“Knowledge Management in Rural Uzbekistan: Peasant, Project and Post-Socialist perspectives in Khorezm”

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ABSTRACT

Agricultural knowledge is important in rural Uzbekistan. Presented in this thesis is sociological data from field research in the Khorezm region of Uzbekistan, illustrating the ways in which knowledge operates in a certain context of power and culture. The way in which this agricultural knowledge is created, shared, stored and used is discussed in this thesis on the basis of three 'systems' of knowledge. These knowledge systems; peasant, project and post-Socialist are used to understand how agricultural knowledge is used differently. The peasant system constitutes the local knowledge of the rural community in the Khorezm province of Uzbekistan. Within this province a development research project, through which this research was conducted, also operates and the particular approach to knowledge creation and sharing is discussed here. Finally, both these systems operate within a knowledge 'governance' structure which establishes the 'rules of the game' for the region. Yet what we find in all three of these systems is that three phenomena of knowledge exist, in varying ways, in agriculture in Khorezm. These three phenomena are: (i) Knowledge dynamics: how knowledge is made, lost and destroyed, (ii) Power and Knowledge: the interplay of knowledge and power, (iii) Knowledge and Culture: why culture matters in knowledge management. Knowledge loss, especially in the post-1991 period is crucial to understanding the economic and ecological challenges in rural Khorezm and the process of knowledge loss (and creation) is prevalent in my research. Specific to the local knowledge system, evidence is presented that whilst specialisation is inherent in any knowledge system; this characteristic of the knowledge system is embedded in the patriarchal and hierarchal nature of Uzbek culture, and the position of power that this entails. Similarly, I examine the modes of knowledge reproduction within Khorezm and find these to be overwhelmingly family based, even in cases where formal education is necessary, although there are examples of external forms of knowledge being accessed and then reproduced within the knowledge system. I find that in all three systems there is a complex interplay of knowledge and power, with a mutually reinforcing of each occurring in social interactions, within and between the knowledge systems. Finally the phenomena of knowledge loss and knowledge/power relations are grounded in a specific cultural context and it is argued that the peculiarities of Khorezm, including the Soviet history and a specific understanding of authority (joshuli), means that knowledge is shaped and informed by the cultural context from which it is drawn. These findings are then discussed in terms of the theoretical implications of this research which argue for a wider appreciation of knowledge loss and deeper analysis of power/knowledge interactions. Finally, practical development advice is given on how foreign projects can better develop local knowledge in Uzbekistan, by seeing agricultural knowledge as it operates in the cultural context of Khorezm and by accessing local knowledge.

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For Halsey Robinson

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GLOSSARY OF TERMS

'Academy'	All-Union Academy of Agricultural Sciences, named after V.I. Lenin (see VASKhNIL)
Argorod	A small (0.1 – 0.35 hectare) piece of arable, irrigated, land proximate to the house in rural Uzbekistan (Uzbek)
Amu-Darya	One of the two great rivers of Central Asia, formerly known as the Oxus River. It is the Amu-Darya which supplies Khorezm with almost all of its water. (Uzbek)
Aspirant	Doctoral student in the Russian/Uzbekistani education system (Russian)
Dekhan	Smallholder (Uzbek)
Desiccation	Drying up, leading to desertification
Elat	Neighbourhood (Khorezmi dialect) Mahalla in literary Uzbek
Fermer	Private (leasehold) farmer, the newly created rural elite in Khorezm. By definition with farms over 10 Hectares in size, leased for 10 – 50 years. (Uzbek)
Hokim	Governor of a province (oblast) or region (rayon). (Uzbek)
Hokimiyat	Governorate, somewhat innocuous as can refer to oblast or regional level, as well as a city's hokimiyat. (Uzbek)
Glasnost	Openness (Russian). Part of the reform process implemented by Gorbachev from 1985 to encourage greater openness and freedom. See also perestroika.
Joshuli	Chief or Boss (Uzbek)
Khashar	Volunteered unpaid labour provided by relatives and friends – usually to help build a house or community project (Uzbek)
Khorezm	Administrative District (Oblast) in which this research is conducted
Kishlak	Village (Uzbek)
Kolkhoz	Collective farm (Russian) also used to identify rural towns.
Mahalla	Neighbourhood (Uzbek) Elat in Khorezmi dialect
Nomenklatura	Soviet ruling elites, literally 'the named' (Russian)
Oblast	Province (Russian) viloyat in Uzbek
Oliy Majlis	National Parliament of Uzbekistan
Project, 'the project'	ZEF/UNESCO development research project in Khorezm
Pudrat	Transformed into Uzbek from Russian word "Podryad" which can be translated as 'contract'. In essence share-croppers or contractual farmers, with obligations to the old 'brigade' or a new private 'fermer'. (Uzbek)

Perestroika	Restructuring (Russian): economic reforms introduced in June 1987 by the Soviet leader Mikhail Gorbachev. See also glasnost
Rais	Kolkhoz manager (Uzbek)
Rayon	Province governed by Hokim (Uzbek)
Shirkat	Joint-Stock farm (former collective farm). (Uzbek)
Sovkhoz	State farm (Russian) – similar to Kolkhoz but owned by the state
Sum	Uzbekistan's currency – approximately 1300 sum = US$ 1 at September 2005 (also transliterated as cym, soum)
Syr-Darya	Northern most of the two great rivers of Central Asia, formerly knows as the Jaxartes River.
Tashkent	Capital city of Uzbekistan (population circa 4 million)
Uzbek	The eponymous ethnic majority of Uzbekistan, also refers to the dominant language of Uzbekistan
Uzbekistani	Used here to denote a person or thing coming from Uzbekistan, not necessarily 'Uzbek' (above).
Urgench	State capital of Khorezm, region of research in this thesis

ACRONYMS

CA	Conservation Agriculture
CDB	Central Data Base (see also MDB)
CPSU	Communist Party of the Soviet Union
CPUz	Communist Party of Uzbekistan
FLEOM	Farm Level Economic Optimisation Model (see also KEOM)
FTI	Follow The Innovation – an approach adopted in the ZEF project 3rd phase
GAA	German Agro-Action (Deutsche Welthungerhilfe)
GIS Centre	Geographical Information Service Centre - part of the ZEF project focused on collecting and digitising geographical data as well as managing the CDB/MDB databases
GoU	Government of Uzbekistan (post-1991)
GWL	Ground Water Level
I&D	Irrigation and Drainage
KEOM	Khorezm Economic and Ecological Optimisation Model (integrating individual research into a decision support tool, a key product of Phase Two of the ZEF project) see also FLEOM
MDB	Meta Data Base (refers also to the CDB and MDB collectively)
MTP	Machine Tractor Park
NIE	New Institutional Economics
UNESCO	United Nations Educational, Scientific and Cultural Organisation.
UrDU	Urgench Davlat (State) University
USSR	Union of Soviet Socialist Republics
UAS	Uzbekistan Academy of Sciences
UzSSR	Uzbekistan Soviet Socialist Republic (УзССР, pre-1991)
VASKhNIL	All-Union Academy of Agricultural Sciences, named after V.I. Lenin (ВАСХНИЛ)
WUA	Water Users Associations
ZEF	Centre for Development Research, University of Bonn (German: Zentrum für Entwicklungsforschung).

CHAPTER 1
INTRODUCTION

This dissertation sets out to study 'Knowledge Management in Rural Uzbekistan: Peasant, Project and Post-Socialist perspectives in Khorezm'. This means examining, through sociological enquiry, how knowledge – who knows what, why and how – is created, shared, stored and used. Specifically, I examine agricultural knowledge in one region of rural Uzbekistan. To better understand how agricultural knowledge is 'managed' in this context three groupings, or 'knowledge systems' are studied. Firstly, peasant knowledge which encompasses the indigenous and local knowledge of the rural population in Khorezm. Secondly, the activities of a specific development research project (of which I was a part) both for its internal dynamics and linkages with the other systems. Thirdly, the post-Socialist role of the state in governing knowledge and as an actor in the rural areas. These three systems are described in chapters four to six in detail. The theoretical framework is expounded on in chapter two. This is followed by a discussion of the methodological approach in chapter three, which details a broadly sociological suite of methods, including living for the year 2005 in 'the field'. Running as a main theme throughout the results chapters I find three main issues which are selected for extended discussion:

1. Knowledge dynamics: how knowledge is made, lost and destroyed,
2. Power and knowledge: the interplay of knowledge and power,
3. Knowledge and culture: why culture matters in knowledge management,

These phenomena are discussed alongside other specific issues in chapters seven and eight where I provide a series of practical and theoretical implications that arise from my research, including new areas for study. Finally chapter nine provides some concluding remarks and questions for future research.

I. THE APPROACH

In this thesis I attempt to understand agricultural knowledge in the way that it is used by individual actors. From this understanding I explain how different actors operate within a 'system' of knowledge and how three different 'systems' interact in the Khorezm region. At a theoretical level this thesis draws upon the knowledge management literature, in defining what constitutes knowledge and why it is that managing this knowledge is important. I discuss in chapter two how different forms of knowing constitute agricultural knowledge and explain why this needs to be situated within its cultural context. This dominant theme of the cultural context of knowledge emerges as important in the three knowledge systems. Likewise, the interplay between knowledge and power is shown to be an important determinant of what knowledge is created and shared and how it is used. These theoretical concepts are developed throughout the thesis, yet other literature was found wanting during the research period, especially literature explaining how knowledge dynamics (e.g. knowledge loss) occur, and how to conceptualise this. I reflect in chapter eight on the contribution that this thesis makes to the body of theory on knowledge management, especially to understanding how knowledge is lost and destroyed. These constructs were tested and adapted during the field research.

The methodological approach was varied, with three different 'objects' of the research, one subject group of which I was a member (the project). I adopted an anthropological/sociological approach, living in a village in rural Khorezm and so far as was possible inculcating myself into the agricultural system there. Much of my field data is thus presented as case studies based on a triangulation between the specific methods of unstructured and semi structured interviews, direct observation, the use of archival & documentary data, and conducting a sociological survey. In dealing with the state actors a more formal approach was used, whereas less formal methods were used with the peasant knowledge system. I discuss these methods in depth in chapter three, as well as detailing the ethical considerations which I took into account during the field research.

II. THE KNOWLEDGE SYSTEMS

Knowledge is held and used in Khorezm by different individuals and groups. The ways in which different individuals use their knowledge reflects a great deal about the cultural reality in which they operate, especially their relationship to power, as well as powerful historical forces at work in the region. For example we see in chapter five the very different approaches that Uzbek scientists have from German researchers, whilst chapter four studies the multiplicity of views within the project. To reflect this diversity whilst drawing useful conclusions from the research, three 'knowledge systems' were distinguished. The first is the 'peasant' grouping, which is the knowledge system of the majority of the rural population. This encompasses a wide definition of what constitutes a 'peasant' and is expanded to include the 'indigenous' as well as the 'local' knowledge of the rural community. The difference between these two terms is that indigenous knowledge existed prior to the Soviet rule (1917-1991) whereas local knowledge encompasses practices adopted in the past century. Secondly, I examine the work of a specific project in Khorezm, the ZEF project, as a discrete knowledge system. This included studying both its internal dynamics as a group of researchers, as well as examining the linkages between this research and the other knowledge systems of Khorezm. The third system examined here is the 'post-Socialist' role that the state (Government of Uzbekistan) plays in setting the institutions (formal and informal) that constitutes the 'rules of the game' for agricultural knowledge creation, sharing and use. This can also be labelled as knowledge 'governance', in defining the rules for knowledge interaction, and also as an actor in Khorezm. We see in chapter five this is an active role.

These systems are not discrete, some individuals inhabit two or even all three systems to some extent, where it is interesting for the research examples such as these are discussed. Yet as a tool for generalising about the similarities and differences, and what drives these phenomena, the use of knowledge systems was found useful. Perhaps some of the most interesting results of this research come from analyses of knowledge transmission *between* the groups as well as inside them, which is discussed next.

III. FINDINGS

The findings of my research into these knowledge systems lead to three conceptual issues which are prevalent in the knowledge system of Khorezm. First amongst these is the issue of knowledge dynamics, which is an attempt to look beyond the black box of what knowledge exists and query why some knowledge is replaced, some is kept and some lost or destroyed, this final issue being important in all three systems. Secondly, I attempt to unravel the relationship between power and knowledge, to better understand the way in which knowledge is controlled to consolidate power, and how one's relationship to power defines one's relationship to knowledge. Thirdly, I make the case for integrating studies of knowledge into the cultural context in which they operate. I argue for contextualising knowledge in a way that helps us better understand how knowledge systems work as well as what role knowledge plays in defining culture.

1. Knowledge Dynamics

Knowledge is not static nor is it neutral, rather knowledge is a dynamic phenomenon which changes forms and functions often. What we see in the findings of this research is that knowledge within a community can be created, replaced, replicated, adapted and lost. For instance I discuss in chapter six how new knowledge, in the shape of research, is created by the ZEF/UNESCO project and how some of the outcomes of this research are communicated to local university partners, which introduces new knowledge into their knowledge system. In doing this, the new knowledge may well replace old knowledge. In this circumstance the old knowledge is displaced, it is replaced by (in an ideal sense) more adequate solutions to certain problems. This is a normal and indeed positive aspect of the research process, which can be described as 'normal science' (cf. Kuhn, 1996). Equally well, if the project moved towards a 'development' or implementation phase then research findings could be shared with the peasant knowledge system, in which case this knowledge would be 'localised' to suit the needs of the community. This would be an example of how scientific knowledge could be adapted to suit the specific needs of the

rural community (which may not have been properly identified by the original researcher). Again, this is a normal process of knowledge dynamics, well discussed in the literature (Brittain, 1996; Evers, 2005). Yet not well addressed in the literature is the phenomenon which I label 'knowledge loss'. This is when knowledge which once existed disappears from a knowledge system. We see in chapter four perhaps the most dramatic example of knowledge loss, where Soviet collectivisation (and Russian imperial control prior to 1924) led to the destruction of indigenous knowledge of post-harvest processing and livestock rearing; which were replaced by newer farming methods, often under duress. For instance livestock rearing was changed from an almost entirely household and nomadic affair to a largely centralised system of production. This knowledge loss was supplemented with knowledge creation, yet with the breakdown of the Soviet Union, and the attendant collapse of centralised industries, the knowledge of how to run these industries has been lost (leaked and destroyed) and the indigenous methods had to be rediscovered, yet the knowledge lost in this process has resulted in continued problems.

Less dramatic is the knowledge 'leakage' from the project, especially with ex-students taking their knowledge with them and inadequate mechanisms existing to stem this loss of knowledge from the project's knowledge system (although in the case of leakage the knowledge moves to a different system, it is not lost altogether). Other examples are provided in the thesis, yet the central issue, not well addressed in the literature, is how knowledge can be lost from a knowledge system and not replaced. I theorise that a lack of appreciation of existing knowledge contributes to the under-valuing of knowledge within systems, which enables knowledge loss to continue, and that existing knowledge management theory needs to take greater account of knowledge dynamics such as knowledge loss.

2. Power and Knowledge

Emerging from the case studies in this thesis is evidence of the strong linkages between power and knowledge. What we see in all three knowledge systems is the differing ways

in which those in relation to power[i] (or those with close relations to the exercise of power) are able to utilise knowledge to their advantage. In the case of local knowledge, 'masters' exercise their knowledge to improve their social and economic position, which is then reproduced within the family sphere. The masters can also take on *ex-officio* capacities within the farming system, linking them to the power structure of the state. Yet exercising this power relies upon their access to and use of superior knowledge, as in the case of agronomists benefiting from the land redistribution process. This exercise of control over knowledge is dominant in the post-Socialist state system, which is heavily involved in the production and distribution of agricultural knowledge in Uzbekistan. In the example of Khorezm we see how the knowledge governors act in a way which extends their control over agriculture and the economy, through their command over the labour process (indirect control) the state norm system (direct control) and by impeding innovation (indirect control). The possession of 'specialised' or expert knowledge is deliberately used by the state to legitimate its control over the economy and agricultural production, acting as a form of 'rational' justification for governance. This results in the maintenance of state power, yet at the probable expense of further innovation.

Within the ZEF project we see how the dominant epistemology (explained below) is infused into the projects activities, with the decisions of what to research and how being taken by those in close relation to power (management). In the same way, centralised controls (mostly formal) over how knowledge is shared within the project could potentially be used to ensure that the management could mediate and regulate knowledge transfers. Yet in this case a more nuanced understanding of the exercise of power versus the hypothetical 'possession' of power reminds us that control is not always exercised. Moreover there is in this case a conscious and deliberate effort to transfer control from the dominant group. This is achieved by striving for interdisciplinarity within the project, through efforts at capacity building within Uzbekistan (with partner institutes and Khorezmi scientists) as well as by deliberately storing data and knowledge in Khorezm. Thus the situation is much more complex, as explained in chapter six.

[i] I define power in terms of Foucault (1980), discussed at greater length in chapter two, section IV-5.

3. Knowledge and Culture

What this thesis also demonstrates is that knowledge is not neutral or absolute; rather it is defined by and situated in certain cultural contexts. This is not simply that knowledge exists in a cultural context, but that this context defines and influences how this knowledge takes shape and is thus 'situated knowledge' (Haraway, 1991). I argue in chapter nine that culture matters in knowledge management and that existing theory does not refer sufficiently to the imbedded nature of knowledge. I refer for instance to the hierarchical (and patriarchal) nature of rural Khorezmi society and explain how the concept of 'masters' occurs in a specific way in Khorezm as a result of this cultural construct. It is not a simple case of specialisation, rather it reflects local customs in how masters are recognised and to whom they transmit their knowledge. Also in the peasant system of knowledge, we see the case of familial reproduction of knowledge, following gender lines, which is itself a reproduction of certain cultural norms. Yet this convergence of knowledge and culture also occurs with the state, where practices inherited from the Soviet system are evident in the post-Socialist reality. Witness for example the state control over academics, which employs both formal as well as informal mechanisms. This creates a 'scientific culture', in this case of fear and submission, which leads to certain outcomes from a knowledge management perspective. This is not necessarily intentional, indeed the Soviet Union did wish to promote research and knowledge creation, yet in its efforts to control this knowledge creation it may well have stifled it. A scientific culture is also evident within the project, albeit in a very different form than in post-Socialist Uzbekistan. I analyse in chapter six the 'epistemic culture' of the project, which is based on certain views of what constitutes science, what development means and what the role of the project is. Like any cultural construct there are contested meanings and a significant diversity of views, yet it is the manner in which the dominant epistemic culture leads to certain types of knowledge creation and authorisation that is of interest here (how this happens is interesting for power and knowledge). Thus in chapter nine I make a fuller argument in favour of situating knowledge within its cultural context.

CHAPTER 2
THEORETICAL BACKGROUND

In seeking to understand how agricultural knowledge is created, disseminated, shared and most importantly used, we need to understand the theories of knowledge. This chapter provides an introduction to the question of what is knowledge, followed by an exploration of why agricultural knowledge is important. This includes its importance to knowledge management (KM) theory in general as well as its centrality to the ZEF research project in Khorezm. This preface is followed by discussions of the three different systems of knowledge that are examined in this research. First amongst these is the farmer knowledge system; the local forms of knowledge that exist within rural Uzbekistan. This local knowledge is situated within a set of institutions and rules that constitute the knowledge governance system of Uzbekistan. This is followed by an analysis of the systems of ZEF knowledge management, operating as a university based research project in Uzbekistan. In each of these three instances this chapter provides a theoretical discussion of how these three knowledge management systems can be understood.

However, none of these three groups, or systems of KM, operates independently. Rather there are significant areas of interaction. I analyse how this interaction and knowledge sharing operates, including modes of knowledge sharing and dissemination. This is followed by an explanation of how the subsequent results chapters relate to the theoretical framework provided here. It should be noted that this chapter serves to introduce the reader to the state of the art of KM theory. Specific implications of the findings of this research are discussed later. Chapter seven analyses the practical implications of the findings, followed by an examination in chapter eight of how these findings impact upon KM theory.

I. WHAT IS KNOWLEDGE?

In order to understand how agricultural knowledge is created, shared, stored and used, we must define knowledge. No single dictionary definition is possible for knowledge. In its essence knowledge is the acquisition of past experiences and received information, combined with the application of thought or learning. It is the application of thought and learning that makes knowledge a distinctly human activity and which distinguishes knowledge from merely information (although information is an important element of knowledge).

> 'Knowledge' is defined as what we know: knowledge involves the mental processes of comprehension, understanding and learning that go on in the mind and only in the mind, however much they involve interaction with the world outside the mind, and interaction with others. Whenever we wish to express what we know, we can only do so by uttering messages of one kind or another - oral, written, graphic, gestural or even through 'body language'. Such messages do not carry 'knowledge', they constitute 'information', which a knowing mind may assimilate, understand, comprehend and incorporate into its own knowledge structures. (Wilson, 2002: 2)

To explain this concept further a description of four different forms of knowledge is provided below, followed by an explanation of why knowledge is not just information. The four forms of knowledge examined here are my own classification, based upon the literature, which I label as; theoretical, tacit, procedural and dynamic. These four forms of knowledge overlap to a significant degree, especially in practice. However by demonstrating what is and is not knowledge it is possible to delimit the study to a manageable size. It should also be noted that this research is focused entirely upon agricultural knowledge and this specifically excludes knowledge to do with, for example, religious practices and marriage rites or family health. However some cross-over of knowledge does occur in terms of farmer's knowledge of the political system in order to access water or other agricultural inputs. More important is skill, of practical ability as a carrier of knowledge, which is crucial to understanding agricultural knowledge. Because of the grounded nature of this study, much of the knowledge examined is that which is used at a practical level. Thus these classifications should be seen as different ways of categorising and describing the application and sharing of knowledge and learning.

1. Theoretical Knowledge

Theoretical knowledge is grounded in both what people know and how they know it, the process of generalisation based on theorisation (Knorr-Cetina, 1999). This form of knowledge draws from the pre-Socratic philosophical tradition of *episteme*, which saw knowledge and scientific enquiry as a 'love of wisdom', distinguished from religious understandings of natural phenomena (Pemberton, 1998: 60). In modern parlance we would probably term this area 'theoretical' knowledge because of its basis in the use of logic and reason in an attempt to create generally applicable theory. We can most easily illustrate theoretical knowledge with examples from the natural sciences. Whilst ancient humans no doubt had 'know-how' about, say, hunting and the gathering of food from plants, they had no systematic manner of ordering or understanding this 'know-how' (Pemberton, 1998: 60).

This is not to deride the value of 'know-how' or specific 'skills', indeed Richards (1985) provides ample evidence of rice classification as a skill, where the theoretical knowledge comes into play is when this skill is considered and reflected upon, enabling the individual to generalise knowledge from their specific information. This is not to say that their generalisations are necessary correct or true, rather that there is a recognition of logic in the thought process. Likewise it would be wrong to dismiss skills; know-how is a carrier of complex forms of knowledge, often unacknowledged, which is why skills are tacit knowledge, which is to say that it is unspoken or silent. Thus the knowledge exists, it is simply not explicit, yet this does not discount its value. Theoretical knowledge does not accept explanations derived from 'the gods'[i] or as acts of divine providence. This does not exclude indigenous theoretical knowledge, which is local knowledge founded on scientific and deductive enquiry. Even though some indigenous theoretical knowledge may be phrased in terms of religion or iconography, it can also exhibit the characteristics

[i] Thus promoters of theoretical knowledge would reject moral objections to, say, bio-technology if the objections were founded on an 'intrinsic *belief* in the biblical story of creation' (Evensen et al., 2000: 43), however if these objections were founded on theoretical ethics then it would be considered valid.

of scientific research[ii]. Likewise the knowledge sharing networks of indigenous theoretical knowledge may well be informal (for example through family ties in the case of traditional healing) however that so long as the use of traditional healing is founded in evidence based medicine (contra faith based healing) then we can still consider this theoretical knowledge (Vandebroek et al., 2004). An important characteristic of theoretical knowledge is that it is mediated and potentially falsifiable. The Socratic philosophical tradition used the *dialektokos* (dialectic) method to test various hypotheses, testing each argument on the basis of sound logic and reason. Likewise modern theoretical knowledge must be open to testing, mediation and verification (Pemberton, 1998: 61). In the established sciences this occurs when a discipline agrees upon a set of "shared rules and standards of scientific practice" (Kuhn, 1996: 10-11) whereby members of the discipline can test findings against set norms and methods. Less formal methods of knowledge testing are of course possible, for instance Dea & Scoones (2003) as well as Richards (1985) both show how farmers are active experimenters and testers of new farming methods. Thus both local and universal methods of knowledge testing and sharing are valid forms of knowledge mediation. The important point is that knowledge "can be challenged, tested, repeated, transmitted over time and verified by others", if this is not the case then it is faith or instinct, not theoretical knowledge (Pemberton, 1998: 61). Thus theoretical knowledge seeks to explain phenomena using reasoning in an attempt to create theories which can explain why certain events occur. Such theoretical knowledge has two essential characteristics; firstly, logic or a search for explanation of a phenomena, and secondly, an ability of the knowledge to be mediated and falsified.

2. Declarative Knowledge

Declarative knowledge is the ability to name or describe a certain phenomena or concept, it "refers to concepts without making inferences about them, and is factual in nature" (Enting et al., 1999: 120). The classification of 'declarative knowledge' owes a great deal to Polanyi (1958; 1966) who distinguished between tacit and codified knowledge. This

[ii] Equally, a large amount of Western medicine and scientific knowledge is mixed with or embedded in dominant religious beliefs and cultural norms.

distinction is important as we must distinguish between tacit (silent, unspoken) knowledge and declarative (codified) knowledge. The clearest way to make this distinction is to look at the example of soil classification. This is followed by a more general discussion of how tacit and declarative knowledge can be accessed and recorded. The naming and classification of soil types is an illustrative example of different types of knowledge. Whether it is formalised scientific soil typologies or locally specific classifications the naming of a particular soil type illustrates knowledge. This may vary in complexity from a very generic analysis (sand, loam, clay) or more detailed schemas such as the USDA Soil Taxonomy, the FAO–UNESCO legend, or the ORSTOM system (Dea & Scoones, 2003: 463). Likewise there exist localised schemas for describing soil types, which reflect the specific factors of the region and as such may not be applicable to other geographic locales. For instance Dea and Scoones (2003: 468) discuss findings from Southern Ethiopia where eight to ten soil types are divided according to whether they reside in the highland, midland or lowland areas. Whether it is the scientific or localised soil classifications, the simple nature of describing or naming the soil type makes this declarative knowledge. Yet this declarative knowledge may likely be tacit (ie not explicit) in the local knowledge system. This is in contrast to process knowledge of soil types, such as that exhibited in the Colca Valley of Peru. In this region, where terraced agriculture has existed for over 15 centuries, soil typologies are hierarchical and bound up with management principles such as "fertilization, irrigation, and conservation tillage such as terracing" (Sandor & Furbee, 1996: 1502). Because these soil classifications entail applying knowledge and action to a given problem, this becomes procedural or process knowledge, as discussed in the next sub-section. So whilst declarative knowledge is a part of process knowledge, it is restricted to dealing with the naming and describing of phenomena, it is by its nature factual.

Because of the relative 'simplicity' of declarative knowledge it is often easier to access and record this form of knowledge. Whilst this issue is dealt with in more depth in the methodology chapter (Chapter Three) it merits some discussion here. Declarative knowledge is relatively explicit, people tend to be aware of their ability to name or describe a particular object or phenomena. Taking again the example of soil typologies, it

is possible to find a scientific book on soil types that is understandable to the non-expert audience. Likewise local farmers can provide descriptions of their land, by commenting that certain fields possess certain soil types. Thus descriptive knowledge is much easier to access and record than tacit knowledge, which is a more difficult form of knowledge to document (Gordon, 1989).

3. Procedural Knowledge

In contrast to declarative knowledge, process knowledge is that which is required to intervene or take action. "Procedural knowledge refers to knowledge that is needed to execute procedures which enable experts to implement their tacit knowledge to solve problems" (Enting et al., 1999: 119). This can take the form of a specific skill (or skills) about how to do something as well as mental knowledge about what to do. Much procedural knowledge exists in a tacit form; people are usually unaware that they are using process knowledge which is what distinguishes their knowledge as tacit (Guida and Tasso, 1994) when they seek to solve problems. This can take the form of automatic behaviours, such as recognising that the weather is cold (declarative knowledge) and deciding to wear a coat in order to stay warm (process knowledge). Here a person may not be conscious that they are using knowledge (whereas they may be aware of their knowledge of the weather and temperature scales) yet they are in fact taking in many inputs of tacit knowledge, ordering them and making a decision. The same is true with more complex decisions, where an expert may not be conscious of using process knowledge "while its existence is proven by the problem-solving capabilities of the expert" (Enting et al., 1999: 119).

Yet because these problem solving mechanisms are based upon both tacit knowledge, past experience, reflection, theoretical knowledge and perhaps beliefs, process knowledge is necessarily bound to a certain domain (de Jong & Ferguson-Hessler, 1996: 107). The geographic specificity of indigenous knowledge is very different from the case of positivist science, which emphasises the use of theoretical knowledge at a 'universal'

level. These characteristics of procedural knowledge are illustrated in the case of the nutritive value of tree fodder in the middle hills of Nepal. Walker et al. (1999) provide an interesting account of how livestock owners in rural Nepal classify tree fodder as nutritious and less nutritious as well as classing dung as 'dry & warm' or 'cold & wet'.

It is in the application of this tacit knowledge that the use of procedural knowledge is particularly interesting. The research showed how farmers would manage their feeding practices depending upon the time of the year, animal condition, the need for organic fertilisation of fields (from animal dung where dry dung is preferred for practical reasons) as well as, crucially, plant maturity, which accounts for varying levels of tannins in the feed (Walker et al., 1999: 89). Unravelled, the decisions of farmers on feeding reflect a procedural knowledge that is capable of dealing well with the complexity of the natural system. Crucially however, farmers did not consider this procedural decision making process as 'knowledge', restricting their conception of knowledge to the tacit descriptions of dung and feed. Despite the tacit nature of this knowledge it is vital that we incorporate, what is necessarily spatially limited, process knowledge into our understanding of what constitutes knowledge. This example shows how process knowledge mobilises many forms of tacit knowledge and combines them with prior experience, theoretical understanding and, perhaps also, dynamic knowledge as discussed below.

4. Dynamic Knowledge

Dynamic knowledge is the knowledge of innovation; it draws on the three previous forms of knowledge, and produces new ideas and concepts. From a research perspective dynamic knowledge is the creation of new knowledge (or the application of existing knowledge to novel environments). Whilst it includes a collection of theoretical, tacit and procedural knowledge, the distinguishing factor is that there is new knowledge being created. The creation of new knowledge is not constrained to only the scientific community; indeed a strong argument can be made for the strength of indigenous knowledge creation. An example of this is provided below, drawing on a case study by

Richards (1985). The other key aspect of dynamic knowledge is that it is open to change and reflection. The search for new knowledge is tireless, as the creation of new understanding creates new areas of the un-known, a phenomenon described as 'the growth of ignorance' (Evers, 2005: 63). Thus new knowledge produces more questions and avenues for enquiry, making dynamic knowledge an unceasing process. Yet as we see in later chapters, this growth of ignorance can be not only relative but can include knowledge destruction. An example of procedural knowledge working at the local level where farmers acted as active experimenters and creators of new knowledge and technologies comes from one of the seminal works on indigenous agricultural knowledge. Richards (1985) provided the example of the Mende people, positing that the greatest advances in food production in West Africa came from 'indigenous' roots. In the Mende example, from a rural region of Sierra Leone, promoters of Green Revolution high yield varieties supposed that peasant farmers were "blind to the importance of even the existence of varieties" (Richards, 1985: 144). This was contradicted by research in the area, which showed that:

> "Mende farmers continue to add to their large stock of planting materials by selecting for useful characteristics and by experimenting with new of unfamiliar planting material. Many varieties released by the Department of Agriculture have been absorbed into the local planting stock and sometimes modified by selection to better suit local conditions" (Richards, 1985: 144-45).

By constantly adapting seed varieties to suit the local conditions, the indigenous Mende were acting as creators of new knowledge. This activity is also based upon theoretical knowledge (seed selection methods) declarative knowledge (describing desirable traits) but crucially there was an on-going search for new knowledge, in this case knowledge (and possession) of improved rice seeds. This is the distinguishing feature of dynamic knowledge, that it seeks new information and attempts to apply it in creative ways. The interesting point to note is that this cycle of experimentation, rejection, adaptation and use is very similar to the research process that the post-colonial ministry was attempting, but failing, to implement. Yet as we see in later chapters, the dynamics of knowledge is not only a one way process as it is often discussed in the literature. Rather I find in all three knowledge systems, but especially in the post-Socialist peasant system, that knowledge loss is a defining characteristic of the 'dynamics' of the knowledge system.

5. Not Just Information

Knowledge is much more than just information (Dueck, 2001: 885). Data, information and facts may exist– but it is only when human activity is applied that this information becomes knowledge. So, an academic journal article contains all sorts of information and data, much of which refers to knowledge such as theory or results from an experiment. However the scientific article only contributes to knowledge when it is read and interpreted by human activity. The human factor is the crucial distinction between information and knowing. This distinction is important as it marks the ability to understand information, to interpret this information in terms of local conditions and to then act upon this information. Thus computers are information stores and not knowledge devices, whilst computers can amass and compute immense amounts of information, there still requires a human input to make sense of this data. Pieces of paper and bytes, by themselves, know nothing; they are nothing more than representations of the human communication of knowledge. Even if this data is transferred to a human, they only become 'informed' about the subject if they understand it. Because of this human factor it becomes very difficult to quantify knowledge. Whilst we can measure information by using word counts, megabytes and gigabytes, pages and the like, we cannot so easily gauge knowledge. In the case of declarative knowledge it may be possible to gather everything that a person knows on a given subject and quantify this in terms of, say, 'how many soil types they can name'. However the procedural knowledge involved in using this declarative knowledge is much more difficult to appraise (Harvey & Anderson, 1996: 71). Thus we seek to understand not so much 'what' is known but rather 'how' it is known. Thus the knowledge process is a question of *how* people create, interpret, apply and share information. The actual subject of the information is less important than the manner in which it is communicated and interpreted, the point at which it becomes knowledge. The next section describes why it is that agricultural knowledge is important, including how we apply knowledge theory to agricultural information and ways of knowing.

II. WHY IS AGRICULTURAL KNOWLEDGE IMPORTANT?

Agricultural knowledge is at the centre of peoples livelihoods in Khorezm, Uzbekistan. It is equally central to the activities of the ZEF project in Khorezm as well as being of critical interest to the Government of Uzbekistan (GoU). No agricultural activity is conducted independent of rural knowledge, whether this knowledge is formal or informal, tacit or procedural. Commensurate with the importance of agricultural knowledge to the livelihoods of farmers in Uzbekistan, agricultural knowledge is also significant in a broader theoretical examination of knowledge and KM in particular. This thesis examines the interaction of various forms of knowledge 'at the interface' between different knowledge systems, especially in interfaces with indigenous knowledge (Arce & Long, 1992: 211). This entails firstly describing how each of the three groups (broadly; rural farmers, government officials and ZEF staff) manage knowledge within their domains, focusing on the types of knowledge employed as well as how this knowledge is mediated and distributed. From this the research also examines the interface of these three modes of knowledge, seeking to explain the mechanisms through which knowledge is shared. This network-actor model should then be able to contribute to the theory of knowledge management (chapter eight) as well as distilling practical implications for improving knowledge sharing between groups, especially between the ZEF project and the other two main groups (chapter seven).

1. Defining Agricultural Knowledge

Agricultural knowledge is the collection of theoretical, declarative, procedural and dynamic understandings of the natural and social aspects of agricultural production. In the case of this thesis this knowledge is delimited to agricultural production in the Khorezm region of Uzbekistan, as held by the three knowledge groups under discussion. This thesis, explicitly, does not seek to catalogue everything that is known by these groups. Rather, by adopting a knowledge systems perspective it is more interested in *how* knowledge exists rather than in attempting to exhaustively record *what* is known. The

initial discussion of ‘what is knowledge’ stressed the point that information of itself is inanimate and does not constitute knowing. Thus specific agricultural information, for example, in a textbook owned by an agronomist, only becomes knowledge when it is read, comprehended and ultimately used. The point at which this knowledge is communicated to another individual, either within the knowledge governors groups to which the agronomist belongs, or to a member of another group, is the point at which this knowledge is shared, be this through formal mechanisms or through demonstration and the learning of a skill. It is these two processes of comprehension and sharing that are the focus of this research. Unlike in the example given of accessing text book knowledge, there is also new agricultural knowledge created within the Khorezm region. In line with their divergent KM systems, the three knowledge groups also create new agricultural knowledge in different ways. This innovative or dynamic agricultural knowledge is of especial interest to this research and to the ZEF project in general.

2. Tacit ‘Know-How’ as Knowledge

Agricultural knowledge is often tacit knowledge - the unspoken and oft neglected expertise required to make things happen. This is the expertise of the ‘life world’ which is actor rather than observer defined (Arce & Long, 1992: 212). Be this in terms of cropping decisions, coping strategies to avoid the imposition of government plans, or in the social knowledge involved in accessing, say, irrigation water. Such tacit knowledge exists largely in the realm of local knowledge, where unstructured and location specific knowledge is most prevalent. However tacit knowledge and ‘know how’ also exist amongst the scientific community (Fox-Keller, 1985). Here such knowledge is often termed as ‘practical experience’ or ‘expertise in the field’. Whilst often unacknowledged and certainly seldom published, know how is also important in the physical sciences (Knorr-Cetina, 1991). There is silent recognition of its importance, for instance in the preference for research students who have ‘field experience’. There is also an inherent physical aspect to know-how, the ability or *aptitude* to physically fulfil a task. Be this the use machinery or laboratory equipment, inherent in this physical skill is a knowledge component, but one which is often under acknowledged or ignored.

In the case of local farmers the three examples provided (cropping decisions, coping strategies and social knowledge) show that different forms of knowledge exist. In the case of cropping decisions there is procedural knowledge, derived from declarative knowledge of soil and plant types, with the addition of decision making processes based upon past experiences and notions of 'best practice' (theoretical knowledge).

In the specific case of Uzbekistan cropping decisions are largely state mandated, thus making means of subverting state rules more important to farmers, these strategies of subversion also constitute knowledge (Wall, 2006b) labelled here as 'coping' knowledge. Coping strategies are a more problematic type of knowledge; it is social knowledge of strategies for subversion and describes how farmers manage to avoid (or play to their best advantage) certain aspects of government regulation. In short, how they escape from or use the governance system. This social knowledge is closely embedded in the local community and personalities involved, is strictly informal (formalisation would marginalise the utility of the knowledge) and is very much at the interface of culture and knowledge. These coping strategies are especially important in the case of accessing irrigation water, where knowledge of the physical and social infrastructure of irrigation management is vital. Each of these three activities is vital in conducting farming in Uzbekistan and relies upon a combination of several forms of knowledge. Thus when we examine knowledge in Uzbekistan we must consider agricultural 'know how' as a type of knowledge, be this in the case of local farmers or with international scientists. In both instances know how and tacit knowledge plays a vital, if often unacknowledged, role.

3. Agricultural Knowledge and ZEF

Contrasted with this informal knowledge is the formalised and mediated knowledge system that ZEF brings to the Khorezm region. As a technically focused project with significant scientific and economic capital the ZEF project makes its own contribution to rural knowledge. Much of the project design of ZEF is focused on achieving superior

technical solutions to those that exist *in situ*. Possible interventions are set to be based upon Western modes of knowledge and knowing. Of course within Western (especially post-modern) science there exist a variety of approaches to knowledge. Provided here is a quick summary of the dominant ideology of positivist knowledge, which in turn holds primacy in the natural sciences and (arguably) in economics. This is not to say that this approach is right or wrong, it merely raises the point that ZEF's KM must be studied and its approach to KM described. To do this it is essential that we examine the ZEF project as a subjective actor, with its own system of knowledge management. This will include how research is planned, conducted and reported upon. For instance, how is it decided that certain aspects will be researched and why these aspects are chosen over other options. In this manner ZEF 'framed' the problem and solution in light of its own views and capacities. Given that the ZEF project is explicitly a 'research project' we need to understand the philosophy/epistemology that drives this research, why is the research actually being conducted? Also, as a research project it is fair to hypothesise that part of this research process involves communicating with the other two knowledge management systems, to reduce duplication and to improve research efficacy. Hence, it is necessary that we examine the extent to which ZEF communicates with the other knowledge systems. This in turn forms part of a large debate about the role of university led research in development. If we look for example at the work of Toakley & Aroni (1998) in assessing the constructive role that universities can play in promoting sustainable development, we see that the creation of 'knowledge' is essential to the attainment of sustainable development. This certainly fits well with the mandate of 'finding solutions to global development issues' which forms a direct link with the role of the ZEF/UNESCO project as a research project in Uzbekistan. In this regard the considerable literature on university led extension would potentially be of use, should the project wish to move beyond research and into extension[iii].

[iii] This is outside of the scope of the thesis, however useful literature includes: Betru & Hamdar (1997); Baxter (1989); Röling (1988); Swanson (1997). In general this literature promotes a move towards the greater integration of University (or elite) knowledge systems with local knowledge. Given the power imbalance inherent in these relationships, it is the role of the elite institution (possessing universal knowledge) to 'localise' its knowledge and to access the local knowledge system.

4. Agricultural Regulations as Knowledge

Closely linked to the local knowledge system is the manner in which agricultural knowledge is governed and controlled. This includes how new agricultural technologies and knowledge have traditionally been diffused, as well as impositions that limit farmer level experimentation. Since circa 1924 agricultural research and extension in Uzbekistan has been through the Soviet system, many features of which have been reproduced in the post-1991 machinery of state. The Soviet method of research and technology transfer was always closely connected with ideology and politics, as it attempted to eliminate traditional forms of expertise and knowledge through 'modernisation' campaigns (Krementsov, 1997: 24) seeing local knowledge as archaic and counter to development. The Soviet system of knowledge management, both within and outside of agriculture, was characterised by secrecy and 'political correctness' (Joravsky, 1970: 8-10) with a strict hierarchy determining which knowledge was 'correct' and providing little opportunity for knowledge to flow from the bottom (or periphery) towards the top of the hierarchy.

When 'knowledge is power' the control of knowledge was and is one way in which power can be exercised or protected. Controlled knowledge was characteristic of the Soviet system of political and social control. This led to academics being unwilling to share their research findings (contra the Anglo-European mantra of 'publish or perish') as well as the politicisation of research decision making, all discussed in greater length in chapter five. In many respects this old Soviet model of knowledge creation and management is still in place today in Uzbekistan, and forms the regulatory framework in which development interventions (such as the ZEF project) must operate. In this regard this second system is more an example of 'knowledge governance' rather than management, as it sets the legal and institutional framework for a country, which is reflected in its analysis. Such an analysis of knowledge governance in the Soviet system and post-Socialist reality is essential, with a particular focus on the control of knowledge and use of secrecy, given the power of the state in agriculture before and after independence.

III. FARMER KNOWLEDGE SYSTEMS

There is a growing recognition of the importance of local knowledge in development research. This is knowledge that is location specific, based in local culture and aware of social contexts and the local economy (Antweiler, 1998). In the case of Uzbekistan this includes 'traditional' knowledge as well as local adaptations of Soviet and 'Western' science. Such informal knowledge is built up over time by the local community, through a process of trial and error, as well as information sharing systems. In some instances this can be through purely 'indigenous' forms of agricultural knowledge, which have been devised by the local community. Equally, it includes the adaptation of introduced technologies, such as imported mechanisation technologies and how these new technologies have evolved to suit the local conditions. Farmer knowledge systems incorporate all four forms of knowledge discussed earlier in this chapter. As classifiers of soil and plant types, they utilise declarative knowledge. When this knowledge is translated into practice through crop rotation local farmers are utilising procedural knowledge. This is often informed to some extent by theoretical knowledge; however this theoretical knowledge tends to be regionally specific (Dea & Scoones, 2003). Finally, farmers are also active experimenters and creators of new knowledge, using the other three knowledge types to enhance their own livelihoods (Richards, 1985).

1. Between Local & Universal Knowledge

Local knowledge is an amalgam of several sources of knowledge. It includes 'indigenous' knowledge, such as that proposed by Richards (1985). Local knowledge also includes 'adaptive knowledge' - how imported technologies are adapted to suit local conditions, or knowledge of why some imported technologies are not utilised. There are also more formalised modes of knowledge that constitute the local knowledge system. Every time a local farmer accesses written knowledge, or contacts with the state advisors, they are utilising formal modes of knowledge. This is an example of knowledge sub-systems interacting, a topic discussed in greater depth in the section 'Knowledge Sharing

Between Groups' which appears later in this chapter. The local knowledge that we examine here can be broadly divided into tacit forms of knowledge (unwritten and informal knowledge) and explicit forms of knowledge (scientific, formal knowledge). Tacit knowledge is knowledge which is not recorded, written down or recognised by the knowledge holder. This does not however mean that it is of less use; indeed there is a growing literature on the importance of local knowledge in conducting formalised scientific research (cf. Canagarajah, 2002; Corburn, 2002). This requires us to bridge the gap between 'local' knowledge and 'universal' science. Whilst traditional research programmes saw local knowledge as irrelevant, more recent studies have shown how farmers are active experimenters and innovators "in an entirely deliberate and self aware manner" (Richards, 1985: 149). Richards argues, that scientists need to treat local farmers as equals, supporting them in changes that they are already keen to make (ibid: 16).

This partnership approach stands in stark contrast to the approach that colonial regimes took to local knowledge in the past. For instance, Kaniki and Mphahlele (2002: 3) point out that in Africa "colonialism discouraged a total integrity of other forms of knowledge, especially Indigenous Knowledge". The Soviet colonial administrators took a similar approach to the 'modernisation' of indigenous knowledge, which was viewed as outdated, outmoded and antiquated, promoting instead a 'modern' Soviet ideal (Morgunov & Zuidema, 2001). Emerging from the 1980s, aided by the 'peasant studies' debates, local and indigenous knowledge is gaining increasing recognition in academia. The initial impetus for this was as a "possible antidote to the failures of externally driven, transfer-of-technology focused, top-down development" (Pottier, 2003: 1). This is a two way process, as academics realise the value of indigenous and local knowledge and that this knowledge must be 'globalised' (i.e. made accessible to the global community). Likewise universal (or global) knowledge must also be 'localised', that is adapted to meet the needs of local communities (Gerke & Evers, 2005: 79-90; Gerke & Evers, 2006). The ascendancy of local knowledge is not without its critics, especially by those who oppose the 'romanticising' of indigenous knowledge (Clammer, 2000: 2; Sneath, 2003). It is not necessary to enter into this debate here it is sufficient to say that it is important to

maintain a balance between the scientific and the elevation of indigenous knowledge to the superior status as 'revealed truth' (Harriss: 2004: 154-155).

2. Accessing and Assessing Local Knowledge

There is a significant literature on how local knowledge can be accessed and analysed. For example Dea & Scoones (2003) identify how local farmers in Western Africa identify and understand soil types and fertility. In many respects the local farmers had a more in depth understanding of soil types and fertility than 'Western' scientists. Thus it is argued that the effectiveness of research in the developing world can be improved by recognising the knowledge of local communities. For this to happen, external actors (such as ZEF) need to focus on the "activities of the local actors concerned, instead of vice versa" (Antweiler, 1998: 2). Similar arguments are made by Veitayaki (2002) in an analysis of indigenous agriculture in Fiji. In this case also, it is shown how successful co-operative agreements can be reached between local communities and the scientific community. Where, for example, the management of marine food resources was improved through the application of specialised local knowledge. The main risk with this approach is that of path dependency, that as farmers adapt solely based upon past experiences (without the benefit of external experiences) that they become 'locked in' to a certain approach to technology[iv]. I discuss in the next chapter my own methodological approach to accessing local knowledge in Khorezm. Whereas chapter seven provides detail on how I recommend foreign projects to access and work with local knowledge in rural Uzbekistan. Agricultural knowledge needs to be understood in light of the knowledge system in which it operates. This requires the researcher to negotiate between the local and universal systems of knowledge. These different knowledge systems carry with them very different epistemologies which inform how the knowledge is managed (moreover, the researcher also brings with them their own epistemology and value system). Thus knowledge needs to be seen as being situated (cf. Haraway, 1991) in a certain cultural context.

[iv] This risk is not unique to local knowledge. Path dependency is a problem within the sciences as well.

3. Knowledge in Cultural Contexts

Knowledge management is also concerned with gaining an understanding of material and technical systems in a social context. "Knowledge emerges out of a complex process involving social, situational, cultural and institutional factors … Thus it is not an accumulation of facts but involves ways of viewing the world" (Arce & Long, 1992: 211). In classical anthropology this entailed seeing cultures through the prism of the 'technological advancement'. British anthropologists in the late 19th early 20th centuries saw 'backward' cultures as those which lacked the advanced industrial power of Europe (Aunger, 2003: 618). Recently anthropologists have begun to see technology and the development of knowledge as essentially human processes. The development of these 'sociotechnical systems' sees technology in terms of how humans relate to it, and the development of new technologies as culturally bound and determined. Pfaffenberger (1992) defined the term "sociotechnical system" as a "distinctive technological activity that stems from the linkage of techniques and material culture to the social co-ordination of labour".

This approach was used to assess the socio-technical system of water tank use in colonial Sri Lanka, showing how interference by British colonial officers was actually counter-productive because of the shortcomings in their understanding of how societal considerations related to the use of technologies (Pfaffenberger, 1992). The socio-technical systems thesis is that technologies exist primarily in their use, in how the local community chooses to use them. Which is also determined by the relationship between the institutions of knowledge and the uses of knowledge, how artefacts have been adapted to certain uses. This may be in manners quite different from the original technical design. Thus the examination of the KM system must necessarily take into account social factors. Sillitoe (1998) makes just this argument for integrating anthropological study into agricultural development projects. The thesis is that indigenous knowledge is indispensable when it comes to developing and assessing new agricultural technologies. This is not to take anything away from quality scientific research. Rather, it exposes the

potential to enhance the efficacy and efficiency of scientific research by including locally available knowledge. This can reduce duplication; increase the appropriateness of the research and potentially improve research quality. Whilst informal knowledge is inherently difficult to analyse, there is sufficient literature to inform methodological approaches and analysis. Sociotechnical systems theory is instructive in describing how to situate local knowledge within the environment from which it comes. To this end Pinch and Bijker (1984) make a compelling case for integrating social studies of science with social studies of technology, arguing that the two phenomena are in fact closely linked. That technology informs society and science and that culture shapes and conditions technologies in their use. Furthermore, there is sufficient evidence to show how useful and important local knowledge can be in improving external research (Scarborough et al., 1997).

In applying this theory to this thesis, we can conceive of local knowledge as a sub-system of knowledge at work in Khorezm (cf. Box, 1989: 167). This sub-system interacts with the more formalised systems of the regional administrators as well as with the ZEF project. Thus we first seek to understand how knowledge is created, stored, shared and used amongst the rural population of Khorezm; as well as how this knowledge is transferred between the other two knowledge sub-systems in Khorezm. This is determined to an extent by the knowledge governance system, discussed below. More generally, I make the case throughout this thesis that knowledge, of all kinds, must be situated within its cultural context. This is especially apparent in the case of indigenous knowledge, yet the point is valid for all three knowledge systems which are studied here. I explain in greater detail in chapter eight how the importance of culture must become accepted in knowledge management theory and in this regard the theory on indigenous knowledge is particularly instructive.

IV. KNOWLEDGE GOVERNANCE

Knowledge governance (KG) deals with the institutional and legal framework of knowledge. This includes legal issues such as Intellectual Property Rights (IPR) and governmental policy, organisational factors such as knowledge control, as well as historical and cultural aspects (Stiglitz, 1999). In a broad sense KG theory applies institutional and legal analysis to the realm of KM. In this regard, KG constitutes, to borrow a term from new institutional economic theory, "the rules of the game" for knowledge creation, sharing, storage and use (North, 1990: 219). These rules of the game concern the formal and informal ways in which knowledge is managed from above, this impacts on how knowledge is utilised by, say, the rural poor. Thus the rules of the game apply to all three groups that form the focus of this research.

The focus here is on the 'knowledge governors' of Uzbekistan and Khorezm. These are the regional governors and implementers of state policy such as agronomists and *Hokims*. In essence there is a governing class within Khorezm who are distinguished by the proximity to power and their active role in promoting state control, I include in this group ex-state farm chairmen (many of whom now manage MTPs) agronomists and other political authorities who control agriculture, and through this, knowledge. By examining the institutional, legal and cultural framework in which knowledge operates, we can come to a fuller understanding of the system in which agricultural knowledge is managed by the government and state apparatuses in Uzbekistan. Given the lack of academic freedom in Uzbekistan, evidenced by politicised research decisions and the absence of freedom or speech protection, the senior individuals within universities and local research organisations also are part of this grouping (although lower level staff are very much subject to the governance system rather than part of it). The system of KG that existed in the Soviet Union, as well as the current (post-Socialist) era, has several distinct characteristics, which I summarise under the headings; knowledge control, politicised science, intellectual isolation and negative incentives.

The most obvious KM issue in the Soviet system and in present day Uzbekistan is that of knowledge control (see subsection one). Whilst the Soviet Union had an immense agricultural research system and Uzbekistan retains a considerable research infrastructure (Pray & Anderson, 1997: 517) these systems have been characterised by significant restrictions on knowledge. This also relates to the politicisation of research decisions (see subsection two) an unwillingness of scientists to share and collaborate (see subsection three) and an unfortunate historical legacy of 'Lysenkoism'. The historical aspects of knowledge governance in Uzbekistan are elaborated in Chapter Five. Together these characteristics of Uzbekistani KM create negative incentives for knowledge creation and sharing.

1. Knowledge Control

Knowledge control is the degree to which knowledge is centralised, the extent to which knowledge governors seek to actively reduce the amount of new knowledge created, or to directly manage the types of new knowledge produced. Strong systems of knowledge control attempt to control and manage the transfer of knowledge between people or institutions, preferring all knowledge to be passed through the central controller, to arbiter which knowledge is shared and how. This is in contrast to open systems of knowledge governance, which promote horizontal sharing of knowledge within and between organisations or countries. Hayek, in his examination of 'The Use of Knowledge in Society' (1945) makes a dichotomy between those states that attempt to plan and manage 'centrally' and those who do so in a diffuse manner, positing that 'planning' (by which he refers to using knowledge for economic purposes) occurs in both cases. He argues that the governance of knowledge is essential to the economic foundations of a country and that;

> "The various ways in which the knowledge on which people base their plans is communicated to them is the crucial problem for any theory explaining the economic process" (Hayek, 1945: 520).

Thus that how knowledge is governed has a defining impact on the economic system (and success) of a country. Certainly the Soviet system adopted a centralising and controlling

influence on both the economy and on knowledge flows. In fact the two are inseparable. In post-1991 Uzbekistan, the economy remains centralised and closed, as too is knowledge controlled through a closed system of knowledge governance, where most governmental information is a state secret, with the assumption being that knowledge should not be shared unless there is a compelling reason (or inducement) to share it and doing this requires permission from above.

Closed systems of knowledge, such as Uzbekistan, seek to control knowledge as much as possible. Such closed systems exist in different ways in various situations. For instance some companies have very restrictive rules for knowledge sharing; fearful of 'losing' their intellectual capital to competing firms (Harris, 1997: 66). This is the irony of the 'information economy', which promotes the creation of new ideas yet actively discourages the sharing of information between rival firms[v]. Such an approach is perfectly understandable in situations where "some companies, such as Texas Instruments, already earn as much through licensing their technological know-how in areas such as computer-chip design as they do through selling their products" (Shulman, 1999: 64). Where intellectual capital is a key factor of production, the desire of firms and states to maintain ownership and control of their knowledge is understandable. As in companies, countries can have very closed, controlling, systems of knowledge governance. For example Singapore, whilst ostensibly promoting a knowledge economy retains a closed approach to governance and KG. There are considerable restrictions on public knowledge of the Government's Investment Corporation, statistics on trade (especially with Indonesia) and expenditure of state funds (Juan, 2001: 157-168). This contrasts with the otherwise relatively enlightened state policies of Singapore, especially in promoting education as an engine of economic growth (albeit within a range of 'thinkable thought').

