a massive volume of water to flow over the dam's spillway and damage part of the new Trigomil dam construction, located some 5 km downstream of Tacotán. The flood had also washed away some heavy machinery. The District had yesterday received urgent instructions from Guadalajara to release as much water as possible from the Tacotán storage dam, in order to ensure enough buffer capacity to take any new flooding. "But this," Ramirez observed some days later, "is a risky affair. If we spill too much water and then the rains stop, we will end up with too little water stored and we are saddled with huge problems towards the end of the irrigation season. Especially now, with this increase in sugar cane."

On Friday, August 29, we completed the cultivation plan, which gave the number of hectares for the different crops to be sown in each month for both the Autlán and El Grullo parts of El Operado. The basis of these data had been the calculations made from borrowing data from the previous year and making rough estimates. Again we discussed the 6,000 hectares of sugar cane with Chuf, the statistician. He had his own monitoring system and had arrived at 5,797 hectares. Acosta concluded, that there were definitively over 200 hectares of sugar cane planted without proper authorisation. Anyhow, he added, that they would use the 6,000 ha figure in the plan, since the unauthorised cane in the end would surely receive water.

### The making of the irrigation plan

The irrigation plan is elaborated on the basis of the cultivation plan. Engineer Ramirez, as the hydrometeorologist in charge, is the only engineer in the District who has the skill to bring together a wide variety of data (on crops, water demand, water availability etc.), and to transform them, through a set of calculations and estimations incomprehensible to most other engineers, into parameters and finally present them as the El Operado irrigation plan (*plan de riegos y cultivos*); a plan which will be mathematically, physically and institutionally consistent. The plan defines for the different crops how much water will be used during the months of the irrigation season.

Apart from the hectic period when he is making the irrigation plan, Engineer Ramirez only has a few tasks to attend to: each day before 9 am he makes radio contact with the gate guard of the Tacotán dam, who reports the water level behind the dam and gives him climatological data. After such contact Ramirez reads the volume of water stored from a table. At 10 am he is phoned by the SARH office in Guadalajara, to whom he reports the volume of water in Tacotán. At 3:30 pm Ramirez has to contact the Tacotán gate keeper again if the *canaleros* have agreed at their meeting on a change in the discharge of water to be released.

On Monday, August 31, Ramirez started working on the irrigation plan. It was

nearly noon when he fetched the piece of paper by now so familiar to me: the cultivation plan as elaborated by us the foregoing week. Ramirez started filling in new forms, a separate one for each crop. Since there are two cycles in the irrigation season, some crops have two forms. Irrigation water need, and irrigation intervals are calculated on these forms and Ramirez would fill in 15 of them. It would take him three full days. On Wednesday, Acosta dropped in. He said he was eager to learn how to make the El Operado irrigation plan. So then we were three again. Ramirez explained to us in detail how the crop forms had to be calculated and filled in. Acosta did not appear to like how often Ramirez had to make estimates. Acosta must have thought: if Ramirez also founded his calculations on guesses and estimates, then the whole irrigation plan was in reality one big guess! Several times Acosta suggested consulting not only the irrigation plan and performance of the foregoing year, but also the irrigation performance of earlier years. Ramirez replied that all foregoing years experiences were already included in the irrigation plan of the previous year. For that purpose he had elaborated a huge table called the *índice*, which laid out the monthly irrigated areas for all the different crops and their water consumption for many previous years. With this reply, and no doubt impressed by the incomprehensible table Ramirez displayed, Acosta seemed more relaxed.

The following days we continued to complete the crop forms and calculate and fill in the four annexes of the irrigation plan, in which the crop forms are totalled and summarised. On Friday, Engineer Corona dropped in. Ramirez asked him a crucial question: "should I calculate on the basis of a full storage dam?" Corona, very decisively and firmly (perhaps also somewhat grimly), responded with a simple yes. "OK," replied Ramirez, "but you realise that we need 129 million m<sup>3</sup> of water. With the 6 millions of evaporation and the 4 millions of silt that makes 139 million to be stored in Tacotán." But Corona reaffirmed his answer. "Count on a full dam," he said. When Engineer Corona had gone, Ramirez confided to me that they had received an order from the Ministry in Mexico City to reduce the volume of water stored behind the Tacotán dam to only 130 million cubic metres. (Its maximum storage is approx. 145 million. On that Wednesday it held 144 million.) Since that order had arrived Ramirez had received a telephone call every day from SARH Guadalajara. He had informed them that the gate was spilling 14 m<sup>3</sup>/s. Ramirez: "I have told them that the gate is completely open. The guy from Guadalajara was saying that we were not executing the order, since the water level behind the dam was hardly decreasing. But I refuse to keep the gate open until after next week. We will need that water!"

Some days later, on Wednesday, Ramirez was busy completing the *diagramas básicos*. This seemed to be the most complex phase in the whole process. Filling in these diagrams should in fact be the first step. Ramirez had decided to change the order. According to Ramirez this saved a lot of time. The formal procedure for arriving at the irrigation plan is very time-consuming, since it necessarily involves an iterative process. A certain cropping pattern is taken as a point of departure, then a whole set of calculations are made following formatted tables and procedures defined by the *Dirección General de Distritos de Riegos*, at the SARH Ministry in Mexico City. These calculations finally lead to a conclusion as to whether or not too much water is

consumed. If so, then a new cropping pattern (with crops that demand less irrigation water or a reduced area) is assumed and the calculations have to be made again, and so on until the cropping pattern fits water availability. The formal procedure follows seven steps:

1. Input data on cropping pattern of next irrigation cycle: from *plan de cultivos*.
2. Fill in the *Diagramas Básicos*, in which each irrigation turn is defined per crop and per season, in 10 day intervals, with water layer applied. Fifteen forms have to be filled in with some 1,500 data.
3. Fill in Annex 3 summarising the crop forms in one table, giving area irrigated per month and per crop.
4. Fill in Annex 4 and 5. Annex 4 summarises net water layer and irrigated area per month per crop; Annex 5 the gross water layer and gross water volume needed.
5. Input data: water available at Tacotán; storage losses (evaporation; leakages)
6. Fill in Annex 1: the water balance, with monthly water releases at Tacotán.
7. Check if water balance fits; if short of water, repeat procedure from 1. to 6., decreasing area or change crops.

Ramirez short-circuits the iterative process through postponing step 2, by far the most elaborate calculation, until after step 7. In step 2, he fills in much smaller, summary 'crop forms' which Ramirez especially developed for that purpose (requiring only 360 as against 1500 calculations). Through this strategy, he obviates the need to do step 2 all over again when in step 7 he arrives at the conclusion that the water balance results are negative. This year, Ramirez got a match directly in the first round of the

Table 6.1 Summary of the irrigation plan for El Operado, 1987/88 irrigation season

crops	winter/ spring	area (ha.)	irrigation turns (no.)	gross water layer (mm)	gross water need (1,000 m <sup>3</sup> )
maize	w	1,324	6.8	1160	15,358
sorghum	w	659	4.6	875	5,769
hort.crops+green tomato	w	516	6.0	1180	6,089
(export) tomato	w	262	7.0	1360	3,563
other crops	w	23	2.0	400	92
maize	s	154	5.8	1250	1,925
sorghum	s	22	4.0	718	158
(export) tomato	s	38	8.0	1760	669
hort.crops+green tomato	s	50	6.0	1064	532
sugar cane	-	5,200	6.0	1734	90,183
sugar cane El Relicario	-	(800)	re-pumped from river with drain water of El Operado		
alfalfa	-	44	10.0	2000	880
fruit trees	-	76	5.0	1251	951
pasture	-	193	6.0	1654	3,192
total		8,561+800	6.0	1511	129,361

Source: Plan de Riego 1987/88, Unidad de Riego Autlán-El Grullo; Distr. de Desarrollo Rural El Grullo.

calculations.

In the meantime, Ramirez completed step 3, and he gave a copy of annex 3 with the preliminary data on the total area of different crops to be grown to Engineer Corona. With these data Corona set to defining the new water fees. That Friday, the irrigation plan was completed, and Ramirez submitted it for approval to Engineer Corona (table 6.1). According to Ramirez this was a formality. His boss did not even know how to read all those tables and annexes. Ramirez was however careful to get the formal approval. From that moment it was his boss who was responsible. The conclusions of this preliminary irrigation plan then were discussed on Saturday, September 12 (see below), by the Water Users' Commission (consisting of water user representatives).

Meanwhile, the tables were typed on huge sheets. The chapter on the water fees, as formulated by Engineer Corona, was appended to the plan. On Monday, Corona and Ramirez presented the plan to the SARH office in Guadalajara, three days late. Engineer Ramirez accompanied Corona, because, as Ramirez told me, "if my boss presents it to them, and these engineers have comments, he does not know how to defend the plan. So he prefers me to go with him". Moreover, Ramirez has some friends among the engineers in that specific office of SARH Guadalajara, which facilitates getting approval. The engineers made some small comments, and Ramirez made some corrections. On Thursday, September 17, Ramirez handed over the final plan to the engineers in Guadalajara.

### Evaluating the irrigation plan

To what extent did the actual situation of the 1987/88 irrigation season differ from the plans made? (table 6.2). Total area cultivated within El Operado was over-estimated in the irrigation plan. From the initially planned 9,361 ha (including those sugar cane plots inside El Operado which are irrigated by a pumping plant with drainage water from El Operado), only 8,674 ha were irrigated. This figure includes 100 ha of melon grown outside El Operado that were not in the plan, but irrigated with water destined for the system. It follows that the plan over-estimated the lands to be cultivated by over 700 ha. In fact the only crop realistically planned for was sugar cane (total sugar cane area planted was 2% more than envisaged), but this is not surprising: at the end of August (rainy season) nearly all new sugar cane had already been planted. Furthermore, Engineer Acosta received detailed information from the *canaleros* on the plots with established crops. Most annual crops which would receive irrigation were planted long after the cultivation plan was formulated (except export tomatoes). Their areas appearing in the plans were not more than educated guesses.

The irrigation plan misjudged the cultivation of cereals by nearly 1,000 hectares: the actual area irrigated was 46% less than expected. The area with (export) tomatoes was less than planned for, but much more of the other horticultural crops was planted. This was due to an unexpected increase in the area of green tomatoes sown, which fall under the category of horticultural crops. The melon crop was entirely unexpected. Engineer Acosta had not received any crop requests for melons by August, so the irrigation plan

Table 6.2 Evaluation of irrigation season 1987/88, as per 1 July 1988

crops	area cultivated (ha.)		gross water layer (mm)		water used (1000 m <sup>3</sup> )	
	planned	realised	planned	realised	planned	realised
maize + sorghum	2,159	1,166	1075	1458	23,210	16,997
hort.crops + green tomato	566	793	1170	1281	6,621	10,159
(export) tomato	300	217	1411	1674	4,232	3,632
melon	-	100	-	3824	-	3,824
other crops	23	70	400	609	92	426
sugar cane	5,200	5,502	1734	1459	90,183	80,261
sugar cane El Relicario	(800)	(600)				
other perennial crops	313	226	1605	1637	5,023	3,699
total	8,561+800	8,074+600	1511	1474	129,361	118,998

Source: Informe del desarrollo del plan de riego, mes de junio, 1988; Distr. de Desarrollo Rural, El Grullo; data for sugar cane were corrected on the basis of my own observations.

did not consider that crop. However, in December 1987, 100 hectares of melons were sown outside the actual confines of El Operado, in an area which will receive irrigation after the Trigomil dam is completed. The melon crop consumed far too much irrigation water, as can be read from table 6.2. Irrigation water demand for melons in former years was considered by the District to range around 1,000 mm. During the 1987/88 season, the 100 ha of melons supposedly consumed as much as 3.8 million m<sup>3</sup> of water, or equivalent to a water layer of 3.8 metres! This is physically quite difficult to imagine. The high consumption rate is partly due to the fact that the melon area lies outside El Operado, and a new stretch of the left main canal which so far had lain idle, was used to bring the water to the melons. Much water was lost through these operations, since water flowed down the new main canal to as far as El Limón.

The irrigation plan was not very realistic with respect to the area of the different crops cultivated. This is not surprising in view of the many educated guesses which underlie the making of the cultivation plan. The irrigation plan appeared quite sound in another respect: the actual amount of water consumed per hectare was quite near to the figure planned. This implies that while the total area irrigated was less than envisaged, also the gross volume of water used was proportionally less.<sup>2</sup>

#### *Decisions on crops*

The above discussion reveals that the decision-making procedures with regard to crops to be included or excluded in the irrigation season are not all that clear.

Firstly, the formal rule that farmers have to submit a crop request before the start of the irrigation season is not strictly followed. Many farmers cultivate other crops than

requested. Other farmers simply do not bother to request a crop at all, since they know the District will not deny them water. District officials when formulating the cultivation plan make rough guesses for those farmers who do not submit a request. The handful of tomato companies are asked to produce information on the area they are going to grow.

Secondly, in the case of sugar cane, which clearly is a special case, farmers do not submit a crop request to Engineer Acosta, head of the Autlán area office. They know he cannot decide on access to sugar cane, i.e. the right to start growing that crop. To get permission, farmers submit a request informally to Engineer Corona or the head of the District personally. At the same time, these farmers contact either of the two sugar cane growers associations. Farmers know that decisions over new sugar cane are the result of negotiations between the District (represented by Engineer Corona and the head engineer), both sugar cane organisations (represented by their presidents) and the sugar factory (represented by its director). These negotiations are behind closed doors. The decisions taken during these negotiations (concerning who is allowed to start growing sugar cane, and how much) are typed out by both sugar cane organisations, but these are not entirely accurate. The final decision seems to lie with Engineer Corona. When a *canalero* reports to him that a certain plot has been planted with sugar cane (whereas in the foregoing year it had another crop), Corona simply replies with: "it is OK," or: "I'll give you a letter to hand out to the farmer concerned."

Thus, access to sugar cane is restricted, which is quite unlike other crops, except for rice (which is forbidden) and alfalfa (no new alfalfa is allowed). Also, the criteria underlying the decision to allow some to grow sugar cane and others not, are known only by those directly involved in the sugar cane negotiations. Engineer Acosta is not informed. Furthermore, Corona does not formulate a list of plots which are finally granted sugar cane, so Acosta remains ignorant about them. This is strange since he is responsible for the cultivation plan.

Finally, the situation of the 100 hectares of melon suddenly appearing is interesting since it shows another manner in which decisions regarding crops can be taken. These melons were grown by *ejidatarios* from the *ejido* El Limón. In former years, El Limón *ejidatarios* used to grow melon, and they had their own organisation, which owned the packing plant (*empaque*) in El Limón. With the demise of melon (since 1984), the farmers organisation and the packing plant also fell into disuse. In 1987, the SARH ministry in Mexico City launched a new programme of rehabilitating all existing infrastructure owned by farmers organisations which did not function any more. The engineer responsible for this programme at the District level (the head of the organisation department) found the packing plant of El Limón to be a suitable site for the programme. He and the local District staff organised a meeting with the members of the melon growers association (*asociación agrícola local*) which owned the plant, and suggested that they start growing melons again. Twenty of the original 80 farmers responded positively. But they formulated one condition: they wanted to grow melons only on lands which had never before been intensively cultivated, since the farmers expected thereby to have fewer problems with crop diseases and plagues. They proposed to grow these melons in the extension zone of El Operado, not far from El Limón.



Those lands already have irrigation infrastructure but will only receive water when the new Trigomil dam is completed. The District engineer had to show the farmers he was serious and started to negotiate with the District head for the permission to grow melons in the extension zone. The request was also formally submitted to the governing board of the District (*Comité Directivo*), in its meeting of September 1987.<sup>3</sup> The board approved the plan, and after the head of the District had consulted his operation department, he gave his approval. This was in October, when the irrigation plan had already been defined and accepted, which is why the melons did not appear in it.<sup>4</sup>

The melon case is special, since here the decision-making process lies outside the operation department. The head engineer is involved and the governing board is consulted. Engineer Acosta and the *canaleros* were informed only in December.

### The relevance of the irrigation plan for operating El Operado

Decisions concerning the crops to be grown and the formulating of the cultivation plan involve essentially two separate activities. The plan is thus not accurate with respect to the areas of the different crops to be grown. Since there are no accurate data on crops, the data arrived at in the irrigation plan bear a questionable relationship to the real situation in the field. Nobody knows the accuracy of the plan with respect to the field situation, and thus, to what extent the irrigation plan and the programme of water discharges have to be respected during the irrigation season.

What normally happens during the irrigation season is that the engineers consult only one graph, that hanging in Engineer Corona's office with the planned water storage in Tacotán for the entire irrigation season, in addition, they may compare actual water releases from Tacotán with discharge during the same period of the foregoing year. If discharges are lower in the current year they conclude that "they are safe". If not, they urge the *canaleros* to irrigate with less water, and try to limit water deliveries to them. During daily operations, hardly any reference is made to the irrigation plan.

### *Drought years*

However, in years with little rainfall the irrigation plan suddenly has immediate and practical consequences for operational strategies. In both 1982 and 1989, the Tacotán dam was only partly filled in August when the irrigation plan was formulated. (Rains normally stop in September.) Serious water shortages were expected.

Because of this, in 1982, the irrigation plan was calculated on a water availability of 69 million m<sup>3</sup> (or less than 50% of maximum storage capacity of Tacotán). Water use had to be restricted through limiting the area planted. The engineers in the District elaborated two different scenarios (the Federal Water Law 1972 version was multi-interpretable in this respect). The head of the District then consulted the Water Users' Commission, who opted for the scenario whereby in principle each water user was allowed to irrigate a maximum of only 6 hectares, regardless of the size of his or her lands in El Operado. However, given that a vast area of sugar cane was already established, the decision was adjusted to local circumstances. Sugar cane growers were

allowed to irrigate a maximum of 10 hectares. At the same time the planned water consumption of sugar cane was reduced by some 20% (from 1217 mm to 979 mm), as the number of irrigation turns it would receive was reduced by one.<sup>5</sup> During the 1982/83 irrigation season, the irrigation plan thus had a significant impact on the day-to-day operation of El Operado.<sup>6</sup>

In August 1989, the Tacotán dam contained only 40 million m<sup>3</sup> of water. The irrigation plan was drafted, but had to be revised at the end of September. It was decided to allow all established perennial crops two irrigation turns, whereas all other crops were forbidden. Thus, 5,300 ha sugar cane (all cane to be cut for the last time was not replanted) and 270 ha of other perennial crops received the lowest possible irrigation quantity needed for their survival.

The difference between the conclusions arrived at in 1982/83 and in 1989/90 is marked. Whereas the measure taken in 1982 can be regarded as liberal, the measures taken in 1989 favoured cane producers, including those with vast areas of sugar cane, while those farmers with no perennial crops were denied access to water. Both examples show that the irrigation plan is important during droughts. However, more important than the plan itself is the way it is interpreted by the head of the operation department. The Federal Water Law is ambiguous about how to proceed in case of water shortage (Hewitt de Alcántara 1985:60-61; López Zamora 1977:256-57; Mares 1980:482; Yates 1981:81). It leaves the head engineer room to decide how to reduce water demand.

#### Water fees

With the formulation of the irrigation plan, new water fees are defined and a budget for the personnel involved in water distribution is formulated. This is done by the department head. The criteria he uses are not clear. Engineer Acosta explained to me that the water fee of a crop depended both on the amount of water it consumed and on

Table 6.3 Relative water fees, water use and crop value, 1987/88 season

crop	water fee 1987/88 (cane=100)	water use (plan) (cane=100)	value of crop (estimated)
sugar cane	100	100	100
maize + sorghum	50	62	40
hort.crops + green tomat.	93	67	90
export tomatoes	173	81	300
other annual crops	50	23	40
alfalfa	173	115	250
fruit trees	75	72	90
pasture	50	95	40
corr.coefficient	-----r <sup>2</sup> =0.32-----		-----r <sup>2</sup> =0.96-----

Source: Distrito de Desarrollo Rural El Grullo, and own data.

the relative profitability of the crop. But Engineer Corona, in charge of defining the level of the fees, was not willing to explain to me how both criteria used are weighed against each other. Table 6.3 gives the relative crop fees as proposed by Corona with relative water use of the crops as planned in the irrigation plan. Also, estimated data on relative gross value of the different crops are given. The table shows that water use and crop value influence the level of the crop's water fee. Crop value appears to be the most decisive criterion.

Water fees are a sensitive issue for District staff. Policy makers in Mexico refer to them as problematic and far too low. Local District officials are reluctant to increase these fees, as they fear opposition from local landlords (see e.g. Olafz 1981:32). Given the inflation rate in Mexico during the last decade, the water fees covered a progressively smaller percentage of total operation and maintenance (O&M) costs. Whereas the water fees in Mexican irrigation Districts are reported to have covered 95% of O&M costs in 1950, between 1960 and 1970 this figure ranged between 70 and 80%, and by 1985 this had fallen to approximately 30% (average figures for Mexico, Olafz et al. 1986:66; cf. Brajer and Cummings 1990). Consequently, federal subsidies to the irrigation sector have risen sharply. However, by 1987 the federal government had issued a new law which stipulates the recovery rate of operation and maintenance costs from water fees (*Diario Oficial de la Federación*, July 16, 1987). For the Autlán-El Grullo irrigation system this percentage was fixed at 80% (i.e. the water fees should cover at least 80% of real O&M costs). It seems that Engineer Corona therefore decided to drastically increase the fees, by nearly 100%. At the end of the 1987/88 season, however, this 80% recovery rate had not been reached. It was estimated that the water fees covered a mere 50% of actual O&M expenditures of the District.

#### The irrigation plan in the operation department, a conclusion

Since the irrigation plan does not include detailed irrigation schedules for the different canals of El Operado, the plan does not have immediate implications for the work of the water guards. As we have seen in chapter 4, they hardly make reference to this plan. The irrigation plan rather serves to show higher levels of the SARH ministry that the El Grullo District is doing its work properly: it allows the operation personnel to show off some of their skills; it provides the department head with data for the revision of water fees and for drawing the graph of the planned water releases from Tacotán.

The irrigation plan is an institutional necessity, with its own internal logic and fixed procedures (exemplified by the standard forms to be filled in), which are defined by the Ministry's headquarters in Mexico City. On the office floor, however, the forms are being filled in by Engineer Ramirez in a slightly different order and following slightly different procedures. The outcomes are wholly in accordance with the rules. The irrigation plan is not very accurate: crop areas assumed may differ from those actually cultivated. The data for the area under sugar cane, however, are accurate. Since sugar cane covers some 70% of El Operado, the overall accuracy of the plan concerning total water consumption is thus acceptable.

During August and September the plan is an issue talked about among District personnel. Irrigation plans have to be made not only for El Operado, but also for all irrigation units (*Unidades de Riego*). Various people are involved in supplying data, filling in forms, authorising them, etc., at different times. The irrigation plan has a scientific image about it. This image also has an impact on engineers themselves. It is illustrated by Acosta's disappointment when he was initiated by Ramirez into the calculations, and came to realise they were anything but precise.

Engineer Corona monopolises two crucial dimensions of the irrigation plan: the right to decide who will grow the most important crop in El Operado, sugar cane; and the formulation of the irrigation budget and revision of the water fees. In the operation department there is a definite line which separates the department head from his subordinates. The head makes the decisions, and personnel involved in elaborating the irrigation plan do not take part. Also the head of the Autlán area office, who is formally responsible for all policy implementation in El Operado, is ignored by Corona. Only in years with water shortage does the plan emerge as a document which influences his decisions.

## 6.2 Presenting the plan: the engineers and the Water Users' Commission

After its manufacture in the District offices, the irrigation plan has to 'touch down' at grass roots level: it has to be made known to the water users, especially the new water fees, and accepted. To this end, the staff of the District present the irrigation plan to the Water Users' Commission (*Comisión de Usuarios*). This is the last phase in the decisions regarding operating El Operado prior to the irrigation season.

The Water Users' Commission, which was set up in 1980, is constituted of 38 delegates, each *ejido* (17) and private landowners association (2) sending two representatives. In addition, farmer organisations like the two sugar cane producers associations are allowed to send observers to the commission meetings. It is significant that the Water Users' Commission has no board, no president, no secretariat, nor office of its own. It normally meets every month at the District office. Its meetings are always presided over by a District official, normally the head of the operation department. It is also a District official who serves as secretary (normally the head of the Autlán area office). Some other lower District personnel may attend the meetings, but field personnel (such as *canaleros*) are never invited. On rare occasions the Head of the District is present. During the commission meeting of September 12, 1987, the irrigation plan was presented and approved. It is worthwhile to analyse in detail the development of this meeting. It not only puts the irrigation plan in a broader perspective, it also shows how some of the institutional arrangements get new content when confronted with water user representatives.

The meeting

The September meeting of the Water Users' Commission in 1987 was held on a Saturday, at the District office. Most water users arrived late. Three engineers were present for the District: Engineer Corona, head of the operation department, his deputy, and Engineer Acosta, head of the Autlán area office. Acosta had formulated the agenda, and had invited all water user representatives. He played the role of secretary, taking notes etc. The three District engineers were seated at one end of the conference table near the blackboard when the water users dropped in, about half an hour late (figure 6.2). Acosta opened the meeting, then went through the list of delegates, mentioning all names, writing down who was present and finally concluding that attendance represented a legal quorum, although only 15 (representing 13 *ejidos*, the majority) out of 38 water users were present. Acosta went on to say that the next point on the agenda was the irrigation plan. He gave the floor to Corona.

Corona then presented the summary of the irrigation plan written on the blackboard (a whole lot of figures, including acreage, water layer, number of irrigation turns and total volume of water demand for the 8 major crops grown, identical to table 6.1, above), and started reading aloud all data, and concluded that thus 130 million m<sup>3</sup> of water was required, which posed no problem, because the storage dam was almost full. He also mentioned that the new storage dam under construction, *Trigomil*, would be completed before the first of May next year, and suggested visiting the works of Trigomil during the next meeting of the commission. He went on to open the discussion on the irrigation plan by asking whether there were any doubts concerning the irrigation plan. A discussion followed which was dominated by two water users. They were astounded by the huge quantity of irrigation water destined for sugar cane in the coming season (some 70%). But no one, of course, objected: of the 16 delegates then present, all but one grew sugar cane. Apart from that, the head of the operation department himself and his deputy both grow vast areas of sugar cane. Some informative questions

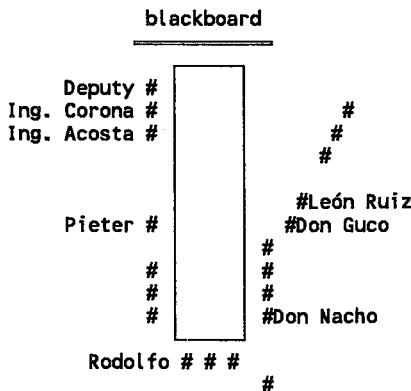


Figure 6.2 Setting of the Water Users' Commission meeting, September 1987

were raised, and a few commented on the lack of maintenance of the canals, but at that moment (in September it still rains) this was not yet a major preoccupation (though this would soon change, see chapter 5). Then, Corona wanted to proceed to the next item on the agenda, the level of the new water fees, and forced a decision on the irrigation plan. He said: "*Señores*, do you approve or disapprove the plan?" It was Don Guco, one of two water users who had dominated the discussions so far who simply replied: "No, it is alright. It is approved." I heard the rest of the water users present murmur approvingly, and that was it.

The next item on the agenda was the most important one for the delegates. They have to report the new water fees to their *ejido*, so the lower the better. The current water fees and the proposed new ones were written on the blackboard. Something like an increase of 90% was being proposed by the District. Corona did everything he could to explain the reason why the fees had to be raised. León Ruiz, the other water user active in the discussions, then asked Corona to specify the expenses: "How much money do you spend per month?", he asked. Corona's answer was: "We do not know." He then quickly switched to another argument; the increase was because of the high inflation rate (in 1987 140%). He explained that these fees covered the expenses of water distribution and of maintenance. However, he gave no details on how the money for maintenance (80% of the budget) would be spent, nor how it had been spent last year, neither did any of the water users insist on a specification. Corona mentioned recent price increases of almost every imaginable product but water. In the meantime, León Ruiz and another water user, Rodolfo, used the opportunity to say how they had been affected negatively by the poor water distribution practices of the operation department and the lack of communication between the sugar cane factory and the District. Another water user, whose land was at the tail-end of the irrigation system, complained that at the tail they never received the six irrigation turns that were planned for in the irrigation plan, and that now appeared on the blackboard. They received only 3 or 4 turns.

The general feeling at that moment was that a price increase of 90% was too much. León Ruiz then indicated he wanted to negotiate a new level for the water fees, and said: "But would an increase of only 25 per cent not be better?" And the discussion went on. I could see that Corona was beginning to feel irritated, and he changed tactics. He had until then, been talking to the water users more as colleagues (he himself also being a water user). Now he started saying things such as: "it is not possible to do the impossible" (*No se puede hacer cosas que no se pueda*). When this did not have the desired effect, and Rodolfo and León persisted, Corona said:

"If we were traders (*comerciantes*) we would tell you that this is the water price, like it or not. But we do not treat you like that. We give you a service. Imagine the amount of money the federal government is investing here in El Operado, for instance, under the rehabilitation programme. Thousands of millions of pesos."

Rodolfo was not impressed by this and proposed to lower the fees by 30%. Corona now became even more irritated:

crop	actual fee pesos/ha	proposed fee pesos/ha	accepted fee pesos/ha
maize	8,000	15,000	14,000
sorghum	8,000	15,000	14,000
horticultural crops	15,000	28,000	27,000
export tomatoes	28,000	52,000	52,000
green tomatoes	15,000	28,000	27,000
other annual crops	8,000	15,000	14,000
sugar cane	16,000	30,000	29,000
alfalfa	28,000	52,000	52,000
fruit trees	12,000	22,500	22,000
pasture	8,000	15,000	14,000

Figure 6.3 The blackboard with the old, the proposed and the accepted water fees

"In the end it is the *Comité Directivo* (the governing board of the District) which determines the water fee, and *Hacienda* (Ministry of Finance) has the last word. *Hacienda* says we should be 100% self-sufficient, but the proposed water fees cover only 86.6 per cent of the operation costs. If we are to lower these fees, *Hacienda* will not accept it."

Finally, a compromise was reached and the water fees were decreased by some 3-6% from those proposed by the District. Corona and Acosta were busy calculating for some 15 minutes, and then announced that the new fee for maize would be 14,000 pesos per hectare (US\$ 10), sugar cane 29,000, and for tomatoes 52,000 pesos. Acosta wrote the new fees on the blackboard. (Figure 6.3.) Corona said: "These new water fees are the lowest possible." Then, a water user proposed a slight change in prices, clarifying that the big tomato producers were not represented in the commission. His proposal was: why not increase the water fee for tomatoes and lower the one for maize. The rest of the delegates laughed because they thought it was an alternative which would not affect them. Corona and Acosta started calculating, and Corona concluded that lowering the water fee for maize by 1,000 pesos implied increasing the water fee for tomatoes by another 8,000 pesos, and Corona dismissed the possibility. After some more talking, he asked: "¡Señores! Once more, do we agree on these prices?". And a similar murmuring of words like '*está bien*' was heard, but no voting was done. León Ruiz had the last word, when he stated: "Yes, it's OK. But you have to give us the number of irrigation turns that are written there on the blackboard." Corona diplomatically comments: "These are averages." And León has to give in: "It's alright, I agree", he said. The rest of the water users appeared to accept that with this conclusion León Ruiz expressed their feelings, and they kept quiet.

The agenda now reached the item 'participation of the delegates'. The delegates invariably mentioned the small problems that affected their own production. Here they seemed to be speaking on their own behalf, and not to be acting as representatives. The answers given by the engineers were vague, such as "we will look into the matter tomorrow" (!), "Monday", "put the request in writing". Anyhow, this point on the agenda took almost an hour. Finally, Corona said that the new water fees had to be

presented for approval at the next meeting of the District's governing board (*Comité Directivo*). He explained that representatives of all government institutions participated on the board. Who was going to attend the meeting next Friday? He turned to the blackboard, and wrote the word *Comité*, then two numbers, 1 and 2. After a moment of silence, Corona glanced for a second at the meeting, and then wrote 'León Ruiz'. For the third time I heard people murmuring approvingly. León himself did not seem to object, but neither was he excited. Then, Corona said: "A minimum of two persons. Who more? Rodolfo?" Rodolfo also seemed not to object, and the rest either showed no interest or nodded approvingly. People now began to stand up, and the first water users left the room. Corona went on that the meeting would be in El Limón, at 10 in the morning. Then, Rodolfo asked, perhaps a little taken aback: "Are you of the *Secretaría* going to prepare everything for that meeting?" With Corona's answer, Rodolfo seemed to relax: "Yes. We formulate the minutes (pointing to Acosta), you only have to read them aloud. And we are going to make a list of the new water fees."

By then, everybody was already leaving the room, but Corona continued: "The next commission meeting; are we going to hold it in Tacotán or in Trigomil?" It was decided to hold the meeting in Trigomil, and Jesús Corrales, leader of the biggest sugar cane growers association would be asked to assist with organising the food and drinks. Corona finally concluded the meeting: "*Señores*, thank you very much." The delegates left the room. Outside the District offices they dispersed amazingly fast, with hardly any social talk. Within five minutes, all the people had left. The three engineers stayed behind. I thanked Corona for letting me attend the meeting, and left somewhat puzzled. Was this farmer participation? A week or so later, I decided to find out what had happened in the *Comité Directivo* meeting that Friday and visited Rodolfo. Rodolfo:

"I read out the minutes and they readily accepted the new water fees. I think it is because the minutes clearly stated that we farmers negotiated the prices and that we succeeded in lowering them considerably, and that we then accepted the new fees. So, also the *Comité Directivo* accepted it, because if we accepted it, of course everybody else has to accept it."

### Analysing the meeting

From the account of the meeting of the Water Users' Commission I wish to highlight a few salient points. First, I would like to stress the *mis-en-scene*: the meeting is held in a District setting; the chairmanship, the agenda, and the information provided are wholly controlled by District staff. Furthermore, the development of the meeting is quite typical. Its beginning is clearly defined by the ritual of welcome, verification of quorum and reading the minutes of the foregoing meeting. Then chaos gradually grows, until the point at which the meeting finally fizzles out. When Corona says: "Thank you, gentlemen," indicating that the meeting has finished, some 20% of all delegates have already left. It is also noteworthy that no explicit vote is taken. At one moment one of the delegates simply concludes matters, after which the other delegates produce some approving sounds. If some delegates do not agree, they at least do not say so. Also, the manner in which the two delegates were elected and commissioned to the *Comité*



*Directivo* meeting was disorganised, and heavily influenced by Corona. Those delegates with the most articulate criticism and who questioned Corona's arguments the most severely were pushed by him to report to the *Comité*. This might be understood as one of the ways in which Corona tries to co-opt those who have been most critical.

Only three of the 17 water user representatives actively participated in the discussions about the irrigation plan and the water fees (speaking in total 34 times). Seven others made one or two small comments during the discussions (speaking 11 times). The remaining seven did not utter a word. During the round devoted to the 'participation of delegates', most delegates appeared to give priority to self-interest rather than defending the interests of their constituency. Here we should take into account the fact that farmer representation in the Water Users' Commission follows the *ejido* structure. Many delegates stem from traditional power groups within their *ejidos*, and thus do not simply behave as representatives of all water users. Moreover, the constituency of each delegate does not directly relate to hydraulic units within El Operado. Also, size of irrigated land varies per *ejido*, between 40 and 1,200 hectares; whereas both private landowners associations have about 2,000 hectares each. This notwithstanding, each congregation sends the same number of delegates. This all makes the relation delegate- water user ill-defined.

Little importance is attributed to the Water Users' Commission by the richest and most powerful user groups. Representatives of both the *Asociaciones de la Pequeña Propiedad* (Autlán and El Grullo, holding 2,300 and 1,800 ha, respectively) hardly ever attend its meetings. In the September meeting they did not send representatives. The big tomato companies, although they are entitled to send observers through their *Asociación Agrícola Local* organisation, never attend. The big producers simply ignore the commission, and this is quite understandable: they seem to view the commission simply as a platform where farmers receive information and instructions from the District staff, and not as a farmer organisation which defends the interests of the water users. These big producers, through their relationships, have direct access to District engineers. To them the commission is redundant. But they also dislike the commission: it is dominated by *ejidatarios*, and many of the big private landholders look down upon them. They hate the idea of losing half a day in a meeting, having to listen to the petty discussions these *ejidatarios* engage in.

For the District, the water users' commission meetings, especially the September meetings, are very useful and time-saving. They can in this way reach the water users, and get their formal approval. Without the commission, the District would have to attend 17 separate *ejido* meetings in order to inform all the *ejidatarios*. At the same time, the District consciously tries to limit the influence of the commission, through carefully filtering the information it provides. So, when León Ruiz asks how the District spends the money raised by the water fees, Engineer Corona decides to short-circuit such a discussion and simply tells him he does not know. The District staff are careful not to account for the water fees collected during the past year, nor do they provide the delegates with a budget for the coming season. It is striking that not one delegate insists on being given this information. The delegates accept water fees, not knowing how they will be spent and knowing that the budget will never be accounted for. When some

delegates persist too much in their demands, the tone of Engineer Corona changes, and he reveals that the whole meeting is in fact a farce, and that the *Comité Directivo* and the Ministry of Finance have the ultimate say. This is a threat, and it is effective. The spokesmen back away somewhat, and finally a price decrease of only 5% is granted by the engineers.

The delegates, through their attitudes, contribute actively to the commission being entirely dependent upon the District engineers and having no real influence or power of its own. In that respect the reaction of Rodolfo to being commissioned to report to the *Comité Directivo* is revealing. He worriedly asks the engineers to prepare the relevant information. With double satisfaction Corona answers this question positively, and Rodolfo is relieved. First, Corona denies the delegates relevant information, and they accept the engineers' proposals without much fuss. And secondly, when a delegate is commissioned, he is grateful that he only has to read what the engineers write down.