[v] However, the case of open source software development (i.e. LINUX, UNIX) and co-operative software development for industry standards (WS-Routing for instance), shows the potential benefits of limiting knowledge control (Economist, 2004: 76)

Knowledge control is certainly much more closed in Uzbekistan than in Singapore, where state accounts and activities remain as opaque as during the Soviet period. The impact that this closed nature has is discussed in Chapter Five. In considering the importance of knowledge control in terms of KG it is useful to note that there is a need for a balance between perfectly 'open' systems of control, which do not afford IPR protection, and closed systems that seek to control all knowledge. There are considerable implications of the type of knowledge governance approach taken. For instance Brayshay et al. (1998) discusses the historical context of knowledge governance and how the state can play a very (counter) productive role in promoting or preventing economic development. I argue in Chapter Five that this is certainly the case in Uzbekistan, with the state retarding economic development through knowledge control.

2. Politicised Science

> "Literature must not be a single step from the practical affairs of socialist construction" – Literaturnaia Gazeta, 24 September, 1930. (McCannon, 2001: 153)

In every society there is a connection between the scientific and political spheres. With governments as the primary financers of universities and research institutes, as well as establishing the legal and ethical frameworks of research, all science is to some extent political (Savelsberg et al., 2002). The question in terms of KG is the extent to which political actors interfere with the progress of science. There is a general consensus in the KG and KM literature that the critical independence of universities must be maintained (Varenne, 2000). In the Soviet era from 1917-1991 this critical independence of the university and research was not maintained. Chapter Five discusses how agricultural science was made 'politically correct' by the Soviet authorities. This was true for almost all sciences in the Soviet era[vi]. The socialist ideology was all encompassing. The place of science within this ideology was to enable to Soviet Union to "catch up and overtake" (догони и перегони) the West, especially industrially and economically (Fitzpatrick, 2000: 382). Thus science was mobilised as a tool to promote the Soviet ideal, in a manner

[vi] The possible exceptions being nuclear and advanced physics and rocket propulsion research, where political interference was reduced to ensure success in the 'race' against the West.

that was "orientated towards, at times obsessed with, mechanisation and technology" (McCannon, 2001: 154). The mechanisms by which politics controlled science were not purely economic. The use of party privileges and trips abroad were balanced against a particularly coercive manner of dealing with those who opposed the Soviet scientific ideal.

> "The process involved great violence (deportations, administrative exiles, ever-growing labour camps, prison population, secret police, informers) aimed particularly at specific groups … and other 'class enemies', 'enemies of the people' (generally meaning scapegoats from the Communist elite)" (Fitzpatrick, 2000: 381).

The degree to which politically correct science impacts on Uzbekistan is discussed at length in Chapter Five, as is the status of the politicisation of science in Uzbekistan and Khorezm. The politicisation of science is an important form of knowledge governance, especially in a closed system which seeks to control knowledge as much as possible. Hence the politicisation of science plays an important role in my analysis of KG in Uzbekistan.

3. Intellectual Isolation

The successful formation, dissemination and mediation of new knowledge relies on intellectual engagement. Scholarly connections can exist in a plurality of ways, within and between disciplines, in linkages with the private sector and through involvement in the public policy process (Harman, 2001; Guston, 2004). These connections between knowledge workers produce benefits at each stage of the education process, in knowledge creation, mediation and dissemination. These benefits are acute in the case of development research. In creating new academic knowledge in development there is a strong case for integrating and involving as many knowledge creators as possible. This approach is termed the 'clustering' approach, and is attributed with achieving enhanced rates of knowledge creation, through the serendipitous process of unintended and unexpected collaborative research outcomes. Adherents of the clustering approach posit that:

> "Innovation, knowledge creation and learning are best understood if seen as the result of interactive processes where actors possessing different types of knowledge and competencies come together and exchange information with the aim to solve some – technical, organisational, commercial or intellectual – problems" (Bathelt et al., 2004: 32).

This requires intellectuals to actively engage with one another, both within and between their disciplinary backgrounds. In international development these connections must also span the North-South divide. Gerke and Evers (2005 & 2006) make a case for greater co-operation between foreign and domestic scholars, in order to improve the quality of academic research on South East Asian societies. The incorporation of 'local knowledge', as supported in this thesis, is another way in which knowledge can be clustered for the benefit of development research. Once this new knowledge is created it is also vital that it is mediated. In academia this normally occurs through the use of peer review, especially in the production of original journal articles and books for publication. This process of constantly testing, reviewing and challenging new ideas and knowledge is fundamental to academia. Isolated intellectuals are simply incapable of testing new concepts in every possible manner. Moreover, the process of mediation itself creates new knowledge, as both the reviewer and reviewed academic are exposed to novel ideas and approaches. As knowledge (and ignorance) becomes more abundant in the world through the growth of information communication technologies, the role of universities and academics as mediators of knowledge becomes increasingly important (Enders, 1999: 71-75). Once this knowledge is mediated it must also be disseminated, both to encourage broader testing as well as application. The dissemination of this knowledge also encourages more research and knowledge creation, contributing to the never ending process of knowledge creation.

Yet knowledge must be communicated to be effective. The simple creation of new knowledge is a worthy goal, yet in the realm of development studies it is essential that this knowledge is disseminated. This enables further testing, mediation, reflection and improvement of the knowledge. Such knowledge communication should not be unidirectional, as was the case with 'technical assistance' provided under the 'transfer of technology' paradigm (Jones and Blunt, 1999: 384). Rather the communication needs to be multi-directional, drawing on the oft neglected knowledge of Southern partners. Baud (2002) presents the case of Dutch development assistance, which seeks to ensure that the "knowledge producing systems in the South … becomes more integrally linked to international research networks as full partners in knowledge accumulation and

international exchanges" (pp.153). Thus knowledge transfers must take advantage of Northern and Southern, local and global knowledge systems. It is insufficient for an isolated intellectual to merely produce knowledge. This knowledge must be disseminated and mediated in order for it to be effective.

Provided here is an argument in favour of academic engagement as a key aim of good knowledge governance. This is in contrast to the Soviet and post-Socialist situation in Uzbekistan (see Chapter Five) where intellectual isolation was encouraged to some extent. Whilst there were strong linkages with industry, the process of mediation was fraught with political interference. Likewise, the isolation from international science that occurred during the Stalinist era, seriously impugned knowledge dissemination. There were also reasons for individual academics not to share their own research findings, due to negative incentives that existed, a factor discussed below. This must also be seen in light of the scientific culture that existed at the time, which might rightly be labelled a 'climate of fear', I discuss in chapter five how this scientific culture has, and has not, changed since 1991.

4. Negative Incentives

Perhaps the greatest task of knowledge governors is to create a set of institutions and incentives that encourage individuals to make decisions that benefit society and scholarship. New institutional economists posit that this requires a set of 'rules of the game' that ensure that the best choice for the individual is also one which will benefit society and the economy as a whole. There are, however, a number of barriers to implementing such an approach, not least the game theory problems of the prisoner's dilemma. This problem is discussed in light of the set of negative incentives that exist to effective knowledge creation, diffusion and mediation in Uzbekistan. The prisoner's dilemma is a classic example in economic game theory which came from Hardin's (1982) book on 'Collective Action', which seeks to explain situations in which individuals will take a path of action that maximises their utility, but which leads to a socially undesirable

outcome (i.e. one where total utility is not maximised). The case of the prisoner's dilemma is of a set of prisoners, who are accused of committing a crime together, there is insufficient evidence to convict them all, so if they all stay silent they achieve a socially optimal outcome (freedom from incarceration). However, if one prisoner informs on the others, they assure themselves of a lesser punishment, yet the other prisoners will all be convicted. This of course creates an incentive to be the first prisoner to inform on the fellow accused. The prisoner's dilemma can be applied to knowledge sharing and creation, where the creator of new knowledge has a disincentive to share his/her knowledge, for fear of losing control. Yet, if no one shares their knowledge then information exchange and mediation will not occur. This knowledge dilemma can be described thus:

> "From the employee's point of view knowledge is power. If I give all my informations <sic> to other people, I lose power in relevant bargaining situations to make a career for myself. Why should I give my knowledge to other people? My knowledge is my power-resource. Despite all cheap talking about knowledge management, I'm not interested in sharing my knowledge. If I would share my knowledge, I expect rewards." (Wilkesmann & Rascher, 2002: 5).

Thus social norms of behaviour and selective incentives must play a role in ensuring that a socially desirable situation is reached. Patents for novel inventions form a legal basis for protecting the rights of knowledge creators, whilst making all the information of the patent public information, to encourage future research and development. This has applications in Transaction Cost Economics, which conceives of networks and can be labelled the 'governance structure of knowledge creation' (Lambooy, 2004: 645). Similarly, in knowledge management "Business models are being developed, which rely on incentive mechanisms to supply contributions to the system and methods for controlling free riding" (Kwok & Yang, 2002: 783). Likewise the Anglo-European academic tradition of publishing journal articles to ensure promotion and tenure also encourages individuals to share their knowledge. This 'structural dimension' of incentives create an organisational climate that can aid or inhibit knowledge sharing (Menkhoff et al., 2006) In the case of Uzbekistan there exist:

> "a range of disincentives, especially for shirkat managers, for the innovation of agricultural methods. For example, seeds for strategic crops are provided cheaply or free of charge by the government, even though they have a high fungible value. Improved sowing methods and the use of better quality seed germination techniques could reduce seed inputs significantly, but there is no real incentive to do so. Conversely adopting a farming method not promulgated by higher authorities invites rebuke and punishment for shirkat and kolkhoz managers. This risk

> is not balanced by the possibility of reward if the innovation is successful. Such a situation favours risk aversion and provides a disincentive to innovation and a real barrier to technology transfer. This has created the mentality within shirkat and kolkhoz management whereby officials would have to take significant risks were they to adopt new technologies, without any hope of tangible gain if the innovation works. Thus, they have no incentive to deviate from accepted central wisdom, and face a punitive bureaucracy that favours dismissal for failing to meet central plans" (Wall, 2004: 100)

This system discourages innovation and knowledge dissemination, a key constraint that is elaborated on fully in Chapter Five. The examples of knowledge control, politicised science and intellectual isolation all point towards the importance of knowledge governance policy that promotes independent knowledge creation, testing and mediation, with stronger links for knowledge sharing with the rural community. In establishing the institutional framework, the rules of the game, for knowledge creation, sharing and mediation, KG plays a vital role in encouraging or discouraging economic and academic growth. Uzbekistan has inherited the KG legacy from the Soviet Union, a system that favoured central control, politicised academics, intellectual isolation and which manufactured negative incentives for innovation.

5. Power and Governance

Central to understanding how governance occurs, and the interplay of political governance and knowledge governance, is arriving at an understanding of 'power'. I adopt in this thesis Foucault's (1980) understanding of how power and knowledge are inter-related. In understanding power we need to see power not a something which is 'possessed' or as a simple reflection of political station, but rather as a phenomenon which is socially defined. That is to say that power only exists in relations between people and that the ability to influence or control others relies upon both their acceptance of this ability and on the power-holders' capacity to enforce this social relationship (Habermas, 1968). In this way power is 'capillary', it operates in relationships between people at every level of the social chain. Thus power, and potential resistance to it, is dispersed in social networks and the ability to harness these networks gives an individual or an entity the ability to 'control' others. This is an inherently culturally situated understanding of power, as the social relations in which power operates differs greatly on the persons involved. I discuss in chapters five, seven and eight the specific cultural

context of power and knowledge in Khorezm, crucial to understanding this is realising the social and fluid nature of power. But an essential background to this analysis is a discussion of how we can conceive of power and knowledge interacting. If we accept that power is not a commodity, that "power is not something that is acquired, seized or shared, something one holds on to or allows to slip away" (Foucault, 1980: 94) then this has implications for how we study the interaction of power and knowledge. Because power is relational within society it is linked with "practices, techniques and procedures" (Townley, 1993: 520) these form then part of the governing structure of society and it is through attempts at 'rational' government that power is exercised. Essential to this 'governability' of society is the use of knowledge, both resulting from power and further enhancing power:

> "The exercise of power itself creates and causes to emerge new objects of knowledge and accumulates new bodies of information . . . the exercise of power perpetually creates knowledge and, conversely, knowledge constantly induces effects of power. It is not possible for power to be exercised without knowledge; it is impossible for knowledge not to engender power" (Foucault. 1980: 52)

This is a departure from the traditional view of knowledge and power as separate phenomena which can be acquired and amassed separately. Rather power and knowledge are coterminous, as knowledge helps to create power yet knowledge is in of itself a form of power. For understanding how this operates within the context of Khorezm we need to contextualise power into a specific understanding of authority which exists in Khorezm, as I do in chapter four. This forms part of a wider understanding of how governance is structured in Khorezm and we see very clearly how the state deliberately controls agricultural knowledge, not only to maintain knowledge control but also to maintain and enhance political control. In doing this the state monopoly, the control over, knowledge is further enhanced. Thus power exists in those institutions (formal and informal) which possess knowledge and it is the very expertise of these institutions which further engenders the power of these institutions (Bevir, 1999). Thus in later chapters when I refer to power it is a socially grounded understanding of power, of that what exists in relations between people in their ability to ensure and enforce conformity. What I set out to prove is that in the case of Khorezm, this power is very much conterminous with agricultural knowledge. Not only that knowledge leads to power but that knowledge is power.

V. UNIVERSITY KNOWLEDGE MANAGEMENT

Universities have acted as the primary source of intellectual capital in post-Renaissance Europe. This is founded on their pre-eminence as 'creators' of new knowledge rather than just 'users' of existing knowledge. Universities have also conventionally been involved in the knowledge process as sharers of knowledge (through teaching) and testers of established knowledge (through peer review). ZEF as a post-graduate research organisation builds upon this tradition, using PhD researchers jointly as creators, sharers and testers of knowledge. Likewise, as a research organisation, ZEF's main asset is its intellectual capital and its ability to create new knowledge. This 'intellectual capital' of the university and research institute is difficult to quantify, yet without intellectual capital the very *raison d'être* of the institution ceases.

Thus there is a strong rationale for exploring more fully how knowledge is managed within ZEF, and in the Uzbekistan project. To achieve this we need to examine the theories of knowledge management within universities and apply them to the ZEF project in Uzbekistan. I approach this challenge by examining the three stages through which knowledge passes; creation, mediation and dissemination[vii]. There is a large degree of cross-over between these three categories and it is important to remember that the educational process involves 'looping' these three stages. So, knowledge is constantly mediated during the creation stage. Likewise the dissemination of knowledge encourages much wider knowledge testing which eventually feeds back into the process of new knowledge creation. Yet, this distinction remains a useful way of analysing the knowledge management approach of universities and post-graduate research institutes such as ZEF. This discussion is concluded with an analysis of how traditional KM theories of the university can be adapted to suit the project perspective of ZEF in Uzbekistan.

[vii] Dissemination both to the academic community (the traditional understanding) as well as more recently in 'technology transfer' to private industry to promote economic development (Lee, 1996)

1. Research as 'New' Knowledge

The creation of new knowledge is perhaps the most important role of the modern university. To create knowledge it is necessary for academics and students to conduct novel research, which draws on previous theory and knowledge, whilst contributing a new perspective or new evidence. This new knowledge takes the form of intellectual capital, which can be defined as:

> "… the stock of knowledge held by that university, which creates value to the society as a whole, especially society in its immediate vicinity. Therefore, the value of the intellectual capital, or at least a large part of it, at a particular university should be measured in terms of its direct or indirect social value."(Castellanos et al., 2004: 479-480)

As mentioned earlier, in a post-graduate research organisation such as ZEF, intellectual capital is the most important asset of the organisation. This intellectual capital must be unique. It is not sufficient for a university to act solely as a 'knowledge seeker' (although seeking knowledge is vital) the modern university must also play a role in creating new knowledge (Cummings, 1994). If we return to our earlier definition of knowledge, it was posited that there are four forms of knowledge; theoretical, declarative, procedural and dynamic. In the case of creating new academic knowledge, or intellectual capital, the definition of knowledge becomes somewhat more specific. University knowledge must be theoretically grounded, so it must contain a theoretical element. This theoretical knowledge can then be applied to declarative or procedural knowledge. The culmination of this knowledge is then, by definition, dynamic knowledge. It is dynamic because it is contributing to the greater *corpus* of academic understanding and intellectual capital.

The process of new knowledge creation can take many forms. For instance the social and technical sciences tend to adopt very different manners of conducting research, utilising theory and producing results (Brittian, 1986: 634). Academics and students also perceive their new knowledge differently. Many, especially undergraduate, students see their knowledge as essentially new 'personal knowledge', creating knowledge of and about themselves (Gamache, 2002). This is *contra* the universalistic and verifiable knowledge preferred by academics and more advanced students. Likewise a variety of societal as

well as technical factors influence how formal knowledge within a university is created (Davenport, 1998: 2). For instance universities in the developing world are forced by a paucity of finance to act more as knowledge seekers than as knowledge creators (Altbach, 1985: 109-110). This problem points to the biggest challenge in the creation of new knowledge, the high cost and low economic reward of knowledge creation. In an era of competitive funding and tightening budgets, many universities have been forced to focus on knowledge application and transmission, rather than on knowledge creation (Grichting, 1995: 63). Yet, despite these differences and challenges the central role of the university remains one of knowledge creation.

2. Mediating Knowledge

Universities also play a key role as knowledge testers and mediators. The mediation of knowledge is when new, and old, knowledge and concepts are tested and verified. This can occur at a broad theoretical level, analysing moving trends in, say, development paradigms. Knowledge testing also occurs at a more immediate level, with the review of papers for publication. From a KM perspective this mediation occurs within and between universities and research centres.

A large amount of knowledge mediation occurs within departments, faculties and universities. When students are examined their understanding of learned concepts is tested, verifying that they possess an 'understanding' of existing knowledge in a given topic. As these students progress through the academic system, they are called upon to produce new knowledge. In the early stages of this process (Masters level) their work is heavily mediated, usually by a supervisor who guides their learning and provides input into the creation process. The findings of this research are then internally mediated by the students' department, which 'approves' a dissertation. The student is then 'qualified' and able to progress to doctoral study, where supervisory oversight is continued, albeit in a reduced form. Here peer review between doctoral students becomes more important, as new approaches and ideas are discussed and debated. As this student concludes their

thesis they are encouraged to share their 'new knowledge' with the wider academic community. At this stage the mediation becomes external. However, internal mediation remains important, through the presentation of 'discussion papers' within the department, as well as through less formal peer review mechanisms.

The publication of academic results, especially in peer-reviewed journals, is the apotheosis of doctoral study. Here new knowledge is presented for mediation by anonymous 'experts' who review papers for publication. If a paper is deemed a contribution to existing knowledge, and possesses sufficient evidence for its claims, then the paper is 'accepted'. Whereas papers deemed unworthy are 'rejected'. The decision to publish is a very explicit form of knowledge mediation, and is followed by less formal means such as if other academics use the new concept as a basis for future research. This creation of new knowledge usually takes the form of 'normal science' where a paradigm of knowledge is created (Kuhn, 1996). There are two criteria in establishing a paradigm, the first is for the new field to be "sufficiently unprecedented to attract an enduring group of adherents away from competing modes" and secondly the establishment of "shared rules and standards of scientific practise" (Kuhn, 1996: 10-11). Each of these criteria relies heavily upon the mediation of knowledge. Once newly created knowledge has been mediated internally and externally, it is ready for dissemination to the wider academic community and society. Of course, dissemination encourages more mediation, feeding back into the process of creating and testing new knowledge.

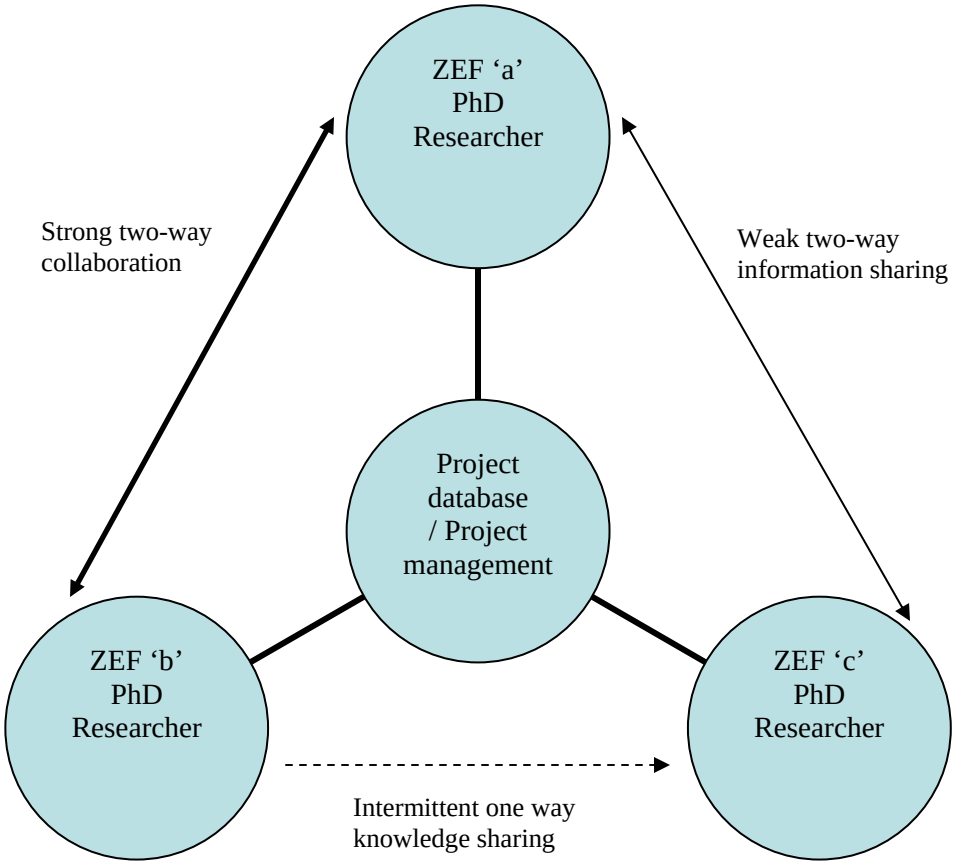
3. Spreading Knowledge

Knowledge must be communicated to be effective. Thus KM looks at the ways in which knowledge is distributed and shared. How this occurs between different groups is discussed at length in the next section. Provided here is a break down of how KM theory deals with knowledge sharing *within* universities and research institutes (such as ZEF).

Firstly it is necessary to understand how each different group within an institution manages knowledge. For instance, is knowledge centralised and distributed in a proprietary manner, or is knowledge diffuse and spread through various groupings of researchers? In the case of ZEF PhD research it is could be hypothesised that research is created individually and then usually shared primarily *within* departments and disciplines. As we see, knowledge management is sometimes a form of system analysis, exploring the ways in which knowledge moves amongst people and institutions within a system. One possible way to deal with the question of knowledge sharing is to use a descriptive model, setting out a simplified system of knowledge sharing within ZEF. A (fictional) model is provided in Figure 1 (p.42), which shows how knowledge sharing can be hypothesised. This model uses as examples three separate PhD researchers, one from each of ZEF's three disciplinary departments[viii]. Each of these nodes feed knowledge into a central node, in this case an interdisciplinary project'. Also shown is the level of interaction between the three students. An example of one-way, intermittent sharing is given (ZEF b – ZEF c) as is an example of strong two way collaboration (ZEF a – ZEF b). This is however only a simplified and hypothetical model, provided here to show how we can conceptualise knowledge sharing in terms of scope and intensity. However, given the anthropological nature of this study, I do not attempt to construct such a model from my results. The scenario in the below figure assumes an interdisciplinary project and seeks to explore the direction, scope and intensity of collaboration between three hypothetical researchers. This model could also be expanded to include, for example, supervisors, project management as a separate group and research assistants. This is where the anthropological enquiry comes into use, in terms of describing the types of interaction between separate nodes. A simple classification of scope and intensity is also possible, a hypothetical example of which is provided in Figure 2 (p.45), discussed at greater length in the section 'Knowledge Sharing between Groups'.

[viii] ZEF is divided for academic and administrative reasons into three departments. ZEF A deals with social science, ZEF B with economics and ZEF C with the physical sciences. The author is a member of ZEF A.

Figure 1: Fictional Model of Knowledge Sharing in a Fictional Project



Such an analysis is complicated by the relative invisibility of knowledge. It is very difficult to measure how much knowledge is shared or to gauge when and how knowledge is shared. Even with formal knowledge, it is quite often that research is dispersed through informal networks (i.e. discussed informally over lunch, yet still formal knowledge as it exists in a journal article). Indeed, much knowledge is not classified as knowledge by its owners (tacit knowledge). Rather, people tend to know a great deal more than they realise (by not classifying, for example, knowledge of natural processes as knowledge) and that in turn they volunteer and record (necessary preconditions for sharing) only a portion of their knowledge (White, 2004: 39). This, of course,

complicates the process of understanding knowledge networks, exchange and management; however, in the case of formal knowledge it is certainly easier to access knowledge owing to its written and ordered nature. Because of the 'invisibility' of knowledge, it is not possible to conduct a thorough quantitative analysis, measuring in precise way the level of knowledge sharing. Rather, a qualitative analysis is necessary, drawing upon anthropological and archival enquiry.

4. Can KM 'Travel' to Uzbekistan

This corpus of literature on university KM draws much from management science, as well as more generally from theoretical analyses of the history and philosophy of science. In terms of university based research, "Knowledge management can be defined as the task of developing and exploiting an organization's tangible and intangible knowledge resources" (Loh et al., 2003: 6). These knowledge resources include research and development outputs, previous staff experiences, strategic information as well as institutional/technical structures that allow for the transfer of knowledge. The question is thus whether such an analysis is possible and useful in analysing a research project such as ZEF's project in Uzbekistan. In order to establish this, Said's theory of 'travel' (1984) is utilised, which asks that "it is when a theory enters into a territory for which concepts are not already available and it is called upon to improvise, that it can be said to be travelling well" (Said, 1984: 229). In choosing to conduct research for this thesis, I have hypothesised that KM theory can indeed by applied to Uzbekistan. Yet the question of how adequately KM theory travels, or how adequately I have applied it in my research, if of course open to the reader to decide. I did find in this research that whilst the disconnect between KM in theory and KM in practice in Uzbekistan is large, that KM theory is useful to help understand what is occurring 'on the ground'. In some respects KM theory falls short and I discuss in chapter eight the contribution that this research makes to the body of theory.

VI. KNOWLEDGE SHARING BETWEEN GROUPS

Knowledge exists in and is shared by each of the three knowledge groups examined in this thesis. To fully understand how knowledge governors, rural farmers and ZEF project staff manage knowledge we must also examine how knowledge is shared *between* groups. So whilst Helmstadter (2003) identifies knowledge sharing as:

> "voluntary interactions between human actors [through] a framework of shared institutions … the subject matter of the interactions between the participating actors is knowledge. Such an interaction itself may be called sharing of knowledge" (pp.111 *in* Menkhoff et al., 2006)

I expand this definition to include interactions between not only individuals but also groups of individuals[ix]. There are several key elements to knowledge transmission between groups which are discussed in this section; intensity, scope, direction and knowledge creation. The first two issues, intensity and scope, are dealt with together, utilising a matrix of research agglomeration. This is followed by a discussion of the role of knowledge networks as knowledge creators. In considering knowledge sharing between groups it is important that we revisit the definitions of knowledge as provided earlier in this chapter. Knowledge is more than simply data or information; rather it must have 'human' understanding applied to it in order for it to be knowledge. In the communication process this understanding may become confused, as the provider of knowledge may intend a different meaning from that which is received.

> "Knowledge is different from data and information: data are unstructured facts, information consists of structured data, and knowledge is the capability to judge, to use information for defining problems and for solving problems. Data and information are given meaning by interpretation and their contexts. Data and information are relatively easy to transfer, even to other countries. Knowledge is more often connected with people, especially when it is not yet codified" (Lambooy, 2004: 644).

This aspect of understanding is particularly important for the directions of knowledge sharing as well as affecting the durability of knowledge networks. Computer based information technologies, pre-eminent amongst these being the internet, only distribute information. Data are easily duplicated, distributed and divulged to partners around the world. However it is only where the human capacity for understanding and thought is applied that this data duplication becomes knowledge sharing.

[ix] Potentially also strategic groups in a knowledge sharing sense, cf. Evers & Schiel (1998)

1. Intensity and Scope

Two variables for gauging the levels of knowledge sharing within a network are intensity and scope. Intensity relates to how often knowledge is shared and the extent to which this knowledge is utilised in a useful and important manner. Scope reflects the breadth of knowledge shared, whether it is very specific or a range of more general knowledge. It is of course impossible to quantify either how much knowledge is shared, or what the intensity or scope of this interaction is. However, it is possible to discuss intensity and scope of knowledge sharing in terms of a matrix of various modes of knowledge sharing. Figure 2 (below) provides a matrix for knowledge sharing within a research project. In this case the assumption is that the knowledge 'groups' involved are different disciplines or departments within a formal academic structure. This matrix shows how different levels of information sharing can take place, varying both in terms of intensity as well as in scope. The 'interdisciplinary ideal' is given when research is both 'integrated' and 'multi- focused'. Whilst the levels of research agglomeration may alter over time, this matrix is a useful way of gauging the state of research sharing, a key aspect of KM. The same matrix can of course be applied to other situations, such as in the case of this research where the knowledge sharing is between three rather different groups – knowledge governors, rural farmers and ZEF (external) university researchers.

Figure 2: Matrix of Research Agglomeration between disciplines

		INTENSITY			
SCOPE		Information Exchange	Co-ordination	Collaboration	Integration
	Single Focus	Scientists communicate via e-mail or meetings on a single subject.	Departments co-ordinate field testing or research foci.	Collaborating departments allocate research tasks to complement each other	Departments seek to solve a specific research problem together drawing on disciplinary strengths
	Multiple Focus	Scientists and managers exchange information relevant to a wide range of issues	Departments work together on policy/scientific issues affecting a whole region (e.g. Khorezm) or problem (e.g. salinisation)	Collaborating departments assign research together and allocate resources accordingly	All departments work together to solve multiple research problems.

The types of knowledge sharing that are examined in this project are more difficult to codify, not least because of the different types of knowledge (and conceptions of knowledge) held by the three rather disparate groups. For instance university researchers place more emphasis on theoretical knowledge than farmers typically do. Likewise formal knowledge governors, especially those in a post-Colonial system, tend to disregard informal knowledge (Kaniki and Mphahlele, 2002: 3). Because of this different knowledge groups may have quite different opinions about the intensity and scope of knowledge sharing. The role of this research is to arrive at some form of verifiable means of describing the scope and intensity of knowledge sharing between such different groups as exist in Khorezm. These findings are discussed at length in chapter eight.

2. Directions of Knowledge Sharing

Knowledge sharing within networks operates in differing directions, reflecting a range of power relationships inherent to the system. Knowledge can be unidirectional, flowing from one knowledge provider to a recipient of knowledge. Equally knowledge can be shared equally between one (bidirectional) or many (multidirectional) partners. This directionality of knowledge flows is then combined with the scope and intensity of knowledge sharing, to create a model of knowledge flows as provided in Figure 1 (Fictional Model of Knowledge Sharing, p.42). Altbach (1985) discusses these various conceptions of directionality in knowledge creation and sharing between groups in terms of the centre and periphery of academia. Drawing on examples from the developing world, especially India, Altbach demonstrates how a range of structural inequalities create different power relationships within a knowledge system. Thus whilst systems of peer reviewed journals purport to provide an equal means of sharing knowledge, this is not necessarily the case:

> "The Third World is also part of an international knowledge network which places it at a significant disadvantage. The control of the network, as well as major sources of production of knowledge, are in the industrialised countries … major publishing houses, large research centres, prestigious journals and the other accoutrements of knowledge creation and distribution are in the West" (Altbach, 1985: 109).

This is an example of the direction of knowledge sharing being overwhelmingly from the centre (Western universities) towards the periphery. In this case the direction of

knowledge transfer and sharing is determined more by serious barriers to knowledge sharing, than it is by an unwillingness to share knowledge. A similar point is made by Gerke and Evers (2005, 2006) in an assessment of 'globalising' academic knowledge in South East Asia. Here also it is shown how academics from the 'centre' conduct research on South East Asia, whilst local (peripheral) researchers lack the resources to conduct research at home or abroad. This knowledge is then shared from the centre to the periphery, with dominant paradigms of development and anthropology coming from universities in the developed world. This unequal knowledge flow is due to the inherent power relationships within the knowledge sharing system, which is one of the possible causes of asymmetric knowledge sharing.

The field of development studies provides a rich literature on unidirectional knowledge distribution, especially in terms of agricultural technology transfer. Unidirectional knowledge sharing was characterised by the transfer of technology approach. This was the prevalent mode of extension used in the introduction of green revolution technologies to the developing world in the 1960s, and was a method used for much of the 1970s. The technology was transferred by way of a "top heavy and top-down" approach of central governments (Swanson et al., 1997: 9), either national governments in the North, or post-colonial ministries run "under the aegis of their new administrators" in the South, funded by international donors (Swanson et al., 1997: 9). In either sense the assumptions made by the administrators was of institutional superiority of knowledge. That extension workers and officials were development plenipotentiaries, in possession of 'superior' knowledge, which (if properly applied) would solve the problems of 'backward' farming systems. This system made no allowance for local knowledge to be utilised or to be transferred to the research centres promoting green revolution technologies. However, this unidirectional model has been shown to be inferior to more multidirectional systems of knowledge sharing. Farmer-centric approaches have also developed in response to the persistently low levels of technology uptake, the marginalisation of minority groups and skewed benefit allocation. The farmer led approach was proffered by Scarborough et al. in the work 'Farmer-Led Extension' (1997). This approach is based on experiences of farmer-to-farmer extension in Latin America and parts of South-East Asia. Various

observational studies found that tacit knowledge sharing networks existed in parts of Latin America, which proved very successful at disseminating knowledge about improved agrarian methods (Scarborough et al., 1997: 46). It is argued that such networks can be integrated into existing research and extension services, in order to share locally appropriate knowledge with the more formalised research organisations. This has led to the development of public extension networks, which are focused at meeting the needs of farmers, as opposed to introducing technologies that extension workers desire. This is a shift of emphasis towards the farmers as the "principal agents of change" (Scarborough, 1997: 2). As discussed in the earlier section on local knowledge, there are many benefits to be gained from moving towards a multidirectional model of knowledge sharing. I propose in chapter seven some very practical ways by which the benefits of cooperative research could be pursued in rural Uzbekistan.

3. Networks as Knowledge Creators

Knowledge networks as sharers and testers of knowledge also play an important role as creators of new knowledge. By accessing multiple sources and types of knowledge, a successful knowledge network can play a dynamic role in creating new knowledge. It is even argued that 'radical' knowledge creation (i.e. paradigm changing knowledge) is only possible with the division of labour for researchers, that knowledge sharing makes possible (Bathelt et al., 2004: 35). The specialisation of research allows for academics, practitioners and even the rural poor, to focus on ever more specific problems. When this knowledge is shared (provided that it is communicated effectively) the entire knowledge network gains the benefits of this new knowledge. This enables others to focus on their specific area of research. Also, because knowledge creation is an interactive process, the sharing and mediation of knowledge also creates new concepts and ideas (Kiong & Bun, 1999). This continual process of growing knowledge (and the concomitant growth in ignorance) is encouraged as more knowledge is shared.

Literature on industrial clusters shows how the benefits of such knowledge networks are often unforeseen and serendipitous in nature (Bathelt et al., 2004). That is to say that it cannot be determined how knowledge sharing will occur exactly, nor what will be the eventual outcome from such knowledge sharing. What is possible to predict, however, is that new knowledge will be created. Often new knowledge creation within clusters is based upon tacit knowledge within a specific industry or geographic locale. This dynamic form of knowledge creation owes much to the concept of 'embeddedness' – the idea that knowledge is 'embedded' in individuals and institutions, who then share their knowledge through formal and informal mechanisms. This embeddedness may be regional, where clusters are geographically similar (Bathelt et al., 2004: 33). It can, however, be structural and relational, cognitive, political and cultural forms of embeddedness (Boekema & Rutten: 2004: 604). In the research of ZEF in Uzbekistan it could be argued that there is a need to manufacture a degree of political and cultural embeddedness in the project team, in order to promote knowledge sharing with the two other knowledge groups, thus assisting in the creation of new knowledge. This argument is made in chapter seven in the discussion of the practical implications of this research. This reinforces one of the main points made throughout this thesis, that is the centrality of culture to understanding and better managing knowledge.

The form of knowledge sharing that exists between individuals and groups in vital in understanding how agricultural knowledge is created, stored, and used in rural Khorezm. These systems are interlinked, as the process of knowledge sharing encourages more knowledge creation. Likewise, the specific theoretical cultures of each knowledge group must be understood in order to improve the levels of knowledge sharing in rural Khorezm, a factor influenced to a great extent by the institutional framework of knowledge governance. How all these interlocking factors influence each other is of great import and summarised briefly below.

VII. SUMMARY

This chapter has shown how the four distinct types of knowledge (theoretical, declarative, procedural and dynamic) all play a role in the agricultural knowledge systems of Uzbekistan. This creation and use of knowledge is an essentially human activity, meaning that knowledge is much more than just information. Rather, the application of human communication is essential in order for knowledge to exist. In Uzbekistan rural agricultural knowledge is especially important. This includes tacit knowledge in the form of rural 'know how' as well as more formalised types of knowledge. Moreover agricultural regulations (and the ability to circumvent them) are also a type of informal knowledge. Rural knowledge and KM approaches exist in each of the three knowledge groups (rural users, governors and ZEF staff) and each have their own systems of knowledge, which collectively constitute the agricultural knowledge system of Khorezm. Farmer knowledge systems are made up of local and indigenous knowledge, including informal and adaptive knowledge. This agricultural know how is culturally situated, not necessarily capable of application beyond a certain geographic region. The knowledge governance structures of Khorezm revolve around knowledge control, politicised science, intellectual isolation and a set of negative incentives for research and development. Together these modes of knowledge governance create a stifling environment for knowledge creation and sharing. Finally the systems of Western-university knowledge management, as exemplified by the ZEF project, require attention. University based knowledge emphasises the creation, sharing and mediation of knowledge. Each of these features are exhibited in the ZEF project, yet require research into their *modus operandi.* Equally we need to test if Western KM theory of universities is actually able to 'travel' to the unintended location of Khorezm. Each of these three groups interacts to form the KM system of Khorezm. To assess this we need to examine the intensity and scope, direction as well as the durability of the linkages. This then leads to an assessment of the utility of the network as a knowledge creator. Each of these issues is examined in depth in the following chapters of this thesis.

CHAPTER 3
METHODOLOGY

> "I don't delude myself that I succeed <in my efforts to adopt foreign ways> but I get my interest and pleasure trying" (Sir Wilfred Thesiger)

This research adopted the 'extended case study' approach as used in ethnography and social/cultural anthropology to study human phenomena. By focusing on the views of three informant groups (peasants, project staff and post-Soviet governors) various forms of data collection were used and verified against each other. Through a process of 'progressive filtering' subsequent case studies were examined, each of which led to more detailed and more comprehensive analysis of past case studies, combined with opening new avenues of research and new case studies. It was considered necessary to adopt a strong reflexive approach to this research, not least because of my being part of the 'project' informant group. Issues of reliability, replicability and representativeness are discussed in this chapter, followed by an analysis of the ethical considerations that arose. The topic of 'entry in the field' is considered as part of the process of research, including how prior work in Khorezm and project introductions informed the research. This includes a short description of the field setting, site selection and ways in which the three informant groups were identified, as well as a comment on how farming a small '*argorod*' served as a useful entry into the field. The qualitative tools used in my research are each discussed here with reference to both sociological theory and my own experiences. Specifically I discuss unstructured and semi-structured interviews, direct observations, the use of archival data and the conduction of a sociological survey, as well as a brief account of working with and through research assistants in Khorezm. This is followed by an account of how data from informants was verified against historical records, other case study accounts and active observation. For instance; triangulation, deviant case analyses and coding procedures were used.

I. AN ANTHROPOLOGICAL APPROACH

The fundamental approach of this research was to use anthropological[i] methods, in order to see knowledge from the perspective of the 'insider'. By adopting the role of a participating observer (and at times observing participant) the aim was to examine the knowledge systems of three groups in Khorezm, Uzbekistan. This was achieved using a wide range of mainly qualitative methods, verified using some quantitative tools. Overall, the approach taken can be roughly described as the 'extended case study method' an approach "which deploys participant observation to locate everyday life in its extra-local and historical context … a reflexive model of science that takes as its premise the inter-subjectivity of scientist and subject of study" (Burawoy, 1998: 4). The utilisation of the extended case study method extended to all three groups of informants. These being the rural farming community, agricultural and political governors (those in formal positions of power, i.e. 'the government' in a wide sense) as well as ZEF project staff. Being a member of one of the informant groups (project staff) does not invalidate this method; rather it increases the importance of my maintaining reflexivity. With none of the subject groups was I ever an objective 'fly on the wall' (Bernard, 1994: 139), observing actions in an entirely uninvolved manner, such an approach is simply infeasible for as conspicuous a person as a Western researcher in Khorezm, Uzbekistan. By choosing to live in the rural community rather than as part of the project 'Guest House' some distance was gained from the project group, whilst concurrently winning increased levels of empathy (or at least curious bemusement) from the rural farming group. I would not seek to claim that I "went native" in the manner proposed by Kuhn, when: "one must go native, discover that one is thinking and working in, not simply translating out of, a language that was previously foreign" (Kuhn, 1996: 204). Indeed, 'going native' in the classical sense of anthropology would have been infeasible, given that three distinct informant groups were used. Instead my extended case study approach can be seen as an

[i] In this thesis the terms 'anthropological', 'ethnographic' and 'sociological' are used somewhat interchangeably – whilst distinctions do exist, the majority of the literature is applicable to all three approaches. Where a significant distinction is necessary, this is made clear in the text.

extension of the classical method of post-Malinowski anthropology which focused on a single cultural group (Urry, 1972) and which sought to examine it as a complete society, with each aspect examined in its miniature.

> "A typical piece of intensive work is one in which the worker lives for a year or more among a community of perhaps four or five hundred people and studies every detail of their life and culture; in which he <sic> comes to know every member of the community personally … It is only by such work that it is possible to discover the incomplete and even misleading character of much of the vast mass of survey work which forms the existing basis of anthropology" (Rivers, 1913: 7).

The extended case study methodology, discussed below, is an extension of this 'ethnographic' method. The importance of theory in allowing the transition to the "general from the unique, to move from the 'micro' to the 'macro'" (Burawoy, 1998: 5) is a key aspect of anthropology, analysed in this section. Crucial to the process of applying theory to unique results, and distilling from these generally applicable findings, is the scrutiny of inter-subjectivity amongst respondents. This extends to the need for reflexive research by the anthropologist, both issues elaborated on below.

1. The Extended Case Study

The extended case study method that I adopted is a development of classic sociological, anthropological and ethnographic research, whilst utilising the same set of methodological tools, the extended case study seeks to use reflexive science in order to deduce or test generally applicable theory (Burawoy, 1998: 6). It is not a single method but rather a set of methods, the choice of which is dictated by the nature of the study and the practicalities in the field (Hamel, 1993: 498). These methods were refined, re-organised and in the case of structured interviews, rejected during the process of my field research. If we take a crude definition of ethnography as "writing about the world from the standpoint of participant observation" (Burawoy, 1998: 6) then my use of the extended case study adopted this approach, then adding a series of iterative filters of analysis. My research process was one of "multi-level analysis which (draws on) the knowledge, expertise and reflective analysis of a variety of key informants" from across the three informant groups, then combined with verification from historical (archival) sources and external cross-checking (McNess, 2004: 318).

The use of verification mechanisms, as well as a wider stable of research methods, means that the case study method is necessarily more concentrated and specific than classical 'ethnologies'. Whilst seminal works such as Malinowski's 'Argonauts of the Western Pacific' (1922) provided a comprehensive view of a culture or a society, extended case studies tend to be focused on specific questions or phenomena. In this research the case study is on knowledge management within Khorezm, examining how three different social groups create, test, share and utilise agricultural knowledge. Thus the extended case study method, as I chose to apply it, is constituted of a series of smaller specific case studies, such as the discussion of sharing domestic seeds amongst the rural population of Khorezm. It is by unravelling these smaller examples and case studies that an understanding of the meso-system of knowledge is better understood. Indeed a reading of the results chapters, especially chapter five (Indigenous Knowledge), shows how a variety of case studies are drawn together to illustrate the whole knowledge system.

These new conceptualisations of systemic features were then tested against empirical data, gleaned from participant observation, and conjectures refuted and revised. "This iteration was not a one-way process but formed part of a recursive loop, so that the data collected at each of these levels both informed and reshaped the research questions and the research findings" (McNess, 2004: 318). To achieve this, my research comprised 'progressive focussing' (Miles and Huberman, 1984: 27) on particular instances of knowledge management in action. As each case was examined, new cases became apparent and new concepts were tested against this data. For example the issue of knowledge loss was a topic that I had not expected prior to entry into the field, and the discovery of it as an issue spurned new avenues of enquiry, such as the Kolkhoz Communism farm. These cases were also then from the perspective of the different knowledge groups and rich data was gained from individuals who were identified with more than one 'community of interest' (Lee, 2001: 68). This raw case study data enabled the creation of 'categories of concepts and their properties' (Glaser and Strauss, 1967: 36-37) which were instrumental in developing an understanding of the knowledge systems at

work in Khorezm. An example of a category or concept which was developed in this way was the concept of 'the master', who plays an important role in all three knowledge groups. Taken collectively, these small case studies and the integration of manifold methodological tools, led to an 'extended case study' of KM in Khorezm.

2. Storytelling?

In writing this chapter I am aware that I am open to attack, especially the academic community of Uzbekistan (who may well take exception to many of my findings), that I am engaged in an unscientific narrative, in creating fiction from limited facts. The ethnographic nature of the extended case method, especially the predominance of recounting the researchers' experiences in a remote region, has to lead to allegations that it is nothing other than glorified storytelling (Aunger, 1995). I believe that the allegation is essentially that ethnography fails to fulfil the main criteria of positivist science, these being reflexivity, reliability, replicability and representativeness (Katz, 1983; Aunger, 1995: 10). Whilst reflexivity is discussed later in this section, the issues of reliability, replicability and representativeness merit discussion here, in terms of how I tried best to manage the demands of rigorous science. This is followed by an analysis of why theory is vital in ensuring that ethnographic accounts amount to more than just storytelling.

i. Reliability

It has been argued that anthropological data is simply unreliable because of the critical role that the researcher plays in shaping their findings. Likewise informants may fail to provide information on certain issues, or even provide false or misleading information.

> "To summarise the problem of anthropological knowledge: … sociocultural reality presents itself to the anthropologist in fragmented bits and pieces. The outcome of fieldwork is very much dependent on the cooperation of the participants, on many uncontrollable practical factors, and on the personal qualities of the anthropologist, whose own sociocultural framework substantially screens the knowledge that he <sic> produces. This all implies that knowledge created in the field is necessarily incomplete, distorted, tentative, speculative, and thus essentially contestable … In light of the absence of 'hard' criteria, a lack of independent information, and a body of generally accepted anthropological knowledge, this raises the question of to what extent plausibility equals rhetorical and stylistic persuasion" (Bakker, 1992: 40).

Certainly in Uzbekistan there are very real problems in accessing reliable data. I am certain that informants lied to me in certain circumstances, many interviewees certainly obfuscated their answers and most informants were, to put it civilly, frugal with the truth. This left me in the situation whereby I had to make judgements on the validity or truthfulness of certain responses. These decisions were based, as best as possible, upon triangulation and cross checking. Never the less, judgements were made, by me as the researcher that no doubt had a bearing on the outcomes of this research. Moreover, there it is very difficult for the reader to be certain that these judgements and the conclusions I draw, are based upon 'hard' evidence. "Because it is difficult to know whether ethnographic statements are based on anything more than personal impressions, many ethnographies are convincing only to the degree that the ethnographer has mastered rhetoric" (Aunger, 1995: 97).

Likewise questions can justifiably be raised relating to the reliability of informant accounts. In post-Communist countries such as Uzbekistan, which retain repressive security forces and oppose political openness, many topics of discussion may be answered in the 'politically correct' manner, which may bear only a tenuous relationship to the 'truth' (see 'Inter-Subjectivity below). I encountered such 'politically correct' accounts anytime I attempted to raise the issue of academic decline in Uzbekistan. The official account being to turn to the 'golden age' of 1000 years ago and talk about that, rather than confront the uncomfortable reality of present day Uzbekistan. Famous amongst anthropologists is the case of Margaret Mead, who was 'hoaxed' when researching adolescent sexual habits for 'Coming of Age in Samoa: a study of adolescence and sex in primitive societies' (1928). Mead was convinced to believe that there were no cultural restrictions on female sexual promiscuity prior to marriage. A hoax believed by some to have been perpetuated by the informants once they thought that Mead was seeking exciting findings, or that this was her hypothesis (Cote, 2000: 617). Because of the lack of external verification for sexual promiscuity, the data and subsequently the ethnography was unreliable. I don't believe that I was hoaxed, but then again if I were, would I know it? Thus, fully aware of the danger of receiving unreliable

data and precisely because of the risks of untrustworthy research, especially given the opaque nature of political and social life in Uzbekistan.

ii. Replicability

A vital aspect of positivist science is the replicability of scientific research and experimentation. It is only if an experiment can be replicated by others that a hypothesis can conceivably be proved false (Popper, 1963). If we accept the premise above, that the researcher plays a crucial role in ethnography, then it is *non sequitur* to suggest that ethnographic research can be replicated exactly. The issue of replicability is further complicated by the fact that ethnographies are set in a particular time. “History is not a laboratory experiment that can be replicated again and again under the same conditions. There is something ineffably unique about the ethnographic encounter” (Burawoy, 1998: 11). For this reason ethnographers disabuse themselves of the strict requirement for replicability. Providing that the researcher is sufficiently reflexive and open about their research, it is still possible to refute their findings without necessarily replicating their research. In cases where the findings are sufficiently new, interesting or just dubious, as to justify a replication, this can and does occur. For instance several re-studies have been made on Mead’s research of sexual mores in Samoa. Some even contacted original informants and re-interviewed them, who then admitted that the story told was a joke[ii] (Freeman, 2000: 609). So, perhaps the most interesting finding of Mead’s work, from an anthropological perspective, is the willingness of Samoan adolescents to deceive and misinform others as part of a joke or hoax.

What the above example proves however is that replicability is in fact possible in ethnography, however that is may be difficult in some circumstance. Perhaps the greatest challenge is the time commitment of replicating an ethnography, at least one year for

[ii] "Miss Mead asked, 'Where do you go?'" recalls Fa'apua. "And we replied, 'We go out at nights.' 'With whom?' she asked. Then we would pinch one another and we would say, 'We spend the night with boys. Yes, with boys.' She must have taken it seriously, but I was only joking. As you know Samoan girls are terrific liars when it comes to joking. But Margaret accepted our trumped-up stories as though they were true." (Freeman, 2000: 612).

field research and an undefined period afterwards for the production of a manuscript or journal articles. Thus many ethnographers accept the idea of replication studies, however seeing them as extensions of the original studies (Burawoy, 1998: 11). Thus replicability is indeed possible, with the caveat that the findings may differ because of the role of the ethnographer as a subjective interpreter of culture. I would comment that in terms of my own research, replication is in fact possible. If not in the exact terms of a laboratory experiment or soil sample, but in terms of another individual conducting research on knowledge in Khorezm, possibly arriving at some similar and some divergent findings. However the key to understanding why these differences occur is in understanding the unique nature of the ethnographic encounter, the details of mine which I discuss later in this chapter.

iii. Representativeness

Because extended case studies do not study an entire community or culture, they are necessarily based upon sampling. Whilst the classical ethnographic method focused on very small groups (perhaps one tribe) modern ethnography tends to study larger groups or cultures, gleaning ethnographic data from key-informants or from a select sample. Questions are invariably raised about how representative ethnography can be of an entire population. The question is, to what extent is my research, grounded in a series of small field settings within Khorezm, indicative of wider Khorezm or indeed Uzbekistan. This is not a unique problem. Because researchers are restrained by the practicalities of research, such as finding willing informants as well as operating within a limited period of time for research, we may well select a sample that is non-representative of the greater culture. A non-representative village can lead to statistical inaccuracy. There is an inherent danger in the "quick and dirty" approach, which is based on finding commonalties within the sample group (Gladwin & Peterson, 2002: 525). In some research, only similarities are reported, which omits the diversity of the sample group, and subsequently ignores the diversity of the entire population.

My research was especially focused in one village, yet I was at pains to ensure a representative (or at least geographically and economically diverse) sample. Thus my selection focused on studying three rayons within Khorezm, and cross checking these with each other as well as occasional cross checking studies in other rayons. One risk in my research is that a large degree of self selection by informants occurred, between those who were willing to participate in the study and those who choose not to. Naturally, my research actually only represents those who choose to participate and it is difficult to know what differences would have been exhibited by those who did not participate fully. This is why most anthropologists distinguish between statistical representativeness and sociological representativeness (Hamel, 1993: 489).

Sociological representativeness relies more on seeing the sample 'village' or 'community' as a microcosm of the greater culture, the intent being to 'expand' and generalise theories on the basis of the case study (Hamel, 1993: 489). The critical test here is simply whether I, as the researcher, have provided enough information to explain where and where not this limited study can be expanded to cover the Khorezm region. This is distinct from statistical representativeness seeks to "enumerate frequencies", expanding the sample to represent the entire community (Yin, 1989: 21). "The object of analysis and potential generalisation is thus not the agent, institution or process but the relationships through which these are constituted" (Lockie and Kitto, 2000: 14). Thus sociological representativeness is determined more by the rigour of the study in question and in the quality of theory generated, than it is by the strict statistical representativeness of the sample. So whilst a small village sample may be of dubious statistical representativeness, if the ethnographer is sufficiently reflexive and uses theory to inform their work, it may well be capable of extension to the wider community. I attempted to incorporate both statistical representativeness in my work by use of a cross checking survey (N = 457) as well as by reflecting upon my experiences in this chapter.

iv. The Centrality of Theory

> "Social anthropology as a science strives for theoretical understanding" (Radcliffe-Brown, 1952: 2).

The three issues above; reliability, replicability and representativeness; all point to the importance of theory in the extended case study method. It is this issue of theory, of applying generalising concepts, that distinguishes anthropology from simple story telling. In seeking to understand complex cultures and social phenomena, anthropologists rely upon theories in shaping this research. "Such understanding requires the creation of a formal system of terms with specified properties and rules for relating the terms, which systems can be shown to fit some field of experience" (McEwen, 1963: 155). This is a didactic and iterative process, whereby theory is used in the conduct of original research, which in turn tests existing theory and creates new theory, a process sometimes labelled 'retroduction' (Hanson, 1958). These two steps are of course inextricably linked, however they are discussed separately here for the sake of perspicacity.

In designing research, the ethnographer always relies upon the existing *corpus* of theory. Be this is the form of existing methodological theory (i.e. how the study is to be conducted), existing knowledge, including histories, of the informant group (i.e. who is to be studied) and the specific phenomena or cultural aspect to be researched (i.e. what is to be studied). In each of these cases there is a body of academic literature that informs and shapes the research design. Frank (2004) describes how "for a story to become social science, it needs theory, which involves a tradition of research in which stories hang together in patterns that make sense as a whole, shifting as the composition of that whole may be" (p.435). In framing the research question, the researcher needs to be cognisant of the existing knowledge, the 'tradition of research', of the society in which they hope to research, as well as informing their research with theory. These theories play an important role in shaping research design, the tentative choice of methodologies (Frank, 2004: 436) as well as determining to some extent what will and will not be researched. It is through an appreciation of theory that the researcher can improve the reliability and replicability of their research, whilst seeking to ensure that their work is representative of the wider community. Without this theoretical background the researcher would simply

be entering a field research area, with the intent of telling a story. Even if they wished to contribute to science, they would be doing so at considerable disadvantage, being unaware of the previous mistakes and findings of the discipline.

Much more widely discussed in critical ethnography is the process of moving from story to theory (or in theorising the story), in effect what happens after a return from the field. McEwen (1962: 156) describes this process as 'confirmation', or the validation procedures through which the empirical validity of propositions is determined. This includes testing existing theory and 'confirming' their usefulness, or in creating new theories and 'confirming' both their own validity and the refuting or delimiting the useful of prior theory. This is a two step procedure (linked back to the initial step, from theory to story), described as:

> "The theoretical problem of the scientist is to develop concepts and prepositions relating the concepts. Validation requires that the empirical correctness of the prepositions be demonstrated" (McEwen, 1963: 156).

In providing empirical evidence (the 'story') for the propositions, the researcher is showing the situations in which their theory is applicable. If insufficient evidence exists then the theory may only be applicable in limited circumstances, if at all. However, where the research is reliable, replicable (as far as possible) and representative, then the theory can often be applied to other fields. To quote Said, the theory is capable of 'travel' (1984: 229). It is then up to other researchers to test this theory in and adapt it to different locations, completing the circle back to using theory in the creation of new stories. For this process to function, a high level of reflexivity is necessary, an issue elaborated upon in the subsequent section.

3. Inter-subjectivity

It is important to realise that the ethnographic approach is not objective, nor does it seek to be. Rather, ethnographers recognise the subjectivity inherent in their work. This subjectivity occurs both with the ethnographer themselves, as well as within the informant group. The first type of subjectivity is termed reflexivity and is elaborated

upon in the next section. Discussed here is the inter-subjectivity of the informant group, the way in which the subjects of research respond to an outsider and alter their behaviour and interview answers, because of having an outsider there. This issue is of considerable importance, given the ability of subjectivity in respondents to invalidate research (cf. Margaret Mead). The subjectivity of respondents can take several forms grouped here as situational, protectionist and reactive, each informed with examples from my field research.

i. Situational

The first form of subjectivity is the situational subjectivity of the respondent. When interviewed, observed or otherwise studied, any informant is representing themselves and their situation; they are not representing the entire community or respondent group. The economic, social, political and familial status of the individual will each influence their world view, which will in turn inform their "speech, their representations, the underlying codes of their discourse and behaviour, and cognitive structures or principles of action and thought" (Galibert, 2004: 458). In short their 'situation' in life will inform their response. There is of course nothing wrong with such subjectivity, it is entirely natural (to the extent that any social process is 'natural' or 'normal') and indeed can serve to elucidate issues from the various perspectives of different actors in a community. Feminist deconstructivists such as Donna Haraway (1991, chapter 9) posit that sociologists must assemble networks of "situated knowledges", which collectively inform the greater ethnology, a concept which I adapt in this thesis to help discuss the 'cultural context' of knowledge. So long as the researcher is aware of the situational subjectivity of each respondent, then their responses can be seen through the prism of their "lived reality" (cf. Hooks, 1989). It is not necessary for the researcher to deconstruct these lived realities, merely they must situate these realities within the society and culture which they wish to study, an expansion of the concept of *verstehen* in European sociology (Emerson, 1981: 354). Cumulatively, this 'network' of situated responses constitutes the greater society that the ethnographer seeks to study. Likewise, the cultural context of knowledge

is not unitary; it reflects the different cultures and epistemologies within a knowledge system.

In my work the biggest differences in situated knowledges was between those who could be roughly grouped as ‘governors’ and the governed. Whilst not downplaying the significant differences, the rivalries and patron/client networks within either group, those who governed and those who were governed, exhibited significantly different world views. The ways in which they dealt with me as an external research were different. Many of the governors saw me as a potential resource, as someone who could be used to access greater wealth or power or prestige, within their existing office. Thus they had a vested interest in exhibiting a certain *persona* of themselves, one which was all knowing and in possession of ‘knowledge’. In one instance, when I explained that I wished to find out about farming in Khorezm for my PhD, the agronomist concerned simply said that he knew all there was to know, so I should just interview him (Field notes, 12 May 2005). Whilst partially joking, he was throughout our relationships seeking to portray himself as omniscient.

This was different from the ‘governed’, who would also at times see me as a resource. Most frustratingly during the ‘marriage season’ of August when I was expected to appear at every wedding as a sign of their familial status, and my position was like that of a corpse at a funeral, essential for the conduct of the ceremony yet whose concerns and cares were irrelevant. Yet the tendency of the rural poor was to underplay their knowledge, to present it as unimportant or self-obvious, not requiring explanation. This reflects a tendency for local knowledge to be tacit, whilst the ‘superior’ knowledge of the governors tended to be explicit. These two very different situational responses to interviews played a large role in informing my conception of how informal knowledge is under-valued within Khorezm, whereas formal ‘scientific’ knowledge is championed, a factor discussed in chapter five.

ii. Protectionist

Respondents may also refuse to co-operate, obfuscate their answers, change the topic or simply invent stories in an attempt to protect themselves or their kin from risk or perceived risk. This form of subjectivity is labelled here as 'protectionist' subjectivity, where informants adopt risk management strategies in an attempt to protect themselves from harm, perceived harm or a 'loss of face'. There is a disappointingly small literature on the refusal of informants to co-operate fully in the ethnographic enterprise. The paucity of literature probably belies the very real practical difficulties faced by ethnographers 'in the field'. What literature does exist deals primarily with the issue of 'taboo' – of issues that are not culturally allowed to be discussed, especially with 'outsiders'. For instance child sex abuse and incest, two forms of 'deviant' social behaviour that inflict considerable harm on the individuals involved, yet which are poorly discussed and analysed because of the cultural 'taboo' associated with them (Durham, 1990: 187). Similarly, it can be argued that the 'invented' stories which were recounted to Margaret Mead were created by informants because of an embarrassment in discussing sexual behaviour with an outsider. Whilst some promiscuous behaviour may well have been evident, social taboos possibly militated against young women sharing these experiences with an older, foreign woman. Similarly, the example of witchcraft is often cited as a complex and secret topic, only accessed by a researcher who has achieved adequate empathy and trust with the informant community (Bernard, 1994, chapter 7).

Uzbekistan is not an open society and self-protectionist behaviour was prevalent in my research. In the field setting of Khorezm I would argue that there is a very real issue of protectionist subjectivity. The current situation[iii] reflects the unfortunate history of Soviet authoritarianism, with the associated restrictions on freedom of movement, speech and education. Moreover, because my research focused on agriculture, especially cotton production, my research was inherently political. This is because of the centrality of cotton (and agriculture in general) to the exchequer, as well as the importance of improving agricultural production as a proving ground for political advancement, in the

[iii] Discussed at length in State Department (2002), Lewis (2005), March (2003)

form of regional *hokims* being responsible for constant increases in cotton production. These factors all converged to make agriculture a politically sensitive topic of conversation. There was a real need for discretion by the informant community, as a mechanism of self protectionism, and one which I was constantly being confronted with in the field. I recognise now that informant interviews conducted soon after my entry into the field, conducted before a high degree of trust existed, delivered very different results from those after trust was established. I would not claim to have fully surmounted this protective tendency, even with my very closest informants. In every interview and in every social interaction, there always remained a level of mistrust and self-protection, one which I believe exists not only for foreign researchers but even with social interactions within Uzbek and Khorezmi culture.

iii. Reactive

Perhaps the most written about form of informant subjectivity is the tendency for reactivity. This is where people change their behaviour once they know they are being studied (Bernard, 1994: 141). The basic assumption in ethnography is that reactivity always occurs at some level and to some degree, however that the more time that is spent in the field site, then the lower the level of reactivity, and, "lower reactivity means higher validity of data" (Bernard, 1994: 141). Informants adopt reactive behaviour for several different reasons. For instance Le Compte attempted to study school children's behaviour, and informed the children that she intended to write a book about them. They reacted by acting out in the style of characters on popular TV programmes, in an attempt to "make good copy" (Le Compte et al., 1993). In situations such as Uzbekistan, where local culture demands that guests be provided with everything that they request, then there is a propensity for respondents to provide the answers that they think the ethnographer wants (Adams, 1999).

In my research this took the form of exaggerating (or simply falsifying) stories in an attempt to provide me 'good research', whilst this was within the Uzbek tradition of providing 'hospitality' it also often served as a cover for topics that people did not want

to discuss. Interviews on cotton would often morph into recounting stories about holidays or military service in the Soviet period. Similarly, for reasons of protectionism or simple modesty, many informants did not answer certain questions, usually changing the subject or more often providing the 'official story' or 'party line' that was guaranteed to keep them out of trouble (i.e. 'life is much better after Independence', which is certainly a debatable proposition). In other cases they may obfuscate their answers. It is a difficult if not impossible task for the research to 'decipher' and then 'reconstruct' the informants accounts, whilst still retaining the 'actor's perspective' at the core of the research (Emerson, 1981: 355) and doing so is fraught with risks of missing or misinterpreting an important issue. Thus I focused much more on minimising the reactivity shown by informants and much less on deconstructing peoples responses. The first way I achieved this is by spending adequate time in the field to ensure that I became as much a part of normal life as possible. I did this in, the perhaps naïve opinion, that informants will seldom 'act' for the researcher indefinitely. Secondly, interviews and other forms of 'prompted' data were verified by examining 'unprompted' data such as observation of human activities and actions (cf. Galibert, 2004: 461). In this way I recognised that it was impossible to prevent reactivity, however I progressed on the assumption that it is reasonable for the researcher to lessen the impact through spending more time in the field and through proper cross checking of data.

4. Reflexivity

> ''Anthropological practice based on extreme proximity to the social reality under study requires, paradoxically, a sharp distancing from the society one seeks to understand and from the society to which one belongs'' (Laplantine 1987: 157 in Galibert, 2004: 456)

Possibly the biggest advance in critical ethnography has been a thorough deconstruction of the role of the anthropologist in shaping and creating research. Reflexive thinking forces the ethnographer to consider their own role in the research process and the ways in which they contribute to the validity of the data. Given the highly interpretive nature of ethnographies, one must direct the analytical gaze at one's self - breaking down the *vide et impera* barrier of 'the other as object' (Fabian, 1983: 118). Once the researcher becomes aware of their central, and subjective, role in the research project, then it

becomes possible to fully examine the subjectivities intrinsic to the anthropological method. This critical self reflection enables the science of ethnography to deepen its theoretical roots and strengthen its scientific findings (Bourdieu, 1977). It is, however, important to caveat the imposition for reflexivity with an acknowledgement that extreme reflexivity turns attention away from the cultural group and becomes no more than an introverted travel diary of the researcher, such "extreme reflexivity … can also render the production of ethnography as something more akin to individual psycho-analysis than as a means of enabling alternative perspectives on the 'real world' to gain public space" (Brockington and Sullivan, 2002: 66-7). In order to avoid this situation of extreme reflexivity, whilst maintaining the advantages of reflexive research, I found it useful to look at the forms to reflexivity. There are four dominant types of reflexivity promoted in the literature; confessional, theoretical, textual and deconstructive (Foley, 2002: 469). In order to better understand what critical reflexivity is, and how I applied these to my research, I review the main forms of reflexivity here.

The 'confessional' approach found its genesis in the publication of Malinowski's 'surprisingly frank diary' in 1967, which opened the way for field researchers to produce additional information on their fieldwork experiences (Foley, 2002: 473-474). This can be autobiographical or personalistic in nature, placing virtue in the act of "'opening up', the candour of 'telling where you come from', the correctness of 'taking responsibility for your roots' and the consistency of 'not making an exception out of yourself' (Pels, 2000: 1-2). The confessional approach still plays a role in modern critical ethnography ands in many ways I have attempted to 'confess' many of my field work failings in this methodology chapter. However the common shortcoming is in the lack of application of theory to the 'confessions'. In turning the mirror of sociological enquiry onto themselves, ethnographers were assuming that there was a unified set of rules for sociological practice which (if properly applied) would result in an objective outcome (Pels, 2000: 15). Thus the 'theoretical' approach critiqued confessional reflexivity as a self-indulgent, narcissistic, 'diary disease' (Geertz, 1988). The theoretical discourse, advanced by Bourdieu (amongst others) saw the ethnographer as part of a scientific field of study, and that it was the field as a whole that merited 'second order' analysis and reflection

(Robbins, 2003: 11-12). This necessity to act honestly foreshadowed his concepts of 'habitus' and 'field' which were used to promote sociology as an ethical science (see following section 'Ethical Considerations').

Textualist reflexivity is more a critique of the anthropological method adopted by many modern (though not many post-modern) sociologists, whereby informants 'speak for themselves' through the use of quoting representative texts (Foley, 2002: 477). Many of my case studies are illuminated in just this manner, using extensive quotations and texts from archival sources. Just as historians check multiple sources, verify statements and critique statements with other data, the textualist reflexivity calls on ethnographers to be more self-conscious in how they use narrative and representational quotes from informants (Foley, 2002: 477). Finally the deconstructive approach argues, perhaps a little too strongly, that it is simply not possible to arrive at scientific truths through any form of subjective research. Thus it is stated that ethnographers are no more than glorified storytellers or artists, presenting their own subjective view of the world (Foley, 2002: 480). Whilst it is useful to bear this concept in mind, it is more important to focus on the other three forms of reflexivity which provide a more practical (and positive) guide on how to negotiate the difficulties of maintaining reflexivity when conducting ethnographic research. If indeed the textualist approach is correct, that all social research is invalidated through subjectivity, then this raises issues well beyond the humble scope of this PhD. Indeed, if it is so then entire academic departments are rendered null and void. Thus I am happy for the debate to occur about the validity of social research, however, I do not deem it within my capacities or interest to judge which critique is most compelling. Rather, what this discussion does show us it that both practical as well as theoretical reflexivity is necessary in conducting effective anthropological fieldwork.

II. ETHICAL CONSIDERATIONS[iv]

There are serious shortcomings when seeking to apply Western liberal notions of research ethics to Uzbekistan. That is the evolving understanding of how, and why, researchers need to consider the impact of their actions on local communities that they research. This problems are not unique to Uzbekistan, but reflect a significant disconnection between Western ethical principals and the practicalities of work and research in the developing world. I argue here that ethical considerations are vital in conducting research in the developing world, more so in a country like Uzbekistan where state interaction is potentially problematic. A 'principled' approach was utilised in this research. This accepted the need to consider the local situation and seek to apply ethical research principles to these situations and I discuss here both the specific approach as well as commenting on issues of wider concern to the development (and ZEF) community.

If we accept the premise that research can (indeed should) be of potential benefit to the developing community then we can arrive in a conundrum. The formulaic nature of Western ethics procedures can effectively bar research from being conducted in countries such as Uzbekistan. However, if adequate and appropriate development interventions are to be undertaken then these must be based on sound research *in situ*. Herein lays the paradox. It is possible that in an attempt to act 'ethically' researchers are discouraged from conducting research in regions such as Uzbekistan. If this is the case, then the development and academic communities are actually acting in an unethical manner, denying the people of Uzbekistan the benefits of research and development interventions. We must also be careful not to 'do harm'. So whilst there is an obligation not to inflict harm upon the objects of research, there is also an obligation to engage with development problems. As a development research organisation, ZEF has an obligation to work towards mitigating rather than exacerbating problems within those developing countries in which it chooses to work. For instance, poor governance (including corruption and

[iv] Aspects of this section are adapted from Wall & Overton (2006)

nepotism) is a crucial issue in Central Asia. By choosing to work in Khorezm, the ZEF project has an obligation to devise strategies to minimise its contribution to poor governance. On an individual level, researchers in the project should avoid activities, such as paying for information, that exacerbates corruption and poor governance. I discuss such dilemmas below with purview to ethics theory.

1. Ethical Principles

Conducting research in Uzbekistan, or indeed any developing country, raises a number of serious ethical issues. The issues are grouped here into three essential principles of self-determinism, non-malfeasance, and justice & beneficence. These are the foundation principles articulated in the Code of Nuremberg in 1947 (Antle and Regehr, 2003: 136), and form the basis of the constantly evolving understanding of the rights and duties of human beings. This evolving understanding dates back to Hippocrates, and has continued to progress with the Helsinki Declaration [1964] and the International Ethical Guidelines For Biomedical Research Involving Human Subjects [1993] (Bhutta, 2002: 114). In the case of self-determinism and nonmalfeasance there is a *prima facie* case that development research faces ethical problems. Cognisant of these risks I judged that the potential for justice and beneficence can be used to justify the potential for harm in conducting this research. This said, every effort to reduce the real and potential risks to informants was taken.

i. Self-Determinism

The principle for self-determinism is that individuals have the right to choose whether to participate in research, and that this decision should be based on 'informed consent' (Macklin, 1999: 26). This determinism to participate must be voluntary. This ethical principle recognises that participants are persons worthy of respect and rights, not simply objects at the use of others (Macklin, 1999: 26). Whilst self-determinism is a vital principle, it is important for researchers to recognise the limitations of self-determination in research. As philosophical concepts 'freedom of will' and 'self-determinism' are

contested terms (McDermott, 1975, chapters 5 & 9). All human beings are influenced by their upbringing, their education and their cultural background amongst other factors. These influences inform decisions made by people, removing the possibility for 'pure' self determination. For example, a Western educated individual has been socially conditioned to accept the need for research, making it unlikely they will refuse to participate in university-sanctioned research. Their decision is in this case determined by their education (as well as privileged socio-economic and occupational position, higher likelihood of themselves being educated), removing the idea that they are making an un-feted or free decision[v]. There are merely degrees of self determination. The Uzbek cultural tradition of providing hospitality to strangers (however duplicitous this tradition may be, c.f. Adams, 1999) means that the host finds it culturally difficult to refuse a guest's request. Hence the host will try to participate in the research, although perhaps adopting a protectionist pose.

The, philosophically dubious, concept of 'free-will' is a largely Western value with a history in the European academic tradition (Antle and Regehr, 2003: 137). The majority of the world does not share this tradition of individualistic rights (Richards, 2002: 796). For instance Macklin (1999) suggests that "informed consent is a concept understandable and applicable in the West but ... irrelevant to social and cultural norms in Africa and Asia" (p26). In such situations Orentlicher (2002: 404) suggests that oral consent from tribal leaders or traditional authorities is more appropriate. In a society where one's word is considered sacrosanct, to request a recording or signature is considered insulting (c.f. Bedouin Culture, Antle and Regehr, 2003: 137). Likewise, tape recorders are inappropriate (and potentially dangerous) in a society where political repression is present. For this reason it is argued that recording consent in the case of this research would likely have been counterproductive and it was only in very select, formalised, environments that I ever sought to record interviews. Firstly, it would have weakened my ability to retain confidentiality, as well as marginalising the research staff that could potentially come under government pressure to identify research participants. In the

[v] c.f. Sartre, 1943, 'Being and Nothingness'; discussed in Simont, 1992, 178-210. Also, Robbins, 2003: 12

research undertaken, all participants were advised that the research was voluntary, and that they were under no obligation to participate. There is here a possible conflict with Islam's injunction to provide hospitality to all guests, and that the researcher as a foreigner was considered a guest to be provided with whatever they requested. This placed potential participants in a difficult situation. However, the fact that numerous individuals declined to participate suggests that self determinism was respected to some extent.

ii. Non-malfeasance

The notion that research participants should not endure unreasonable harm is sacrosanct amongst ethical principles (Bhutta, 2002: 114). Non-malfeasance requires an anticipation and articulation of the conceivable risks of participation, which "include[s] not only physical risks … but also potential symbolic or personal discomforts, such as embarrassment, fear of loss of reputation (for example, research that addresses a socially stigmatised issue" (Antle and Regehr, 2003: 138). At a very practical level the ZEF project partially addresses these concerns, for example providing crop protection insurance for farmers involved in field trials (Interview, 25 August 2005). Inextricably linked with non-malfeasance is the requirement for confidentiality, especially given the risks involved for those in Khorezm who speak against the government. The rule of confidentiality is an important tool in ensuring harm minimisation, and like self-determinism is subject to critique as a Eurocentric concept (Macklin, 1999: 32). In the case of my research it is argued that confidentiality was to be strived for, both to reduce potential harm, and to improve the efficacy of the research (an issue discussed below in 'Justice and Beneficence'). The politicised nature of the rural economy (importance of cotton to the exchequer etc.) coalesced to make confidentiality vital in this research. However, prior research in the region identified some problems with ensuring confidentiality from interpreters as well as focus group participants. The simple solution to this problem would have been to adopt a *pro forma* approach, whereby interpreters and focus group participants were required to sign confidentiality clauses. In my opinion this solution would have been disingenuous or simply ineffective, as it may not necessarily

have guaranteed confidentiality. As a solution to this problem, it was resolved to undertake extensive training of interpreters, as well as including comments on confidentiality in the briefing to focus group participants.

iii. Justice and Beneficence

The principle that researchers and academics must act in a just manner dates back to Socrates, who suggested that very few academics upheld justice, yet that it was their obligation. (Plato, Crito; *cited in;* Koehn, 1998: 117). Indeed, Bourdieu argues convincingly that the concept of 'habitus' when working in the field places a large ethical obligation on the researcher not to do harm (Robbins, 2003: 12). This fiduciary 'duty of care' of the field researcher is moral in nature, the responsibility for which rests primarily with the researcher themselves. The principle of justice in this research implies that the benefits and burdens of the research should be distributed evenly, ensuring that disadvantaged groups gain from the research and are not exploited by it (Antle and Regehr, 2003: 138). The concept of justice is inseparable from the principle of beneficence, the injunction that research must be of potential benefit to the participants. It is this beneficence that must be weighed against the potential for malfeasance and harm, to determine whether research should be conducted (Orentlicher, 2002: 407). This judgement cannot be made in aggregate, but must also consider the just distribution of the costs and benefits, amongst at-risk groups and minorities. It must also recognise that different people and cultures attribute different value to certain costs and benefits, and that it is wrong to impose Western value systems in this regard. This research hoped to be of long term benefit by assisting in developing sustainable farming technologies that reflect farmer needs and priorities. The ecological disaster of Khorezm and the Aral Sea region, justifies the need for such research. This need has been reinforced by local desire for these technologies, evidenced in prior research (Wall, 2004; Wall & Lamers, 2004). The issue of justice was addressed by working with those individuals who constitute the 'target group' for the downstream benefits are the same target group of the research, hopefully ensuring equitable distribution of burden and benefit.

III. ENTRY INTO THE FIELD

Having established the theoretical-methodological approach, much of it prior to the field work, the next step was to gain entry into the 'field'. The 'entry into the field' is often discussed as the most difficult aspect of the ethnographic method (Bernard, 1994: 143). It was certainly challenging, confronting the hurdles of bureaucracy and suspicion from the authorities. However, in many ways my entry into the field was eased by my prior work in the region, as well as working as part of an established international project with good political connections and high visibility in Khorezm. How this was achieved had an impact on the field setting in which I worked. Likewise the issues of site selection and the identification of the three key informant groups is an important part of my infiltration. I would say however that prior to my entry to the field, the consensus from the project local staff (though not from management) was that finding a house in a kishlak would be impossible and that official permission would not be forthcoming. The reality could not have been more different. My move to the kishlak was, whilst not without some challenges, the single most rewarding aspect of my field methodology, both professionally (in conducting better research) and personally (an often under-recognised aspect of methodology). Despite the troubles associated with finding an appropriate home there were few administrative hurdles to be crossed and I would strongly encourage future researchers to enter their own rural field setting as quickly as possible, politely ignoring the implorations of urban staff.

1. Prior Work and Established Introductions

This PhD research was not my first entry into the fields of Uzbekistan and Khorezm. I had been working in the Tashkent region as a consultant on a New Zealand Agency for International Development project, examining the social and gender issues of technology change in the rural environs of Tashkent. Further to this I had conducted four months of research in the Khorezm region under the aegis of the ZEF/UNESCO project, for my Master of Arts from Massey University, New Zealand (Wall (2004). Thus I had some

prior knowledge of the rural system within Uzbekistan and even within the Khorezm region; moreover this knowledge was situated loosely within the ZEF/UNESCO project in which this PhD was firmly grounded. As I perceive it, there were two main benefits to my prior work. Firstly was a limited understanding of the situation 'on the ground' in Uzbekistan (my own 'local knowledge'). This made the choice of theory and method much easier, as I had some understanding of what would and would not 'work'. This is also a potential disadvantage as I used a large amount of tacit, somewhat untested, knowledge and preconceptions in the formulation of my study design. On balance I believe that having prior experience enabled a better choice of theoretical-methodological approach. The second benefit of prior experience was a set of established introductions in the field setting. Whilst my work for my Master of Arts had been a form of rapid rural appraisal (cf. Chambers, 1984), I still maintained some contacts with key informants amongst the peasant and post-Soviet governors groups, who were able to help in the early phases of my field work. Likewise, I had been working with some of the ZEF PhD students for, in some cases, two years prior to beginning my PhD, thus I had the privilege of well established introductions into this informant group. Hence my entry into the, otherwise very challenging for ethnographers, field of Khorezm was made more manageable as a result of prior research and the presence of prior contacts.

2. Working as Part of a Project

This research was explicitly part of a larger project, that of the Centre for Development Research (ZEF) and The United Nations Educational, Scientific and Cultural Organisation (UNESCO). My Doctoral studies were conducted at Bonn University, to which ZEF as a research institute is affiliated. Thus I was very much part of a larger group of researchers in the region. Because the project formed one of my informant groups, I utilised not only participant observation but also acted as an observing participant. That is to say that I was making observations on a group of which I was an active participant. This is discrete from my role with the other two informant groups, where I participated to an extent, but where my main focus was on observing the actors. There were benefits as well as possible costs to my involvement in a larger project. In

practical terms working as part of a project was administratively easier. Whereas permission is necessary for all research in Uzbekistan, much of these formalities were managed by the project. In other instances, being attached to an 'official' project with UN credentials was of immense help. This opened doors to senior administrators, helping me to access the knowledge governors much more readily than would have been otherwise possible. Likewise my involvement in such a project meant that some farmers were aware of the project[vi], and had a positive impression of it, prior to my interviewing them. This made it much easier to establish rapport and trust. Quite difficult in normal circumstances because of the suspicion that accompanies Western researchers.

Perhaps a disadvantage was a lack of critical independence from the ZEF/UNESCO project as an informant group. My ability to openly critique the project of which I was part (and upon which my funding relied) could be questioned. In general I feel that I was able to critique the project within, to borrow a phrase from Chomsky, a 'realm of thinkable thought'. So, gentle review of the projects activities was possible whereas an overall critique of overall project objectives was, on reflection, not welcome by all of the project management. Whilst no direct injunctions were made, I would argue that the pressures of funding (my stipend was under annual review by project management) and the role that project managers play in vetting the research proposal meant that the topics of research were constrained. I never had any direct experience of not being able to conduct research or publish findings, aside from mild self-censorship.

There is an interesting issue here that arises from the theme of power and knowledge, as I as a student and reliant upon the project for funding, was reliant upon those with power. How this power dynamic then shaped and informed my choice of research topic, especially how I presented results, is a difficult area of discuss reflectively. I never felt that my methodologies were influenced by the project management, however in the later stages of thesis writing I certainly became aware that my chapter on ZEF knowledge

[vi] Especially in Yangibazar and Khiva rayons, less so in Yangiarik where I worked mostly.

management was receiving special attention. The influence that this had on my presentation of findings is difficult to gauge, but it certainly had an impact. It would be interesting to reflect on this point further in a later publication, once the power relationship of management/student and donor/recipient no longer exists.

3. Field Setting

The chosen field setting is the Khorezm district of Uzbekistan. This is a politically delineated 'Viloyat' (Province) in the Western area of the country, which is marked on its northern boundary by the Amu-Darya river (north of which is the semi-autonomous republic of Karakalpakstan). To the south is the Republic of Turkmenistan, with which diplomatic relations are far from warm. Shown in Figure 3 (p.78) is the greater Central Asia region, with Khorezm identified. The Khorezm region is also the focus of the ZEF/UNESCO project, largely because of the considerable environmental and human impacts that have occurred because of the desiccation of the Aral Sea. Provided in Figure 4 (p. 78) is a map of Khorezm, indicating the Rayons (administrative districts) in which the research was conducted. The Amu-Darya River flows from the South-East towards the North-West, making Gurlen the most downstream Rayon within Khorezm. The administrative capital of Khorezm is in Urgench city, which is centrally located within the Urgench rayon. The ZEF/UNESCO project has its main base of operations in Urgench also, with a project guest house and office located within the city. The office is beside the Urgench State University (UrDU), which is the local partner within Khorezm. Whilst this research was focused in the Yangaryk rayon, case studies were conducted in a wide variety of different regions and this research is a study of Khorezm as a region. Cross checking studies were conducted in Gurlen, Khiva and Urgench rayons, which provided a useful geographical spread of examples and helped to capture the diversity of the region, especially Urgench rayon where agriculture is shaped by the large urban population.

Figure 3: Map of Central Asia - Khorezm Identified (The Economist, 26 July, 2003)

Figure 4: Map of Khorezm Rayons (Author's own manipulation of Project Data)

4. Site Selection

> "In any ethnographic study, the choice of a site is crucial" (Lloyd, 2002: 521)

Having chosen rural Khorezm as my focus area, I decided that the best way to access in-depth knowledge of the region was to live in a kishlak, situated in one of the rayons. Site selection was largely a pragmatic affair determined by several criteria. Firstly, I wanted to live outside of the urban biased Urgench rayon, yet needed to be within driving distance of the city in order to maintain my contacts with the project, thus Urgench, Pitnak and Gurlen were excluded. Yangibazar was also excluded, largely because of the amount of research already conducted by the project in this rayon and fears that this might colour my research or respondents participation. In the end I determined to find a rayon which could be said to be typical (and sociologically representative) for the region. Ultimately I settled upon Yangiarik as a rayon with average levels of cotton production, water access, poverty and access to markets.

Within Yangiarik the selection of a specific village was determined by what housing was available for rent, given that most houses are occupied and that population growth is placing pressure on existing housing. Finding an appropriate house within Karamish kishlak was largely a result of persistence and luck, coming at the end of a long process of inspecting houses. In a sense the specific site selection became a random or arbitrary process, and it is only due to good luck that I can claim to have arrived at such a fortuitous research site. So whilst I would consider the site of Karamish as an excellent location in which to conduct research, there was little to suggest this prior to my entry into the field. In the absence of any reliable census data or accessible agricultural production data, the would-be anthropologist entering the field of Khorezm is left largely to their own intuition and networks. This was certainly the case for me, even with the advantages of working with an established project in Khorezm. I would advise any researcher considering work in Khorezm to trust their own intuition and judgement, this may well run contra to urban contacts who advise against living in rural areas or who want to find a 'nice' (read rich) household for the 'guest' to live in.

5. The Argorod as an Introduction

Upon entering the field, I made use of my 'tamorka' plot of 0.12 ha attached to my house. This attempt to understand agricultural knowledge at the most immediate and household level turned out to be incredibly rewarding, both professionally and personally. From a professional research perspective it served as perhaps the best way of introducing my motivations to the community. Rather than entering the field with an agenda for what I wanted to teach or provide, instead I was deliberately making myself reliant upon the help and advice of the local community. This very quickly broke down barriers between those who had been suspicious of me and my work; it also reduced any concept that I was a 'westerner' with superior knowledge. On the contrary I was reduced to asking the simplest questions. At times this deliberate (occasionally feigned) ignorance was met with disbelief and good humour. My not knowing how wide to make the seed beds for watermelons was almost a community joke.

The *argorod* also aided a great deal in the early stages of building personal relationships with Bemat, my key informant and local supervisor, as well as a range of other individuals who came to proffer advice, knowing it was welcome (Interview, April 7, 2005). The usefulness of the approach was reinforced on one occasion when the police visited, they asked us what we were doing and Bemat was able to answer "they grow potatoes, and tomatoes, some carrots … oh, and two sheep and some chickens", diffusing the situation with humour. In retrospect, having the *argorod* also equipped me better for conducting research. I was able to relate my own difficulties in interviews, which built empathy with respondents. Subsequent to my research, I realise that this should not be surprising. For instance Emerson (1981) argues that active participation by the ethnographer is the key means of integration into the community, generating a richness of observational data and insight (Emerson, 1981: 351). It also provided me with research topics that I might otherwise have missed, such as the risks associated with animal health. A topic I became aware of when six of my chickens died during my first month in the kishlak. The fact that my neighbours lost all their chickens to disease might well have passed unnoticed had it not been for my practical integration into this aspect of rural life.

IV. SPECIFIC METHODS EMPLOYED

i. Unstructured Interviews

Unstructured interviews were the principal method of data collection in my research, a common situation for the ethnographic method (Bernard et al., 1986: 383). In this extended case study unstructured interviews, in all their different guises, played a primary role in gathering data. In essence an unstructured interview is a very informal method of research, where I as the interviewer would suggest an opening topic, then allow the respondent to answer the question in the way they wish to (cf. Rubin and Rubin, 1995). This allowed the respondent to speak about topics of interest to them, rather than answering questions on topics that are of specific interest to me as an interviewer. The big benefit of this is that it removes a degree of interviewer bias, in terms of which questions are asked and how they are asked. Perhaps most importantly it leaves open avenues of enquiry that were previously discounted by, or simply unknown to me as the researcher. Thus the informant speaks with their own voice, and less through the lens of the interviewer's desired information. "The strength of unstructured interviewing is that informants have great freedom to express themselves using their own cultural constructs independently of the presuppositions of the ethnographer" (Bernard et al., 1986: 384). I found however that for this freedom of voice to take shape however, the interviewer must also be willing to share their own experiences and talk 'openly' and 'truthfully':

> "the interview should be an occasion that displays the interviewers' willingness to share his to her own feelings and deepest thoughts. This is done to assure respondents that they can, in turn, share their own thoughts and feelings. The interviewer's deep disclosure both occasions and legitimates the respondent's reciprocal revelations" (Holstein and Gubrium, 1995: 12).

This rapport building is essential to the unstructured interview. If respondents did not feel confident to speak, then they will not respond positively to an unstructured interview. Thus I would typically premise interviews with people I did not know, in terms of explaining why I was conducting my research and what exactly I was hoping to find out. It was here that the *argorod* became an immense asset. An example of a particularly useful interview is when I approached a key informant and simply asked her to explain everything that she knew about collecting seeds, as *I myself needed to collect seeds.* I

found this interview eminently more useful than other, abstract, interviews on the same topic.

Providing that an affinity of some sort did exist between the interviewer and the informant, then several types of unstructured interviewing were possible. This could involve beginning with a 'grand tour' question, then asking more probing questions on matters that arise from a theoretical interest or in response to past enquiries (Bernard et al., 1986: 384). Unstructured interviewing was also more *ad hoc*, where I would simply ask the informant to explain a particular event that is occurring, such as a wedding or the planting of a new crop. This is labelled in the literature as 'opportunistic' or 'mud-hut' interviewing, and as an equally valid form of ethnographic interview (Bernard et al., 1986: 384). Many of my interviews were just this; informal and unstructured, centred upon something that was happening at the time and recorded in my field notes (approximately 80 such interviews), in addition to 51 unstructured interviews that I recorded separately. Yet I found these, especially during the early phase of my field research, amongst the most informative interviews.

ii. (Semi) Structured Interviews

Structured and semi-structured interviews are a more formalised method of ethnographic research, and a method I adopted in more formalised field environments, such as meetings with the *rais* or senior *agronoms*. Rubin and Rubin (1995) note that both methods are from the same family of ethnographic methods but differ slightly in their approach. Whilst similar to unstructured interviews, the structured approach systematically asks each informant the same (or thematically similar) set of questions (Barnard et al., 1986: 385). This makes the process of coding and analysing responses much easier, as each interview deals with qualitatively similar data. I made extensive use of this method in researching ZEF as an organisation, where a small 'N' sample size and the sensitivity of the research meant that precise and comparable data was required. Also, given that I was able to conduct these interviews in my native language, the use of more precise questions was possible where it may not have been when working in Russian or

in Uzbek through an interpreter. The structured approach was particularly useful for assessing agricultural and economic activities that were more or less standard across the sample population, for instance livestock health (Bernard et al., 1986: 385). This enabled me to develop an understanding of cultural norms for certain behaviour, such as the normal method of planting tomatoes for domestic consumption, sourcing seeds etc. This norm is interesting in its own right, as well as enabling further analysis for variations from these norms. Such 'deviant case analysis' was often instructive in discovering which are the critical cultural aspects of a 'normal' activity and implications for when these cultural norms are not met, leading to a deviant case (McEwen, 1963: 157).

Structured interviews were also very useful in clarifying specific queries that I had built up after a series of unstructured interviews. Whilst theoretical clarification is possible in the unstructured interview, at times it was useful to take a more methodical approach to data gathering. In cases where the interviewee was (or considered themselves to be) important then the structured approach made more efficient use of time, and served to reinforce my role as 'serious' in my work and that I was taking them 'seriously'. My interviews with project partners and scientists at Tashkent institutes made extensive use of this. To this end I occasionally used a Dictaphone, both to ensure a more thorough recording of the interview, and also for its utility as a prop. In one case the interviewee declined to use the Dictaphone, which became understandable when he made a number of overtly critical and political comments, which we did not want to be recorded saying. In this research, especially in dealing with the knowledge governors, it was vital that I appeared 'serious', part of this was having well ordered sets of questions available for senior knowledge governors, yet my preference was and remains for the less formal method of enquiry, as they allow much greater latitude for unexpected and unsolicited responses. It is exactly these responses that were useful, especially in the formative stages of my field research. So, in the first three months I conducted fifty four (semi)structured interviews, compared to the final three months where this number was down to twenty one (in total I conducted over one hundred). Whereas in Tashkent, meeting with local partners and discussing both project knowledge sharing and knowledge governance, I conducted 24 interviews, almost all by Dictaphone.

iii. Direct Observation

A rather less obtrusive manner of conducting field research is that of direct observation which I also employed. The ideal situation is of an omnipresent 'fly on the wall' who "describes without omission or distortion all the environmental conditions of a particular field site, all the behaviour of the people there, and all their utterances" (Bernard et al., 1986: 388). This is unrealistic, not least because of the impact that a strange looking foreigner would have on the people concerned. Not to mention some serious ethical concerns about self-determinism. It was however possible for me as an ethnographer to observe what occurred around me, including the rich diversity of social interactions and forms of cultural transmission that occurred, as unspoken as these are in all societies. In the instances where I used direct observation, such as with participating in building new houses, I was joining a group of men who I already knew well and related to, if not as equals, but in an equitable fashion. Regardless of the personal closeness of the observed group, I would argue that direct observation necessitates the taking of precise notes. Ideally these notes should be made either during or immediately after the observation session, in my case it was almost always the latter. Perhaps the best comment on the importance of excellent and detailed field notes comes from over a century ago, with the genesis of British anthropology:

> "In taking notes the explorer may be recommended not to be afraid of tedious minuteness, whereas the lively superficiality of popular books of travel makes them worthless for anthropology" (Tylor, 1889: 392).

There are also other considerations to be taken into account when conducting a direct observation, such as the subjectivity of the respondents. As mentioned earlier in this section, individuals tend to act differently when they know they are being observed. A partial solution to this is to spend enough time in the community so that one's presence is as least obtrusive as possible, a strategy I employed by living in the local community and only observing those individuals whom I already had relationships with. However, any ethnographer must always remember that their presence has an impact. This includes considerations of power structures at work, as well as the impact on social structures that a foreign individual brings to any group (Manias and Street, 2001: 236). In my experience this impact gradually reduced with more time spent in the field developing

relationships and trust. So in the first three months in the kishlak I spent an average of four hours per day, five days per week conducting active observation (with a lot more passive observation and simply 'living'), whereas by the end of I was spending an average of three days per week observing in my kishlak, with more time dedicated to the ZEF project and researching knowledge governance. Whilst behaviour was always influenced by the presence of me as an outsider, a superficial façade or act was seldom maintained in the long run. This also entailed me accepting certain limitations on what I could and could not observe a strategy of observation determined by the local culture, the subject matter and the particular attributes of the individual researcher (Clancey, 2001).

The strategy adopted in my research was to become a participating observer of the peasant knowledge system, trying as closely as possible to integrate into the work at hand. This was of course always imperfect, my lack of Uzbek language and obvious strangeness of appearance militated against full assimilation. Yet I still found observation a vastly rewarding source of data, especially for understanding the cultural embeddedness of knowledge in the indigenous system. One of the better examples being my participation in the *khashar* (voluntary work) to build a wall for the new cemetery in my village, as well as assisting in building a mud house for the son of a key informant (Field notes; 14 April, 2005; 17 May, 2005). My strategy for observation within the ZEF project was different again, especially given my position *within* ZEF as a knowledge community. Here I collected public (although specifically not private) emails, took notes in staff meetings and recorded discussions. Yet I made a deliberate decision not to 'spy' and avoided noting private or personal conversations. In short, if a person within ZEF was being observed, they knew about it. This meant that I was unable to use some rich data in writing this thesis; however it ensured that I felt part of the team and that people felt they were able to relate to me, without a fear of being 'spied' upon.

iv. Use of Archival/Documentary Data

Archival and documentary data played an important role in verifying informant based information. In discussing archival and documentary data I mean to include all forms of

written and recorded materials that have not been written by the ethnographer (Bernard et al., 1986: 390). This included contemporary sources such as newspapers, subject specific sources (for instance academic articles published within Uzbekistan), as well as more traditional archives, which provided an historical account of social phenomena. For instance the newspaper archives of Khorezm, especially 'The Truth of Khorezm' were studied, coded and their texts analysed, in order to understand the historical process of policy formation and implementation (c.f. Kaskutas et al., 2000: 330). It was also possible to glean quantitative data from archives and contemporaneous sources, to investigate official levels of agricultural production for instance. In total I selected 104 articles and archives for full translation, coding and analysis. Because archives and documentary sources in Uzbekistan have traditionally reflected 'the party line' (and still do) a high degree of data checking is necessary. Archives and my reading of them were 'triangulated' with extant literature and informant accounts (cf. Hirabayashi, 1998: 168). Given that I undertook a lot of subjective analysis and coding it is became important that my interpretations were reflected on, to ensure that they matched the evidence and are provided a fair reflection of the archives, not a selective account (Fabian, 2002: 779). I include in archival materials all emails that were sent within the project, as part of a public or group listing. Many of these were stored and coded also, however at no stage were private emails or written communications entered into the data set.

Permission to access the archives of Khorezm was a relatively slow process as permission needed to come from the *Hokim's* office in Urgench. For a variety of reasons this permission was slow in arriving, although it was emphasised by my local contacts that this was not a sign of unwillingness to grant the permission, rather that my request was a low priority issue in a bureaucracy with no shortage of papers to sign. Once permission was granted it became possible to access all prior copies of the Truth in Khorezm, as well as selected other journals going back to 1946. Other, more sensitive archives such as governmental correspondence are centrally held in Tashkent and remain largely inaccessible. Thus my archival sources are more limited than I might otherwise wish, yet these public sources do provide an eloquent account of the 'official line'. However they tell us little about the machinations behind the scenes.

v. Sociological Survey

In May – June 2005 I conducted a sociological survey of Khorezm, in order to collect some corroborating quantitative data on the rural household. The aim of this exercise was to triangulate my preliminary qualitative findings as well as to see if, in the process of conducting the survey, new avenues to enquiry existing that I had missed. From the start of the survey I made the deliberate judgement not to get involved in the data collection myself, nor to rely upon travelling survey teams as prior studies have done (c.f. Djanabekov, 2006). I believe that each of these approaches, for different reasons, prejudice the results of such survey when conducted in Uzbekistan. Whilst involvement by a researcher is of course necessary in all research, I felt I was best to focus my efforts on nuanced qualitative data rather than risk influencing quantitative data collection. One big risk of becoming involved as a foreigner is that a large sample (with which the researcher cannot possibly have personal connections) is subject to a bias towards providing the answers that the respondent thinks are desired, or will cover up embarrassing aspects that people would rather foreign visitors were not aware of. This bias is accentuated by the prominent role of the 'guest' in Uzbek and Khorezmian culture. Secondly the choice taken in some prior studies has been to employ a team of local 'roving researchers' who travel in UN number plated cars and interrogate farmers. Whilst this enables a high sample size to be gained, I believe that the veracity of these results must be questioned. Precisely because agriculture is such a political subject and because many coping strategies are ostensibly illegal, farmers are unlikely to provide honest data to a stranger. I believe that respondents are even less likely to respond honestly to young – urban – students of economics, dressed in suits, enjoying the prestige of being chauffeured in a UN car and interrogating them in a superior fashion[vii]. This may be an isolated occurrence, but it does highlight the importance of conducting research in an appropriate (and ethical) manner, which indeed is the case of most of the research that I observed in the project.

[vii] I have this both from my own observations, conducted during my Masters study in 2004 and from a chance encounter with a family who were interviewed by these individuals and, subsequently were reticent to be interviewed by anyone associated with the project.

In order to try and avoid the risks discussed above I decided to employ three survey assistants, all recent graduates from UrDU, who lived in kishlaks. The hope being that these students, because they were known trusted and recognised within their own villages, could gather more accurate data. Once selected, the students were then tasked with surveying 160 respondents (8 per day) within their own kishlak. The size of the sample kishlaks ranged from 600 – 1,657 households or approximately 3,500 – 10,000 persons). In the end I had 467 valid responses from 480 households, representing just over 5% of the sample villages.

The group was trained in survey methods, especially on household definitions and introduced to the survey form, which they were asked to complete for fifteen households each as a test study. The results from these first trials, combined with oral feedback from the surveyors, were integrated into a revised survey sheet (Appendix A). Then further training was provided, both by myself and by Dr. Peter Mollinga, in the importance of survey methods and proper sampling procedures. Through discussion with the surveyors and from their experiences in conducting the test survey, it was decided to adopt systematic sampling of the village, where every N^{th} house on every street was to be sampled. In the case of the two larger kishlaks, 'Uzbekistan' and 'Istiqhol' (1657 and 1349 households respectively) this meant every 10^{th} household, whereas in the one smaller kishlak (circa 600 households[viii]) every 4^{th} household was sampled. One of the problems often raised in conducting a household survey is the definition of a 'household'. For example Kandiyoti (1999) critiques the concept of a household in her article 'How to Get it Wrong in Rural Uzbekistan: An Ethnographic Critique of Household Survey Categories' discussing how contested definitions of the household in rural Uzbekistan can at times complicate survey data. In a large part these definitional problems and conceptual disjunctures relate to paid employment - an issue which was not the focus of this survey. However other problems did arise with the definition of households. For example the following cases:

[viii] No census data was available for Chanyrkat kishlak, possibly because it is a smaller kishlak.

- A widow / divorced woman lived in her old family home. She (and her children) eat from the same one pot as the family, they live under one roof and pool their finances. Yet this woman and her children are considered in Khorezm to be a separate household.
- Three 'households' were registered as being separate households in order to get a tamorka. Yet they consider themselves to be one household, they fulfil the main criteria of being a household and have no plans to split up their household unit – except for bureaucratic reasons.
- Two households lived together and wanted to become separate households. But village authorities could not or would not grant them new land on which to build a new house and establish separate a separate tamorka. Thus they remained a single household.
- One old retired woman lived in her own home with no family. Because she needed someone to take care of her and had no relatives to do so, her neighbour provided one son to look after her. It was agreed in advance that this son would then inherit any property left behind after her death. Both in the village and for the survey the woman and her 'adopted' son was treated as one household and the neighbour another.

Despite these problems with defining a household, the sociological survey was able to gain a response rate of 95%, with 457 households agreeing to participate out of 480 being asked to do so. I suspect that this high response rate owes a great deal to the decision to hire surveyors to work in their own kishlak, where they are known and the suspicion factor is lower. That said I doubt that the survey fully covered some of the more sensitive aspects of household economies, for instance the figure for the percentage of households that have members working outside of Uzbekistan[ix]. However I believe that the lesson of using local surveyors to question people within their own kishlak, remains valid.

vii. Using a Research Assistant

I employed the help of a number of different staff in varying roles during this research. For instance I attempted to use translators much less as basic interpreters of the language, but more as cultural guides/interpreters and as research assistants who were able to access information that I was unable to see. Some staff responded well to this opportunity, some lacked the capacity or skills to do so; either way I think it was a useful process from a research and capacity building perspective. It should be noted that local capacity in Khorezm is severely limited; those with opportunities outside of Khorezm take these opportunities and travel to Tashkent or abroad. This lack of local capacity is one of the areas in which the project can and does contribute significantly to the Khorezm region.

[ix] 16% seems low from my qualitative cross checking and experiences within my own kishlak

Aside from the sociological survey discussed above I also encouraged one student to conduct research on my behalf into the indigenous knowledge of cow health and livestock rearing in general. This was achieved by placing the student in a training course organised by GAA and conducted in September 2005. After two weeks training, I spent one week working with the student on research methods and theories, developing together a set of questions and survey form for use. For three weeks while I was in Tashkent conducting my formal interviews with partners there, the student then conducted this research by himself, recording results in an agreed format and writing down his observations and findings. There were certainly some problems with this method, not least because of the low level of training in social sciences that persists throughout Uzbekistan, yet despite these challenges I found it a rewarding and useful research method. Yet on reflection the training period was far too short to achieve either excellent research outputs or real capacity building and the specific individual concerned was far from ideal. In the abstract, using research assistants certainly bears consideration for future studies, as an effective method to both build capacity and to gain insight into respondent answers that are different from those provided to a foreigner. Judiciously used, I would recommend this approach to other researchers in Uzbekistan.

V. ANALYTICAL TOOLS EMPLOYED

1. Validation / Triangulation

Because of the inter-subjectivity of researcher and respondents in my thesis, it was vital that all data was validated or triangulated. These two terms mean roughly the same thing, which is that data must be checked against other data and critically examined. The term triangulation is taken from navigation, where readings are taken off of three known points of reference, and then a 'triangle' is established on the map, inside which the alpinist or sailor knows they are. Thus it is not a precise reading, but an indication that they are within a known area. This is a fair analogy for ethnography, where by using multiple data sources (hopefully at least two, preferably more) it is possible to determine a realm in which the 'truth' resides. To continue the metaphor, the quality and proximity of the 'readings' in navigation affect the certainty and size of the triangle, with more precise and proximate readings leading to a more specific position. Likewise the proximity of the ethnographer to their informants and sources, as well as the accuracy of these data will affect the certainty of the research. To ensure the highest level of validation and triangulation, I adopted the strategy of cross referencing and checking each research finding with at least one other source, preferably more. In practice this meant going through my field notes from an interview, or through my archival or sociological survey data, and checking if the point being made was backed up, or contradicted, by other findings. In cases where it was not, then I devised strategies for cross checking the data. This often took the form of raising the issue in a subsequent interview, checking with some of my key informants in an informal manner, or seeking possible solutions in the literature. In each case this was then referenced back to the original finding and conclusions drawn. In an ideal case each research finding would be constantly checked, triangulated and reflected upon. However the realities of field research meant that an infinite process of reiteration was not possible. What was reasonable however was to ensure that each research finding was triangulated with at least one other source.

2. Deviant Case Analysis

Deviant case analysis is a powerful tool of heuristic investigation. Aside from helping to sort the meaningful from the meaningless relations, extreme or deviant case analysis can be used to achieve theoretical saturation, helping to understand not only *what* is occurring but crucially *why* it is occurring (Hignett, 2003: 882).

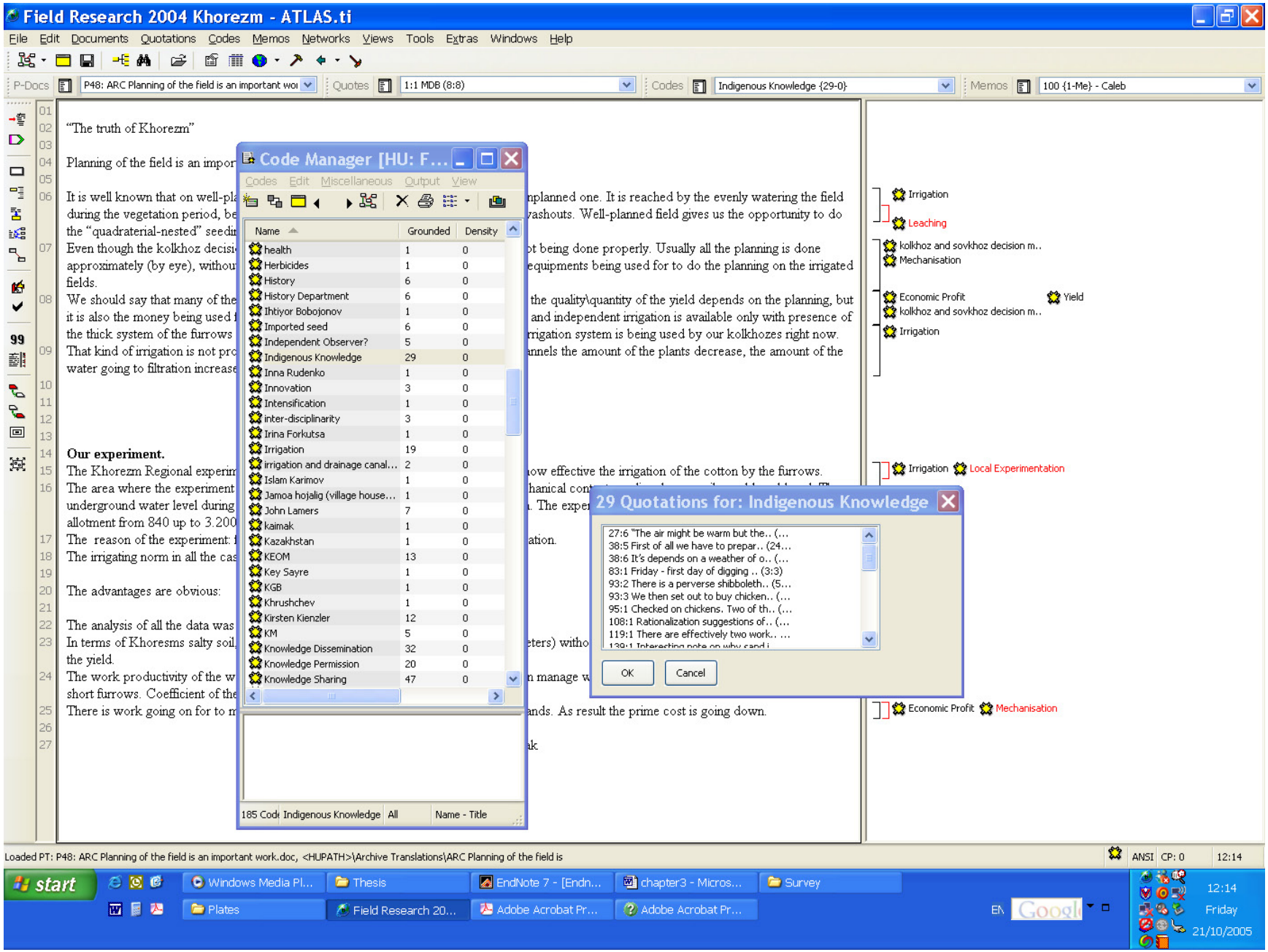
> "By selecting a situation, a group, or some occurrence that deviates from an expected pattern, it may be possible to detect the really important relations, which in the expected cases are so difficult to sort out from the mass of trivial phenomena" (McEwen, 1963: 157).