The linkage between the District and the water users as established in the September meeting is thus wholly geared to the District's needs, and entirely orchestrated by the District. The delegates play a passive role. Of course, the delegates are aware of the marginal role they play. Corona tries to please them by offering them the opportunity to bring forward private irrigation problems (during the 'participation of delegates' round); and he regularly organises social gatherings (*convivencias*) for them where they are offered food and drinks, such as the meeting proposed for October at Trigomil. At this October meeting the delegates were offered a lavish party (*pachanga*), with food, (alcoholic) drinks, and music (*mariachi*), which must have cost several thousand US dollars. The meeting was further remarkable in that, apart from the delegates and some 10 District personnel, some 10 (politically) important people from the valley were also present. This gave the meeting an extra dimension. It provided the ordinary *ejido* delegates with the illusion of forming part of the valley's elite. Furthermore, it diverted their attention from the pressing problems which at that moment were felt in the field: the lack of canal maintenance. Although some delegates mentioned these problems during the party, no minutes were written, and no measures were taken. This then is one of the perks which Corona and Jesús Corrales leave the delegates. They expect docility in return, which, as we have seen, they get.

### 6.3 Some observations on the analysis of an irrigation institution

This chapter has examined the way certain decisions concerning crops, water use and water fees are arrived at. I have shown that crucial decisions concerning crops which people are allowed to grow are not made during the formulation of the cultivation and irrigation plans, nor during the Water Users' Commission meeting. Decisions are made elsewhere, as exemplified by the way requests to grow sugar cane are negotiated between the highest representatives of the irrigation District, the two sugar cane growers

organisations and the sugar refinery. The lower-level District employees formulating the cultivation and irrigation plans are not even well-informed about the exact outcome of these negotiations. The water fees are also fixed by the head of the operation department. Farmer representatives are allowed to give their opinion about the new fees, but are not given the power to ultimately decide on them, nor the information to critically assess the proposal.

The making of the irrigation plan follows the rules and procedures designed by the Ministry in the capital city. However, from the account given above it would appear that it has developed essentially into a local activity. Higher District staff leave lower personnel to work on the irrigation plan. The latter may think they are involved in the process of making crucial decisions. The outcome of these complex calculations, however, are interpreted by these senior engineers with a considerable degree of freedom, and the power of decision-making lies wholly with one or two engineers. The prescribed procedures concerning the making of the irrigation plan are happily incorporated into the local institution without affecting it much. It might rather strengthen it, making it look more serious, more professional, while making it more difficult for laymen (like water users) to critically assess its underlying criteria.

The relationship between District engineers and the majority of small water users is strained. Water users tend to regard engineers as government officers vested with authority, rather than civil servants supposed to provide them with adequate services. Farmers will hesitate to criticise or even comment on proposals put forward by District engineers. Engineers have become accustomed to the manner in which they are approached by farmers, and anticipate and expect such attitudes. Given this institutional culture, the water users' commission is a queer fish. Farmers are not expected to fundamentally question District proposals and yet a farmer platform exists.

In this chapter, I have tried to contextualise the activities concerning decision-making, while appreciating the environment in which civil servant's work, or farmer representatives discuss with engineers. I purposely included small events which coincided with these activities. I did not systematically analyse the institutional decision-making process on the basis of a set of pre-defined factors, like tasks (or goals, objectives), performance and organisational structure. Such an analysis might not do justice to the institutional reality found in the El Grullo District. Below, I show that a seemingly unimportant factor like 'setting' merits attention because of its analytic power for analysing management issues. Appreciating the settings of actions and negotiations leads us to consider the District office as an arena where different groups at different stages interact, struggle or are set aside (cf. Crehan & Von Oppen, 1988).

### *Setting*

This chapter has included information on the spatial arrangements through which interactions take place. The way space is organised, and the way physical structures are situated and people take up positions helps us to appreciate the physical co-presence of people, and of people and materials. This helps us to primarily analyse situations in their actual appearance.

Take the operation department floor. We note first the difference between how office

space and space in field situations is organised (e.g. the big old tree as ordering artefact in the field, chapter 5, as against the organisational chart in the office); and how the operation department differs in appearance from the maintenance department (whereas the operation department is quite shabby-looking, the maintenance department's walls show impressive charts). From the distribution of the department's space we can partly read its formal organisation. At the same time, we observe the fact that it is not all that rigidly applied. Due to space shortage, personnel have to be flexible in sharing offices. Consequently, contacts and exchanges of information are effective and not time-consuming. Compartmentalisation of the office not merely reflects its organisational structure, it also provides its personnel with niches where they enjoy privacy, can relax, joke with friends, or gossip.

I have tried to indicate that things such as a drawing table may become the focus of tensions between colleagues; how locked away coffee pots may characterise the office atmosphere, and that erasers may become important vehicles of meaning. These material artefacts reflect or may become metaphors of other, much wider, issues. The same considerations apply to the Water Users' Commission meeting. Take for instance the setting of the September meeting (figure 6.2). It was surprising to see that water users appear to maintain some minimum physical distance towards the engineers, which is much bigger than the distance they observe among each other. The farmers form a half-circle around the three District engineers, and do not seem to be willing to pass that boundary. Also revealing is my own position in the scene. I am caught between both groups, my distance towards the engineers being less than the distance the farmers keep, but the distance between me and the farmers still larger than that which they observe amongst themselves; a fairly precise reflection of the position I felt I had. Much more salient is the setting of the October meeting of the Water Users' Commission. It hardly left any doubt about what was happening in that arena, and what relationships the various groups participating have. The venue was the construction site of the Trigomil dam, a one-hour drive from El Grullo.

After an excursion over the construction plant organised by ICA (the company constructing the dam), we went to a place near a small lake that formerly must have been the river bed. It is rather a curious place, because it is a pit where heavy machines have deposited and later excavated huge amounts of sand. The place is undulating. At the lowest point of the pit a central table had been placed, which became the 'centre' of this *convivencia*. Around this table some 15 people sat. They included the head of the District, the head of the operation department, the head engineer of ICA and his second-in-command, a representative of the Autlán municipality, and three farmers who were not delegates to the commission, among them one of the richest sugar cane producers. Furthermore, five farmer delegates also sat around the table, at the head of which was seated Jesús Corrales, who arranged the meal.

Around this focal point of the meeting there are 4 smaller groupings of people and activity, concentrated on four heaps of sand. The heaps form a half-circle. The result was a kind of arena, with the key actors sitting in the centre court. On one of the extremes there was the place where the drinks and food were kept, and where there was a coming and going of people and to which beer, sodas and *mezcal* were constantly

brought. The beer was kept cold with huge blocks of ice. The ice was also used for the *cubas* (*mezcal* with coke). As an appetizer, pork crackling was prepared and distributed among the guests. In all, some 50 men were present (not one woman). Also, some policemen walked around, among whom were the bodyguards of Jesús.

The majority of farmer delegates and District engineers sat on the ground or on trunks, some having arranged a chair. I participated in the group remotest from the food and drink spot, and nearest to the lake. It was a rather high heap of sand (maybe 6 metres high) upon which we sat, and we had a nice view on the scene below us. There we sat: 5 District officers, among whom was Engineer Acosta, one farmer with his 10 year old son, and me. A handful of delegates were seated below a nearby tree. Another tree gave shade to some other delegates. We all looked at the oblong table in the centre. Over there, the ambience was good and loudly expressed. All kinds of jokes were told, most of them stressing different aspects of *macho* behaviour. We looked on, in silence. I was fascinated by the scene, and felt a kind of intimacy among our group, which perhaps was created by our peripheral position.

## Chapter 7

### **Irrigation and intervention; the case of the Water Users' Association**

As has been convincingly argued by Hunt and Hunt (1976:394-396), irrigation often implies the emergence of more linkages with distant markets and institutions. Irrigation systems thus give rise to a more marked presence of outside institutions, which intervene more intensively in the local scene. In this chapter I want to explore the nature of interventions in El Operado, the responses to these at local level, and the resulting change or lack thereof.

The argument is built around three interventions concerning the organisation of water users in El Operado.<sup>1</sup> The first intervention relates to the foundation of the Water Users' Commission in 1980; the second to the creation of the Water Users' Association in 1988, which replaced the commission; and the third intervention to the effects on El Operado and its Water Users' Association of the new rural modernisation programme together with the organisational reform launched by SARH in 1989, which involved the creation of the National Water Commission (*Comisión Nacional del Agua*, CNA).

In the next three sections these interventions will be analysed in chronological order. It will become clear that these interventions not only came from outside, but local actors, involved in struggles for control over El Operado, also played important roles. An attempt is made to link these local struggles with the social dynamics found at higher institutional levels. In the fourth section the issue of irrigation and intervention is discussed in a broader context.

#### **7.1 Creating the Water Users' Commission: intervention by local actors**

As has been briefly mentioned in chapter 2, at the root of the creation of the Water Users' Commission in 1980 lay the clash between a group of entrepreneurial farmers, allied with a handful of high-level functionaries of local government institutions and banks, on one hand, and the then Head of the District, Engineer Chavez, and some of his close collaborators, on the other. The entrepreneurial farmers wanted to plant vast areas of new sugar cane, but the chief engineer was opposed to this and tried to confine

the area of sugar cane to clearly defined limits. The ordinary water users were also partly involved, in that their interests could be affected by the interests of either of the opposing groups. In Chavez' vision, a handful of entrepreneurial farmers planting new sugar cane would jeopardise water availability and thus affect the interests of the majority of farmers. Conversely, the efforts of the District to limit the sugar cane area implied that many small farmers who also wanted to start cultivating sugar cane would not be allowed to do so. The struggle between the entrepreneurs and the engineers was partly played out over the heads of the ordinary farmers.

The struggle grew because both groups linked their self interests to policies developed in Mexico City. The entrepreneurial group consisted partly of some senior employees of the valley's sugar factory, and these maintained very good contacts with the national sugar cane lobby. In 1976, when some 3,000 hectares of sugar cane were grown in El Operado, the state-owned sugar factory in the valley had applied to the central commission of the sugar industry in Mexico City (*Comisión Nacional de la Industria Azucacera*, CNIA) for a major increase of its milling capacity, which was received positively.<sup>2</sup> In April 1979 the increase in the factory's milling capacity was formally accepted, allowing the sugar factory to mill some 5,300 hectares of sugar cane. Simultaneously, in 1976, the SRH Jalisco office had studied the sugar factory's request for an extension of the area under sugar cane to 5,300 hectares, and arrived at the conclusion that only a maximum of 4,017 hectares of sugar cane could be allowed in the El Operado irrigation system. This conclusion was based on a technical analysis of the availability of irrigation water for El Operado.

In 1977, El Grullo District got a new head engineer, Engineer Chavez. One year later, this engineer became committed to a new SARH policy of food self-sufficiency. This policy had been elaborated in Mexico City during 1978 and 1979 by a group of senior engineers, among whom was Chavez' former teacher and *padrino*, Engineer Velazco. Backed by the latest SARH policy, Chavez decided to stick to the 4,000 hectares limit for sugar cane. He argued that sugar cane consumed more water than other crops, and that the steady growth of the total area irrigated had reached the limits of water availability (during the 1977-78 season water consumption nearly equalled the storage dam's capacity). In his view, any further increase in area under sugar cane would mean less water available for the basic food crops. On top of this, too much sugar cane (a perennial crop) would create big problems in years with water shortage and would especially affect the annual (food) crops.

Opposition to Chavez' sugar cane policy was heavy and came from a variety of people who closed ranks. We may therefore speak of a 'sugar cane lobby'. The lobby consisted of some of the entrepreneurial farmers who wanted to shift from horticulture to sugar cane production, some employees of the sugar factory and a handful of bureaucrats of two banking institutions in El Grullo.<sup>3</sup> They aimed at an increase of several hundred hectares in 1980. The requests were put forward to the District by *medieros* (share-croppers) and *prestanombres* (relatives and trusted employees of the said entrepreneurs). A further element in the struggle was that all protagonists of the lobby were members of local families. Engineer Chavez was thought of as a stranger, as he was from another region. The sugar cane lobby simply would not accept outsiders

curtailing their (autochthonous) power. Statements ('*manifestos*') appeared in regional newspapers, signed by the sugar cane growers organisation, defaming El Grullo District's management.

Aware of the importance of the situation, Engineer Chavez invited the presidents of all *ejidos* to a meeting of the *Comité Directivo* (governing board of the District) in April 1979. Normally only one *ejido* representative per municipality participates, which means farmer representatives form a small minority. In the April meeting, however, 12 *ejido* presidents participated. Thus, together with the 5 representatives of the farmer organisations for once they constituted a majority and the vote of the meeting was therefore to stick to the limit of area under sugar cane, and the agreement was signed by all parties involved: not only by *ejido* leaders, by representatives of the sugar factory and the sugar cane producers' association (now obliged to go along with the majority decision), and the District, but also by the head (delegate) of SARH Jalisco himself and even by the representative of the federal government in Jalisco. In this way, Chavez managed to contain the sugar cane area within the 4,017 hectares limit during the 1979/80 season.

At the end of 1979 and in 1980 a 'paper war' was fought, principally between the Head of the District and the Field Officer of the sugar factory, both writing to senior functionaries of government institutions in the capital city. SARH engineers from Mexico City came and investigated the El Grullo situation. Chavez realised that his position had become almost untenable and that he had to do something or face replacement. The solution came from a trusted junior colleague and former university friend, Engineer Ochoa, whom Chavez managed to get transferred to El Grullo and appointed head of a department. Ochoa appreciated the initiative of Chavez to involve all *ejido* presidents in the *Comité Directivo* meeting.<sup>4</sup> This brought him to the solution of the El Grullo conflict. If farmer representatives themselves had to decide how to distribute the rights to grow sugar cane, then they would soon come up with the only solution: not to expand the area under sugar cane. This would be precisely what Chavez wanted, and achieved without making his hands dirty. Chavez and Ochoa readily started to organise *ejido* meetings, where the idea of the formation of a Water Users' Commission (*Comisión de Usuarios*) was launched. It was proposed that every *ejido* would send two delegates to the commission. The delegates would participate in the collection of crop requests which water users had to fill out each season, they would be entitled to present specific irrigation problems in their *ejido* at the commission meetings, and to decide on the irrigation plan. One District engineer recalled in 1988:

"The lobby would never have allowed us to get our hands on sugar cane. They have never let the District control the sugar cane, and they never will, because it is a closed political group and the sugar factory agreed with them. (...) The principal motive in creating the Water Users' Commission was for us to control the sugar cane growers. How to control them to a certain degree? To get them together at the District, so that they would speak there, and not go elsewhere behind our backs."

The strategy followed by Chavez and Ochoa was to create a second front, or what they themselves called applying 'the tactic of the scissors' (*la táctica de las pinzas*) which entailed attacking your opponent simultaneously from above as well as from below.<sup>5</sup>



In conclusion, contradictory elements were at the core of the formation of the Water Users' Commission. First, there were the local competing power groups, one primarily concerned with expanding its economic activities, the other with implementing a new government programme which was considered sound and just. Second, there were contradictory policies at national level (stressing basic food crops as against stimulating industrial crops). The local groups then articulated their interests with national policies, and the District head was confronted by a strong lobby which he was unable to control. He therefore invented the Water Users' Commission. This commission shielded Chavez from attacks from the sugar cane lobby, since he succeeded in enrolling the commission in his own project. The commission's delegates then performed exactly as the Head of the District had orchestrated, since he had saddled them with responsibilities they had not asked for, and had placed them in a dilemma, namely, for each hectare of new sugar cane they allowed farmers to plant, they had to indicate which hectare would be denied access to irrigation water. They could not but decide therefore, that it was impossible to grant any water user the right to plant new sugar cane.

The creation of the commission was an intelligent move. It was effective since it enabled Chavez to stick to the new SARH policy of stimulating food crops, while securing his position. At the same time, it fitted Engineer Ochoa's conception of farmer involvement in rural development. For him, the commission was a first step. The subsequent history of the commission shows that it was not able to serve both purposes simultaneously.

The formation of the commission was mainly a local affair. Although initially both contending groups (engineers versus entrepreneurs) tried to find allies at higher levels (in the state and the federal capital), the group that succeeded in creating an ally at local level was able finally to impose measures which affected the other group. The story is thus not confined to outside intervention only, and to the implementation of (contradicting) government policies. It also, and essentially, is about how local groups try to manipulate the local state of affairs in their own interests, through taking risky initiatives and creating coalitions. The founding of the Water Users' Commission was to have some lasting consequences.

#### *The Commission's apparent consolidation and demise*

During subsequent years, the commission was not able to contain the sugar cane area to the limit of 4,000 hectares. The expansion of sugar cane became a negotiated process. One major event in the history of the Water Users' Commission was the water shortage which struck the irrigation system in the 1982-83 irrigation season. (See chapter 6.) In October 1982, the Tacotán storage dam was only filled up to half its capacity (69 million cubic metres). It was the first time in El Operado's history that this had happened. The cropping plan had to be adapted, and the planting of sugar cane was severely restricted. This generated a conflict between the District and the sugar factory. The District prohibited the factory to re-plant sugar cane. Then when the factory went on planting 200 hectares sugar cane, the District effectively denied them irrigation water and the cane died. The District also succeeded in enforcing the restriction on irrigated crops, i.e. each water user was allowed a maximum of 6 hectares, or, in case of sugar

cane, 10 hectares. This was a major success for Chavez, since in practice it is very difficult to effectively control access to irrigation water.

His success can partly be attributed to the Water Users' Commission: for once it really got involved in the matter, it formed the important and effective link between the District's engineers and the water users. Shortly after that season's first meeting of the Water Users' Commission, most *ejidatarios* were informed about the restrictions on irrigated crops, restrictions which hardly affected the *ejidatarios* but which did affect the larger landowners. The majority of small producers supported and apparently were able to control and enforce the measures decided in the commission.

This event suggests that the commission was gradually consolidating itself as an organisation. The subsequent decline of the Water Users' Commission had much to do with its 'founding father', Engineer Chavez. He recalls that,

"During the last years that we stayed in El Grullo [1983-1985] we did not dedicate enough attention to the Water Users' Commission. There was a huge pile of other work to be done."

At the end of 1983, Chavez was called by the new director (*delegado*) of SARH in Jalisco to help him to define a large-scale re-organisation of the SARH, which concerned the fusion of the *Distritos de Temporal* (rain-fed Districts) and the *Distritos de Riego*.<sup>6</sup> Half a year later, Chavez was called by his former teacher, Engineer Velasco, to participate in the planning of the same re-organisation process at federal level, at the Ministry in Mexico City. By that time Chavez had become known as an extremely astute engineer.<sup>7</sup> Consequently, Chavez had little time for his District and could not supervise the work of Engineer Corona, who, in his capacity as Head of the Autlán area office, was directly involved in the matters relating to the Water Users' Commission.

The commission began to participate less and less in the decisions made by the District concerning El Operado. The influence of Corona in the commission increased further when in September 1985 Chavez was transferred and appointed head of another District, taking with him Engineer Ochoa. In El Grullo District, Engineer López García became head engineer. López García, like Corona, was from the valley, and had been head of a rain-fed District. After some months, he made Corona the new head of the the operation department, when the head of that department resigned. López García had no experience with irrigation systems, and thus he gave Engineer Corona *carte blanche*.

## 7.2 Founding the Association: intervention by regional actors

By 1987, the role of the Water Users' Commission had become marginal, and had little say in the management of El Operado (chapter 6). Control over El Operado was entirely monopolised again by the District's triangular power core, namely the District's head

and the heads of the operation and maintenance department (chapter 5). Then, from different sides came an initiative to create another, more powerful organisation, the *Asociación de Usuarios*, the Water Users' Association.

The idea for such a new water users' organisation came first from a relatively small number of discontented farmers, who were especially dissatisfied with the poor maintenance service provided by the District. They wanted to form a water users' association, an organisational entity recognised by the Federal Water Law (unlike the water users' commission) which would get real responsibilities for the management of El Operado, especially over maintenance, and have real decision-making power. These farmers referred to another irrigation system, that of El Agua, where at the end of 1985 a similar water users' association had been formed, under the auspices of Engineer Chavez and Engineer Ochoa who, as I explained earlier were now working there.<sup>8</sup> That association now managed canal maintenance. They said they were an informal group of water users who were meeting more or less secretly, and that they planned a trip to the El Agua association. The group was not more than a network of persons, which met in small subgroups of three or four, which changed composition constantly. Much of these informal discussions were held in the *plaza* of the town, where you always find (older) people sitting on the benches, talking and gesticulating, or simply looking at the people who pass by. As one of the participants explained to me in a rather cryptic way: "Yes, we are already a group, but so far we have not met as such. We only talk in the *plaza*."

One major characteristic of the network was that it linked different water users: *ejidatarios* with 8 hectares of irrigated land, as well as rich private landowners with over 50 hectares, and even a few lower-level District personnel. The informal way this pressure group was organised resulted from a real fear the participants felt about being identified by political and government people as opponents, dissidents, or maybe even as members of the new coalition of left opposition groups.<sup>9</sup> The network structure of the group was effective because it was not a formal group, and thus difficult for others to identify, let alone to infiltrate or encapsulate. Probably the group's most important contribution to the formation of a water users' association was that some members informally visited the Head of the El Agua District, Engineer Chavez, whom they knew. They inquired about the functioning of the El Agua Water Users' Association, and the possibility of forming one in El Grullo. This network emerged at the beginning of 1987.

Somewhat later, in May 1987, the Head of El Grullo District, López García, participated in a Water Users' Commission meeting, where he put forward the idea of putting the water users in charge of the maintenance tasks of El Operado. He was not in favour of such a move, but this idea had been suggested to him by one of his superiors in Guadalajara, Engineer Velasco. López García presented the idea cautiously, as if he only wanted to sense the opinion of the delegates. The reaction of the delegates who spoke was very clear: they immediately objected to the idea. They responded by pointing out that it was the head engineer who was responsible for maintenance and that he should not try to pass this burden on to the water users. López García must have been relieved with this reaction, as he could now safely dismiss the formation of a water users' association, and for the moment he let it rest. The farmers' leaders on the

commission were not among those who participated in the network mentioned above.

The emergence of the network of 'dissident' water users wanting to create a water users' association, and López García's sounding out, at Guadalajara's suggestion, the water users' view on being put in charge of maintenance, was of course no coincidence. Both events were connected through Engineer Chavez and his former professor, Engineer Velasco.

*The engineers continue to keep the initiative*

More than half a year later, in February 1988, Engineer López García again attended a meeting of the Water Users' Commission and informed the farmer delegates of the new SARH policy of 'decentralisation of its functions to farmer organisations that work in an organised fashion and efficiently', and proposed for the second time the creation of a water users' association. It is perhaps surprising that this time the commission accepted López García's proposal with little discussion, whereas in May 1987 the 'opinion leaders' had responded negatively. The existence of the pressure group may have influenced their decision. Now, López García, who was still quite reluctant to launch a new water users' organisation, was ordered to do so by his superiors from Guadalajara. His (political) ambitions compelled him to appear disciplined and comply with this order. Two weeks later, he called another meeting, this time with all *ejido* presidents (no private landowners present). At this meeting, López García informed them of the new policy:

"The objective of this meeting is to work out a strategy for the hand-over of the maintenance tasks of the Autlán/El Grullo irrigation system to the water users. The policy of SARH is one of decentralisation, which means handing over activities to farmers in a way which ensures that they will be executed as before but with greater seriousness, faster, and more efficiently."

He then mentioned one of the problems the District faced: the collected water fees had to be deposited in the Ministry of Finance, who later on a monthly basis made certain repayments to SARH. However, these amounts were fixed and were not compensated for inflation, which created a big problem. The result was that the District could not comply with the President's decree of 1987 that the El Grullo unit should be 80% self-sufficient financially. López García then said:

"Two years ago the maintenance tasks of the irrigation units of El Agua and La Cienega were handed over to water users' associations, and we can already conclude that this is more efficient. Here in El Grullo we are lucky, because there is already a Water Users' Commission. For the District, this commission has been very good, it has given the District good backing. Unfortunately the commission is not an organisation which is legally recognised. What we want is to form a Water Users' Association, in a legal manner. When this is done, they have authorised us to hand over the canal maintenance to this association. We will not only offer you technical assistance but we will also give you machinery, such as the dragline, the *poclains* etc. It has already been approved by the Water Users' Commission, and I called for this meeting in order to work out the strategy to follow for the creation of the water users' association. [...] The most important point is the election of delegates. You must explain this very well to your *ejidos*, in order that the information will not be distorted. Think very hard who will represent you. Be careful that he is not someone who will start working for his own ends. This is very important. And when all the delegates have been elected,

then the Water Users' Association can be founded. [...] I want to insist that the delegates should be born leaders, in the good sense of the word. But we do not want to interfere in the elections of delegates."

Although no formal voting was held on López García's proposal to form the association, the *ejido* presidents implicitly agreed since they accepted his suggestion to organise *ejido* meetings and inform the *ejidatarios* about the new policy. Then, over a period of seven weeks some 24 meetings were held in the 17 *ejidos* and in both *Asociaciones de la Pequeña Propiedad*. From each of these 19 bodies 2 delegates were elected, totalling 38 delegates.

### *The ejido meetings*

All the meetings followed the same pattern: a long discourse by a District official (either López García, Corona, Fuentes or Acosta) started the meeting, explaining why the District could not do the maintenance efficiently, and why a water users' association could do it better. The language used made it difficult for the greater part of the audience to follow. Invariably some 5 to 10% of the *ejidatarios* present asked a whole series of questions. I nearly always had the feeling (and in a few cases I was later able to check that I was right) that this relatively small portion of 'involved' farmers came from the group of *dirigentes* (leaders) of the particular *ejido*. Because these meetings are held in the *ejido* setting, these same people were always able to dominate the meetings, and so it is no surprise that those finally elected belonged to this same group of leaders.<sup>10</sup> Twenty-three out of 38 farmers (or 60%) elected into the *Asociación* had previously sat on the commission (or 60%). This raises the question of why this association had to be newly formed, and why the District did not simply force a decision to rename the commission an *asociación*. In March 1988 I asked Engineer Corona about this.

Corona: 'The *Comisión* is not a legal body.'

Pieter: 'OK, but you can always find a way to simply transform it, can't you? Or is the reason that it is not convenient for you to do so?'

Corona: 'Indeed it isn't, because.. I don't know if you noticed that there are a lot of delegates in the *Comisión* who are only concerned with personal problems: my inlet, my canal, etc. The *Asociación* will be far more important, and therefore we need more serious people.'

This comment of Engineer Corona was interesting, because as I have tried to show in chapter 6, the behaviour of representatives in the Water Users' Commission was partly influenced by the very same District engineers. They had denied the commission decision-making power and had contributed to the 'individualism' of representatives which Corona now complained about. Corona now had to develop a strategy to overcome the culture he himself had helped to create.

His strategy was to try to relate to the water users' experiences and show he was aware of how farmers saw the District. In order to re-establish a link with the water users, he had to dispell the images farmers had created of themselves and the District. During the *ejido* meetings, Corona acknowledged the fact that farmers usually saw the District workers as *la engorda* (lit. the engorged one; as for fattened animals), and that

this was in fact a useful image to summarise actual practices of District personnel. Farmers were surprised to hear this from an engineer (who himself could not be said to be slender), and had to laugh. Corona then went on to explain the institutional constraints which made it understandable why the District could not do its job more effectively. Therefore, he continued, the idea now was to directly involve the farmers, who would do a better job because it was in their immediate interests to see that the canal system was properly cleaned. Engineer Corona had to use the 'farmer image' and their language in order to attract attention to try to regain their confidence, and to reach his goal. Hence in this situation, it was the farmers who defined the language through which the problem was re-formulated.

After the last *ejido* assembly in May 1988, the constitutive assembly of the association was celebrated with the participation of the newly elected delegates. The meeting was presided over by Engineer Velazco, who had come from Guadalajara for the purpose. Engineer López García did not get a chance to participate, whereas the engineer from the state capital gave the delegates ample opportunity to raise questions and express doubts. In the meeting Velazco proposed forming a working committee which would draft the internal regulations. Once this had been completed, the general assembly could discuss, amend and accept it, and only then would an executive board be elected. This proposal was agreed upon. Six delegates were elected to the working committee. In November, the association's assembly of delegates met again, the drafted regulations were agreed upon without discussion, and six delegates were elected to the Association's board. In this way the El Grullo Water Users' Association had become a fact.

The idea of forming a water users' association that arose in El Grullo in 1987 seemed an appropriate solution for tackling the maintenance problems that the El Operado farmers faced. In the next chapter I will analyse how the association begun its work. Here I am interested in the way actors intervened in its foundation.

Its creation cannot be understood solely as a local initiative of unsatisfied water users in El Grullo. The wider institutional environment also had much to do with it. The role of actors at Jalisco level was decisive. But also the national level was involved: the serious interest senior engineers in Mexico City demonstrated in the El Agua experiment contributed greatly to the confidence people like Chavez and Velazco experienced in 1987/88. So, the idea was an outcome of initiatives that came from different sides, with distinct objectives, and which were influenced and shaped not only by actors at the local level, but also by people and developments at regional, state and even national level. Moreover, the intervention was shaped by earlier experiments undertaken by some of the regional actors involved. In addition, the intervention to create the association was also linked to the political climate in Mexico during 1988, the last year of the *sexenio* (i.e. presidential 6-year period).

The interventions which resulted in the creation of both the Water Users' Commission and the Water Users' Association have several similarities. In each case, the intervention was rooted in a struggle between two opposing groups, and on both occasions, one of the two opposing groups proposed the founding a new farmers organisation with the intention of creating a new ally in the struggle in which the group

was engaged. Furthermore, the District engineers who launched the Water Users' Commission in 1980 had many connections with those engineers who in 1988 had ordered the creation of the new Water Users' Association. A further parallel is that in both interventions the water users were essentially onlookers, although with the Association a group of discontented farmers were active in establishing links with El Agua District, and with Engineer Chavez. Thus for both interventions the organisations created were geared to the needs of a particular faction within SARH. Before turning to the third intervention it is therefore worthwhile to take a closer look at the institutional dynamic found within SARH.

### *The institutional dynamic*

Earlier in this section, we saw that within the institutions of SARH different vertical chains of alliances coexist alongside each other. Actors belonging to one such chain used a profitable political context to strengthen themselves and debilitate another such chain through the formation of the Water Users' Association in El Grullo.

These chains are highly personalised and involve trusted friends, colleagues, allies, pupils and tutors within a given government institution. One important characteristic of such a chain is that it cross-cuts different levels of the bureaucratic hierarchy. Hence, Grindle (1977:150) speaks of vertical chains of alliances that need not be short-lived, often enduring more than one *sexénio* (six years). Institutions such as SARH are interwoven with such chains and any ambitious young engineer must knit him or herself to a senior one, this being virtually the only way of rising in the hierarchy, to become for example a Head of a District. One engineer explained:

"An engineer has to have a relation with a senior engineer at state level. 'I bind myself with so-and-so' (*Yo me discipliné con fulano*) and thus identify myself with him. Groups coalesce around the different leading engineers."<sup>11</sup>

Being part of a chain gives people a certain strength and self-confidence and provides them with an 'identity'. Chains also short-circuit the normally slow information flow between different levels within the bureaucracy which may result in unexpectedly fast and effective policy implementation (cf. Kelley 1981:2). These chains of trusted relationships may determine the implementation or non-implementation of policy measures decided upon at higher levels, but may also bring about new initiatives at a local institutional level. This occurred with the chain tying Engineers Ochoa, Chavez and Velazco to each other. Over the years, they have been responsible for a consistent series of initiatives (involving water users in irrigation Districts), and have made a good 'team' (*equipo*). They also succeeded in interesting colleagues and superiors in their approach as an effective response to institutional and political reality.

Viewed from the position of a lower-level bureaucrat, some person plays an important role in the chain at a higher level: he connects the local level chain members with the institutional centre, since that person has direct access to it. He plays the role of patron or political godfather (*padrino político*), protector and elder. A vertical chain of alliances essentially consists of protector-protégé couples. The protégé is supposed to be always loyal to his protector (cf. Greenberg 1970: 51), and the relation is

cemented by mutual favours. One interesting consequence of the many patronage relationships that exist in a government institution is that bureaucrats tend to be more honest to their protectors (i.e. superiors) than to their equals (cf. Greenberg, 1970: 130).

The relations within an alliance network are usually friendly, though they need not be. Nor should such a network be considered a fixed and well-defined group of people, with clear mutual obligations, and a clear set of objectives to strive for. This sometimes occurs, when the institutional and/or political context is favourable. But most of the time members of a network do not interact frequently, although they are quite aware of the (remote) presence of other alliance members - as potential resources which can be activated when the time is ripe. Alliance members move around in different fields of action, often at different 'levels'. It is precisely because of this that these alliances can be mutually convenient. The individual member will normally pursue highly personal 'projects' which are probably not even known to his 'protector' or 'protégés'. At any one time personal interests may clash with projects other members pursue. A member of an alliance is thus caught between self-interest and demands from patrons. There always exists the possibility of protégés becoming too powerful which in the end may result in a clash with their patrons and the emergence of a new chain.<sup>12</sup>

During the transition from one *sexénio* to the other, members of one chain individually 'spot' signs at higher levels: who is likely to become the new minister, which people are likely to rise in position. Whereas during the earlier years of the *sexénio* most members hardly see each other, during that last year interaction intensifies; they contact each other, and exchange information. The new political situation may enable them to strengthen their group, to occupy more crucial positions, and finally to compose a team (*hacer equipo*). Such a team, they think, will be likely to perform much better than former ones.<sup>13</sup> This was the perspective that Velazco and others saw when the new *sexénio* was shortly to begin. The emphasis on the financial self-sufficiency of irrigation systems in 1987 was for them one of the signals from the political centre to go ahead with the creation of other water users' associations, despite the fact that institutionally such a move had not yet been accepted. They gambled that if they succeeded, it could have a major impact and this would enhance their position during the new *sexénio* considerably.

Of course, the Velazco alliance was not the only one in the region. For instance, Engineer López García, Head of the El Grullo District, identified with another senior official within SARH, a colleague of Engineer Velazco. During the transition period between *sexénios*, tensions are likely to build up between competing alliances. Yet differences in opinion and competition may have their roots in earlier years, for example during college years. In mid-1987, Velazco was involved in a power struggle with an engineer colleague at state level, who happened to be López García's 'institutional godfather' and protector. All the more reason for Velazco to use the information he got from his protégé, Engineer Chavez, and to debilitate López García's position through an order to form a water users' association in El Grullo. In such a way, vertical chains of alliances are an important factor in policy implementation.



### 7.3 Modernising rural Mexico and the backlash

Having examined two interventions where respectively local and state actors played decisive roles, we now turn to another which took place during 1989 and 1990. The intervention concerns the takeover of responsibility for El Operado by the local office of a new body, the *Comisión Nacional del Agua*, which was instituted at national level in January 1989. Consequently, El Grullo District (the *Distrito de Desarrollo Rural*) lost its coordinating role in the operation of the irrigation system. I examine this outside intervention so far as it concerned the Autlán-El Grullo Water Users' Association. The intervention was connected to a new government programme (the modernisation of rural Mexico programme) launched by SARH during 1989. I first examine this new programme, and then sketch how it articulates locally and how it is connected to the story of the Water Users' Association.

#### Policies at the centre: the modernisation of rural Mexico

The presence of government agencies in rural areas of Mexico has been marked ever since the land reforms in the 1930s. Over the years, however, there have been alternating tendencies of the government to regulate and de-regulate rural Mexico. The presence of the federal government in rural areas is clearest in irrigation districts. Even in 1949 ideas already existed to de-regulate government influence in these irrigation districts, as a discourse by the then director general of water development (SRH) makes clear:

Big irrigation Districts are now operated by the Government and water users are being organised in such a way as to make it possible to turn lateral systems and eventually the whole District over to them. (Rodriguez 1949:8)

This idea however was never implemented, probably because irrigation districts had become too important politically.<sup>14</sup> Then, following the presidential elections of July 1988, government policy towards farmer organisations has begun to change. During his political campaign in the first half of 1988, the future president of Mexico, Salinas de Gortari, launched an ambitious plan to modernise rural Mexico (*la modernización del campo*). Modernisation not only implied a more open and capitalist approach to agricultural development, it also implied a break with established practices of government intervention in rural areas. Independent farmer organisations would now be able to participate and profit from government programmes and the virtual monopoly of the 'official' organisations (CNC, CNPP, PRI etc.) in principle would be broken. The new programme was much in line with the strategy Salinas de Gortari adopted throughout his campaign of 'social reconciliation' (*concertación social*) which was meant to give people a feeling that they were being listened to. All this was a desperate attempt of the future president to respond to the desperate situation that the majority of

the rural population found itself in.<sup>15</sup> Government programmes, canalised through (semi-)government institutions and official farmer organisations, did not reach the population who needed them most. These programmes were often poorly defined. Implicitly it was recognised that independent farmer organisations were better equipped to formulate and implement development programmes. With this policy, Salinas de Gortari attempted to halt widespread discontent with government rural development programmes, dampen the growing opposition during the electoral campaign, and compromise independent organisations, through binding them to his new programme. This strategy of the 'official' presidential candidate was continued during the first year after he took office (1989).

The modernisation programme had two basic characteristics: (1) diminishing government intervention in agriculture; and (2) government sharing responsibility for development programmes with producer organisations (Hernández 1989:9). The Minister of SARH, shortly after he took office, gave his analysis of the failure of former development programmes:

Surely this is due to the fact that we intervened a great deal, and without them [the peasants] (*seguramente se debe a que intervenimos muchos, menos ellos*). (De la Vega Dominguez 1989:6)

To accomplish this change in policy, the Minister urged all Mexicans:

to break dykes and vicious practices, to defeat apathy and corruption which perpetuate injustice, waste resources and prevent change. (De la Vega Dominguez 1989:8)

One of the brains behind the modernisation programme was Gustavo Gordillo, once involved in one of the most important independent farmer organisations of Mexico (see Gordillo 1988), now subsecretary of the department of farmers organisations in SARH. He describes the whole effort as 'a national crusade which promotes the reactivation and efficient productivity of the agricultural sector' (Gordillo 1990:3). In his analysis of what went wrong with the old approach to rural areas, Gordillo observes that the 'tutelage' or paternalism of the government which was designed to guarantee social justice in rural Mexico, has gradually evolved into government institutions becoming the protagonists of rural development instead of the producers, resulting in bureaucratisation, inefficiencies and the obstruction of production (Gordillo 1990:4).

Thus, modernising rural Mexico implies, firstly, returning to the producers their central role in rural development. This could be implemented through redefining the functions of institutions and producers. Secondly, the mechanisms which enabled differential access to resources and public services (Gordillo calls this mechanism '*renta institucional*', something like: institutional tribute) have to be dissolved, because they generated greater social inequality and inefficient use of resources. Thirdly, the institutions should become flexible, permitting the instruments of the agricultural policy (among others subsidies) to be applied selectively and differentially according to product, type of producer and region (p.9).