I used deviant cases as a way of seeking to understand why some phenomena occurred and did not occur. Perhaps most useful was the study of ethnic Koreans and Russians, whose modes of farming are very different from Uzbek modes (e.g. more pork production) and the layout of their gardens is very different, yet there are also considerable similarities which were useful for comparison.

3. Coding Procedures

In order to best manage the significant hermeneutic data built up from archival, interview and observational sources, I used an electronic database, 'Atlas.ti'. Built into this programme is the ability to store, sort and code primary documents. These can then be searched as well as coded for certain attributes. Figure five (p.93) provides a screen shot of one such primary document. On the left is the document itself, in this case a translation of an article from the 'Truth in Khorezm'. Laid on top if this is the 'code manager' that stores all the codings, showing how frequently they occur and where. The small box to the right of this, the quotation manager, shows the available quotations for the selected code, in this case 'indigenous knowledge'. On the right hand pane the 1st, 2nd and 3rd level codings of the text appear. I used the same coding system for all primary documents, regardless of whether they were interviews, archival or field note data. In general I attempted to code on a daily basis, to ensure that I was not missing any important aspects of the knowledge system. Also with time, as new issues arose, I was then able to return to older documents and add codes & concepts that I had previously missed.

Figure 5: Screen shot of Atlas.ti - Coding procedures



VI. SUMMARY OF METHODS USED

What I have attempted to set out in this chapter is an account of what I did in Khorezm, how and why. The serious academic questions raised on inter-subjectivity and reflexivity were considered prior to my research, and I believe that having them as a background was useful preparation. Likewise an awareness of ethical considerations should, I believe contribute to, not constrain, research. I utilised these ethical principals in this manner, as tools to guide my behaviour in a way in which I was comfortable. Whereas the coding procedures and methods of cross checking were developed during the research period, in a way to suit my evolving research needs. In a sense this is how I perceive methodology, as a suite of tools that are developed and re-designed to suit the needs of the researcher in the field. Yet I would be wrong to assume that I was 'part' of the community. I was not, nor ever could be, yet I did have friend there and learnt a great deal. In explaining this, I am constantly impressed with the honesty of Sir Wilfred Thesiger:

> "I was happy in the company of these men who had chosen to <spend time> with me. I felt affection for them personally, and sympathy with their way of life. But though the easy quality of our relationship satisfied me, I did not delude myself that I could be one of them. They were Bedu and I was not; they were Muslims and I was a Christian. Nevertheless, I was their companion … a bond between host and guest" (Thesiger, 2003: 119).

I present in the following three chapters the findings of my year spent in Khorezm meeting people and becoming part of the local community. Whilst the methods differ in formality between the three groups, the approach is always focused on gaining as accurate as possible understanding of rural knowledge from the perspective of the informant group. Certainly the methods which I employed to this end were modified during the research period. I made much less use of formal interviews than I had initially envisaged, using instead informal interviews and impromptu methods such as tending an *argorod*. I would not however propose that these methods are necessarily the best for Khorezm, rather the point I have tried to make in this chapter is that methods must be adopted and adapted as required to suit the specific needs of the researcher. I have presented my experiences and reflected on these, as a way of allowing the reader to understand how I arrived at the results of the following three chapters.

CHAPTER 4
LOCAL KNOWLEDGE SYSTEMS

The indigenous or local knowledge system of Khorezm is defined by several key characteristics. Each of these is discussed in this chapter with particular reference to case studies and real examples from my field work. The first of these phenomena is the prevalence of 'Masters' as specialised actors within the knowledge system. These 'masters' are socially determined experts who hold a special place within the agricultural knowledge system, they are consulted for advice and often possess political or economic power on the basis of their knowledge. Whilst specialisation is inherent in any knowledge system, I show here how this characteristic of the knowledge system is embedded in the patriarchal and hierarchal nature of Khorezmi culture, and the position of power that this entails. Secondly, I examine the modes of knowledge reproduction within Khorezm and find these to be overwhelmingly family based, even in cases where formal education is necessary, although there are examples of external forms of knowledge being accessed and then reproduced within the knowledge system. I then look at the extended case study of cotton and wheat production, where indigenous knowledge is at an interface with formal knowledge, knowledge governors and university based experts. I find here that knowledge is transferred from the top down, with little exchange of ideas or knowledge from the farmers upwards. Fourthly is the issue of 'knowledge loss', which seems to be a striking aspect of the post-Communist indigenous knowledge system in Khorezm. I cite numerous case studies of where knowledge is decreasing, leading to a 'growth of ignorance' in absolute terms. Finally I discuss the unitary nature of 'collective knowledge' and demonstrate how this knowledge is shared and reproduced 'horizontally' within the indigenous knowledge system. Each of these characteristics is then incorporated into a model of indigenous knowledge, which attempts to describe how the *system* of knowledge operates at the indigenous level.

I. THE MASTER

A large amount of agricultural knowledge in Khorezm is highly specialised in nature. This manifests itself in the Masters. This is not a highly formalised arrangement of craftsmen's guilds, rather it is an informal and socially defined structure of masters, who act as centralised repositories of specialised knowledge. Their knowledge is not collective as that discussed in section IV. Rather, the distinguishing factor of the knowledge of the Master is its specialised nature and the fact that this knowledge is specifically held by one individual, the 'Master'[i]. This knowledge can be accessed in various ways, depending upon the type of specialised knowledge employed. The knowledge involved in producing a certain product or in delivering a certain service, is much more easily traded and paid for. Whereas it is culturally considered that 'advice' should be a non-market good, at least in terms of direct financial payment, I suggest that social capital (cf. Bourdieu, 1985; Menkhoff et al., 2006) can be amassed by trading advice on the market place of ideas. Whilst specialisation is a feature of almost all societies and economies, I argue that the form that it takes in Uzbekistan is the result of culturally embedded practices and beliefs regarding authority. In some cases the specialisation of the Master is culturally or socially defined, or has its origins in Soviet epoch labour organisation. Likewise, university or technical qualifications instantly classify someone as a specific type of expert (знаток), which holds a privileged place as a qualified master. In some instances also, political and administrative post gives an individual *ex officio* specialisation and the ability to act as a master[ii]. Each of these masters is well defined in their social position and 'expert' knowledge is well respected. However, this expertise must be practically grounded in order for the expert's knowledge to gain currency, remote and unapplied knowledge of the 'outsider' is not well received by the rural community.

[i] See Evers & Menkhoff (2005) for a detailed discussion of the role of experts and consultants in 'knowledge economies' as a very different form of specialisation.

[ii] There is perhaps also an aspect here of rational-legal authority (cf. Weber, 1922) derived from the post that the individual holds. This is relevant for the discussion of power and knowledge in chapter eight.

I analyse the role of the master by examining three issues of: the type of specialised knowledge and their social origins, the modes of knowledge dissemination, and the necessity for this knowledge to be acceptable to the rural community. As we see in the series of following case studies the master holds specialised knowledge and his position, and knowledge, is at the centre of the indigenous knowledge system of rural Khorezm.

1. Types of Specialisation and their Social Origins

A master or an expert may specialise in any field of agricultural activity. This specialisation is contingent upon their amassing superior knowledge of one, or perhaps more, spheres of rural life, where the basic level of collective knowledge is insufficient. The level of qualifications required to attain 'mastership' vary depending upon the type of specialisation. This can range from a 'master' electrician who can learn their trade in an informal manner and then make a living by performing contract labour. Similarly, some specialisation, as we will see with pig production, is more culturally defined, or may involve gendered definitions of work. The agronomist (агроном) represents a mid-point in the master-expert continuum, as both educated yet practically grounded. Agronomists are university educated and possess specialised knowledge in a wide range of agricultural activities. Both historically and today agronomists possess considerable power within the political structure and have, as a class, benefited greatly from the land reform process (Trevisani, 2006a). Specialisation to the point of being an 'expert' requires advanced study, as well as pre-eminence within the community; an excellent example is the veterinary surgeon or doctor, of which there is typically only one in a kishlak. Here I wish to analyse several case studies of various masters and experts, analysing both their knowledge sharing function as well as their social origins. It is worthwhile noting that the lexical source of 'master' is not my own. Rather it is simply a literal translation of the Russian and Uzbek words in common use in Khorezm[iii]. In interviews, discussions at the bazaar and popular writings there is frequent reference to

[iii] Literally 'master', мастер in both Russian and Uzbek, also хозяин, of 'hazayan' (Russian) which also denotes power, translatable as both 'master' and 'boss'. This has connotations of *joshuli* as discussed later in this section.

'masters'. This encompassing term is used to denote any person with specialised knowledge. For instance when I interviewed large scale sheep herders in Khorezm and asked them what they do with their wool, the response was "we give it to a master to process" (Interview, 13 May, 2005). As we will see below in 'Soviet labour organisation' this lexical meaning has its roots, at least partially, in the system of specialisation favoured by the Soviet Union. It is thus in some ways ironic that the adoption of Taylorism (the scientific management principles of Taylor) in the Soviet Union led to a similar process of de-skilling as that described by Braverman in his study of 'Labor and Monopoly Capital' (1974).

i. The Master and their training

Mastership in Khorezm denotes an advanced state of practical knowledge, the possession of a certain skill or expertise, but this knowledge must be applied in order to be valued. This applied knowledge comes from a background of training and experience. Whilst there are no formalised apprenticeships, masters gain their credentials through a combination of practice, reputation and qualifications, both formal and informal. The case studies of the village veterinarian and of a local rice miller provide contrasting examples of two masters. Both of these men work in my primary field site, Khorezm *shirkat*, yet display very different sources of training. In between these two contrasting examples, the wide range of masters operates, each displaying different levels of formal training versus experiential knowledge.

Case Study: Village Veterinarian

Having identified veterinarians are important 'experts' in the rural economy, I interviewed the veterinarian in three kishlaks, as part of a case study of the role of these experts in the knowledge system. These interviews were compared with informal discussions with farmers, especially livestock farmers, as well as my own observations and cross-checking (for instance with experts in the project). What I found, as explained below is that veterinarians are amongst the most formally trained of the masters in the rural society of Khorezm. Strongly promoted during the Soviet period, the veterinary

sciences were seen as an applied science that contributed to rural livelihoods (Akhunova et al., 1984: 9-10). The training of a veterinarian requires five years of study at a university or scientific institute, incorporating practical and theoretical training as well as conducting dissertation research for six months (Bahtiyor, 17 August, 2005). This level of education is unique in rural Uzbekistan, with the only possible exception of local doctors. However, most advanced human medical care facilities are based in rayon capitals whereas veterinary services are centred in the kishlaks. Within the local community veterinarians are well-respected individuals, vital for ensuring animal health and referred to precisely because of their mastership and education. Interestingly enough my own observations are that they are quite poorly paid (as are most 'professionals' from the post-Soviet era) and rely heavily upon the state for their income, mostly from settlement account payments for cattle vaccinations (Field notes; Bahtiyor, 17 August, 2005). However, two different sources suggest that this payment does not always arrive on time, if at all[iv] and thus private payments of 1000-2000 sum are necessary to ensure veterinary service. This is somewhat of a reversal from the Soviet period, when state sponsored experts received superior salaries and privileges.

Alongside the formal education of a veterinarian there is an expectation of 'grounded-ness' in the rural community. Vets themselves express a commitment to rural livelihoods and recognise the importance of animal welfare in terms of the rural economy. "The cows are very important for our people … it is one of the few ways that you can make money and survive here … I am always thinking about how I can care for them, for the people" (Bahtiyor, 17 August, 2005). Similarly, the local community seems to expect that the village vet possesses some experience within the kishlak. Thus their formal education must be complemented by some practical understanding of how animal health fits within the rural system. It is, therefore, unsurprising that both veterinarians in my field site had their family roots within the kishlak in which they worked (Karamish and Sheykhvan). Yet both men were required (both were educated in the Soviet period), by law and by

[iv] This is a common complaint in rural Uzbekistan. Many teachers, pensioners and other recipients of state payments complain of late or partial payment of their salaries.

potential clients, to undertake highly formalised education outside of Khorezm (in Samarkand or Tashkent) in order to attain mastership within the community. However, post-1991 a training college has been established in Khiva, which provides (limited) veterinary training. Yet this training must be supplemented with work experience under an existing master, as a form of 'practical experience'. It is here that a mixture of the formal aspects of mastership meets with the informal requirement to be grounded in the local community. Only when both criteria are fulfilled is the veterinarian considered a master, demonstrating how their knowledge operates in a cultural context.

Case Study: Rice Milling

A rice miller, 'Gleb', operating within Khorezm demonstrates how purely informal education can act as a suitable training for mastership. In this case the master learnt about growing, weeding, harvesting and milling rice purely from his father's business activities and then later during his own work experience (Interview, 7 June, 2005). In this respect his training was purely informal as well as familial, a common combination as discussed in 'modes of knowledge reproduction' below. When asked about when he first planted rice, the interviewee replied "I cannot remember when I first grew rice, I was very young" (Interview, 7 July, 2005). He then went on to explain how he had 'grown up' growing rice with his father and considered his training in rice growing to be a function of his familial background. There is also an ethnicity aspect to this, the rice miller being of Korean origin. It was not only the core business of rice growing that he had learnt from his father, but also the associated and more profitable task of milling the rice. In this case he designed and built his own mill, based upon his experiences working with his father, who was previously in charge of a mill at the collective farm (possibly also helped by his Korean ethnicity). The master then perfected this familial learning with experiential knowledge, gleaned from his own attempts to build a rice mill.

> "my father taught me how – he used to do iron work so I also know, I learnt a lot from him – also, from experiments. For example the rice lift cannot be at more than 90 degrees – I tried a lot of times and did not work but now it does so I know that way … it used to be that this was the only mill in the region and people came from everywhere – but then some people asked me to help them make mills in other places" (Interview, 7 June, 2005).

The sorts of knowledge that are being described here by the respondent are skills; they are tacit forms of knowledge which he does not necessarily recognise as knowledge. Yet

without these skills, be they iron working or the ability to design mills; he would not be a master. It is worth noting that the master in question has been very successful at profiting from his knowledge of rice production and milling. Whilst his advice on rice growing was not something that he could charge money for, those farmers who sought his advice did have an obligation to mill their rice through his mill, thus creating a direct profit. On some fields he also took a more active management role, where his knowledge input assumed considerable value. An indicative arrangement for this was given as:

> "The field belongs to another man and we are in a 50/50 partnership. The owner, a fermer, provides the land. I <the master> give the seeds. The financial inputs are split 50/50. I provide all the knowledge, and for this get 50% of the product" (Interview, 7 June, 2005).

The knowledge he is referring to here is difficult to define, as it consists of managing the rice growing process, both agronomically as well as politically (i.e. accessing water). There is also a management function that the master was providing, supervising work in the paddies and enlisting labour, all of which was associated with his knowledge of rice and his status as a master.

Most profitably the rice master was able to provide drawings and advice for other businessmen wanting to build private rice mills. The knowledge that was transferred was drawings and design skills which have a direct value, unlike advice which he describes as having marginal value. "Without me they cannot build a mill, they need my drawings and advice and supply, but people can still grow rice without me" (Interview, 7 July, 2005). Thus the master was able to create a livelihood from the knowledge that he had learnt and perfected in an entirely informal manner. Notably, the more advanced the knowledge was, the more essential the master became, and the more money he was able to charge for access to his knowledge. The rice miller is a very good example of a 'knowledge worker' (cf. Stehr, 1994) or an expert consultant (cf. Evers & Menkhoff, 2005), albeit an informal one. This shows us how knowledge is in effect being valued within the rural economy as a skill which can produce income. It is a factor of production and is valued as such by the rural economy, which pays for the knowledge embodied in the skills of a master.

ii. Soviet labour organisation

Several of the types of masters and opportunities for specialisation have come about as a result of Soviet era labour organisation principles. The concept of 'specialisation' was seen by the Communist party as a mechanism by which to achieve the ambition to 'catch up and overtake' (догони и перегони) the West; moreover, the impact of Moscow's policies has a defining impact on labour organisation to this day, as the power relationships which were instilled in the Soviet period (e.g. the agronomist as a technical and political actor) have been reproduced in latter day Khorezm. I discuss two examples of the type of specialised and applied tasks of the Soviet era. The first is an historical account of the role of agronomists in the rural USSR, the second a case study of the specialisation of roles at Machine Tractor Parks (MTP).

It is useful to note at this point that the concept of specialised knowledge as a rationalising instrument in development is neither new, nor unique to the Soviet system. For instance Weber discusses *Herrschaft kraft Wissen*[v] in terms of the "efficiency and power of specialised knowledge derived from a thoroughly old-Prussian conception of the efficacy of the military and civil service apparatus" (Stehr, 1994: 172). In the case of the Soviet system, the move towards 'Taylorism' (scientific management) and 'Fordism' (specialised production, adapted to agriculture) was also part of an attempt by the state to increase control over the labour process. Informed by Marx's writings on the importance of the labour process, the party adopted organisational management principals that increased top down control and made individuals responsible for achieving certain targets and objectives. This convergence of practical tasks and political objectives was very clear in the case of agricultural production, as the agronomist example below shows us. Reflecting on this process from a theoretical perspective we can see how the use of direct control over the labour process was used to create an (in)direct form of control over the knowledge system. I am influenced in this opinion by the work of Anne Lacroix (1981) on the subordination of agricultural labour, as a means of understanding how de-skilling

[v] Translatable as "bureaucratic administration means fundamentally the exercise of control on the basis of knowledge" (Stehr, 1994: 172)

of labour results from the specialisation of labour into mechanised industries, such as that which the Taylor inspired Soviet authorities attempted to create in Uzbekistan. What this specialisation creates, from a knowledge perspective, is an increase in the power of those determining what knowledge is to be specialised and what knowledge is to be pursued. Those in possession of 'expert' knowledge thus gain legitimacy and power from this knowledge, and this very expertise (knowledge) is used to extend power relationships, both for the direct possessor of the knowledge (the expert) and for the 'authoriser' of the knowledge, in this case the government which establishes and reinforces these experts, as we see in the case of the Soviet agronomist.

Case Study: The Soviet Agronomist

In order to understand the current status of the agronomist in rural Khorezm, it is useful to first look at the Soviet history that shapes and defines the cultural context in which present day agronomists work. Perhaps no other specialisation in the Soviet countryside held such political sway and opportunity for advancement as the post of Agronomist. Agronomists acted as implementers of state agrarian policies whilst at the same time playing an important role in local politics, as the technocrats tasked with allocating production targets at the field level. To understand the primacy of the Soviet 'agronom' we need to look at their introduction into the Soviet system of agricultural extension. In the period immediately following the First World War, Soviet administrators searched European history for an example of a country recovering from serious backwardness in the countryside, exacerbated by a catastrophic war and series of crop failure. They found the example of Germany;

> "the most catastrophic European conflagration before the Great war, the Thirty Years War (1613 – 1648) <which> reduced the population of German states by 40 percent and caused untold losses in agricultural land, livestock and commerce … the heroes who would pull the rural economy from the abyss were agronomists practicing their new science in the German countryside. With their help German agriculture was transformed. The disappearance of famine in the German states (and in most of Europe) was coterminous with the appearance and application of the agronomic sciences" (Heinzen, 2004: 64).

In light of the series of devastating crop failures, the destruction of WWI followed by the Russian Civil War, as well as the interminable ambition and optimism of the Bolsheviks, the German example was beguiling. It became official policy to place agronomists at the centre of farmer education and training programmes, as well as investing considerable

local decision making autonomy in their hands[vi]. For instance we see in the archives that cotton seed selection was to be conducted by the agronomist, with fiscal and other awards for superior results. At the same time the *agronom* was tasked with improving the level of farmer education in cotton seed selection (Truth in Khorezm, 22 August, 1959). This was reinforced by dictates from Moscow that emphasised the role that agronomists played in 'increasing the country's internal resources in very concrete ways' and 'strengthening the country's international position' (Heinzen, 2004: 142-143). What we do see from the available primary archives and interviews in Khorezm is a gradual expansion of the agronomist's responsibilities, encompassing decisions such as allocations of the state plan for cotton and wheat to certain farms (Halullo, 4 March, 2005; Truth in Khorezm, 22 August, 1959). With the reduction in state expenditure on research institutes that accompanied glasnost, perestroika, and accelerated post-1991, the importance of agronomists has, if anything increased (Morgunov and Zuidema, 2001). Nowadays agronomists also fulfil state functions in addition to their personal mastership, which is discussed below under 'ex officio masters'.

Case Study: Specialised Roles at the MTP

Machine Tractor Parks (MTPs) were pivotal in the socialist attempts at the mechanisation of agriculture. As a central depository of machinery and skilled operators, the MTP was established, especially in the post-WWII period, as the mechanical foundation for modern Soviet agriculture (Truth in Khorezm, 27 September, 1957). This mechanisation drive, with the collective MTP as its engine, is discussed in chapter five. Of interest here is the degree of specialisation within the MTP, especially the extent to which job titles are defining aspects of an individuals' career. The archives are rich with examples where specialisation was promoted as a sign of an advanced Socialist economy. For example 'The Working Class of Uzbekistan Along With the Scientific Technical Revolution' (Ahunova et al., 1984) is more or less an exposition of the benefits of specialised labour, with quotes from Lenin and examples of 'Soviet competition' at work.

[vi] Whilst 'charismatic leadership' (cf. Weber, 1922) was no doubt important for these agronomists to establish their local power base, their power was largely derived from their expertise and agrarian knowledge. Thus their power was inherently linked with their knowledge and vice versa.

To test the extent to which Soviet era labour organisation continued in 2005, my research at two different MTPs within Khorezm identified that jobs at MTPs are specialised and demonstrate an internal hierarchy that favours the master[vii]. The drivers of various machines are specialised and command respect as 'masters'. For instance tractor drivers[viii], excavator driver, combine drivers and drivers of mechanical cotton pickers all hold their position as the 'driver' of a certain piece of equipment (Interview, 20 April, 2005). These drivers not only drive their designated piece of machinery, they are also responsible for the repairs and maintenance on the machinery, ensuring that it is in working order (Interview, 31 May, 2005). Thus a 'tractorist' or 'excavatist' is not only a driver but also an informal mechanic. It is however important to note that an individual is a master of only one type of equipment. For example Ishmael, interviewed on 11 May, 2005 was the first person to learn how to operate a new excavator that arrived in the MTP in 1981 and had been the one and only 'excavatist' in the MTP since then. Likewise, Bazaarbey first learnt how to drive a combine harvester in 1983, learning from his father who was also a 'combinist' (Interview, 31 May, 2005). During that time he drove two different combines, the first for eleven years before it was scrapped and the second until 2005, during which time he had also trained his son in driving and repairing the combine. What is notable from these examples is that the Soviet model of labour organisation within the MTP is resilient in post-1991 Khorezm. As with many aspects of the Soviet system, it has been 'localised' and adopted/adapted by the people of Khorezm. Thus it forms what is now the cultural context in which the labour process operates, and as we see below these culturally defined tasks are apparent in Khorezm.

[vii] This is of course unsurprising; however it fits into the cultural context of *joshuli* which is explained later in this section. They are masters because of their knowledge, but this mastership also gives them authority. The key theme is the level of specialisation and viewing this in its historical and current cultural context.

[viii] Literally 'tractoristi' тракторист in Russian, taktorchi in Uzbek. Excavator drivers are Excavatortsik, экскаваторщик in Russian, excavatorchi in Uzbek and Combine drivers are Combainyor, комбайнёр in Russian, kombaynchi in Uzbek.

iii. Cultural tasks

Some areas of specialisation in agriculture are favoured by, but not limited to, certain cultural groups. For instance the milking of cows is almost always done by women and there are cultural injunctions against men milking cows under most circumstances. The culturally defined specialisations I find most interesting in terms of indigenous agricultural knowledge is that of Korean pig production and of the gendered division of labour for producing silk. Both of these examples, whilst not absolute (some non-Koreans produce pork, some men work with silk worms), serve to illustrate how mastership can be culturally defined or delineated. This is not simply to say that this knowledge is based upon the culture, rather that the culture of Khorezm, and sub-cultures, defines to an extent who possesses which forms of knowledge. Hence the Korean specialisation is situated (cf. Haraway, 1991) within the culture of Khorezm.

Case Study: Korean Pig Production

> "I know how to keep pigs because my family always had pigs, when I was growing up we had them. We are Koreans, it is what we do" (Reisa, 19 May, 2005)

There is a noticeable Korean population in Khorezm, especially in the main urban centre Urgench, in the northern Kolkhoz 'Communism' in the Gurlen district, as well as scattered in different regions. Moved to Uzbekistan from Korea during the Stalinist period, ostensibly to teach the locals how to grow rice, but also to meet certain ideas of 'managing' culture with the USSR, the Korean population of Khorezm are visibly active in certain areas of economic production. For instance the spiced carrot and egg-plant salads for sale in the bazaars and restaurants of Khorezm are labelled 'Korean salad' and sold almost exclusively by Korean women. For agricultural knowledge the most interesting example is the agricultural specialisation in the production of pig meat. Whilst pig production and consumption is only a small aspect of total livestock production in Khorezm[ix], it serves as an illuminating insight into culturally defined specialisation.

[ix] In my survey, only 0.44% of respondents kept pigs – but this is more a reflection of the fact that no Koreans lives in the three villages which I surveyed – and strengthens the point about cultural specialisation.

During the Soviet period pigs were mostly kept by individuals on their private plot, as part of their domestic household, separate from the property of the *kolkhoz* or *sovkhoz*. According to contemporary accounts it was the Russian and Korean populations that kept pigs, whilst most Uzbeks followed Islam's injunctions in not producing (if occasionally eating) pig products. My survey data for 2005 confirmed that pig production remains a small activity in rural Khorezm, with only 0.44% of respondents having pigs, compared with 90.8% for cows. Whilst much of this production was previously centred on *kolkhoz* 'Communism' in Gurlen rayon, much of it has now moved into the rural environs of Urgench rayon (field notes and interviews, May 2005). This reflects changing demographics, as many Korean families have gravitated towards the urban centre. "Before, when I grew up – there were many Koreans here <in kolhoz Communism> but now not – they are all in Urgench" (Artur, 19 May 2005). Also for example *Kolkhoz* Begabat in Urgench rayon, which was once entirely Korean but in 2005 had only one remaining Korean family, signifying the degree of change in rural Khorezm.

Yet there is strong anecdotal, survey and interview evidence that the folklore of 'Koreans produce pigs' holds true. I conducted a series of interviews in an attempt to discover why there is such a degree of culturally defined specialisation in pig production. The usual answer given is simply that Uzbeks are Muslims and thus have nothing to do with swine; however this does not stand up to empirical tests. Uzbeks in Khorezm do occasionally eat pork, but this is only occasional. For instance there were no pig farmers in my entire kishlak, yet many of the Uzbeks there would eat pork were it offered. "Not very often, but when I visit my friend in Urgench we sometimes eat pork, I like the taste" (Malihat, 18 May 2005). Likewise it was emphasised to me in interviews (both with ethnic Koreans, Russians and with Uzbeks) that pig production was not purely a Korean enterprise, and certainly that the Muslim ban on consumption of pork meat is only adhered to by the most pious. Indeed in *Kolkhoz* Begabat, an Uzbek man decided to produce pigs for economic reasons, learning how to do so under the guidance of a Korean neighbour. However, I found a lot of evidence that the few Uzbeks who do raise pigs face difficulties in marketing it, not least because of a reputation that they are 'amateurs' who do not have the deep knowledge of the Koreans. This is manifest in the belief expressed

by some people that it is better to buy from Koreans because “some Uzbeks do not know how to castrate the male, so when you cook the meat it smells and tastes bad, at least that happened to my family once” (Irina, 20 May, 2005).

Also a survey at the Urgench bazaar showed that the only individuals selling processed pork products was a single Korean family, although some of the small scale butchers in Urgench (many of whom are non-Korean) also process and stock pork sausages. Interestingly, ‘Slava’ who learnt how to raise pigs by studying a specific Russian text book as we see in a later case study, was still consulted inside Yangiarik rayon as an expert, in part (so he believed) because of his ethnicity, which was Korean (Slava, 18 May, 2005). So whilst it may be possible for Uzbeks to acquire the knowledge needed to raise pigs, they might face difficulties in selling the meat. Likewise, I did talk with some Uzbeks who said that they would rather not raise pigs, because it would damage neighbourly relations, in part because of the smell as well as for the cultural scorn that might be bought to bear on them. So whilst pig production is not an exclusively Korean domain, the cultural definition of Koreans as pig producers remains strong in Khorezm. In those cases where Uzbeks did raise pigs, they learnt to do so from Koreans, suggesting that the cultural definition of Koreans as specialists in pig production remains strong, but is being diluted with time.

Case Study: Silk Worm Production

Silk worm production in rural Khorezm dates back to the Soviet period and is predominantly a household activity. Whereas the processing of the finished silk cocoons is a centralised activity, with these same central processing factories also providing ‘seeds’ or silk worm larvae to participating households, the rearing of worms in conducted within rural family units. Household level production entails a number of distinct tasks, which illustrate how there is a gendered distribution of certain knowledge related activities. Set out in the table below is a rough description of the processes involved in sericulture and the gender of the persons normally associated with that activity. I also rate the knowledge aspect involved, drawing on my own observations and

interview data. It is important to note that my interview data and observations for this case study derive mainly for an in-depth case study of one particular household. Whilst I conducted cross-checking activities and triangulated my findings, it may be mistaken to extrapolate these results as representative for Uzbekistan.

Table 1: Gendered Specialisation in Household Silk Worm Production

Task	***Gender of responsible person***	***Level / Type of Knowledge required***
Travel to factory and purchase of larvae	Male (head of household)	Negotiating / bureaucratic ability
Construction of 'beds' for silk worms	Male	Basic construction
Laying out of paper and larvae to begin raising of worms	Female (wife of head of household)	High degree of experience
Cutting mulberry trees and stripping leaves for feeding to worms	Mixed (entire family)	Low skill labour
Spreading out of worms as they develop	Female (adult women)	Medium skill labour
Managing the timing of feeding and spreading of worms	Female (wife of head of household)	High degree of experience
Feeding of silk worms 3 - 4 times daily	Female (adult women)	Medium skill labour
Preparation of dry branches for silk worms to cocoon onto	Female (adult women)	Medium skill labour
Decision on when to harvest cocoons	Female (wife of head of household)	High degree of experience
Separation of cocoons from wood and cleaning of cocoons for sale	Female (large number from kishlak) with some men from the family	Medium skill labour
Sale of cocoons back to factory	Male (head of household)	Negotiating / bureaucratic ability

What we see here is that the central role in silk worm production is held by a woman, in this case the wife of the head of household. In cross-referencing interviews I found that this role was also fulfilled by a woman, if not necessarily the wife of the head of household. Also a lot of the roles requiring some experience and knowledge are fulfilled by women from within the household (with the exception of bureaucratic negotiation), working together in somewhat of a shift situation. Especially towards the end of the production process when the worms required very frequent feeding. Similarly, the cleaning of the cocoons was a predominately female activity, albeit one that involved a

large number of women from the kishlak. The only discernable male activities were the construction of the 'beds' and the business dealings with the factory. The former is unremarkable in a conservative rural situation and the latter reflects a range of gendered roles related to business and financial transactions that are dominant in rural Uzbekistan.

Without entering into a detailed gender analysis of why these roles exist, I submit this case study as one example of how certain activities are culturally defined as female activities. In this case, we see that a woman in acting as a knowledge 'master' in many ways, however the fact that she was never once referred to as a 'master' is notable, and passing on this knowledge to other women within the household. This reflects the fact that the endogenous use of the term master is limited to men, thus strengthening the argument that mastership is an essentially culturally grounded concept. Mastership confers power and authority, through *joshuli* (discussed later) and thus women are largely excluded from becoming masters. Even in cases where their knowledge is pre-eminent, they cannot actualise this mastership. For instance, we see here how the 'important' tasks of dealing with the bureaucracy are increasingly the domain of men. Thus this is a type of specialisation which is culturally determined[x]. Thus certain boundary conditions are emerging, on what forms of knowledge a woman can possess and how this can be used, with knowledge not necessarily conferring authority due to cultural constraints. These definitions are fluid[xi] (especially between urban and rural centres) yet they are culturally determined, illustrating the primacy of cultural contexts in which knowledge operates.

[x] We can also compare this with silk looming, which occurs 24 hours a day in Margalan (Ferghana Valley), and where women work in shifts. However because of safety and religious concerns, this is an almost entirely domestic, cottage, industry – worked almost exclusively by women. Whilst men then play the role as traders within this household economy (Interview, 22 November, 2005).

[xi] Indeed, I am informed by my colleague that "In the privatisation exercise of last winter <this> family has lost the Mulberry plot to a fermer and this year they have not been raising silk worms" (Veldwisch, personal communication, August 2006)

iv. Ex Officio

Some Masters hold their position within the knowledge system due to the political or official office which they hold. These *ex officio* masters are a sub-set of actors within the greater system of masters, yet are unique in several ways. Firstly they possess the political authority of the state and often have formal or informal recourse to the coercive aspects of state power. In some cases they may also possess a certain moral authority through the trust or authority invested in their office. For instance a '*rais*' (head of a *shirkat*), leader of a brigade and agronomist (discussed at length elsewhere in this chapter) all hold political offices which afford them the political authority of the state, as well as placing them in decision making and advisory structures within agriculture (Interview, 15 November, 2005). Moreover, to fulfil their job properly these individuals must possess mastership in their own right. This first group is of greatest interest here, discussed in the case study below. There is also a second group of *ex officio* masters, which I do not discuss, these are the community authorities whose mastership is outside of the agricultural system. Massicard & Trevisani (2003) discuss at length the use of village authorities and their co-option by the state, especially through the politicisation of the *mahalla/elat* system. These offices are largely outside of the agricultural knowledge system which I examine, yet remain crucial actors, which should not be left out of a wider analysis.

Case Study: The Rais

The *Rais*, or *shirkat* manager, holds a position at the intersection of the local system of agricultural masters and of state authority and control. Coming from the local community in which they manage agricultural production and the fulfilment of the state plan, the *rais* is also on the cusp of governmental control. During the communist period of kolkhozes and the post-1991 restructuring into shirkats, the *rais* retained eminence as the individual who was ultimately responsible for agricultural production within the *kolkhoz*/*shirkat*. To fulfil this role, the *rais* is required to possess advanced agricultural knowledge (many *rais* are former agronomists whose loyalty to the regime has been proven) as well as bureaucratic knowledge and political capital (Interview, 15 November, 2005). Precisely because of the command and control system of agriculture in Uzbekistan and Khorezm,

the *rais* is also an important conduit through which new technologies, priorities or norms are passed from the state to farmers. For instance the introduction of the wheat self sufficiency goals of the state post-1991 relied heavily upon the *rais* of each *kolkhoz* (ibid.). Whilst the direct role that a *rais* plays in agricultural production may be limited (different *rais* operate in different ways, some are more 'hands on' than others) they act to enforce the supremacy of the state in agricultural affairs. This included in 2005 removing land from those farmers who had not accepted the 'advice' of the *rais* for their cotton and wheat crops which had subsequently failed to meet the state plan (Field notes, 7 March, 2005) on 'private' land. This example points on an interesting aspect of the *rais*, which is the fact that they remain as a social class, even after the 'privatisation' of agriculture and the dismantling of the shirkats.

In most rayons (where shirkats in theory no longer exist) the *rais* remains an important master, directing cotton and wheat production and holding farmers responsible for their yields, yet doing this from their new position as head of an MTP (Trevisani, 2006b). Even in one case where I found that the *rais* had not moved on to become a head of an MTP (Interview, 19 November, 2005) he remained an important pseudo-state actor, enforcing the *hokim's* authority with regard to the planning of the state crops, cotton and wheat. This reinforces the *rais*'s role at the intersection of the master and the state, having a considerable impact on the indigenous knowledge system. It is here that we begin to understand the role of specialisation and how this becomes imbedded in state control. Power exists in Khorezm not only through formal structures, but also through the enforcement of rules and norms for agricultural production.

How these norms are enforced, how discretion is applied and how this benefits certain groups over others, are all determined by the exercise of specialised knowledge. This is again an example of Foucault's (1980) understanding of how power operates in a 'capillary' manner, through social interactions linked with knowledge. It is the possession or control over this expert knowledge that enables the *rais* to both fulfil his obligations to higher political authorities, as well as to exercise this power within the community. Thus

his power comes from both rational state power (legitimated by his knowledge) and from a form of social status, accorded to him because of his official (rais) and unofficial (master) status. This expertise is crucial to maintaining and legitimating their power and in return their power enables them access to (and the ability to mediate over) new forms of knowledge. Here knowledge really is power, as the increased knowledge of the *rais* which comes through specialisations (or control over specialised *agronoms* and the like) enables him (as it invariably is) to control the labour process and manage the agricultural production process in a certain way. This takes place both through indirect mechanisms such as the ability to restrict innovation (and the control over the labour process, earlier discussed) as well as through the more direct exercise of control, through the state norm system. This occurs in the ability of the *rais* to take land away from private *fermers* if they fail to fulfil the state plan, or adopt methods which are not officially allowed, utilising both their indirect control to prevent innovation and the legal/rational authority (cf. Weber, 1922) that flows from their monopoly over 'acceptable' farming practices. Again this power only exists within the social relationships of Khorezm which allow it to exist, the strict legal power of the *rais* is somewhat more limited than that which is exercised, but it is the *Rais*'s knowledge of this legal process (guaranteed by the coercive instruments of the state, which he has access to) which enables this power over the local *fermers* and *dekhans.* This power/knowledge supremacy of the *rais* is actively reproduced within the culture of Khorezm which favours a certain form of authority and power, discussed next.

v. The Cultural Embeddedness of Masters

> "Here – no one will listen to you until you are old and a big Uzbek man. You can go away to study, come back with good ideas – but people say 'quiet and listen, learn first'. It does not matter what you know until you are one of these big old Uzbek men, you know – with the big belly. Only then do people listen to you – whether you have good ideas or not" (Young Informant, 26 August, 2005)

The common response to the discussion of masters in the Uzbek context is to say that masters or a degree of specialisation is inherent in any economy or society. I would not attempt to deny this. Indeed, specialisation and the compartmentalisation of knowledge is perhaps a defining feature of economies and cultures as they progress towards

'knowledge societies' (cf. Stehr, 1994; Evers & Menkhoff, 2005). However there are particular aspects of Uzbek culture, intertwined with the cultural delineations of knowledge and the Soviet history of specialisation, which make the masters of Khorezm worthy of study. This is the cultural concept of authority. I argue that the prevalence of the idea of '*joshuli*', a 'chief' or boss, existing within each social relationship and structure is central to Uzbek culture and identity. The phenomenon of the '*joshuli*' is closely linked with that of the master and means that the technical specialisation of certain people into certain tasks is reinforced by this cultural norm. A *joshuli* is more than just a head of the household, they are also someone to be respected and whose opinions must be listened to, because of the specific understanding of authority in Khorezm. Invariably these *joshuli* are men, with women only having certain, clearly delineated, areas in which they can be masters (and only masters over other women[xii]).

We see for instance in household structure that the male head of household is a powerful force within the household, and it is he who carries significant legal power in speaking on behalf of, and making decisions for, the household (Kandiyoti, 2002b). But it is more than this, as the status of *joshuli* also legitimates the knowledge of this individual as 'correct'. Without attempting to unravel the reasons behind this (as it would require a separate thesis) we can say that this cultural concept is legitimated in religion (Zanca, 2004), history (March, 2002) and Uzbek self-identity. It is interesting to note that the president of Uzbekistan, Islam Karimov, uses his role as 'head of the family' as a powerful device of legitimation for his position as head of state (March, 2003; Karimov, 1997). Equally the idea of specialisation is exemplified by the appointment of a 'picker' within the '*mahalla*' committee (*elat* in Khorezmi dialect), who is responsible for informing the community about wedding and funeral celebrations (Interview, 15 November, 2005). Central to this concept of *joshuli* is that of control and power and we see in the following examples how knowledge and power intersect within the cultural situation in Khorezm.

[xii] See for instance the silk worm case study in this chapter, also my field notes, Wall 2004, as well as the gendered literature on Uzbekistan, e.g. Kandiyoti, 2002b.

At a practical level we see decisions within the household, and indeed at the *elat* (neighbourhood) and even national level "expressed in the respect towards the elders and their influence in decision taking both in the family and in the community" (Massicard & Trevisani, 2003: 209). So once a decision is reached by the head of the household, this decision is acknowledged and followed by those within the household. Regardless of the 'correctness' of this decision, outright refusal to follow this decision seldom occurs within the Uzbek household. Nor, at an *elat* or state level, are the decisions of the leader openly questioned. It is this cultural dynamic of submission (moderated by silent and unseen forms of resistance, as discussed in Wall, 2006b) that plays an important role in perpetuating the authoritarian system, in all its guises, in Uzbekistan. So too does the role of the master fit into this realm of 'authority'. Once a master has established himself, be this through aptitude, office, cultural status or erudition, then he holds an informal authority, not through an office but through his command of knowledge. It is interesting to observe that when a new 'master' is introduced into Khorezm, for example a visiting foreign expert, then it is normal for farmers to ask a wide range of questions of that person, in order to test their authority (Field notes at livestock training seminar, 21-23 September 2005). Yet once this mastership is established it is not easily disobeyed or disregarded. Indeed, I observed a frequent phenomenon of people seeking advice from a 'master' for activities which they had, at least partial, knowledge of themselves. In a sense responsibility for an action is absolved if recourse is made to a master, and here again we see the close linkage between people's general lack of agency (or their failure to utilise what space does exist) in the authoritarian system, as well as risk avoidance strategies, probably devised during the Soviet period (Wall, 2006b). Conversely, people often refer to a master, for instance I visited a large (370 head) cattle farm with a group of farmers, discussing afterwards about what was wrong with the farm, one man remarked "there is no expert, no one there to say what to do and to be in charge, there is no one who knows" (Field notes, 27 September, 2005). In discussing the cultural embeddedness another useful example is the building of a wall for the new cemetery that was built in the Spring and Summer in my village. I joined in for several days of the '*khashar*' of men from the village, and wrote in my field notes:

> "There are effectively two work teams for the pouring of a concrete foundation for a wall. One is made up of older men and they plan the work, decide upon the boxing and the placement of the wall. The younger men all work together to make the concrete and pour it in. There is a degree of interaction down - that is that the older men help the younger and show/tell them what to do … I am always reminded of an apprentice style of KM here in the village. Everyone knows a basic amount of 'labouring' work which can be applied in all different manners. There are also various 'experts' in the form of the master … Collectively the group is able to get all sorts of things done, yet individually people would probably lack the range of knowledge required." (Field notes, 14 April, 2005).

I think that this example also demonstrates the cultural manner in which age and experience are respected and the notion that mastership can only be attained by experience and age, although there are instances where younger people can prove their knowledge is superior to received wisdom and thus establish their own very specialised mastership. These factors were reinforced for me, when participating in a different *khashar*, building a wall with one of my key informants. Here three generations of masters were present, along with others, and the intersection of age and mastership was reinforced (Field notes, October 2, 2005). The younger members of the *khashar* were learning a set of practical skills in a manner reminiscent of an apprenticeship. So there was a form of knowledge transfer or sharing occurring here, with the mastership being reproduced along familial lines (more on this in 2.ii below). But this knowledge reproduction was from the top down, with authority (and age) determining who was teacher and who was the student. It is exactly these cultural specificities that make the master a unique cultural construct within Khorezm. Whilst specialists occur in every 'knowledge society' the cultural aspect of 'authority' embeds the master into a certain power structure which exhibits certain specificities of the Khorezm region.

2. Modes of Knowledge Reproduction

The knowledge of the master is shared, reproduced and disseminated in a variety of ways. However, the way in which masters reproduce and share their knowledge is important in understanding how the knowledge system of the master operates. I discuss here three different modes of knowledge reproduction and sharing; familial training and accessing external sources. These different modes reflect both the diversity of the types of masters as well as the evolving importance of 'masters' in rural Khorezm. This importance is increasing, largely as a result of the knowledge loss, or deskilling, that occurred during

the Taylorism and specialisation of the Soviet period. We see in these cases how the present cultural context is informed by the changes wrought by the Soviet period, and it is important to understand the reaction, especially a refocusing on the family, as a response to this.

i. Familial Training

In my review of field notes and interview data the most common mode of knowledge sharing and reproduction is within the household, between generations. This familial training occurs for different forms of knowledge, from the static and declarative to the procedural and dynamic. Yet it is especially with the transfer of collective knowledge (discussed later) from older to younger generations, a transfer that occurs somewhat by 'osmosis'[xiii]. Here I am particularly interested in how the role of a 'master' is transferred from father to son or mother to daughter, or in some cases from father to daughter. I examine here two case studies of familial knowledge reproduction; egg incubation and house building; however, other examples abound, such as the third generation combine harvester drivers discussed earlier in this chapter(Interview, 31 May, 2005). Both instances demonstrate how masters actively 'reproduce' their knowledge within their own family system and that this is a deliberate act.

Case Study: Egg Incubation

With the post-Soviet growth in domestic chicken production, concomitant with the decline in state based industrial chicken production, there is demand for egg incubation services. One example of a family fulfilling this need is in Yangibazar rayon, where a husband, wife and son team provide eggs incubation services to the local community. During the incubation season (March – May) the business is open for farmers to come from on any Wednesday or Saturday, to deposit their eggs or to collect and pay for their hatched chicken, geese or ducks. The business was started in 2001, with the purchase and adaptation of equipment from the bazaar. In order to find out how to incubate the eggs,

[xiii] A gradual, often unconscious process of assimilation or absorption.

the father spend a period of time ‘learning from and asking questions of’ another master, who had been employed at a state factory and who had trained in Tashkent. This knowledge was developed through trial and error, with the father perfecting his technique. Given that customers pay per live hatch (60 sum for chicken, 100 for ducks and 200 for geese) there is an economic benefit in improving the technique and methods adopted. The business now claimed an 87% success rate for live hatches from eggs (Interview, May 18, 2005).

The interesting aspect of this business was that there was an explicit aim to transfer the knowledge about incubation towards the youngest son, aged 14. My observations of how he was involved in the business would fit into an ‘apprenticeship’ model, where the son was involved in every aspect of the business (Observation, 19 May, 2005). I asked a series of questions about their business growth plans, and they replied that they hoped to “train up our son, so he can manage the business … we will be pensioners soon” (Interview, May 19, 2005). At this point of the interview a customer was paying for his hatched chickens and ducks, he was told by the father to pay directly to the son, saying then to me with a laugh “he is already the cashier” (ibid). The family was also investing resources in training the son, whilst the older son had been sent by the local school to assist with thinning the cotton seedlings, the family had paid a bribe to ensure that the younger son stayed at home during the crucial incubation season. This is, in my opinion, a clear investment in their future livelihood strategy, as it is the youngest son who must stay at home to look after aging parents, and who will inherit any parental property, for instance a household business (Interview, 11 May, 2005). In light of this livelihood strategy the family had also decided to invest in direct, father to son, knowledge transfer. Where the knowledge involved is both procedural/technical (how to incubate eggs) as well as dynamic (running a small business). Whilst the father accessed this knowledge externally and through experimentation, there was a clear strategy to reproduce this knowledge within the family.

This can be seen as a deliberate livelihood strategy, especially given that it is the younger son who cares for the parents in their old age. It also illustrates well how knowledge is becoming an important factor of economic production in Khorezm. This commodification or valuing of knowledge marks an interesting departure from the Soviet collective system, where the means of production (including knowledge) were centrally owned and controlled. Where this has broken down, as in egg incubation, the knowledge has been adapted and used in a private manner. The fact that this family is explicitly passing this knowledge on to the younger son shows, to me, the importance and value attached to this knowledge. However I am conscious that this may be a particularly Western, even mercantilist, reading of the situation. For instance a Khorezmi colleague noted that in Uzbek culture all sons are seen as equal and thus the training of one son for economic reasons would be considered unlikely. On reflection I realise that there may be multiple motivations for choosing the second son to assume the mastership (perhaps he is just more interested in it) yet regardless of the motivation, the impact of livelihood security remains the same.

Case Study: Building Master

Most of the houses now being built in rural Khorezm are constructed of mud from the household plot. Almost all of this construction is by hand, with the only machinery commonly used being an excavator to lift the mud from the *argorod*, up to where the house is being built (Interview, 11 May, 2005). Specialised tools, such as shovels for lifting large cuts of wet mud, are used by semi-skilled labourers to build the walls of new houses in a series of steps. It is the 'building master' who controls all this work, supervising the construction of the house and ensuring that quality standards are maintained. The labourers are also divided according to their experience and knowledge, with only the most experienced (non-master) labourers being trusted with building the walls with the wet mud thrown to them by the less experienced men. However it is the shaping of the walls, ensuring that they are vertical and smooth, that is the domain of the master. This task requires a high degree of skill and *aptitude,* or learning based upon experience. Crucially there are also some tools of the master, a plum-bob and string line that provide a physical definition of the master.

> "Bemat then produced his instruments and small set of tools … these tools are a trademark of a master. Similar to a plov master - who wear their tools as a sign of their mastership" (Participant observation, 14 April, 2005).

These tools are the socio-technical markers of a master; they help to place the master in charge of construction at a house or building in the same way that the plov master uses their tools, or the tractorist at the MTP has their tool box. Of course, these tools also serve an explicit technical purpose, but built into this purpose is an implicit identification of the tools with the master. The tools thus carry with them a degree of social respect.

I participated in building projects and observed building masters at work during 2005, on a number of private houses as well as in the collective community construction, *khashar*, of a new Mosque, cemetery and walls. My key informant for this aspect was Bemat, who carried considerable respect within the community for his building skills. This was most apparent at the community construction sites, where he was acting somewhat as a 'master' of 'masters', instructing other house construction masters on how to lay the foundations for the new wall for the cemetery (Participant observation, 14 April 2005). This was helped in part because his father was a respected building master in former times, as well as from a long work history of building houses. Bemat had, by the time of reaching semi-retirement been able to pass on his 'mastership' to his son, Bojan (Bemat, 17 May, 2005). His son Bojan was then able to turn his knowledge into an, at least part time, profession for which he received payment in cash and in kind (Bojan, 14 & 15 April, 2005). The fact that he studied under and received the tacit approval of his father gave Bojan the ability to begin his career as a respected building master, providing him with social recognition and cash employment. This is an example of a family of masters deliberately reproducing their knowledge in order to ensure a livelihood. The family intended to continue this tradition, in training a member of the fourth generation in building mastership, a task which had begun by 2005 (Field notes, 2 October, 2005). This is a conscious act by the family, investing in reproducing specialised knowledge as an economic asset to be passed on within the family. Signifying that the local community themselves attach value to mastership and knowledge as income earners.

ii. External Sources

It is also possible for an individual to become a master without necessarily accessing formal knowledge or through familial reproduction. Would be masters can access external knowledge sources, be they; foreign projects, books, and from these sources (as well as through experience and experimentation) someone can become a master. We saw for instance in the egg incubation example that a master was accessed by the small business owner, who then adapted the knowledge to suit his smaller operation. In both the case of Slava as well as with other cases there is a combination of accessing external data sources, comparing/complementing this with existing knowledge within Khorezm and then testing it in reality.

Case Study: Slava's Book

Slava, a Korean pig and chicken producer with five hectares of vegetables, is a fascinating case study of accessing external knowledge. Three years before I interviewed him, Slava decided to take advantage of the privatisation opportunities in Yangibazar rayon. "I decided that pigs were what I wanted to farm … so I rang my cousin in Russia and told him to bring back a book on pig husbandry" (Slava, 18 May, 2005). On the basis of his comprehensive study of this book, Slava searched the rayon for suitable pigs with which to begin his pig farm. Comparing desirable characteristics from the book, he purchased four sows and one male. Based upon this book he built up, within three years, a herd of forty pigs, adopting breeding and selection techniques he gained from his intensive reading of the book. When I asked him to point out which of his numerous piglets (circa 3 months) he would choose for future breeding, he pointed to two particular pigs which were "long in the body, solid and eat all the time" which he talked about in terms of "being in perspective". Whilst simple and declarative, this knowledge stemmed from his reading of external knowledge sources, which he then localised. In cases where the book did not provide adequate information, he then set out to find other external sources. For example the book did not provide adequate information on pig health, so Slava asked for guidance from a local veterinarian (a fact no doubt made easier by the vet also being his wife's brother) who showed him how to administer basic injections.

At the time I interviewed Slava in May 2005 he had gained the social status of a ‘master’ within the Yangibazar rayon, with people coming to him for advice on pig breeding as well as health. Thus, within a short period of time and with only one external knowledge source combined with extensive experimentation and accrued practical knowledge, Slava became a ‘master’ and profitable business owner. This is not the only example of an individual accessing external knowledge through a book. A further case study is of the small grain mill in my village. In this case the machinery for operating a mill was purchased from Khanka bazaar, along with a book and instruction manual (in Russian). The owner of the mill stated that he simply built and operated the mill according to the instructions, without any further training or experience, save basic knowledge of machinery (Field Notes, 26 September, 2005). Yet the lesson is instructive, that despite the knowledge loss discussed later in this chapter, new knowledge creation and accessing external sources does occur in rural Khorezm. This dynamic knowledge, of experimentation and the creation of new knowledge is however the exception rather than the norm in rural Khorezm, because of the restrictions which are placed on businesses and agricultural experimentation.

Thus mastership should be seen as an essentially fluid situation, new masters can establish themselves (especially if they already have social or political status as a *joshuli*) old masters can find their ideas displaced by new or more adequate knowledge, and the knowledge of masters can be lost in a variety of ways. Hence we need to speak of the local knowledge system as essentially dynamic, with knowledge creation and loss, power relationships and cultural context constantly changing. I present in the following subsection examples of how, despite restrictions and limitations, farmers in rural Khorezm are acting as active experimenters and knowledge creator and, that this knowledge creation is informed by the legal and cultural context of Khorezm.

II. COTTON & WHEAT - NORMS, NOMENCLATURE AND KNOW HOW

Given the predominance of cotton in the agricultural system of Uzbekistan, it provides a crucial case study for local knowledge, of how external knowledge is adapted and localised within Khorezm. However, because cotton and wheat are central to the government budget (and provide crucial forms of income and patronage opportunities for officials) it is important to consider how this local knowledge is shaped and informed by the system of knowledge governance. Thus I adopt an *extended case study* of cotton growing throughout the agricultural cycle, using this as a vehicle to discuss the interfaces between state norms, the nomenclature and local know how.

I consider this to be amongst my most important case studies, both because of the centrality of cotton and because it demonstrates how local knowledge operates at the *interface*[xiv] with other knowledge systems, especially 'the named ones' (nomenclature). What I have attempted to set out below is a step by step analysis of cotton growing, both as a *bureaucratic activity* as well as an *agronomic undertaking*. These are also the two main areas of the agricultural labour process and illustrate the modalities of how state control of knowledge is exerted as power, and vice versa. Knowledge of both of these realms of farming, the political and the practical, is essential to the local knowledge system as well as the modes of knowledge control used by the state. Thus this is not a study of cotton in isolation; indeed cotton growing has strong linkages with other agricultural activities. For instance, the granting of rice land as a reward to those farmers who fulfil their state plan and demonstrate loyalty to their patrons (Veldwisch, 2007) is closely linked to the bureaucratic *and* the agronomic knowledge of successful cotton

[xiv] In using the term 'interface' I am consciously borrowing from Arce & Long (1992), and others who work on knowledge transfers 'at the interface'. However I take a wider view of how knowledge is mediated through social relationships, which may or may not involve the actors actually meeting – knowledge can be mediated through social relationships in many other ways also, especially in this case through the mediation of bureaucracies and bureaucratic control. Thus we need to understand 'interfaces' not only as direct meetings but also as a mediated process, which can occur indirectly and can work through transmitters (other individuals) and artifacts (physical objects which are used to express knowledge).

production. Instead what I present here is the example of cotton as a rich example of how local knowledge is very much a product of, and interacts frequently with, the state knowledge system of Khorezm[xv]. Much of the data for this comes from my own field research, but I have also leaned upon other, much more specialised, studies on the cotton agro-industrial complex in Uzbekistan, for it is how knowledge is interacting with the political control structure that is the key focus of my work here.

1. Determining the State Plan

The process of determining the state plan that is allocated to each *fermer* or *pudrat* is complex and opaque. Trevisani (2005) discusses the actual legal-bureaucratic process in some depth, and there is little I can add to the description of the method. What is possible is to discuss the process to inform our understanding of the role that bureaucratic knowledge[xvi] plays in shaping a farmer's statutory commitments. In doing this it is possible to distinguish between those farmers who posses 'bureaucratic' knowledge and those who do not. In principle the cotton plan is determined according to strictly technical criteria, using a system of norms and calculations which deliver a definitive result (Trevisani, 2006a; Kandiyoti, 2002b). In reality the data that is required for this calculation (soil quality etc.) is unavailable or old and it is recognised that a more flexible approach is warranted. This flexibility also opens up opportunities for graft for those in the decision making structure whose discretion and judgement can be assured through corruption (Interview, 24 October, 2005). This creates a situation whereby those who possess bureaucratic knowledge and social capital are better able to capitalise on this and reduce their cotton and wheat burden, those who are less knowledgeable have their burden increased. I observed considerable discord about this growing disparity. Because it is necessary for a farmer or *pudrat* to negotiate their allotted plan with the authorities,

[xv] I deliberately do not refer to ZEF project activities here, discussing them instead in Chapter Six. This is a study of cotton for the general situation.

[xvi] By which I include; (i) a knowledge or experience of bureaucratic rules and procedures, (ii) a skill at negotiating the way through these procedures and, (iii) personal connections with bureaucrats, enabling the process to move more smoothly.

and because a degree of discretion exists, those who have more political capital and bureaucratic knowledge are better equipped to profit from this negotiation (Field Notes, 20 April, 2005[xvii]). So for example one of my key informants, a prior agronomist in the *kolkhoz*, had both the contacts (a form of knowledge) and the bureaucratic ability to negotiate a reduction in his state plan (Field notes, numerous in April, 2005). On the premise that the land was previously beside a road (and thus supposedly of poor quality, although he subsequently planted it in cash crops and vegetables) and near to a drainage collector, the agronomist was able to use his 'science' to convince the authorities that a lower plan was justified, and that it would be in everybody's interests for him to convert one hectare into an orchard.

This stands in contrast to another key informant, who discussed how their family was unable to capitalise on the land reform process because the head of their household was sick, and thus unable to mobilise political capital and his skills in bureaucratic negotiation. Given the patriarchal nature of bureaucratic ability (men need to negotiate with men, senior men with senior men) it was not possible for one of his young sons or his wife to fill this role, thus leaving the family materially deprived[xviii]. The case study of silk worm production in this chapter confirms this conception of bureaucratic knowledge as vital. Closer to the issue of cotton we also see that those *pudrat* farmers who are able to negotiate effectively with their landlords or the *shirkat* bosses, are better able to ensure a profitable crop, by reducing the state plan allotted to them (Interview, April 21, 2005). Here the *pudrats*, as with the *fermers*, are employing a different form of knowledge than what is strictly seen as 'agricultural knowledge'. They are mobilising their political capital and negotiating ability, combined with knowledge of farming and how the 'system' works to maximise their farming profit. This was clearly illustrated by one of

[xvii] On this day I observed and participated in a heated discussion between several *dekhans* who were considering becoming private 'fermers' in a new stage of land privatisation. They discussed the implications of this move with reference to their own observations and opinions on what happened in previous privatisations.

[xviii] This is the family's own assessment of the situation as well as the feeling of others in the kishlak that I checked with, including the head of the *elat*, the *aksakal* (old grey beard). Interestingly, there is little patience from others in the kishlak for the poverty of the family, who blame the 'laziness' of the sons.

my key informants, the agronomist, who was able to utilise his scientific skill (knowledge of soil types) his negotiating skill (acquired through work in the rais office) and his political capital (connections made during his work for the state) to profit from the land reform process. Indeed, on several occasions he expressed an conscious awareness of how he was achieving this.

This was not an isolated example, those farmers able to utilise this 'bureaucratic knowledge' consistently arrive at better outcomes than others (Trevisani, 2005). This bureaucratic knowledge can be enhanced through social means (marriages to promote closeness) through strictly legal means[xix] and by network building. It is also interesting that this knowledge is essentially knowledge of how to relate with the 'state' sphere, of communication outside of the indigenous sphere of knowledge. Here again we see how those in relation to power, i.e. the agronomists of those in positions of political authority, utilise this power position to enhance their knowledge. Equally, the possession of superior knowledge (be it technical or bureaucratic) enables an individual to enhance their relations to power and thus to arrive at superior economic outcomes. In this way the state is acting as an arbiter of knowledge, exercising an indirect form of control over knowledge through the direct control over the cotton production and planning process. This is an issue very much at the centre of the issue of state norms, discussed below.

2. Norms and 'Know How'

There are certain 'rules of thumb' or forms of 'know how' associated with cotton production which could easily be classified as 'communal knowledge' in the pursuant section. Equally well these 'rules of thumb' would typically be written up as excellent examples of local knowledge in the classical literature on this topic and I provide some of

[xix] The OSCE has identified this as a key issue for new farmers and is pursuing an educational campaign to make farmers aware of their legal rights in this regard (Interview, 24 October, 2005), yet this assumes a certain bureaucratic perfection – that legal cases will always be decided on their merits – however the Uzbek legal system is perhaps less robust than the OSCE is suggesting by placing an emphasis on legal rights. Conversely the project management see this as an exercise in 'empowerment' which can be used as a tool to confront the less formal aspect of bureaucratic knowledge.

this ‘indigenous’ knowledge later in this section. However, I argue that the commonly accepted and universally acknowledged ‘rules’ for cotton production are in essence not indigenous knowledge, because they are the result of state ‘norms’ and need to be recognised as traditional knowledge. Moreover they relate to external knowledge which is localised and are thus more accurately referred to as ‘local knowledge’. The ‘norms’ for agricultural production are state dictate which specify the input timing and amounts for almost all agricultural inputs. Developed during the Soviet period these norms now play less of a role in agriculture than they once perhaps did, yet remain crucial in all levels of official planning and input provision. For example Veldwisch (2007) discusses the use of water ‘norms’ as a foundation aspect of water planning for the year, where a crop’s requirements are calculated according to the ‘norms’ and a delivery schedule devised to suit these[xx]. Some of these ‘rules of thumb’, such as the dates when one can and should plant a certain crop exist *both* within the spheres of local knowledge and state knowledge. That is to say, farmers interviewed all gave very similar answers about, say, when it is possible to start planting crops. These answers also correlate with the state norms, which in the case of the strategic crops cotton and wheat, are enforced using the apparatus of the state.

This concurrence of knowledge between the two systems does not necessarily imply that the knowledge is ‘correct’ (from a positivist scientific perspective) indeed some of the ‘norms’ which are also ‘rules of thumb’ usually take a specific position on a subject that is very much open for debate in world science. For instance the ‘norm’ that cotton must be water stressed to encourage boll development, a practice abandoned in the United States and Australia twenty years ago (Expert Interview, 30 October, 2005) yet one which does seem (in some literature) to hold considerable benefits. Yet the agreement on the need for water stressing, and many other points, between the two knowledge systems is almost absolute, reflecting the pervasiveness with which state political control has been translated into the control of agricultural knowledge. This also reflects the lack of

[xx] This technical process is not unique to Uzbekistan; indeed water management commonly makes use of norms. What is specific to the Khorezm example is the degree to which this top-down enforcement is conducted at every level of the water management process (see Veldwisch, 2007, for a fuller account).

adequate extension services in Khorezm which could potentially eradicate such beliefs. Rather in Khorezm there is only one 'correct' answer and in many cases this is not open for scientific contradiction, certainly not for open contradiction at the local level. Thus my argument is not whether the current norms are technically adequate or correct, I cannot judge this. Rather, that the knowledge monopoly of the state acts against the possibility of alternative paradigms developing. This is the essence of Uzbek agricultural science as it plays out in Khorezm, that there are certain concepts that *cannot* conceivably be deemed false. Farmers are not allowed to contradict them (although there is considerable negotiation and non-conformity on the ground) and scientists are not allowed to prove these norms false (see chapter five). Just as the vertical spindle cotton picker was decided on, and thereafter no debate about the merit of horizontal spindles was allowed (see chapter five) so too has the Uzbek state determined that water stressing of cotton is necessary, and thus that this is always the case. Thus innovation is impeded and the creation of new knowledge slowed.

I suggest that retaining this level of knowledge control is central to the Uzbek state's efforts to control the agricultural production process, and through it the economic and political structure of Khorezm. By retaining control over the labour process (through specialisation, limited privatisation and retaining power over MTPs) the state continues to act as an arbiter of knowledge for agriculture. Likewise, there is a direct control over *how* the agricultural production process occurs. This ensures that the state's pre-eminent role as 'expert', holding a monopoly on 'correct' knowledge, reinforces the state's central political-economic role. It is at this intersection of power and knowledge that we see also a clear intersection of knowledge systems. This raises a question of what forms of communication, and through which modes of transmission, is this knowledge shared. What I suggest is that the system, whilst perhaps not uni-linear, is certainly one of top-down transmission belts of knowledge being transferred without being tested. I discuss next the case studies of the '*Pakaz'* as one mode through which knowledge is transmitted from the top down, from the nomenclature to create norms, and contrast this with cases of non-conformity.

3. The 'Pakaz' & Power

One interesting example of indigenous knowledge and knowledge governors coming together in a formal sense, an interface of knowledge, is the '*pakaz'*, originally a 'demonstration' during Soviet times (*pakaz*, показ, is Russian for demonstration). The archives from Khorezm discuss this as a way to introduce farmers to new technologies, especially new machinery. However, in the post-1980s period they have become more a case of reinforcing old lessons rather than introducing new information. This phenomenon is well described by Trevisani as:

> "The compulsory seasonal seminars and meetings called-in by the hokim or a MTP-Rais, where the farmers gather to get instructions on how, when, what to do on their fields. Although the pedagogical use of these meetings is low (fermers usually already know what to do) these are occasions to put the authority on stage and to publicly reaffirm unity and control over the many hundreds of fermers sometimes gathering". (Trevisani, 2006a, Ch 4)

I would agree with Trevisani that the *pakaz* does indeed reinforce control structures in agriculture, yet I would disagree about the pedagogical value that he accords to these meetings. Indeed, the concurrence between local knowledge and the norms which are taught suggest that this 'transmission belt' of knowledge is functional in transferring knowledge from the top-down. Perhaps what Trevisani (above) identifies is that no new knowledge is being introduced, and thus that farmers indeed do 'already know what to do'. Yet in many instances this is not the case. One excellent example is a comparison between two interviews, with the directors of filial institutes in Khorezm, one focused on cotton, the other on wheat (Interviews, 5 November, 2005). Both agreed that the *pakaz* was an important way for political authorities to enforce their power as most *pakaz* were simply 'checks' conducted on fields by the agronomist, who used social pressure and a 'name and shame' approach to reprimand those farmers whose fields did not conform to the state planting method (these interviewees represent applied research, not political interests). Both also agreed that farmers knew a lot already, yet the big area of disagreement was between cotton and wheat.

Cotton has been grown in Khorezm since before 1945, whereas wheat production was massively increased after independence to promote grain self-sufficiency. When comparing the two interviews, it was striking that the wheat institute director was able to

provide examples of collaboration and instances where the knowledge provided to farmers was both novel and welcome (ibid). Subsequent interviews with key informants, *fermers* and *pudrats* confirmed this view (Interviews, 7 November, 21 March, 2005). Thus I would suggest that the pedagogical value of the *pakaz* is realised only when a new method or crop is being introduced, in the majority of cases where the knowledge is static (as with cotton) then obviously no new knowledge is actually being imparted. It is unsurprising that knowledgeable farmers resent enduring homilies on cotton production, yet their positive response to, for instance, wheat production instruction suggests that this does remain a useful, if often underutilised, interface between state knowledge and the indigenous knowledge system (Interview, 15 November, 2005).

This hypothesis was confirmed for me when I attended a *pakaz* on fruit trees, provided by the Khorezm Dekhan and Farmers Association, with the political patronage of the deputy *hokim* of Khorezm (who arrived in his embarrassingly large Chevrolet, which was explained by him saying 'the cotton harvest was good this year', reinforcing the importance of fulfilling the cotton plan to rewards within the state system). At this *pakaz*, of circa 100 *fermers* and farmer association officials, there were those farmers who claimed "our way is better" instead of listening to the expert flown in from Tashkent (Field notes, 10 November, 2005). There were also *fermers* eagerly taking notes, as shown in Figure 7 (p.132). This reinforced the point that where information is new or interesting at the *pakaz*, it is accepted. If it is not deemed useful by *fermers*, then indeed the pedagogical use is limited. For instance in the fruit tree pakaz, the instructor demonstrated the angular pruning of fruit trees, above the third bud, to encourage better fruit development in the next season. This was eagerly written down and questions were asked by the farmers in attendance, some of whom compared it with their own rules of thumb (above the second, fourth bud, etc.). Whereas, the instruction given on the re-planting of fruit trees and the application of manure, received little welcome. The instructor assumed (wrongly) that farmers re-planted from cuttings and that they were ignorant of the benefits of manure as a natural fertiliser.

This is unsurprising if we look at the literature on top-down versus participatory knowledge dissemination (chapter two, III) as the instruction ignored the benefits of local needs analysis and did not consider the contribution that local knowledge could make to the seminar. In the Khorezm case there is an aspect of reinforcing the political structure inherent in the pakaz. Illustrating the point that knowledge is controlled by the state to extend its political control. Whilst in this case the deputy *Hokim* played little or no practical purpose, but as patron of the event his attendance was crucial in legitimating the training seminar. For instance the teaching did not begin until he arrived (late) and the television coverage on the local station that evening emphasised that the pakaz occurred under his patronage (as well as, misleadingly, a 'foreign expert' – i.e. me). The *pakaz*, whilst serving to reinforce existing power structures, does also fulfil an educational function at the times when there is actually new information to impart. Yet, regardless of whether the knowledge is novel or not, the power function exercised over knowledge remains. In either scenario, it is those in 'with' power who are in possession of superior knowledge which they are providing to the local knowledge system. Notably, most *pakaz* are followed up by visits to farmers' fields to ensure that the 'correct' or 'new' method has been adopted at the local level. For example in checking ("against laziness" according to one agronomist) that the cotton fields are thinned (4-5 plants per metre) and weeded 'correctly' during the initial vegetation stage. There is no facility for new knowledge or innovations to flow upwards; the final section of a *pakaz* is for questions, not comments. The fact that farmers have no choice in whether to use this knowledge both demonstrates the power of the state, but perhaps more crucially, prevents new knowledge from being created. By impeding innovation (new knowledge creation) at the local level by enforcing existing norms and refusing to accept alternative views, the state in governing knowledge in such as way that does not allow for the local knowledge system to create new knowledge. This further increases the monopoly of the state over agricultural knowledge, allowing this 'expertise' to legitimate state control over agricultural production. Thus the connection between power and knowledge is strengthened in a very specific manner in Khorezm.

Figure 6: Photograph – Fruit Tree Growing Pakaz, November 2005

Figure 7: Photograph – Eager note taking at the Pakaz, November 2005

It is important not to confuse the purely training 'demonstration' *pakaz* with another form of *pakaz*, the 'first seeds' ritual. This is the adaptation of a much older tradition where "an older man who is well deserved and respected" plants the first seed of the cotton and wheat crops, whilst "making prayers and well wishes" (Interview, 15 November, 2005). The tradition of blessing the crop with religious overtones clearly predates Communism, yet the fact that it is cotton and wheat (the strategic crops) which are being blessed suggests that this tradition has been co-opted or adapted. Likewise, the post-Independence practice of using machinery to plant the first seed, under the direction of the 'old man' shows how state goals (wheat self-sufficiency for the post-1991 government) intersect with ancient practices in a very real way by the deliberate actions of the state. The 'first seeds' *pakaz*, whilst religiously inspired and with mystic undertones, has been co-opted by the state in order to fulfil a specific knowledge transfer function. Whilst simultaneously legitimating the state (at both a technical knowledge and mystical level) and suggesting that newly Independent Uzbekistan is a re-birth of an older, and great, civilisation. Thus it should be considered separately from the purely training *pakaz*, yet remains an interesting avenue through which different knowledge systems converge and state political control is reinforced.

What it also illustrates is that there are alternative paradigms that exist in rural Khorezm and that local knowledge, as stymied as it may be, does develop in Khorezm. In many ways this local knowledge must operate within the 'boundary conditions' of the state plan and state norms, but within these conditions a degree of freedom does exist for local knowledge to develop. Non-conformity also occurs at the local level, sometimes in opposition to and sometimes to simply avoid or take advantage of, somewhat clumsy state norms and regulations. This local 'know-how', or coping ability within the state norms is an important aspect of the local knowledge system in Khorezm. I discuss next how non-conformity in cotton and wheat illustrates local knowledge, followed by some case studies of local knowledge operating within the narrow confines of the state norm system.

4. Coping with Cotton and Wheat

Wheat and cotton are classified as 'strategic crops' in Uzbekistan and practically all private *fermers, pudrats* and *dekhans*, have to provide a mandated tonnage of wheat and cotton every year, described in their 'state plan' (Wall & Lamers, 2004: 20-21). This weight tends to account for between 30 – 60% of their total wheat yield and, in reality, 100% of the cotton yield[xxi]. The imposition of the state plan, aside from the direct knowledge implications discussed above, also sets out boundary conditions in which local knowledge must operate. Yet it would be wrong to assume that local knowledge is purely a reflection of state norms and knowledge. Rather there is evidence of farmers in Khorezm taking advantage of the opportunities that exist within the current system, using it to their considerable advantage. This includes both non-conformity (bending the system) and innovation (working within the system) discussed in the next section.

Case Study: Wheat Non-Conformity[xxii]

One of the ways that I observed that farmers taking advantage of the state plan system was in adopting different stacking methods for state plan and personal wheat. The first method is that used for the 'state plan' wheat is simply thrown onto a pile, with little concern for the impact on post-harvest quality. The second method, for personal wheat, involves delicate stacking of the wheat, notably this is the method adopted by *dekhans* who are operating for their own profit or consumption. This stacking protects the bushels of wheat from sun and rain damage, and ensures a better post-harvest product. Thus from the same crop there are two very different qualities of wheat produced. The former, provided to the state, is of a low quality. The private wheat is of better quality than the state plan wheat, as greater care is taken in the post-harvest process. So whilst providing the state plan of wheat is seen as one of the costs or obligations of having (otherwise low-rent) land, this obligation can be lessened by putting in only the minimum labour required for the state plan. No extra labour is 'wasted' on stacking the state plan wheat, protecting it from potential wind or rain damage.

[xxi] Although there are complicated pricing structures for different grades, which are rigidly enforced.

[xxii] This and the following case study appear in a similar form in Wall (2006).

Case Study: Cotton Non-Conformity

One of the more blatant forms of non-compliance is the excessive irrigation of cotton *after* boll development. There is no agronomic rationale for irrigating during this time. However there is a clear economic rationale for doing so, given that farmers are paid by weight.

> CW: Why are you irrigating now?
> HM: "We make the cotton wet, because we just get paid by weight … it is an old trick"
> CW: "Does it do anything to the quality of cotton?"
> HM: "I don't really care … the pay is the same – too low" (Wall, 2004: 69).

As with the example of wheat, farmers are mandated to provide a specified weight of cotton in their 'plan'. If they do not achieve this goal then they risk losing their land tenure and certainly compromise their prospects for gaining more 'private' (leasehold) land in future privatisations. '*Fermers*' adapt to this regulation by taking perfectly rational (short term) decisions, increasing cotton boll weight (for which they are paid) at the expense of cotton quality (for which they are not paid[xxiii]). The fact that this undermines the ability of the central state to achieve premium prices for cotton exports is of little concern to either private farmers (or for that matter kolkhoz officials or workers who pick cotton and are paid by weight) who would likely see little if any of this surplus. This flooding also has negative impacts on the environment through the wastage of irrigation water, which in turn increases soil salinity[xxiv]. The real victim of the ecological degradation and increasing soil salinity, which in turn compromises the ability of farmers to grow other crops, is these same *fermers* that over-irrigate. So here farmers are taking advantage of the, agreeably perverse, incentives at work in rural Khorezm. They are using agronomic knowledge in a way that delivers a superior result for them personally. Likewise the fact that this act of adding water is an 'old trick' suggests that as a form of coping strategy it has been internalised into the local knowledge system for some time.

[xxiii] Officially there are five different grades of quality, each having a different price. In reality two grades exist – for the first and second pick. There is perhaps another adaptive mechanism here, with farmers being incentivised to delay their first pick to maximise their profit. However I have no evidence to confirm or deny that farmers avail themselves of this opportunity.

[xxiv] The impact that land privatisation has on this practice is unknown – land tenure theory suggests that privatisation would encourage farmers to play a more active role in ecological preservation of their land – yet there is no evidence that farmers link excessive irrigation and raised ground water levels with the problem of salinisation.

The knowledge aspect of interest in these cases is that farmers are demonstrating a range of forms of knowledge regarding wheat quality. Declarative knowledge on 'hard' or 'soft' wheat and procedural knowledge on how to stack this wheat to ensure better post-harvest quality, with similar knowledge being displayed in the case of cotton. However, the farmers are consciously choosing to employ this knowledge in different ways, depending on the incentives that exist. This is presumably evident to the nomenclatures who govern agricultural production, yet the fact that the incentive system has not been adapted suggests that the transmission of knowledge and expertise is stifled in moving from the 'bottom up'. Reinforcing the point that the intersections of knowledge that do occur tend to reinforce the political 'top down' structure yet are not able to accommodate knowledge moving from the indigenous system into the governance system[xxv].

5. Innovation within the State Plan

Despite the state plan placing impediments on innovation and generally restricting local knowledge creation, farmers in Khorezm are active experimenters. There are numerous examples of farmers developing local knowledge to improve their cotton and wheat yields. I present here an indicative example of such local innovation, Indicator Maize in Cotton. Yet this is but one example of a great number of small, easily missed, ways in which the local knowledge system of Khorezm is operating under the state plan system. Here it is important to clarify the main theme of cultural context. Local innovations occur within the structures of the state plan system, which places boundary conditions on what is possible. Within these conditions there is a surprising level of innovation and experimentation. Yet this local knowledge creation still needs to be understood in light of the cultural context of Khorezm, as innovations which oppose state norms (for instance in planting times) or which are not possible within the state plan (large scale crop rotation) are innovations which cannot occur. There are also certain limits placed on knowledge, explained in part four of the next section. But here I present an indicative example of local innovation within, or in spite of, the state plan.

[xxv] I discuss this case study in greater depth, with added consideration of the effectiveness of this non-conformity and its reflection on local power structures in Wall (2006b).

Case Study: Indicator Maize

One of the ways in which irrigation water supply, especially for cotton, is managed in rural Khorezm is through controlling or managing the water table. This is a complex socio-technical process and I would not wish to comment on the detail of the process, other studies (Veldwisch, 2007) have done this more adequately than I would attempt. Yet one aspect of managing sub-surface water tables that is of interest for the local knowledge system is the way in which local farmers have adopted the use of indicator maize. Put simply this is where small rows of maize plants (grown in Khorezm for fodder) are planted in the cotton fields and used as indicators of the ground water level and even of the salinity of the water. It was explained to me by numerous informants, ranging from agronomists (who first made me aware of the practice) to *fermers*, *dekhans* and *pudrats*, that by examining the foliage, early ear development and leaf tips, it is possible to discern ground water level and salinity. I am unsure (and my field notes are insufficient) to tell me that extent to which this local knowledge qualifies as collective knowledge (section IV, below) or is a form of mastership (section I, above). What it is however is an example of how farmers are operating within the boundaries imposes upon them by state-led agriculture. These boundaries are met by using indicator maize. So, irregular and unreliable irrigation timing is managed by raising the water table to a level which can be accessed by the tap roots of cotton. This is not the sort of knowledge which occurs in the agronomic textbooks of Uzbekistan, nor is it indigenous knowledge (i.e. which has existed since before the Soviet period) instead it is the result of local experimentation. The observation of certain phenomena (e.g. that early maize ears appear brown in conditions of medium-high salinity) which is utilised at the local level. When such forms of knowledge are deemed useful in the local community, they are then shared and transmitted within the local knowledge system (a process explained in greater length in section IV, below). It is through this process of observation, experimentation and speculation that local agricultural knowledge does develop, in spite of the considerable barriers to innovation that exist in rural Khorezm. But this cultural context (the state plan, scientific culture) do define and delimit what local innovation occurs and how this can be used. Sometimes diminishing local knowledge, as we see next.

III. KNOWLEDGE LOST?

What is not known is as important as that which is known. Whilst Evers and Menkhoff (2005: 145) discuss 'the growth of ignorance' in terms of a relative growth of ignorance as a corollary to a growth of knowledge, I wish to discuss here the growth of ignorance in terms of knowledge loss during and after the Soviet period. That is to say that indigenous knowledge has in some ways been 'lost' during the period of Soviet colonialism of Khorezm. Likewise there has been some attrition of indigenous knowledge in the post-Soviet era. This is pertinent in terms of knowledge of livestock production and post-harvest processing. In addition there is the simple, static, ignorance of new technologies and farming methods that are available in other parts of the world, yet which are not known in Uzbekistan. This is largely caused by the knowledge control approach adopted by the government of Uzbekistan, which is discussed at length in Chapter Five, however the direct impacts merit discussion here. As do the role of ineffective linkages between farmers and local (i.e., Uzbek, non international) research institutes and universities, for failing to combat knowledge attrition in rural Khorezm. Whilst indigenous knowledge is dynamic, in that it is constantly evolving and changing, it is not always in the ascendancy. Instead what I show in this section is that whilst the Soviet period introduced a considerable amount of new agricultural knowledge, which was adapted to local conditions and thus made 'local', there was also a considerable growth of real ignorance (distinct from Evers', 2000, relative ignorance) which is manifest in Khorezm today. This is not to totally discount the level of indigenous knowledge growth that has occurred in the 15 years since Independence. What is worthwhile mentioning is that a significant amount of knowledge was simply 'lost' during the Soviet period, mainly due to the collectivisation of certain agro-economic activities. With de-collectivisation and the break down of existing collectives, post-1991 this attrition of knowledge continued. This is particularly relevant for the rural economy of Uzbekistan, as this 'lost' knowledge could potentially play a large developmental role in promoting new livelihood strategies, such as through post-harvest processing.

1. Livestock Production

With collectivisation in the 1920s, livestock production was transferred from an almost purely domestic affair into a collectivised and specialised industry of the state[xxvi]. Whilst post-WWII reforms within agricultural production allowed for limited domestic production of livestock within the household economy, large amounts of indigenous knowledge had already been lost. For instance chickens, which were allowed for much of the Soviet period yet were reared from eggs centrally and distributed to the households. The healthcare of these chickens was centrally managed, with a *kolkhoz* veterinarian being responsible for ensuring regular inoculation (Interview, 17 August, 2005). With the collapsed of the Soviet Union, these structures collapsed, leaving rural households without their pre-collectivisation knowledge. This is manifest in many ways, for instance the ignorance of how to treat sick chickens (Field notes, 5-6 April, 2005). This same lack of knowledge is also the case with cattle production. I conducted a survey on farmer's knowledge of cattle health and milk production in October and November of 2005, including 50 in-depth interviews with farmers. The findings of this survey confirmed the issue of knowledge loss, which was even identified by a number of respondents themselves, noting the decline in cattle rearing post-de-collectivisation. The education level of those involved in livestock tasks, most importantly feeding and milking, was limited. Very few respondents expressed any knowledge of sanitary and hygiene rules associated with milking, the one woman who did employ a strategy for sanitation possessed this 'specialised' knowledge because of Soviet era training. Whereas, two of the respondents (both men) were owners of a large number of cattle and possessed a superior level of knowledge about the anatomy and feeding requirements of cows, yet professed that they applied little of this. I was unable to fully understand why this was the case, but my suspicion is that the cause is tied up with the ceiling on entrepreneurship discussed later in this section. Another interesting aspect of livestock knowledge is the

[xxvi] I am conscious here that pre-1920 knowledge on livestock was far from static. Rather the Russian Imperial history has bought with it considerable amounts of new knowledge and different animal breeds. Likewise the gradual shift away from nomadic and pastoral livestock production towards centralised rearing should not be seen in an ahistorical context. Rather I am discussing a phenomenon of post-Soviet knowledge loss which is very different from these knowledge 'transitions' between different modes of production, because it was the shock event of decollectivisation that destroyed one system of knowledge whilst not fully developing the new system. This is thus a study of knowledge in dynamic transition.

gendered issue of knowledge transmission within the family structure. To quote directly from my research assistant:

> "People learn farming mostly from family members, from their childhood taking care of cattle is one part of their life. There is no special age or time to teach farming for children, they learn farming as a one part of their daily lives. According to the survey, male children learn farming from their fathers, 18 men from the 27 male respondents learnt farming from their fathers. The other learnt farming from the everyday life practice, this could the absence of their father or they lived with their mother in the childhood. The female farmers learn farming both from female member of the family and the male members of family. For example, in the survey, 10 female farmers learnt farming from their mothers and 11 women learnt from their father and both from mother and father"

This male dominated knowledge transmission process, combined with the issue of knowledge loss reinforces my earlier points on the specialisation of knowledge within Khorezm, that cultural norms find their expression in knowledge sharing processes, even in cases where this knowledge is diminishing. What it also illustrates is the state of relative ignorance and indeed the post-1991 growth of ignorance, which has occurred in rural Uzbekistan. This is not to say that no knowledge exists, on the contrary rural Khorezm illustrates the ways in which farmers respond to challenges in creative ways. For instance how social networks are used to promote the breeding of cattle and sheep with those from other kishlaks. Here farmers are demonstrating that they understand the risks of inbreeding (and indeed vocalised this understanding in interviews) and are acting upon this knowledge in a culturally grounded manner. That is using existing social and community linkages with other kishlaks to mutual benefit. This is another instance where knowledge takes a form and function which mirrors the cultural context in which it operates. Equally we should remember the political power function that knowledge plays in agriculture and realise that Soviet centralisation of production and the specialisation that this entailed were not politically neutral, rather the process served to further the centralisation of control and to reinforce central power. With the collapse in agriculture, there have been masters and large scale farmers who have been able to profit from superior knowledge (or political connections) to build businesses based on the knowledge deficit of others. Thus the knowledge loss is dynamic, it is changing and local solutions are being developed to confront the post-1991 collapse or livestock knowledge.

2. Post Harvest Processing

During the Soviet period almost all industrial processing of raw agricultural materials occurred outside of Uzbekistan and Central Asia (Spoor, 1999: 5). Cotton, wool, leather and other agricultural commodities were 'exported' to other Soviet Republics for processing, in accordance with the Soviet doctrine of division of labour[xxvii]. This created a system of agricultural production and dependency, reminiscent of European colonialism, with uneven development and reciprocal differentiation (Wall, 2004: Ch.3; Kandiyoti, 2002a) and one that had a deleterious effect upon indigenous knowledge in Khorezm. Without entering into the discourse on whether Soviet rule of Central Asia constituted a colonial relationship, it is worthwhile noting that the impact on the indigenous knowledge regarding commodity processing bears much in common with colonial experiences from India and elsewhere. So just as colonial India was created as a dependent, vassal, state by way of moving all processing of cotton towards England (Baran, 1957) a similar case arguably occurred in Uzbekistan. This is because the knowledge associated with how to process agricultural commodities, such as cotton and wool, was simply 'lost' or destroyed between 1917 and 1991.

Cotton production prior to the Soviet period was also grown to order for Tsarist authorities and processing was centralised towards Moscow (Peachy, 2004: 3). The attempts at creating post-harvest facilities in the period after 1991 have had mixed success, whilst the industrialisation of the cotton industry remains a state priority, numerous formal and informal barriers are erected. The economic and political problems behind these barriers are the topic for another study. Rather, I focus here on a common commodity, wool. Whilst cotton is economically, ecologically and socially the most important crop in Khorezm and Uzbekistan; post-harvest processing remains slight (Kandiyoti; 2002a, 2002b). Likewise wool plays a minor role in the economy of Khorezm, yet holds considerable potential, as explored below.

[xxvii] Interestingly, this was taken as much from descriptive work of Marx on the capitalist labour process as it was from the normative writings of the American management scientist Taylor.

Case Study: Wool Processing

We know from historical writings that there was a well developed wool industry in Khiva during the 'Kushan' period (Tolstov, 1948) and it is reasonable to assume that domestic processing occurred until the imposition of soviet rule (circa 1917-1924). However, there is little indigenous processing of wool occurring in Khorezm today. Whilst small domestic production of woollen socks and gloves does occur, this is a rather specialised activity, I was able to find only two households in my village who were engaged in this trade[xxviii]. Likewise, there are two carpet factories in Khorezm which process large amounts of wool, yet these operate outside of the indigenous knowledge system. Economically, wool products make up only a fraction of internal trade and are negligible in terms of exports (Ruzmetov et al., 2004: 8-10). Yet sheep rearing is quite common in Khorezm, with 16% of respondents to my rural survey (N=457) reporting that they kept sheep[xxix]. Thus I attempted to explore why it is that wool is not being processed and found that knowledge loss is a significant contributing factor. For instance, one informant, the owner of over one hundred sheep and forty goats, which he grazes in the desert is an eloquent example of how far the wool processing industry has declined. Despite having such a large flock, it is simply not economically worthwhile to sell his fleeces "I get 50 cym per kilo of wool – it costs that much just to shear the wool – I am not interested" (Polvon, 13 May, 2005). Thus each year the wool is composted in the desert and goes to waste. This is an understandable reaction to problematic economic conditions and is perhaps little related to knowledge loss. However, the astounding aspect of the Polvon case study is that he is interested in making a profit from his wool and sees it as potentially valuable. Yet he admitted to be unaware how he could make a profit from this latent resource. One option involved turning the wool in ropes, with which to tether his sheep at night. Yet even for this he was going to have to consult a 'master' to access this knowledge.

[xxviii] It is of course possible that my kishlak was exceptional or that I simply missed a form of processing, however my experiences were of a considerable level of ignorance about wool processing.

[xxix] An average of 5.94 sheep per household which reporting having sheep, with a maximum of 25 and a minimum of one.

This stands in some contrast to the Khiva carpet factory, which was established in 1972, producing wool-synthetic blended carpets for around the Soviet Union (Interviews with factory manager and head of work brigade, 7 October, 2005). Whilst there were obvious disruptions in the immediate period after 1991 and the disintegration of the Soviet Union, the factory has been able to continue production, indeed in 2001 a large investment was made in buying new German technologies (Field notes, 7 October, 2005). In discussions with the various 'brigade leaders', the heads of each manufacturing process in a form of labour organisation imported from the Soviet era, each demonstrated how they were able to apply their knowledge and adapt to new realities of operating post-1991 (Field notes, 7 October, 2005). Indeed, the investment in the German technology meant that new knowledge was acquired, and adapted to suit local conditions, reversing this trend of knowledge loss. It is worth noting that now they use much less wool in their carpets, explained both in terms of cost and in the difficulties of sourcing quality wool domestically. Given the low price for wool explored above, this disconnect may suggest that there is a crucial need for development in the wool post-harvest sector, and one that certainly involves knowledge as a central point.

As explored in the previous section, the state's control over the labour process (direct power) and indirect control impeding innovation, both lead to this knowledge loss and the failure of the local knowledge system to innovate. By restricting (through power relationships) the development of new technologies, and continuing to control labour in a manner which favours large scale 'mechanised' industries the local knowledge system has been unable to develop or rediscover the knowledge needed to process wool. Rather a set of economic barriers, discussed later, combine with a simple lack of alternative sources for knowledge. The state retains a monopoly on agricultural knowledge, controlling through direct and indirect means what knowledge can be developed. In the case of wool processing, it is not a state priority and thus the local system remains in ignorance of how to process this potentially valuable product.

3. Post-Soviet Knowledge Loss

Knowledge loss in Khorezm was not restricted to the Soviet period. In the years since 1991, when the Soviet Union collapsed, farming in Khorezm has gone through significant reorganisation, which has at times led to even more knowledge loss. Whilst the Soviet era system of knowledge governance (discussed in chapter five) was imperfect, it did provide a well resourced agricultural research infrastructure (Morgunov & Zuidema, 2001). The examples of knowledge loss discussed in the above sections refer to processes which were either related to Soviet-era agricultural organisation or which were on-going at the time of independence. I discuss here two instances of where the demise of the USSR led directly to knowledge loss in Khorezm.

Case Study: Kolkhoz Communism Cattle Farm

An eloquent example of knowledge loss is that of a large private cattle farm just outside of *kolkhoz Communism*[xxx] in Gurlan. It consists of 200 cows, 12 pigs, 70 hectares of cropped land and 15 employees. Privatised from the collective in 2001, it was sold to the local animal expert who had worked at it previously and who held high esteem within the village. He had studied animal sciences in a Moscow Institute and was a 'master' in animal health and milk processing. It seems that the specialised knowledge of this master was a key rationale for why it was privatised to him and not to another individual, the purchasing process remained opaque. This was described to me by the current farm manager in that the master had understood how to make excellent cheese, how to care for the animals when they were sick and was an 'expert' on all issues of farm and livestock management (Interview, 19 May, 2005). When I was shown around the farm, the current manager spoke of all the challenges that they now face as a business because the 'master' died the previous year at the age of 43 - leaving only young sons (the oldest being in the 8th grade, circa 15 years old) and married daughters. Thus it was left to his wife to continue as manager - whilst she had some training whilst living in Moscow, she was not

[xxx] Now officially going by another name, but locally referred in the old manner

a 'master[xxxi]'. Thus all the accumulated knowledge of the 'master' was lost, with very little evidence that those left behind were able to continue. "We carry on doing our own jobs as before, but do not know how to do many things that the master knew" (Interview, 19 May, 2005). The decline in the farm was palpable. Only 14 of the 200 cows gave milk anymore, there was a lack of knowledge about breeding and encouraging milk production. Likewise, the business no longer produced cheese of any sort, instead selling (less profitable and less transportable) cream on the local market. The most post-harvest processing that occurred on site was the boiling of cream to make baby food, utilising only a Chinese separator (to separate the cream) and a wood fired kazan (large pot) to boil the cream in. In 2005 the business was, for the first time, growing cotton - largely because they have been unable to continue making money from the cows.

Other efforts at diversification, which had been started by the 'master', were flagging for instance pig production. It was initially the idea of the master, but after he died the herd is being slowly culled. One example of knowledge loss within the farm became evident at an occasion when a first time mother crushed all but one of her piglets. The manager did not know if this was normal or what to do about it. They had only two sources for knowledge to replace that which was lost. Either from the Farmers Union in Gurlan which provided booklets, or from the wife of the deceased master, with few other options apparently open to them. In either instance this external knowledge could not replace the knowledge that we suddenly lost with the early death of the 'master', and with only young sons and no other knowledge reproduction strategy, this knowledge was lost to the cattle farm.

What this illustrates in the case of post-Soviet Uzbekistan is that the agricultural knowledge system has been unable to adapt to the economic and social disruptions of post-1991 independence. There are insufficient levels of knowledge within the local system and, constrained by the state, it is not possible for the local system to innovate and

[xxxi] How much of this was because of her gender and how much was because of a lack of knowledge I am unsure of.

create new knowledge internally, or to access external knowledge sources outside of the state system. As a corollary of this, we see how state control and interests are actually enhanced by the situation, with the farm turning (voluntarily, if for want of other choices) towards cotton production which is a central state interest. Thus the states monopoly on agricultural knowledge is reinforced, with this 'privatised' farm reverting to the centralised knowledge of the state for cotton, precisely because of knowledge loss from the local knowledge system.

Case Study: Seed Selection

Seed selection has, for some species, deteriorated rapidly in the post-Socialist period. The loss of improved varieties, especially for maize, has been caused by a break down in the collective systems of seed breeding, selection and distribution. Whilst the GoU has been largely effective in ensuring the supply of improved varieties of cotton and wheat (the strategic crops) there has been a decline in the availability and quality of improved seeds for maize and some other cultures, including potatoes (Nasriddin, Interview, 26 April, 2005). So whilst state attention is focused on the two strategic crops, which command their own breeding centres, other crops lack centralised seed selection centres. In many ways seeds are a physical expression, an artefact, of knowledge. The ability to select and reproduce improved varieties involves a complex set of knowledge, for example procedural knowledge in how to select seeds and dynamic knowledge in constantly improving strains, and the end result of improved seeds are an expression of this knowledge chain.

Seeds are symbols, invested with knowledge, which illustrate how indigenous knowledge is created, shared and used. Yet what I observed in Khorezm was that this knowledge chain had been broken. Seed improvement techniques that we know existed during the Soviet period (various archival sources; Nasriddin, Interview, 26 April, 2005) have subsequently broken down. For example the sovkhozes and kolkhozes previously conducted a lot of their own seed selection and storage for non-strategic crops whereas cotton and wheat were generally the concern of higher institutes or specialised academies

(Truth in Khorezm, 22 August, 1959). This was conducted by trained specialists, within the ambit of their work at the collective farm, and these seeds were then also passed horizontally and vertically upwards through the network of collective farms (Unknown, 1988: 308-310). What improved seed did exist for varieties such as Maize in the form of imported hybrids, often labelled locally as 'Ulughbek', was distributed through the *kolkhoz* farm system. In post-Socialist Khorezm non-strategic crops are increasingly grown from heritage seeds that the farmers collect themselves. This reversion to heritage seeds has been significant, necessitated by the break down in the former *kolkhoz* farms and systems of seed selection and improvement (Van Dusen, 2006). If we accept that seeds are the physical manifestation of a knowledge chain, then it is fair to discuss the quality of these seeds (in terms of harvest quality and yield) as an expression of the knowledge inherent in these seeds. This is where knowledge has been lost in post-Soviet Uzbekistan.

The varieties of seeds available for crucial fodder crops such as maize and sorghum are inferior to those previously available in collective farms (Nasriddin, 13 April, 2005). The same is even true, to a lesser extent, with wheat. Whilst specialised breeding centres do exist within Uzbekistan, it would appear that high quality wheat seeds are not distributed through the former *kolkhoz* system. Whether for lack of infrastructure, finance or political will, state plan farmers do not always receive improved wheat seeds (ibid.). Indeed, my interviews identified that it was necessary for a farmer to travel to the Jizzax or Samarkand rayons in order to buy improved wheat seeds. The same is not true for all crops. Indeed imported European seeds for various kitchen vegetables and cash crops such as watermelon; cucumber and tomatoes are available in the bazaars of Khorezm[xxxii]. Yet this importation is exactly the point, there has been a loss of knowledge of improved seed varieties and how to develop these within Uzbekistan. The increased reliance on seed sources from outside of Uzbekistan is emblematic of the knowledge lost in the post-Soviet period. Although it should be noted that this situation is complex, as vegetable production has recovered to almost pre-1991 levels (Ali et al., 2003: 21). Yet this has

[xxxii] Vegetable seed distribution is discussed in more depth in a case study in the next section

been because of indigenous knowledge creation and local knowledge sharing, rather than because of any explicit state assistance (see next case study, also Van Dusen, 2006). So whilst the state has continued to invest in cotton and wheat production, this somewhat myopic policy has lead to a marked reduction in the quality of genetic material for other crops, especially those which provide nutritive fodder for livestock. This is because the state does not profit from areas of agriculture outside of cotton and wheat, yet exercises control over the entire agricultural production process. This restricts the development of local knowledge because innovation is not encouraged or even really allowed.

With the break down of Soviet era capacity in seed selection, there has not been investment from the state in non-strategic crops. In some cases the knowledge to do so has 'leaked' back to Russia, in other cases the knowledge potentially exists to select better seeds but the physical infrastructure to allow this knowledge to be used, is not present. Because seeds are a carrier of knowledge, the knowledge on seed selection needs to be used to be effective, in the absence of use this knowledge is being lost, and it is only being recovered because of the growth of indigenous knowledge in Khorezm (see next section) rather than because of any state assistance. This demonstrates how knowledge loss is more fluent than might otherwise be assumed, as we see clear evidence in the case study on seed selection, of how local people (especially women) are actively creating and sharing knowledge through their selective breeding (and sharing) of vegetable seeds, using both indigenous and introduced varieties to deliver improved nutritional and economic outcomes.

4. Limits on Knowledge

> "If I get more I will have to give all to the kolkhoz, there are a lot of taxes ... everyone wants a tax. The environmental protection department, the customs, everyone... so it is not worth having more sheep" (Polvon, 13 May, 2005).

There are also limits on individual farmers and on agriculture in general that contribute to this phenomenon of post-Soviet Knowledge loss. It has been said that "there are no medium sized businesses in Uzbekistan, only large and small ones" (Rasanayagam, 2002:

55). This reflects the dominance of state sponsored companies in all spheres of the economy. Whether these are official monopolies such as the cotton sector, or businesses which are officially private yet are controlled by the same political class that controls the rest of society and the economy, so called ‘minister millionaires’. At the farm level these restrictions are played out in a ‘ceiling’ that is placed upon individual ambitions and entrepreneurialism. Wealth building and value adding to commodities is possible only to the extent that ones’ political capital allows, which in the case of most ‘kolkhozniks’ (rural farmers) is very low. Without going into the details of the economic system, the effect that this has on knowledge creation is stifling. Farmers remain unwilling to expand their production (see above quote) because of a real concern that they will end up worse off. Processors of raw products express a similar concern (Interview, 11 May, 2005). Likewise, because the labour process remains state rather than enterprise controlled, insufficient surpluses are being generated to allow experimentation and greater knowledge flows. There is also a more direct restriction on innovation, with state norms and mandated methods preventing the development of local knowledge. Thus the preconditions for knowledge creation, to replace knowledge that has been displaced with the fall of Communism, do not exist in Khorezm, nor is the current government allowing such a condition to develop because of the link between power and knowledge, which is central to state control over agriculture. These limitations and restrictions on economic life, which have direct consequences for knowledge creation and loss, should be considered as part of the system of knowledge within Khorezm, as a key constraint to indigenous development. This is because knowledge would be able to develop indigenously were it possible for producers to profit from further developing their production and labour processes. Yet this is not possible under the current system of state economic and knowledge control.

IV. COLLECTIVE KNOWLEDGE

Collectively, if not in all cases individually, the population of Khorezm are a repository of skill and experience essential to the farming system. This collective knowledge is the sum total of the know-how, skills and *aptitude* of the community. The distinguishing factor of collective knowledge is that it is held within the rural community and is largely not acknowledged as knowledge *per se*. Rather; collective knowledge is knowledge which is taught and developed in an experiential manner. This is then supplemented, where necessary, by accessing the knowledge of the Master, however, collective knowledge is exhausted before turning to specialised knowledge. In any case, the knowledge of the Master is closely linked with collective know-how, both drawing on and contributing to collective knowledge, as well as the fact that most Masters live and operate within the rural community. The case studies for collective knowledge are those of everyday work, conducted by the majority of the population, considered by them to be obvious and self-apparent. This collective knowledge is the everyday know-how of the rural population, essential to survival, yet largely unacknowledged. It is always dangerous to classify the behaviours and knowledge of such a large group as the population of rural Khorezm. I am equally aware of the dangers of extrapolating from small sample, anthropological research, and attempting to define characteristics of collective knowledge for the entire Khorezm region. On the basis of my triangulation procedures and cross-referencing (see chapter three) I believe that my sample possesses the depth and breadth to justify discussing collective knowledge in Khorezm. Despite the methodological challenges there are several features of collective knowledge that contribute to our understanding of the indigenous knowledge system of Khorezm. First amongst these is the relatively unitary nature of collective knowledge. Secondly, and demonstrating greater variability, is the inter-linkage between livelihoods and local knowledge. Also important is the efficiency and effectiveness of horizontal knowledge sharing, which contrasts with the slow rate of knowledge creation.

1. Unitary Nature

On my first entrance into the field I was struck with how unitary the knowledge of the rural community was. This may be in part caused by the long history of forced political conformity and internal social controls, or it could be a result of some *a priori* cultural preference for conformity, I have insufficient evidence from my research to pronounce on this. Either way, it reinforces the key theme of culturally situating knowledge, of recognising that the local knowledge of the community is understood and framed in a specific way in Khorezm. I present here, from my field research, a set of illuminating experiences of interacting with the collective knowledge of the local community in Khorezm. Early on in my entrance into the field it was necessary to begin the soil preparation and planting of the '*argorod*' attached to my house in the kishlak. This experience forms a case study to demonstrate the unitary nature of knowledge in the kishlaks. This is followed by a more detailed analysis of the modalities of how this conformity is ensured through the horizontal modes of knowledge sharing.

Case Study: Preparing the Argorod (оғород)

Almost every household in the Kishlaks of Khorezm has a small (0.1 – 0.35 hectare) piece of arable, irrigated, land proximate to their house. These plots, in combination with the larger tamorka plots (located away from the house) play a vital role in ensuring food security and rural livelihoods, a matter discussed below in sub-section two (livelihoods). I too had such an *argorod* immediately attached to my house measuring 0.1 hectare. My entrance into the field coincided with the start of spring and the necessity to prepare the *argorod* for the year. Taking advantage of this opportunity to access local knowledge as an observing participant I attempted to replicate as closely as possible the 'local method' of preparing the *argorod*. I did this by enlisting the help of Bemat, the local man employed to assist us (my colleague and I) with life in the Kishlak. Malihat, our housekeeper also had a significant input, as well as numerous other individuals from the village who provided advice and feedback on our plans. In addition, a local agronomist (and later key informant) was enlisted to provide specialised input[xxxiii]. The most striking

[xxxiii] Indeed, the agronomist had been advising on the household plot prior to our entrance into the field – he had been pruning fruit trees to ensure growth as well as developing grape vines.

aspect of all the advice was its unitary nature. It is striking because in the literature (Richards, 1985 etc. discussed in chapter three) one expects to find active experimentation with different methods and a variety of alternative options become available. So whilst I went to the field expecting to find vibrant examples of indigenous knowledge at work, this was not entirely the case. Rather, in each aspect of preparing the *argorod* there was little room for discretion or deviation from accepted methods.

The first aspect of preparation was the leaching of the soil, whereby the land is flooded twice or three times in order to wash away all the salt that rise to the surface during the previous growing season. Leaching is followed by the turning over of the soil, a labour intensive task for which the whole household is mobilised (authors' participant observation). As may be expected there is one way of doing this task. Ignorance of the 'correct way' to do this on my part was met with a degree of mockery and disbelief, as working the soil is so basic in the body of collective knowledge that ignorance of it is difficult to understand[xxxiv]. This know-how is universal, all persons living in the Kishlaks possess it and there is little or no variation in its application. Once the land was tilled by hand, there was a need to irrigate and plant the seeds. An interesting example of collective, declarative knowledge is that of irrigation types. Essentially there are two types of irrigation options for domestic plots, canal water relying upon waiting for one's turn, or using an electric pump from a domestic well. There is a clear dichotomy made between these two irrigation sources, canal water is 'warm' water and ground water from an electric pump is 'cold'.

> "With this cold water the seeds will take twenty days to rise, the cold water cools the soil – the water from the canal is better because it is warm, the seeds will rise in ten days" (Bemat, 7 April).

This simple declarative classification was confirmed on the same day by a follow up interview with two informants from the kishlak, who had visited the *argorod* to observe what we were doing:

[xxxiv] Conversely, once I had become proficient at the manual working of soil – I gained respect from several key informants by being able to demonstrate that my know-how was equivalent to (or conformed to) the collective know-how. One agronomist commented "he does it like a professional" (13 April) and thereafter attributed me visibly more respect and assistance.

CW: “We just finished irrigating using the pump, is that the right thing to do?”
Informant One: “The pump water is cold, is slows down the seeds rising – canal water is better”
CW: “Is canal water more, or less, salty?
Informant Two: “It depends, you cannot say exactly”

There is a scientific basis for the preference for canal water over ground water, as cooler water does indeed slow germination. What is interesting from a knowledge perspective is the way in which it is simply classified as cold or warm, an excellent example of simple, yet highly functional, declarative knowledge. Likewise this knowledge is unitary, follow-up interviews in different rayons and with a wide variety of farmers confirmed this classification. This unitary knowledge occurs not only within irrigation options at the household level, but also in terms of planting decisions and especially with leaching. This origins of this knowledge would, contra the example above, seem to be purely indigenous. There is almost no large scale use of ground water for cotton and wheat (the amounts of water would be too great) and thus the influence of the state is minimal. Rather this is evidence of local experimentation and experience, where the local community has decided that certain types of irrigation are superior. There is reasoning and logic behind this decision and it draws on various forms of declarative knowledge, yet places it within a procedural and dynamic framework of knowledge creation. It is thus a rare example of local knowledge which exists outside of the limits of the knowledge governance system.

2. Horizontal Knowledge Sharing

A crucial aspect of how the collective knowledge system works is through the horizontal sharing of knowledge between members of the community. This is informal in nature, although some modes of horizontal knowledge transfer may occur in an organised or ritualistic manner, and some formal events may also serve a knowledge sharing function. I select here seeds as the most articulate example of collective, horizontal knowledge sharing. Given the knowledge which is invested in seeds, as transmitters or carriers of knowledge, seeds are a useful artefact of knowledge. Usefully, because they are a physical objects, the networks through which they moves are more easily mapped and the exchange of knowledge followed.

Case Study: Seed Sharing

My investigations into seed sharing within the rural community, especially for vegetable seeds associated with domestic (tamorka) production, identified that seeds move freely between households within villages as well as between villages and entire regions. Yet this network, whilst largely horizontal still has nodes and central points which connect between individuals. It is thus not dissimilar from a 'knowledge network' with knowledge brokers and knowledge users, as discussed in the knowledge management literature (Kiong & Bun, 1999). I have already discussed in this chapter why we can see seeds as a physical expression of some forms of agricultural knowledge. In the case of vegetables and fruit for domestic consumption, there is also knowledge of nutritive value, suitability for preserving and decorative value, inherent in these seeds. This helps to understand the gendered nature of the seed sharing network, which is largely women based. In analysing how seeds, as expressions of knowledge, are sharing within the community I conducted an in-depth case study in (initially) my kishlak, adopting a 'follow the seed' research approach by working outwards from one family and tracing the seeds which had been shared, with whom and why. From this 'snowball' survey of seed use, there are several key aspects to the horizontal seed sharing networks which merit discussion, these include; seeds are shared for free, neighbours and social acquaintances are the main avenues for sharing, introduced varieties move quickly into the system and that there is a gendered aspect to how seeds are shared.

> "If some people do not have the seeds, or if their seeds are bad, of course we will give them free of charge to friends, neighbours and relatives" (Boris, Interview, 4 August).