Gordillo, however, is aware that such a programme carries obstacles and risks, since it implies a redistribution of forces at the regional level. Moreover, he hints at deeply-

rooted feuds within the state apparatus (p.14). The idea is that through involving producers and producers' organisations, a kind of social accountability ('*contraloría social*', SARH 1989:12-13) over government institutions can be build into the programme, which should ensure the efficient and just implementation of the programme by these institutions.

Despite its interesting features, the programme received a lot of criticism. Here I leave aside the many partisan critiques by spokesmen of independent farmer organisations, especially addressed to Engineer Gordillo who was accused of betraying the independent movement in Mexico. I here mention only three critiques which focus on the content of the programme.

(1) A main criticism of the new programme was that the strongest independent farmer organisations were found in irrigation Districts, especially in the northern part of the country. These were privileged farmers, but through their strong organisation they were best equipped to formulate projects and secure funds under the new programme. This was compounded by the fact that in 1989 it was in the government's interest to quickly show that the new policy could work. However, sound projects were scarce. Hence all strong farmer organisations who had submitted projects immediately received funds. In contrast, the majority of poor peasants in Mexico are rain-fed producers, who live scattered all over the country and who are not organised. How will they get access to the new programme? (Hernández 1989:22). Curiously, Gordillo himself had foreseen this pitfall when, in 1988, he speculated on future developments.<sup>16</sup>

In those situations where farmer organisations exist but are still feeble (because of their 'institutional' heritage), throwing all the weight of formulating productive programmes on the organisation's executive board, and more importantly, quickly channelling considerable amounts of money through these organisations will most likely result in the corruption of farmers' leaders and the disintegration of organisations.

(2) Another drawback of the programme was that it depended for its implementation on regional and local government officers. Apart from the fact that they had little interest in the programme becoming a success, they were also poorly equipped to strengthen farmer organisations, since government policy had always appeared to favour the opposite (van der Zaag 1991).

(3) Finally, the legal framework of Mexico was not yet adapted well enough to the new programme and many laws were multi-interpretable, which consequently offered unwilling regional elites and government officers many escape routes with which to obstruct any genuine farmer initiatives (van der Zaag 1991).

In short, the programme did not contain guarantees that it would indeed reach the rural poor, nor that it would strengthen farmer organisation.

### *Opposing forces*

The above programme neatly fits in with the initiatives in both El Agua and El Grullo to create water users' associations. However, at the time of the creation of these organisations, no explicit policy had been formulated in the federal capital. In June 1989, with the publication of the national development plan for 1989-1994 (*Plan nacional*

*de Desarrollo*), these initiatives received institutional support:

It is reckoned convenient to create bodies with the participation of the social [=ejido] and private sector, which will become responsible for the operation and maintenance of the hydraulic infrastructure. It is aimed to see that the irrigation Districts will be financially autonomous and administratively independent (Poder Ejecutivo Federal 1989:77).

At the state level, the position of engineers such as Chavez and Velazco was quite comfortable, since they had been busy creating independent farmer organisations and handing over financial responsibilities from the government to water users well before it had become an explicit policy. So, by 1989, they had put themselves centre stage, because they could provide a concrete perspective for implementing part of the modernisation programme. Moreover, some of the members of their institutional alliance had been promoted to key positions in different government institutions. Chavez and Velazco expected to be appointed soon to higher positions as well.

However, institutional change does not come about without counter moves by those who feel jeopardised by it. Some groups of engineers within SARH opposed the programme since it turned upside down the normal government policy of channelling funds and programmes through 'official' organisations and government institutions. In this sense the programme was revolutionary, and it questioned the proven practices of bureaucrats over the past decades which seriously disturbed the old hydraulic engineers (known as the *dinosaurios*, dinosaurs). These engineers form a powerful group within SARH who at the time controlled SRH (Hydraulic Resources) before it fused with SAG (Agriculture) in 1977. They opposed the new programme. During the presidential campaign, this group did not openly criticise the new programme. In return for their silence they demanded the re-institution of the old *Distritos de Riego*, conceived under a new, relatively independent body within the ministry (the *Comisión Nacional del Agua*, or CNA). This National Water Commission would, apart from other things, manage and operate the Irrigation Districts.<sup>17</sup> Since the CNA would incorporate most hydraulic engineers, the engineers would be able to retain their relative position of power within the Ministry.

By early 1989, SARH was re-organised into 4 departments and one commission, CNA. The Minister of SARH said about this new organisational structure: 'Now we are better integrated in order to comply with our obligations' (De la Vega 1989:2). But, at the local level, as we shall see, the Ministry disintegrated.

### Modernising the local level: winding the clock back a decade

Here we again take up the story of the formation of the association. After May 1988, when the association held its constitutive assembly, nothing much happened. The lack of speed with which the association was finally formed contrasts sharply with the urgency the engineers first showed. It reflects the unsettled atmosphere within government institutions during the second part of 1988. The presidential elections in July created some turmoil. During the period after these elections and before the

inauguration of the new president in December, the activities of all government institutions sharply decreased in the rural areas. The federal government had run out of money, and many government officials were more interested in speculating about the composition of the new cabinet, and the personnel reshuffles this would entail, than to provide services to the public. In El Grullo District, the chief engineer had to temporarily resign during his own electoral campaign (he stood as candidate for mayor in Autlán during the December municipality elections). Engineer Corona was nominated acting head but faced budget restraints and could not perform canal maintenance properly, and he did not even bother to revise the water fees for the 1988/89 irrigation season. He eagerly awaited his formal appointment as the new Head of the District. Institutionally the interest in the Water Users' Association had suddenly faded (cf. Grindle 1977:164-166).

About the same time, rumours began to circulate about Engineer Ochoa becoming the new District Head. This worried Engineer Corona, as he too had ambitions to be appointed head, and he knew his chances were slim. Together with other engineers, he had heard about the incipient creation of CNA. Corona and the other engineers decided to do everything they could to activate the necessary contacts and networks to secure positions in this new body.

Other rumours directly related to the formation of the Water Users' Association also circulated in the valley. Several were about important persons who tried to put forward trusted delegates as candidates for the association's presidency. Quite a different rumour, encountered in the remotest *ejidos*, was that the SARH District supposedly had received a government subsidy of 190 million pesos (equivalent to some 90,000 dollars) for canal maintenance. This rumour made sense to the *ejidatarios*: now they understood why SARH functionaries were rushing to get rid of the maintenance task, to put this money into their own pockets. The rumours may not have been true, but what matters here is that the rumours were there, and that they circulated in the villages.

In early 1989, Engineer Ochoa was appointed head of the El Grullo District. One of the first things he did was to marginalise the position of both heads of the operation and maintenance department, Corona and Fuentes. He simply did this through a major reshuffle of responsibilities, so that they reflected the official organisational chart, and not the informal one. Thus, all concerns with policy implementation were redirected to the area offices. This meant that from now on, the head of the Autlán area office, Engineer Acosta, an old friend of the new District head, was placed in charge of El Operado. Engineer Ochoa was in a euphoric mood, because he had been able to set aside both department heads in one stroke without sacking or degrading them. Having now a trusted engineer in charge of operating and maintaining El Operado, meant he could proceed with strengthening the Water Users' Association. First he handed over the maintenance machinery to the association, then the association's delegates were given the responsibility of gathering requests for canal cleaning and checking any work done. The association executed the cleaning of canals quite successfully: better, more opportunely and less expensively than in previous years. The financial position of the association was stabilised by defining and collecting an additional water fee for the 1988/89 irrigation season (which had not been revised by Engineer Corona). For Ochoa

this was not enough. He wanted to put a fully-fledged water users' organisation in place before the CNA took over management of El Operado, in September that year. In July 1989, Ochoa suggested that the association's board should start thinking about how to get involved in operation (water distribution) as well. Ochoa mobilised many of his extension workers and after some busy months, they finally created a new position: that of the gate leader (*jefe de toma*). In the *potreros* along all canals farmers elected gate leaders. (Chapter 8.)

By August 1989, Engineer Ochoa was satisfied: the basic structure was in place, and many senior officials were interested in the project. Not only did the director of SARH in Jalisco visit his District and the association, but so did the Governor of Jalisco. Together with the board members of the association, Ochoa formulated a document including the advances of the organisation, which was presented to the governor (see appendix 4, first document).

At this most glamorous moment in the story, things again began to change. The change came from above, with the appointment of the resident engineer for the newly formed local CNA office in El Grullo. His office was in El Grullo, but he was in charge of two other irrigation systems as well. This meant that the old 'Irrigation District' structure, identical to the pre-1977 situation, was re-instituted. This implies that the District headed by Engineer Ochoa (the *Distrito de Desarrollo Rural*) was put aside in all matters relating to the management of El Operado. The heads of both the operation and maintenance department were transferred to the new CNA office, and were again in charge of El Operado.

The engineers Fuentes and Corona, who had never shown interest in a strong water users' association, together with the new CNA resident engineer, started to work along two lines. Firstly, to higher authorities they started to portray the association as a highly effective farmer organisation which was the logical response to the modernisation programme, and suggested that it was entirely their invention. To this end, they produced some documents and a video film, which they sent to their superiors (for the video text, see appendix 4, second document).

Secondly, they tried to curtail the influence of the association in matters concerning El Operado, and to give themselves a prominent place. They therefore revised the Association's regulations or charter (*acta*). The resulting new regulations as accepted in the general assembly of February 1990, gave the association's board many powers, and reduced the central role which the general assembly of delegates had. The board now defined the assembly's agenda, delegates were allowed to add further issues to the agenda but only if 2/3s of all delegates agreed. In the former regulations no such limitation was defined. The new regulations did not define whether delegates had the capacity to call for an extraordinary assembly, and the suggestion was that they did not. In the former regulations 5% of the delegates could call for a general assembly.

Other changes made in the regulations included: replacing all references to the Rural Development District by CNA; and sharply increasing the number of clauses by which the power of the board was subject to control by the CNA office. The CNA was also able to appoint one of its engineers to the board. All financial proposals, arrangements, and reports (including defining the water fees) by the board had to be presented to the

CNA for approval. Also all activities in the field were subject to supervision by the CNA. The CNA member of the board had the capacity to intervene temporarily in the association in cases of serious conflict, and it was left to the discretion of the CNA to decide when a conflict had become serious. The regulations furthermore stated that one of the basic tasks of the association was 'to carry out and to let others carry out the decisions taken in the sub-committee of operation and maintenance', which in fact were decisions taken by the CNA (Asociación 1990, Instructivo, p.4). The new association thus was tightly bound to the CNA.

The CNA engineers had to overcome one major obstacle in order to secure their own central position in El Operado. Having a formal water users' association meant that the irrigation system ceased to be an 'irrigation district' (system managed by the government, now CNA), and was now an irrigation unit of rural development (*unidad de riego de desarrollo rural*, a system managed by its users and supervised not by the CNA but by the Rural Development District). This implied that the CNA would lose its mandate over the system and had to transfer it back to El Grullo District. In Mexico City a senior engineer found the solution: the El Grullo Water Users' Association should become a foundation (*Asociación Civil*), which, in a legal sense is not the same as a water users' association. Thus El Operado remained an irrigation district. Furthermore, creating a new foundation implied that its constitutive deed had to be formulated, which offered the CNA engineers the possibility to revise completely the association's regulations.

Most water users were not surprised by the new 'tutelage' to which the association was subjected. They had never had much confidence in the association in the first place. The same more or less held for their representatives: since their role in the association had been severely restricted, there was little they could do. Finally, the six members of the association's board felt little sympathy for the CNA engineers and their zeal to dam the power of the association. They realised that if they openly opposed the new regulations, the CNA would simply dismantle the association. The association's board, however, did succeed in negotiating that in the new regulations the association should have responsible for water distribution. According to board members, this was planned to be agreed to in July 1990. Therefore, the board members opted to play the CNA game for the time being. They suggested to me that once water distribution was in their hands they had more means to ignore interventions from the CNA. In the meantime the board was busy training (paid) staff, among whom there was a young engineer who would later take charge of water distribution. During the first half of 1990 the board had to play a double game. This confused the delegates and strengthened scepticism among water users.

## 7.4 Irrigation and intervention: a conclusion

This third case of intervention in the Water Users' Association is a case in which distant, or outside forces play an important role (the new modernisation programme developed in the federal capital, and a major re-organisation within SARH). However, new policies provide new opportunities to local and regional actors, who re-interpret these policies and use them to their own benefit. In El Grullo, modernising the rural areas with a view to 'producers determining their production programmes, their commitments and work styles, without the authorities exercising anachronistic and harmful tutelage' (Gordillo 1990:2) resulted in just the opposite.

The three cases reviewed in this chapter are interrelated, since they all concern the water user organisation of El Operado. These interventions cover a period of a decade, and provide a diachronic picture. We examined the background which led to each intervention, their implementation, how they worked out, and finally how particular groups of actors reacted in various ways against them. All interventions were double-layered: (1) the stated goal of the interventions (e.g. let water users participate in decision-making, in maintenance; let them pay the real operation costs) were geared to solve institutional problems; and (2) the (more or less hidden) goals of the intervening engineers. They themselves wanted to gain institutionally from these interventions. This is best demonstrated by the way in which the intervening engineers of the second and third interventions cautiously managed public relations. The engineers made the association write documents which selectively displayed its impressive developments, and the crucial role the institutions had played in it. The goals of the interventions thus were ambiguous.<sup>18</sup>

Despite the three interventions having many common characteristics, they also differed. The first intervention, the creation of the Water Users' Commission, was not planned well in advance and was implemented very quickly. The intervention was designed to contain the power of the sugar cane lobby, but it had no stated long-term aim with regard to the management of El Operado. The foundation of the Water Users' Association, the second intervention, by contrast was a slow and tedious process. Its stated goal was clear: to hand over maintenance tasks to the organisation. Nobody involved, however, exactly knew how this goal could be reached, and the District engineers displayed different commitments to it. Water users and water user representatives at first did not fully understand what the intervention was about, and were not able to contribute actively to its implementation. The third intervention, whereby the CNA took over responsibility for El Operado was all the more confusing, since now two local offices (CNA office and District) of the same institution (SARH) openly displayed contrary intentions. The stated goal of the CNA was to proceed with the consolidation of the Water Users' Association. What it in fact did was to debilitate it.

All three interventions were implemented at a formal level (creating a formal organisation), but the interventions failed to take account of the implications both for the organisational set-up of the management of El Operado, and for the social



relationships found at local level. The interventions remained confined to formal rules, and did not therefore have an impact on existing practices with respect to the management of El Operado.

Only when the association defined precisely its relationship with its productive resource, i.e. the canal infrastructure, and the local actors at field level received their role in the operational process (first the role of the farmer representatives with respect to maintenance was clearly defined; later a new nexus much nearer to field level was established through gate leaders), did the association have a proper structure to enable the practices of the people involved to change (see chapter 8). Counteracting forces were omni-present, and it appeared that attempts to reorganise the existing order through programmes devised in a distant centre created new opportunities for local actors, especially for those who profited most from the existing order.

The three interventions gave rise to a series of encounters and social interactions which were important. In table 7.1, I single out a number of interactions I found crucial. One thing emerges from this: interventions are implemented partly through encounters and interactions between actors stemming from different social worlds (e.g. engineers-farmers, engineers-entrepreneurs) or belonging to different levels in the institutional hierarchy. These encounters can be understood as social interfaces, since

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Table 7.1 Important encounters in three interventions in the water users' organisation

- |      |   |
|------|---|
| (1)  | <b>creating the commission</b>  |
| (a)  | no direct interaction between rival groups (local District engineers-sugar cane entrepreneurs)  |
| (b)  | intimate encounters between SARH engineers cross-cutting hierarchical lines   |
| (c)  | District engineers convincing farmers in ejido meetings   |
| (2a) | <b>creating the association</b>   |
| (a)  | some farmers informally discuss at the <i>plaza</i> , express their discontent, and some of them having an interview with the head of El Agua district                    |
| (b)  | high level SARH engineer orders District head to form the association and to hand-over maintenance  |
| (c)  | District engineers address <i>ejido</i> meetings  |
| (2b) | <b>reviving the association</b>   |
| (d)  | the new District head sets aside some engineers, and works intensively with the elected board   |
| (e)  | the district head works with lower level engineers, who elaborate a plan for farmer involvement in water distribution   |
| (f)  | board members have an autocratic attitude towards the delegates during assemblies   |
| (3)  | <b>take-over by CNA</b>   |
| (a)  | two District engineers mobilise their networks in the hierarchy, and are appointed into local CNA office  |
| (b)  | once the CNA is in charge, these engineers make clear to the board members that regulations have to be revised, and the CNA role secured; the board strategically abides. |
| (c)  | District engineers and the association's board meet informally  |
-

major discontinuities between the participants exist (Long 1989). This is also consistent with the thesis of Hunt and Hunt (1976) that irrigation development goes hand in hand with the emergence of linkages with formerly distant or absent entities. But another thing which emerges is that in each intervention crucial actors are set aside, neglected or by-passed. These non-interactions or 'disjunctions' (Von Benda-Beckmann et al. 1989:213) are as important to capture the essence of the interventions as are the encounters or social interactions that take place. Indeed the majority of common farmers were hardly taken into account.

It is important furthermore to note that most social interactions were imbued with power inequalities: engineers convincing *ejidatarios*; farmer representatives deciding while they felt the hot breath of the engineers on their necks; engineers making clear to the board that regulations had to be revised, and so on. The three interventions reviewed did have immediate effects (i.e. the sugar cane area was contained; better canal maintenance to be achieved), and coincided with needs felt by water users (especially the case with the association). These interventions did not change the relationships between the major groups of people involved in El Operado. However, the moment the association defined a more prominent role for local-level water users the stage was set for more fundamental changes, changes in the practices of people involved in El Operado: of farmers, their representatives, entrepreneurs and functionaries. This I will explore in the next chapter.

## Chapter 8

### **Decentralising irrigation management; farmer participation and changing practice**

This chapter, like the foregoing, deals with both water users' organisations of El Operado. In chapter 7 I examined how outside interventions impinged on these organisations, and we analysed how the various parties involved dealt with the interventions. In this chapter we will look in detail into the internal dynamics of both the defunct Commission and the new Water Users' Association. Since water user participation in irrigation systems is a major theme in irrigation policies nowadays, it is of interest to know how both water users' organisations, which are rather unique in Mexico, actually function. My argument centres around water users' representatives, and how they cope with both District engineers and their constituencies (i.e. the water users). Power relations are likely to crystallise around such intermediate positions (Fox and Gordillo 1989, Bartra 1980, Long 1989).

In the foregoing chapters we concluded that the role of the District engineers in the daily operation of El Operado was less central than they themselves thought. It emerged that farmers' informal participation in the government managed irrigation system is important and not to be neglected. We saw how farmer initiatives partially filled the gap that exists between water users and District engineers. The question now arises of how a formal water users' organisation finds a place within the existing patterns of interaction between water users and District engineers. In other words, if local farmer initiatives with respect to, for example, canal maintenance fill an organisational vacuum, is there space for a formal water users' organisation? How does the organisation relate to the numerous informal initiatives, working arrangements and the informal patterns of cooperation between farmers, and between farmers and lower level District personnel?

The first section gives a base-line of formal farmer participation, through an analysis of the functioning of the now defunct Water Users' Commission. Then, we will examine how farmer representatives and District engineers dealt with each other, in June 1988, when they defined the formal charter of the Water Users' Association. By December 1988, there was still little to distinguish the new organisation from the old commission. In the third section we see how, at the beginning of a new *sexénio*, the association gradually developed into a serious farmers' organisation, as it was able to break with some of the old practices characteristic of El Operado's management. This section then, is about a change of practice. The final section discusses the perspectives

and pitfalls of the Water Users' Association. At the time of writing its ultimate fate was all but settled.

## 8.1 The Water Users' Commission operating at the intermediate level

In order to contextualise the theme of farmer organisations in El Operado, it is necessary to analyse in detail the commission's internal dynamics. I will discuss the commission in terms of an intermediate organisation. Then I will pay attention to the commission's composition and analyse the attitudes of commission members during meetings. The empirical material upon which the analysis is based was gathered during 1987, when the commission was still in place.

Farmers' organisations can be understood as intermediate structures, mediating between on the one hand government (or other) 'outside' institutions, and on the other the individual farmers (Esman and Uphoff 1984). For a government agency, such organisations present an important entrance at grass roots level. For the farmers, in turn, the organisation is viewed as a canal through which access to a distant institutional and economic reality can be realised. Similarly, the Water Users' Commission can be understood as an arena where different forces and interests meet or intersect.

The Autlán-El Grullo Water User Commission was set up in 1980 and designed to solve institutional problems like safeguarding food crops for instance (see chapter 7). From its origin, the commission was designed to serve the purposes of the government agency rather than the water users. Over the years, this gradually became the basic characteristic of the commission. Farmer delegates being unable to make their own demands on top of the agenda and to hence change its practice. Moreover, since 1984, some engineers purposely marginalised the commission's mandate and heavily influenced management matters<sup>1</sup>. They cunningly played a strategy of divide and rule on the commission. This strategy was effective because it was easily articulated with existing mechanisms of distrust.

The most succinct analysis of the commission's actual functioning as an intermediate organisation was given by a delegate, Don Guco. Shortly after the September meeting (see chapter 6), Don Guco invited me to his house, and gave me an 'in-a-nutshell' power analysis of this intermediate organisation.

"It was the engineers of the *Secretaría* who created the commission out of self-defense, not because it was necessary, but in order for them to strengthen themselves. To the effect that those from the *Secretaría* washed their hands of the bad things (*las malas cosas*) they engaged in. We, as delegates, stand in between the water users and the *Secretaría*, but we do not serve to defend our water users. We bend before the *Secretaría*. So, the *Secretaría* hits (*chinga*) the water users through us in the commission."

Don Guco stood up, bowed his back, and plastically indicated with his hands how the

District, over his back, reaches the water users, and how he is used in this process. It was clear that Don Guco was not satisfied with the actual functioning of the Water Users' Commission. So what does he do about it?

"We cannot change the situation. I don't have the papers; the data. They have not given us the information. I do not have the probabilities [hydrological data] in order to judge [their decisions]. The people in the commission do not speak up, don't you see? Who spoke up during the meeting?"

The problems with the Water Users' Commission can be partly explained by the obvious power issues at hand: District personnel can side step the commission at will. Since El Operado's construction, the District has had a central role in managing the system. Like all medium and large scale irrigation systems in Mexico, El Operado was designed to be managed centrally by a government agency. Water distribution, canal maintenance and decision making were all to be handled by the District. Strategic decisions, such as the level of water fees and the cropping plan, were to be formulated by the District's personnel in the annual irrigation plan, to be approved by the board of the District (*Comité Directivo*).<sup>2</sup> Farmer involvement in the management of El Operado was virtually nil. The only decision farmers could influence was in relation to the cropping plan. Individually they decided which crops to grow. The Water Users' Commission was not able to change the relationship between District and water users. The commission was debilitated by its crippling organisational set up. Its organisation precluded the commission's ability of becoming an effective organisation through which farmers defined and defended their own interests.

Firstly, the commission was a lame organisation because it did not have an elected board or a secretariat, nor its own financial resources. It was designed to have none of these. Secondly, the organisation had no legal backing, since federal water law only recognised water users' associations. Only to associations could the federal water laws be applied. The head of the District purposely gave the organisation the title of 'commission' precisely because it then had no legal backing, and was thus easy to establish without repercussions. Thirdly, the delegates were recruited from among the *ejidos*, each *ejido* electing or designating one delegate and a deputy. Thus, the commission's organisational set-up formed part of the organisational structure of the *ejidos* in the valley. In addition, the commission tends to follow the existing power structure underlying the *ejidos*, subsequently copying their practices. The commission's attention was easily diverted from its specific tasks, concerned with the irrigation infrastructure and its management. Delegates limited their participation to generalities (like rubber stamping decisions already made by the District), and normally did not address practical issues. This resulted in their contribution being insignificant, and had much to do with the fact that the relationship between the delegate and the water users he represented was feeble, and his responsibility over (part of) El Operado's infrastructure was ill-defined.

We can understand this when we consider that the *ejido* boundaries do not follow the 'hydraulic boundaries' created by, for example, lateral canals. There are great differences in the irrigated areas between *ejidos*, but all are entitled to one delegate and a deputy. The commission's constituency is not thus defined in hydraulic terms. This

directly affects the type of relationship established between a delegate and his constituency: he is meant to report during the monthly *ejido* meeting but does not discuss problems farmers may face in the field. *Ejido* meetings have their own dynamics and seem to follow their own logic (see chapter 2), which ensures that certain practical issues are hardly ever addressed. Water users do not see what their delegates do, and cannot thus control them or demand an account of their actions. As such the content of the relationship between water users and their representatives tends to be divorced from the dynamics encountered at canal level. As we saw in chapter 5, at canal level, the experiences of farmers' cooperation and mobilisation allow us to conclude that in the field there is a reality to be found that consists of informal collective water user initiatives which are defined along canal boundaries rather than *ejido* boundaries. By contrast, the commission's reality is rather theoretical and self-contained.

In conclusion, then, the Water Users' Commission is ineffective as an intermediate structure since it does not establish a link between the 'grass roots' and the institutional reality.<sup>3</sup> How do the water user representatives cope with this situation, and what attitudes do they take during commission meetings?

### Speaking attitudes

The delegates of the commission, who are all male,<sup>4</sup> do not form a unified social group. Many do not even know each other by name. In some instances, factions of delegates have emerged around specific geographical areas (see below). An important division is that between the delegates living in Autlán and El Grullo as against those living in the small hamlets of the valley. Though, perhaps, the best way to distinguish between delegates is to consider whether or not a delegate has any 'political' or administrative experience; either as a member of the *ejido* board (*mesa directiva*) or another farmer organisation, or through being active in party politics. Half of all delegates (members of the commission in 1987) have former administrative experience outside the commission, most of them having, at some point, occupied a post in the board of their *ejido*. In total 20% of all delegates have had important posts in either local politics, or in other farmer organisations (*Asociación Cañera*, *Unión de Ejidos*, *Asociación Agrícola Local de Horticultores*, for example). These 20% are often referred to as the '*políticos*' by their fellow farmers.

In order to characterise the way delegates deal with the commission, I examine their speaking attitudes during the September meeting (see chapter 6). During the discussions concerning the cropping plan and the water fees, there were a total of 88 spoken (verbal) interventions. In all, two engineers and 10 out of 17 delegates participated in the discussion, but of the delegates three clearly dominated the discussion (table 8.1).

Some 40% of the delegates do not speak. The only opportunity they take to talk is during that point on the agenda designated as the 'participation of the delegates'. The silent people on the commission may seem apathetic in their attitude. However, many of the people who keep quiet in fact observe the proceedings in detail, and often have clear-cut opinions (frequently quite critical ones), but simply decide not to speak up.

Table 8.1 Verbal interventions during part of the September 1987 meeting of the water users' commission

name of speaker	farmer/engineer	number of interventions	percentage of total
León Ruiz	farmer	20	23
Don Guco	farmer	7	8
Rodolfo	farmer	7	8
7 other farmers	farmers	11	12
Engineer Corona	engineer	38	43
Engineer Acosta	engineer	5	6
sum		88	100%

Source: own observation

idea or opinion, but only affirm the point of view of one of the engineers or another delegate. They invariably adhere to the invisible 'rule' of always hiding behind someone. Then there are delegates (another 40%) who, when speaking do not come up with a new else's back, and 'copy catting' the persons they have identified as their opinion leaders, but hardly ever openly attack the point of view of a District engineer. They avoid clashes. A third category is formed the remaining 20% of delegates who easily come up with their own opinion, or offer a new point of view. This category includes "the (experienced) *políticos*", who talk in a political fashion: cautiously and diplomatically, frequently expressing themselves in a highly populist way. Among the speakers, however, there are also those farmers who simply speak their minds, often without considering the consequences this may have. They seem to lack the skills needed to express their thoughts more diplomatically. Thus they are often not taken seriously, and are unable to influence decisions decisively (cf. Heijdra 1989:76). However, to their advantage the straight-forward ones (so far) have kept their independent nature and, unlike the *políticos*, have resisted cooptation by outside forces. The District engineers do not have control over them, and in some instances the engineers conclude that the attitudes of these straight-forward farmers is unbecoming and 'undisciplined'<sup>5</sup>. In extreme cases, people who do not stick to the rule of discipline will be removed from the commission, although formally speaking the District has no say in who represents a particular *ejido*.<sup>6</sup>

This classification of delegates according to speaking attitude is partly compatible with the categories many farmers use themselves, as they often distinguish between *productores* and *políticos*. The former being the common farmers, often seen in the field, being productive and independent. The latter are hardly ever seen in the field, and tend to live off their *compañeros* and the wider political and economic system.

It would be too simple to conclude that the commission does not function properly

because the water users in the commission lack certain knowledge, or are too timid, and because others are too opportunistic. The majority do not speak up. But it is not because they are blind to the mechanisms at work. They know how conflict and cooptation work out. Although it is true that they do not always understand technical details, they are nevertheless very keen to know what is going on. Delegates have learned that speaking up in the commission either does not have any effect, or end up being counter-productive.

### Metaphors and mechanisms of distrust

When I talked with people informally about the general theme of farmer organisation, particularly members of the Water Users' Commission, I raised the issue of cooperation. All the farmers responded that in fact there was little cooperation among them, not even among farmers of the same *ejido*, or with adjoining plots, let alone between delegates of the Water Users' Commission. Most of them added that people tended to distrust each other (*desconfiarse*). Also, all of them clearly expressed that they considered concepts like cooperation and trust positively, and distrust negatively. The model these people have of how they think community life should be is opposite to how they experience community life in practice. I asked them the origin of such distrust. Why was it? Where did it come from? They answered that they had no satisfactory answer to this difficult question, or repeated what they had already said. But quite a few of the farmers interviewed responded by recounting a local saying.

An organisation such as an *ejido* might be compared to a beehive (*colmena*), where industrious bees may work together and produce plenty of honey. *Ejidatarios*, however, indicated that beehives could be infested by male warrior bees (*zánganos*), and then no honey is produced at all. Some people would emphasise, when interviewed, that although distrust among community members was widespread, it was not because they see themselves as distrustful by nature. Circumstances have made them so, much like how the donkey has been made intractable (*la burra no siempre era arisca, la hicieron*). Local (farmer) organisations face big problems, since people prefer to work individually rather than cooperatively. People easily recognise that they are like monkeys or spiders, each having their own rope or web (*cada chango a su mecate, or cada araña por su hebra*). Most people realise however that not everybody has equal ability. The differentiation between human characters is reflected metaphorically in the different abilities of various species of a particular insect (the *mayate*). Some may have special qualities that others lack, and therefore within the community some people will have higher positions than others (*no toda clase de mayate haría bola*). For those who have successful careers, and get rich fast, people used to comment that they will not go very far, like the spiders who will only make it halfway when climbing the wall (*no hay araña que pasa de media pared*). In the community, there are some lazy members who mask their laziness by criticising others and making many allegations. These people are like sheep, easily aroused but lazy (*eres como los borregos: pendejo y bufón*; and, consequently: *que no hay pendejo que no sea bufón*).<sup>7</sup>



I was surprised, invariably these sayings were metaphors derived from the animal world, and were based on the meticulous observations of animal behaviour. I gather people also observe in the same detailed fashion what goes on in human interaction. People express their thoughts about such fundamental issues in a metaphorical way because the metaphors mimic closely their own experience. Perhaps people would have difficulty in finding words adequate to express their feelings. I noted that people felt embarrassed to discuss these 'negative' aspects of their community with a stranger, like myself.

Ordinary people do not easily speak up in community affairs. Many people expressed their fears of being 'burned' in front of the community (*quemarse uno ante la gente*), and that they preferred to keep a 'low profile'. Their perception of the community is characterised by a fear of being subjected of gossip. Their fear of going against the 'common opinion' inhibited the course of many initiatives, they kept silent enabling those who did take initiatives to go on, without objections to their actions. I was told of the numerous 'cases' in which those persons who had taken initiatives become subject to severe gossip. From this perspective it appears that the moment you speak up or take an initiative you are left with only two options: you either betray your own people, by being co-opted by the people against whom you want to speak up, or you make yourself look ridiculous, becoming involved in some kind of 'Don Quijote fight' against 'the system', as one farmer put it, and in doing so you harm the case you want to settle. Either way, you may end up jeopardising your own standing with local people, who may loath you because you thought yourself better than them. One tragic outcome of people's fears is that of (apparent) apathy, or rather the suppression of initiatives (an active process!). I must emphasise that such an attitude originates from the close observation of and profound insights into community affairs, and not from a lack of awareness or ignorance.

Most people will do anything in order to avoid either of the two positions mentioned above. This, then, is the 'silent' majority who tend to distrust anyone who takes the lead. That this is a 'social issue', a thing people think and talk about, is also reflected in the words they typically use in order to express their feelings. The words they employ are typical '*mexicanismos*' some are not Castellan in origin but derive from native Mexican languages.<sup>8</sup> It seems that these words are used foremost in situations where community members cross the 'boundary' between the (local, peasant) community and the wider social environment. In using these words, local people seem to emphasise the existence of this boundary and contribute to the maintenance of the cultural identity of their community.

Distrust seems an understandable reaction by local people against government involvement. It contributes to community moral, in that the use of special words and expressions recreate and reinforce cultural boundaries, boundaries which in normal course of events tend to be easily blurred. Thus, although it is clear that distrust among fellowmen contributes to the perpetuating paternalism on the part of government functionaries and the people's own leaders, and, at first sight, seems to function as an obstacle to any change, suspicion and distrust may also become shared by many people, and eventually result in joint action. Suspicion and distrust may be aired in gossip

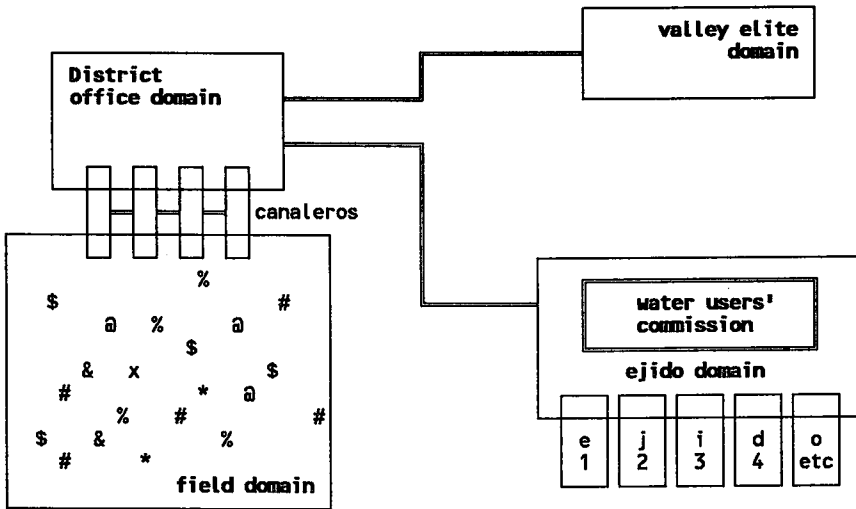


Figure 8.1 The Water Users' Commission in El Operado's arena, with its four major domains. Note the missing link between the canals and the ejidos.

(chismes) with trusted friends, which may start to circulate in extended networks. In the foregoing chapter we saw how an informal network emerged as the result of people's desire to form a water users' association. On that occasion such a gossip network became both positive and constructive in meaning: a new idea started to circulate and finally succeeded in linking certain water users, who formed a pressure group propagating a new organisation.

*The commission and the domains of El Operado*

We can sketch El Operado's arena, identifying four 'settings' or 'domains', and position the commission in this arena (figure 8.1). These four 'domains' we have already come across in this and preceding chapters. The field or canal domain, as described in chapters 4 and 5, is characterised by the heterogeneity of water users, with different soils and crops, with big and small canals etc. There is a District office domain, as described in chapter 6, with its hierarchical structure. In addition we have the valley's elite which has been touched upon in previous chapters, consisting of local politicians, rich entrepreneurs and higher officials of several (semi-) government institutions and banks. The valley's elite frequent very specific places which are often not accessible to other people, where they meet and interact. This then, is the domain of the valley's elite. Finally there is the *ejido* domain, notably the monthly *ejido* meetings where the farmers' leaders are in charge.

People's practices and their interactions emerge in particular physical settings which

I have now labelled 'domains', in the very practical sense of territory. Yet from the material presented so far, it can be seen that domains are more than simply spatial or physical settings. In a particular domain, people behave in particular ways, and also, expect particular attitudes of others, and value particular things that in other domains might be quite irrelevant. Actors may also derive part of their identity and self-esteem from the domain to which they feel they belong (cf. Karp 1978:155). Farmers in the field, then, behave differently from farmers' leaders in an *ejido* meeting, and engineers in their offices have developed yet other practices. Engineers control much of what is going on in their offices, but on a field trip they often are not capable of exerting control over, say, farmers. Reversely, farmers take different poses in the field, in an *ejido* meeting, or in the District office.

Figure 8.1 shows that the commission forms part of the *ejido* domain and is divorced from the canal situation (no direct link between the commission and the field). The District's top engineers mainly communicate with the valley's elite on a more or less equal basis, and maintain contact with the commission in a paternalistic fashion. The link between the District and the field is established through the *canaleros* who receive directives of a general nature which they have to adapt to the heterogeneity found in the field situation (characterised in the figure by the different symbols scattered around).

## 8.2 The formal institution of the Water Users' Association

As we already know, after the commission's gradual demise, in 1988 an initiative was taken to create another organisation, to be called *Asociación de Usuarios*, which would receive much more formal powers than the stripped commission. Initially there were only minor differences between the defunct commission and the newly formed *Asociación*. In mid 1989, however, the new Water Users' Association started to work, it began cleaning the canals of El Operado. By 1990, it also started to participate in water distribution. As we saw in the foregoing chapter, in 1988 the head of the El Grullo District launched the formation of the association. During March and April, meetings were organised in all *ejidos*, where the new project was explained, and delegates elected.