Within social circles seeds for household production are shared free of charge and without immediate reciprocity (although social capital may be expended or gained, cf. Menkhoff et al. 2006). Naturally improved varieties, enhanced through self selection and adaptation to local conditions, are shared between different households as a way of improving yield and managing risk (Karima, Interview, 4 August). This horizontal sharing of seeds tends to occur within already existing social circles, be these friendly relations within the kishlak or between family members now living in distant parts of the country (Karima, Interview, 4 August). In my study I found how quickly (within two growing seasons) improved seeds had moved through eight different levels of social

connections, within three different geographic locales. Yet the actual introduction of these improved varieties was from a single source, or node. Within the purely local knowledge system (i.e. discounting externally introduced seeds) there is a linkage here with masters who do charge for their seeds (and especially for their grafted fruit trees and grape cuttings) yet once these improved varieties are introduced into the system they move rapidly through the horizontal networks. These masters form central knowledge nodes within the system, those who can afford to seek improved varieties of (especially grapes and fruit trees, which are considered higher value and more difficult to self-seed) genetic stock, which then flows into the local knowledge system, often following the same paths as for tomatoes and other vegetables, which do not require the same level of 'master' knowledge. These transmission belts of knowledge are the same, whether it is local knowledge, specialised knowledge or external knowledge. For example imported potatoes that were provided free of charge by German Agro-Action[xxxv] (GAA) were observed by me to move very quickly through horizontal networks, usually between women and often between mothers and daughters[xxxvi]. It was explained to me that "sometimes we all sit together as neighbours and friends and share our seeds - if the seeds are good" and that these new potato varieties had in fact come directly from her married daughter who was living in a different village (Karima, 4 August, 2005). Likewise the 'lamp'[xxxvii] tomatoes that were introduced by GAA spread quickly through these same horizontal networks. An informal survey of ten households in my village identified that all of these households were growing 'lamp' tomatoes and that in every case these were grown for the particular purpose of preserving over the winter, a task for which it was agreed that they were eminently more suitable than the 'circle' variety. In each case these

[xxxv] Deutsche Welt Hunger Hilfe, an International NGO also working in Khorezm and conducting a range of activities there, focused on agricultural humanitarian assistance.

[xxxvi] Because of the virilocal tradition, married women in Khorezm move to live with their husbands and cease to be part of their mothers' household, even in genealogies prepared by respondents this was often the case. However, this is not the end of social or familial interaction, with 'guesting' to visit one's daughters being an obligation of the parents – including an element of social control on the part of the parents to ensure that their daughter is being well cared for. Such interactions formed the basis for these seed sharing activities.

[xxxvii] Labelled as such because of their elongated nature, that means that they look more like a light bulb instead of the 'circle' round variety.

households had not been the initial recipients of the GAA seeds, rather they had passed between three to eight prior households, evidencing the speed and efficiency of the horizontal knowledge sharing networks. This adaptation of local and indigenous varieties to meet particular household consumption requirements ties closely with the issue of gendered relationships in horizontal knowledge sharing. In general the household tamorka is *primarily* the concern of the women in the household. This is not to claim that it is an entirely female affair, it is not, men play an active role in the tamorka also. However as women are responsible for providing food for the household, and as the tamorka is the main source of this food, it is unsurprising that women take responsibility for this. However, certain parts of a tamorka are often the responsibility of the men, for instance the carrots being under the control of one of my key informants, whilst the rest of the plot was the women's concern. But in general women play the lead role in tamorka production and associated horizontal seed sharing, making especial use of their social networks and sharing seeds through daughters living in other villages, making a crucial link *between* different kishlaks. Thus we can understand seed selection and sharing as a form of horizontal knowledge network, which operates through central nodes (masters, knowledge brokers) as well as having significant inter-linkages between actors in the network, especially women. There is a real potential to harness these networks in introducing new seed varieties, as the GAA example shows, in a way which can benefit the local knowledge system by using the existing knowledge infrastructure.

V. SUMMARY OF INDIGENOUS KNOWLEDGE

The system of indigenous knowledge presented in this chapter is one which is embedded in the culture and history of the Khorezm region and the Uzbek nation. The history of Khorezm defines the knowledge system, changed in the past century from one of indigenous to local knowledge. Likewise specific aspects of the system, such as mastership are influenced by both Soviet era labour organisation and cultural preferences for a certain type of authority. In the same way, collectivisation has created a situation of knowledge loss which is not yet being halted. These dynamics of knowledge occur within the changing context of Khorezmi culture, for instance the hierarchal and patriarchal nature of Khorezmi society, which apportions certain types of knowledge to different groups, pigs to Koreans, bureaucratic knowledge to men, as well as ranking the validity of knowledge in terms of someone's social status. Presented in this chapter is my attempt to explain how the local knowledge of Khorezm is constituted and how it interacts with other knowledge systems. One of the key groups of individuals at these interfaces of knowledge are those masters who possess *ex officio* or state roles in agricultural production. This group is closely connected (sometimes indistinguishable) from the group of other masters, whose informal contributions lay largely outside of the realm of direct state control. This grouping includes all those 'masters' in Khorezm society who work both cooperatively as well as in competition, and the variance within this group means that it should not be mistaken for a homogenous body. Rather it is assessed here for its connections both with the ex officio masters and with the *fermers* and *pudrats* in the indigenous system. Together these three groups coalesce to form a body of collective knowledge, which could be considered the baseline of local knowledge that all actors share. Other forms of knowledge are held either exclusively by one group, and traded on the marketplace of ideas within agricultural Khorezm, or are shared with other groups. Knowledge loss is a feature of the local knowledge system, with a great deal of knowledge being simply destroyed and not replaced. Influencing all of this are the strictures of the state system, especially at the interfaces created by the state plan system discussed in detail in the next chapter.

CHAPTER 5
KNOWLEDGE GOVERNANCE IN UZBEKISTAN

'Knowledge governance' within Khorezm is a system of political power and 'correctness' determining what knowledge is created and how this is disseminated, shared and used. This governance knowledge structure (cf. Stehr, 1994) politically controls knowledge in such a way that it stifles knowledge generation and education, utilising both formal and informal mechanisms of control. In stating this I am describing the institutions and 'rules of the game' that together create the 'governance structure' of knowledge in a country. This builds upon work by Evers (2005) in examining how knowledge is governed and the constructive role that knowledge can have for development. The model I present here is more intricate than a uni-linear relationship, rather a complex set of social and economic relations determine which forms of knowledge are politically acceptable. I suggest that this political process also occurs differently within Uzbekistan, with peripheral regions such as Khorezm having less 'upward' input into the political process, and hence less room for manoeuvre, than exists within Tashkent. I explore the system of knowledge governance within Uzbekistan from a historical/anthropological perspective, placing little emphasis on the legal elements. In Uzbekistan, formal laws and rules are enforced selectively and imperfectly, so it is more useful to examine how governance works in action, rather than how remote legal apparatus say it *should* work. Starting from an historical review of 'Soviet Science', I examine how particular policies on knowledge had their impact on Khorezm, especially in creating a society climate of fear. I then examine the way in which Soviet science was deliberately politicised and what progress has been made post-1991. This politicisation is explained in terms of changing modes yet unchanged impacts of politically controlled science, including central curricula planning, the growth of the presidential cult and the systems of punishment and rewards.

I. ‘SOVIET SCIENCE’ - A HISTORY

Agricultural production was very important to the Soviet system. Successive Five Year plans emphasised increases in the production of key commodities, especially grains and cotton. This was both to ensure food security, but also to allow the creation of an industrial and scientific system that would ‘Catch up and Overtake’ (догони и перегони) the West. In order to achieve the production increases required by such ambitious plans, significant investment was made into the agricultural research system of the USSR. This system took shape in the ‘All Union Academy of the Sciences’ (The Academy) named after V.I. Lenin as VASKhNIL in 1929. ‘The Academy’ always reported to the central government, initially directly to the cabinet of ministers and then to the Minister of Agriculture (Morgunov & Zuidema, 2001: 7-8). “The first 42 members of the Academy included the best agriculturalists and biologists of the time (14 of them were later to die in the Stalin camps)” (Morgunov & Zuidema, 2001: 8). Research priorities were dictated from the top-down, with research aimed at meeting the direct needs of subsequent Five Year plans. This close relationship between the Academy and the Communist Party led to science becoming ‘politically correct’ in order to gain resources and avoid punishment. I explore here how the early, Stalinist, history of science in the Soviet Union shaped the institutions and individuals within them. By drawing on the case study of Soviet science at its worst, and perhaps worryingly at its closest level to agriculture, I illustrate how the system of political control over science was established at both the Soviet level and within Uzbekistan and Khorezm. This is of course not to say that Lysenkoism was necessarily the norm for Soviet science, other examples such as Linguistics and Physics research provide counter examples. However it is certainly representative of several phenomena[i]. I give here some examples of Western scientists and extension agents who worked in the Soviet Union during this period. Their stories provide an illuminating insight both into science and extension during this period as well as into the dynamics of foreigners working in agricultural extension.

[i] This is an on-going historiographical debate, which I discuss in greater length in Wall, 2006a, ‘Lysenkoites, Physicists, and Scientific Cultures: Approaching the Politics of Stalinist Science’.

1. Politically Correct Science

Through the 1920s and 1930s, the Academy became a tool through which the Communist Party "tried to make science knuckle down, to make it an extension of itself" (Nikonov, 1990). Academy membership became the greatest honour of Stalinist Sciences "shared by brilliant scientists and ignorant political functionaries" (Krementsov, 1997:3). The process of political correctness went both ways, with party members and high ranking politicians seeking academic recognition (often on spurious grounds) of their contributions to academic research. Honorary degrees, questionable doctorates and membership of the Academy were all used by politicians to enhance their prestige and gain legitimacy for their policies during the Soviet period (Iurevich, 2001: 60). However the politicisation of science was largely in terms of the scientific agenda being determined by political masters. This was very much along the lines of 'Communist' or people's science, derived from Marxist and Leninist philosophy:

> "This communist science profoundly affected the professional culture of Russian science as a whole: during the 1920s, a new lexicon and a new polemical style appeared in scholarly writings. References to Marxism and practicality began to permeate scientific literature, and scientific criticism acquired a militant, combative tone … scientific literature was first and foremost a 'fight for materialism'" (Kremenstov, 1997: 24-25).

The move towards materialist science, distinct from the 'bourgeois' science of the West, was premised on a quote from Marx's Eleventh Feuerbach thesis that disparaged impractical philosophical enquiry.

> "Die Philosophen haben die Welt nur verschieden interpretiert; es kommt darauf an, sie zu verändern"[ii]

Thus research with no clear practical application to the most recent five year plan was considered subversive and the independent peer review of research became less important than political revision. By the 1930s, Krementsov (1997: 45-47) argues that all forms of scientific endeavour had been 'Bolshevized'. This included the adoption of party etiquette in group behaviour, such as public repentance and self-criticism, as well as constant reference to Marxist ideology in scientific papers[iii]. This was followed by the

[ii] Philosophers have only interpreted the world differently, what matters is to change it. (Evers, *pers.comm*.)

[iii] This practice continues in a modified form in Uzbekistan today – many academic articles start with a quote from Islam Karimov, the president, to legitimate or 'authorise' the arguments made.

introduction of ‘social’ criticism, where denouncements of ‘wreckers’ was used to ‘expose’ and ‘debunk’ those who dared to deviate from the party line (Krementsov, 1997: 46; Sheehan, 1993: Ch. 4). The aversion to ‘Bourgeois’ science was so strong that official publications attributed every important discovery to Soviet scientists, sometimes reaching ridiculous extents: “the formula $E=MC^2$ <was> attributed to Lebyedyev and S.I. Vavilov … <in an> article on space and time, Einstein was not mentioned, but instead Butlerov and Fyodorov” (Sheehan, 1993: 233). This politicisation of science, especially in the field of agriculture is typified by the case of Lysenko, examined below in ‘Scientific Culture’. Perhaps the greatest impact of science in the Soviet Union being ‘politicised’ was in the determination of research priorities. The central government choosing what would and would not be researched. In the case of agriculture there was a huge shift in the priority given to rural research. The 1920’s through to the 1940’s saw agriculture at a dominant position as an engine of economic development, whereas by the 1960’s the emphasis had shifted to other areas; notably mathematics, advanced physics (especially those associated with space exploration) and astronomy.

A comparison of speeches by the heads of the Academy of Sciences to the British Royal Academy during these periods is eloquent on this point. For instance Kolesnikov (1943) reported in his speech ‘Branches of the Academy of Sciences of the USSR’ on a wide variety of advancements in agricultural science with almost no mention of research in other disciplines. These ranged from new sheep varieties in Kazakhstan, new cotton strains in Armenia and orchard development in Tajikistan (Kolesnikov, 1943). There is limited mention of new observatories and some conferences, for instance on elasticity in mathematics, yet these are certainly positioned within the speech as significantly less important. This is in stark contrast to the speech, in the same forum, in 1965 by Keldysh, then President of the Academy of Sciences in the USSR. In this speech Keldysh almost ignores the agricultural sciences, focusing exclusively on the developments in “fundamental research: in mathematics, physics, chemistry, geology, biology, and in the humanities” (1965: 442). As mentioned earlier the real emphasis is on advanced physics and mathematics, with a caveat that this research must have applications. Keldysh states plainly in the introductory paragraph that “in the twentieth century science has come to

play a special role in the development of society and the role of the state in organizing science has been enhanced" (1965: 441). In this regard he was commenting on a phenomenon which applies and applied to both Russia and the Western world. Science has grown in importance in almost every jurisdiction and in many countries, including Europe and North America; the state has assumed an ever increasing commitment to funding and directing scientific research. Soviet science exhibited this state direction to an extreme degree, which had both positive and negative results for science, and I attempt to unravel these below. This state control of science, as well see in section II, also had a huge impact on rural Uzbekistan.

2. Intellectual Monogamy

The second main issue in Soviet KG is that of scientists being unwilling to co-operate or share research data, *contra* the intellectual promiscuity of Western science. This is somewhat of a paradox as VASKhNIL did provide a potentially useful forum in which scientists could network, communicate and gain recognition for their achievements (Morgunov & Zuidema, 2001). Whilst this recognition was unlikely to be financial, incentives for success included coveted overseas trips as well as promotion within the party system, which in turn would produce material gain. Counterbalancing this was the lack of certainty for scientists. Introducing new scientific ideas, especially if they questioned the politically correct party line, was a dangerous occupation. Likewise, with a constant lack of certainty about what would be politically acceptable, there were risks in straying from the path of enquiry set down from above. It was a fear bound system with disincentives for experimentation beyond the 'realm of thinkable thought'. Despite the rewards bestowed on favoured scientists, there was little to be gained from creating new scientific theories and knowledge. Rather the purges of the scientific elite showed that this was a precarious position to take, with previous favourites of the regime suffering at times the worst punishments. To defend against these political risks, scientists coalesced into the idea of there being 'two camps' in science, that of "us" versus "them" (Krementsov, 1997: 218-219). The juxtaposition of Soviet science with Western and Bourgeois science became a central motif in VASKhNIL meetings and

scientific publications (ibid) and can be read as an attempt to protect scientists within the Union from charges of political incorrectness. This is evidence of how such a system of negative incentives for the creation of new knowledge and potential punishment for disseminating politically incorrect knowledge created a climate of knowledge control. Knowledge control was exercised by the state over scientists as well as with a high degree of self-censorship by the scientists themselves. Such a system of limited information sharing is characterised in KM and KG literature as stymieing the creation of new knowledge (Antonelli & Quéré, 2002). This may well relate to the overall very low return on investment of agricultural research in the Soviet era (Pray & Anderson, 1997).

3. Scientific Culture

The final aspect of Soviet science is the unique epistemic, or scientific, culture that it created. This obviously links very closely with the prior two points. KG and scientific culture in the Soviet era (at least at its lowest ebb) is illustrated by the perverse case of 'Lysenkoism'. The case of Lysenko is that of the triumph of pseudo-Science and ideology over objective research. In this case Lysenko, a man from peasant roots with little scientific training was able to gain support for a new 'Soviet science' which made Mendelian genetics illegal and opposed experimental biology (Roll-Hansen, 1985: 261-262). By promoting the vernalisation of seed (itself a useful technique) Lysenko was able to gain support for a school of pseudo-Science which saw (through the prism of Soviet ideology) a victory of "faith in the environment as opposed to heredity" (Jovarsky, 1961: 39). The driving force behind Lysenko was his explicitly non-scientific background. Indeed *Pravda* praised Lysenko in 1927 as a 'barefoot scientist' a sobriquet he used often. The same article went on to attribute him with solving

> "the problem of fertilising the fields without fertilisers and minerals … turning the barren fields of the Transcaucasus green in winter, so that the cattle will not perish from poor feeding, and the peasant Turk will live through the winter without trembling for tomorrow" (Pravda, August 7, 1927; cited in Joravsky, 1970: 58-59).

The contemporary reader is of course surprised at the extreme and emotive nature of the praise given by Pravda, yet this style is characteristic of both Pravda at the time and of Lysenko's place in the regime. It was the ability to promise and promote the unrealistic that gave Lysenko and his adherents so much influence. When presenting before the

Academy or in political fora, the promises of superior yields coupled with a reputation for 'peasant science' out tongued more reasoned and scientifically grounded arguments. However, the ascendancy of Lysenkoism was only possible because of support from the highest echelons of the Communist Party. Whilst Lysenko was a non-party member apparatchik, Stalin and after him Khrushchev, gave unfettered support to this counter scientific movement. Enabling it to hold prominence from the middle of the 1930's, until 1964 when Khrushchev lost power. During this time dissent was quashed through a succession of purges and in many respects the progress of Soviet agricultural science was stopped. Many of the finest agricultural scientists were purged during this time, at incalculable cost to future research. However, this is not to say that Soviet science was without its successes. Rather, the immense resources of Soviet science led to a number of impressive advancements, many of which were quickly translated into material gains. For instance Kremenstov (1997: 3) points out that "the greatest achievements of Soviet science occurred exactly at the time of the greatest repression: practically all Soviet Nobelists received this highest scientific award for research done when arrests were common and the Gulag camps overflowing". Equally, huge grain shortages and consistent agricultural underperformance are often attributed to the self-destructive agricultural policies promoted by Lysenkoism (Joravsky, 1970: ix). Herein lays a paradox, for whilst the Soviet scientific culture was one of repression and political correctness it also achieved some outstanding successes. Suggesting perhaps that the Lysenko affair was an aberration of Soviet Science rather than the norm. This a contention disputed by Joravsky (1970: x-xi) who posits that Lysenkoism was the *norm* for Soviet Science[iv]. This argument remains unresolved and is an issue of continuing contention in post-Socialist literature. More important for this thesis is the impact that Lysenko and Soviet Science had upon Khorezm and Uzbekistan. However first it is instructive to examine some of the recorded experiences of foreigners attempting to work in science, research and agricultural extension during this time.

[iv] With the possible exception of Nuclear Physics in the post-World War Two race to achieve nuclear parity. However Kneen (1998: 1184) argues that meetings were held in 1949 to address "the situation in physics in light of the VASHKhNIL meeting", the meeting referred to was in 1948 when Lysenko triumphed over 'formal' genetics. Thus the exception of physics from politically correct science may have been only slight.

4. Foreigner's Experiences

Most Western histories of Soviet science and agriculture during the Stalinist period tend to focus on the accounts of Eric Ashby, an Australian plant physiologist and diplomat, based in Moscow during this period (Ashby, 1946). This work makes a useful contribution to the debate about Lysenkoism yet is largely outside the interest of my dissertation. Of considerable interest are the accounts of some lesser known Western scientists and agricultural extension agents who worked in Russia during the Soviet period. Deborah Fitzgerald (1996) provides a fascinating investigation of American farmers, academics and industrialists who worked in Stalinist Russia, at the invitation and expense of the Soviet government. This help was sought, on a commercial basis because of the view by the Communist authorities that American agriculture represented an enviable and emulateable model of 'industrial' agriculture (see 'Mechanisation' below). Gladly some contemporary accounts were published by those who travelled to Russia, one author's articles for the farmer's journal 'Wallaces' Farmer' provide some insight into how he perceived the situation, with titles such as; 'Nine out of Ten Pigs Died', 'Where Hired Men Issue Orders' and 'What is Russia's Major Vice?' (Fitzgerald, 1996: 460). Another account argued that the Soviet worker "especially the ignorant, uneducated workman, has a sublime faith in his own knowledge and ability which is ludicrous" (ibid: 477). A defining aspect of these accounts is how they, as many foreigners attempting to re-create the technical advances of their homeland, regarded the issues as purely technical, "they presented their plan as though it were a strictly technical and nearly formulaic problem that could be solved without considering social, psychological, political or cultural issues at all" (Fitzgerald, 1996: 469). The results were perhaps predictable:

> "Stirniman recalled his horror at discovering one tractor crew taking a break and draining all the hot water from the tractor's radiator so that they could make tea. Jean Walker, a tractor engineer, complained that the Soviet field workers refused to do any maintenance work on their tractors, were satisfied if their tractors could run on two or three cylinders. Combines that would have worked for ten or twelve years in America were 'ruined' after two in the Soviet Union … in an embarrassing irony, Walker related that while he and his combine crew helped the peasants finish their traditional harvest in 1930, by 1931 the peasants were helping Walker, so broken down was his machinery" (Fitzgerald, 1996: 476).

Telling in many ways is the similarity between these experiences of Americans in Russia, and the frustrations and set-backs (although less well documented, and certainly not as

forthright) that Russians experienced in Soviet Central Asia (Hodnett, 1974). In each case the problems with adoption was seldom one of technical adequacy or even the appropriateness of the machinery in a purely technical tense. What was the constraining factor, both in Western lead and Russian extension during the Soviet period, was an incognisance of the social, political and economic issues at hand (Hoddnet, 1974; Pomfret, 2002). These Soviet experiences are not all together dissimilar from early colonial experiences of extension, which typically introduced improved technologies and cultivars to 'progressive' farmers, through "imperious and regulative" extension agents (Baxter et al., 1989: 6). Similarly, development experts in the post-WWII period also attempted to 'modernise' under-developed agriculture, by introducing new technologies which in many cases were unsuitable to local working conditions, not from a technical standpoint, but from a social and economic perspective, these technologies were not suitable and thus were not widely adopted (Swanson et al., 1997). What the colonial extension agents, the Russian commissars and post-WWII development experts all failed to recognise is that agriculture occurs within a cultural context which cannot simply be ignored. Current practices in use by farmers reflect not only technical knowledge but also fit into clearly understood (locally) relationships between balancing workload, accessing labour and credit, managing risks and returns as well as ensuring domestic food security. That a consideration of these factors leads to farmers making different choices than those suggested by the somewhat simplistic aims of extension agents (increased food production, profitability) is unsurprising. What is telling is the way in which three different development paradigms all made the same essential mistake in attempting to plan and direct agricultural development, without considering the local context in which new agricultural technologies must operate. This irony was discussed by Friedman:

> "The objectives of foreign economic aid are commendable. The means are, however, inappropriate to the objectives….The proponents of foreign aid have unwittingly adopted a basic premise of the Communist ideology that foreign aid is intended to combat. They have accepted the view that centralized and comprehensive economic planning and control by government is an essential prerequisite for economic development" (Friedman, 1958: 77-78).

It would be unfortunate if the ZEF project were to reinforce the mistakes of previous development approaches, in introducing technologies in a manner incognisant of the local realities and cultural context.

II. THE IMPACT OF 'SOVIET SCIENCE' ON KHOREZM

A review of available archival materials, as well as interviews with current and retired academics, identified that the impact of 'Soviet Science' was (and remains) significant. Available archival materials such as the newspapers 'The Truth of Khorezm' (Хоразм хакикати) and 'The Truth of the East' (Правда востока) were eloquent on the role of politics on science in Khorezm. More general articles on Uzbekistan were sourced from 'The People's Word' (народный слово) which provided an official view from Tashkent. Seminal books referred to on agricultural science in Khorezm demonstrate the influence of power on state goals, such as mechanisation and increasing cotton production, in agricultural science in Khorezm[v]. Similarly, interviews and primary data collection provided a rich insight into the history, as well as current state, of science in Khorezm. Showing how political aims found voice in scientific research. Thus politically mandated development goals, such as mechanisation, became the aim of research. There were formal mechanisms to ensure this occurred. Yet more insidious was the 'climate of fear' within science which informally enforced control of the sciences. The impact of this fear on scientific culture is more difficult to assess, yet we see the impacts of it in Khorezm in a refusal to conduct research outside the scope of what is defined by the centre (Moscow and later Tashkent). Rather local research was confined in its scope and the results were somewhat pre-determined by the findings of 'central' institutes in Moscow or Tashkent. As I discuss in the pursuant section, little has changed in this regard, indeed the centre-periphery relationship has been reproduced in an only slightly altered form. To illustrate my thesis that research is defined by formal state aims and an informal culture of fear, I draw upon three case studies. The first of these is mechanisation, which can be seen as a key aim, and propaganda victory, of Soviet science in Khorezm. Second, is the tendency to take state aims and to adopt these as the goals of scientific research. Thirdly, I discuss the politicisation of science in Khorezm in terms of imbuing agricultural, economic and social re-organisation with Communist ideology.

[v] For assistance with these references I am indebted to Professor M. Matniyazov of Urgench State University's Department of History.

1. Mechanisation

> "Our country has left behind the USA and other capitalistic countries of the planet in the mechanisation of the agricultural production and in the usage of technology. It is known that farming in the countries of the Central Asia used to be very poor. Omach and ketmen – were all the previous 'techniques'. There was not even any talk about agricultural machines! At the moment in Uzbekistan there are 14 tractors per thousand hectares, while in France 7 tractors for the same area, in Italy 4, and much less powerful." (The Truth of Khorezm, 28 December, 1952)

The mechanisation process and how this was implemented in Khorezm tells us a great deal about scientific research and technology transfer in the Soviet era. The planting and especially picking of cotton was one of the last major crops to under-go mechanisation in both the United States as well as in the USSR (Hodnett, 1974: 60-62). This was largely due to technical difficulties that resulted in crop losses and processing difficulties (Pomfret, 2002: 171). Almost immediately after the Second World War the Soviet leadership invested considerable resources in promoting mechanisation, both as a means to ensure increased cotton production as well as for the propaganda victory of replacing arduous work with machinery (Pomfret, 2002: 183). This fitted with the Soviet idealisation of 'industrial agriculture' which saw the introduction of machinery and 'industrial' modes of production (both technological and in labour organisation) as the ideal state of development. This paradigm of technologically lead development is not of course without parallel, yet the particular lengths the Soviets went to (especially with labour organisation) to achieve it are remarkable. The first Russian made cotton picker was the SkhM-48, a vertical spindle picker, which appeared in 1949 to much political fanfare. This was introduced to Uzbekistan in 1950 and promoted extensively in Khorezm by the Soviet authorities (Zinin, 1975: 105). Interestingly there appears to have been considerable resistance at the *kolkhoz* level, especially by *kolkhoz* managers, to the disruption (to the labour process) that this new machinery caused. This normally took the form of reporting that the machinery was broken or somehow un-operational and then proceeding with hand-picking of cotton, a practice that was warned against in the popular press (Truth in Khorezm, 1 April, 1960). Other 'Truth in Khorezm' articles from the same period (for which the exact date is unavailable due to inconsistencies in the archives) note that "even though the *kolkhoz* decision makers do know that, the planning of the fields is not being done properly", where properly should be read as using mandated equipment. Zinin (1975: 109) reports that "for the 19 years 1950-1960 the

mechanization level went up to 15% ... still the machines were not used on a big scale". The initial reaction to this was to supply greater amounts of equipment, despite the fact that existing mechanical harvesters were not being utilised fully. This indicates that central state control over the district level labour process was not as strong as they would have desired, with local adaptation of labour practices, reinforcing my earlier point about introducing new technologies without appreciating the cultural context in which these technologies operated. The central response was to coerce local leaders into using the machinery, with threats of dismissal for non-compliance. Despite these threats, mechanisation levels failed to grow at the rate Soviet planners hoped for, and indeed declined in official (All-Union) statistics from 1981 onwards (Pomfret, 2002: 172). It appears from available statistics, bearing in mind that non-performance of Moscow mandates was politically risky, that Khorezm led the way in refusing/failing to mechanise at nearly the rate expected, a fact reflected in the declining number of mechanical cotton harvesters from 1971 onwards, some ten years ahead of the All-Union average and contrary to trends within Uzbekistan (except for Tashkent, where urban growth and industrialisation played a role in the shift away from agriculture in general).

Table 2: Cotton harvesting machines in Uzbekistan, by regions (pieces, year end)

	1965	1970	1971	1972	1973	1974	1975
Karakalpak ASSR	2 029	2290	2 274	2 228	2210	2315	2 456
Andijon oblast	2 063	2 396	2 277	2 207	2 362	2 366	2 265
Bukhara oblast	1 402	1949	2108	2115	2 258	2 371	2 498
Djizakh oblast	786	1 306	1 718	2133	2 577	2619	2 675
Kashkadaryo oblast	613	1 394	1 469	1 381	1 529	1902	2 157
Namangan oblast	1 241	1 802	1 836	1 981	2 305	2 074	1959
Samarkand oblast	2 463	2 635	2 688	2 560	2 562	2 657	2 697
Surahandaryo oblast	1 121	2 084	2123	2 232	2214	2 385	2 438
Sirdaryo oblast	2 203	2 743	3417	3 086	2715	2 844	2949
Tashkent oblast	4 163	3 431	3 464	3 166	313	2811	2 760
Fergana oblast	1883	2 168	1 983	1956	1985	194	1934
Khoresm oblast	1541	1 679	2 001	1 787	1 742	1648	1662
Uzbek SSR	**21 570**	**25 877**	**27 418**	**26 832**	**27 590**	**27 949**	**28 480**

(Central Statistics Office, 1975: 131)

This could of course be explained in different ways, some authors argue that non-mechanisation was a plot to keep Asiatic peasants on the land and working (Pomfret, 2002: 172). However the persistent discussion of mechanisation within the contemporary popular press, and Soviet histories of the 1970s, suggests that under-performance was locally rather than Moscow driven. This is reinforced by, what we would think now to be falsified statistics, presented to the Cabinet Ministers by the Central Statistics Department. For instance in 1951, only one year after the introduction of the SkhM-48 and when the local press were reporting low uptake, it was reported that 60% of all agricultural tasks were mechanised, a figure suspiciously close to the 2/3^{rds} mandated in the state plan (Truth in Khorezm, February 2, 1952).

The crucial aspect in this discussion is that scientists and research stations in Khorezm did not appear to play a role in opposing or questioning the merit of mechanisation. Given that Pomfret (2002: 170) has estimated the economic cost of premature mechanisation at US$ One Billion (in 1960s dollars) independent science would have been justified in querying the wisdom of premature mechanisation. However, the contrary occurred, with local research stations playing a role in attempting to encourage the spread of cotton harvesters and conducting research designed to encourage mechanisation. For instance the Khorezm Soviet Seed Experiment station (СоветНИХИ) focused considerable attention on developing seed varieties more suitable for machine picking (Truth in Khorezm, 27 September, 1957). This research responded to well defined directions on what to research. A good example is from 1959 when the Central Committee of Uzbekistan SSR Communist Party and Council of Ministers of Uzbekistan SSR decreed that the Academy of Science of Uzbekistan Agriculture and Academy of Science of Uzbekistan SSR should:

> "Develop cotton varieties … which provide good adaptability for care and gathering of harvest with the help of machines and which meet the requirements of industry" (Truth in Khorezm, August 22, 1959).

This political interference also occurred at the level of spindle design for cotton harvesters. We see in the archives a conflict between Moscow and local politics in the choice between planting methods and the choice of horizontal or vertical spindle cotton harvesters:

> "Political infighting hampered the refinement and improvement of harvester design during the 1950s. The Tajik leadership advocated planting in narrow rows and square clusters to increase cotton yields. The Uzbek leadership and cotton officials in Moscow opposed this … Khrushchev resolved the debate in favour of the Tajik position, primarily because the Tajiks were fulfilling their cotton quotas while the Uzbeks were not, and because he was not keen on more investment in irrigation. Khrushchev also supported the Tajiks in their advocacy of horizontal-spindle machines; production of the SkhM-48 ceased in 1954" (Pomfret, 2002: 176)

The choice of horizontal spindles was not made on strong scientific or economic analysis, rather made by a poorly qualified autocrat, in large part reflecting political goals (state plan fulfilment) rather than technical merit. The result was also that research on vertical spindles virtually stopped, or at least was not reported upon in any available journal or archival source. Indeed when we do read the archives that are available, it becomes apparent that the technical debate regarding horizontal versus vertical spindles was conducted at the political level, with occasional recourse to technical design aspects as one argumentation point:

> "The Deputy Minister of Agriculture of the Uzbek SSR comrade Volkov (former chief of the State Special Design Bureau for Cotton) the Deputy Director for Research of the Central Asian Institute for the Mechanization and Electrification of Irrigated Agriculture comrade Zenin, the Chief of the laboratory for vertical-spindle machines of the SSDBC comrade Prikhod'ko through their actions attempted to keep the horizontal-spindle machines out of serial production. They wouldn't listen to the voice of scientists, designers and operators who, on the basis of experimental data, considered the horizontal-spindle machine more progressive. When anyone spoke in favour of a healthy competition between the vertical-spindle and the horizontal-spindle machines, comrades Volkov, Prikhod'ko and others labelled them 'anti-mechanisers'." (Kulichenkov, 1955)

This politicisation of science is discussed further in section three below. The important point to gain from the discussion of mechanisation was that, even though local *kolkhoz* officials resisted mechanisation for a variety of reasons, scientists in Khorezm only acted as agents of state extension, never questioning the wisdom of state policies. There were clear formal mechanisms which ensured that the research conducted fed back into these state aims. Likewise, the very topics and funding of this research was directed from Tashkent and Moscow to focus on politically determined goals, advancing rather than questioning these central goals. This interference also took the form of turning state norms into working assumptions, as we see in the next section. However much more interesting is the informal, social, process through which scientists in Khorezm internalised mechanisation as a scientific goal. Certainly some were swayed by the propaganda of the time, one can understand how beguiling the idea of fully mechanised (industrial) agriculture would have been to scientists in Khorezm, accustomed to manual

agricultural labour. Yet more important is the way in which no option was afforded to scientists, but to support mechanisation. The research they conducted was to prove its efficacy and efficiency, no option was given to refute this. And the case of spindle choice shows how even if they conducted helpful research, the impact of this was often minimised by the central bureaucracy making decisions without recourse to scientific advice. At an informal level it was well understood by scientists in Khorezm that their careers and potentially their lives were in danger if they opposed the centrally set aim of mechanisation and, perilously, these state aims could change with time (Interview with Khorezmi scientist working at the time, 29 September). Yet unlike local farm managers who exercised a form of silent non-compliance, I found no evidence in the archives or in my interviews, that scientists in Khorezm adopted non-compliance. Rather the social process by which they understood the dangers to their careers and physical threats to their existence ensured that research on mechanisation was conducted by scientists in Khorezm questioning or challenging the state goal.

2. State Goals as Scientific Goals

The developmental goals of Moscow and Tashkent found voice in the research topics of science. This phenomenon helps us in understanding why it was that Soviet science was inherently politicised, as well as how this manifested itself in a preference for applied (invariably 'hard') science. I explain here the process through which state industrialisation and developmental goals were adopted by scientists, a process which also explains how scientists who played to these political masters, such as Lysenko, were able to amass political capital. The political system of the Soviet Union, whilst opaque in its policy formulation, was fairly explicit in the statement of these polices. For instance objectives and goals for the future were enunciated in terms of five or ten year plans, which were promulgated through the popular press (Erkinbay, 1975). It is not difficult for researchers now to identify what were the stated objectives for the political elite. Indeed, these plans also detailed the resources allocated to difference responsible organisations, often including specialised Institutes. Many of these specialised institutes operated (and continue to operate) under the authority of respective Ministries of State, these were (and

are) largely separate from, if subordinate to, the Academy of Science (Interviews; 23 September; 18, 20 October, 2005). Those developmental goals that required research were then distributed from the top-down to relevant institutes and universities. For example 'aspirants' (the equivalent of Western doctoral students) were allocated their dissertation topics in Moscow, by a committee made up of experts and bureaucrats (Interview, 20 October, 2005). At a higher level ambitious and politically astute heads of institutes could focus their work on politically relevant topics, which was a good way in which to ensure future funding and personal promotion (Interview, 19 October, 2005). The emphasis here was on science delivering results that met the politically determined development goals. It is however important to note that scientists also played a role in shaping these goals, in providing recommendations and advice to politicians and by suggesting ambitious technical development projects (such as large irrigation schemes) that in turn were adopted in successive plans. This situation is not unique to the Soviet Union; indeed planned capitalist economies (especially during war time) often operate in a similar manner, achieving considerable successes and failures (Galbraith, 1967). So while state goals informed research aims and priorities, these very state goals could be shaped and fashioned to suit the interests of those scientists who were politically well connected, a process not unique to the Soviet Union. What was unique was the extent of the extremes encountered in the system of Soviet science, the massive swing between Lysenkoism contrasts with successful aeronautical and nuclear endeavours. However, the success of these areas of science was determined more by central policy than it was by the adequacy or efficacy of the scientists involved. It is this triumph of policy over science which makes the system of Soviet science unique. This policy formulation procedure within the Soviet Union in turn had an impact on Uzbekistan and the Khorezm region, which were peripheral, dependent, regions within the Soviet system (Wall, 2004). Thus it was this process that determined the manner in which science was politicised in Khorezm, and an understanding of this is vital to understanding policies such as the mechanisation campaign.

Figure 8: Soviet Dissident Art - 'Boris' 1963 (Author's private collection)

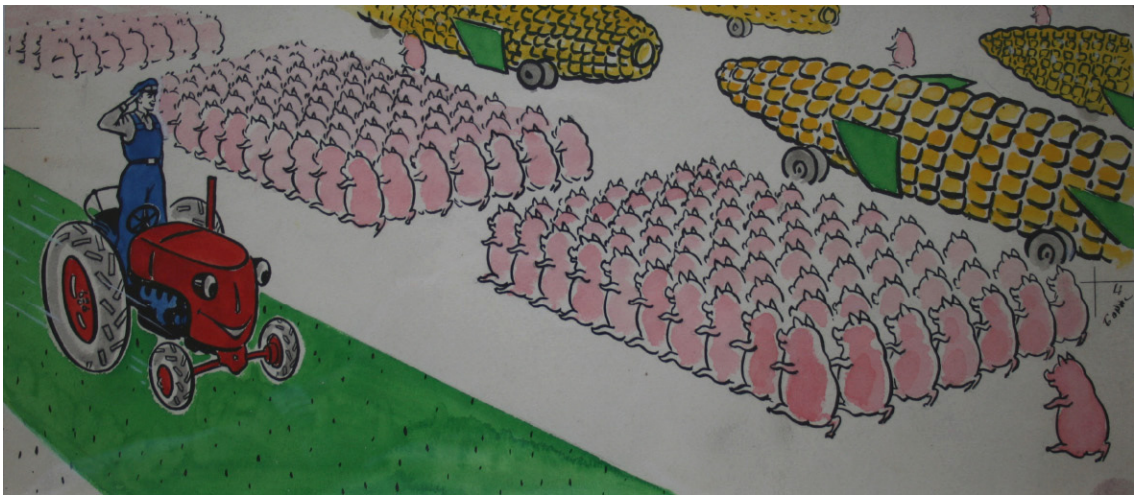


Figure 9: Soviet propaganda poster – A. Baskakov, 1987 (Author's private collection)

The parody in Figure 8 is of Khrushchev, who following a visit to the United States was inspired by industrial pork and maize production. His efforts to promote maize earned him the sobriquet *kukuruznik*, "the maize enthusiast"

Translation of Figure 9:
"I'm rejoicing,
Me - that is my
labour flowing into the
work of my republic"
V. Mayakovskiy
The woman is working on a cotton loom, coloured to resemble the flag of the Uzbek Socialist Republic. The artist Baskakov was trained as a propagandist after serving with distinction in WWII, and remained a 'state' artist until his death in 2003.

3. Politicised Science in Soviet era Khorezm

Instances of political interference in Soviet era science have already been discussed at length in this chapter. The example of mechanisation is eloquent of the subservient role of science to politics. What I hope to assess in this section is exactly *how* this power system was and is affected. My thesis is that awards and advancements were used as incentives to follow the 'party line'. Conversely there were punishments, at times quite coercive in nature, meted out to those who did not accept the role of science as legitimator of state policies. I then suggest that this system of awards and advancements, along with politicised funding decisions, lead to a primacy of the 'hard sciences' over the 'soft sciences'. In part because these sciences were perceived as more 'useful' to achieving state goals, in part because these were more easily 'controlled'.

i. Awards and Advancement

> "In 1956, the Khorezm cotton growers had a good yield and they received the Order of Lenin. For a good contribution to the cotton growing process 11 men got the honorary title of the Heroes of the Socialistic Works. More than thousand people received honourable mentions and medals." (Truth in Khorezm, 27 September, 1957).

The Soviet system was adept at selecting leading individuals and awarding them a variety of honours, to act as an example to others, and in order to define desirable behaviour. This, somewhat militaristic, system of medals and awards was well reported on the local press. At times single individuals were identified for superior attainment of their plans, equally whole brigades or an entire *kolkhoz* were praised. One example from the Truth in Khorezm (6 March, 1959) is indicative:

> "Here are the people to be proud of: Yuldosh Shomurodov, Hayitboy Abdullaev, Ibrohim Homurodov; 8-, 5-, 7- brigades. All the work in 50 per cent of their fields is done and ready for the salt washing <leaching>. The members of the "Kommuna" Kolkhoz also doing a good job, and they are trying to get the fields washed by the 25th of March"

This same system of honours, awards and titles was prevalent within the sciences. This could range from various medals and awards for service to the state, media mentions and commendations enhancing social capital, through to the title of 'Merited Scientist' (Kolesnikov, 1943: 233). Students at various Institutes competed against each other, usually in groups, to gain flags and pennants as well as the status that these afforded (Akhunova et al, 1984: 58). Financial incentives were also introduced in Uzbekistan in

1959, for "agronomists who attained results on the cotton selection and seed growing and also for … district agriculture inspectors, seed growing laboratories etc." (Truth in Khorezm, August 22, 1959). This was on top of quite high salaries for academics in the Soviet period:

> "as a senior scientific collaborator, I got 165 roubles, as soon as I defended I began to get 270 roubles, and this money at Soviet times was a good salary, for this salary you could provide a family, you could travel with your family to the Black Sea coast, or some where else, and was considered good money at that time. And if you defended your doctoral thesis you could get 450-500 roubles" (Interview, 19 October, 2005).

If we take for a benchmark salary sixty roubles, which was the standard workers salary, the income of 450-500 roubles is certainly rewarding. Moreover if you consider the purchasing power of the rouble during the late Soviet period when 3 roubles would buy 1 Kg of Meat or 0.5 litres of Vodka and 80 kopeks (0.80 roubles) would buy 1 Kg of sugar (Interview, 11 May, 2005). But it were the non-financial rewards that we the most coveted by scientists in Khorezm and Uzbekistan. These included preferential housing and rations in the immediate post-WWII period, access to better schools for their children and other incentives (Kojevnikov, 2004: 186). Yet perhaps the most important privilege for Soviet scientists was that which was almost impossible for ordinary people: travel. Senior scientists were rewarded with trips to seminars and conferences around the Soviet Union and it would be reasonable for a senior scientist to expect an annual trip to a neighbouring republic (say, to go to Almaty, Kazakhstan) and bi-annual travel to a more exotic destination such as Sochi (on the Black Sea) and ultimately to attend a presidium of the academy of science in Moscow (Field notes, Interviews; 20-21 October, 2005). Whilst career progression went through a series of identifiable stages and each of these steps was necessary, the speed at which one progressed through these steps was the telling aspect of one's career (Interview; 15 & 18 October, 2005). The apotheosis of an agricultural academician's career was to be inducted into the Lenin All-Union Academy of Sciences (VASKhNIL). "The Academy of Sciences of the U.S.S.R. is the highest scientific institution in the country. All the constituent republics, except the Russian Federation, have academies of their own" (Keldysh, 1965: 441). It should be noted however that these republican academies of science were always structurally and politically inferior to the Lenin Academy, which by being Moscow based also reflected something of the centre-periphery relationships within the highly centralised bureaucratic

structure of the USSR. As did the various thematic academies, such as the Academy of Agricultural Sciences or the "social sciences section, which unites departments of economics, history, philosophy and law, language and literature" (Keldysh, 1965: 454). However these inferior academies still played an important role as mediators (controllers) of knowledge, operating the main scientific publishing houses and controlling academic journals. It was through publication in these journals, with the political correctness that this entailed, that promotion became possible. However, publication and scientific activity also carried with it significant risks, a matter expounded upon below. Yet if we take an example of one of those individuals who was able to take advantage of the opportunities that the Academy offered, we see that the possibilities for promotion were almost limitless. For instance, Salimkhan Pulatov, the first Uzbek member of the Lenin Academy of Sciences, whose life is celebrated in the book 'Perfect Man' (Makhmud, 2000) perhaps revealing some of the author's views. The progression of Pulatov, an ethnic Uzbek from Namangan, through the levels of Uzbek and All-Union academia provides an interesting example of the opportunities that did exist within the period, allowing a progression almost beyond academia and into a life as a 'social statesman' with considerable political sway (ibid). Whilst adherence to the 'party line' is evident in the official biography of Pulatov, it is also notable the extent to which he was able to act as a local organiser of the sciences within Uzbekistan, demonstrating and being allowed a certain degree of discretion in managing affairs away from Moscow. Despite this he was very much a 'party man' who stood as an example of the rewards for loyalty, contra the high costs of failure as discussed below.

ii. Punishment

Respondents in Khorezm remain unwilling to discuss the punishments and punitive aspects of the past. There are many reasons for this reticence, including; a desire to not revisit a painful period, a lack of clarity in their own minds about how to reflect on Soviet repression[vi], a foreknowledge that this topic is political, yet lacks a 'politically correct'

[vi] Simply put: life was better during the Russian period, but not without its faults

answer[vii] - and as such is dangerous to answer. Perhaps most importantly there is ambiguity from the official (Uzbekistani, post 1991) histories about the role of repression during the Soviet period and the 'correct' attitude to this. As we see in the next section, Uzbekistan has retained some Soviet mechanisms of state control, with many individuals and state structures simply inherited - renamed but largely unchanged, from the Soviet era. This is expressed in the way in which senior staff are simply fired without reason, often by government officials eager to pass the blame for a policy failure, making risk taking by academics unlikely (Field notes, 17 October, 2005). It is in this, informal, set of social interactions that the mechanisms of political control over science really exist. For it is in the state on constant uncertainty and fear that scientists are controlled and innovation impeded. The formal system is explicit, yet the uncertainty of the informal rules is what has the most negative impact on education and research in Khorezm. Experimentation is not permissible, even if within the formal rules, because one can never be sure when these will change or of the informal response to initiative. Because of the difficulties of discussing this topic with local respondents and due to a lack of documentary evidence, I have focused on one case study that I think eloquently shows the level of repression of Khorezmian scientists *and* the reticence of people in 2005 to discuss these past events.

Case Study: Photographs along the Corridor

In 2002 and 2003, when I was in Khorezm conducting my Masters research (Wall, 2004) the ZEF project was housed in the main building of Urgench State University (UrDU). On the second floor the corridor was lined with photographs of 20th century academics from Khorezm, detailing their work and accomplishments and giving their dates of birth and death[viii]. Men and women academics were shown, from a range of disciplines, with many of the photographs resembling military or passport photos, which had been enlarged to fit the standard frame. The notable aspect was that regardless of when these

[vii] When I raised this issue in interviews, respondents would often answer with a 'politically correct' answer (albeit to a very different question), extolling the virtues of Uzbek science in the middle ages, whilst failing to confront the causes of the decline of this science, or to discuss the Soviet period (e.g. Interviews, 29 September; 3 November, 2005)

[viii] I have this from my own field notes for 2002/03, through interviews with other project members at the time, and confirmed in informal discussions with academics at UrDU.

academics were born, they all died during the period from 1935-1940, an epoch labelled by western historians as 'The Great Terror' or 'The Stalin Terror'. A time of immense purges; when vast swathes of the population in the USSR (especially in the military and in the instruments of education) were sent to Gulag camps and killed[ix]. Whilst there was no commentary on these deaths, or specific discussion of the great terror, their deaths (at coinciding times) were noted. I cannot be certain of the numbers involved, but there were certainly more than thirty photographs, which would have accounted for a significant proportion of academics in Khorezm at the time.

In 2005 I attempted to find these pictures, which were no longer displayed on the wall. Initially I was informed that the corridors are a display space for different academics and old exhibits are removed "because we have 430 teachers who do research work and we take old research work off the walls and put new ones instead of old. This is as a rotation" (Interview, 3 October, 2005). This does not square with the displays for the rest of the university, which are overtly political and reflect centrally determined ideologies (see 'Post-Socialist Progress' later in this section). When pushed further, the respondent became restive and commented that "such kind of information is the university's internal affairs and that no one can give this information to others … especially nowadays." (Interview, 3 October, 2005). This comment, especially the final two words which were made *obiter dictum*, provide some insight into the level of internal control that is exercised, and the final comment suggests that this is in fact worsening in recent times. Further inquiries aroused a great deal of suspicion, many of my respondents were unwilling to discuss the matter at all, and those who did respond, bushed it aside with comments such as "Some of these pictures were of people who did not work there" before quickly moving onto politically correct topics such as the greatness of Khiva 1000 years ago (Interview, 29 September, 2005). The fact that so much suspicion was aroused by my requests, suggests two things to me. Firstly, that academic purges during the 'Great terror' did occur in Khorezm, and, secondly that this issue remains, 70 years later,

[ix] Political opponents were also purged, although the great terror was distinct from the earlier purges of 1924-1930, because their focus extended well beyond the Communist party (Rashid, 1994: 90).

a sensitive and political subject, demonstrating that the risk of punishment and differential privileges did (and arguably still does) occur in Khorezm for those academics who fell from political favour. Yet understanding this mechanism is made difficult by the degree to which it is internalised by the academic staff involved (cf. Burawoy, 1984) who do not discuss how they limit their research, as the decision is not explicit or even conscious, rather it is a response to being educated, trained and operating in an environment of fear.

iii. Applied Research

> "Nowadays it is impossible to manage agriculture without depending on science. The organization of agricultural production should be built on a firm base … It is time for a real connection between agricultural science and production".
> - N.C. Khrushchev. (Kolkhozchilar Ovozi, Voice of the Kolkhoz, August 26, 1961)

One of the defining characteristics of the Soviet system of knowledge governance, indeed of Soviet Science, was the need for the practical application of research findings. Research in all fields needed to have direct applications, and that research which purported to work on applications considered crucial to the Soviet government, was lavished with rewards and praise. Conversely un-applied research was branded 'Bourgeois' research, of no use to the peasant or worker. The archives in Khorezm are expressive on the point of applied science, for instance when Bregnev mentioned at the fifteenth meeting of the CPSU "To an increasing extent the meaning of the scientific search for answers to the principal problems of world development and international relations. Such as the revolutionary process … struggling for democracy and struggling for socialism" (Pravda, 25 February, 1976). The response from academia was to discuss the importance of their department (in this case the Institute of National Economy) in terms of "serving like big attractive power for developing countries of Asia, Africa and Latin America, which have been released from the colonial yoke and are solving by themselves agrarian question in workers' interests" (Matrasulovich, 1976: ii). This view, that science could play a role in furthering economic development within the Union, was a paradigm established in Moscow and communicated to the national and oblast level. Heinzen (2004) provides excellent detail on how the People's Commissariat of Agriculture (Народный Комиссариат Земледелие) was used as a deliberate tool for

applying scientific findings. Noting that the role of research in the party's eyes was to provide new seeds and techniques that suited the needs of the peasantry and, perhaps more importantly, the industrial development goals of the party (Heinzen, 2004: 50). This was especially the case in the development of peripheral regions, as noted by Keldysh (then president of the Lenin All-Union Academy) in 1965:

> "You must remember that many of the border regions of Russia, out of which these republics developed, were appallingly backward before the Revolution. One of the measures to deal with this backwardness was the setting up of branches of the Academy of Sciences of the Soviet Union in these republics, and it is from these branches that the republican academies have evolved" (Keldysh, 1965: 442)

It was to this end that 'professors of the plough' were promoted as academics who could apply their research to the direct needs of the Soviet economy (Heinzen, 2004: 131-132). This most often took the form of promoting agronomists as the apotheosis of applied agricultural science, a matter discussed earlier in chapter four (Section I.1.ii). One informant explained this to me in very simple terms "my topic was important because the salinity, the soil, said it was important - not because I or anyone else said it was" (Interview, 18 October, 2005). In fact many senior scientists who I interviewed during 2005 discussed how the height of their institute's history occurred coincident with the political importance of their work. For instance SANIIRI was at its height in the 1970s when Moscow's policies of promoting arid agriculture and improving water distribution were at their height (Interview, 15 October, 2005). Whereas the fortunes of the organisation declined significantly during the late 1980s, as the political focus shifted towards glasnost and perestroika in attempts to stem the disintegration of the Soviet empire (ibid.). Corroborating this account is examples of institutes which were effective during the Soviet period at delivering 'material improvement', for it were these institutions which were "rich, empires within empires" (Interview, 18 October, 2005). It was notable in this interview how the success of the institution was measured to a large extent in terms of the number of foreign trips and political functions (such as visits from Deputies) that the institute was able to attract. This idea that the quality of scientific work is evidenced by external recognition is a strong current in Uzbekistan today, with many interviewees describing good research as that which had led to international travel or projects, as opposed to publication as with Western academics.

iv. Physical Sciences over the Social Sciences

A corollary of the system of incentives and awards, as well as political ideals about the applicability of science, lead to a greater number of 'physical' scientists than in the 'social' sciences. This disciplinary superiority was reinforced at the institutional level, both nationally and within Urgench State University. Firstly, I examine the numbers of doctoral students (taken here as a proxy for the level of interest in advanced research for each discipline) within the whole of Uzbekistan and within Khorezm. I then examine the research institutes and university departments themselves during the Soviet period, in an attempt to examine the institutional factors that militated against the social sciences. The number of students studying at an advanced level in Uzbekistan is a good indicator of the level of interest in, and support for, various disciplines. I take the figures for 1975 as useful benchmark as it was a suitable distance from the excesses of Stalinism and purges, thus separating their immediate effect from long term trends. I stay clear of more recent data, due to the distorting influence of mid-1980s economic decline, and the transforming effect of glasnost and perestroika, although comparisons with the late Soviet period yield very similar findings. I choose 'Candidates' of science (equivalent in the European system to PhD students) because of their role in both creating new knowledge, through research, and as sharers of knowledge, through publications and in their jobs post-graduation. We see in the figures for the whole of Uzbekistan that almost exactly two thirds (66.4%) of candidates in 1975 were involved in the disciplines that I classify here as 'physical'[x]. If we are to include economics as a 'physical' or more properly 'hard' science then this figure climbs to 79.7%. Likewise these students of the physical sciences generally studied in superior institutions. The original data makes a crude distinction between 'scientific institutions' (i.e. universities, specialised Institutes) and 'Institutes of higher education'. Here we see that of all students studying the 'physical' sciences 55.3% are installed in, institutionally superior, 'Scientific Institutions'. The reverse is the case for the social sciences. Only 44.0% of social sciences candidates studied at universities. Unfortunately corresponding statistics from within Khorezm are not available, what we

[x] This almost exact proximity to 'two thirds' might be statistical coincidence, or it may well reflect a crude Soviet norm, being reported as fulfilled. During my field research I was unable to access the appropriate archives to confirm either hypothesis.

do know from interview data and an institutional analysis, is that there were probably many more physical scientists in Khorezm compared to the UzSSR average. This distribution of social scientists towards the centre, as well as the general predominance of physical sciences, was and is not unique to the Soviet Union. Similar countries in this epoch had analogous levels of physical scientists, for instance India and South Korea (then both as similar levels of 'development') adopted state aims in education and research. What is telling is that within the social sciences, there is almost no direct study of contemporary society. Rather historical (and especially archaeological) study was 'safe', as was philosophy more a study in Marxist rhetoric than a search for new thoughts on the human condition.

Table 3: Allocation of PhD Candidates by Discipline: Uzbekistan (end of 1975)

	Quantity of all the candidates	Studied in	
		Scientific institution	Institute of higher education
Physics & Mathematics	438	251	187
Chemistry	75	41	34
Biology	169	126	43
Geology-minerals	136	96	40
Technical studies	684	313	371
Farming household vet	321	252	69
Geography	22	6	16
Medical care	149	18	131
Total – Physical Sciences	***1994***	***1103***	***891***
Percentage (of total)	*66.4 %*	*55.3 %*	*44.7 %*
History and philosophy	202	71	131
Economics	398	234	164
Philologist	167	40	127
Lawyer	18	15	3
Teacher	132	38	94
Art	27	17	10
Architecture	38	25	13
Psychology	25	3	22
Total – Social Sciences	***1007***	***443***	***564***
Percentage (of total)	*33.6 %*	*44.0 %*	*56.0 %*
All	**3001**	**1546**	**1455**

(Central Statistics Office, 1976: 43)

For the study of centre and periphery relations, the most telling aspect is that there are no 'Scientific Institutions' or 'Institutes of Higher Education' focusing on the social sciences in Urgench. Whereas Tashkent used to and still hosts a full range of specialised institutes, ranging from a Law School, Arts University through to Fine Arts College, Urgench hosts no such institutions. Thus the social sciences, along with the leading physical sciences, were very metropolitan and centralised. Whereas Urgench University acted as a training institute to replicate centrally devised knowledge (Interview, 29 September, 2005). Similarly, there were no 'research' stations for the social sciences in Khorezm, yet there was one main agricultural centre[xi] as well as numerous other research centres, such as the Forestry Institute (Interviews, 29 September & 20 May, 2005). Thus, at an institutional level there were probably many fewer social scientists working in Khorezm than even the national average, which was also the case in 2005. Certainly today the capacity of the social sciences in Khorezm must be said to be weak compared to the physical sciences (which is also very limited by any international standard). Of those faculties which do exist (history, law, languages) it is really only the English language faculty which has high levels of student enrolment. This is largely a reflection of the desire by local women to create opportunities for themselves outside of the home and a view that English language skills offer this opportunity. However the study of history is so permeated with political correctness, and I explain below, that it is difficult to take seriously as a foreign researcher. Likewise, few if any opportunities exist for a student of history, which is reflected in the low enrolment rates. This is somewhat different from the ecology faculty, with which the ZEF project partners closely, which does have some scientific capacity and research output. Again, this enhanced research ability is a result of the state's interest in agriculture and the fact that some attention (and hence funding) is given to the ecological problems of the Khorezm region. Illustrating once again how it is government priorities, not scientific merit, that is the key indicator of whether a scientific discipline succeeds or not.

[xi] The Khorezm Regional Experimental Agricultural Centre, was established in 1926 and well funded for much of the Soviet Period (Matrasulovich, 1976)

III. POST-SOCIALIST PROGRESS?

The Soviet system of education and research, for its faults, was one that delivered appreciable results in terms of material and economic advancement of the Union. Yet it was the nature of Soviet, 'big', centrally controlled science that also played a large role in restricting the development of the Soviet Union. So whilst the conterminous nature of science and economic development, accompanied by significant political interference, were characteristics of Soviet science, this was still a system that delivered some very positive results. As Kojevnikov (2004) reminds us, despite its illiberalism and contrast with Karl Popper's conception of scientific openness, Soviet science did succeed in developing a nuclear bomb, space programme and significant agricultural development. I examine here the way in which Uzbekistan's knowledge governance structures responded to the downfall of the Soviet empire and the problems that came about as a result of this. In the immediate period after 1991 (beginning during glasnost and perestroika) funding for the sciences largely dried up, with state salaries left unpaid and practically no funding available for research (Interviews October 2005; Morgunov & Zuidema, 2001). The GoU's response to this problem, and to the acute difficulties for the entire economy and society, has informed the post-1991 development of science and education in Uzbekistan. As we see in the following section the changes in the organisation of science in Uzbekistan have led to a different way in which science is politicised, with less day to day control, accompanied by greater uncertainty and problems with funding. Secondly, I discuss how knowledge loss in the post-1991 period has to some extent undermined the system of science within Uzbekistan, and how policies to date have not been successful in stemming the tide of knowledge loss, with large numbers of academics returning to Russia in the early to mid 1990s. Thirdly, I discuss one of ways in which the GoU has attempted to encourage efficient and effective research, through competitions for funding which marks a departure from the Soviet model of financial distribution and serves as a positive (if nuanced) example of how the Uzbek governance structure is adapting.

1. (Still) Politicised Science

> M: All researchers only do this under the State. They do it under the name of state. Only then the State decides what work is to be done.
> CW: What happens if someone wants to study a theme against the State?
> M: If it will be against the State - the research work will not be confirmed. Here, if one man does research against the government, he will be taken to jail … Here everything must be in the shape of the government. (Interview, 29 September, 2005).

Science, education and research are politically controlled in Khorezm through both formal and informal mechanisms. Political approval and 'correctness' are essential before any research work is approved or undertaken, a process which is overseen by the scientific council of the university (within Khorezm) but one which is still inherently answerable to political authority (Interview, 19 October, 2005). "Before I want to do any research, any work, I must get the government involved, to get their permission" (ibid.). This permission comes through application to the centre in Tashkent with which the institute or individual is affiliated. This can be a university, an institute or through the academy of sciences. There are committees in the centre which decide whether or not to allow research on a particular topic and these decisions are made not on the basis of scientific merit (in the Western sense) but on the contribution that this research makes to the state (Interviews, 17, 19, 20 October, 2005). The same process exists for PhD students, who must travel to Tashkent (formerly to Moscow) to gain permission to research their topic, another mechanism through which central control is enforced and science is focused on contributing to state aims rather than strict scientific criteria. What this system of checks ensures is that science and research is conducted within a, relatively narrow, realm of 'thinkable thought'. Thus research is possible, but this research can only occur if it leads (or could foreseeably lead) to proving existing knowledge correct and reinforcing state policies. It is not possible to conduct research, either in the social or physical sciences, which can contradict of challenge the 'truth' as politically determined. In this regard the systems of state control over science have remained strong in the post-1991 period. Whilst there is less active, day-to-day, control over research (Interview, 20 September, 2005) this change is mitigated by the lack of funding and sense of torpor that pervades the academic institutions of Khorezm and Uzbekistan. But most importantly is the way in which science is controlled and channelled in a way that its findings inevitably support the state and reinforce state aims.

i. Cotton Comes Before College

Cotton is central to understanding power and knowledge in rural Khorezm. It is a central theme in state media, presidential speeches and popular culture, and this concern for cotton is inculcated into the education system, more notably in the 'regions' such as Khorezm and less in Tashkent. For instance, every year students begin their studies at university on September 2nd, immediately after the Independence Day celebrations on the 1st of September. Having spent a day being reminded of the greatness of Uzbekistan[xii] and of its strength within the world economy, students in Urgench then return to university, in order to be conscripted for the 'cotton campaign'. Academic staffs are practically unreachable during this time, as their role becomes one of warden, caregiver and cotton policy enforcer, ensuring that their students fulfil their 'plan' (Field notes, 6 October, 2005). Academics are held personally accountable for their cotton 'plan', which is certainly an extension of their professional responsibilities beyond that of most universities in the West. What it does reflect is the different understanding of community participation and work. One could conceivably describe the cotton campaign as a very large form of *khashar* to voluntary work, as discussed in the *mahalla/elat* scenario in chapter four. This idea of compulsory volunteer work was also prevalent in the Soviet system (from which the cotton campaign originates) where students frequently engaged in 'sybotniki' (субботники) or 'Saturday work' which was supervised by their teachers, who saw it as an integral part of their education. When discussing the current cotton practice, one dean explained to me that "I am responsible for my plan, to make sure my students get the cotton in time" in describing why he was so busy during the cotton campaign, despite being a professor in the humanities (Field notes, 29 September, 2005). These plans and obligations are passed on down the chain of authority, with junior staff having to 'control' their students for ten days at a time, taking personal accountability for the students meeting their plan (Field notes, 6 October, 2005). At this level the Western concept of academic freedom (cf. Popper, 1962) is certainly not fulfilled, as volition has a very different understanding in Khorezm than in the West.

[xii] With such curious comments as "Biz hech kimdan kam emasmiz, hech kimdan kam bo'lmaymiz!", "We have never been, nor ever will be, less than any other nation"

Most important for our understanding of how knowledge operates within Khorezm is examining how this primacy of cotton has an impact on what types of research is conducted and how this shapes the scientific culture of Khorezm. What we see from an examination of masters theses prepared within UrDU is that of those focused on the physical sciences, a vast majority (depending on how you classify the thesis topics) are related to cotton. This is unsurprising, given its importance for the economy of Khorezm. What is more important is that the research topics of the theses are prepared in such a way that they not only do not, but simply *cannot* contradict the cotton policy. There is a very different understanding of what constitutes good research between Khorezm and the West, a challenge for collaboration discussed in the next chapter. Pertinent here is not simply saying that science in Khorezm is politicised. Rather, there is a particular, almost autistic, way in which science in Khorezm is forced to conceive of research in terms that cannot contradict or challenge the cotton policy. Within this 'boundary condition' technically adequate research is being conducted in Khorezm. The quality or 'correctness' of this research is not something that I can judge. What is possible is to point out that within Khorezm the understanding of what constitutes 'good' science is different from in the West. The politicisation is of a sort that defines and delimits what knowledge is validated and accepted. Within agricultural science this is centred on confirming and enhancing the cotton policy. The next example shows how this same process of politicisation finds voice in the humanities.

ii. Islam Karimov: President, Scientist, Economist, Historian…

> "If someone wants to understand what is Uzbek, what is the strength and might of the Uzbek nation… he must to recall the personality of Amir Temur" (Karimov, 1997)

Islam Karimov was first secretary of the Communist party of Uzbekistan from 1989, overseeing Uzbekistan's transition from Soviet satellite to independent republic in 1991. Since that time he has remained President of Uzbekistan, and has controlled the speed of political and economic reform (Fierman, 1997: 396). It is not necessary to enter into a discussion of Karimov's rule; however the manner in which his persona is imbued in the knowledge structure of Uzbekistan, especially education and research in the humanities, is of interest to us here. Karimov is, apparently, an avid author, publishing books on

various subjects that discuss 'his' ideology of Independent Uzbekistan. These books range in scope from a broad analysis of Uzbekistan's situation "on the Threshold of the Twenty-First Century" (Karimov, 1997) to more detailed work on economics, law, philosophy and history. The reading room at UrDU contains 641 books, of which 53 (over 8%) purport to be authored by Karimov. This figure increases if you take into account the translations of these works into English, German and other languages; so in this way foreigners can also benefit from the advice. For example history, where Karimov's works are used as foundation text books for the university courses, promoting a particular ideology of Uzbek national independence (March, 2002). These concepts closely imbue the writings of academic historians in Khorezm, for instance the Dean of History writes that:

> "The president I. A. Karimov has set a new goal for the scientists; write a new, objective and truthful history. In order to do that … the theoretical and methodological bases of these explorations <must be> organized by the president of Uzbekistan I. Karimov in his decrees, speeches and essays; facts of the sessions of the Oliy Majlis, the establishment of the vizier <Islamic advisor> of the republic, the decree of the Khorezm region hokims" (Matniyazov, 2005: 2).

So whilst rejecting the political influence of earlier Soviet histories, the author is here claiming to create a objective history, which is apparently best done through a close analysis of the President's works. The case of history is not unique, with the president also writing about, and thus influencing the curriculum of, other subjects such as economics and law. This is combined with a dearth of external literature in the libraries and curricula of Uzbekistan's universities. This is likely to be exacerbated by a decree, issued in 2004[xiii] that makes it necessary for imported books to obtain a license from the Ministry of Culture, and local publishers require a license to print any book (Ilkhamov, 2006). Also at the school level, all subjects must be taught from Uzbek authored books, even for those minority language groups (mostly Tajiks and Kyrgyz) who enjoy the constitutional right to education in their native language. Yet books are not imported from the neighbouring countries for this purpose, rather they must be approved translations of Uzbek books, in order to ensure 'accuracy'[xiv]. Walking the campus at

[xiii] Decree of the Cabinet of Ministers of the Republic of Uzbekistan, № 275, 11 June 2004.

[xiv] This is not problematic in of itself, but there are significant differences in how common histories are treated between the history books of the four neighbouring republics and Uzbekistan, which suggests that political agendas are being furthered in the name of accuracy.

UrDU is an interesting insight into university education, with ubiquitous quotes from Karimov interspersed with photographs of him appearing 'presidential', for instance shaking the hand of President Clinton. This image of Karimov as a statesman and leader of the Uzbek people is propagated by direct comparisons with Amir Temur (Tamerlane) who is presented as a model for an ideal Uzbek leader, thus making a direct appeal to the perceived golden age of Uzbekistan (Ilkhamov, 2006). A good example of this in practice is at UrDU, where the main building of the university has a statue of Al Khorezmi situated being three quotations from Karimov, in the colours of the Uzbek flag, emblazoned on the front of the university (Figure 10, p.192). This message is reinforced in the walkways of the university, where a series of quotes are displayed from academic heroes of the Uzbek golden ages[xv]. Figure 11 (p. 192) shows the long row of placards, each with a quotation from a scholar of the golden ages. Innocuously amongst these is a quote from Karimov, reinforcing the image of him as one of the great Uzbek thinkers.

These quotes are ubiquitous also in the textbooks of UrDU. Each discipline has, amongst its compulsory reading, a set of books authored by Karimov, setting out the politically correct account of that discipline. These views are then mirrored in other publications and clearly define the 'official history' of Uzbekistan. It is dangerous for academics to step outside of this 'official' view, as we see later. A good example of an official history defining the 'correct' view, and thus determining the outcome of other scientific 'research' is the story of the cotton scandal or so called 'Uzbek Affair'. Here the Soviet State between 1978 and 1983 paid over 1 billion roubles for cotton that was never actually produced (Rashid, 1994: 92). Comrade Sharif Rashidov, the serving premier at the time of the fraud, was removed from his prominent grave in Tashkent in 1986. This was a controversial move by Soviet authorities as many Uzbeks considered the fraud as a legitimate snub to Moscow's insistence on increased production[xvi] (Rashid, 1994: 92). The Uzbek affair, with the disgracing of Rashidov and 2,600 nomenklatura, possibly had

[xv] e.g. the Karakhanid epoch; 10^{th}-11^{th} centuries A.D.

[xvi] Indeed, Islam Karimov (Uzbekistan's President) pardoned most of those convicted in the "cotton scandal" soon after independence (Fierman, 1997: 375). See also Gleason, 1990 for a discussion of 'Nationalism or Organised Crime – The Case of the Cotton Scandal in the USSR'.

a large impact on popular perceptions of Soviet rule, and could be a contested issue of historiography. Yet the history of this event, as with other aspects of Uzbek history, is not up for contest. The official view, which elevates those involved to the place of patriots working against the Soviet colonisers, is the only acceptable perspective. Alternative readings from the Soviet period have been purged from the university library and new research simply does not occur. If we refer back to the quote on page 189, we see how the new 'non-political' history is indeed highly political. So it is that the state view is mirrored in the historical books available in the UrDU library, for example Hudoyberganov (2000) which discusses his experiences as one of the nomenklatura who were jailed. Presenting a complementary picture of the (new) official history, detailed in Karimov's works, and commenting positively on the (current) situation in Independent Uzbekistan as consistently better than the Soviet period. I conducted interviews with academics who would openly claim that ideology and politics played no role in their teachings, whilst at the same time they were sitting at a desk with a photo of Karimov behind them, with books of his on their desk and in one case a calendar from the political party of the President's daughter, all the time emphatically claiming that their work was apolitical (Interview, 9 November, 2005). This perspective perhaps illustrates just how internalised the politicisation of science is for actors in the system. It is not just symbolism that is important, but also the substantive impact on science and research, and in the case of social science research in Khorezm there is a considerable impact of politics controlling and defining science and research. By merit of the actions and inaction of Khorezmi scientists (what is researched and is not), it is apparent that politics does influence science and that power structures exist over knowledge by defining the limits of knowledge. This relationship is instituted through the formal processes by which research, teaching and curricula development are governed by the state. These direct mechanisms are explicit in illustrating where power lies and the role that this has over knowledge. Equally important are the informal and indirect mechanisms of control, especially the 'climate of fear' and use of incentives & punishments. Specific to the case of Khorezm is the aligning of political power and knowledge in a way that creates a scientific 'culture' which is subservient to politics. This intersection of power and knowledge is an eloquent example of how knowledge is governed in Uzbekistan.

Figure 10: Photograph – Welcome to Urgench University

Figure 11: Photograph – Karimov and the philosophers of the Uzbek Golden Age

Left: "As ignorance rises, doubt & uncertainty increases" F. Hikmatlaridan (C. 11th - 12th)

Right: "Finding youth who are thirsty for education & talented, and educating these youth to serve our motherland as a true citizen is our great task" I. Karimov (C. 20 - 21st)

Note how *'Bilim'* – Knowledge in Uzbek – forms the root of the first word in both quotes

iii. Old Academy, New Academy

The Uzbekistan Academy of Sciences (UAS) provides a well documented example of how an institution has changed little in the post-1991 era. The official history of the academy (UAS, 2005) discusses the foundation of the academy in 1943 without any reference to the political situation at that time, then moves on to establish the main functions of the academy. Notable is the extent to which these stated objectives are similar to the objectives of the All-Union academy during the Soviet period (Keldysch, 1965; Kolesnikov, 1943). So the emphasis on science as existing to help national economic development, according to politically determined aims, remains strong. Likewise, an analysis of their organisational structure shows very little change since the Soviet period, with the exception that the General Meeting of the Academy is now the head of the organisation, whereas the All-Union Academy previously held this position. From an administrative perspective the academy continues to operate much as before, albeit under significantly reduced financial backing (and without Moscow's oversight). The significant development is that the academy now plays a role in administering the competitions for funding that are essential for the survival of most Institutes. This specific issue is discussed at length in sub-section three below. It is worthwhile noting here that the administration of this new initiative remains based within an unreformed organisation. There is little evidence of a change in the philosophy or epistemology of science, the approach or working methods of the Uzbek Academy of Sciences. For instance the politicisation remains as strong as ever. One high ranking member of the academy, based in Khorezm, described to me his multiple academic and political roles:

> "I have five offices: The first is here, as Dean of <deleted for anonymity>, secondly as Chairman of the Faculty, thirdly as director of science and technology at the <deleted>, fourthly as Director of the President's Institute for <deleted> and finally as Secretary of Ideology for the <pro-Presidential political party>." (Interview, 2 November, 2005).

It is notable that this same individual was Second Secretary of a regional chapter of the Communist party during the Soviet period. Thus his newly assumed offices can be seen as an extension of an existing linkage between his political and academic careers. Indeed the two must be seen as inexorably linked. This sets up the formal and direct connections between power and knowledge, yet the informal, indirect mechanisms are also important.

iv. Controlling Knowledge

Political control of knowledge has decreased from its height during Stalinist rule. However research, teaching and learning all remain controlled, that is limited and constrained by the governance system in a closed manner, within Uzbekistan. So whilst knowledge may be less politicised than it has been in the past, it remains a very controlled commodity. Apophrical examples and case studies abound of students who come into trouble for writing essays that contradict the officially accepted truths. For instance one case of a student in Tashkent whose class was encouraged by their history teacher to write their own opinions on 'what Independence means', with the promise that their views would remain secret. This student then wrote a far from complimentary account of post-1991 Uzbek politics, the paper was handed to the Institute's administration, and the student threatened with expulsion should be repeat his actions (Field notes, 18 October, 2005). Aside from disconnected examples, a good example of how knowledge is still formally controlled and politicised in Uzbekistan, is in the case of curriculum development in the nations' universities and institutes of higher education.

Case Study: Curriculum Development

Urgench State University and institutes in Tashkent do endeavour to provide high quality teaching to their students. Yet the curricula they use are certainly controlled by the state. For instance, the Masters degree in Bio-Ecology at UrDU has state prescribed lessons on 'Religions, Extremism and Terrorism[xvii]' and 'The Idea of National Independence' as well as obligatory research on cotton (Interview, 30 September, 2005). At a more general level the development of curricula for university courses is largely decided upon by the Academy of Sciences and/or the relevant ministry. So for those universities that fall under the authority of the Ministry of Higher and Secondary Education, a set of state prescribed 'courses' must be taught, using pre-determined texts and with defined assessment criteria (Interview, 25 October, 2005). The Academy of Science, which governs many research institutes, has rules which are in principle the same, yet the degree of freedom allowed to these institutes to teach courses other than those prescribed varies

[xvii] The follies of, not a guide to.

by discipline, yet in general it can be said that the academy has more strict controls on the curriculum (Interview, 19 October, 2005). Specialised research institutes which conduct research on a topic of relevance to one particular government department are governed by that specific department (Interviews, 15 & 20 October, 2005). Because of the graduate and post-graduate nature of these specialised institutions, curriculum development is less of an issue than the allocation of dissertation research topics. These are largely determined for students by their supervisors, in a manner that reflects the priorities and purpose of the institute, *a propos,* and their responsibilities to their particular department. For the physical and the social sciences, the nature of the curriculum is determined by the government, with a view to the state directed development goals. One soil science professor described the curriculum to me in the following terms:

> "We have government curriculum, from this curriculum we will have plan of teaching, then also a work plan, and other plans and so on … Now we are working on new curriculum, because it has already been fifteen years now we are working on this one, so all these calculations … we must prepare our work based upon the branches of national economy. This is the current curriculum <shows old curriculum book> we took it from Moscow University. Now however soil has its own special curriculum, it has its own law on this." (Interview, 25 October, 2005).

This curriculum was in effect developed by the academy of sciences under the aegis of the Cabinet of Ministers (ibid). Thus those universities teaching soil science were obliged to use this 'standard' curriculum. Some universities, such as the University of World Diplomacy and Economy operate under both the Ministry of Foreign Affairs and The Ministry of Higher and Specialised Education (Interview, 25 October, 2005). Yet because of the political patronage that their institute enjoys[xviii], they have some freedom to teach courses that are outside of the prescribed classes (ibid.). But these should not contradict state policy (especially the policies of the Ministry of Foreign Affairs) or run counter to the 'prescribed' courses. In Khorezm, where state patronage is a rarer commodity, deviation from the norm appears to be less evident than in Tashkent. For instance the economics faculty had its most recent curricula determined according to a declaration

[xviii] The current dean is the retired minister of Foreign Affairs, the University has recently finished construction of a US$100,000 tennis court paid for by the President and have a brand new indoor swimming pool that other Universities certainly do not have. Ironically the University is housed in the former training institute where senior party members would receive periodic 'reeducation'. The only such institute in Central Asia, the school's alumni includes Afghans, Indian nationals and senior members of the all Central Asian republics (Interview, 25 October, 2005).

from the Ministry of Higher and Specialised Education, with most of the changes reflecting changing state priorities in terms of managing the economy through transition (Interview, 2 November, 2005). This dependence upon Tashkent originated declarations is exacerbated by the fact that the faculty is a 'filial' institute, associated with the centres of learning which are all concentrated in Tashkent. One example of this in action is the necessity for 'aspirant' students from the regions to travel to Tashkent to receive approval for their research topic, which cannot be granted anywhere but in the centre (Interview, 9 November, 2005). Thus increasing the differences between the centre and periphery, with Khorezm based institutes being dependent upon the centre for guidance and leadership. The greater degrees of freedom enjoyed in the centre is somewhat contradictory to our typical understanding of centre-periphery relations. However, what we see in the context of science in Uzbekistan is that whilst the formal rules would tend towards greater freedom on the periphery, the informal rules and social understanding mean that greater liberty is taken in the centre. This is because the changes in ideology and focus are much more closely monitored, and more readily influenced, at the centre. Thus changes in state policy are less surprising and more easily avoided from academics working in central institutes. Whereas academics in Khorezm are so far removed from these changes that their steer a very straight course through well mapped academic waters, straying very little from the politically determined 'correct' approach. There are few incentives to explore new opportunities and socially well understood implications for erring too far from politically correct science. Creating a situation where formally there should be more flexibility at the periphery, yet informally and in reality there is much less. This paradox still reflects the close connections that exist between power and knowledge, yet it also identifies how in Khorezm this knowledge governance structure is informed and 'situated' (cf. Haraway, 1991) within the cultural context. How power and knowledge interact is thus a construct of formal and informal institutions in Khorezm. The outcome of this power/cultural construct is that scientific research in Khorezm is forced, through formal and informal mechanisms, to operate within very strict 'boundary conditions' which are established by the state, and the role of scientists in Khorezm is to reproduce state determined truths, rather than to search for new ones themselves.

2. Knowledge Loss in Universities and Institutes

> "We were left with all the oils from our professor when he died, they were labelled and explained, but we do not know about each one in particular, he was a great man, a great scientist and now we are trying to carry on his work … but as you see it is not easy" Dr Aitmuchamedovana, (Field notes, 2 September, 2005).

The knowledge loss phenomenon is not restricted to rural Khorezm or local knowledge. Khorezmi universities and institutes, so well funded for much of the Soviet period, have also suffered from knowledge attrition and material decay. The lack of funding for research and education in post-1991 Uzbekistan is evidenced in a number of ways. Especially in the quality of staff and students and in the quality of the research conducted. This stands in contrast to the pre-1991 education system, which for all its politicisation, ensured high living standards for academics and (somewhat) meritocratic career advancement for students (Interview, 19 October, 2005). In this regard I would argue that whilst a 'social contract' once existed between academicians and the state. In this, unwritten and informal contract, which certain freedoms of thought and action were sacrificed by academics in exchange for security and enhanced social standing. Likewise the state gained loyalty from such staff, who provided the benefits of science for political prestige, legitimating and aiding in economic development[xix]. In my opinion this social contract has been broken in education, with academics no longer enjoying prestige, status, foreign travel or a higher income. Whilst concurrently being subject to top-down, sometimes arbitrary, political restrictions which impinge upon their research.

The quality of staffing in universities and institutes suffered set backs early on post-1991, with many ethnic Russian and other non-Uzbek scientists (amongst them Germans) deciding to leave Uzbekistan or to remain, but seek work in business or the bazaar (Interview, 19 October, 2005). In many cases these non-Uzbek scientists held the more senior positions within the institutes. This 'brain drain' was exacerbated by poor state funding for research and science. I was told by an older scientist, who had enjoyed a comfortable though not opulent life in Tashkent during the Soviet period that:

[xix] For discussion of the rural social contract in Uzbekistan see Kandiyoti, 2003; Roy, 1999 and Trevisani, 2006 (Chapter 4). The legislation governing the current Uzbek Academy of Sciences continues to stress the contribution that science makes to economic development (Karimov, 2002)

> "A lot of scientists left Uzbekistan after 1991, because of little financial aid and little attention from the government - <now> if you want to do research - you do not have enough tools and means. If you want to research land you should have 2 - 3 hectares just to pay for the research. If you want machinery, you should work in a factory and make your own." (Interview, 20 September, 2005).

He then explained how this was so different from his experience during the Soviet period:

> "I used to work on large projects - 15 engineers, 15 agronoms, 15 tractors - all on big fields. In Belarus, in DDR, everywhere in USSR. They had big projects; also in Uzbek SSR they also had these projects. Now I am only one, I am the engineer, I am the technician. I have to design and build everything myself" (ibid).

By creating such working conditions he then talked about how many of his colleagues chose to quit work, opting instead to go into business or to leave to work in Kazakhstan or elsewhere. Another informant elaborated upon two types of knowledge loss; the loss of key staff as discussed above, as well as the "loss of connections, of contacts" with other scientists within the former USSR, who collectively constituted a highly functional knowledge network (Interview, 18 October, 2005). This is a clear example of how diminishing knowledge sharing is identified by the respondents as a driver to reduced knowledge creation. This was exacerbated by a loss of access to literature, collaboration through the All-Union Academy, and contact with international developments (Interview, 19 October, 2005). Whilst some excellent staff do remain within the universities of Urgench, and Uzbekistan in general, an academic career is no longer recommendable or desirable to many young, aspiring, Uzbeks. The difference between the past and the present was a constant theme amongst those academics and junior staff I interviewed, mirrored in ructions between the 'old' and the 'new' generation (Interviews, 19-20 October, 2005). For instance, a retired professor spoke about how life was much easier pre-1991, when you knew what you could and could not say in your publications, but within this defined area it was possible to conduct good academic work and provide a living for your family, which he contrasted with now "when if they don't like what you write, you go to jail" (Interview, 29 September, 2005). Suggesting that the 'boundary conditions' are more fluid and less explicit than during the Soviet period, perhaps helping to explain why greater 'degrees of freedom' exist in Tashkent than in Khorezm. This has a flow-on effect on the quality of students, and future staff that universities are able to attract. This is exacerbated by a move away from the physical and agricultural sciences, towards the 'new economy' subjects favoured by the 'new Uzbeks'. For instance in Tashkent, where all the premier institutions are based, it is much more difficult to enter

the institutes of Diplomacy, World Economy, Foreign Languages, Law than it is to enter those schools with an Agricultural or Humanities focus (Interview, 20 October, 2005). Likewise the perception amongst those young people in Khorezm was that university was a sort of purgatory, where one waited for a job.

> "Everyone knows that you just pay for your degree, you go to class but you do not learn, we just laugh at our teachers because they are the ones that could not get a job elsewhere" (Interview, 4 April, 2005).

This statement is beyond the truth, yet it is not opposed to the truth. The problem of corruption and is understood by senior scientists within Uzbekistan, who discuss the difficulties in attracting good students, because of a lack of pay and other rewards (Interview, 18 October, 2005). This situation is made more difficult, in my opinion, by the obtuse manner of some academicians, who are more focused on their past glories and self-importance, than on facing the reality of their institutes decline. It also seems to me to be a feature of some senior academics, that they feel they must act in a contumelious manner to students and junior staff (Field notes, 30 September, 2005). The self-perspective of many of the Uzbek institutes is well illustrated by the requirement that for a German PhD to be recognised in Uzbekistan, the student must also publish two papers in Uzbek journals (Field notes, 28 February, 2005). In light of such challenges it is difficult to be optimistic about the role that universities can play as research institutes in Uzbekistan. What knowledge once existed is diminishing or outmoded, and new the incentives and infrastructure for new knowledge creation are simply lacking.

3. Competition for Funding

One of the ways in which the GoU responded to the disintegration of the Soviet Union was to establish competitions for funding. Whilst "In the Soviet period funding was not a problem, what you asked for you received, if you had the support" such levels of funding were not possible post-1991 (Interview, 19 October, 2005). Thus a system of academics applying for competitive funding was established for all institutes and disciplines, whereby academics apply for funding to a set budget for certain specified work, set out in a research proposal (Interview, 7 October, 2005). This system of funding is supposedly anonymous, with the proposal and budget being submitted in a different folder than the

personal details of the applicant; however there are some doubts as to how effectively this rule is enforced (ibid.). What is clear however is that merit plays a large role in determining the funding allocations, and that those institutions that have been successful in attracting this new state funding have been more able to survive in the post-1991 era[xx]. For middle level scientists this funding is a crucial way to advance their careers, for it is only through this sort of funding, outside of the core budget of the university, that they can actually conduct any research. It also brings with it the ability to travel to foreign and domestic conferences, further advancing one's career prospects (Interview, 23 September, 2005). This same system of competitive funding also exists within universities, where the scientific council decided upon the merit of various research proposals, in a somewhat less anonymous manner. It should also be noted that this system is not actually novel to Uzbekistan, indeed 'Soviet competition' (contra capitalistic competition, which was ideologically unacceptable) was used to promote growth during the Soviet period. For everything from the cotton harvest, vehicle production and academic funding. The method is new but the approach is not. The system, whilst a credible effort to deal with reducing funding, is imperfect. One academic who sits on the panel determining which proposals are funded, complained that the funding proposals they received were all alike, simple copies of research proposals that had been previously successful - and of which all applicants would be aware (Interview, 19 October, 2005)[xxi]. This suggests that the capacity for designing research proposals or academic merit is somewhat lacking within the academies and universities of Uzbekistan or that the risk of punishment further encourages a repetition of previous 'safe' research. Such a view certainly squares with my own and other's observations of researchers in Khorezm, for whom the design of research or even the concept of the scientific method (from a Western perspective) is lacking (Interview, 20 May; Field notes). Certainly also the funding decisions are made in line with politically mandated development goals, if anything strengthening the linkages between politics and science.

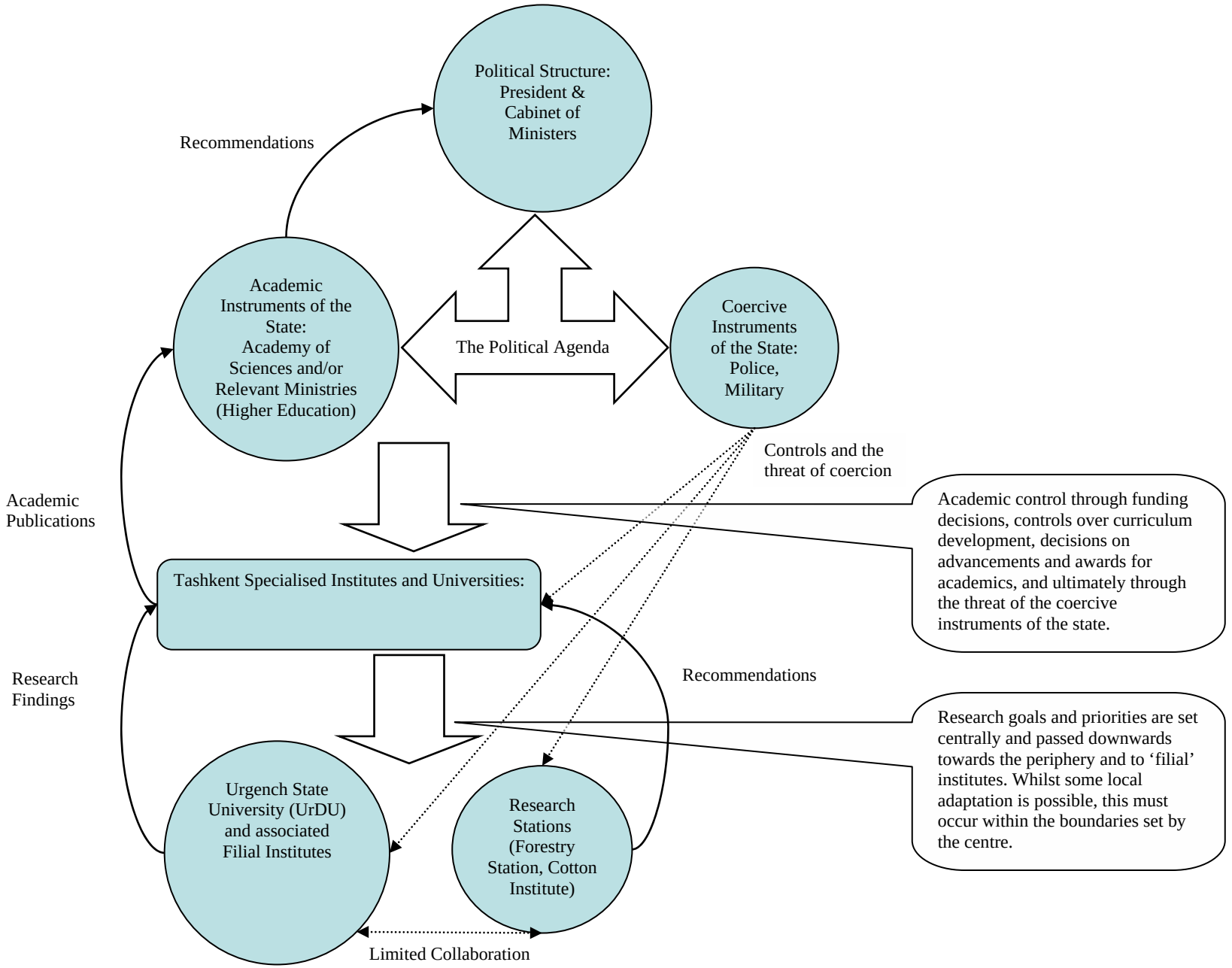
[xx] With the exception of those institutes capable of attracting significant foreign funding, which is considerably more lucrative, yet increasingly difficult to obtain given the shift away from the West by Uzbekistan in 2004-2005, ongoing at the time of research (Interview, 18 October, 2005).

[xxi] Interestingly, the ZEF project management make similar complaints on the quality of research proposals.

IV. A MODEL OF KNOWLEDGE GOVERNANCE IN KHOREZM

There are several defining aspects of the knowledge governance system of Uzbekistan and how this system operates within Khorezm. These are; the control of politics over science, accompanying this is the necessity for 'politically correct' science, the modes through which awards and advancements reinforce state aims, 'feedback' mechanisms from science to the state and the role of the coercive state bodies in knowledge governance. These 'rules of the game' and phenomena together constitute a political structure which can be schematically modelled. Figure 12 below provides a schematic diagram of how the *political* structure of knowledge governance can be seen to operate within Uzbekistan and how this impacts on peripheral regions such as Khorezm. I would not claim that this presents a total picture; aspects such as the complex processes at work within various constituent parts (especially the 'political agenda') are beyond the scope of this thesis. What I attempt to set out however is the hierarchical manner in which the actors operate, with significant downward power and influence exerted. This is only partially matched by the 'feedback' mechanisms available to academics, namely using their research findings to produce 'recommendations' which will in turn influence the state determined agenda. Yet knowledge creators operating within this system have little opportunity to exercise 'voice', leaving them 'exit' and 'loyalty' (to adopt Hirschman's classification). Whilst voice is very limited in the current Uzbek context, the dynamics of loyalty are an important, and understudied, feature of Uzbek culture. Likewise, exit, from academia and from Uzbekistan is a sign of discontent, certainly evident in my field research. We see here also the role that non-knowledge related state actors, labelled here as 'coercive instruments', have in determining and reinforcing state policy and the 'political correctness' of science. I believe that this chapter has demonstrated that this historical phenomenon continues to the present day. What this model does not fully show is the knowledge sharing that occurs between partners. In a sense the 'feedback' mechanism is an illustration of how knowledge is passed upwards, and the determination of curricula has inherent in it knowledge aspects.

Figure 12: A Model of Knowledge Governance in Uzbekistan and Khorezm



CHAPTER 6
ZEF KNOWLEDGE MANAGEMENT

Just as I have examined the knowledge systems of the indigenous farmers of Khorezm, and the knowledge governance system in which they and Uzbekistani academics must operate, I focus here on one particular project working in one region of Uzbekistan. The aim of this chapter is firstly to elucidate the mechanisms through which knowledge is created, shared, distributed and ultimately implemented (used) within a foreign research project. This model of knowledge management within the project is then discussed in terms of the co-operation and collaboration that occurs with the other knowledge systems, namely the indigenous knowledge and knowledge governance structures. This is finally applied to an analysis of how knowledge management within the project can inform its activities and operations, especially in its collaboration with Tashkent and Urgench based universities and institutes. Likewise the level of cooperation with local farmers, from the indigenous knowledge system, is discussed. The analysis of the ZEF project begins by querying what forms of knowledge exist within the project, how these constitute knowledge and the validation procedures within ZEF to accept this knowledge, with all this knowledge contributing to the 'project goal', however this is defined. I then discuss who creates what knowledge within the project and some of the problems of knowledge loss and restrained knowledge sharing that accompany this. Aware of these constraints a fuller analysis of the levels of knowledge sharing, by different groups, within the project is suggested. Including several case studies of different knowledge sharing mechanisms, followed by an account of how the project collaborates with local institutions and the knowledge governors in Tashkent. Finally, I address the issue of knowledge dissemination, both in its current and planned stages, although it should be cautioned that my research period extended only as far as the end of 2005, so planned project activities are discussed only in the hypothetical.

I. WHAT KNOWLEDGE?

Knowledge is central to the activities of ZEF as a development research organisation. Yet there are different types or kinds of knowledge and differing opinions on what constitutes knowledge. These opinions on the 'kinds of knowledge' that are valid are socially constructed values, they are the result of personal opinions, institutional structures and bureaucratic rules that together constitute the 'knowledge environment' in which the ZEF/UNESCO project operates. The description of this knowledge environment is inextricably linked with the questions of what the project does and the justifications for doing so, given that the project is knowledge focused I deal with this issue here also. This section is an attempt to understand what different views of knowledge exist within the project, and why these exist. Drawing upon interview data, documentary sources and project policies I describe here the dominant and discordant views on what kinds of knowledge exist within the project, what constitutes knowledge and various opinions on the validity of various kinds of knowledge. It should be noted that the analysis here is of the ZEF/UNESCO project as an entity. Whilst the project is a part of ZEF, it would be wrong to assume that the characteristics of the knowledge system within the project are equivalent to that of ZEF as a greater organisation, or to apply these findings to other ZEF research projects in different parts of the world. Equally, the reader should note that I am not claiming that the experiences of this project are unique, indeed many research projects operating in the developing world experience similar challenges, and attempts at interdisciplinary research and knowledge sharing are notoriously difficult (Golde, 1999; McNeill, 1999). What I do find is that certain conceptions of knowledge and ideas of what constitutes 'good' or valid research do exist within the project. Certainly the management and design of the project reflects a particular, tacit, epistemology of science and development. This is reflected in conceptions of what constitutes knowledge and what kinds of knowledge and research are valid. These differing views are made most clear when project staff provide their own opinions on 'why the ZEF/UNESCO project exists'. Together I see these are contributing to the 'scientific culture' of the ZEF project.

1. What kinds of knowledge exist within the project?

The project possesses, through its staff and students and in its databases, a wealth of knowledge on agriculture in Khorezm. What I examine here is the kind of knowledge that this is and who or what defines knowledge within the project. To do this it is useful to turn back to Dueck's conceptualisation of knowledge as theoretical, declarative, procedural and dynamic (Dueck, 2001: 885). I argue here that much of the knowledge within the ZEF project fits into the first three categories. The fact that theoretical knowledge is a large part of the knowledge set of the project is unremarkable, as an academically orientated project which utilises PhD students as the main knowledge creators (more on this below) it is essential that theoretical knowledge exists within the project. This theory is applied in a manner that in my opinion shows a correlation between the project design and Dueck's concepts of knowledge typologies. So whilst the first phase of the project was focused on collecting data on the 'status quo' (Vlek et al., 2001) we can discuss this in terms of declarative knowledge: describing the current situation. The knowledge is manifest in the GIS data that was built up during the first phase, and is reflected in the PhD topics of that time, which were designed to document the situation, with occasional reference to the past[i]. This declarative knowledge was then employed in designing the second phase of the project, which called for greater research on how the situation in Khorezm was changing and could be changed (ZEF, 2003). Here field research and the design of a 'restructuring concept' required greater procedural knowledge of how phenomena occurred in practice. This included knowledge on-farm restructuring and water distribution from a social perspective, modelling the economy of Khorezm at the micro and macro levels for economics, and from the physical sciences a range of 'experiments' on possible solutions to these problems. This applied theoretical knowledge to the problems and issues identified in the first phase (consisting of static knowledge). This procedural knowledge is of how specific and discrete phenomena occur within Khorezm and Uzbekistan. This knowledge is also situated within a certain political and legal-bureaucratic structure in which the project must work, which includes

[i] E.g. 'Assessing the extent and state of shelterbelts and tree patches in the Khorezm landscape', 'Analyzing of existing water allocation and water use patterns in Khorezm', 'Water user association in the theory and practice'.

the knowledge governance structure but which is somewhat broader than this. Certainly the project's understanding of how to operate effectively within Uzbekistan has also greatly increased since the period of the original project design, witnessed by the learning experiences shared by the senior management in interviews (Interviews 2 & 5 December, field notes, November 17).

Yet I would not yet characterise the knowledge base of the project, as observed and studied in 2005, as being dynamic. In the terms of this project the knowledge collected should become dynamic when it is implemented at the farm and political levels within Khorezm, an activity reserved for the third phase of the project, which my research does not report upon. However, drawing on the knowledge typologies set out in chapter two, I would stress that dynamic knowledge is the knowledge of innovation, it draws on the three previous forms of knowledge, and produces new ideas and concepts. Thus if the project is to establish itself as a creator of dynamic knowledge then the third phase needs to be approached in terms of encouraging joint learning and the revision of knowledge accumulated in the earlier project phases. This will require a departure from the 'technology transfer' paradigm which is prevalent in the early project proposals (Vlek et al., 2001: 8-9). Certainly in the first proposal the language adopted is very much from this 'technology transfer' paradigm:

> "The results from phase 2 will be compiled into jointly crafted reports and presented in an adequate manner addressing different target groups (e.g., scientists will be approached by the means of an international scientific congress; policy-makers will be presented with reports and asked to participate in hearings, and stake-holders will be offered training and extension services)". (Ibid. p.9)

There is no discussion of how this presentation will allow ideas to flow from the stakeholders 'upwards' to the scientists preparing the reports, nor of any mechanism by which this training and extension will seek to learn from end-users of technology. Likewise, in the planning and execution of phase two of the project, the documentation makes no discussion of how stakeholders are involved in the research, other than in a brief section labelled 'Science application towards development options', where the method is described as:

> "…several of the work packages addressed up to now … have a high potential for practical application and are of relevance for designing development options" (ZEF, 2003: 24)

Yet the design of these development options, or 'work packages', occurred without consultation with local farmers or the rural poor. This consultation is seen as an implementation issue, which was given as a task for "the external agency" to do (in the future) and which is viewed by management as outside of the mandate of ZEF (Interviews, December 5 & 8). This reflects the view that only scientific knowledge is relevant to, or within the domain of ZEF as a 'development research' institute. This is not in of itself problematic; rather what I would critique is the view that 'development research' can be conducted in a poor country without acknowledging local wishes or attempting to access local knowledge. This has defined the types of knowledge which exist within the project as being 'scientific' knowledge at the possible expense of accessing local knowledge, a view very much in line with the technology transfer paradigm.

2. What constitutes knowledge?

Knowledge within the project is broadly defined by the project proposals, senior staff and students. Because of its nature as an interdisciplinary academic endeavour the project claims to accept a broad range of types of knowledge. Examples given with project literature discuss very wide ranging ideas of what constitutes knowledge. This includes the classification of land use in Khorezm, utilising advanced satellite imaging and computer tools and measuring irrigation use in the province (Ruecker & Conrad, 2003). Likewise, hydrological data at the system level is set in project documents as equally valid as knowledge on the social process of water distribution (ZEF, 2003: 28). This knowledge on such a broad range of topics manifests itself in a variety of ways. For instance, project publications and conference proceedings are seen as an important output from the project, creating artefacts of the knowledge that exists and to some extent putting this knowledge into an environment in which it is tested, validated, shared and discussed. This 'data first' approach is reflected in the design of the overall project, which saw the creation of a 'database' of the status quo to be a necessary first step for the project and which continues to see the 'output' of data as an important part of the knowledge that ZEF contributes. Again, this is a typical situation for an academically

orientated project (McNeill, 1999). Which in this case is a reflection of the need for ZEF to meet a variety of very different conceptions of why the project exists (discussed later in the chapter), including pressure from Bonn University to maintain an 'academic' direction.

Similarly the production of PhD dissertations is perhaps the single biggest form of knowledge documentation within the project and it represents the output of the main knowledge creators. Here a mass of knowledge, or information, is produced in an academic form; presenting and discussing results from research and applying theoretical analysis to this. To date in 2005 only limited attempts had been made to 'translate' these findings (both literally and figuratively) into a form of medium which could be understandable to local farmers. Rather, the focus was on creating artefacts of knowledge which were academically convincing and which could serve the basis of project bids for continued funding. It should be noted that, as an interdisciplinary endeavour, the ZEF project aims to accept knowledge created by different disciplines and to incorporate qualitative knowledge as well as the quantitative data[ii]. Thus a very wide definition of knowledge, including the 'know-how' of working effectively in Khorezm, is considered to constitute knowledge within the project.

3. What Knowledge is valid?

Despite the broad-minded definition that the project takes to what constitutes knowledge and to the different types of knowledge that exist within the project, there are differing views on what knowledge is valid. I define this approach as 'all knowledge is valid, but some knowledge is more valid than others'[iii]. The evidence gathered from my research suggests that the knowledge which is more equal is that which is quantifiable, with

[ii] Although this is not explicitly referred to the first proposal the discussion of work packages focuses on institutional/legal aspects, qualitative data gains increasing mentions in the second proposal (ZEF, 2003) and especially in Martius et al. (2006) where for the first time future work packages are designed using qualitative methodologies (pp. 83)

[iii] Phraseology consciously borrowed from George Orwell's 'Animal Farm'.

qualitative knowledge being 'less equal'. This is not to say that qualitative knowledge is regarded as invalid, quite the contrary it is included and is seen as part of the project. But, when compared to quantitative data, qualitative data is considered inferior, and I argue that this reflects the dominant epistemology or 'scientific culture' of the project. An illustrative example of this is the key data storage and sharing facilities within the project. Especially the Meta Data Base (MDB, discussed as a case study later in this chapter) and the planned KEOM/FLEOM model, both rely upon the input of quantitative data. For example the MDB sorts data inputs according to the major criteria of:

- Spatial Coverage
- Sampling Unit / Scale
- Start Date
- End Date
- Time frequency
- Data Format
- Data Quality
- Data Source

Inherent in these classifications is a concept of knowledge as data which is discrete, time bound, spatial in nature and which can be quantifiably graded for quality. In short, quantifiable data, or more specifically GIS data. It is difficult to conceive of how qualitative data could be meaningfully placed within the MDB/CDB[iv]. Yet the MDB is cited in each project proposal (Vlek et al., 2001; ZEF, 2003; Martius et al., 2006) as a central tenet of the ZEF project's commitment to inter-disciplinarity. Likewise the KEOM/FLEOM model is discussed as a key output of the second phase (ZEF, 2003: 47-48). Yet interviews with those involved in its design identify that the role consigned to non-quantitative data is one of advising and suggesting improvements on the model once it is in a beta testing stage (Interviews; 8 March, 26 July, 2005). I would argue that the problems associated with incorporating qualitative inputs into the 'decision support tool' are less an issue of modelling techniques, but more an issue of a dominant epistemology within the project. This epistemological dominance is not necessarily the result of any explicit goal of my discipline to 'dominate' another; it reflects some of the historical problems that the project has faced in promoting interdisciplinary research, such as a lack of engagement on the part of early social science collaborators and others.

[iv] Indeed I came across one example in my research where qualitative data was explicitly rejected from the MDB, precisely because it could not be 'classified' according to the criteria of the database (Interview and forwarded email, anon., 21 July, 2005). Providing an eloquent example of how defining the criteria for 'valid' data, unintentionally, led to the rejection of certain forms of qualitative data as invalid.

This epistemology or culture of science (cf. Knorr-Cetina, 1999) within the ZEF project is reflected in the design of the 'restructuring concept' as being inherently computer based and quantitative in nature. Leaving aside the issue of the appropriateness and applicability of such a model (of which I discuss more on later in this chapter) what this does represent is the dominant epistemology within the project that perceives certain types of knowledge to be more valid than others. The validity is not necessarily scientific prejudice, it also reflects the (in)ability of the project structures (the KEOM model, the databases, data exchange policies) to make sense of qualitative data. Whilst the modelling activities do aim to use qualitative data, and qualitative findings could theoretically be integrated into the MDB (although have not been and if they were they could not be classified) this integration would be from a 'less equal' standpoint. It is because qualitative data cannot easily be incorporated into the models and databases that by the design of these structures qualitative data are inherently, if unintentionally, marginalised.

This may not be deliberate, but in the determination to use computer modelling and a database which favours certain knowledge types, the influence is still acute. In fact many of these decisions were taken in the first project stage, in an attempt to promote interdisciplinary collaboration, yet they failed to account for the different epistemologies within the project, assuming instead a positivist stance which tended to preclude other forms of knowledge. To this end the scientific culture of the ZEF project is biased towards quantifiable data which is perceived as 'hard' and verifiable. Indeed, the need to do qualitative and subjective research is acknowledged as playing a contributory role, adding understanding and depth to the quantitative research that is conducted (Meeting notes, 11-12 February, 2004). This is why I use the Orwellian characterisation of different levels of equality. In principle all forms of knowledge are valid within the project and are judged according to the standards of their discipline. However, because the needs of the project design, an outcome of the dominant epistemology of knowledge from the project management, certain forms of knowledge are better able to become 'validated' against the requirements of the project. Thus these forms of knowledge are validated as 'more equal' than others, because the project culture and structures are better able to use them.

It is difficult to accurately define these different epistemologies, and individual researchers may hold views which conform to aspects of different epistemologies. In general the dominant epistemology can be described as 'positivist'. Positivist epistemology has been the dominant discourse in the sciences for over a century (Comte coined the phrase in 1864) and can be defined as "all approaches to science that consider scientific knowledge to be obtainable only from sense data that can be directly experienced and verified between independent observers" (Susman & Evered, 1978: 583). This paradigm has come under attack from many fronts, not least from social scientists who find it an inadequate position from which to conduct their research (Morgan & Smircich, 1980: 491). I do not here wish to enter into a debate about the validity and value of different approaches to science. Rather, I wish to explore how these epistemologies of science influence the approach taken to development research and to interdisciplinary collaboration, the two issues on which the project, and ZEF, take pride.

i. Impact on Development Research

The project preference for certain types of data over other types has an impact on how it conducts the 'development' aspect of its research agenda. What this can mean is that 'local' knowledge is not easily integrated into the research agenda, because the types of data which are produced are not easily made acceptable to the scientific epistemology of the certain project structures. For instance the modelling exercises are constructed in a way that does not make full use of local knowledge. This is not intentional, indeed project managers in interviews have expressed an honest desire to integrate local knowledge and an equally honest incertitude of how to achieve this (Interviews, October 7, 12; December 5, 2005). The inherent problem is that the types of knowledge which exists at the local level cannot easily be integrated into the positivist epistemology of the project. It is inherently localised (not universal like 'scientific' knowledge) it is difficult to access and it is informal (not recorded or written). For instance the local knowledge of masters relating to seed selection or the use of maize as an indicator crop would not easily be integrated into a strict 'scientific' epistemology. Such knowledge forms part of

the ‘grey’ literature which the project proposals (ZEF, 2003: 11) discuss as difficult to access in Khorezm, yet which efforts are made to access (e.g. through the ‘work paper’ series which enables local collaborators to contribute to the project). What is lacking is a mechanism by which this local knowledge can be ‘translated’ into a form of knowledge which is understandable or comprehensible to the project. This is despite efforts to incorporate local knowledge, for instance on “hygiene, waterborne diseases … tree species … wind erosion and much more” (email from project management, 18 August, 2006). The problem is not a lack of effort, but rather inherent to the epistemological constraints that certain project structures (the MDB, computer modelling) places on the types of knowledge which can be validated.

Existing data/knowledge structures such as the modelling exercises and the MDB are inherently incapable of dealing with localised knowledge (since they struggle to deal with qualitative scientific knowledge). In this way the scientific culture of the project is, unintentionally, setting itself in a situation by which it *cannot* access or use local knowledge to a significant degree. Even though the project proposals for the first and second phases make no mention of collaborative research with farmers, interviews with the project management express a desire to do so[v]. Yet, the cultural differences (scientific and social) would tend to preclude this if the data structures of the project are not modified in a way which ‘allows’ other forms of knowledge to be integrated. I discuss later in this chapter how the third phase proposal aims to work much more on ‘innovation’ at the farmer level. But if this is not accompanied by a shift in the dominant epistemology within the project, then the challenges will remain (cf. Sillitoe, 2004). That is because the challenges are not purely about *what* is being researched, but more importantly about *how* this is being researched and the types of knowledge that can conceivably be produced by this.