After the last *ejido* meeting, in May 1988 the constitutive assembly of the association with the newly elected delegates was celebrated. During the meeting, Engineer Velazco, a senior official from SARH office in Guadalajara (involved from the outset in the El Grullo association), proposed to elect a working committee which would write up a draft of the association's charter. Only when the general assembly had accepted it, could an executive board be elected. The delegates agreed and the working committee was installed. The working committee met five times during May and June 1988, to draft

the charter of the water users' association. This was the first concrete activity in which farmer representatives were involved. The manner in which this committee found a way of working was to influence subsequent events for the Water Users' Association, since later three of its members were elected onto the association's board. I will not describe in detail how the five meetings developed. A short conclusion suffices.

#### *The working committee*

The committee consisted of six farmers; four are *ejidatarios*, two private landowners. The two youngest have attended university. Two others have much administrative and political experience (one having been, among other things, director of the local Agricultural Credit Bank, the other having been mayor of El Grullo). Another farmer owns several shops. Only one farmer seems to come closest to the average water users with simply 8 hectares of land and some experience on the board of his *ejido*. Of the six committee members, two control (much) more than 30 hectares of irrigated lands.

The five sessions of the committee were principally about definitions: not only to define the charter, but also, at first, to define what the meetings were about, and, how the relationship between water users and District officials would be reshaped. From the outset it became clear that the water users of the committee were at a disadvantage. They had to work out something for which they did not have the relevant detailed knowledge. This gave rise to a feeling of uncertainty. However, they soon grasped the only 'handle' they were offered, the charter of the El Agua water users' association. With it, they were able to do their work without having to question again and again what it was they were doing. The El Agua charter played such a prominent role in the meetings, that it in fact hindered a clear vision. The language used in the charter is formalistic and academic, this did not help matters. The charter induced a process of 'distancing', the more the farmers got into the El Agua charter, the more they got away from El Grullo, and the practical question of how to get the association started. The fact that they used the El Agua charter as a blueprint created formalistic discussions, endlessly repeated, concerning the relationship between the association and the *ejidos*. These discussions were not clearly resolved. One may ask: was it necessary to discuss such formal rules so prematurely.

Another problematic feature of the working committee was that the members maintained little contact with their constituencies: the other delegates and the common water users. No feedback discussions with groups of delegates or water users were held. The other delegates and water users were not consulted to help define criteria underlying the new charter. The committee members consequently tried to make the best of it on the basis of their own criteria.

The meetings revealed that the District engineers, and especially Engineer Fuentes, were not willing to contribute positively to the association's formation. Their attitudes were in fact obstructive. The farmers were not well enough equipped to counteract these effectively, although they did display some cunningness in circumventing pressures exerted by the engineers. Forming the association implied a major shift in the existing relationships between the functionaries and the farmer leaders. Although the meetings were often tense, they did not adequately re-define this relationship. What can be said

is that the uncertainty the farmer-leaders experienced was to some extent also shared by the functionaries: their position was questioned by the very fact the meetings took place at all. The uncertainties created an ambiguous atmosphere at the meetings. Farmers tried to define in as much detail as possible their own positions, whilst the functionaries seemed eager to restore their status by creating confusion and vagueness.

In this diffuse situation, the farmer representatives tended to work on their own initiative and in isolation from their constituencies. Later when the association's board was elected and began to work, they adopted similar attitudes: the link between the leaders and their followers remained problematic. In their zeal to work out a charter which was adequate for the new association, the committee members became involved in a tenacious struggle with the engineers, forgetting their own position of power derived from representing hundreds of water users. It was only at the end of the last meeting that they referred to this fact. Shifting the entrenched positions of the two major groups seemed impossible through formal rule making. Especially when one of the parties is simply not prepared to give in.

#### *The executive board elected*

In November 1988 the District engineers finally organised the association's second assembly of delegates. Not, however, until various farmer leaders and officials of government institutions put pressure on the District head to proceed with the association's formation. The District sent an invitation letter outlining the assembly's agenda to all the delegates. There were two points on it, first, the association's charter and second the election of the board. During the assembly, the drafted charter was read aloud and agreed upon without discussion. Then, after a very chaotic discussion on how to elect the board, it was decided to vote secretly and with ballot papers. Six delegates were elected onto the board, which consisted of an executive committee (*mesa directiva*) with a president, secretary and a treasurer and a control council (*consejo de vigilancia*) with the same composition. Together they formed the executive board.

Out of 31 possible candidates, only 9 names were offered to the vote. Of the six persons elected, four lived in El Grullo and two in Autlán; not one was from a rural village. Furthermore, although the private land holders only formed a small minority in the association (4 against 34), they had half of the seats on the board. Three of the elected board members belonged to the economic elite of the valley, and two of the remaining three are also quite 'well-to-do'. Don Teodoro, the favourite of Engineer López García, head of the District, got elected president.<sup>9</sup> It was of course the *políticos* who were elected onto the board. Not one of the board members could be considered a 'common' water user. This is hardly surprising. What is remarkable is that the board integrated an interesting range of *políticos* with different power bases and qualities. The board appeared to be ideally composed and quite well-balanced as far as it was concerned with the political affluent. In retrospect, it is tempting to rationalise the board's composition in the following way (table 8.2). The president of the executive committee was chosen because of his close relations with the District head, but also because of his administrative and political experience. The executive's secretary was elected because of his dynamism, his administrative experience and his technical

Table 8.2 Board members, their assets and administrative experience; it is indicated which members were also on the working committee that drafted the charter

position	name	ejido?	land	committee	group	political or administrative experience
<b>mesa directiva</b>						
president	Teodoro	yes	10 ha	yes	lópez	ex-bank director, head of traffic police
secretary	Salvador	no	>30 ha	yes	grullo	secretary CNPP sugar cane growers association
treasurer	Fidel	yes	8 ha	no	corrales	secretary ejido, deputy mayor of El Grullo
<b>consejo de vigilancia</b>						
president	Angel	no	20 ha	no	grullo	ex-canalero
secretary	Zacarias	no	>30 ha	no	lópez	several administrative positions
treasurer	Bernardo	yes	8 ha	yes	corrales	ex-mayor El Grullo, ex-pres. of ejido

knowledge as an engineer. The president being from Autlán implied that another *ejidatario* from El Grullo would be elected onto the executive committee, in this case the treasurer. The president of the control council had much practical experience with canal maintenance and he knew El Operado's infrastructure better than anyone else, since he had worked for 26 years as a *canalero*. The secretary was chosen because of all water users he probably had the best contacts, with most easy access to both the Jalisco political centre and further afield. Finally the treasurer was chosen thanks to the powerful leader of the sugar cane growers. To reconstruct the board's election in this way suggests that everything was orchestrated beforehand. This is in fact not what happened; during the secret ballot several forces had secured allies and competed with others. Three alliances could be distinguished: two groups around Engineer López García and Jesús Corrales, respectively, and a grouping of 'independent' farmers, mainly El Grullo based.

### 8.3 Changing practice through creating effective linkages

Between November 1988 (when the board was elected) and February 1989 much happened but little to do with the association. Nobody had confidence in the organisation. Even Engineer Fuentes appeared to have some second thoughts when, coming out of the January assembly meeting, he exclaimed:

"These people don't know! Look here: we [the engineers] had to organise the assembly, invite them. We! They do not take initiatives. The *ejido* structure has become useless. We have to think of

another way of organising them."

Would this organisation ever become a serious alternative for El Operado's management?

In December the new Mexican president was inaugurated, and at the end of that month the new ministers are announced. Also in December 1988, municipal elections were held, and Engineer López García was elected mayor of Autlán. In January, the annual *fiestas* of Autlán took all the association's president's time in his capacity as head of traffic police. In February 1989, the new head engineer of the El Grullo District was appointed: Engineer Ochoa, who came from the El Agua District. As we observed earlier, Engineer Ochoa had formerly worked under Engineer Chavez in the El Grullo District and it was he who came up with the idea of the Water Users' Commission in 1980. In 1989, he started to revive again the newly formed association.

### A new beginning

The first thing the new head engineer does is to formalise the official organisational structure of the District, which meant that the heads of the operation and the maintenance department (Corona and Fuentes) were stripped of their powers. Responsibility for both water distribution and the maintenance of El Operado is transferred to the head of the Autlán area office, Engineer Acosta, an old friend and colleague of Engineer Ochoa.

At the beginning of March, the association's board met with the new head engineer for the first time. During the following months, Engineer Ochoa put a lot of energy in to stimulating the board of the association to work. He urged them to visit the El Agua irrigation system. The association's charter was again revised (on the basis of the newest charter of El Agua association). Engineer Ochoa furthermore demanded that the distinction between executive committee and control council be removed and that the six board members work together on the executive board. He helped the board prepare the monthly assembly meetings. From then on, it was the board's president who presided over the assembly of delegates, and not a District official.

On March 30th, an assembly of delegates was held. The association's president introduced Engineer Ochoa to the delegates. He also informed them about the actual changes within the District, and explained that subsequent requests for canal maintenance from a water user to the District, should only be considered if the delegate in the association supported the user's request. The written request must be signed and delivered to Engineer Acosta, head of the Autlán area office and not to Engineer Fuentes. Bernardo then informed the delegates about the board's excursion to the El Agua irrigation system, and how its association functioned:

"The president of the El Agua association insisted and kept on insisting telling us: 'when we received the irrigation system, SARH did not give us one screwdriver'. Thus, they made us understand that for them it was not a fancy nor an opportunity nor a present which they received from the government. Also they explained to us, *señores*, the needs they had: field ditches, canals, lateral

canals, all were totally silted up. There were canals normally carrying 20 irrigations which, they told us, hardly could bring two. [...] With these canals silted and lacking an adequate water distribution their crops were suffering. So, when they started organising, as I said, it was not because of an opportunity but it came from the need to survive. Either their irrigation system would be finished or they would take up the responsibility. They explained to us that after having organised ejido meetings, they agreed to make a plan of necessities. They made it, analysed it, saw what it would cost, and gathered their delegates and said: this it will cost to start working. But because they paid a water fee of three thousand, three thousand!, pesos per hectare, they said: with that we stay as we are. Analysing this, I would like us to really understand (*compenetremos*) this, because this is the heart of the matter: with the three thousand pesos the things will get even worse because everything has become much more expensive. And the first leap they agreed upon was to..., at how much engineer? It was ten thousand. Which means they multiplied it three times! Please correct me if I am wrong. For me, this impressed me much, and what I am telling you I bear not in my head but in my heart. They made this three-fold increase for the first time because they needed to buy trucks because they had bad roads, bad drains, bad canals, bad deep-wells. And so did they equip themselves. I want you to take it in your minds and talk at your [*ejido*] meetings about the situation these people are experiencing, they showed us their good intentions (*buena voluntad*), and it is worthwhile to think how we are going to equip ourselves. So, they started equipping themselves, and the next year they increased [the water fees] to over 40 thousand per hectare and at present they pay over 80 thousand pesos."

With this speech, Bernardo was able to capture the interest of his audience, colleague farmers, through translating an experience into a convincing discourse. He exaggerated where necessary. Bernardo was genuinely enthusiastic about the El Agua association, and convinced they could do it in El Operado. Energetically he tried to transmit this to his audience. After the speech, the assembly of delegates formally decided to take over the responsibility of canal maintenance of El Operado from the District. Only a month after his arrival in El Grullo, Engineer Ochoa seemed to have revived the association. With his enthusiasm he was able to inspire the board members. These members, in turn, tried to energise the delegates, as did Bernardo, in his colourful speech.

During April and May 1988, the District engineers held tedious discussions with the association's board on how to get started with the maintenance task. One of the major problems concerned the existing financial arrangements. The water fees of the 1988/89 irrigation season had already been paid by the majority of water users. However, the fees had not been adjusted in August 1988, so water users had paid the same fee as in the 1987/88 season. Due to the inflation Mexico experienced, in real terms the fees were very low, and they covered only some 30-40% of the running costs of El Operado for the 1988/89 season. By May 1989, the maintenance department had spent 50% of the collected fees. The remaining budget was just enough to cover the expenses of water distribution. Where was the money to come from with which the association could start cleaning the canals between July to December 1989; the period with expected highest maintenance needs?

Engineer Ochoa came up with a practical solution: define an additional water fee on the basis of the required budget; the old water fee being used to cover operational costs (still executed by the District), and the new fees forming the association's maintenance budget. The water users would pay the additional water fees to the administration department of the District (as yet the association did not have a proper administration),



and this department then would hand it over directly to the Water Users' Association. Ochoa's proposal was accepted by the board. New fees were calculated and the board expected to collect 300 million pesos (some US\$ 110,000), which was envisaged to be enough to complete all the maintenance tasks for July through to December 1989.

The association needed machinery and personnel for cleaning the canals. So in May 1989 all machines of the District involved in El Operado's maintenance (2 draglines, 2 bulldozers; 2 hydraulic excavators; 1 grader; 1 dumper and 1 pick-up) were officially handed over to the Water Users' Association, which were held for use on a permanent loan basis. The board decided to pay the District personnel operating the heavy machines an extra salary on top of the government salary which they still received. Moreover, the association got its own office, in one of the buildings of the District. With the Association having its own budget (by May 30th, the association had already collected 12,500,000 pesos out of the water fees), the machinery, and its own office, the conditions were created for existing practices to change.

#### Cleaning canals: three practices change

During May 1989, the maintenance needs were inventorised in detail. The board gave the association's delegates the responsibility to define maintenance needs along the canals of their constituencies. Then, the board, aided by the District engineers calculated the detailed costs of the required work. New water fees were fixed on the basis of the required budget. The required work, the budget and the proposed new water fees were presented to the assembly of delegates (they got photocopies). The delegates were informed how the money would be spent, and although they thought the new fees were high, they wanted all canals to be cleaned, and accepted the fees (for example, the fee for sugar cane was fixed on 70,000 pesos/ha; farmers had already paid the old water fee of 29,000 pesos, so they were then left to pay an additional 41,000 pesos). This change in the way the water fees are established, shows how practices change, compared to how the commission functioned: delegates establish the water fees on the basis of detailed cost estimates. If they want to lower the fees, they have to specify which canals or drains to leave outside the cleaning programme. Furthermore, the delegates now have information with which the association's expenditure can be checked at the end of the season.

The water users who want maintenance work to be carried out on a particular canal have to report this to his/her delegate, who submits it to the association's board, by filling in a requisition form. Any water user going directly to the head of the maintenance department (as was the normal practice) is turned down, since this department no longer controls the maintenance machinery. Farmers going to the Autlán area office, in charge of managing El Operado, to request for maintenance services, are categorically turned down by Engineer Acosta, and are told to refer to their delegate. Apart from the six board members, who do the bulk of the management work, the ordinary delegates also have a clear-cut responsibility. The result is remarkable: the responsibility boosts the delegates' morale and puts them into a position whereby both

the association's board and the water users start to take them into account. The delegates not only take note of maintenance needs, but also monitor whether the work is done properly. By introducing a procedure for making requests and installing a (visible) control mechanism, the informal and ad hoc way of handling maintenance work (see chapter 5) is abandoned, and a second practice is altered.

At the end of the year it was concluded that canal maintenance was performed satisfactorily according to both farmers and the *canaleros*. The association had cleaned more canals in less time, and with only half the budget when compared to how the maintenance department of the District did it the previous year. In January 1990 the association presented its balance sheet for the period between May to December 1989. It had collected over 300 million pesos. It spent 200 million (125 million on canal maintenance and 75 million on office equipment), and had built up an acquisition and machine maintenance fund of over 100 million (approx. US\$ 36,000). Part of it was used to acquire two pick-up trucks and two second hand tippers. It appeared that through cleaning part of the canals by hand, a saving of 20 million pesos was achieved. The balance sheet furthermore revealed that the hiring out of machines beyond El Operado for private persons and institutions had generated some 50 million pesos of extra income (US\$ 18,000). Here a third practice has changed: machines are no longer used solely as personal assets.

In a short time some fundamental issues were settled: the new organisation was respected by District officials, it had its own office, and more important, its own budget and assets (such as heavy machinery). All of which are important preconditions for such an organisation to start functioning.<sup>10</sup> Furthermore, important officials have visited the association; firstly the director of SARH Jalisco in August, and in October the Jalisco governor. This notwithstanding, the association was not able to change two other important practices. First, the association's board still depends on the District. Not only for technical and administrative support, but also financially. This dependency comes from two sides. The board still lacked the skills and experience to work independently, but the head engineer of the District did everything in his power to support the board. The Water Users' Association, he saw as his own personal project, which had to succeed. He used every opportunity to strengthen the organisation, and thus he also supported the association financially, by providing operators for the heavy machinery and their salaries, and by providing free repairs and fuel. This implied that the balance sheet of the association as presented in January 1990 did not reveal contributions from the District of over 200 million pesos, or 60%.

The second practice that remained concerns the relationships both within the association (between board members and delegates) and between the association as such with the water users (i.e. the relationships between delegates and water users). These remained feeble.

### *Weak linkages*

The two board members that remain crucial for the daily functioning of the association are the secretary of the executive board and the president of the control council. The former is a civil engineer by profession and has ample experience in managing

organisations, the latter, a retired *canalero*, knows El Operado as few others and has had much experience with executing and managing canal maintenance by hand (during the 1960s and early 1970s). Both board members have been able to learn fast and quickly.

Farmers remained sceptical about the new organisation, although most were satisfied with the canal cleaning during 1989. Farmers, however, still feared that within a year or two the board, the delegates and the District would return to their former practices. The farmers' scepticism was strengthened by the way they were informed. The delegates hardly involved their water users in discussions concerned with basic decisions. Instead they informed the water users afterwards, if they informed them at all. This is much the same as how the defunct commission used to function. The delegates themselves were duly informed by the board but hardly any discussion took place during the assemblies. These assemblies continue to be a unidirectional information flow from the board and District engineers to the delegates with no clear decision making procedures to follow. The board members were energetically involved in getting the association started. In doing so they become close to some District engineers, while becoming more estranged from the delegates, who look on.

During assembly meetings, board members still tended not to give reasons for certain decisions made, but rather played on the sentiments of the delegates. When during the February 1990 assembly new water fees were discussed one delegate was very persistent in asking for more detailed information on the estimates of the proposed budget. Neither the board nor District engineers answered the question satisfactorily, but the delegate insisted. Then, the board's president said: "We are only doing what the assembly agrees. We only pay those who are really working. And we need the confidence of you, the delegates, to go ahead."<sup>11</sup> This was a power play: who of the delegates would openly dare to question the intentions of the board?

The Water Users' Association had started to break with current practices of favouritism and personal gain, exemplified by new procedures to identify maintenance needs. Some moves were made to give the delegates a more prominent role in the organisation. This improved somewhat the delegates' involvement during assembly meetings, and it also stimulated contact with their water users. But these links remained most precarious. The association was a formal organisation, and as yet it did not appeal to, or connect up with another set of existing practices of farmer initiatives, and cooperation at field level.

#### *Putting new linkages in place*

In September 1989, the association having acquired some experience with maintenance, felt confident to participate also in water distribution. This was prompted by the water shortage which struck El Operado. The association decided to allow only the perennial crops to be irrigated, and these to only receive three irrigation turns (one in December, February and April). All annual crops were forbidden. To effectively control water distribution, Engineer Ochoa realised that intensive vigilance was needed, and that water users could be instrumental to this end. In discussions with the association's board, Engineer Ochoa and Engineer Acosta decided to post a District extension worker to

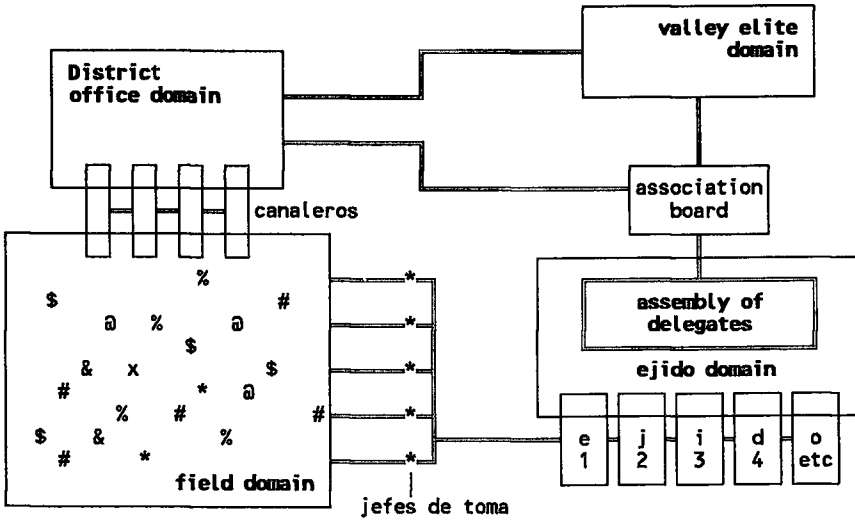


Figure 8.2 Through the *jefes de toma* the water users' association has established a strong link with the field domain.

each *canalero*, and that along each canal, farmers were nominated to supervise water distribution, the so-called *jefes de toma*, or gate leaders. The extension workers should ensure that the gate leaders and *canalero* work together. A group of extension officers worked intensely during September through to November, organised *ejido* meetings and along each canal farmers were elected gate leaders. These gate leaders supervise areas which in most cases were a *potrero* (a group of adjoining fields of one *ejido* or in the hands of one or more private landowner). In some *ejidos*, the institution of the *jefe de toma* linked up with an already existing institution, that of *jefe de potrero*. The position of *jefe de potrero* thus becomes both concrete and practical with respect to water distribution. At the end of November this new organisational structure for water distribution was formally instituted in a general assembly of the association, whereby not only the delegates were present, but also all elected gate leaders, and, most significantly, the six *canaleros*. Each zone of El Operado had formed work teams (*equipos de trabajo*), each consisting of a *canalero*, an extension worker and two or three delegates representing the *ejidatarios* and/or private landowners for that zone. The gate leaders were entrusted to supervise water distribution at field level. The board's president explained why the work teams were formed:

"The work teams are instituted in order to prevent corruption as much as possible in this year of water shortage, which is to say that we do not want anybody to use his position to his own benefit, but instead serve effectively those we represent."

At the end of this most important meeting, when everything seemed to be in place for farmers to actively participate in water distribution, a new engineer presents himself as the resident engineer of the new local CNA office (*Comisión Nacional del Agua*) and says that from today it is not the District but the CNA who is in charge of El Operado.

With some rains in December, it was decided to postpone the first irrigation turn until January. When the first irrigation turn was distributed, the delegates and gate leaders were left aside. During the association's assembly in February, the president and other delegates criticised severely the CNA resident engineer for not having allowed the delegates and gate leaders to be involved in water distribution, as had been decided in November. The CNA engineer reluctantly gave in, and during the next irrigation turn, the new organisational set-up was successfully implemented on the left bank of El Operado.

### Conclusion

By establishing a new position (i.e., that of the gate leaders), the association seems to have established a crucial nexus with the field level. Apart from the formally elected delegates who link the board (and District engineers) with the *ejido*, the *jefes de toma* form the (so far missing) link between the association and the field. This second link makes monitoring the field situation possible (figure 8.2, compare with figure 8.1). Field staff (*canaleros*), board members and the delegates of the water users can be held responsible for their actions by the water users. Moreover, a canal-based form of farmer representation, for the first time makes it possible for the association's formal organisation to link up with other existing expressions of cooperation found at canal level. This is a fundamental change in the existing practice of water distribution: now water users at field level, *canaleros*, delegates and board members are no longer divorced from each other. The contribution of the first two actors to the organisation's work style and dynamic may be considerable, whereas the last two actors still have to come up with practical guidelines to implement water distribution at field level. This is what in fact happened during the first half of 1990. The association's president became less and less interested in his position, since the association gradually evolved into an institution implementing a practical task, making it less a politically important institution. The two members of the board with the most practical experience in administration and water management, the board's secretary and the president of the control council, do most, practical, work.

The association is now also involved in water distribution, which may have a beneficial side-effect. Farmers are keen on water, and they will not easily accept the mis-management and abuse of such a crucial input. With more water users becoming involved, they now may as well take an interest in how canal maintenance is performed. Since canal maintenance concerns many more resources (money and machines), this is where eventually most problems are likely to occur.

The success of the association depends heavily on its executive board. The water users see their leaders interact frequently with officials, and may question how far an

executive becomes absorbed by the District. The water users may doubt the association's real identity and where its boundaries lie. The executive may talk nicely during assembly meetings, but at the end of the day he simply has to perform in the field; cleaning canals, and ensuring just and reliable water distribution. Through establishing a strong link with the field, by means of the *jefes de toma* (gate leaders or gate keepers in more than one sense of the word: also in the sense of boundary managers, cf. Morgan, 1986:167), the association clarifies its mandate, reaffirms its identity and its boundaries and checks its executive. This strengthens the association, strength needed to cope with a new institution, the CNA.

#### 8.4 Decentralising irrigation: intervention and the practice of change

In this chapter we have analysed the two water users' organisations of El Operado. In the first section our focus was on the Water Users' Commission and how it functioned. It provided us with a base-line from which we examined the Water Users' Association, which replaced the commission. It appeared that the formal set-up of the commission was inadequate, and that it lacked clearly defined responsibilities and a mandate. It furthermore appeared that the attitudes of most farmer delegates on the commission were congruent with the formal powers of the commission: the delegates did what District engineers expected them to do.

In the second section we saw how water user representatives negotiated with District engineers about the association's regulations or charter, in a series of committee meetings. Compared to the now defunct commission, the association received substantial responsibilities, in particular with respect to canal maintenance. However, in these negotiations, water user representatives found themselves in a difficult position: not only because of the lack of cooperation displayed by the engineers, but also because they did not have a clear picture of what the association should become. The representatives did not consult other water users for advice. When they finally completed the draft of the regulations, it took five months before a second assembly of delegates meeting was held. In that November meeting, the draft was accepted without discussion, and the association's board elected. The board consisted mainly of politically influential farmers, all of whom lived in either El Grullo or Autlán. Not one of the six board members could be considered an 'ordinary' water user. Having said this, it nevertheless is remarkable that these six persons represent various 'currents' among the water users, and in this sense it is a rather well-balanced board.

From this second section it emerged that putting a Water Users' Association in place with a similar organisational set-up to the commission, and entrusting it with some responsibilities with respect to maintenance was not enough to make it work. The association faced the same fate as the commission. However, in the third section we saw how a new District head came and set aside the existing power core of the District (the

'triangle'). Together with a more cooperative engineer, the head of the Autlán area office who was now in charge of both operation and maintenance of El Operado, the head of the District succeeded in reviving the association, and within a few months the association was in charge of canal maintenance, and they were given the tools to do so: a budget, machines, personnel, and an office. The elected delegates were also involved in defining maintenance needs, approving new additional water fees, and checking maintenance in the field. Although it successfully complied with its task, the association still faced two major dangers: it still depended heavily on the cooperation of District engineers, and internally, the relationships between board, delegates and water users was weak.

The most recent step in the association's short history appeared to have tackled this last issue, through creating and installing a new position, that of the gate leader. The gate leader would supervise water distribution at field level, whereas delegates together with the *canalero* and an extension officer of the District would coordinate water distribution in each of El Operado's six zones. With this structure a crucial linkage between board and delegates on the one hand, and water users and *canaleros* on the other was put in place. One characteristic is that now water users who are involved in association affairs represent a stretch of canal rather than just an *ejido*. This provided an opportunity to break away from obsolete practices found within the *ejidos*, to redirect the association's lopsided/top-heavy organisational structure, and to concentrate on practical issues rather than on political wheeling and dealing.

Another characteristic results from involvement in water distribution, and the process of defining more clearly the association's relationship with the majority of water users. The association, in this way, also gradually defined its relationship to its productive resource (El Operado's canal system) more precisely. Having reached canal level, it is to be expected that the association link up with the farmers' expressions of cooperation and their initiatives found at field level. At field level, these scattered experiences have already led to farmers appropriating their canals. The association is gradually establishing a firm property relation with El Operado's infrastructure.<sup>12</sup>

Whether the new set-up of the association is viable for solving the other issue, that of the association's dependency on government institutions remains to be seen.<sup>13</sup> With the new CNA office in El Grullo, the association now has to work with less cooperative engineers whom they know so well.

### *The Association as an arena of negotiation*

The Autlán-El Grullo Water Users' Association is best described as an intermediate organisation as against a local organisation (Esman and Uphoff 1984; cf. Heijdra 1989), since it mediates between the water users and a wider (institutional) reality. This intermediate feature is further strengthened by the fact that the association has a two-tiered organisational structure: it is not the water users themselves but their representatives that constitute the association. In Mexico, sociological and political discussions about the mediation between local and wider forces have essentially focused on local and regional elites who derive much of their power through connecting the rural population to the wider regional and national economy and polity, and vice versa.

Originally, analyses focused on the role of *caciques* (local and regional bosses). Later, farmer organisations such as the *ejido* came into the picture as having partly taken over this crucial role in the mediation process (cf. Bartra 1980; Fox and Gordillo 1989:136-137). This, then, gives rise to the ambivalent nature of farmer organisations: they may defend the interests of the farmers, but they may also evolve in an instrument of manipulation for wider economic and political interests (Henao 1980:265). Fox and Gordillo (1989:137) conclude that 'the *ejido* is simultaneously a state apparatus of political control and an organ of peasant representation'. Facing this situation, farmer leaders themselves become a power factor to take into account. In the Mexican context at least, farmer organisations are often the arena in which different interests clash. This and the previous chapter leave little doubt about that. In the Water Users' Association of Autlán-El Grullo it appears that initially the wider institutional interests predominate over farmer interests, but that gradually a new equilibrium is found.

*Decentralising irrigation management: changing practice*

Getting farmers to clean their canals and administer their own funds necessarily implied a change of practice for the people involved: functionaries, farmers and their leaders alike. Shifting the burden of canal maintenance to farmers, was a fairly pragmatic government policy, because it faced a severe financial crisis. However, this 'shifting the burden' started a dynamic which in the end addressed the fundamental relationships between the major groups involved in El Operado.

It seems that interventions aimed at changing the organisation of a practical activity, such as canal maintenance, necessarily entail changes in practice, or the intervention fails. In the case of the Association, it appeared crucial that changes in the organisational set-up articulated with existing (informal) practices of the common farmers, and thus bridging two domains found in El Operado: the field and the office. For the first time ordinary farmers got a proper place in El Operado's arena.

Connecting the Association with existing initiatives, expressions, or covert actions of resistance provides a perspective. Because these farmer expressions are not in the first place political expressions (they might also be) but simply ways to survive and get enough water to their plots (cf. Scott 1985: 26; 30). For the Autlán-El Grullo Water User Association this implies a re-structuring of its organisation along canal lines, since for water users this is a more important 'practical' unit (the dimension along which most of their irrigation practices are organised) than the *ejido*. This has been partly attained through the institution of the gate leader. A further perspective could be to organise canal meetings in the *potrero*, shifting formalised interactions away from the playground of the happy few to the playground of the majority of the farmers, to an arena where they feel more self-confident.



## Chapter 9

### Irrigation, intervention and change: a conclusion

#### 9.1 Outline of the El Operado case

This final chapter attempts to tie together the findings of the foregoing chapters, beginning with an overview of the empirical material presented so far.

Three issues came into view from the account of agricultural and infrastructural development in the Autlán-El Grullo valley over the period 1850-1985 (chapter 2). First, throughout this period a marked inequality has persisted between entrepreneurs and small farmers. Despite the land reform, and despite the construction of El Operado irrigation system, which gave many small farmers access to irrigation water, most small farmers still see themselves as 'the poor' as against 'the rich' entrepreneurs, and indeed economic differences are still huge. Second, many people from the valley interpret the development of new infrastructure in terms of local control versus outside interference. This local - extra-local divide is intertwined with the first issue, the gap between the rich and the poor, since on various occasions outside actors formed a pact of convenience with particular factions of the local elite. Third, intermediaries and intermediate positions have been important throughout the agricultural development of the valley. This refers to the fact that often infrastructural development, and innovations or changes in agriculture coincided with the setting up of intermediate positions and of farmers' organisations, such as the *ejidos* and the Water Users' Association. These issues reveal a development dynamic, to which also the El Operado irrigation system is subjected.

Chapter 3 found that in terms of agricultural production and water distribution efficiency El Operado compares favourably to other irrigation systems. This might be attributed to the relatively abundance of water. Its infrastructure has some shortcomings which explains why each year many irrigation canals are silted up at the beginning of the irrigation season, which poses a problem both for water users and for District personnel.

The *canalero* or water guard is the actor who ensures that water is distributed effectively (chapter 4), even though the District's organisational chart does not acknowledge his central role. Adequate salaries, together with checks and social control by the water users, have facilitated that most *canaleros* perform their job seriously. The

fact that they are 'small boys' and stand closer to most ordinary farmers than to their superiors in the District offices, helps to explain why most farmers tend to accept their decisions. But this is only so, because the *canaleros* are technically competent, and have been able to translate the broad guidelines they receive from the District engineers into far more complex actions which account for the diversity found in the field. It is not that water guards simply *use* the physical infrastructure. Water guards have become part of the structure, and the structures have taken a place in their minds.

Farmers participate little in water distribution; they do not even feel the need to do so. In canal maintenance, this situation is quite different (chapter 5). Whereas in water distribution an effective link between the District and the field was established by the *canalero*, in canal maintenance a clear gap was found between the District's maintenance department and the reality that farmers encountered in the field. Farmers 'participate' in cleaning the canals because they have no other option, thereby mobilising social networks present at canal level. This is not a self-evident affair, since among farmers distrust exist, and initiatives to undertake joint actions are often received with suspicion. The emerging practice of farmers' cooperation, however, has far-reaching consequences for the way they perceive the irrigation system. Gradually, groups of cooperating farmers appropriate the canal infrastructure, thereby changing the relationship they maintain with fellow farmers, with District officials and with the canals.

Within the operation department of the District a set of formal procedures are followed in order to produce the annual irrigation plan (chapter 6). The plan supposedly guides the decisions by District engineers concerning water distribution, and defines the water fees farmers have to pay. The plan, however, seems to have little relevance during the irrigation season, since water guards are simply not aware of it, and District engineers prefer to consult only the graph with planned water releases from the storage dam. Rather, the formal procedures rather function as cover ups for the discretionary power the chief engineer of the operation department has in deciding the level of the water fees, and for the actual negotiations that occur concerning access to sugar cane.

A meeting where District engineers try to get the irrigation plan accepted by the water users' representatives revealed that farmer participation in management decisions concerning El Operado runs counter to the existing culture and practices of engineers, farmers and their leaders. The District engineers are in fact not willing to let farmers participate in management affairs, and neither are the farmers prepared for it. From the chapter it appeared that the physical setting within which people originating from different worlds negotiate with each other may highlight 'hidden' aspects of the relationships these groups maintain.

Chapters 7 and 8 tried to capture the changes that took place in El Operado's management when faced with a series of interventions with respect to water users' participation. The three interventions reviewed in chapter 7 showed that actors at local, state and federal level were important in shaping the implementation of these interventions. The three interventions focused on the formal organisational set-up of El Operado's management, and were geared to the interests of particular factions within El Grullo District and SARH. Farmer participation in El Operado remained feeble, and

the interventions failed to bring about more fundamental changes in the practices of the various groups of people involved. The dynamic of each intervention could be described through the encounters and social interactions that emerged, but also by appreciating the fact that some groups of actors were excluded.

A focus on the internal processes within the water users' organisations revealed that the now defunct Water Users' Commission did not function properly because it was in fact a lame organisation; but also that the new Water Users' Association experienced problems, even though it had a budget, an office, a written charter and a governing board (chapter 8). When farmer representatives and ordinary farmers acquired more practical roles to play in canal maintenance and water distribution, the stage was set for practices to change.

The above forms the core of the case material on El Operado. On the basis of this material I now wish to explore how people's practices and their interactions relate to the physical infrastructure and the formal organisation of an irrigation system, and how the organising processes change over time in the face of outside interventions.

## 9.2 Organising processes and the canal system

### *Irrigation prompting social interactions to emerge*

Soon after its construction, El Operado became fully embedded in the valley's social reality, and in the antagonisms between small farmers and rich entrepreneurs, and between local people and outsiders. The issue of intermediate organisations appeared so important that I have dedicated a great part of the thesis to it.

El Operado's lay-out has certain technical features which influence the way the system is operated. The design did not take into account the existing organisation of land tenure. Canals cross-cut *ejido* boundaries, and most secondary and tertiary canals feed plots belonging to different *ejidos* and private landowners. Moreover, the design lacks clearly defined and more or less uniform (in size and organisationally) hydraulic units or tertiary blocks. This implied that (informal) farmer organisation at tertiary level emerged only slowly. The incongruence between *ejido* and hydraulic units also affected the formal organisation of water users, in particular the Water Users' Commission.

It is perhaps no coincidence that the water distribution method adopted in El Operado left farmers relatively free to make their own farm decisions with regard to crop choice and irrigating, since the local elite would not have easily accepted rigid water distribution schedules fixed by District engineers who are conceived of as outsiders. The on-request delivery system, made possible by an irrigation infrastructure characterised by adjustable gates and orifices, had two implications: first, it enhanced the individualisation of farmers and inhibited farmer cooperation at canal level, and second, it put a burden on the field staff who had to operate these structures. The *canaleros*, however, have been able to provide a service well-tailored to the individual

needs of plots, crops and farmers. The *canaleros* developed practices that were prompted by the possibilities and constraints the infrastructure posed, and that had to operate at the centre of a social reality characterised by a District that was hierarchically organised, and by differences that existed among water users themselves. These differences are exemplified by the distinction between small and big farmers, a distinction which more or less follows the division between *ejidatarios* and private landowners, and the distinction between farmers growing sugar cane, who are strongly organised into two grower's organisations, the companies that grow and export horticultural crops, and the farmers producing traditional food crops, who are not organised at all. To make things more complex, some of the big landowners are closely related by family ties to some District engineers.

Canal maintenance created more serious problems to the users than water distribution. Institutional rules inhibiting staff from providing an adequate maintenance service, and the heavy machinery of the maintenance department being an economically valuable resource, formed the background of the type of practices found in the maintenance department that differed from those in the operation department. A striking lack of accountability of District staff to their clients was identified. Farmers' initiatives to clean the silted canals themselves resulted gradually in them viewing the canal structures as their own.

In conclusion, El Operado's irrigation system has prompted different groups of people to develop particular practices with respect to the system. These different practices emerged out of a need to coordinate actions in the system where different groups of people are knitted together through the use of one common resource, and in particular through the need to secure access to that resource. It emerged that many practices of people bore a tense relationship with the formal rules supposedly governing El Operado's management.

### *The formal irrigation organisation*

The formal organisation of El Operado does little justice to the complexity of water distribution. Some District engineers have difficulty in acknowledging the role of the *canaleros* in it, and seem to think that they themselves are the ones defining the irrigation plan and eventually the way in which irrigation water is distributed in the field. The organisational set-up also fails to appreciate the *canaleros'* crucial role: it is assumed that they pertain to the lowest echelon of the District, merely receive orders, and simply do what they are told.

Neither does the formal organisation do justice to the specific problematic of canal maintenance. The institutional arrangements made to cater for the peak demand of canal maintenance during August through November seem inadequate, but more importantly, the division of operation and maintenance into two separate departments, and the lack of an institutionalised feedback from the water users, make the department unaccountable for its performance.

The formal organisation of El Operado, then, appears to be a neat model, but is inadequate for the actual management demands the system poses. In order to arrive at conclusions for an improved organisational set-up, it is necessary to consider the social

dynamic as encountered in El Operado, and to attribute agency to the persons involved in El Operado's management.

### *Organisation and the social reality*

In El Operado, particular patterns of interaction and social practice are found in different settings or, as I called them, 'domains'. Domain is a concept which emerged from the empirical material, but also helped to bring some order to the field data and thereby assisted in the analysis. The concept of domain conveys the idea of a spatial territory, and this is how people themselves see it. However, people develop practices in their domain, and ideas on values and attitudes, that differ from those found in other domains. People then, may even derive their identity from the domain in which they operate. Hence, the existence of different realities in the field, in the District offices, and in the domain which I called the '*ejido* domain', to be distinguished from the domain formed by rich entrepreneurs, which can be called 'the domain of the valley elite'. These are the four domains of the major groups of actors involved in El Operado. and they exist separately from one another.

Farmers often seen working in the field view the field or *potrero* as their territory, they themselves or their fathers having fought for the land they work, which forms the cornerstone of their economy. It is also the realm of the burning sun, mud and muscles. The story of the silted canals most clearly shows a particular social dynamic at canal level. Farmers with plots along one canal are knitted together through multiple relationships, which enhances the possibilities for joint action. The initiatives by individuals to organise group actions are, however, often looked upon with reservation if not suspicion. In the canal I examined in detail, the emergent group initiative became lasting in character since later also other activities were undertaken, and gradually transcended formal boundaries between different *ejidos*. Through their own actions, farmers domesticated their canal, and even suggested that they would not allow the District officers to enter their *potrero*. The 'field', then, emerges as the territory of the water users, the domain where they and they alone determine the language they speak and the values that underlie their actions.

The field's counterpart is the 'office'. The office is the domain of the District engineers. There, it is the engineers who determine what language is spoken, and how others are received. The engineers who may use the spatial organisation of the offices to their advantage (recall how the maintenance head let farmers wait in the corridor). Spatial arrangements in the District office reflect in part both the formal and actual relationships between officers. In the operation department we saw how some things are arranged openly, like the making of the irrigation plan. Other things are done more covertly, behind closed doors, for example, fixing the water fees. The differences in practice found in the operation and maintenance department are partly exemplified by the neat technical drawings hanging on the walls in the maintenance department. The operation department by comparison looks shabby and forgets to provide any display. It seems that, whereas the operation department works, the maintenance department is busy to show that it works.

An examination of the attitudes of farmers' representatives in the Water Users'

Commission led to the definition of a third domain, which we might call the 'ejido domain'. The relationship between water users and their representatives or leaders appeared problematic, which is also a characteristic of the functioning of the *ejido*. Since the representation of water users in the commission follows *ejido* lines, the same problem surfaces in the commission. Leaders are viewed with suspicion, and we saw how ordinary farmers, by using a certain vocabulary tended to create boundaries between 'their' domain and that of the leaders. In the commission, there was no mechanism that made water users' representatives accountable to their constituencies.

The relationship between members of the Water Users' Commission and the District engineers also appeared strained. The engineers were not willing to let the commission participate in decision-making. Since the commission did not have any formal powers, it could do little else than engage in petty discussions and benefit from the lavish parties and small favours of District engineers.

### 9.3 Power effects in El Operado

*"que el poder era como una vara ardiendo, que habría que soltarla a tiempo, si no corría el peligro de quemarse.."* (Castaños 1987:81)

One of the major problems of El Operado's organisation is the gap that exists between on the one hand, the field domain, and the domains of the *ejido* leaders and the District offices, on the other. Different realities coexist alongside each other, people have made images of others, and many of the actions people undertake are reinterpreted by people from other domains to fit these images. The story of the Water Users' Association revealed that it is possible to change the formal organisation through establishing new linkages between the domains, and that the new interactions that emerge may not only improve the effectiveness of the management (in terms of coordination of activities), but also help to change the actions and attitudes of people, which may lead to new practices.

Before spelling out in more detail how this process of change developed, it is worthwhile to consider the issue of power in El Operado's management. The theme of power in irrigation has received the attention of authors, such as Wittfogel (1981) and Hunt and Hunt (1976). However, the concept of power is extremely difficult to define, and it is still more bothersome to pin it down in a practical manner. Here I am concerned with those irrigation situations which clearly have a 'power effect', however vague this term may be. In the foregoing sections it was argued that the canal infrastructure exerts some structuring influences on the way people act. This is one kind of power effect found in irrigation situations. Another is that people with different resource bases and often opposing interests also have an impact on the way El Operado is being managed.

Some authors have argued that irrigation systems require discipline, and can even

result in despotism (e.g. Wittfogel 1981). Others maintain the opposite, holding that introducing irrigation is facilitative and likely to increase agricultural production. The truth, in my view, lies in the middle: irrigation water itself is not despotic but enables farmers to increase agricultural production. However, for it to become productive, the coordination of activities and a certain degree of discipline among people is required. Consider the following view on power in an institution:

..the disposal of its space, the meticulous regulations which govern its internal life, the different activities which are organised there, the diverse persons who live there or meet one another, each with its own function, his well-defined character - all these things constitute a block of capacity - communication - power (Foucault 1982: 218).

Although this is not a text about irrigation, we may follow Foucault, and consider an irrigation system to be much like for example an educational institution. The 'capacity-communication-power' block can be recognised in the case of the users of lateral 2 (chapter 5). First, some farmers realised they had the capacity to do the job, i.e. to construct a new intake structure of their canal; then communication became important: not only meetings of farmers were organised but also a variety of institutions were approached; finally it resulted in an adequate new inlet structure, the problems of water shortage were solved, farmers were satisfied about their achievement and were thinking of denying District engineers access to their canal. Certainly some power effect was accomplished. In the case of canal lateral 2, farmers became actors. Here we see that 'organisation' and 'agency' are interrelated (Clegg 1989:188).

#### *Controlling space: the power of management*

People act and interact in time-space settings (Giddens 1987). The setting partly contributes to these actions, and thus influences behaviour, as much as people construct those settings (cf. Bourdieu 1977:90-91, Miller 1987:101). An irrigation system provides such settings and in these settings different configurations of interaction arise, which led me to identify a number of domains present in El Operado. It was concluded that there is a distance between the office and the field, not only in cultural and social terms, but also simply physically.

Much irrigation management is concerned with harnessing a relatively extended space (the field with its canal system). The question is how office people succeed in this. This has to do with a typical activity performed in the office: the manufacture of a 'summary representation actively constructed and pursued within micro-situations' (Knorr-Cetina, 1988:39). In the operation department the most quintessential summary representation was the Tacotán graph, with planned and realised water releases from the dam. Summarising, however, implies simplifying, disregarding heterogeneity and, ultimately, making equivalent what is fundamentally different, summing these up, and collapsing these into one datum. Engineer Corona generalises and simplifies, and in doing so he produces distance towards his field personnel. As was concluded in chapter 4, through documents, devices and drilled people (Law 1986), the engineer effectively establishes a kind of remote control over his field personnel.

Through the dull compulsion of their work, most *canaleros* can do little else then

to comply as best as they can with their task. As Miguel put it: 'to not follow the rules would make my work much more complex'. Although the *canaleros* may seem to be the victims of this control system, they have possibilities to devise their own summary documents (see the example of the photograph, chapter 4), instruct people, and exercise some remote control over their superiors. Here we return to Foucault: to grasp fully the relationship the *canalero* maintains with his boss, we have to attribute agency also to the *canalero* (Foucault 1982:220).

### *Power, patterns and images*

In different domains, different power effects are found. Whereas a peasant producer may feel quite comfortable in the field, he may lose this confidence in a formal meeting setting. Conversely, a farmer leader may feel uneasy when meeting *compañeros* in the *potrero*, where muscles rather than the mouth are respected and where locally specific knowledge about crops, soils and canals are more valued than detailed knowledge about how to survive in an institutional environment.

In the field, forms of interaction were concerned with the practical problems that water users faced, which coincided with a failing bureaucracy. In this manner, water users built up experience of small successes of initiatives and joint actions, but also learned to know the District better. These experiences become important 'points of reference' for future initiatives. For instance, when a farmer succeeded in cleaning up a canal with some *compañeros*, the next year, when a new problem presented itself, the experience of the former year would be referred to and used as a model for new actions. In this manner, events and interaction in the field domain became structured, and acquire a pattern, such that people's practices are linked together (cf. Knorr-Cetina, 1988:38).

In the office, another pattern was found. In a meeting with the Water Users' Commission, the engineers dictated the agenda, monopolised information and in the end the farmers' leaders always consented. The content of discussions in the commission often had little to do with irrigation and the field. For the vast majority of the water users the commission had little relevance, and they viewed it with suspicion. Never did local forms of mobilisation or cooperation in the field articulate with this water users' organisation, because the delegates were too far removed from their *compañeros*.

People anticipate the social patterns that exist. Engineers expect peasant farmers to behave in this or that way. *Ejidatarios* know how most engineers and their *ejido* leaders are likely to behave. Hence people construct images about other people. Some images are powerful, especially when such an image helps to structure new developments. As mentioned in chapter 7, farmers use an image to summarise their view on government functionaries: functionaries belong to *la engorda* (lit. the engorged one; as for fattened animals), a concept derived from the farmer's domain. With *la engorda* farmers define a (symbolic) boundary between the District engineers and themselves. When at one moment the engineers wanted to implement some change in El Operado's organisational set-up, they were forced to mirror themselves in the image that farmers had of them, before the latter would respond. Thus the power of the farmers lay in the fact that they defined the language that the engineers used to solve institutional problems.



### *Power and strategy*

Some people are more cunning at exerting power or can influence events more than others. This has something to do with the ability to design effective strategies. The strategic conception of power, which is heavily influenced by Machiavelli's writings, conceptualises power as 'the strategies and practices whereby, for instance, agents are recruited to views of their interests which align with the discursive field of force that the enrolling agency is able to construct' (Clegg 1989:17). Callon (1986) has developed a method to uncover the power effects resulting from people's strategies. He calls his approach the 'sociology of translation'. It is easy to apply his approach to one major event in El Operado: the creation of the Water Users' Commission, which highlights the strategising capacities of the engineers involved (see appendix 5; and chapter 7).<sup>1</sup> Recall how in 1980 the District head found himself in a very awkward position when he faced the sugar cane lobby. The process of translation started the moment his friend and department head got the idea of displacing their struggle with the sugar cane lobby and treating it as a struggle between 'the water users' and the lobby.

The story shows that the District engineers succeeded in inventing an actor (the commission), enrolling it and finally making it the spokesman of the engineer's interests. Through all phases, displacements and transformations occur. The engineers redefine interests farmers are supposed to have and shift the struggle to a new platform. They also bring the farmer representatives to the District office where discussions take place. In the final stage, it is the farmer representatives who transform themselves into spokesmen of the engineers, and displace the sugar cane lobby from the central position they occupied. Later, the engineers copy the strategy in El Agua. The success of the El Agua water users' association is carefully recorded by the engineers in a document, which they present at the annual conference of irrigation engineers, thereby projecting the story on a national level.

To translate is not only to displace but 'also to express in one's own language what others say and want' (Callon 1986:223). In this story there is a double translation, whereby the engineers first translate their problems into farmer terms, and then they let the farmers translate it, appointing their own spokesmen. (Ironically, some of these farmer delegates did not always understand what it was they were saying. 'We did not understand the engineers, and they did not understand us'.) Hence the engineers succeeded in bringing together quite separate worlds: that of the farmers, that of themselves, and finally also that of their colleagues scattered throughout the country. They provided one solution to this diversity of actors.

### *Conclusion*

The above review of some of the power effects found in El Operado could be considered arbitrary, since no firm or encompassing theory underlies it. Apart from the fact that as yet no adequate theory on power in irrigation situations is available (at least I am not aware of any), the aim of this section has been to discuss several situations or aspects where power issues are at stake. The types of power effects reviewed differ from each other in many ways. One type attributes power to artefacts, another to people having differential access to resources, yet another to people being strategists. One view

on power is that there is a finite quantity of power available, and that the game of power boils down to a zero-sum game. Another view is that power should be considered a capacity. From this perhaps disappointing or confusing picture which seems to lack consistency, it can be derived that power is not a straightforward phenomenon. This is probably why it is so overwhelmingly important, and yet so difficult to pin down. We also learn that when considering social change in irrigation systems, (1) micro as well as macro- aspects have to be taken into account, (2) both the system's material and social dimension should be studied, and (3) the social dimension should include both social institutions and social actors. Otherwise, a one-sided picture emerges, suggesting one type of power to be all-encompassing. This, in turn, leading to a too straightforward and too simple an understanding of irrigation development.

#### 9.4 Diagnosing irrigation management and an intervention strategy

The Water Users' Association that replaced the commission took over responsibility for maintenance from the District. This intervention restricted itself to the formal level (creating a formal organisation), and strengthened practices that already existed: in other words, engineers hardly involved water user representatives in decision-making, and, when they did, the latter did not bother to inform and consult their constituencies. When the association's board was offered adequate conditions (an office, a budget, machines, cooperative District engineers etc.) it got duly involved in canal maintenance. Although it successfully accomplished its task, there were two issues which remained problematic and endangered the association's future: its dependency on the District engineers, and the weak relationships between board members, delegates and water users. Hence the same old practices were still in place. The gap between the office domain and the field domain had not been bridged. As soon as the Association extended its activities to the domain of the field, ordinary water users were given a place in the organisation. Gate leaders were elected, who were to supervise water distribution along each (or part of a) canal. Ordinary water users are accorded a place in the Association, when that organisation extends its boundaries to include the field domain. Getting the farmers to clean their canals and administer their own funds necessarily implies a change in the practices of the people involved - farmers, their leaders and functionaries alike.

This points to an intervention strategy that focuses on the creation of linkages between 'domains' that formerly remained separate, thus making room for certain practices that exist at field level, and giving these a formal status through incorporating them into the organisation's formal structure. In this way, groups of actors acquire new responsibilities which are defined more precisely.

The Association's ultimate fate, however, is all but settled. Much depends on whether gate leaders and water users are able to exert pressure from below on the association's board, and whether water users keep a check on their gate leaders. Much

also depends on how the board and the delegates respond to this, and on how they are able to cope with the government institution now formally in charge of El Operado, the CNA (*Comisión Nacional de Agua*).

*Diagnostic tools for the analysis in irrigation organisation*

The study of El Operado provides a view of how social action and infrastructure are interrelated in one particular irrigation system. The results may be relevant to other irrigation situations, especially with respect to intervention strategies. In this study, interventions aimed at changing practical activities imply changes in social practice. This, in turn, implies changes in the irrigation system's organisational arena. In my opinion, the characteristics of the different domains present in irrigation systems and their interrelations are crucial not only for diagnosing the system's actual organising processes, but also for how possible improvements might be arrived at. I first want to derive some lessons for diagnosing irrigation organisations.

Someone diagnosing an irrigation organisation will have a particular reason to do it: the irrigation system may experience problems with water distribution or canal maintenance, the system's management may be negatively affected by a conflict between certain parties, or someone may have launched the idea of turning over responsibilities from a government agency to the users. The different reasons for diagnosing an irrigation system's organisation will determine which aspects will be considered. The outline for a diagnosis that I present here should be adapted to the specific aims and needs of each case. In general, then, a diagnosis would include:

1. A description of **practices** with respect to the main activities of the organisation; often these activities include water distribution, canal maintenance and strategic decisions concerning crop choice, irrigation applications and water fees.
2. An assessment of the different **domains** which co-exist; domains can be identified through the practices and social interactions that have been identified in particular settings.
3. An assessment of the irrigation system's **arena** and how it functions with respect to the main activities identified. The irrigation arena refers to the way in which actors from different domains come together with respect to the irrigation system, their relative positions, and the power resources they control.
4. An assessment of the **linkages** that emerge between the different domains, to detect possible gaps or disjunctions between them, and to assess strengths and weaknesses in the irrigation organisation.

If, for example, one makes a diagnosis concerning the practices of water distribution or canal maintenance, the practices can best be described through examining both routine acts and the problematic situations that emerge. Since these activities may cross-cut different domains, it is important to describe practices as fully as possible. The foregoing chapters suggest that four factors are relevant to the analysis of problematic situations. These are as follows:

- The **context** in which a problematic situation has emerged, which includes a description of the situation itself, the technical aspects that may be involved and a brief history of events related to that situation (compare chapters 2 and 3 in this thesis).

- The social interactions which occur.
- How different groups of people interpret the problem.
- What strategies people develop to overcome the problem.

When the material on practice has been gathered, it can be analysed along two lines. First, the different possible domains or fields of activities present in the irrigation system's organisation can be distinguished vis-à-vis different types of practice. Second, linkages between these different domains have to be examined and the possible disjunctions highlighted. This second step can be called 'interface assessment', since these linkages refer to social interactions between actors stemming from different social worlds or belonging to different levels in the institutional hierarchy (see appendix 6).

#### *An intervention strategy for irrigation organisations*

Intervention in irrigation organisation, as I envisage it, develops from the idea that one continues and stresses certain practices which are already present. It should make use of, and appeal to, existing experiences and initiatives found in certain domains. Such a view of intervention breaks with the more conventional model of intervention, depicted as

a discrete set of activities that take place within a defined time-space setting involving the interaction between so-called 'intervening' parties and 'target' or 'recipient' groups. Such an image (...) isolates 'intervention' from the continuous flow of social life and ongoing relations that evolve between the various social actors (Long and Van der Ploeg, 1989:4).

Since intervention, much like research activity, involves a learning process, it can never therefore be completely planned for from the outset (Bremner 1983:31-32; Long and Van der Ploeg 1989). In this sense the notion of 'planned intervention' is misleading. This also implies that the process of change cannot be controlled by any one of the actors involved. The type of intervention, which I have in mind, aims at changing irrigation practices and social interactions, through strengthening certain activities already present in specific domains while breaking down others. This approach is both concerned with continuity and discontinuity. It also takes seriously existing practices and informal patterns of interaction, which in some instances may provide alternatives to existing modes of management. This can be done in various ways. (1) It may be necessary to change the formal irrigation organisation and adapt formal arrangements to informal initiatives and experiences. This will be elaborated below. (2) Another possibility might be to attempt to change social processes outside the immediate realm of the irrigation organisation. For the Mexican situation, it may be relevant to attempt to change certain practices found within the *ejidos*. (3) Another way would be to choose a technical instrument in order to take away particular practices which negatively affect the system's management. For instance, in large scale irrigation systems decentralisation of management to lateral systems might imply technical adjustments in the type of division structures at the lateral system's intake. With respect to canal maintenance, also many technical solutions may also be found to diminish the silting up of canals, or to upgrade the organisation's capacity to clean them.

With respect to possible interventions on the level of the formal organisation, the

following adjustments might be considered:

- Defining new, or re-defining more precisely, ownership relations with respect to the canal system, and to its crucial resources (i.e. irrigation water and funds).
- Defining new, or re-defining more precisely, the responsibilities that groups of people have towards the system and towards each other.
- Re-organising the system's arena, through re-positioning the different domains.
- Establishing new linkages between the domains, or better, formalising informal links, while breaking with others.
- Adapting the settings of interactions.

If, for example, an intervention concerns canal maintenance, it is necessary to look in detail at how canal maintenance is undertaken in practice, to appreciate productive practices, while also detecting obstructive practices, and finally building a strategy upon the former (for instance through the type of diagnosis presented above). In this way an intervention can be defined in practical terms.

Interventions aimed at change do not come about automatically and are likely to be received with reluctance or opposition by some actors. This points to the need for outsiders who have formal powers to implement changes in the organisational structure of an irrigation system. For example, being in the position to constitute and formalise a users' association. Outsiders seem necessary since change implies new ways of seeing things. They may be instrumental in guiding groups of people to appreciate those self-evident practices that already exist, but may also provide perspectives for change. Such changes in practice may require new skills, which can be learned through training initiated by these outsiders. The outside interventionist, then, has an important role to play during a transition phase. In the end, however, it is the different local parties involved who have to adopt new practices and support institutional change.

## Appendices

### Appendix 1

#### Some data on climate, soils and crops of El Operado

##### *Climate*

El Operado is located at 20 degrees North Latitude, and has an elevation of between 900 and 950 metres above sea level. The hottest period is from April to September, with an average temperature of 26 °C (av. day temperature 32 °C; night: 20 °C), with absolute maximums exceeding 37 °C. January and February are the coldest months, with an average temperature of 20 °C, with warm days (just below 30 °C), and cool nights (11 °C). During one or two nights in January or February night-frost may occur. Average annual precipitation is 700 mm, of which 85% falls during June to October. The remainder, approximately 100 mm, falls during the irrigation season. Relative humidity fluctuates just below 90% during July-November, whereas in the months before the rains start (April and May), humidity drops below 70%. Wind-speed may build up in the afternoons during the months preceding the rains, April, May and part of June. Pan evaporation averages 1840 mm for the entire year, whereas for the irrigation season (November to June), evaporation amounts to 1320 mm. Only between July and September does precipitation surpass pan evaporation (figure A.1).

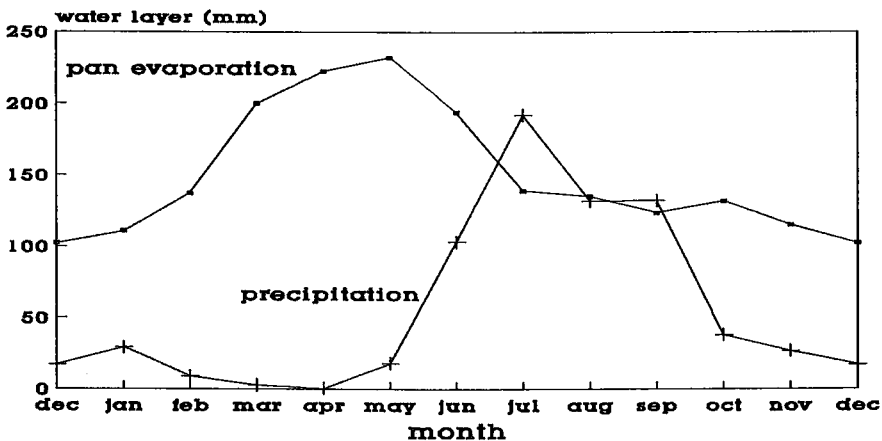


Figure A.1 Pan evaporation and precipitation in El Operado; 1980-1989.  
Source: Distrito de Desarrollo Rural, El Grullo

### *Soils*

Half of all the soils of El Operado are clay (silty clay, clay, clay loam). Many of the heavy clays are badly drained and may be waterlogged during the rainy season for several days or even weeks. Some of these soils have developed high salinity levels and some have sodic characteristics. Along the Ayuquila, high lying sandy river banks (*playas*) are found, covering 10% of El Operado. The sandy loam soils have very good internal drainage, and irrigating these implies high percolation losses, with seepage water draining to the nearby river-bed. The remainder of the soils (40%) fall within the loam/silt loam class. These are very productive soils, which have been intensively cultivated for more than a century. Levels of organic matter in topsoil of this type are higher than in the other soils (up to 4%).

### *Water availability*

El Operado receives water from the river basin of the Río Ayuquila, a tributary of the Río Armería. Thirty kilometres upstream of the head works lies Tacotán dam, which regulates the Río Ayuquila waters for El Operado. The dam captures the water from a 1,170 km<sup>2</sup> drainage basin. The volume of water that passes the dam in one year varies from 60 to 450 million m<sup>3</sup>, and averages 230 million m<sup>3</sup> (1958-1986). Of this volume, 95% reaches Tacotán during June to November. With its effective storage capacity of 140 millions m<sup>3</sup>, the dam fills completely in 60% of the years. The actual water need of the irrigation system (126 million m<sup>3</sup> in 1987/88 season) is met in 2 out of 3 years. Through cautious operation of the dam, at the end of a normal irrigation season some 15-20 million m<sup>3</sup> of water is left to the next season. This means that in fact only in 1 out of 4 years are there real water shortages. Water shortages may be alleviated by rainfall and river discharges during December to March (which happened in the 1982/83 and 1989/90 seasons). Extra discharges occur along the 30 km. separating Tacotán from El Operado (at head works, drainage basin is 2,530 km<sup>2</sup>).

### *Crop water need*

The crop needs for irrigation water at the field inlet vary from 660 to 1,500 mm, depending on crops and on soil quality. Sugar cane takes the largest share of water consumed (68% of all the irrigation water during the 1987/88 season). On the basis of available pan evaporation data, net irrigation need of 1290 mm for sugar cane was calculated. However, the District tries to limit the water consumption by cane. According to District estimates, sugar cane only receives 800 mm, in 5-6 irrigation turns from October through June. Data used by the District are not based on measurements at field level, so they must be interpreted cautiously. In practice, the number of irrigation turns as used by the District is often higher than estimated. Furthermore, it is not clear whether the data of table A.1 refer to the net available water at field inlet or the net available to crops. Since the irrigation efficiency as estimated by the District (55%) partly includes field application losses (chapter 3 above), I assume that the data also partly include them. The net available irrigation water to crops is probably some 10-30% lower.

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**Table A.1**      **Estimated crop water use; 1984-1988**

	number of irrigation turns	net water layer (mm)
annual crops (figures refer to one crop)		
tomato; melon	7-9	920 - 1130
other horticultural crops	5-6	650 - 830
maize	6-7	830 - 940
sorghum; beans	3-5	380 - 650
perennial crops (figures refer to entire irrigation season, October, 15-June,1)		
sugar cane	5-6	770 - 780
fruit trees	5-7	510 - 900
pasture	5-7	720 - 880
alfalfa	9-12	1220 - 1710

Source: estimated data from Distrito de Desarrollo Rural, El Grullo

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## Appendix 2

## Discharge fluctuations in the main and secondary canals

In order to assess how the canal infrastructure responds to flow fluctuations, the basic lay-out of an intake structure of a lateral canal branching off from the main canal will be discussed in some detail. First, some of the hydraulic properties of the main canal are given. At the head reaches of both main canals (right and left bank), the profile of these canals is as follows:

	right bank first 1,850 metres	left bank first 700 metres
slope (m/m)	0.0003	0.0003
bottom width (m)	3.00	3.00
side slope (vert./hor.)	1:0.80	1:0.95
max. water level (m)	2.30	1.90
design discharge (Q) (m <sup>3</sup> /s)	14.1	8.6
flow velocity (v) (m/s)	1.25	0.9
apparent k-Manning value (-)	60	50

The main system is currently working far below design capacity, which means that water levels are much less. Since the main system requires some minimum water levels in order to feed the lateral canals, radial gates in the main system are lowered so that water is backed up and water levels are maintained at an artificial level. This implies that real flow velocities are running around 0.5 m/s instead of 0.7 - 0.9 m/s when flowing freely. This also implies that water is stored in the main system.

*Lateral canals branching off from the main*

There are a few lateral canals branching off from the main canal without a radial-gate regulating the water level at intake. The rate of intake at the orifice fluctuates less than the discharge fluctuations in the feeder canal. This I will try to show below.

During a period of 40 days (with 30 discharge measurements), mean daily discharge fluctuations were calculated to be 130 lps, with an average discharge of 4,000 lps. It appeared that in the main canal (bottom width 2.5 m, side slope 1:0.80, canal slope 0.0003 m/m,  $kM = 60$ ), an increase in discharge of 130 lps (+3.25%) resulted in an increase in water level from 1.285 to 1.308 m, or of 2.3 cm (+1.8%). Suppose that at this point in the canal there is an orifice which feeds a lateral canal. Assume further that the orifice is not submerged and completely opened, and that its centre is located 35 cm above canal bottom. A steady 500 lps is running into the lateral. When the water level in the main canal rises by 2.3 cm, the discharge will increase to 506 lps, or by a percentage of  $0.5 \cdot (2.3/93.5) \cdot 100 = 1.2\%$ . So, in this case fluctuations in the main canal translate into smaller fluctuations in the off-taking secondaries, but result into even higher fluctuations further down the main canal (here +3.54%, namely  $[(3,624/3,500) - 1] \cdot 100$ ).

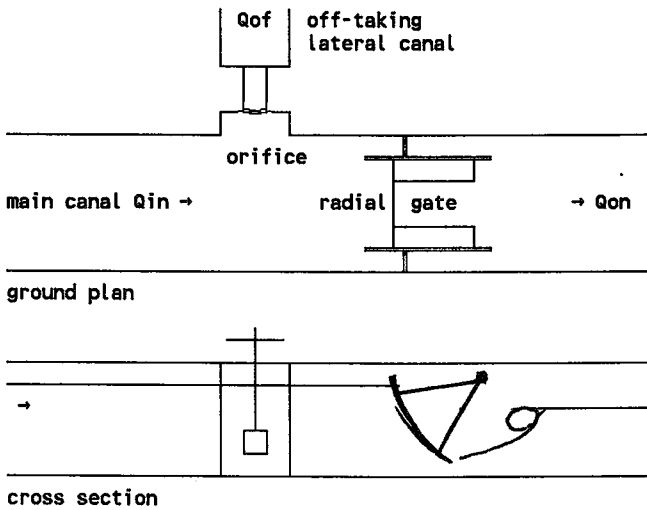


Figure A.2 The typical hydraulic module of an off-take in the main canal

Now we consider the situation which occurs most frequently: most lateral canals branch off the main canal near a radial gate, which serves as a cross regulator (without a sill). This is the hydraulic module (figure A.2). In one such situation, we measured 15 times over a period of 40 days the discharge in the lateral, whereas there were 36 discharge measurements taken for the main. The results show that whereas discharge in the main canal fluctuated by 130 lps per day, on average, or 3.25%, discharge in the off-taking lateral fluctuated 14 lps with average discharge of 555 lps, or 2.55% (figure A.3). Also in this typical hydraulic situation with a radial gate in the on-going canal and an orifice (an 18" pipe, centre 30 cm above bottom level, water level in the main canal around 1.75 m) as an off-take, fluctuations in the main tend to be slightly flattened in the off-take, which inevitably results in bigger fluctuations in the ongoing main canal.

Theoretically, these findings imply that the flexibility  $F$  of the hydraulic module is smaller than 1. I use the term flexibility ( $F$ ) as defined by Bos (1978:94), the ratio of the rate of change of discharge in the off-take to the rate of change of discharge in the continuing supply canal, or, more simply, the sensitivity of the orifice ( $S_{or}$ ) divided by the sensitivity of the radial gate ( $S_{rg}$ ). Sensitivity is defined as the rate of change of discharge of a canal structure as a result of a unit rise of the upstream water level. In formula:

$$S_{rd} = \frac{u}{h_1 - h_2} dh \qquad S_{or} = \frac{u}{h_1 - d} dh$$

in which  $S_{rd}$  is the sensitivity of the radial gate,  $S_{or}$  that of the orifice,  $h_1$  is the upstream water level,  $h_2$  is the water level downstream of the radial gate,  $dh$  the unit change in

upstream water level, and  $u$  the power of head, derived from the discharge formula of the canal structure. It is assumed that the orifice is operating freely, that is that the downstream water level in the off-taking lateral canal does not influence its discharge. Flexibility of the entire hydraulic unit, then, will be:

$$F = S_{or}/S_{rd} = (h_1 - h_2)/(h_1 - d)$$

Since normally the depth of the downstream water level in the on-going canal ( $h_2$ ) will be much greater than the height of the orifice above canal bottom ( $d$ ), it follows that:

$$h_2 > d, \text{ hence } F < 1$$

In the submerged case, then, sensitivity of the radial gate is greater than that of the orifice. Thus, flexibility of the module would be smaller than unity. This would imply that, with unchanged settings, a change in incoming flow  $Q_{in}$  results in only a slight change in discharge at the off-take ( $Q_{of}$ ), and a major change in the ongoing flow ( $Q_{on}$ ). Flow fluctuations in the supply canal, thus, translate into greater fluctuations further down the system. This theoretical finding is in accordance with our empirical data presented above.

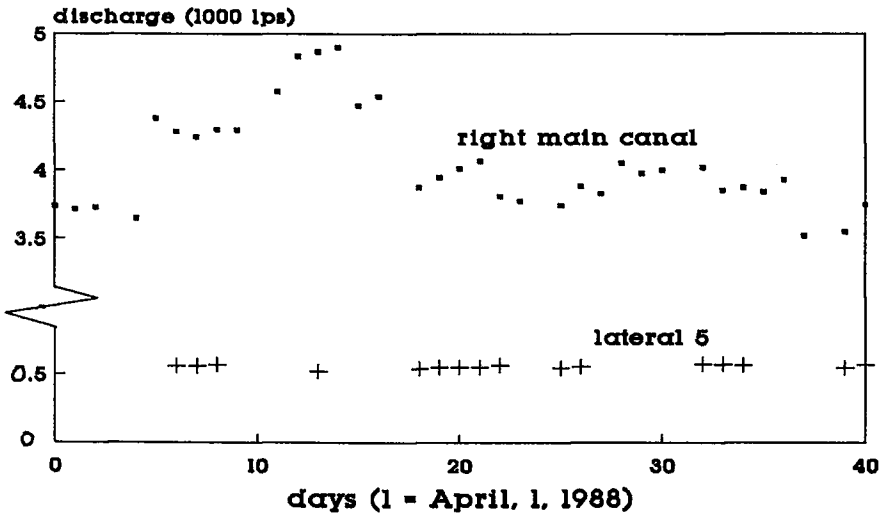


Figure A.3 Flow fluctuations in right main canal (at km. 0) and in off-taking lateral 5 (at km.5 in main canal). Source: Distrito de Desarrollo Rural, El Grullo.

## Appendix 3

## The working routine of a water guard: one day in the life of Miguel

*At sun rise*

Miguel wakes up at 5:30 am, this 13th of November. Without losing any time, he kills 7 chickens which his wife, Celia, will clean and sell in the hamlet where they live, La Chupadera. At 7 o'clock, Miguel goes into the field with his pick-up truck. He checks two irrigation turns for two tomato farmers who grow tomatoes near the hamlet. These farmers give him 20 nylon sacks which he will use for the harvest of the maize he share-crops. Forty minutes later he returns to his house, has breakfast and talks a while with his 3 children, who then go to school.

When he leaves his house, there is a water user awaiting him, who asks for an irrigation turn. Without checking his notebook in which he has noted relevant data (crops, landowner, irrigation turns received) of all fields of his zone (500), Miguel tells him the day and the hour when he will get the irrigation water. When he finally leaves the hamlet, in the researcher's Volkswagen and not, as usual, on his wreck of a motorbike, he comes across another water user, the representative of his *ejido* in the Water Users' Commission. Miguel hands him the invitation letter for the next commission meeting. He asks the farmer to sign for the receipt, which he has to give to his superior. At 8:20 we arrive at a sugar cane plot. He calls the irrigator, who readily appears out of the sugar cane. This irrigator is a hired labourer. Another water user arrives in his pick-up. He is the owner of the neighbouring sugar cane plot, which is now under 'suspension of irrigation', which means that it may not receive any water as the crop will be harvested within 6 weeks. The three men talk. Miguel urges the irrigator to be careful while irrigating, in order not to water his neighbour's field. The irrigator informs them that during that night the tomato farmers (who have their plots upstream in the same tertiary canal), had cut off part of his irrigation water. Miguel says that this is better than the flow increasing, and leaves. He goes to the tomato farmers (who he had already visited that morning) and tells them that when they have finished irrigating, they should lower the intake of the tertiary and ensure that the water flow does not increase, because of the 'suspended' sugar cane plot. Both farmers tell the *canalero* that he may cut tomatoes whenever he wants.

On our way to the first of two fixed meeting points (*cita*), we hear over the walkie talkie that the dam guard at Tacotán is transmitting climatological data to the District. We drive a further 5 kilometres, and pass through the hamlet of El Camarón. Here we meet Salomé, a water user who was born in this hamlet but who now lives in El Grullo. He works his mother's plot who is *ejidataria* of the *ejido* El Guamúchil. Salomé's plot is now receiving irrigation water. Miguel informs him that he will decrease the water flow a little, so that another farmer, a *rentista* (who is renting a nearby plot), may irrigate his field of green tomatoes.

In time, we arrive at the *cita* where Miguel has to show up at 9 am each day. The farmers who want to request an irrigation turn await him there. Miguel has a second *cita*, at 11:30 am, at a place along another canal. Two youths are awaiting Miguel. One

of them, the son of the *rentista*, asks him for an irrigation turn which Miguel had already programmed. Miguel fills in a form, writing down the name of the owner of the plot (not the *rentista*), the number of his plot, the crop, the day and hour of the beginning of the irrigation turn, and the name of the water user to whom he has to hand over the water when finished. Signing this 'irrigation order' becomes a problem, as the youngster hardly knows how to write. But Miguel says it is necessary for him to sign the paper to avoid problems. The boy's friend is laughing at him. Miguel urges the youngster to irrigate with care, in order not to wet the neighbouring sugar cane plot, which is 'suspended'. They then talk about the cleaning of a tertiary canal which has silted up. Miguel gives them his opinion on how and when to do it. Then, both youths criticise Miguel for giving preference to Salomé: 'you let him irrigate his sugar cane every week', whereas the established norm for sugar cane is only one irrigation turn per month. Miguel is irritated and says this is not true. They ask him the actual price of the local maize varieties paid by the intermediaries. After giving the information, he says he will pass by tomorrow, greets them and leaves.

#### *The sun starts to burn*

Miguel goes on with his round. He checks Salomé's plot, and passing the plot of a friend he tells me that he might share-crop this plot in the coming irrigation season. He checks another plot, but the irrigator is not present. He is irritated: 'you will never find him on his plot at this hour' (breakfast time). We arrive at another plot that receives a turn. Miguel talks with the irrigator (a labourer). Everything is OK. He asks the *mozo* what his boss is paying him for irrigating the sugar cane. He answers 5,000 pesos/ha (US\$ 3). Miguel informs him that other farmers are actually paying 8,000 pesos.

After having reviewed another irrigation turn (the seventh this day), we arrive at yet another plot. There is nobody present. In search of the irrigator we walk through the muddy field, and see that all the water is flowing directly into a drain. Miguel takes out the infraction booklet, and writes out the fine, specifying the day and hour, and an estimation of the discharge flowing into the drain. He talks to the neighbouring farmer, who has just harvested his maize crop. Miguel asks him to estimate the yield, data he has to collect and give to the District, which the engineers process for statistical ends. Soon we go, and Miguel locates another, very old, water user, to whom he gives the irrigation turn of the abandoned plot. Miguel consults his notebook and with some satisfaction he sees it has been exactly 30 days since its last irrigation turn. Miguel shows by his attitude to him, that he respects this old water user. He explains to me later that he has always been a very dedicated, hard-working farmer, whom you will find each day in the field. Later, Miguel confides in me that hard work is an important criterion: one gives preference to hard working farmers, as they finish their irrigation turns more quickly, and never cause problems. In contrast, the lazy farmers always create problems, and tend to irrigate much longer. This affects the irrigation programme, since he will 'fall behind schedule', creating problems for other farmers. Miguel looks down upon idle farmers. The old water user, his son and Miguel discuss a problem with a tertiary canal. The water user knows what he is talking about because he has been a farmers' leader of the area (*jefe de potrero*) during the greater part of his

life, and his son, who is a bricklayer, has rehabilitated the major part of all field canals in this *potrero*. Miguel gives his opinion about the problematic tertiary canal. The atmosphere is pleasant and one of mutual respect.

It is already 10:30, so Miguel continues, arriving at another canal, about 5 kilometres away. He finds the irrigator of the plot receiving the water. This particular agricultural labourer irrigates nearly all the plots on this tertiary canal, on behalf of the farmers. Therefore, Miguel takes 5 minutes to discuss with him how to proceed. This makes Miguel's work a lot easier. He need only to discuss with one person instead of 6. Miguel then asks him about the situation of another nearby plot, which is apparently to be planted with sugar cane, although no official permission for it has been granted. He knows that the irrigator is related to the owner of the plot. He gets the information required, which he will need to give to his superior. Miguel needs a constant flow of information if he is to do his job properly. He says goodbye and follows the main canal. He slightly draws up two big radial gates in the main canal. He has to draw up all 7 gates in his part of the main canal (18 kilometres), in order to pass on the *cambio*, that is the change in discharge, destined for both *canaleros* downstream: Gabriel and Pedro. Today, Miguel has to pass on 300 litres per second more than the day before (1700 lps as against 1400).

He arrives at another plot, calls the irrigator, who after some 5 minutes finally appears. There is a problem here with a blockage in the canal, which the landowner has made in order to let his cattle drink. The blockage affects the irrigations. It appears that the landowner is a partner with Miguel in the other (second) maize crop he is growing. He is working at the Agricultural Bank, and so arranged a credit for Miguel. The night before, he had come to Miguel's house and asked for an irrigation turn. Miguel had agreed, but had said; 'you should fix that canal'. Now, in the field, Miguel sees he has done nothing, so he decides to postpone the irrigation turn until the following day. Between 10:55 and 11:30 he checks 3 other irrigation turns, moves three gates, visits a plot which has a new but illegal intake structure, and sees how a sugar cane plot, which only received an irrigation turn two weeks ago, has been burnt for the harvest that night without having observed the normal 4-6 weeks of suspension of irrigation (the longer the suspension, the lower the gross yield). Miguel comments that this water user has a position on the board of the sugar cane growers organisation. Miguel shows his disgust.

### *The sun at its peak*

Whilst driving from one place to another Miguel explains many details of his work to me. Time and again, he expresses himself with the words 'here I have two irrigations', 'that plot I am going to irrigate next week' etc. We arrive at another plot where the irrigator (labourer) complains about his neighbour who has robbed him of his water. He says he is afraid of this man, because he is 'a brute'. Therefore, he has not been able to finish his turn in the time agreed upon. Miguel tries to find a way to solve the conflict. 'I understand your point, I understand why you are angry. But if he robbed water from you, he will finish his turn sooner, is it not so? You are very tired because of this irrigating. Tomorrow it is Saturday and Sunday. And when he has finished then

there will be enough water for the two turns downstream.' Miguel shows his pragmatism, and promises to pass by the next day. After having checked two other irrigation turns, Miguel arrives at his second *cita*, where he has to be at 11:30 am. It is already 12:15, and nobody is there. He waits 5 minutes. Then he continues. Until 1:45 pm he checks 4 more irrigations. Then he returns to the main canal and checks the gates he had moved in the morning. At 2 o'clock he has his first break, and we drink a soda. Less than 10 minutes later, we drive to the District.

### *Afternoon*

Some minutes before the *canaleros*' meeting starts at 2:30, Miguel arrives at the District, and he hastily goes to Mario's office, where the meeting is to be held. Mario is the agricultural extension supervisor or *promotor* of El Grullo. Miguel sits down, and starts writing his irrigation report (each Monday, Wednesday and Friday): the number of each plot which has finished its irrigation turn, the area and crops grown.

At 2:40, the meeting starts. All 6 *canaleros* are present, also the two water gaugers (*afadores*), the irrigation supervisor and the *promotor*. Mario writes down the water measurements for each of the 6 zones, collected by the water gaugers. He asks whether the *canaleros* want a *cambio*. In the meantime, Miguel finishes his report: there are 23 plots that have finished their irrigation. He has to revise his notebook to check all the data. Then, he gives the report to Mario, with the fine he had written out this morning. The atmosphere is relaxed. The *canaleros* are not talking about work, but about the bull fights and *fiestas* in a particular hamlet. Some time later, Mario starts to read them a list that the sugar factory has sent to the District: a list of the sugar cane plots that now are suspended from irrigation. The *canaleros* take notes. Although in the meantime they go on talking and chatting, they are alert.

At 3 o'clock, Engineer Corona, head of the operation department, and the senior engineer for the *canaleros*, enters the room. Mario informs him of what they are doing. Corona makes some comments, and emphasises the importance of carefully implementing the 'suspension' of the sugar cane plots mentioned. Various *canaleros* comment that the sugar factory's list has many errors. Corona then leaves the room. Mario goes on with the list, which seems endless. Miguel looks tired and I feel exhausted. Fifteen minutes later, Engineer Acosta, head of the Autlán-El Grullo area office, and immediate superior of the *canaleros*, enters the room. He tells Gabriel, a *canalero*, that finally the hydraulic excavator has arrived at one of his silted canals. Some *canaleros* then say to him that there are problems with the payment of their overtime allowance. With this plea, they show they trust him more than Corona. Three *canaleros* leave the room. The room is very small, and they are simply a little irritated. Outside in the hall they go on chatting. After some other details have been discussed, the meeting ends at 3:50 pm. Outside, the group disperses, while one yells to the other that he has heard the rumour that the money for their salaries has arrived, and perhaps will be paid that same afternoon.

Miguel returns directly to his house, where his wife serves him beans, meat, *tortillas*, water, coca cola and a pineapple. The children had already lunched. At 5 pm, Miguel goes to the maize mill in El Grullo, where he is to meet the *ejidatario* who is

his 'socio' or share-crop partner, in one of the two maize plots. This *ejidatario* had done the harvesting and now they settle their accounts. It appears that the harvest was good, and they have made a profit. Finally at 7 pm Miguel goes one last time to the field, revising the irrigation of export tomatoes nearby his village. The work day ends where it started.

*At the end of the day..*

That day Miguel drove 80 km, checked 20 irrigation turns (one of which he checked three times), talked to 20 farmers and 10 irrigators, and met with 15 persons at the District. That day, there were 3,150 lps of water entering his zone, of which he used 1,450 lps and let the remaining 1,700 lps pass to downstream zones. He worked from 7 am till 4 pm (9 hours) for the District, of which 7 and a half hours were in the field. Also he spent some time on his wife's business (killing chickens) but he had little time for his own business (the maize plots). Miguel on various occasions urged farmers to irrigate carefully, because of the suspension of sugar cane plots. He discussed a varying range of items with the farmers. He explained to some of them the irrigation schedule, he issued irrigation orders, and fined one farmer. He had provided farmers with information on current crop prices, and one agricultural labourer with information concerning current wages for irrigators. Miguel also asked for information from these people. Information about particular plots and persons. Each encounter lasted between 3 and 15 minutes. He also attended an exhausting meeting at the District. On top of all this, he conceded an extensive interview to the researcher.



## Appendix 4

## Two documents of the Water Users' Association

*Document 1*

The participation of water users in operation, maintenance and administration of the irrigation unit Autlán-El Grullo. [Read by the board's president to the Jalisco Governor; August 1989 (Asociación de Usuarios, 1989)]

'Although there has been an experience of farmer participation in the operation and maintenance of the infrastructure during the period 1980-85, these activities were characterised by little involvement of the water users in the programming, supervision and evaluation of the works, over which SARH took responsibility. This unilateral way of tackling the said responsibilities did not forestall the water users, apart from paying the water fees which were imposed on them, having to undertake great quantities of work to get the water to their crops. Despite this extra financial burden [...] the maintenance works which the District realised were not on time, insufficient and often of poor quality, no doubt because of bureaucratic fetters and personal interests, which resulted in disrupting water distribution or the impossibility of the same in vast areas. Such obvious anomalies stimulated currents of opinion against the District, which proved to be a bad administrator and incompetent in improving the irrigation service and lowering the costs of operation and maintenance. The same currents of opinion became obstacles to fixing the water fees which would make the system financially self-sufficient, as stipulated in the Public Works Law. [...] Therefore, it was proposed to let the water users participate in the responsibility for the execution of maintenance works, and to let them administer the water fees themselves, a measure based on the Planning Law, and the National Development Plan of 1989-94.

The Water Users' Association was founded on November 11, 1988. [...] From December 1988 till May 1989, its regulations were revised, clearing up several doubts by organising a visit to the Water Users' Association of the El Agua irrigation unit. On May the 9th 1989, the new regulations were accepted and an agreement signed whereby SARH handed over heavy machinery [...] for operation and maintenance. This machinery, although in the present irrigation season is still financed by SARH, is administered by the Water Users' Association. Satisfactory results with respect to punctuality and low costs for the work have been obtained. Apart from this, the following has also been achieved: an increase in the water fees, which are now managed by the water users themselves; an agreement not to increase the area of sugar cane until the new storage dam is ready; the approval of a joint maintenance programme for the current year between the Association, SARH and CNA; [...] an agreement that water distribution will become the responsibility of the water users in the 1989-1990 irrigation season starting in October; the assignment of an office; [...]

These achievements give us the confidence to attain financial self-sufficiency and administrative autonomy in the medium term, and thus to contribute to the objectives of our rulers: greater productivity and profitability of the rural areas, to the benefit of

our families and our state [...].

Faithfully, the Water Users' Association. [Signed by the Board members.]

*Document 2:*

The Autlán-El Grullo irrigation unit, A.C.; in coordination with the *Comisión Nacional del Agua*, and the Jalisco State Government. [Text by video film, April 1990 (in: *Asociación de Usuarios*, 1990)]

'[...] In accordance with the federal government's policy of modernising rural Mexico, the president of the republic [name] has determined that operation, maintenance and administration of the Irrigation Districts shall be handed over to the water users, counting on the support of [...] the Constitutional Governor of Jalisco. In the irrigation unit Autlán-El Grullo, actions have been undertaken to attain this objective [...]. In this irrigation unit it is envisaged to hand over the operation, maintenance and administration to the water users themselves, which will be done by the CNA. To this end [name] the Director General of the CNA has sent instructions to [name] the National Director of Irrigation Districts, and [name] the CNA Director in Jalisco. In November 1989, a visit of CNA functionaries was received to agree on the guidelines to follow [...].

At present the Foundation (*Asociación Civil*) has been constituted and is formalised. Since March it has participated with the CNA in water distribution and in canal maintenance since last year; it has a well-defined technical structure. Previously, water distribution was realised solely by government personnel without the participation of the water users. Presently, the Association executes water distribution on the left bank of the irrigation unit. It coordinates activities with the Irrigation District [i.e. CNA, not the Rural Development District] for the training of its personnel, with the objective of guaranteeing the CNA correct operation, and taking jointly the decisions which are best suited for making correct water use more efficient. The participation of water users through instituting auxiliary delegates at canal level and intake structure, jointly with personnel of the Irrigation District [i.e. CNA], realise the irrigation calendar, according to the *tandeo* (turn-taking) water distribution method. As a consequence, conflicts and disparities in turn-taking and timing of irrigation have been prevented. Similarly, it was agreed to permanently supervise and guard the infrastructure and the water in order to prevent misuse of these resources, achieving through these actions a better awareness in the participation and use of the irrigation unit on the part of the users.

The Association coordinates the maintenance works of the irrigation unit jointly with the Irrigation District No.094, realising maintenance of the machinery and equipment in possession of the CNA, achieving in this way significant progress in the maintenance of the hydraulic infrastructure. Maintenance has been undertaken by the Association since May 1989, surpassing the programme as defined by the official sector by 200% [...]. "The modernisation of rural Mexico is based on a better use of resources, the most important being water" [...].

The Water Users Association of the irrigation unit Autlán-El Grullo, A.C.'

## Appendix 5

### Translations during the creation of the Water Users' Commission in 1980

Callon (1986) has developed a method to uncover the power effects resulting from strategising. He calls his approach the 'sociology of translation'. It is quite easy to apply his approach to one major event in El Operado: the creation of the Water Users' Commission (see chapter 7). His approach distinguishes four phases, starting with the problematisation of the issue at hand; followed by 'intéressement', 'enrolment' and finally 'mobilisation' of actors.

#### *1. problematisation: engineers defining groups, problems and solutions*

The engineers first perform a study and from it they identify which actors are involved in the struggle. The identity (including names of the crucial actors) of the sugar cane lobby is carefully recorded. The other actor is formed by the majority of peasant producers, which is pictured as having common interests only. They furthermore define the problem 'the water users' supposedly have, namely that their (annual) crops might be affected by water scarcity as a result of the expansion of (perennial) sugar cane by a handful of entrepreneurs. The engineers thus define the relationship between the majority of water users on the one hand, and a handful of entrepreneurs and the sugar cane factory on the other. They curiously do not define themselves as a party in the conflict.

#### *2. intéressement: getting the farmers accept the engineers solution*

During the next phase, engineers go down to the villages, organise ejido meetings, and try to interest the ejidatarios for the huge problem they are facing regarding the spread of sugar cane. The ejidatarios are told that their crops are being threatened by the actions of a small group of entrepreneurs, and that the ejidatarios have a common interest, which clashes with the interests of the sugar cane lobby. The engineers succeed in putting a wedge within the sugar cane growers' association, which is dominated by some members of the sugar cane lobby, but with a majority of small ejidatarios. The engineers thus re-define groups and interests along new lines, and postulate a breach between small and big farmers. The engineers tell the ejidatarios they are there to defend the interests of the majority of the producers, i.e. the small producers, and so they also define a link between them and the ejidatarios. Finally they say that the conflict can only be solved if the ejidatarios agree to form a water users commission.

#### *3. enrolment: getting the farmers displaced*

When the commission is finally formed, the engineers first displace the water user representatives to the district offices, where they meet and discuss. (Recall how one engineer put it: 'How could we control them to a certain degree? To have them gathered together at the district, that they would speak there. So that they would not walk around on other sides.') Then, at their own discretion, the engineers give water user representatives certain duties and powers. They furthermore set the agenda of the issues

to be discussed and solved, and provide them with (carefully selected) information and data. This all results in the engineers effectively enrolling the delegates in their project.

*4. mobilisation: getting farmers enact solutions and colleagues impressed*

At first, within the commission tensions built up, since a large minority of delegates are small cane producers. But in the end the delegates perform exactly as the engineers have orchestrated, saddling these delegates up with responsibilities they had not asked for, and letting them decide that it is impossible to grant any water user the right to plant new sugar cane. The engineers, then, have succeeded in positing the commission at the centre of the conflict. Even the sugar cane factory and the big entrepreneurs grudgingly accept this new institution, and do not contest its conclusion to freeze the sugar cane expansion. Meanwhile, the engineers wash their hands in innocence (as one farmer said).

## Appendix 6

### Rapid Irrigation Practice Identification

Diagnosing management and organisational issues of irrigation systems does not require a huge investment in time. In this appendix, I will try to demonstrate that rapid identification is possible, through a focus on irrigation practice. Irrigation practice refers to the practices of people concerning three typical irrigation issues: (1) water distribution; (2) canal maintenance; and (3) management issues. Management issues here refer to: how conflicts between different groups are sorted out; how annual decisions concerning cropping patterns, volume of water used, level of water fees are arranged. These management issues will inevitably crop up when studying in detail problematic situations related to water distribution and canal maintenance, since these management issues provide the institutional context within which canals are maintained and water is distributed.

#### *Step 1*

Define which interest group you want to benefit from your investigation. Find out when both maintenance and water distribution tasks are most intensive (nearly any farmer will tell you directly). Probably these will fall in different periods. If so, follow steps two and three (below) both for maintenance and for water distribution.

#### *Step 2*

The issues of water distribution and canal maintenance can now be studied during one week of field work each. One tries to find concrete problems related to the issue under study. When identified, one tries to record: 1. context; 2. differential interactions; 3. shared values; 4. strategies.

#### 1. Context

- Time: when does the problem happen, did it happen before?
- Place: where does it happen; head- or tail-; crops etc.; technical reasons why this could happen?
- Social groups: roughly sketch the groups that are involved in this problem, and/or who (hypothetically) are affected by it, or benefit from it

#### 2. Differential interactions

- Who interacts with whom concerning the problem? Who takes the initiative? Who is left out?
- How are these interactions connected to the wider environment (including the institutional environment)? Which networks are mobilised, and established?
- What is the interaction about? How are certain groups excluded? What arguments are used and which negotiations take place? Are goods and favours exchanged; what is the final outcome? Who gains, and who loses?

### 3. Values which are shared or not

- In which terms is the problem defined? Is there consensus about what the problem is actually about? How is it that some people are able to make others do what they do not like to do?
- Do people refer to similar situations which occurred in the past? To which images do people appeal concerning the problem situation? For the different groups involved, which images and prejudices are reproduced by it?
- How do the groups involved interpret the situation? Which solutions are suggested, and which constraints are anticipated?

### 4. Strategies

- What strategies do people develop in order to attain certain goals (including those people who do not openly interact/feature in the problem but who might be affected/might gain by it)?
- What goals do people strive for? In what do they differ?
- How are these strategies shaped by former experiences (with similar situations)?

#### *Step 3*

Then, after the week of field work, field notes are worked out **in the office** where management resides, and issues relating to the system's management are tackled/solved. One week spent in the management realm enables the researcher/interventionist to become familiar with this other field situation. It is important to socialise and accept any offer from the people who work there to accompany them to a specific meeting/situation, or help them with calculations, etc.

Record context, differential interactions, values and strategies in this office context. Problematic situations in this office context may be multiple and not clearly defined. That is exactly what should be studied. For example, how are problematic situations emerging in the field welcomed/received in this office? And does problem definition in this office bear some (if any) relation to field problems? The relation inside-outside office, and linkages, should also become the focus here.

#### *Step 4*

When the material on practice has been gathered, it can be analysed along two lines. Firstly, different possible domains or fields of activities can be distinguished with markedly different types of practice present. Secondly, linkages between these different domains have to be examined, and possible disjunctions highlighted. This fourth step can be called interface assessment, since these linkages refer to social interactions between actors stemming from different social worlds or belonging to different levels in the institutional hierarchy.

Having analysed in detail practice related to problematic situations, possible solutions, as forwarded by people involved, can be reviewed in the light of the result of the interface assessment.

*Step 5*

The conclusions of this analysis can then be discussed with the different groups involved, which again may produce crucial new information, and may deepen the analysis. Thus, separate group discussions with main interest groups identified in steps 2 and 3, are organised in their respective domains. The discussions focus on problem definition (what is the problem with this organisation). People are stimulated to give suggestions for solving the problem. The interventionist should be careful not to accept problem definitions and suggestions too easily, but rather to provoke elaborate discussions about them. Step 5 should be carefully recorded.

*Step 6*

First reporting findings of both water distribution, maintenance and management issues to the interest group defined as the target group. List possible solutions with constraining factors. See whether the target group agrees. Add if necessary any new insights. Discuss with them possible consequences of reporting findings to the other interests groups. Rewrite report if necessary. Report to remaining groups. Propose final version of possible solutions with clearly defined constraining factors, in accordance with interests of target group. Actions as defined in the report can now be undertaken. Later, these action in turn can be diagnosed, adapted or new actions developed.

## Appendix 7

## Glossary of frequently used Spanish words and terms, in their local connotation

aforador	water gauger, a District employee who measures daily water flow in main canals
agrarrista	peasant revolutionary
aguas bronceas	'wild waters', silt-laden brown coloured river water during and directly after the rains
agua muerta	'dead water', standing water dammed by lowered gates in the irrigation canal
asociación	
-agrícola local	local producers organisation aimed at the production and marketing of a specific crop
-cañera	sugar cane producers' organisation
-civil	civil foundation or voluntary association
-pequeña propiedad	local organisation of private landowners ( <i>pequeños propietarios</i> ) in one municipality
-de usuarios	water users' association; found in all <i>unidades de riego/URDERAL</i> in Mexico; and also in a few irrigation systems operated by the SARH ministry through the District
brigada d.macheteo	slashers brigade; group of workmen of maintenance department cleaning canals by hand
cacique	local or regional boss
canalero	water guard, or ditch tender, employee of the District
cambio	change; here often used to indicate a change in water flows in canals
castigar caña	under-irrigating sugar cane; litt. punishing cane
C.N.C.	<i>Confederación Nacional Campesina</i> ; national peasant union, affiliated to the PRI party
C.N.P.P.	<i>Confederación Nacional de la Pequeña Propiedad</i> ; national union of private landowners, affiliated to PRI
coamil	traditional maize cultivation system, using the <i>coa</i> as a dibble; still practised in the hills
comisión	
- del Sur de Jalisco	important government commission during the 1970s, headed by José G. Zuno Arce
- de usuarios	water users' commission; here: the Autlán-El Grullo water users' organisation which was set up in 1980, but which lacked the legal recognition of the later association
- nacional del agua	national commission of water (C.N.A.), created in January 1989
comité	
- directivo	governing board of the Rural Development District
- de vigilancia	control council in <i>ejido</i> , with a president, secretary and treasurer; normally composed of those <i>ejido</i> members who failed to get elected in the <i>ejido</i> 's executive board ( <i>mesa</i> )
compadrazgo	ritual kinship, co-parenthood
compadre	co-parent
compuerta	gate or intake in irrigation canal
convivencia	get-together, party
cuota	water fee ( <i>cuota del servicio de riego</i> )
delegado	delegate; can be a farmer representative in an organisation; can also be the State representative of a Ministry (e.g. <i>Delegado</i> of SARH in Jalisco)
distrito	short-hand for Rural Development District; also for the irrigation system of El Operado
- agropecuario	district of agriculture and livestock production; the El Grullo District between 1983-86
- d.desarrollo rural	from 1986 onward the El Grullo District is called Rural Development District
- de riego	irrigation district; before 1977, there was one District in Jalisco, the El Grullo office was called <i>Unidad</i> ; in 1977, the <i>Distrito de Riego no.094, El Grullo</i> was formed, which managed three irrigation systems; from 1979, the El Grullo District also supervised <i>unidades de riego</i> , and became <i>Distrito y Unidades de Riego No.094 y 594, Sur de Jalisco</i> ; in 1983, it fused with Autlán Rain-fed District to become <i>Distrito Agropecuario</i>
- de temporal	rain-fed Districts, which between 1976 and 1983 co-existed with the irrigation Districts; in the former mainly agronomists worked, in the latter mainly irrigation engineers
ejidatario	member of an <i>ejido</i> , who holds usufructuary rights on part of the <i>ejido</i> land



ejido	agrarian community which corporately holds lands, received as a grant from the government; <i>ejido</i> lands may not be sold
empaque	packing plant for horticultural crops for export (like tomatoes, melons)
entrada	inlet, intake structure, syn. <i>toma</i>
extensionista	agricultural extension worker, employee of the District
faena	work party
gasto	expenditure, expense; flow, discharge
grande irrigación	local office of the construction department of SARH
hacienda	large ranch or estate, owned by <i>hacendado</i> , mostly dispossessed during the land reforms
Hacienda	Ministry of Finance
ingenio	sugar mill, sugar factory or refinery
jefe de potrero	leader of a group of <i>ejidatarios</i> working the lands of one <i>potrero</i>
jefe de toma	leader of a group of farmers served by one canal inlet
lateral	secondary irrigation canal
líder	(political) leader
mesa directiva	executive committee of <i>ejido</i> , with president, secretary and treasurer
mezcal	locally brewed and distilled alcoholic drink, made from the agave plant
mozo	agricultural labourer
padrino	godfather
padrino político	political godfather, protector
pequeña propiedad	private landownership, in contrast with the <i>ejido</i> type of landholding
pequeño propietario	private landowner, who can sell-off the land
potrero	group of adjoining fields (covering 10-100 ha); formerly fenced part of a <i>hacienda</i> ranch
P.R.I.	<i>Partido Revolucionario Institucional</i> ; political party in power virtually since the 1920s
prestanombre	name of relative, friend or trusted employee used to obscure real landownership
promotor	extension officer, District employee responsible for agricultural, live-stock and forestry extension services in one municipality, supervising the <i>extensionistas</i>
ramal	minor irrigation canal
rebajo	decrease of water flow
recursos	used to refer to the District; from <i>Secretaría de Recursos Hidráulicos</i> (SRH)
regadera	field canal
rentista	rents agricultural land
represa	check-structure in irrigation canal with which upstream water levels can be manipulated
represo	dammed up water immediately upstream of a <i>represa</i> that has been lowered
SARH	<i>Secretaría de Agricultura y Recursos Hidráulicos</i> , Ministry of Agricultural and Hydraulic Resources; in charge of the Rural Development Districts; formed in 1977
secretaría	short-hand for the SARH ministry; also used to refer to the Rural Development District
sexénio	presidential period of six years in Mexico (1971-1976; 1977-1982; 1983-1988 etc.)
SRH	<i>Secretaría de Recursos Hidráulicos</i> ; Ministry of Hydraulic Resources (until 1977)
sublateral	tertiary canal
suspensión	suspension; often used with respect to the temporary suspension of irrigation water service to sugar cane plots 4 to 8 weeks prior to harvesting
toma	intake; syn. <i>entrada (de agua)</i>
tomate de cáscara	small tomato with a green skin; ingredient of <i>salsa</i> sauce in the Mexican cuisine
trapiche	sugar mill, normally oxen-driven, not found any more in the Autlán region
unidad de riego	irrigation unit; nowadays often used to refer to <i>URDERAL</i>
unión de ejidos	second-tiered organisation of several <i>ejidos</i> , normally of one municipality; the <i>unión</i> often provides inputs, like fertilizers, seeds, agrochemicals to its members
URDERAL	<i>unidad de riego de desarrollo rural</i> : small-scale irrigation system operated by water users organised in an association; during 1970s-1980s, many <i>unidades</i> were constructed
yunta	yoke, team of oxen; also: area measure of approx. 4 ha

## Summary

Existing studies of irrigation systems show that technical elements influence social processes, and also, that certain social relationships may have technical implications. However, little has been said about the precise content of this interplay. A better insight seems important, as irrigation systems, when put into operation, often have unforeseen organisational and social consequences, and a disappointing performance. The present thesis aims to answer the question: How do the social practices of people relate to the physical infrastructure of an irrigation system and its organisation, and how do these practices change over time. To this end I studied the organising processes of an irrigation system, that of El Operado in the valley of Autlán-El Grullo, Western Mexico, from February 1987 through April 1989. To explore this theme I use the concepts of *practice*, *social interaction* and *intervention*. Through a focus on intervention I envisaged being able to single out the crucial factors for diagnosing irrigation organisation, and to assess viable intervention strategies.

To capture the social dynamics that emerge around irrigation situations, I chose an actor-oriented research method, based on detailed observations (qualitative and quantitative), informal interviews, and (group) discussions. I also modestly participated in the stream of events concerning the El Operado's Water Users' Association.

The present monograph on El Operado brings the system's social and technical dimensions under one common denominator, that of practice. To accomplish this, the thesis has the following structure. After an introduction to El Operado's historical and technical context, case studies follow on three irrigation activities. The focus then shifts to interventions in El Operado's management, and I analyse how, as a result of these interventions, people's practice changed. On the basis of this material I finally give an outline for an intervention perspective.

The thesis is written for irrigation scholars and practitioners in the field. The study forms part of a multidisciplinary research project of Wageningen Agricultural University and the Colegio de Jalisco, Guadalajara, entitled '*Contrasting patterns of irrigation organisation, peasant strategies and planned intervention: comparative studies in Western Mexico*'.

### *The context*

The context of an irrigation system can be sketched through an appreciation of historical developments and the spatial-technical features of the system. An historical investigation of projects related to water and land development in the Autlán-El Grullo valley, from 1850 to the present, shows that such projects faced three recurring themes: a strained relationship between insiders (from the valley) and outsiders; contradictions between small farmers and the local elite; and the awkward position of intermediary actors and

of farmer organisations, such as the *ejidos*. As we will see, the social dynamic found in the El Operado irrigation system, which was constructed in the 1950s, can also be characterised by these three sets of problematic relationships.

Spatially, *El Operado* with its 9,000 hectares covers nearly half of the Autlán-El Grullo plain, and serves some 2,500 plots, 69% of which planted with sugar cane. The 1,300 water users include a small number of entrepreneurs who control 40% of the land, and a majority of small farmers (1,100, mainly *ejidatarios* organised in 18 *ejidos*), who have less than 10 hectares. The third category of actors are the personnel of the Rural Development District (*Distrito de Desarrollo Rural*), a local office of the Ministry of Agriculture and Hydraulic Resources (SARH). The District, among other things, manages El Operado, and is responsible for distributing water to the farm plots, for canal maintenance, and for decisions concerning water fees, crops and conflicts.

An important technical feature of *El Operado* is that all division structures are adjustable, which allows water delivery to follow the 'on request' method. Farmers are free, within limits, to choose the crop they cultivate, and to choose when to plant and when to irrigate.

### *Irrigation practice*

In getting to grips with irrigation practice in El Operado, I focused on water distribution, canal maintenance and the making of the irrigation plan.

The actor-centred study of the water guard, or *canalero*, revealed how, through properly operating the structures, he succeeds in tailoring water delivery to a variety of local demands. He has internalised the physical properties of the canal system. Water guards do not strictly adhere to the technical guidelines from District engineers, which are too general, but interpret them while drawing on their technical competence. Water guards are 'interfacers', linking farmers to the District, the District to the sugar refinery, and creating linkages among farmers.

In El Operado problematic situations occur every year at the end of the rainy season, when canals silt up, and the District's maintenance department is unable to duly clean them. When water shortages become serious because of the silted canals, groups of farmers organise their own solutions, this despite the fact that farmers often regard group efforts with scepticism. Joint undertakings vis-à-vis the physical infrastructure (e.g. investing labour, money, and social capital in cleaning a canal) have an impact on the participants' sense of ownership over it; it shifts from 'the government's' to 'ours'. Canal groups repeatedly engaged in joint activities that took on a lasting character. Paired with farmers' new sense of ownership this provided a perspective for future farmer involvement in El Operado's management.

The irrigation plan which the District's operation department formulates every year, appeared not to be an important instrument of decision-making for *El Operado's* management. Crucial decisions, for example regarding the water fees or granting certain farmers permission to grow sugar cane, are negotiated by a few important actors behind closed doors. In a meeting with the water users commission, District engineers did not provide sufficient information, so that the farmers' leaders were unable to critically assess the irrigation plan and the proposed water fees, nor formulate alternatives.

In conclusion, the analysis of irrigation practice revealed that different groups of actors, such as water users, farmers' leaders, District engineers and field personnel, develop different practices. These practices occur in different domains: 'the field', the domain of the farmers; 'the office', the domain of the District engineers; and 'the *ejido*', the domain of farmers' leaders. In El Operado, it appeared that these domains of interaction co-existed alongside each other and were relatively autonomous.

### *Intervention and change of practice*

The following step in the analysis dealt with intervention and change in El Operado's management. Of three interventions reviewed, one intervention concerned the formation of a new Water Users' Association, which took eventual charge of canal maintenance.

The intervention resulted from power struggles within the intervening institutions, but its outcome was shaped by the interface encounters that unfolded during implementation: encounters and negotiations between actors stemming from different social worlds or holding different positions (e.g. engineer - farm leaders). Importantly, the intervention left particular actors out, namely the ordinary farmers, which is crucial to our understanding of what happened. Although the intervention had some immediate effects (improved canal maintenance for example), it remained confined to the formal level and did not change the practices of the people concerned.

Practices finally started to change when the Water Users' Association also got involved in water distribution. The position of 'gate leader' was instituted, who supervised water distribution along one minor canal. On a higher level, farmer delegates of the Association together with the water guard coordinated water distribution in each of El Operado's six zones. With this structure a linkage between board and delegates on the one hand, and water users and water guards on the other, was established. Put differently, domains got interconnected, and farmers, for example, could now better check their delegates.

This new organisational structure means that the basis of the Association not any longer is formed by *ejido* representatives but by water users who represent a canal. The Association can now discontinue obsolete practices originating from the *ejidos*, can redirect the Association's lop-sided organisation structure, and can concentrate on practical issues rather than on political wheeling and dealing. Having touched down at canal level, the Association links up with farmer practices found there. As we saw earlier, this has already led to farmers appropriating their canals. The association now follows suit.

### *Perspective*

The analysis of *El Operado*, summarised above, describes the actions and interactions of people involved in the irrigation system, while taking seriously their material settings. Practice appeared a sensitising concept which helped to pin down the interplay between people and things in this micro-society.

In answer to the research question, different groups relate to the canal system in specific ways: District engineers have the overall responsibility for it, field personnel have to work with it, and farmers depend on it. These groups develop particular

practices as people cope with the constraints put forward by the system. Practice articulates with physical infrastructure through the actions of people in specific domains. The irrigation system's arena is made up of different domains, but some domains are disconnected. This helps to explain some of the operational problems. Interventions aimed at solving these problems succeed if they change existing practice accordingly. Changes of practice occur when new settings of interactions are put in place, and when different domains formerly separated become interconnected. New linkages imply that practice at one level feeds practice at another.

On the basis of these findings, I suggested a type of diagnosis of irrigation organisation which is based on a descriptive account of practice concerning key activities; of the different domains present, and of the existing linkages between domains. Practice can be described through examining the context in which an irrigation activity takes place, the social interactions it entails, the interpretations people give of this practice and the strategies the different groups involved develop. When the diagnosis detects problems, these can be discussed with the people concerned. With them possible solutions can be reviewed and intervention strategies designed.

The type of interventions which I have in mind aims at changing irrigation practices, through strengthening some practices found in specific domains while breaking down others. The approach thus is both about continuity and discontinuity. This can be pursued through adapting formal organisational arrangements to informal initiatives and experiences. Adjustments on the formal level could include defining more precisely ownership relations with respect to the canal system, and to irrigation water; (re-) defining responsibilities that groups of people have towards the system and towards each other; re-organising the system's arena through establishing new linkages between domains while breaking down others; and adapting the settings of interactions. This approach to intervention starts from the idea that irrigation management implies 'interfaces', that is, interactions between actors with structurally different positions, and it acknowledges that these interactions are of an emergent character, which means that their outcomes can never be wholly planned. The approach thus aims to carefully manage interfaces, but without the illusion of controlling them.

Finally I turn to my own experience with the research methodology which centres around actors, and tries to understand people's actions and practices. Interviews with the 'research population' often resulted in interface situations, in which the attitudes and actions of both myself as well as of my discussion partners were questioned. This is a first small step in an intervention process.

## Samenvatting

Bestaande studies van irrigatiesystemen laten zien dat technische factoren sociale processen beïnvloeden en, omgekeerd, dat bepaalde sociale verhoudingen technische consequenties kunnen hebben. Er is echter weinig gedetailleerde kennis over de wisselwerking tussen techniek en sociale verhoudingen. Het is belangrijk daar meer inzicht in te krijgen omdat in de praktijk blijkt dat het opzetten en het veranderen van een irrigatiesysteem vaak andere organisatorische en sociale gevolgen hebben dan men verwacht, zodat beoogde doelstellingen dikwijls niet gerealiseerd worden.

In dit proefschrift wordt de wisselwerking behandeld tussen de sociale en technische structuur van een irrigatiesysteem en wordt gekeken hoe deze wisselwerking met de tijd verandert. Ik bestudeerde organisatie-processen in het irrigatiesysteem El Operado in de vallei Autlán-El Grullo, in West-Mexico, daarbij gebruikmakend van de sociologische begrippen: 'praktijken' (handelwijzen), 'sociale interactie' (hoe mensen met elkaar omgaan) en 'interventie' (meestal: overheidsingrijpen). Het doel van het onderzoek is het opsporen van factoren die organisatie-processen beïnvloeden, om daarmee een irrigatiesysteem nauwkeurig te evalueren en, indien noodzakelijk, een geschikt verbeteringsplan op te stellen.

Om de sociale dynamiek in de verschillende situaties rond het irrigatiesysteem te kunnen beschrijven, is gekozen voor een onderzoeksmethode waarbij personen, begrepen als bewust handelende mensen of actoren, centraal staan. Het onderzoeksmateriaal is verzameld op basis van gedetailleerde waarnemingen, informele interviews, (groep)diskussies, maar ook door actieve deelname aan de oprichting van een watergebruikers-organisatie.

Deze monografie van El Operado probeert de sociale en technische kanten onder één noemer te brengen. Het proefschrift is daartoe als volgt opgebouwd. Na een inleiding over de historie en de technische opzet van El Operado volgen detail-studies van drie irrigatie-activiteiten. Daarna worden drie ingrepen in het beheer van El Operado beschreven, en nagegaan wordt hoe tengevolge van deze ingrepen de verhoudingen tussen groepen van mensen veranderen. Op basis van deze gegevens wordt tenslotte een model ontworpen dat gebruikt kan worden bij het stellen van een diagnose van het beheer van irrigatiesystemen en voor het bepalen van ingrepen die moeten leiden tot verbetering van het irrigatiesysteem in zijn geheel.

Het proefschrift is geschreven voor beleidsmakers, deskundigen en veldwerkers. De studie vormt een onderdeel van een multidisciplinair onderzoeksproject van de Landbouwwuniversiteit Wageningen en het Colegio de Jalisco, Guadalajara, getiteld '*Contrasting patterns of irrigation organisation, peasant strategies and planned intervention: comparative studies in Western Mexico*'.

### *Kontekst*

De kontekst van een irrigatiesysteem kan beschreven worden met behulp van een historische en een ruimtelijk-technische analyse. In de landbouwkundige ontwikkeling van de Autlán-El Grullo vallei in de periode 1850 tot heden blijken drie zaken een belangrijke rol te spelen: een gespannen verhouding tussen lokale bewoners en buitenstaanders; de tegenstelling tussen kleine boeren en lokale elite; en de moeilijke tussenpositie waarin bepaalde personen en boerenorganisaties, zoals de *ejidos*, zich bevinden. Ook in het irrigatiesysteem El Operado dat in de jaren vijftig werd aangelegd, zijn deze maatschappelijke verhoudingen terug te vinden.

Ruimtelijk beslaat El Operado 9.000 hectare, de helft van de Autlán-El Grullo vallei en het voorziet 2500 velden van water; twee-derde van deze velden is bebouwd met suikerriet. Een klein aantal ondernemers van de 1300 watergebruikers controleert ongeveer 40% van het areaal. De grote meerderheid van boeren (1100, voornamelijk *ejidatarios* georganiseerd in 18 boerenorganisaties of *ejidos*) heeft minder dan 10 hectare. Een derde categorie personen wordt gevormd door het personeel van het Rurale Ontwikkelings District van El Grullo (*Distrito de Desarrollo Rural*) van het Ministerie van Landbouw en Waterstaat (SARH). Het District is verantwoordelijk voor de waterverdeling tot aan de veldinlaten, voor het kanaalonderhoud en voor de beslissingen inzake waterprijs, geteelde gewassen en voorkomende conflicten.

Een technisch kenmerk van El Operado is dat alle verdeelwerken verstelbaar zijn, waardoor het mogelijk is de waterverdeling op verzoek van boeren aan te passen. Boeren kunnen, binnen bepaalde marges, beslissen over de keuze van hun gewassen, over het tijdstip van zaaien, planten en irrigeren.

### *Irrigatie-praktijken*

Drie irrigatie-activiteiten zijn beschreven: de waterverdeling, het kanaalonderhoud en het formuleren van het irrigatie-plan.

Door het werk van de zes waterverdelers, de *canaleros*, nauwkeurig te volgen, valt op hoe zij door het vakkundig bedienen van verdeelwerken, complexe verdeelpatronen bewerkstelligen die aangepast zijn aan de (in tijd en ruimte) sterk variërende vraag naar water. De waterverdelers hebben zich de technische kwaliteiten van het stelsel eigen gemaakt. Ze volgen de algemene richtlijnen van hun superieuren, de District ingenieurs, niet exact op, maar interpreteren ze en brengen ze in overeenstemming met lokale situaties, daarbij steunend op hun vakmanschap. In de praktijk zijn waterverdelers bemiddelaars (*interfacers*), die de verhoudingen tussen District en boeren, tussen District en suikerfabriek, maar ook tussen boeren onderling, helpen gestalte te geven.

Elk jaar aan het eind van het regenseizoen slibben veel kanalen dicht. Uit de studie naar het kanaalonderhoud bleek dat de onderhoudsafdeling van het District niet in staat is de kanalen op tijd schoon te maken. In sommige kanalen was het watertekort zo nijpend, dat boeren de handen ineensloegen en zelf de problemen oplosten. Als gevolg van deze groep-acties raakten boeren nauwer betrokken bij de irrigatie, en kreeg het kanaal een nieuwe betekenis: van 'het kanaal van het District' verschuift het naar 'ons kanaal'. Deze informele kanaalgroepen kwamen regelmatig in actie, en kregen zelfs een blijvend karakter. Samen met hun nieuwe eigendomsbesef vormde dit een belangrijke

basis voor een grotere participatie van boeren in het beheer van El Operado.

Het irrigatie-plan, dat ieder jaar gemaakt wordt door de waterverdeel-afdeling van het District, blijkt geen belangrijk beslissings-instrument te zijn in het beheer van El Operado. Belangrijke besluiten, bijvoorbeeld over de hoogte van de waterprijs of het verlenen van recht aan bepaalde boeren om suikerriet te telen, worden genomen op basis van onderhandelingen tussen een paar invloedrijke personen (zowel functionarissen van het District en suikerfabriek als invloedrijke boerenleiders).

Uit het voorgaande blijkt dat verschillende groepen betrokkenen, zoals watergebruikers, boerenleiders, district-ingenieurs, en veldpersoneel, verschillende praktijken ontwikkelen. Deze praktijken bestaan in verschillende werkterreinen: het veld - domein van boeren; het kantoor - domein van District ingenieurs; de *ejido* - domein van de boerenleiders. In het onderzochte irrigatiesysteem blijken deze domeinen naast elkaar te bestaan en relatief autonoom.

#### *Interventie en veranderende praktijken*

De volgende stap in de analyse was gericht op drie ingrepen in het beheer van El Operado. Eén van deze interventies betrof de oprichting van een watergebruikers-associatie, die verantwoordelijk werd gesteld voor het onderhoud van kanalen.

Het resultaat van dit initiatief werd sterk beïnvloed door de manier waarop de associatie werd gevormd, en door de kontakten en sociale interacties tijdens de oprichting. Deze interacties, bijvoorbeeld onderhandelingen tussen ingenieurs en boerenleiders, werden begrepen als '*interfaces*' tussen actoren met verschillende posities. De meeste watergebruikers kwamen echter in het verhaal niet voor. Ondanks dat de oprichting van de watergebruikers-associatie direkt resultaten afwierp, zoals een sterk verbeterd kanaalonderhoud, veranderden de praktijken van de betrokkenen nauwelijks, omdat de interventie beperkt bleef tot het formele nivo.

Toen de associatie ook betrokken raakte bij de waterverdeling begon de situatie te veranderen. Een nieuwe functie werd gecreëerd, nl. die van inlaat-leider die toezicht kreeg op de waterverdeling in het betreffende tertiaire kanaal. Met deze nieuwe structuur onstond er een formele link tussen het bestuur van de associatie en de boerenleiders aan de ene kant, en watergebruikers en waterverdelers aan de andere kant. Anders gezegd, nieuwe verbanden tussen domeinen werden gelegd, waardoor bijvoorbeeld de boeren hun formele leiders beter konden controleren.

Omdat het laagste echelon van de associatie nu bestaat uit watergebruikers die een kanaal vertegenwoordigen, werden verouderde *ejido* praktijken doorbroken, werd de organisatie-structuur van de associatie minder top-zwaar, en ging men zich concentreren op praktische problemen. Nu de associatie op kanaal-nivo werkt, raakt het direkter betrokken bij de praktijken van de boeren. En daar, zoals we eerder zagen, zijn boeren verwickeld in een proces van toeïgening van de kanalen. De associatie volgt hen nu in dit proces.

#### *Perspektief*

Een analyse van El Operado kon worden gemaakt door de acties en interacties van de betrokkenen in hun werksituatie of *setting* te bestuderen. Aan de hand van het begrip



'praktijken' kon ook de wisselwerking tussen mensen en hun fysieke omgeving worden beschreven.

Verschillende groepen mensen hebben op specifieke wijze te maken met het kanalenstelsel: district-ingenieurs zijn er verantwoordelijk voor, het veldpersoneel werkt eraan, en de boeren zijn er afhankelijk van. Deze groepen ontwikkelen verschillende praktijken omdat ze geconfronteerd worden met bepaalde beperkingen die het systeem hen oplegt. Zo heeft iedere groep zijn eigen domein gekreëerd en uit de analyse blijkt dat sommige domeinen geïsoleerd zijn geraakt. Dat is een reden waarom er operationele problemen in het beheer van El Operado zijn ontstaan. Ingrepen met de bedoeling deze problemen op te lossen slagen alleen wanneer mensen hun werkwijzen of praktijken overeenkomstig veranderen. Praktijken veranderen niet vanzelf. Uit de studie blijkt dat wanneer contacten en interacties tussen mensen in nieuwe 'settings' plaatsvinden, en er zodoende nieuwe verbanden ontstaan tussen de verschillende werkterreinen of domeinen, ook de praktijken van mensen veranderen.

Voortbouwend op deze konklusie is geprobeerd een model te maken dat gebruikt kan worden om een irrigatie-organisatie door te lichten (diagnose). Dit model is gebaseerd op beschrijvingen van (1) praktijken met betrekking tot irrigatie-activiteiten, (2) de domeinen van interactie, en (3) de verbanden tussen de domeinen. Een beschrijving van de praktijken kan de volgende elementen bevatten: de (historische en ruimtelijke) kontekst waarin de activiteiten plaatsvinden, de sociale interacties die eruit voortkomen, de interpretaties die mensen geven aan deze praktijken, en de strategieën die door de betrokkenen worden gevolgd. Wanneer een dergelijke diagnose problemen identificeert, kunnen die met de betrokkenen besproken worden. Met hen kunnen mogelijke oplossingen geëvalueerd worden en interventie-strategieën ontworpen.

Het type interventie waar ik aan denk richt zich op het veranderen van irrigatie-praktijken. Praktijken in specifieke domeinen kunnen versterkt worden ten opzichte van andere. Bijvoorbeeld door de formele organisatie aan te passen aan informele initiatieven; het opnieuw definiëren van eigendomsrelaties ten aanzien van het stelsel, en van verantwoordelijkheden; het re-organiseren van de irrigatie-arena; en het aanpassen van de omgevingen van interacties. Dit type interventie gaat ervan uit dat irrigatiebeheer stoelt op de wisselwerking tussen mensen met verschillende posities. Het resultaat van ingrijpen in deze wisselwerking is echter nooit geheel te voorspellen. Deze benadering wil dus interface-situaties sturen, maar heeft niet de illusie ze te controleren.

Tenslotte een woord over mijn ervaring met de gevolgde onderzoeksmethodologie. In het onderzoek stonden mensen centraal en getracht werd hun handelen te begrijpen. Gesprekken met 'onderzochten' mondden vaak uit in 'interface' situaties waarbij de houding en handelen van zowel mijzelf als van mijn discussie-partners in geding werden gebracht. Dit is een eerste stapje in een interventie-proces.

## Resumen

Estudios de sistemas de riego muestran que los elementos técnicos afectan procesos sociales y que, también, ciertas relaciones sociales pueden tener implicaciones técnicas. Sin embargo, en términos precisos, poco se ha dicho sobre la interacción de los elementos físico, técnico y social. Lograr una mejor percepción de este proceso es importante, ya que en la gestión de un sistema de riego, frecuentemente se tienen resultados inesperados tanto a nivel organizativo del sistema mismo como en consecuencias sociales, que conducen a una frustrante ineficacia. La intención de esta tesis es abordar la manera en que las prácticas sociales de las personas involucradas en un sistema de riego se relacionan con la infraestructura física del mismo, y cómo estas prácticas cambian en el tiempo. Para ello he estudiado el proceso de organización de un sistema de riego, El Operado, ubicado en el valle de Autlán-El Grullo en el occidente de México, durante el período comprendido entre Febrero de 1987 a Abril de 1989. Utilicé los conceptos de *práctica*, *interacción social* e *intervención*. Este último concepto me permitió identificar factores cruciales para el diagnóstico de la gestión en los sistemas de riego así como valorar estrategias viables de intervención.

Para captar las dinámicas sociales que surgen alrededor de los sistemas de riego, escogí un método que concibe al actor como central para la investigación. Hice observaciones detalladas tanto cualitativas como cuantitativas; entrevistas informales; discusiones de grupo y también, modestamente, participé en algunos eventos cuyo fin era la formación de una organización de usuarios del agua.

La presente monografía de *El Operado* intenta juntar las dimensiones técnicas y sociales bajo un común denominador: las prácticas. La tesis tiene la siguiente estructura: después de una introducción del contexto histórico y técnico de El Operado, siguen tres estudios de caso de actividades de riego. Luego me enfoco a la intervención en la gestión de *El Operado*, y se analiza como en función de éstas intervenciones las prácticas de la gente cambiaron. La parte final de esta tesis trata de delinear un perfil para una perspectiva de intervención.

La tesis se dirige tanto a expertos en riego que trabajan en universidades, como en instituciones oficiales o en el campo. El estudio forma parte de un proyecto multidisciplinario de investigación de la Universidad Agrícola de Wageningen, y el Colegio de Jalisco, Guadalajara, llamado *Contrasting patterns of irrigation organisation, farmer strategies and planned intervention: comparative studies in Western Mexico*.

### *Contexto*

El contexto de un sistema de riego puede ser descrito considerando su desarrollo histórico así como las características en la organización de su espacio y tecnología. Un

reporte histórico de los proyectos relacionados con agua y tierra en el valle de Autlán-El Grullo, desde 1850 a la fecha, mostró que estos proyectos enfrentaron tres recurrentes temas: una relación tensa entre los pobladores del valle y los forasteros; las contradicciones entre los pequeños campesinos y la elite local; y la difícil posición de los actores intermediarios y organizaciones campesinas, como es el caso de los ejidos. Ahora bien, la dinámica social encontrada en el sistema de riego de El Operado, el cual fue construido en 1950, puede ser caracterizada por este conjunto de relaciones problemáticas también.

Referente a su espacio, con sus 9,000 hectáreas El Operado cubre casi la mitad del valle de Autlán-El Grullo. Distribuye agua a 2,500 parcelas, que en sus dos terceras partes cultivan caña de azúcar. Ahora bien, con respecto a los actores, se toma en consideración a los 1,300 usuarios, de los cuales un reducido número de empresarios controla el 40% de las tierras mientras que la mayoría son agricultores pequeños con menos de 10 ha. cada uno (1,100, principalmente ejidatarios organizados en 18 ejidos). Un tercer grupo de actores son el personal del Distrito de Desarrollo Rural, El Grullo, dependencia de la Secretaría de Agricultura y Recursos Hidráulicos. Entre otras cosas, el Distrito administra El Operado, distribuyendo el agua a las parcelas, conservando los canales, y decidiendo sobre cultivos, cuotas así como en conflictos.

Una característica técnica de El Operado es que todas las estructuras hidráulicas pueden operarse manualmente, lo cual permite un sistema de distribución muy flexible del agua que responde a la 'demanda semanal', como es llamado localmente. Eso implica que los usuarios, dentro de ciertos límites, son libres para escoger el cultivo que prefieran, así como el tiempo para sembrarlo y cuando regar.

### *Prácticas de riego*

Para captar las prácticas de riego, estudié la distribución del agua, la conservación de canales y la formulación del plan de riego. El estudio del canalero reveló cómo este actor, operando ingeniosamente las estructuras hidráulicas, logra una distribución del agua bien adaptada a la gran variedad de demandas locales. Al haber internalizado las estructuras físicas del sistema de canales, no siguen estrictamente las reglas que los ingenieros del Distrito les dan y que tienen un carácter demasiado general; las interpretan y aplican basándose en su habilidad técnica. Los canaleros aparecen como actores con *interfaces* múltiples, que relacionan los agricultores con el Distrito, el Distrito con el Ingenio de Azúcar y crean vínculos entre los mismos agricultores.

Cada año, al final de la temporada de lluvias se dan situaciones problemáticas en El Operado porque los canales se azolvan y el departamento de conservación de estos no puede limpiarlos a tiempo. La resultante escasez del agua forza a grupos de usuarios a buscar soluciones, aunque no es la solución preferida por los agricultores que ven con escepticismo los esfuerzos conjuntos. Sin embargo, al invertir trabajo, dinero, y capital social en la limpieza de un canal, la percepción de propiedad con respecto a la infraestructura física cambia: "del canal del gobierno" a "nuestro canal". Grupos de usuarios que repetidamente intervinieron en la limpieza del canal lograron este último carácter como duradero. Este elemento aporta una perspectiva para el futuro involucramiento de los agricultores en la administración de El Operado.

El plan de riego, formulado anualmente por el departamento de operación del Distrito, no es el instrumento con el cual se llegan a importantes decisiones para el manejo de El Operado. Las decisiones cruciales como son el fijar la cuota de riego o ceder a ciertos usuarios el derecho de sembrar caña de azúcar, son tomadas en negociaciones a puerta cerrada entre los actores concernientes.

En suma, el análisis de las prácticas de riego revelaron que los diferentes grupos de actores, los usuarios, sus 'líderes', los ingenieros del Distrito y el personal de campo, desarrollan diferentes prácticas. Estas se dan en diferentes esferas de interacción: el 'potrero', para los usuarios; 'la oficina', para los ingenieros del Distrito; y 'el ejido', para los líderes ejidales. En El Operado estas esferas coexisten lado a lado, cada uno reteniendo su grado de autonomía.

### *Intervención y practicas cambiantes*

El siguiente paso en el argumento aborda el punto de las intervenciones en el manejo de El Operado, y de los cambios que allí aparecen. De las tres intervenciones examinadas, una se refiere a la formación de una nueva asociación de usuarios que se encargaría de la conservación de los canales. Esta intervención fue el resultado de las luchas de poder entre las instituciones interventoras, pero sus resultados fueron la conclusión de los encuentros de *interface* que se presentaron en el proceso de implementación, es decir: encuentros e interacciones entre actores con diferentes antecedentes sociales o diferentes posiciones (por ejemplo entre ingenieros y líderes ejidales), donde al mismo tiempo, otros actores fueron excluidos, como fue el caso de los agricultores comunes. A pesar de que la intervención tenía un impacto inmediato, la mejor conservación de los canales, permaneció confinada al nivel organizativo formal y no logró cambiar las prácticas de las personas interesadas.

Las prácticas finalmente empezaron a cambiar cuando la asociación de usuarios también fue involucrada en la distribución del agua. Se instaló la posición de "jefe de toma", un usuario quien ahora supervizaba la distribución de un canal lateral, mientras que los delegados ejidales de la asociación junto con los canaeros coordinaban la distribución del agua en las 6 zonas de El Operado. Con esta nueva estructura se establecieron vínculos, por un lado, entre la mesa directiva de la asociación y los delegados, y por otro, entre los usuarios y canaeros. Dicho de diferente manera, las esferas se interconectaron y ahora los usuarios controlaron más fácilmente a sus delegados.

La asociación basada en los usuarios, que ahora representaban un canal en vez de un ejido, ayudó a discontinuar algunas prácticas anacrónicas originadas en los ejidos; balanceó una estructura organizativa desequilibrada y la asociación se concentró más en asuntos prácticos que en tejemanajes políticos. Por otra parte, al haber aterrizado en el nivel del canal la asociación se confronta con las prácticas de los usuarios comunes, que como ya hemos visto, habían estado involucrándose en un proceso de apropiación de sus canales. La asociación sigue todavía.

### *Perspectiva*

El análisis de El Operado, arriba resumido, ha descrito acciones e interacciones

sociales, tomando en cuenta su ambiente físico. El concepto de 'prácticas' emergió como un concepto sensible que facilitó encontrar la interacción entre personas y cosas en esta micro-sociedad que es El Operado.

En respuesta a la pregunta de investigación, los diferentes grupos se relacionan con el sistema de canales de manera muy específica: los ingenieros tienen la responsabilidad de su funcionamiento; el personal de campo es quien lo opera; y los usuarios dependen de él. Enfrentados con restricciones del sistema, estos grupos han desarrollado diferentes prácticas que, a través de acciones, se articulan con la infraestructura física en las diferentes esferas de acción. Al ser un sistema de riego un espacio construido por estas diferentes esferas, el hecho de que algunas de ellas estén desconectadas podría explicar parcialmente los problemas operativos que existen en El Operado. Las intervenciones que intenten solucionar estos problemas tendrían éxito si lograran cambiar las prácticas presentes en la forma deseada. Este cambio se facilita cuando se crean nuevos espacios de interacción, y cuando esferas anteriormente separadas son interconectadas. Así, nuevos vínculos implican que prácticas originadas en ciertas esferas alimenten la práctica de otras.

Partiendo de estos resultados, sugiero un método de diagnosticar la organización de riego basado en un registro descriptivo de las prácticas relacionadas con el sistema; de las esferas de interacción presentes; y de los vínculos que existen entre estos. La descripción de las prácticas de riego puede incluir: el contexto de la actividad de riego; las interacciones sociales que ahí surgen; las interpretaciones que las personas dan a éstas prácticas; y las estrategias que diferentes grupos desarrollan. En el caso de que éste diagnóstico revele problemas operativos en la gestión de riego, estos pueden ser discutidos con la gente interesada. Con ellos se puede revisar posibles soluciones o diseñar estrategias de intervención.

El tipo de intervención que tengo en mente pretende cambiar prácticas de riego, donde al reforzarse unas, otras son debilitadas. Esto implica tanto continuidad, como discontinuidad. El cambio puede ser conseguido a través de adaptar acuerdos organizativos formales a las iniciativas informales o a las experiencias dadas. Los ajustes del nivel formal incluyen: definir con más precisión las relaciones de propiedad referente a la infraestructura física; y re-ordenando las esferas de interacción. Este enfoque de intervención parte de la idea de que la gestión de riego, en esencia, consiste en situaciones de *interface*, es decir, de interacciones entre actores con posiciones diferentes, y reconoce que estos encuentros tienen un carácter emergente cuyas procedimientos y resultados nunca podrán ser completamente planeados. Así, este tipo de intervención trata de manejar cuidadosamente las *interfaces*, pero sin la ilusión de controlarlas.

Dirigiéndome finalmente a mi experiencia con la metodología empleada, donde el actor fué el centro del análisis y el intento entender sus prácticas y acciones, las entrevistas con las 'personas investigadas' a menudo resultaban en situaciones *interface*, en las cuales la gente cuestionaba mi posición, y en las cuales yo podía cuestionar a mis compañeros. Esto es un primer paso en un proceso de intervención.

## Notes

### Notes chapter 1

1. This word has been used in a similar way by Handelman (1978). See also David Brown (1982). Later, interface was also used in irrigation contexts, see Freeman and Lowdermilk (1985), and Ubels (1989).
2. I use Sayer's definition of structure: a set of internally related objects or practices (1984:84).
3. These management issues include: defining and enforcing by-laws, water fees, procedures on conflict resolution, water rights, cropping plan etc. Although in the literature authors group irrigation activities somewhat differently (e.g. Coward 1980; Hunt and Hunt 1976), the above distinction into three major groups of activities is useful, in that it distinguishes between the different nature of these activities.
4. Data on technical characteristics of the irrigation system were often readily available in the El Grullo District. Other institutions also gave me access to their archives which provided important quantitative information.

### Notes chapter 2

1. Project I use here in a broad sense: a planned undertaking by a group of actors, either private citizens, government agents or both.
2. It has been estimated, that at the time of the Spanish conquest of the region (around 1525), the total population of the valley could not have been less than 24,500 (Kelly 1945). Thereafter, the population declined rapidly, only to recover its original size in the first half of the 20th century (in 1900 around 20,000; in 1910 around 23,000; Indice.. 1912). In 1990, a rough estimate of the population living in the valley was around 80,000, of which 75% lived in the main towns of Autlán and El Grullo. So, the population increased on average by 1.55% per year. The growth of the towns has been dramatic, especially due to a population flow into both towns from rural areas. Autlán grew from slightly over 10,000 people in 1910, to 35,000 in 1990. Between 1970 and 1990, the annual population increase was 3%. El Grullo grew in the same period even more rapidly: from 2,300 in 1910 to 10,000 in 1970, and to some 25,000 people in 1990 (growing on average 5% per year between 1970 and 1990). (1910 figures from Indice.. 1912; 1970 figures from Winnie 1982.)
3. Until the 20th century, the town of Autlán was known as Autlán de la Grana.
4. There is evidence that a gradual shift took place in the major commercial activities of the *haciendas* in the region, from cattle-raising during the 18th century towards sugar production in the 19th century. Nevertheless, at the beginning of the 20th century this *hacienda* of Ahuacapán is said to have still herded 1,500 cows.
5. Often, this name made some reference to the crops that were being cultivated or were said to have been cultivated there in former times (*La Lima, Los Aguacatitos, El Arrozal*), or to its soil quality (*El Banco, Tierras Negras, Salitreras*), type of enclosure (*Corral de Piedra*), or trees present (*El Guamúchil, Las Higueras*); its location (*Playa de Enmedio*), its shape or size (*La Longaniza, Potrero Grande*) or any other typical landscape feature of that *potrero* (*Cruz de Piedra, Los Charcos*), or historical event (*El Milagro*); the name of the owner (*Lo de Leon*), a saint (*San Isidro*) or simply the name of that location (*Ixtlán, Tepocilama*).
6. Letter from Ricardo Zárate to the Secretario de Gobierno del Estado de Jalisco, dated December 7, 1903. Archivo del Estado de Jalisco, Guadalajara. File F-6-896 AUN/220.

7. In 1782, a project started to construct a new dam. In 1845, a new 'water project' was initiated which included the construction of a large feeder canal (id., p.363). By 1866, the Autlán town council had approved the budget for the construction of an aqueduct for the town water supply. The budget amounted to 237 pesos (Archivo del Estado de Jalisco; file 1270 Año 1866, Cajos F-64).
8. In short, a full-fledged organisation had been built up for the administration of the Ayutita water, including employing a *fontanero*, or water master. The regulations also defined 'that all the landowners who want to use water for their sugar plantations, vegetable gardens and other crops, pay this or that water-tax, and that these farmers follow several other rules with respect to the quantity of water to which they are entitled, the days of the week on which they can take water etc. etc.' (Colección.. VI, p.296)
9. Autlán is not unique in problems with domestic water supply. It is said that in Mexico nearly all villages and towns experience grave problems with town water supply. For example, the situation of the second village of the valley, El Grullo, is worse when compared to Autlán. My file on problems concerning El Grullo's domestic water supply contains at least 50 official documents and newspaper articles, apart from the three petitions an independent village committee held, one containing a list of 1800 signatures. See below.
10. The law must be seen as a result of a long-standing discussion on the position of the 'indigenous' population within the Mexican state, which started before Mexico's independence, at the end of the 18th century. Abad y Quiépo, for example, proposed in 1799 a new law, 'a law that establishes an absolute civil equity of the Indian class with the Spanish class' (Florescano 1976:138-139). Florescano concludes, however, that Abad y Quiépo, and with him the later liberals, failed to see the *hacienda* system as the cause of the Indians' poverty, and consequently did not propose a land reform affecting the *hacienda* lands. See also Gutelman (1974).
11. The lawyer summarised the case as follows: "It is a fact that the land distribution commission of the indigenous population was established in accordance with government decree no.121, and that the Autlán town council recognised this commission as being composed of individuals of the primitive race, to which the law is favourable. The town council decided and met to give them the land or lands which it owned, and in spite of the lack of will of this institution and her alderman (*síndico*) to give up these lands which it administered, and after having requested the *síndico* many times to do so, the latter together with the administrators of these lands (*mayordomos*), Don Nicolás Mardueño and Don Epifanio Meza, presented himself, and handed over the terrains, of which the land taxes had been received by the municipality. In the act of handing over the land, that is to say, when the extension of the land was indicated by the *mayordomos*, Don Pedro Michel and Don Jesus Corona opposed, saying one that he owned part of the land, and the other that he had claimed another part of the land, without presenting land titles nor basing their opposition on arguments, with the result that it seemed better to come to an agreement between the members of the town council and the ones who opposed in order to evade the rights of the Indians (*indios*). (...) With this simple opposition, the town council decided not to execute the said decree, sending from 1850 onwards requests to the government not to take the land which it owned, and which the government ordered to be distributed (*repartir*), recurring to different arguments which, in different forms, always were the same, and we deduce from it a very tenacious opposition in order not to execute the decree no.121, and to not obey the resolutions of the government." (Colección.. VI, p.4-5)
12. Archival materials consulted provide no more information after these entries.
13. The Mexican revolution (also called Madero revolution, 1910-1917); the first agrarian movement (1918-1924); and the Cristero counter-revolution (1926-1929), respectively.
14. An *ejido* is an organised agrarian community that corporately holds lands, in accordance with the land reform laws. These lands are received as a grant from the government, which legally remains the owner. The beneficiaries of this right to farm land are called *ejidatarios*. Usufructuary rights are inheritable but cannot be divided (Heijdra 1989:99). An *ejido* is often village based, although only a (small) part of the villagers are *ejidatarios*. In the Autlán-El Grullo valley, an *ejido* has between 20 and 400 *ejidatarios*.
15. All *ejidos* in the Autlán-El Grullo valley handed out their *ejido* land to the individual *ejidatarios*. Fields were not held communally, with the exception of the poor lands on the hills, which were used for the communal herding of the cattle which was individually owned.
16. Until 1935, the valley was in fact quite isolated from the rest of Mexico; the only way to get in or out was on horse-back, following the trails which were called *herraduras*. It would take seven days from

Autlán to reach Guadalajara (180 km), and five to Cd. Guzmán (100 km). The main town linking the valley with wider Mexico was Sayula where the railway to Mexico City ended. It would take the *marraneros* 15 days of walking their herd of pigs (*marranos*) to Sayula, where they were shipped to Mexico City. The pigs were equipped with leather shoes, without which they would not make it to Sayula. When in 1935 the all-weather road Guadalajara-Autlán was inaugurated, and in 1937 the bridge over the Río Ayuquila was constructed, this opened up the valley for outsiders, and conversely, for the inhabitants of the valley this meant a widening of their horizon which ended only in *El Norte* (U.S.A.). It is said that the rich of the valley at this time started to buy their first Ford 'pick-ups'. Furthermore, Autlán was also linked to the coast (Kelly 1945:3). The new road infrastructure would have an irreversible effect on the orientation of valley entrepreneurs towards commercial activities.

17. I know of the *ejidos* Ahuacapán, Ayuquila, El Cacalote, and El Grullo, where during 1933-1937 the *ejido's* president sold part of the recently acquired *ejido* lands.
18. After the Guadalajara-Autlán road had been inaugurated in February, in June 1935 the Autlán town council organised an agricultural fair. According to a brochure dated February 1937, thousands of visitors attended the fair, not only people from the region, but also visitors from Guadalajara and Mexico City. 'Autlán is known through this event for its promising agricultural and cattle-raising potential', stated the brochure.
19. This policy has a striking resemblance to the policy adopted by the Salinas de Gortari federal government in 1989 to the so-called *responsabilidad compartida*, shared responsibility.
20. For example, the construction of the electricity line to the valley cost an estimated 12.5 million pesos (1 million US dollars); of which 6 was paid by the Chapala electricity company; 3.6 by the federal government; and 2.9 million by individuals; of the latter figure 2 million was paid by the San Francisco manganese mine near Autlán, the remainder by the villagers of both Autlán and El Grullo. For the asphaltting of the Autlán-Barra de Navidad road, as well as for the telephone connection, a similar approach was followed (Alvarez 1959).
21. From the official information provided by the SRH ministry, a curious picture emerges. Whereas from the Informe Laboral 1954 it appears that the construction works on the Tacotán dam had advanced to 60%, the next year's Informe stated that some changes in the project were made: 'the designs for the location of the general plant and the retaining wall of the Tacotán dam were revised and modified' (SRH: Informe Laboral 1955).
22. The rehabilitation and extension project which started in 1979 was supposed to install the pumping stations, but to date no attempts have been made to start with the construction works. See below.
23. The total cost of the project was calculated as follows: the Tacotán dam cost 51.45 million pesos; the diversion dam at El Corcovado 3.80, and the canal infrastructure 33.45 million pesos (SRH: Informe Laboral 1950, 1951, 1952, 1954-1959, and 1961; and SRH: Presa derivadora El Corcovado.. 1960). This seems inexpensive when compared to the market value of crops. The irrigation infrastructure enabled farmers to grow a second crop. Suppose they would grow maize with yields of, say, 3 tons/ha, then the export value of this crop would range around US\$ 200 or representing 25% of construction cost (between 1960 and 1965, Mexico exported maize at a price of US\$ 58 per ton on average (FAO 1963, 1966).
24. This relationship dates from the time that the Mexican president in 1951 visited El Grullo to inform the farmers of the construction of the irrigation system. Apparently, Nacho Díaz had already studied the plans and he was the only local person who dared to raise a question during the meeting with the president. He asked why the project did not include a drainage system, the lack of which made meant at least 2,000 hectares of the most fertile lands would never be irrigated, because these were marsh lands. (Nacho Díaz himself owned most of these lands.) The president immediately turned to the Jalisco SRH representative, asked for an explanation, and ordered him to send a team of engineers to El Grullo who would study the drainage problem. The team indeed did arrive in the valley, and they paid a visit to Nacho Díaz.
25. *Bonanza* means prosperity. It is also the name of one of the Autlán-based tomato companies.
26. The first Americans to get involved in agriculture in the valley arrived a few years earlier. They grew chickpeas for export with two rich El Grullo landowners (Nacho Díaz was one of the two). Unfortunately, the Americans left with all the produce without paying these farmers their share.
27. The tomato boom has been particularly important in Autlán, which is documented at length by Humberto Gonzalez (1990, 1991).



28. The fall of Walter Holm seems to be caused by a coincidence of (1) bad luck with the transport of the melons to the U.S.A., since various loads of melons that were transported by train were affected by a railway strike in the U.S.A. and all melons rotted; (2) various farmers did not respect the contract they had signed with Walter Holm, so Holm is said to have lost various tractors and implements to El Grullo farmers who simply did not return these to him. Furthermore some farmers sold their melons to other buyers, not paying back the money invested by Holm; (3) Holm was defrauded by his own local representative.
29. There have been frauds reported in El Grullo, Autlán, and the Tuxcacuesco area, involving a handful of U.S. companies and various brokers of both American and Mexican nationality. The total value of these frauds committed during 1970-1990 amounts to several hundred thousands US dollars.
30. The frauds committed followed a clear pattern. 'In the Costa region there were many American companies active, and all worked like this: the first two years they worked properly, and in the third and fourth year they made a run for it, with all and all [the profits]'. Interview with the first president of the El Grullo melon growers' association, 24/2/89.
31. Simultaneously, the packing plant of nearby El Limón, 50% owned by the El Limón growers association and the rest by yet another U.S. company (Valley Union), ran into problems related to mismanagement. Some years later ( around 1983), the same would happen with the farmer owned packing plant in San Juan, along the Río Tuxcacuesco which had been founded in 1981. This packing plant marketed their produce of melons and cherry tomatoes through the regional Griffin & Brand representative. In both the El Limón and San Juan cases, and similar to the situation in El Grullo, management problems have been attributed to a gradual build-up of close relationships between the local farmer leaders and the local representatives of U.S. companies, to the effect that the majority of farmers were estranged to the daily management of marketing, the signing of marketing contracts, and the fixing of prices, which to many seemed quite arbitrary. For a fascinating study of the San Juan 'drama', see Heijdra 1988 and 1989.
32. Melon is a low-growing trailing herb, cane is over 2 metres high. Sugar cane does not flower and is a perennial crop, whereas melons you sow every season, and they flower. Many different melon varieties exist, and it is polymorphic, whereas different sugar cane varieties look much the same. Melon you have to treat with devotion and care, whereas cane normally is treated more roughly (for instance, irrigating a melon crop has to be done meticulously, and it requires many hands; a sugar cane plot, in contrast, you can easily irrigate by yourself and not much care is required). Finally, for farmers the melon fruit is beautiful, and something to be admired, tasted and compared among them, whereas sugar cane farmers never see the final product of their crop, except the black burnt cane stalks carelessly piled up in the lorries.
33. As a result, ground water extraction in the Autlán region increased from 3.4 million m<sup>3</sup> to 79 million m<sup>3</sup>/year. Since the annual recharge of the ground water system was estimated at 78 million m<sup>3</sup> in a 1973 study, the ground water table started to fall. A Presidential Decree of February 10, 1978, declared a ban on new drillings in the Autlán area for an indefinite period. Notwithstanding, in subsequent years another 60 or so deep-wells were drilled. The first deep-wells in Autlán were drilled to a depth of 40 metres, the latest deep-wells, however, are said to be drilled to 120 metres or more. The oldest deep-wells ran dry.
34. I only know of two deep-wells in the hands of *ejidatarios* that are mainly, and very intensively, used for vegetable production. Both deep-wells, which are situated near the town of Autlán, were constructed by the *ejidatarios* themselves.
35. His ownership of these lands, however, was not that clear. These lands had been claimed by an *ejido*-formation. However, in its 20 year long struggle this *ejido* never succeeded in getting the land.
36. Gonzalez (1988) presented some evidence of the General's hostility towards the entrepreneurial companies. The General especially was disturbed by the formation of the various growers' associations in the region. These farmer organisations were not directly affiliated to the CNC and CNPP farmer unions, and hence were not firmly rooted in the Mexican 'institutional' political system, and, in his view, might become a threat to it.
37. Brunt (1989) estimates that over 15% of all *ejidatarios* in the valley are female, the majority being widows of male *ejidatarios*.
38. It is striking that many of the large farmers who during the seventies were heavily involved in melon production, and who made the shift to sugar cane during the early 1980s, were the initiators in breaking

- away from the CNC association, and founding the growers' association affiliated to the CNPP.
39. In contrast, the labour force of the sugar cane refinery stay permanently in the valley, and many live in quite comfortable houses owned by the refinery. The labourers from the refinery do not mix whatsoever with the cane cutters.
  40. One employee is said to have controlled over 300 hectares, through semi-legal and illegal practices. According to the then head of the irrigation District, a study undertaken by the District concluded that as much as 40% of all sugar cane was controlled by refinery employees, through share-cropping, the use of *prestanombres*, and simply by demanding a percentage of the harvest value whenever an *ejidatario* applied for the right to grow sugar cane.
  41. Some local observers have analysed this hegemonic struggle over sugar cane development in the valley in terms of two antagonistic groups, one identified with general García Barragán who had asserted direct influence over the sugar refinery's management, and the other identified with José Guadalupe Zuno Arce, who headed the *Comisión del Sur*. The new ambitious leader of the CNC cane growers association was recruited from among the ranks of Zuno. (See below.)
  42. This is partly attributed to these pests and diseases, and partly due to limiting irrigation applications, enforced by the District.
  43. In the Mexican political system, until recently to be nominated as the PRI candidate for any election normally implied that you would be 'elected'.
  44. These *unidades de riego* have been studied by Michael de Bont (1989), Wilma van Esch (1989), and Hans Heijdra (1988).
  45. The political relevance of the *Comisión del Sur* for the Autlán-El Grullo valley mainly lies in the fact that Zuno represented a Jalisco based political group which competed with the group around García Barragán over political dominance. Apart from antagonistic relations that existed between García Barragán and José Guadalupe Zuno's father (who had been state governor in the 1920s), Zuno Arce had been a left activist, who during his student years at the University of Guadalajara had been one of the radical student leaders, and had supported several militant grass-roots movements which during the 1960s experienced increased repression (Alcántara Ferrer 1979). There is little imagination needed to see what, in 1968, Zuno Arce must have thought about the student killings at the *Plaza de las Tres Culturas*, and about the persons responsible for that act, among whom was General García Barragán in his capacity of Minister of Defence. See for a lively account of Zuno's life and ideas Loret de Mola, 1979.
  46. This is not so surprising as it may seem, since it is well-known that some officials in the *Grande Irrigación* department of SARH, where projects are conceived, elaborated and decided upon, are themselves connected to engineering and construction firms (cf. Greenberg 1970:73).
  47. It may have been that the project calculated a considerable rise in irrigation efficiency once rehabilitation had been completed, and the existing earthen canals would be replaced by lined concrete canals. With it, gross water demand per hectare would be reduced, partly offsetting the need for extra storage capacity. However, comparing water distribution efficiencies as calculated (not empirically measured!) by the irrigation District, we learn that before rehabilitating El Operado, this efficiency was assumed to be 49%, and in 1987/88, when rehabilitation was nearly completed, it had risen to 57%, thereby offsetting the need for extra storage capacity for only 1,400 ha extra irrigated lands ( $(57/49) \times 8,700$  ha), assuming that water availability before rehabilitation was adequate.
  48. Loan conditions were: an amortisation period of 20 years, at an interest rate of 7.5%, with a credit fee of 1.25% on undisbursed balance; and a disbursement period of 3.5 years (id., p.5.). The Autlán-El Grullo project formed part of a wider IDB loan, including the rehabilitation and expansion of the Xicotencatl irrigation system in Tamaulipas. Both projects were selected by IDB out of 5 projects presented by SARH. IDB chose these two projects because their studies had been completed; the presence of organisations of beneficiaries (here, for Autlán-El Grullo probably the sugar cane and melon growers' associations were meant) and of organisations of the 'interested public sector'; their agricultural potential; and because of the positive estimated time of return of investment (Contrato de Garantía.. 1979, Annex: Mexico, Irrigation system rehabilitation and expansion project, p.2-3). The project was considered economically feasible, with a cost-benefit ratio of 1.3, and an IRR of 14.9%. For the individual water users, an increase of income of 3,700 US\$ at the year of consolidation of the project was expected. However, its impact would vary according to farm size. The loan agreement itself acknowledged the

existing wide disparity in farm size, and thus in income, between *ejidatarios* (88% of all water users, with an average farm size of 6.5 ha); private landowners with less than 20 hectares (representing 7% of the water users, with an average farm size of 10.9 ha); and the large landowners (5% of the water users, with farms of 49.2 ha on average). It was estimated that incomes varied from US\$ 2,200/year for *ejidatarios*; US\$ 7,000 for small landowners with less than 20 hectare; to over US\$ 15,700/year for the large land owners (for some even more than US\$ 50,000). (Contrato.. 1979:15)

49. When he took office in December 1982, the peso stood at approx. 100 to the dollar. When he left office in December 1988, this figure had increased to 2,500.

### Notes chapter 3

1. Cf. Finkler (1978) for a discussion on share-cropping practices of *ejidatarios* in irrigated agriculture in Mexico.
2. The case of the farm of the family Gonzalez is illustrative. It cultivates in total 106 hectares of sugar cane. In the factory's records, sugar cane is registered in 10 different names (father, mother, father's sister, and 7 children). However, one son administers the farm and dedicates all of his time to it. The other family members have other activities and are not seen on the farm. My two informants agreed that this was clearly a case of one enterprise.
3. The canals were constructed next to the existing earthen canals, in order not to disrupt irrigation. El Operado's infrastructure includes 311 km of irrigation canals, 136 km of drains and 295 km of field roads. Of all irrigation canals, 235 km are lined (80 kms. main canals, 87 km of lateral canals and 68 km of sublaterals) and 76 km are earthen field canals.
4. Before the irrigation season starts, farmers have to formally request the crops they want to grow. These requests are considered by the District, and normally granted. Some crops are however prohibited, such as rice, as well as a second irrigation crop. Also sugar cane is subject to certain restrictions.
5. This statement does not wholly apply to El Operado, since water is not in short supply in most years. The following discussion on water losses does show some of the weaknesses of the system's operation.
6. I made small corrections due to some sewage water coming from the towns, and some pump irrigations along the river. The efficiency was calculated as follows:  $(7,100-3,300)*100/7,100 = 55\%$ . Of all the water drained into the river 10% or 7.2 million m<sup>3</sup> were re-used in 1987/88 by a pumping station serving some 600 hectares within El Operado (zone 2b; see figure 3.6, below). Overall water efficiency would rise to some 58% if we included this re-used water in our calculations.
7. 'Dictámen técnico por el Ing. José Luis Santana y el aforador Francisco García los días 22 y 25 de marzo de 1988.'
8. Based on a sample of 40 plots (20 on sandy soils, 20 on clay), covering in total 162 ha.
9. Before rehabilitation, it could take weeks before the water reached the tail ends of the main canals (its profile had been gradually enlarged because of annual excavation of silt).
10. Compare this with the Gezira Scheme of Sudan. There, storage in canals appears important for easy water management, especially storage in tertiary canals. See Plusquellec, 1990.
11. Sandy soils receive 25 to 30% more water than loamy soils, and clay soils receive approx. 30% less water than the loamy soils, given current practices. With these figures I estimated a soil correction factor with respect to irrigation water use: for silty clay/clay/clay loam 0.85; loam/silt loam 1.10; sandy loam 1.40. This correction implies that e.g. sandy soils receive 65% more water than clay soils (1.4/.85). This is a reasonable figure, since maize farmers use to give up to 8 or 9 irrigation turns on sandy soils, whereas on clay soils only some 4 or 5 turns are given. There is no evidence to believe that farmers on sandy soils give smaller irrigation applications per irrigation turn. For sugar cane a similar practice has been identified (see above).
12. Cropping patterns were virtually identical. Climate was very similar. Pan evaporation was 10% higher in 1989 than in 1988, but this is attributed to a rainstorm during the reviewed period in 1988 of 20 mm, whereas during that period in 1989 precipitation was zero. Hence, the irrigation water need in the 1989 period was 4% higher than in the 1988 period. Gross water flow into El Operado between January-March

in both years are comparable (5,830 and 6,090 lbs), and become nearly identical when correcting the 1988 figure for the 20 mm rain storm.

13. Gross returns of 1 ha sugar cane, with a yield of 90 ton/ha, ranges around 3.5 million pesos or US\$ 3,500; 1987 prices. According to the irrigation District, water fees vary for different crops depending on irrigation water need. The District also says it takes differences in market value of the crops into account, when the height of the fees are reviewed (annually). We were not able to assess the exact criteria upon which the water fees are defined.
14. During the drought of 1982/83, each registered water user was allowed to irrigate a maximum area of 6 ha. This measure, which appears in the Federal Water Law, is 'progressive' in the sense that it favours small producers (those with less than 6 ha could irrigate all), and affects those water users with more land. In practice the implementation of this measure is difficult. Not only because the larger producers see their interests severely affected, but especially because it is difficult to decrease the area with established sugar cane. It is also unlawful, since an already established crop may not be denied water. So, during the water shortage which occurred in the 1989/90 season, a very different measure was taken: only the perennial crops were allowed, and all remaining plots were denied water.

#### Notes chapter 4

1. We have to note that the extent of the *canaleros'* work unit, both in terms of area, number of plots, and in number of farmers served, seems quite normal for Mexican irrigation systems managed by SARH (cf. Mares 1980:476; Haissman 1971). When compared to irrigation systems found in Asia, the work unit of the *canalero* in Mexico seems vast indeed (cf. Bottrall 1981; Bos and Storsbergen 1978). However, the area served seems an inadequate criterion for comparing Asian and Mexican irrigation systems. Better criteria would be: number of plots served, number of farmers served, or number of canal structures operated per water guard (cf. Hunt 1988).
2. I find the *canalero's* routine important as it reflects many aspects of his work. In Appendix 3 a description is given of one working day of Miguel.
3. From the description of Miguel's work day (see Appendix 3) it can be seen how frequently problems related to the suspension of sugar cane plots emerge.
4. The material upon which this analysis is based is limited: I use 5 encounters between Miguel and farmers that I observed and recorded on tape. Compared to the numerous other routine encounters I witnessed, these 5 are not atypical.
5. In the following section we will see that in encounters that are more potentially conflictive, Miguel's tactic is to try to explain thoroughly to water users whatever technical reason may have caused certain problems. During these interactions, again Miguel makes many openings towards the water users.
6. Although these encounters follow a pattern, and thereby have a structure, they are not automated, but have meaning. This has perhaps something to do with the discussion process itself. The moment Miguel feels that a certain subject is becoming sensitive (when he has to force a measure to be taken, or criticise the farmer etc.), he readily finds a temporary exit option, which relaxes the atmosphere but at the same time elicits useful information.
7. Cf. 'the headman's dilemma' used by Fallers (1967:175).
8. Through his close relationship with Engineer Corona, Luis is able to secure relatively more water for his zone. See what happened when Luis was transferred from zone 2 to zone 1, in August 1988. The rather high water consumption he had been able to secure in zone 2 in the 1987/88 season, fell in the next season by 14%, whereas his new zone experienced a sudden increase in water consumption by 50% over the period January-March 1989. See chapter 3.
9. Here I refer to the documents, devices and drilled people, mentioned by Law (1986) as particularly important for (long-distance) control mechanisms.
10. This is not to say that the higher ranked are more 'aware' or so. I would rather argue the opposite: the lower placed actors have to think twice (and frontline workers perhaps even three times) before doing something: "what ought I do in order to please (or frustrate!) my boss, and what do I want myself". See

Jos van der Klei (1990); stelling 11.

11. In their recent book on farmer developed irrigation systems in the valley of Tehuacán, México, Enge and Whiteford (1989:174-175) make mention of *apisadores* or *canaleros* who play a key role in the water distribution process. In these farmer managed systems, characterised by the *galerías filtrantes*, some people own specific shares of the irrigation water. There is a water market where shares are bought and sold. The *canaleros* operate on these markets and emerge as true water brokers. This is similar to some cases found in Eastern Spain, where *regadores* (in Campo de Lorca) and *celadores* (in Campo de Cartagena) both distribute the water and buy and sell shares on behalf of farmers and water-owners (Broeshart 1989; Willemsen 1990).
12. In any institution concerned with the implementation of policies, you will find this kind of 'frontline worker'. Examples are shop stewards in England (Gluckman 1953), policemen and social workers (Lipsky 1980), unit managers in the Mahaweli Scheme, Sri Lanka (Siriwardena 1989), and managers in the CONASUPO food programme in Mexico (Grindle 1980).
13. There is one particular factor which induces *canaleros* to engage in 'free-entrepreneurship': as *canaleros*, they see a lot and they know of most of the 'personal projects' of their superiors in the District. They have experienced throughout the years how these engineers use the field personnel to distribute favours to water users, without giving the personnel their 'share', even though it complicates the work of the *canalero* considerably. The *canaleros* know that in comparison to the bonuses the engineers receive, their own projects are 'peanuts', only a small percentage of their income. This has of course created a lot of resentment among *canaleros* and has worked as a stimulus to enhance their own projects.

## Notes chapter 5

1. Some 80% of all management costs of El Operado are destined for maintenance. In 1987, maintenance costs for El Operado represented around 50% of the entire budget of the District.
2. A recent literature survey on irrigation water management (Jurriëns and De Jong 1989) does not dedicate one paragraph specifically to canal maintenance. The same holds for Robert Chambers' work on canal irrigation in South Asia (Chambers, 1988), or Uphoff's work on irrigation bureaucracies (Uphoff et al. 1988). Welcome exceptions are Bottrall (1981) who includes maintenance in his survey of four irrigation systems; and Merrey (1986) who presents a case study of water course improvement (a special case of canal maintenance) to reveal cultural patterns which underlie irrigation practice in a village in Pakistan.
3. Martin (1986) found for several farmer managed irrigation systems in Nepal that joint canal maintenance forestalled conflicts in water distribution.
4. Including canal maintenance as a topic in so-called rapid appraisal missions seems self-evident. Chambers and Carruthers (1986), however, do not refer to maintenance as an important diagnosing indicator. Yoder and Martin (1985), however, do include maintenance in rapid appraisal surveys.
5. Such was the case in both 1987 and 1988. Maintenance works in El Operado include taking care of the storage dam, the irrigation canals, drains and road infrastructure. Canal maintenance is perceived as most critical, since a lack of it directly affects water distribution. It thus has to be executed in a relatively short period. In this chapter I will limit the argument to canal maintenance only.
6. During two months in 1987, I recorded over 40 major events directly related to 5 severely silted canals.
7. I am indebted to Piet for letting me share his valuable research findings. I do not hesitate to use his material since his work bears some of my own finger prints as well: I initiated him both into the valley and into social interaction research, although he alone has given his research its own unique form.
8. The control structure in the on-going lateral 5 had backed up the water so that water could enter the high-lying Limoncito canal. Lifting the plate would imply cutting the water flow to the Limoncito canal. See figure 4.5, chapter 4.
9. Only later did I find out that they had never taken the photograph. Still later, I found out that it was not the farmers but Miguel who invented the story. Don Alonso really played his part convincingly!
10. Chico's half brothers are cousins of Abraham.
11. You see this kind of village 'norm' at work when you fail to greet a friend or acquaintance. He may

- remind you of it on a next occasion, and ask: *¿por qué te pones orgulloso?* (why are you so arrogant?).
12. Chico distrusted his own father in the share-crop arrangement he had with him. 'When it comes to dividing the harvest, I am sure he will take it all and give me some small money for the work', he told me. This was in fact what finally happened.
  13. This discussion on norms underlying village life resembles somewhat Foster's model of 'limited good' (Foster 1967, see Long 1977:41-52 for a discussion). I do not want to take this normative aspect rigidly. I merely try to show that before Chico took action, he had to weigh up the social consequences of his initiative.
  14. See Long 1989:228-231, on the importance of emergent structures.
  15. The work party or *faena* involving the cleaning of the canal has some parallels with the *ayllu* organisation found in Peru (Skar 1982). The *ayllu* is described as an extremely flexible grouping of individuals normally brought together in the form of an ego-centred network which comes into being for a specific purpose and lasts for a limited duration (Long 1982:16). The *faena* also can be understood as an action-set: a set of persons who have coordinated their actions to achieve a particular goal (Boissevain 1974:186). Chico mobilised part of an already existing network, a mix of kin, neighbours, and friends. This network existed already for quite some time, and the people of that network might be considered to form a quasi-group. This quasi-group exists through a series of contexts of activity without any formal basis of membership (Mayer 1966). It may be that the subgroup performing the *faena* may become a quasi-group itself, after they engage in more such activities.
  16. Or, in Bourdieu's words, their acting upon a physical artefact, enacting the *faena* in an essentially material setting, has contributed to their dispositions or *habitus* (Bourdieu 1977).
  17. As Miller (1987:106) has argued, the physical and external presence ensures that artefacts lend themselves to becoming symbols. For Miguel, the *canalero*, the *faena* took an extra dimension with the invention of the photograph, another artefact which became the symbol of the maintenance department neglecting its task and farmers taking action (see chapter 4).
  18. Moreover, Engineer Corona, head of the operation department, in earlier years worked in this village as an extension worker and had his own agro-chemicals shop, and advised farmers on horticulture. Everybody in the village knows him, and vice versa, he knows everybody, which makes it more easy to go and see him.
  19. Officially the Autlán-El Grullo area office should be in charge of both tasks. It is not so. See chapter 3.
  20. For the total maintenance task the department has at its disposition: 2 draglines, 2 bulldozers, 1 grader, 2 hydraulic excavators and 1 industrial tractor equipped with a small-size excavator.
  21. The discrepancy in financial years of both departments also reflects how different departments within the District in some respect are more vertically linked to their 'mother' departments at SARH offices in Guadalajara and Mexico City, than to each other at District level.
  22. The accountability issue is compounded by the fact that no direct relationship exists between water fees paid by farmers and the department's product, namely clean canals. The water fees paid by water users are not readily available to the department, but instead make an enormous detour (Engineer Corona uses the nice understatement of *vueltecita*) via Mexico City.
  23. The word *triangulación*, derived from topographical jargon, refers to triangle, but it subtly conveys an affinity with *estrangulación* (strangulation). The word thus suggests that this triangle relationship holds the District strangled, and frustrates the efforts of others.
  24. The supervisor drives through El Operado to check farmers irrigating. He is able to observe maintenance works as well. Moreover, he knows the maintenance department and its personnel, since he used to work there before Fuentes became head.
  25. This superior, in turn, finds himself in a similar position, but probably much more awkward, since the institutional resources controlled at State level are much greater and more important to his superiors (both the *delegado* heading the State office, and superiors at the Ministry in Mexico City). Consequently, higher engineers are still better controlled and tightly bound to their superiors. As a detailed (but dated) study of the (then) SRH ministry concluded: 'Ironically, the higher one goes in the ministry the more one must worry about the future, and the more insecure one becomes' (Greenberg 1970:120).
  26. Greenberg (1970) found that within the then SRH ministry, engineers are most loyal to the ones who appointed them. Consequently, the relationships of superior-subordinate in the ministry's hierarchy are

- highly personalised (cf. Grindle 1977).
27. Power relations within the institution being highly personalised, raises the question of how the ministry's centre is able to exert control over its subordinates. It is generally accepted, at least by SARH personnel themselves, that the basic control mechanism is information management. Apart from the formalised vertical flows of information, more informal flows are characteristically channelled through the personalised vertical relationships already mentioned. Another institutionalised form of information management is through audit commissions, which may be sent to any District by a higher authority. These commissions are especially interested in finance. Evidence found on financial gaps is directly sent to the higher authority. The commission will let the implicated official know that they can prove the case. The official by now knows that his superiors can make or break him, and he will normally respond to any demand put forward by them. Then, nothing is heard any more of the audit report, which is discretely filed. Very rarely does auditing have 'visible' results (like dismissal). (Cf. Greenberg 1970:128-130.)
  28. However, later I found out that high SARH officials at the Guadalajara office were informed over the actual critical situation with respect to maintenance. They have their own vertical chains of trusted subordinates, through which they have access to this type of local information. See chapter 7.
  29. This was important to Corona because in the 1988/89 irrigation season the area cultivated attained an all-time high, while at the end of the 1987/88 irrigation season, the storage dam had been almost depleted.
  30. This is government owned land, which can be leased to farmers. However, farmers can be evicted from it when this is in public interest, e.g. when the river changes its riverbed. All *zona federal* lands by definition lie outside El Operado, and are officially not entitled to receive irrigation water.
  31. The new field intake would serve especially Enrique's recently acquired lease of 10 hectares of *zona federal* at the very tail of the canal. Apart from this, Enrique has his regular 8 ha plot with sugar cane, and 80 cows (along the Llano canal).
  32. The intake was constructed without permission. When Fuentes discovered it he became angry. Alonso told him to stop nagging, because anybody could see that it was functioning well. (Sijbrandij 1989b:68)
  33. Farmers are well aware of this, but to elect another leader is difficult (1) because as yet the canal organisation has no formal structure, nor are regular meetings held; the position of *jefe de potrero* is only formally recognised in the *ejido*, which is quite a different setting; (2) someone who proposes that Enrique has to resign, himself risks becoming the subject of back-biting ('he wants the position' etc.).
  34. 'The problematic situations [...] are not capricious or randomly generated, but rather reflect both past and current nooks in the social and material world' (Van Maanen and Barley 1985:34).
  35. As has been stated earlier, the official organisational set-up of the District is such that the head of the Autlán-El Grullo office should be in charge of both operation and maintenance of El Operado.

## Notes chapter 6

1. In 1984, the name was again changed to *distrito agropecuario* (agricultural district) and in 1986 to *distrito de desarrollo rural* (rural development district). The term *secretaría* refers to the ministry in charge of the District: the *Secretaría de Recursos Hidráulicos*, and since 1976, the *Secretaría de Agricultura and Recursos Hidráulicos*. The term '*recursos*' is used as a synonym.
2. The report upon which the actual figures of table 6.2 are based is not reliable. The figures are estimated data, especially the figures on water volumes. I made several adjustments in order to make the figures more in line with the actual field situation. So I estimated the area served by the El Relicario pumping plant at 600 ha. The 'Informe del desarrollo del plan de riego, mes de junio, 1988' however took this area to be 241 ha (whereas the irrigation plan still uses 800 hectares). To under-estimate the area of sugar cane served by the El Relicario pumping station implies that the area with 'regular' sugar cane increases in the books, and consequently, the gross water layer applied to the regular cane apparently diminishes. It seems in the interest of the District to diminish the apparent water use of sugar cane. Another figure, namely the total volume of water used as appears in table 6.1 (119 million m<sup>3</sup>) is not in accordance with other data I consulted. More likely, is the figure of 124 million m<sup>3</sup> which I use in chapter 3. However,

I did not include this figure in the table, otherwise I would have had to adjust all other figures accordingly. Gross water layer applied would become 1536 mm.

3. On the board sit representatives of all the local offices of the government institutions involved in agriculture and rural development in the entire region covered by the El Grullo District (like rural credit bank, ministry of land reform, the parastatal which gives crop insurances, and of course the District), as well as representatives of farmer organisations (CNC and CNPP farmers unions, *uniones de ejidos* etc.). The farmer representatives are normally a minority on the board. The board is presided over by the head of the District.
4. On December 22nd, farmers started to cultivate 100 ha of melons. Initially there were some problems with the canals and structures, which had never been used, and much water was lost because of the isolated position of this area (outside El Operado). The farmers finally had good yields, and although they faced many problems with respect to the marketing of their crops and with respect to their own formal organisation, most of them realised high profits with the 4-5 hectares of melons.
5. The District worked out this 'flexible response', as it would have been practically impossible to deny water to already established sugar cane crops on such a vast scale (in the order of 1,000 ha or more): it would be against the water law, and obviously it would create a lot of opposition by the big (often influential) sugar cane growers. Moreover, cane can be under-irrigated (*castigado*) without resulting in total crop failure.
6. The irrigation plan envisaged allocating 62% of all water to sugar cane. Due to rains in December, water demand decreased. Sugar cane was irrigated on average only 2.5 times (as against 3.4 times planned in October) and only received 50% of all irrigation water. In total 5,700 ha of crops could be irrigated of the 7,900 ha irrigated the previous year, but only some 300 ha of sugar cane got lost. Actual water consumption during the 1982/83 irrigation season amounted to 76 million m<sup>3</sup>.

## Notes chapter 7

1. Since it is analytically difficult to draw a line between outside and other types of interventions, for the moment I will concentrate on initiatives and actions which are clearly identifiable as intervening in the local state of affairs.
2. In 1976, Echeverría was still President of the Republic, and political influence of this CNIA was still growing. Shortly afterwards, López Portillo was inaugurated as the new Mexican president. In his agricultural policy he stressed food self-sufficiency, a policy which finally culminated in the ambitious SAM programme launched in 1980 (*Sistema Alimentario Mexicano*) (Grindle 1981:20.). Sugar cane was not considered a basic food crop. However, political influence of the sugar cane lobby forced López Portillo to negotiate and at the end of 1979 he decided to raise the guaranteed price for sugar cane (Guzmán 1989:6).
3. To plant new sugar cane farmers need access to credit, as buying the seed material, transporting it and sowing the sugar cane (and often levelling the land) is capital intensive. To a great extent credit was controlled by a few bank employees and sugar cane factory personnel. Hence the latter's crucial role in the lobby.
4. Engineer Ochoa knew of a group of young engineers in the agricultural department of the Jalisco state government who had actively started to promote farmer organisations. He was also aware of a recently launched government programme of creating rural outlets for basic food products, in the hands of the consumers (Coplamar/Conasupo). This programme had some impact on grass roots organisations in rural Mexico. See Fox and Gordillo 1989, and Barkin 1988:150.
5. Fox and Gordillo (1988:150) mention a similar tactic adopted by a manager of the Coplamar programme.
6. Jalisco was one of the pilot states in Mexico where the reorganisation process was tested. Engineer Chavez worked together with his former teacher, Velazco. In December 1983, the integration of both types of Districts was implemented, and Chavez was busy restructuring his own District.
7. It is illustrative to mention that Chavez was the only District head in Jalisco who was not forced to another District during the coming and going of four SARH Directors over the period 1977-1989. When



- in 1985 all District heads were replaced to other Districts, Chavez was the only one who could choose.
8. When Chavez left El Grullo, he took with him the experience of the Water Users' Commission. On arriving in El Agua (October 1985) he was confronted with an irrigation system (13,000 ha) with two pressing problems: a badly maintained infrastructure (canals, drains, structures and roads), and a ridiculously low water fee. Chavez knew he personally would never succeed in raising the water fee (which was a prerequisite to rehabilitate the infrastructure), because this would create big opposition. It was not by chance that the former head of the El Agua District had not dared to increase the fee, since among the El Agua water users you find very powerful industrialists and political people with direct connections with Mexico City. Chavez' decision to create here a farmer organisation which would decide on the level of the water fees and be responsible for maintaining the infrastructure within one month after his arrival in El Agua, was a rather big step. He was helped again by his trusted friend, Engineer Ochoa. With the formation of the association, the first of its kind in Mexico (cf. Hunt 1987), they succeeded in arousing the interest of SARH engineers at federal level, who came all the way down to Jalisco to visit El Agua. This coincided with the return of Engineer Velazco, Chavez' teacher, to Guadalajara, who was promoted to an important position at the Jalisco SARH offices. He was charmed by the successes of his pupil in forming a fully-fledged water users' association. One reason why Velazco appreciated water users taking charge of the maintenance task was that it would reduce the subsidies the government channelled every year to these irrigation systems, an amount which was never equalled by the collected water fees. This is an important argument in the last year of a *sexénio*, when government budgets tend to get reduced to the minimum. By forming water users organisations in other irrigation systems, Velazco could gain political prestige. Not unimportant at the beginning of a new *sexénio*.
  9. From 1987 until the presidential elections in July 1988, this opposition coalition steadily grew in importance, and became the central concern of political and government persons in Mexican society.
  10. Although in most *ejidos* the elections seemed an internal *ejido* affair, in some *ejidos* District engineers heavily influenced the elections of delegates.
  11. Cf. Grindle (1977:69): 'The various trajectories of [public administrators] have all been determined by the *palancas*, the *equipos*, and the *camarillas* they have formed or mobilised. Their careers have been built upon the exchanges of loyalty, obedience, and job performance which cement vertical alliances in Mexican public life.'
  12. As we have observed earlier, chains of alliances within SARH partly follow departmental lines. Differences between departments within one District might therefore be considerable.
  13. Typically for Mexico, an institutional alliance tends to see former *equipos* as inefficient, corrupt and favouring certain elites. As Grindle observed for a case she studied, the alliance which was on the rise did not seriously consider 'that previous *equipos* might have shared their concerns and motivations and still have failed to achieve positive results.' (1977: 167) She argues that therefore the institutional memory is confined to the *sexénio* time horizon, which greatly affects performance of programmes.
  14. With the Rural Development Districts covering the entire rural area of Mexico, the federal government has put in place an important logistical infrastructure, which it controls from the country's capital. One important task of the Rural Development Districts is to logistically support federal elections, which was marked during the July 1988 presidential elections. The District's heads, however, were also briefed to politically support the elections. The Districts became an important federal device for exercising pressure on the District personnel to vote for the PRI candidate, who in turn had to pressure the peasant population in all the hamlets and villages to vote PRI. In some instances, Rural Development Districts were instrumental to the federal government through organising ballot rigging.
  15. Some indicators to highlight this dramatic situation are: Public investment in the agricultural sector dropped from 19% in 1980 to 5% in 1989 (De la Vega 1989); the area cultivated decreased dramatically (from 1983 to 1989 some 22%, Auping 1991), and resulted in an even sharper drop in marketed produce. Consequently huge quantities of food stuffs had to be imported. Nevertheless per capita consumption of e.g. maize (the basic staple food in Mexico) decreased 6% in 4 years (1981/82-1985/86) (Calva 1988:47). Auping (1991) arrives at a more dramatic figure of a 27% decrease during 1980-1988. Per capita meat consumption dropped by 45% during 1981-1987 (Calva 1988:48). These overall figures still mask the even more critical situation of the poorer families. The official minimum wage decreased in real terms by some 37% over 1981-1986 (EIU 1987). But also farm gate prices dropped (e.g. the guarantee farm-

- gate price for maize nearly halved in real terms between April 1987 and April 1988; Calva 1988:191). Farm gate prices of most (if not all) crops lagged much behind price increases of inputs, like diesel and fertilizers (Calva 1988:24). Government expenditure for rural development and on the agricultural sector dropped around 45% (in real terms) over the period 1980-1986, whereas government expenditure to service foreign debt in the same period doubled (Calva 1988:41).
16. See Fox and Gordillo (1989:159): 'Perhaps autonomous forces will become increasingly drawn into a government process of "*concertación social*", winning political or economic changes for a few well-endowed and/or well organised producers.'
  17. The mandate of the CNA included the supervision of all types of water use in the country: not only agricultural, but also domestic and industrial use. The CNA was created because of a growing concern about water pollution by industries and the dramatic consequences this had on the water supply of urban areas, specially Mexico City. So far, different ministries had administered water use. The CNA would become the umbrella commission to coordinate and supervise all the different water uses. Officially the CNA is a decentralised body of SARH with the capacity to decide over use of the national waters in quantity and quality. The CNA's priorities include: to rationalise the use of water according to its availability; to propose and execute national policies which take into account 'sectoral interests' and regional public opinion; to give congruence to and authorise programmes and budget in an integrated way; to facilitate coordination between institutions at federal level, and between states at river basin level; and to strengthen decentralisation policies (Poder Ejecutivo Federal 1989:78). It in no way is mentioned that the CNA would also be in charge of directly managing water use, nor operating irrigation systems.
  18. The intervening engineers thus played an ambiguous role. Their interventions were aimed at involving farmers in the management of El Operado, and thereby in fact decreasing their own influence. But quite contradictorily, the engineers hardly let the farmers participate in these interventions. This is nicely displayed in the second document of the Water Users' Association (Appendix 4) which was edited by the CNA. The CNA engineers have to ascertain their effectiveness through stressing the success of the association, while not neglecting their own role.

## Notes chapter 8

1. For instance, the District did not put the annual problem of the sugar cane increase on the Commission's agenda, which is remarkable since the Commission thanks its existence to the sugar struggle. By 1986, this was entirely controlled by the District head. Through banning any increase he engaged in what Wade has called 'rumour mongering' (Wade 1982:300). Of course sugar cane acreage did increase; however at some cost to the farmers involved, and without water users having any say in it.
2. It is here that some participation of farmers came in. On the board some representatives of the *ejidos* and other farmer organisations participate. Farmer representatives formed only a small minority. In practice, however, the decisions taken in the *Comité Directivo* were planned by local SRH personnel, and the central SRH (later SARH) offices at State (Guadalajara) and Federal (Mexico City) level could always veto its decisions. Greenberg wrote in 1970 on the functioning of these boards: 'The Committees [boards] actually functioned as rubber stamps for the Agricultural Ministry and the SRH' (Greenberg 1970:29). Others have argued that government officials often acted in collusion with the region's elite through their membership of such boards (Mares 1980:478, 492; see also López Zamora 1977:249-250).
3. However, given the presence of the *ejido* power structure, the Commission is an organisation where *ejido* forces and District forces are somehow mediated. In this sense, the Commission has similarities with other such 'institutionalised' organisations found in Mexico, such as for instance the 'official' *ejidatarios*' union (CNC). Few people would maintain that such an organisation serves the interests of the majority of small farmers.
4. The Commission is a men's world. This is not only how I understood it, it is also explicitly mentioned by water users. One (unwritten) requisite for an *ejidatario* to be elected delegate in the Commission is to be male.
5. As mentioned earlier, in the Mexican political context to be called 'undisciplined' is one of the most

severe criticisms you can get.

6. This happened to one delegate in 1987; he accused the District of corrupt practices. A District engineer went to see the *ejido* president of this delegate and demanded his withdrawal, which the president did. *Ejido* leaders tend to give in to demands of government functionaries. This shows the ambiguous nature of the *ejido*: as part of the state apparatus as a means of political control, and as an organ of peasant representation (cf. Fox and Gordillo 1989:137, and note 13).
7. District officers also use images from the animal world to express the problems they face. For instance, one engineer trying (without success) to mobilise farmers to attend an *ejido* meeting, says cynically: *nomás San Isidro arrea bueyes* (only Saint Isidro drives oxen; Saint Isidro is the patron of the farmers, or rather of the plough), comparing peasants with oxen.
8. Mexicanisms like *metiche* (someone meddling), *grilla* (someone who likes gossiping and politicking) and *mitote* (someone who is always intriguing, plotting).
9. This is not so improbable as it may seem. Don Teodoro himself is said to control at least 7 delegates, but perhaps a few more. (It is interesting to note that all these delegates come from neighbouring *ejidos* in one corner of the valley.) Furthermore, Engineer López García could mobilise the votes of the delegates of one particular *ejido* (whom he designated himself), but perhaps others as well. So, Don Teodoro could count on 10 votes (his own vote included). He got 16 votes. His next rival got only 6 votes (out of a total of 31).
10. Comparing the new Association with the defunct Commission, the Association is not a lame organisation because it has an elected board, a functioning secretariat and its own financial resources. Second, the association has legal recognition, as defined by the Federal Water Law. Third, a serious start is made to hand over responsibility for maintenance, including its machinery, which means a change in the original set up of El Operado, designed to be managed entirely by the District. Also, the Association has a decisive say in the level of the water fees.
11. Taken from Michiel Kuijk, Field notes El Grullo, December 1989-March 1990.
12. I want to follow here Henao (1980:268) who concluded for a particular type of water users' organisation in Mexico, that their importance and consistency derives from the degree to which these organisations have been able to clearly define the relationship between their organisation and the productive resources they manage. See also Coward 1986a and 1986b.
13. Since I could not study the Association's performance much after its foundation (my last visit to the research area was in April-May 1990), to assess the association's viability at this premature moment is impossible.

## Notes chapter 9

1. The engineers themselves understood their strategy as that of 'the scissors'. What also can be considered an important power-effect is the way both engineers, the head engineer and a trusted department head, developed a work style with the District head facing the outside world, that is outside the District, and the department head facing inward, he managing the internal affairs of the District. They thus can be considered a tandem, backing each others back. The District head protected his faithful subordinate from the higher institutional side, as he played the diplomat, maintaining all contacts with higher level offices. The department head controlled the situation within the District, did most thinking, developed new strategies and policies and protected his boss from getting involved in intra-district fights. Some close friends to the department head once referred to him as the *tlacaélel*, the man behind the District head, and the one who effectively exercised power. *Tlacaélel* (1398-c.1480) was the most influential advisor to the fourth, fifth and sixth king of Tenochtitlán (Itzcóatl, Motecuhzoma, Axayácatl, respectively). When he was offered the kingdom after Motecuhzoma had died, *Tlacaélel* refused, saying: 'what more king would you like me to be'. And the *Códice Ramírez* comments: 'And he did not lack reason, because with his industriousness, while not being king, accomplished more than when he would have been... because nothing else was done in the entire kingdom than what he ordered.' As the man behind the throne, he was able to influence the kingdom during 1428-1480, much longer than any individual king (Léon-Portilla 1983: 87-102).

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## Curriculum Vitae

Pieter van der Zaag, born in Wageningen, The Netherlands, in 1959.

After completing high school (Ede) in 1978, I studied irrigation at Wageningen Agricultural University. My first confrontation with irrigation in the field was in design and construction of large scale irrigation in Mozambique, during 1983. Back at the university, I attended a Masters course on water management, in the Department of Irrigation and Soil and Water Conservation, which introduced us to organisational and social issues related to irrigation. Stimulated by this course, a student colleague and I studied the irrigation system of *La Huerta* of Valencia, Spain, in 1984. We were fascinated by its infrastructure, its history and its complexity, but we appeared to lack the 'tools' (we were engineers) to account fully for the different aspects which made up the Valencia irrigation system.

In 1985 I did fieldwork in the Basse Casamance region, Senegal, supervised by Jos van der Klei, Lecturer in Anthropology at the Free University Amsterdam. The Diola system of rice cultivation, and their method of water management are quite unique. What impressed me most was how Diola village structure was so clearly interwoven with the polder infrastructure of dykes, rice fields, and fish ponds. Jos van der Klei taught me interviewing techniques, the value of observations and of keeping detailed records.

After having graduated in January 1986, I worked at the Department of Irrigation and Soil and Water Conservation as an assistant researcher. In December 1986, unexpectedly, I was invited to join the Mexican-Dutch research project. Working in a multidisciplinary team, and studying a 'modern' irrigation system managed by a government authority, appealed to me. This would counter-balance my former experience with 'traditional' or farmer-initiated systems. It also offered the opportunity to study irrigation in both its technical and social dimensions, while assured of qualified supervision by Lucas Horst and Norman Long.

After the fieldwork in Mexico (February 1987-April 1989), I returned to Wageningen, and struggled with the research material. Based again at the Department of Irrigation, there were always things to distract me: giving lectures, supervising students, discussions with fellow researchers, and participating in the workshop 'Design for sustainable farmer-managed irrigation schemes in sub-saharan Africa', held in February 1990 in Wageningen. In the meantime, I enjoyed attending the weekly sessions of the Advanced Research Seminar at the Department of Sociology of Rural Development. In addition, I visited Mexico for two months in April-May 1990.

Mid 1990, Marlou Bijlsma took up a job in Uganda, and now it was my turn to follow her. In the lush green surroundings of Hoima and Masindi, I found the right atmosphere to complete the thesis. At the time of writing this, I have started work as a free-lance consultant on water and land development.