[v] Vlek et al. (2001) and ZEF (2003) both make no mention of the contribution that local knowledge could possibly make to the design of a restructuring concept. Indeed, the contribution of Khorezm is in providing data in the first phase, which is to be fed into the project’s mechanisms for the design of a restructuring concept. This is changed somewhat in the third phase proposal (Martius et al., 2006) which is discussed later in this chapter. This change towards accepting a greater involvement of local knowledge was also expressed in interviews with the project management (Interviews; October 7 & 12; December 5 & 6, 2005

ii. Impact on Interdisciplinary Collaboration

Interdisciplinary collaboration is not easy especially. When working in a different cultural context and on complex issues like natural resource management, these challenges are exacerbated. The ZEF project is not alone in facing these challenges, nor in managing a dominant epistemology of science which, unintentionally, constrains research. For instance McNeill (1999) analysed interdisciplinary research programmes on the environment and development in Scandinavia, Britain and the USA, finding that there are two 'gaps' to be bridged, namely those between the social & physical sciences on the one hand and between research & application on the other. In Uzbekistan there is also a 'gap' between Uzbek and Western conceptions of science and research. It is theses gaps between scientific cultures (both disciplinary and geographic) which are often overlooked. The impact of the dominant epistemology is that certain types of knowledge and thus disciplines gain an ascendancy over others, reinforcing this scientific culture. We need to see knowledge within its cultural context in the ZEF project, where the scientific culture is heavily informed by positivism and a certain, technological and teleological, view of development. In this context certain types of knowledge, for instance those which contribute to the modelling exercises, are seen as more valid than knowledge which is not so easily understood by the dominant epistemology. Yet this should not be seen as a deliberate or duplicitous attempt to exclude certain types on knowledge, on the contrary the ZEF project evidences a commitment to interdisciplinary collaboration (both in project proposals and in interviews with project management). The problem is that the rules of how this collaboration occurs have largely been determined in advance by the design of project structures, leading to the 'gap' between scientific cultures. This gap is not insurmountable, but what is required is a change in how different forms of knowledge are validated within the project, towards a model which can incorporate different forms of knowledge. Both sides need to work towards closing the gap, if collaboration is to occur, and I would note that the third phase project proposal (Martius et al., 2006) demonstrates much greater openness to different forms of knowledge. Thus, the phenomenon of interdisciplinary collaboration being difficult to achieve is not unique to the ZEF project, but what we do see is the influence of a dominant epistemology on how knowledge is validated.

4. Why the ZEF/UNESCO Project exists

Some of the lack of clarity in terms of the constitution and validation of knowledge within the project comes from a fundamental confusion as to why the ZEF/UNESCO project actually exists. In essence, the key goal and the main objectives of the project are rather elusive [vi]. The initial project proposal states that:

> "The goal of this project is to establish the basis needed for the demonstration of an effective and sustainable restructuring of the landscape in the district of Khorezm, and to outline suggestions for the necessary administrative and legal-administrative re-organization." (Vlek et al., 2001: 10).

This stated goal, as amorphous as it may be, is not present in later project publications where the emphasis appears to shift much more towards capacity building and research. Indeed in a discussion with one of the project managers, he discussed how he envisaged the project as being "about helping the poor people here … ultimately to improve their lives" (Field notes, 8 March, 2005). Whilst this idea holds some support from individuals within the project (Field notes, 6, 13 August, 2005) there is no mention of such an explicit aim within the project documentation. The confusion about the actual goal of the project, the reason why knowledge is being created, is similarly interpreted differently by students within the project. When interviewing or accompanying PhD students on their field visits, I asked the consistent question: "why does our project exist". No answer was the same and responses varied from

> "To reverse the current situation and problems or difficulties in agriculture and to come up with ideas on how to improve the situation. Then not only to know but to show what can be changed, for example through a demonstration farm" (Interview, 9 August, 2005. *Emphasis in original interview*)

Through to:

> "It is economic and ecological restructuring. Coming not only from the technical side but also from the practical side. Using our status as foreigners to try things that the locals cannot do" (Interview, 25 August, 2005).

The discussions within the project for the planning of the third phase (discussed at greater length below) also show the degree of differences of opinion as to the fundamental purpose of the project. Notable from a knowledge perspective is that research and education (knowledge creation) that occurs within the project is directed towards certain objectives and aims. Yet it is difficult to discern how these discrete aims contribute to an

[vi] I adopt here the lexicon of the 'logframe', as presented in ZEF., 2003: 50-51

overall project goal. For instance all three of the project managers discussed how the project aims to build scientific capacity within Uzbekistan, seeing this as an extension of a prior UNESCO project with added specificity (Interviews: 13 & 15 December, 10 November, 2005). When asked explicitly what the justifications for the project were, these three managers all had very different views. One saw it as an exercise in conducting "excellent research", another to "work on ecological and economic problems" and another gave a variety of ways in which the project would "help the people of Uzbekistan" (ibid.). Without commenting on the correctness or otherwise of these goals, what is fair to note is that considerable confusion does seem to exist between project management and staff about what it is exactly the project hopes to achieve. This confusion also comes from a lack of clarity between different types of project objectives.

There appears to be a disconnect between the scientific goals of the project (which are explicitly stated in the project documentation) the societal objectives (more innocuous yet present) and the personal objectives of project staff and local partners (which vary greatly). Within the tangled web are certain boundary conditions which are externally set, such as the pressure on ZEF, from Bonn University, not to become too 'practical' (Interview, 15 December, 2005) and an overall pressure from ZEF for the project to contribute to the goals of the institute. I criticise later in this chapter how the poverty of rural Uzbekistan is used by ZEF as a *raison d'être* for funding purposes, yet there is at best an indirect link between current research and future poverty alleviation. Tied into this confusion are very different understandings of 'development', with the original project proposals (Vlek et al., 2001) adopting an elite driven mode of development, working through successful farmers. This of course is framed within conflicts between the three ZEF departments, which have different ideas of development. The fertiliser experiments, oft trumpeted as an example of farmer interaction, are an example of working with amongst the richest farmers. Such an approach is inimical to a 'bottom up' approach to development, which has emerged as a dominant discourse in development studies (Ellis & Biggs, 2001) yet which has not had an impact on the ZEF project.

Whereas the project's local partners, themselves elites (in their access to power, resources & opportunities) have different goals of what they hope to get from the project. This is evident in their view of the role of academics to 'provide advice' to the government but not to be directly involved in rural development themselves. Notably this is not dissimilar from the first project proposals approach of developing technologies for transfer to the Uzbek state (Vlek et al., 2001). Essentially having a research project which operates independent of the rural situation, recreating 'laboratory' conditions, in the case of this project by having a 'model farm' which is largely divorced from the realities of farming in Khorezm (i.e. guaranteed water availability, freedom from the state plan) whilst at the same time claiming to develop relevant 'restructuring concepts' for the Khorezm region. In essence this confusion relates back to the differing epistemologies within the project, with the same conflicts between positivist science (which claims to lead to development, *deus ex machina*) engaged societal perspectives and the perspectives of local project partners. The outcome of this lack of clarity is that project knowledge creation does not seem to be directed into one distinct goal or set of objectives.

Rather some knowledge creation serves certain purposes (e.g. capacity building with local partners) whilst other knowledge creation serves separate objectives (conducting 'world class' research) whilst other work packages could be seen as deliberate attempts to develop locally appropriate technologies (i.e. conservation agriculture, discussed later in this chapter). Resultantly, the knowledge created lacks cohesion of purpose, and whilst the quality of this knowledge creation process may be excellent, the sharing of this knowledge is at times hindered by a lack of surety of purpose. This disclarity of purpose needs to be understood in light of the 'gap' between both local knowledge and different forms of knowledge within the project, so whilst the dominant epistemology may favour a certain view of development there is even disagreement internally within the management about how best to achieve this. This is understandable given the confluence of professional, personal and social objectives which the project pursues, yet it does mean that the knowledge management of the project is not being managed towards a single identifiable goal or purpose.

II. CREATING KNOWLEDGE

Knowledge creation is a central to the ZEF project in Khorezm. In this section the methods and mechanisms through which knowledge is created are explored, in light of the different kinds of knowledge discussed in the previous section. It would be mistaken to consider that knowledge creation within the ZEF project, or indeed in any situation, occurs in isolation. Rather, the way in which knowledge is shared within the project and with its partners, as well as disseminated to farmers (which can in turn be a learning experience) also leads to all forms of new knowledge creation. It is exactly this sort of collaborative learning that the project claims to strive for, especially by framing the project as an 'interdisciplinary' endeavour (ZEF, 2003). Yet despite these goals of interdisciplinary collaboration coupled with excellent individual research, I find below that the structural design of the project, by focusing on PhD students as the key knowledge creators, has costs as well as benefits.

Firstly, I examine the role of the ZEF PhD students, who create much of the new knowledge within the project. Included in this analysis is the risks of knowledge loss and the barriers to knowledge sharing that working with PhD students entails. Secondly, I discuss the more varied group of knowledge creators within the project who are not conducting their research towards a doctorate. I find here, amongst the various permutations that this group involves, that these individuals are creating knowledge in many fields, nevertheless that the project lacks a mechanism for effectively gathering and utilising this knowledge. Thus the design of the project in terms of structuring how knowledge is created and who is creating this knowledge has a large impact on the related issues of knowledge sharing and knowledge dissemination. These aspects should be read collectively, as opposite faces of the same coin, for it is only through the process of knowledge sharing and testing that new knowledge is created and ultimately utilised.

1. The PhD Student as Knowledge Creator

The design of the ZEF project has focused on PhD students as the primary knowledge creators. Aside from the in-country project coordinator and the Bonn based scientific coordinator, the majority of full-time professional staff are PhD students[vii]. The exceptions that do exist tend to come from external funding sources[viii] and these can be considered exception cases. In almost all instances research is being conducted by, or through, PhD students. Both Uzbekistani and foreign students are inducted into the 'International Doctoral Studies Programme' at ZEF, allocated to a disciplinary department and then take a series of both inter-disciplinary and disciplinary courses for their first few months in Bonn. There are also PhD students who, for a lack of English language skills or financing, also conduct their PhDs through the project but matriculate from a university in Uzbekistan. Both types of PhD students are then responsible for preparing a research proposal that must be deemed suitable by their supervisors as well as project management. In many cases at least one of the supervisors of the student is also a member of the core project management team of the scientific and project coordinators, and the leading director at ZEF in Bonn. In practice the nature of this research proposal is largely agreed upon in advance and in many cases the supervisors and/or project management have a significant input into the research design. A useful example, just one of the 24 PhDs undertaken or commenced by 2005, is on fertilisers. This research was conducted in a broad study by one PhD student, who was then also tasked with conducting research *for* a senior scientist within ZEF management (Field notes, 25 August, 2005), which is an unusual arrangement within the project. The design of this research project was largely, though not wholly, determined in advance and the position was advertised to conduct this particular research (Interview, 25 August, 2005). A more typical case is of a discrete PhD study being designed as part of a 'work package' in a project proposal and then staff recruited to conduct this research package. Likewise much of the data collection that has occurred has been conducted by PhD students in aid of their individual research topic whilst also contributing to the project database.

[vii] I exclude here domestic support staff from the list of 'professional staff' not as a comment on their professionalism per se, but because they are largely peripheral to the core goal of knowledge creation

[viii] For example an INTAS funded post-Doctoral fellow, who was a previous doctoral student

i. Knowledge Loss

By concentrating the organisation's knowledge assets in PhD students, ZEF has chosen to create knowledge in a manner which is 'lumpy'. PhD students are 'lumpy' in the development economics sense of the term; they carry a large value (in this case of knowledge) that tends to come all at once and which, if lost, tends to be lost in its entirety. For instance, in development economics a cow is considered a 'lumpy' asset for a poor household. It requires constant maintenance (fodder, or stipendia in our case) and delivers only a small return on investment during the ownership cycle (milk, occasional conference presentations or publications) and much of the value comes at the end of the investment period (sale or slaughter, submission of the dissertation which is seldom akin to slaughter). So if a cow dies from ill health or a student leaves for some reason, then the entire investment is lost with little return.

Moreover, once the investment 'matures' then the asset essentially leaves the household economy, or, community of scholars. So once a PhD student graduates, the project is in a situation of losing a great deal of knowledge that is attached to that person, and what knowledge has been gained by the organisation is inherently newly acquired and untested, because of the nature of the dissertation as a three year work with most of the outputs coming in the final few months. From the perspective of building up capacity within the Khorezm region, this poses a clear risk. As pointed out by one of the project partners in Tashkent, there is a danger that Uzbekistani students who choose to remain in Uzbekistan after graduation might tend to gravitate towards Tashkent as a metropolitan and academic centre (Interviews, 18, 21, October, 2005). Local partner's views differ on how much of the knowledge is lost in this case, one collaborator stated that all his students "remain in touch", regardless of their workplace, so "they are not really lost" (Interview, October 15, 2005) whereas another Tashkent partner identified the knowledge loss for Khorezm and Uzbekistan in general as a critical weakness on project design (Interview, 18 October, 2005).

Whereas the first five years of the project showed that many Uzbekistani students either emigrated after graduation or found employment elsewhere in the region (for instance, Kazakhstan). Thus suggesting that the issue of knowledge loss which arose in the preceding two chapters is as much an issue for ZEF as it is for the indigenous knowledge and knowledge governance spheres. It is difficult to assess just how much knowledge is lost by the project in this way, and it largely depends upon what one conceives of as knowledge. For instance one doctoral student identified "once I am gone, all my contacts are gone also, there is no one here to keep them up and to use them … for example <previous PhD student>, his contacts are now lost to us as a project" (Notes of meeting, 8 October, 2005). In a more formal academic sense of knowledge the issue of loss remains pertinent. Whilst the doctoral dissertation provides a tome of information and findings based upon the research of a PhD student, it is difficult to apply or use these findings without recourse to the author. Thus as the project moves away from 'pure' towards applied research focus in the third phase, the issue of knowledge loss is likely to be exacerbated. If the project does not retain the knowledge of its alumni, then it will find it increasingly difficult to utilise the knowledge that they created, in essence losing this wealth of erudition. This is an issue of which the project is critically aware and some risk mitigation strategies have been devised, like for instance efforts to hire students from Khorezm (contra the Tashkent based students of the first phase) who have a tendency to remain in their home region. Likewise the strategy of utilising PhD students from Europe, who conduct their field research in Uzbekistan and then return to Europe, poses real risks in terms of knowledge loss. However this 'problem' of knowledge loss should also be seen in light of the aim of ZEF and the project to assist in 'capacity building'. By building capacity the project is explicitly training young scientists with the express purpose of 'losing' their knowledge to another system. This capacity building is increasingly targeted at Urgench University, and thus the third phase may well see a departure from European PhD students, much more towards post-Doctoral positions with a permanent presence in Urgench (Interview, 11 November, 2005). This growing acceptance within the project of a need for greater capacity building of the Urgench partners (Interviews; 11 November & 15 December, 2005) was, in 2005, leading to greater investment in local PhD students because of the issue of knowledge loss.

ii. Problems for Knowledge Sharing

> "He is an output of ZEF - he does not share his data, when I was there for the interdisciplinary course I found a lot of people like that" (Interview, 26 February, 2005).

The nature of PhD research places a great deal of pressure on project students to produce a novel contribution to science within a relatively confined time span. The knowledge that is collected in this process is necessarily specialised, yet often has applications that are of interest to other staff and students within the project. This creates a conflict between the students whose interest it is to retain proprietary control over 'their' knowledge, other students and staff who do not wish to duplicate the research and thus seek to access existing knowledge, and the project which aims to encourage interdisciplinary collaboration and knowledge sharing. Thus a fundamental conflict exists and it is fair to say that this conflict is exacerbated by the prevalence of doctoral students as the central creators of knowledge within the project. This problem is not unique to this project, for example Golde (1999) discusses how traditional PhD programmes are not necessarily conducive to interdisciplinary research. In conducting my field research I came across a number of examples where PhD students, and even external academics, were simply unprepared to share their knowledge. In one case this disagreement had to be resolved at a formal level, yet the informal repercussions within the project were identified by some key informants as placing serious constraints upon knowledge sharing (Interviews; 24 & 26 July, 25 August, 9 May, 2005).

There also appears to be a cultural difference at work here. According to an external evaluation this has led to break downs in knowledge sharing between these two groups (Meeting notes, 14 May, 2005). My findings are somewhat dissimilar, that different scientific cultures exist within Europe and Uzbekistan, which favour differing ideas of cooperation and very different approaches to knowledge sharing (Interviews; 20 May, 19 October, 2005). Comparisons between the interviews I conducted with the PhD students in the programme identified that personality also accounted for a great deal, with some individuals describing how they were eager to share data (Interview, 9 May, 2005) whilst others guarded it jealously, e.g. "it is my effort that goes in to finding this data and I do not want others to get credit for it, that is unfair" (Interview, 29 September, 2005). Taken

as a whole, the interviews with over twenty of the PhD students indicated strongly that whilst informal knowledge sharing occurs for all students, the level of formal sharing varies greatly. Driving these variances is cultural difference. Both differences of scientific culture as well as different ideas between Germany and Uzbekistan on the importance of knowledge sharing, with the Uzbek students tending to be more informal in their sharing practices and avoiding the formal project structures much more than their German counterparts (cf. Kiong, 1999). We see in the next section how social capital (i.e. the ability for informal enforcement between actors) becomes an important indicator of knowledge sharing, with much higher levels of informal knowledge sharing occurring between similar cultural groups. This phenomenon is important in contributing to our understanding of how knowledge is 'situated' within cultural constructs. In the ZEF project there is a convergence of different cultures, of scientific cultures (epistemologies) which are in turn defined and influenced by the social background of the researcher and their education. Equally, the culture in which the knowledge sharing occurs informs and shapes what knowledge is created and shared. Thus the scientific culture of ZEF is heavily influenced by the choice of PhD students as knowledge creators, and the inherent boundaries that this places on knowledge sharing. The pressures of PhD study then have an impact on the ZEF project as a whole, creating a culture that may not always encourage knowledge sharing. This is of course only part of the explanation of what is a much more complex question on knowledge sharing within the project, which includes other actors. The following section discusses this in detail. What is important to note is that the choice of PhD students as the principal knowledge creators within the project has had a large impact on the sharing that has occurred because of the inherent restrictions that PhD study places on knowledge sharing.

2. Other Knowledge Creators within the Project

Operating within the project is also an eclectic mix of other knowledge creators, conducting research on a part or full time basis, who contribute in various ways to knowledge creation within the project. This group includes but is not limited to post-Doctoral students, Masters students seeking practical experience, supervisors and senior

European academics who conduct or support specific research, as well as the project managers themselves, who maintain research interests. The topics of research of this group are as varied as the backgrounds of those conducting it. What I have found from my interviews is that whilst these different knowledge creators are operating under the aegis of the project, in not all instances are their findings being incorporated and retained within the project. In many cases these studies link directly with a specific work 'module' or work package, for example those defined in the second phase project proposal (ZEF, 2003) which specifies certain reporting requirements for specific work conducted by an external researcher. The project is certainly open for collaboration, with one manager stating that "from the start, we were always open to others coming in, to collaboration" (Interview, 12 March, 2005). This collaboration is centrally managed. As with much of the knowledge management within the project, individual and disjointed studies are brought together through the project coordinator and the scientific coordinator. Whilst flexibility is obviously necessary in attempting to incorporate complex and varied findings, there would seem to be a work load issue there, that one or two managers simply cannot manage this amount of data. Inevitably some data is lost or not utilised and I have recorded in interviews complaints from a number of individuals that their earlier research is being duplicated (Interview, April 9, October 1, 2005). I suggest that this is not the intended outcome of the project management, who indeed are committed to broad collaboration (Interviews 5 & 8 October, 2005; field notes 21 August, 2005). Whilst the management approach of centrally managing and incorporating diverse knowledge creators (using also the MDB, discussed later in this chapter) intended to allow as wide as possible creation of new knowledge, it is unclear the extent to which this new knowledge is able to be; (a) incorporated into the project and, (b) shared with other actors. What this management decision illustrates is the, often unintended, impact that centralised management can have over knowledge management. In the case of external knowledge creators, outside of the project, their input is mediated by the project management in accordance with the dominant epistemology or scientific culture. Thus knowledge creation is shaped and informed by the dominant scientific culture, another way in which we see how knowledge is situated within a certain cultural (epistemological) context.

III. KNOWLEDGE SHARING

The ZEF/UNESCO project in Khorezm aims to be collaborative in nature. Successive project proposals call for both interdisciplinary research, implying knowledge sharing between disciplines, and for greater contact with Uzbek project partners entailing knowledge sharing with partners (see for example; Vlek et al., 2001, ZEF, 2003, Martius et al., 2005). Likewise as an academic, research orientated project the knowledge created by team members, be this knowledge abstract or applied, could be reasonably said to be perhaps the greatest asset of the project. Such a view is supported by the structure of project reporting which emphasises 'outputs' in terms of completed PhD and Masters theses. In light of these stated project goals it is important to critically examine both the scope and the intensity of knowledge sharing within the project, and between the project and its partners. I distinguish here between knowledge sharing within the project community and knowledge dissemination to the wider community, which I discuss in the subsequent section. When I discuss the scope of knowledge sharing I am referring to theories of knowledge sharing discussed in Chapter Two (VI, 1.) where intensity relates to how often knowledge is shared and the extent to which this knowledge is utilised in a useful and important manner. Whereas scope reflects the breadth of knowledge shared, whether it is very specific knowledge or a range of more general knowledge. It is of course difficult to quantify either the intensity or scope of knowledge sharing that exists within any project or community of scholars. What is possible is to look at several aspects of an organisation and from these to arrive at some conclusions regarding knowledge sharing. First amongst these factors are the specific policies that relate to knowledge sharing within the project and the policies that determine interactions within external partners. Second are the mechanisms and means by which knowledge is shared within the project and with outside organisations. Thirdly, more subjective, are the perceptions of those working within the project. I examine each of these factors in an attempt to understand the level of knowledge sharing within the project, as well as attempting to understand why it is that knowledge is and in not shared.

1. Knowledge Sharing within the Project

> "You <project students> need to talk to each other, when you sit together in the guesthouse at dinner, you need to talk to each other, about your work, what you are doing, you need to share more" (Scientific Coordinator, Meeting notes, 16 February, 2005).

Knowledge is the key commodity within the project and as an inter-disciplinary project it is fair to expect high levels of knowledge sharing between project staff and students. To gauge the scope and intensity of knowledge sharing within the project I analyse the Meta Data Base (MDB) as a centrepiece of the project's attempts to promote data exchange. Similarly the traditional academic outputs, such as conference presentations and joint authored publications are analysed, to see how much substantive knowledge sharing is occurring. Then the 'data exchange policy' of the project is examined, combined with interview data from project staff and students, to describe the reasons why knowledge is and is not shared within the project. Discussed in the following case studies is how knowledge sharing within the ZEF project is limited both in scope and intensity. In the course of this research I was unable to find significant evidence of academic collaboration between PhD students in the project, nor of substantive interdisciplinary collaboration, occurring at a wide scope and continuing intensity. There was intermittent knowledge sharing on a variety of topics, knowledge sharing occurs within the project, but this is limited by a number of factors. Given that it is doctoral students who constitute almost the entirety of full time project staff, and given their principal role as knowledge creators, the lack of peer-to-peer knowledge sharing is significant. I conducted direct interviews with past and current doctoral students, and analysed the inputs into the 'Meta-Database' (MDB) a central part of the project and platform for formal, mediated knowledge sharing. I also analysed the outputs from knowledge sharing within this academic context, for this I take co-authored papers and journal publications as a proxy. As with the MDB these are quantified results, which suggest that horizontal knowledge sharing is very low. To test whether there was more knowledge sharing occurring than formalised, quantitative, analysis suggests I also draw upon interview data. Yet the finding remained that, with few caveats, knowledge sharing between PhD students is low. The evidence for this and my hypothesis of why this occurs is presented below.

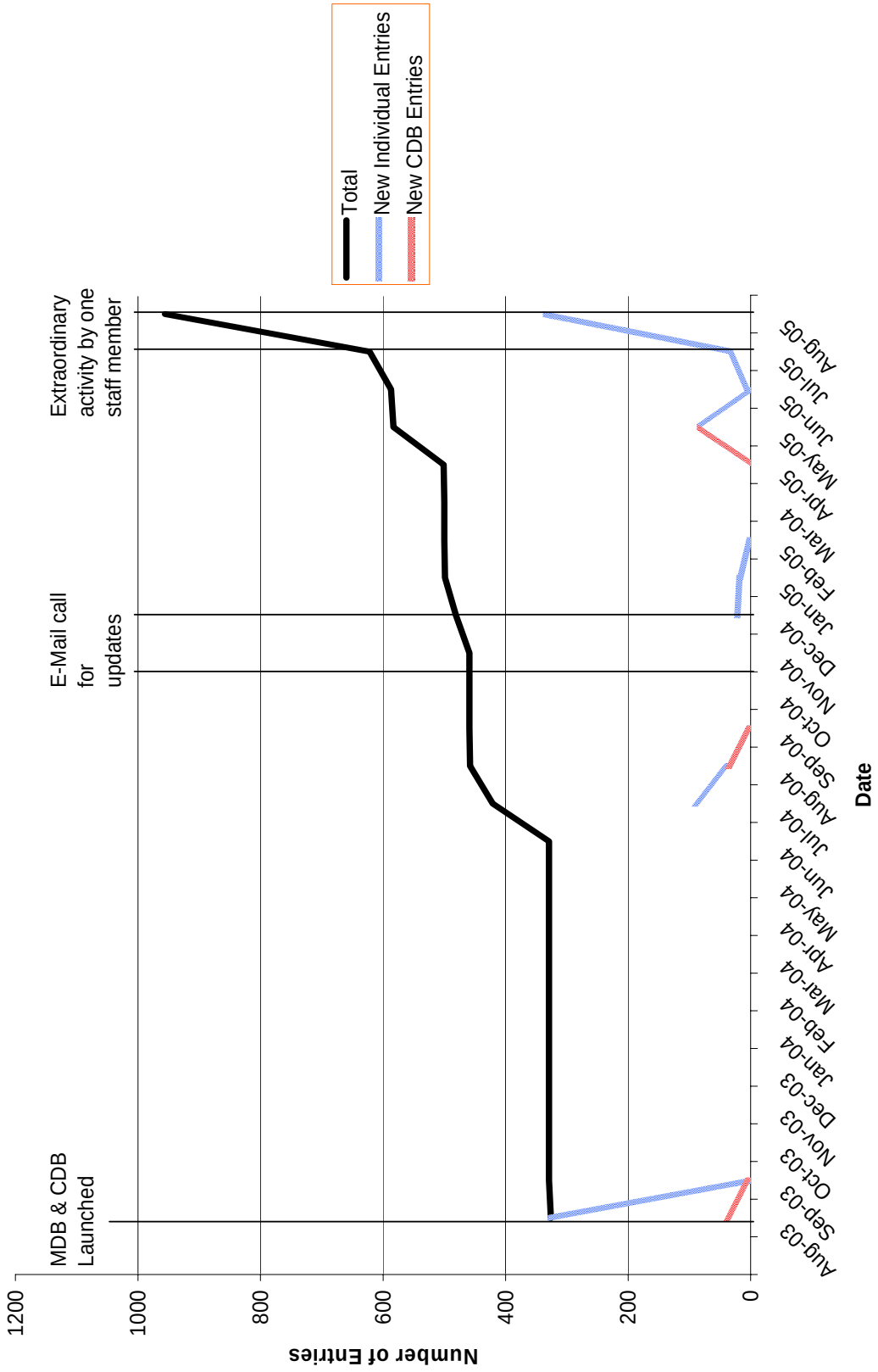
Case Study: Meta Data Base

The Meta Data Base (MDB) and the Central Data Base (CDB) (hereafter referred to collectively as the MDB) is an online database of information for the ZEF/UNESCO project, accessible to all project staff and partners. The distinction between the CDB and MDB is slight as "the CDB contains the actual data, whereas the MDB contains information about the data structure, allowing users to search for a specific data set" (ZEF, 2003: 46). Launched in June 2003 the MDB is aimed at reducing research duplication and promoting knowledge sharing between researchers. Project documentation refers to the MDB as a source for researchers to review existing knowledge within the project "thus facilitating inter-disciplinary integration" (ZEF, 2003: 13). Project documents, such as various funding proposals as well as the MDB user guide, proclaim the importance of the MDB as the central repository for project information and as the node through which data should be shared. What we find from an analysis of the MDB usage, is that the MDB is a static repository, which does not appear to be used at all often by most project members. It is very difficult to find any evidence of the MDB being actively used to share data, rather it appears to provide more of a mechanism through which some data must flow, in order to meet certain requirements of author's rights protection (see 'Data exchange policy').

Figure 13 provides an overview of MDB activity for the period August 2003 – September 2005. Here we see very intermittent usage of the database. For instance in the first month after establishment, a wide range of different individuals contributed to the MDB. This was followed by nine months of almost no activity in terms of new postings of data, although during this time I found one instance of qualitative data being rejected as it did not conform to the 'parameters' of the database (Interview, April 23: 2006). Whilst it is conceivable that project staff were actively downloading and using data during that period, my interviews found no instances of people doing so. Moreover, the fact that no new data was added, suggests that that data which was initially placed there was not used. In November and December 2004 a series of emails were distributed to project staff, imploring them to update their data postings (Email, 15 November, 2005). It appears that little activity followed this email exchange, with few new entries being recorded until the

April/May period of 2005, when the GIS centre was busy updating the MDB for an evaluation commission visit. Shortly after this, just prior to my analysis here, a period of rapid activity was recorded, of 334 new entries within one month. Closer examination shows that all but one of these entries were made by a single contributor, across a two day period. Thus this is a very distorting picture of the MDB in terms of the number of entries, constituting 45% of the total number of entries. In conducting my interviews with ZEF staff and students, I asked about the use that people made of the MDB. Yet I was not able to locate an example of an individual making use of a posting from another member of staff (i.e. from the MDB) except in circumstances where they had to go through this formality in accordance with the data exchange policy (see below). There were some instances where the CDB was accessed, for instance to get GIS data that the project holds, yet this does not seem to fulfil the main function of the MDB, that of facilitating horizontal (peer-to-peer) knowledge sharing. Rather, it seems to be serving a function as a static repository of central information, without exhibiting any signs of dynamism, of working as an aid to innovation and idea sharing. This contributes to the idea of knowledge sharing within the project as being an inherently 'vertical', mediated, affair. Knowledge is passed upwards toward the project and scientific coordinators, who then approve, mediate and distribute this knowledge downwards. Whilst some horizontal knowledge sharing does occur, this does not appear to be common or consistent, nor is it occurring through the MDB. Where it does occur, this is through informal rather than formal mechanisms (Interviews, 23 April, 26 July, 10 & 17 November, 2005) The fact that the second version of the MDB abandoned the ability for users to 'make requests' for data was grounded on the lack of responses to these requests, symbolising the limited state of knowledge sharing that has occurred from peer to peer. Likewise the paucity of responses to the email calls for updates suggests that the MDB is not a functional tool for knowledge sharing which is utilised effectively. This is not necessarily a fault of the database itself, but also reflects a wide lack of enthusiasm for knowledge sharing.

Figure 13: MDB Activity: August 2003 – September 2005



Case Study: Data Exchange' Policy

It is inherently difficult to monitor ways in which knowledge is transferred: what we can gauge is physical manifestations, artefacts, of knowledge. Just as I look at seeds as artefacts of indigenous knowledge, here I examine data as a representation of knowledge and research. The official policy on data exchange within the project was clarified by the project's scientific co-ordinator, in an email addressed to all project staff and students. I cite there the entire email that constitutes the policy and take it as a cohesive document.

> "Dear all,
> I would like to remind all project participants that any data requests to other project members should be officially addressed to <the project coordinator> or myself <the scientific coordinator>. This is not meant to put additional bureaucratic burdens on you (or us, for that matter!) but the reason is to make sure that author's rights are protected as well as the legitimate requirements for data exchange in this interdisciplinary project are met. The aim is to allow for synergies through data sharing but also give primordial rights to data exploration to those that generated them (the authors) and give fair credits to those who share data with others. I guess you all will understand the philosophy behind and the needs for some coordination in this which <the project coordinator> and I will provide. Thank you for your understanding…" (email, 15 July 2005)

The key concept exhibited within this policy is the idea of ownership of data. This has a well established academic tradition and is understandable. We see here that this ownership is being explicitly balanced in the policy with the need for data exchange. In the case of this project the need for authors to assert their academic rights is exacerbated by the fact that most knowledge creators are doctoral students, who are subject to specific requirements of novelty in their work and must conclude this within a restricted time period (see previous section). Added to this is the pressure that some sources of data are state based and impose strict controls on how this knowledge is to be shared – a reflection of the closed knowledge governance system of Uzbekistan. Thus the balance between authors rights and data exchange is shaped by the staffing of the project and the knowledge governance structure in which the project must work. It is also worthwhile noting that a number of my interviews with project staff identified that a particular incident, involving one doctoral fellow and a PhD student, was the cause of this policy being reiterated as a 'reminder' (Informant Interviews, 15 July 2005 & 26 July, 2005).

> "The whole discussion started with <post-doc> wanting a lot of <PhD student> data - more or less all their data. <The post-doc> wanted to do something that goes in <the PhD's> direction - they felt under pressure… I wanted some of <the PhD's> data - and they reacted badly … it was just meteorological and soil parameters. It went back and forward … So now we have very strict rules. That is better than no policy." (PhD student, 26 July 2005).

The outcome of this is that all (official) data exchange is moderated and controlled, through mediators of knowledge. Whilst this has some benefits in terms of transparency and the protection of author's rights, it also slows down the knowledge sharing process. For instance one Masters student working in the project complained to me that they had sought certain data from a colleague, but was unable to get it until permission was granted, and both of the 'knowledge mediators' were unavailable (Interview, July 26, 2005). This same student then expounded upon the fact that they had an established, though informal and unapproved, data sharing relationship with another project member, and they commented that neither of them wished to formalise this arrangement (ibid.). Such informal, collaborative, relationships would appear to be at the heart of the interdisciplinary nature of the ZEF project, and I found them to be quite common. On a field visit with a PhD student, who could be described as 'the first amongst equals' in terms of the resources and importance attached to their research, the situation was clarified. This student, who collects a large amount of data on specific issues as well as general soil & meteorological data, described how for general data or for people with whom they had an existing relationship, data was shared freely and outside of the project policy. Yet when someone is working on a closely related issue, or if the student is at a "sensitive time" (i.e. close to graduation) then the formal policy is used to protect the authors rights (Interview, 25 August, 2005). This view, that the policy is a formal instrument that is often ignored, was the norm in my interviews. So whilst the policy grasps the most important issue, or author's rights, it seems to do this in an excessive way. Most students bypass the 'knowledge mediators' and instead establish their own informal arrangements, creating a policy pluralism which may mean that the policy is not as useful in guiding behaviour as it could be. In each of fourteen interviews I conducted with PhD students in the field, each of them described how they shared knowledge informally, yet were put off using the MDB and data exchange policy, for a variety of reasons from a fear of "wasting the project manager's time" (August 7) to "wanting to share data quickly" (June 9). This of course carries with it a series of risks, for when data is shared and then seen as stolen by its author; this can cause real disruptions to future knowledge sharing. Hence why the policy exists, yet this should be balanced against the dynamism of allowing knowledge sharing to occur untrammelled by formal policy.

Case Study: Joint Authored Publications and Presentations

One of the verifiable indicators that can be used to measure the outcomes of interdisciplinary collaboration is joint authored publications and presentations. The project has an academic focus on producing results and reporting on these in journals, conferences and work papers (Martius et al., 2006: 10). Thus it is reasonable to discuss how these project outputs evidence the degree to which knowledge is shared between disciplines and different project partners. I analysed the project list of outputs from January 2001 to December 2005, examining 106 publications, 88 presentations, one doctoral thesis and four MSc theses, for interdisciplinary collaboration.

Table 4: Joint Authored Publications: Annual Totals by Classification

Type of Works	*2001*	*2002*	*2003*	*2004*	*2005 (Nov.)*	**Total**
Publication	1	5	4	64	32	**106**
Presentation	6	27	2	52	1	**88**
Doc. Thesis				1		**1**
M.Sc. Thesis		1		3		**4**

Authors were categorised into the three ZEF departments (a=social sciences, b=economics and c=natural sciences) as well as Tashkent partners, external partners and collaborators within Khorezm. What I found was the ZEFc, the natural science department, published a vast deal more, both with and without collaboration, than the other disciplinary departments. Internal collaboration is shown in the below table, where the vertical and horizontal classifications are the same. For instance ZEFa, where there are 16 instances of publications without collaboration; these are also indicated in italics.

Table 5: Joint Authored Publications: Collaboration Analysis by Department

Department	*ZEFa*	*ZEFb*	*ZEFc*	*Tashkent Institute*	*Khorezm partner*	*External Partner*
ZEFa	*76.2%*	10.5%	2.0%	0.0%	0.0%	14.3%
ZEFb	9.5%	*78.9%*	2.0%	0.0%	5.9%	0.0%
ZEFc	4.8%	5.3%	*56.0%*	66.7%	29.4%	21.4%
Tashkent Institute	0.0%	0.0%	24.0%	*22.2%*	11.8%	0.0%
Khorezm partner	0.0%	5.3%	10.0%	11.1%	*41.2%*	14.3%
External Partner	9.5%	0.0%	6.0%	0.0%	11.8%	*50.0%*

What is clear from this analysis is that the evidential outcomes from collaboration suggest that ZEFc is conducting the most collaboration with both other ZEF departments as well as with other project partners. This view should be tempered because of the larger number of staff and students within ZEFc as a portion of the project. However, if we compare ZEFc to either ZEFa or ZEFb, then we recognise that collaboration between departments is very much the exception rather than the norm. Likewise publications with Khorezm or Tashkent based partners are limited. Of those publications which do exist, many, although not all, are project proposals or other 'official' publications. Whilst numerous partners appear as authors on these, it could be questioned the extent to which these are academic publications and the extent to which different partners actually contributed to the writing process. Thus what we can see is that in terms of identifiable and verifiable research outputs, there is little evidence that interdisciplinary collaboration is the norm within the project. Examples of collaboration do occur, however these are limited in scale and scope. Much more common is for individuals to publish without collaboration, of when collaboration does occur it is within disciplines and typically involves existing knowledge relationships, for instance supervisors being noted as second authors. There are several factors which are potentially driving this lack of knowledge sharing. The mediation of knowledge, the shortcomings of formal policies (the MDB and the data exchange policy) 'gaps' between scientific cultures and the unique pressures that PhD students are under all may play a role in determining why interdisciplinary collaboration is low in the project. But what we see from this case study is that the main research output from an academic standpoint, publications, exhibit signs of limited interdisciplinary collaboration within the project team. Where collaboration does occur it tends to be defined by staff from the dominant scientific culture of the project (with ZEFc staff as lead authors, other departments as secondary authors). This is not to say that knowledge sharing is not occurring, that is a somewhat separate issue. What it does say is that where knowledge sharing does occur, it is sufficiently limited in scope and intensity and it does not lead to significant research outputs (publications) that demonstrate interdisciplinary collaboration.

2. The Project and its Partners

The project has two fairly distinct sets of partners within Uzbekistan, and one potential partner group. The first is the Khorezm based partners, first amongst these Urgench State University (UrDU) and other accompanying institutions. Secondly is the group of 'Tashkent partners' of government ministries, specialised institutes and other foreign project which are all centred in Tashkent as the political, administrative, scientific and economic capital of Uzbekistan. There is also a third group, the international donor community as represented in Uzbekistan, which had weak linkages with the project during my research. I discuss these three sets of partners below to present the varied manner in which the project shares knowledge with its local partners. The central finding is that knowledge sharing with these partners is mediated through the project management and that subsequently the level of knowledge sharing is mediated by the interests and priorities of the project management team.

i. UrDU and the Khorezm partners

> "The very big difference is here academics are not independent in thinking, they come to the professor and ask the professor what should I do? And professors says go, one step to right, one step to left and so on. So, they do and come and say I did the last step, what should I do next? Or during the lecture, professor explains, students sit down and after 5 or 10 minutes everything is lost" (Interview, 10 November, 2005).

The key local partner for the project is Urgench State University (UrDU) especially one faculty within it, the Ecology Faculty. Other local partners do exist, for instance the laboratory at the local grain mill (Interview, 28 August, 2005). These are very much on an *ad hoc* basis and the level of collaboration is necessarily single issue focused and limited in scope. Thus, I examine here the collaboration with the Ecology Faculty and compare it with the other UrDU faculties. The pre-eminent local partner within Uzbekistan is certainly the faculty of ecology at UrDU. Led by a dedicated dean, who enjoys excellent personal and professional relations with the management of the ZEF project (Interviews, 7 & 10 November, 2005) the faculty has a number of key knowledge sharing connections which fit conveniently within the dominant scientific culture of the ZEF project. This knowledge sharing ranges from providing practical experience within the project for under-graduate and masters students, to academic exchanges between

senior staff, as well as opportunities for laboratory assistants (trained within UrDU) to progress within the project and to obtain masters degrees. This 'capacity building' aspect of the project had increased significantly in 2005 from what was described in the first phase proposal (Interviews; 25 & 28 August, 5 October; Vlek, 2001). Likewise the faculty, acting for the university, provides logistical and local support for the project, as well as imparting the knowledge that accompanies this. In almost all of the cases that I studied, this collaboration occurred through the knowledge mediators or the faculty and the project. In practice research collaboration was initiated and managed by the dean of ecology and the project coordinator, with responsibilities handed down to some relevant persons. Yet the control over the research and especially the research outputs was much centralised.

In the early stages of the project the knowledge transfer was largely from UrDU towards ZEF, however even the dean of the ecology faculty discusses how it is more personnel and support that is provided now, with the transfer of knowledge being overwhelmingly *towards* UrDU (Interview, 7 November, 2005). This is borne out in discussions with those project members who are collaborating with UrDU. In each case they were working with a junior student from the ecology faculty, and in every interview the issue of the local students being considerably under-skilled and ill-educated arose (Interviews, 25 July, 9 & 28 August, 2005). In light of the real gaps in capacity at UrDU it is reasonable to expect that the knowledge transfer is very much one sided, with ZEF providing knowledge. This is not to disregard the considerable support that UrDU provides for the project; rather what it identifies is that in this relationship the knowledge flows are biased towards UrDU. This is even identified within UrDU when asked what the main benefit comes to the ecology faculty as a result of working with the ZEF project, the dean explained to me that:

> "the <UrDU> students are participating in the scientific research, this is main benefit. There is issue among students, it is such a disease, they copy from each other, but the students working in the ZEF project, they look at everything with reality; they work enthusiastically, with understanding. We are happy that students have a good contact with the world science" (Interview, 7 November, 2005)

This also reflects an acute lack of capacity within UrDU and Uzbekistani academia in general. Whilst the project was initially intended as a partnership between foreign and domestic academics, this approach considerably over-estimated the ability of local partners to contribute scientifically. The first phase proposal makes it clear that the scientific effort was to be co-operative, yet interviews in senior researchers identified that there was an over-estimation of what the local partners could contribute (Interview, 20 May, 2005). A combination of under-funding, the political controls on research and education discussed in chapter five and the malaise that has settled on so much of public life in Uzbekistan, coalesced to make the local partners recipients and collaborators, rather than genuine contributors. This is exacerbated by the very low level (by any international standard) of scientific capacity within Uzbekistan (and Urgench especially) as well as very different understandings of what constitutes good science (different scientific cultures in the phraseology of this thesis). So whilst the project has been successful in encouraging further collaboration between the Ecology Faculty and Tashkent institutes, the impacts of this have been insufficient to overcome the structural problems within Uzbekistani education (ibid.). So whilst the Soviet system established an excellent *infrastructure* for education, this has not been utilised fully in the post-1991 period:

> "The specialists should be demanded by community, if there is no demand, then students study like my students do. They study because their parents want them to study, but they don't understand this by themselves" (Interview, 7 November, 2005)

In terms of collaboration with the project this poses obvious constraints. Moreover, there is a bias towards certain aspects of ZEF's knowledge base in its collaboration with UrDU. This bias is towards the ZEF-C natural sciences aspect. This is of course understandable given the synergy between the ecology faculty and the topics of ZEF-C research. It does mean that other departments play a lesser role, which is worthwhile assessing.

Initially the project was designed to work with all departments within UrDU "to have the same strong relationship with all of them like we do with the Ecology Faculty" (Interview, 10 November, 2005). However the lack of capacity, especially within the ZEFa and ZEFb sides, soon became apparent. The history and law faculties certainly

have a vastly different approach to their work from Western counterparts, compelling one student to describe the potential local collaborators as 'dinosaurs' (E-mail, 4 March, 2005). Within the economics faculty a similar lack of capacity exists. The project is attempting to develop what competence there is within the faculty (Interview, 2 November, 2005). Collaboration was historically retarded both by a lack of consistent staffing from the ZEF side as well as by unforeseeable setbacks, such as the loss of key staff within UrDU (Interview, 11 November, 2005). Because of the inherently personalised nature of knowledge sharing in Uzbekistan, these staffing problems led to difficulties for collaboration, which were not experienced by ZEFc and the ecology faculty at UrDU. The third phase of the project certainly envisages greater collaboration between ZEFb and the Economics Faculty, joint lectures and training by ZEF PhD students are all planned as are research modules within the project (Martius et al., 2006). This is building upon historically low rates of co-operation, especially within the social sciences discipline. As far as ZEFa is concerned it is difficult to envisage a situation in which strong linkages exist between the history and law faculties and ZEFa, the differences in scientific culture and perceived capacity are simply too great, yet despite these differences this lack of collaboration is a knowledge management failure.

ii. Tashkent Institutes

> "So, first when you come to see the Tashkent guy or guy here, they first try to hide the data, or they say we have the data, but we have problem giving to you, because, because bla bla. First thing immediately fall the collaboration. Or people are open, they discuss, but they want to get something out of it. … The second thing is that the interview, people are very afraid of officials." (Interview, 10 November, 2005).

Ascertaining the level of knowledge sharing between ZEF and the Tashkent partner institutions is necessarily difficult. Aside from the difficulties in measuring or tracking invisible transfers of knowledge and ideas, interview respondents are understandably cautious to comment on knowledge sharing, for fear of appearing critical and thus endangering their future opportunities for collaboration. For instance one interviewee discussed the flaws of international development projects and cooperation, *sui generis*, very openly. However when asked about the exact details of the ZEF project, he responded, once asking for the Dictaphone to be switched off, that:

> "There are some questions that I cannot talk about. You understand. You need to find the problem, not the person. That's all." (Interview, 18 October, 2005).

In the same manner, many people were cautious about discussing too openly with me their perspectives on ZEF's knowledge sharing, due to a lack of certainty about what I would do with my research findings. Interviewing academics who are accustomed to external 'controls' often meant that I was presented with the 'right' answer rather than an accurate appraisal of the situation. Nonetheless I present here the best possible analysis of which I have been able to ascertain.

In the first two phases of the project, covered by this research, ZEF attempted to build linkages with the existing research institutions within Uzbekistan which were focused on land and water use and the ecological and human problems associated with this. Invariably these institutes were based in Tashkent, reflecting the centralised nature of Soviet and post-1991 administration and political control (Wall, 2004). The early period of the project, especially during the preparation of the project proposal, were learning times for ZEF and its senior staff, as they attempted to understand the situation in Uzbekistan and Khorezm (Interviews; 10 November, 15 December, 2005). Even in 2005, five years into project operations, the project coordinator saw opportunities for collaboration with Tashkent institutions that were able to conduct certain tasks, such as computer modelling, better than the project was (Field notes, 17 February, 2005). Many of the collaborators from Tashkent institutes whom I interviewed had been invited to Bonn for an inception and planning workshop, and discussed the role they played in shaping the ideas of the project. Some of these individuals felt somewhat slighted that they had not been involved further, after providing their knowledge to the project, with many complaining at a lack of continued cooperation (Interviews; 17-19 October, 2005). This picture is somewhat mixed however, as those institutions which ZEF has continued to work with remain generally happy, whereas there are individuals who have seen their participation in the project decrease and have subsequently been disappointed (Interviews, October, 2005). Regardless of whether the Tashkent partners were satisfied with the level of sharing, or sought more, all of them noted that their sharing of knowledge occurs through one of two conduits. The first was direct cases where the

partner was a local supervisor of a ZEF PhD student, thus directly involved in creating the knowledge which they immediately accessed. But the more common case was of sharing occurring through the conduit of the project coordinator, or in some limited cases, through the scientific coordinator. Thus we see that knowledge sharing for the project is structured in a mediated manner.

A common complaint from the Tashkent institutes, both those with strong and weak connections to the project, was that ZEF was failing to deliver research results that were of interest or use to them. This should be tempered with the fact that these same interviewees often discussed ZEF as a positive example compared to most other international projects, comparing it favourably with projects from other governments, universities or development banks. I did certainly detect a feeling that ZEF has received information or data of interest to it, without necessarily reciprocating in full, at least as perceived by some of the Tashkent partners. One partner explained it to me that:

> "Initially they needed me because I helped with <technical assistance>, and I often visited Khorezm and was tight contact with ZEF … <now> I don't know what the program is working on. And I would like that I was informed on what is the current condition of ZEF" (Interview, 19 October, 2005)

Another example was of a respected scientist in Tashkent who provided some data to the project, which was subsequently published without reference to his input (Interview, 25 October, 2005). In this case the scientist contemplated discontinuing his cooperation with the project, ultimately deciding to continue supervising PhD students but resolving to not provide any more data (ibid.). There are of course many ways to read this situation, and it deserves to be considered in the light of the on-going and excellent relationships that the project enjoys, at the personal and professional levels[ix], with many of the key Tashkent institutes. It is worth noting that many of the Tashkent partners see their core business as delivering 'recommendations' to government and farmers, with a significantly more 'applied' focus to their work than the (perceived) 'fundamental' research focus of ZEF (Interview, October 18, 2005). Thus as the ZEF project moves into its third phase,

[ix] Although Uzbek culture and to a large extent post-Soviet culture does not make the clean, Weberian, distinction between professional and personal spheres of life. Indeed the two are often analogous in Uzbekistan.

focused much more on farm level application and creating recommendations, there is a clear opportunity for synergies between the interests and demands of the Tashkent institutes and the research outputs of the ZEF project. Yet my interviews found that ZEF data has a welcome audience in the Tashkent institutes, and that the sharing of this data may well pay dividends in terms of gaining access to previously unavailable knowledge from these partners. There is however a fundamental problem of differing conceptions of what exactly are the problems in rural Khorezm and to how to arrive at possible solutions, that exists between the project and the local (institutional) partners. For instance one collaborator of the project, a rather senior figure in Tashkent scientific circles, commented to me:

> "There are some differences to approach, Western scientists' and our, local scientists', and sometimes these differences shock me. With their approach, and I think that we don't understand each other. I think that the Western approach is different from our problems, and they are detached from our reality, what they often offer is something that, is in principle impossible to do here. So when you try to explain it, that it is impossible in our conditions and we must take another approach, then its their iron argument for their own benefits, and they tell that <this technology or approach> is all over the world and ask why not in our country. But I think it's not right, How its doing in all over the world? It's one another matter, but not to take into account the local specificity it's absolutely impossible." (Interview, 19 October, 2005)

This view reflects a disconnect that I have observed and discussed with respondents, both within the project team, with the collaborating institutions. There exist very different academic traditions in Germany and Uzbekistan (see chapter five). The project attempts to bring Western modes of research and science into Uzbekistan, which leads to confusion and disagreement. Without commenting on the correctness of either academic tradition, it is fair to note that the result of this is that knowledge sharing is disrupted. In situations where the partners do not necessarily value or appreciate the work of the other partners, the level of knowledge sharing and genuine collaboration, remains low. One member of the ZEF academic staff, a supervisor, critiqued the work of the local partner institute when he discussed their conceptions of 'research':

> "Their idea of research is very different. They have what has been published before, and they do not publish much, and use that as a bible. New research is a way of repeating this information, without testing it - the idea that it might be wrong or that it could be improved - is not there. Nor do they think that they could add to the bible. Most of the students do not even have a hypothesis; understand why it is important to have one. It is very different from our system of research. We have the past experience but want to find out if that is true or not - they do not have that." (Interview, 20 May, 2005).

The interesting aspect of the comments from the above two staff is that they come from collaborators working on the same research theme. The particular research theme is considered a successful aspect of the project and is included in the planning for the third phase. Yet, the partners on both sides are expressing clear problems with the relationship and both of them commented on a lack of knowledge sharing, from both sides. This can be read as a deviant case of a non-functioning relationship. However, the case cited here does point to a deeper problem, where a polite and seemingly functional working relationship, masks a deeper seated misunderstanding on conceptions of research. This disconnect manifests itself in low levels of knowledge sharing, a problem that was identified in many of my interviews with both Tashkent institutes and with staff from the project. It could also be posited that the structure through which knowledge is shared, i.e. through the conduits of ZEF management whereby it is mediated, militates against strong and consistent knowledge sharing between the project and its partner institutions. Key knowledge creators (PhD students) are based semi-permanently in Khorezm, and besides their direct local supervisors or partners, have very little contact with the wider community of Tashkent partners. The same is true with the donor community, discussed below.

iii. International Donor Community

> "Is there enough linkage between the <international project> in Tashkent and our project? Right now we have four places in Central Asia conducting research on <specific technology> – if we work together we can really learn from one another … but right now we are not" (Interview, 14 August, 2005).

ZEF is not the only international project working on the issues of land and water use in Uzbekistan (or Central Asia) nor is it the only organization working in Khorezm. Despite this, project linkages and knowledge sharing arrangements, can be characterised as weak. If we look first at the national and regional level, there are several organisations which I interviewed who discussed a keen interest in the work of the project, who identified clear synergies for collaboration and who seemingly had knowledge of interest to the project, yet there was no knowledge sharing to date with these organisations (Interviews; 21, 24 October, 2005). Conversely management staff from within the project identified that other organisations, with significantly larger budgets and political capital, were working

on issues of interest to the project, yet that knowledge had not been accessed (Field notes, 14 May, 2005). Even an alumnus of the project, working on similar issues in another Central Asian country with a different international organisation, characterised the on-going knowledge sharing as in need of improvement (Field notes, 6 September, 2005). It is difficult to speculate as to the causes of this lack of collaboration; however I would identify the centralised, mediated, nature of knowledge sharing within the project as partially to blame. So whilst the management staff act as 'mediators of knowledge' and monopolise collaboration and co-operation with the international community, the success of this collaboration is largely determined by their personal efforts and the time that they can afford to commit for this collaboration to occur. The lack of collaboration with the donor community is perhaps also a result of their opinions about its usefulness, with one senior manager discussing how "no one else is working on agricultural research, so there is little to share" (Interview, 10 November, 2005). Within Khorezm greater levels of knowledge sharing occur, with a key partner, German Agro-Action. Both projects work on similar issues within Khorezm, with GAA adopting a more practical implementation approach and ZEF conducting research (Interview, 8 November, 2005). In several areas, especially related to improve potato and maize varieties, the different capacities of these two organisations are brought together in a manner which is deemed useful for both partners (Interviews; 8 & 10 November, 2005). Whilst further collaboration is deemed feasible by the in-country managers of both organisations, especially as ZEF moves towards an implementation phase, at the time of writing it was likely that GAA would have its funding discontinued (ibid.). Thus even in a case where international cooperation is deemed useful, the linkages of knowledge are temporary and limited. What this lack of collaboration with the international donor community identifies is that there are perhaps avenues for knowledge sharing and dissemination which have been overlooked in the project to date. The one exception to this case is purely speculative, which is the proposed involvement of GTZ in the third phase of the project (which was not covered in this research). I discuss in the next section how future collaboration is planned to occur.

IV. KNOWLEDGE DISSEMINATION

I discuss here knowledge dissemination as the process by which the project spreads and shares its body of knowledge with outside parties. Specifically, with farmers in Khorezm and those decision makers who are not identified as project partners (who are rather perhaps stakeholders) in the project. The distinction that farmers are stakeholders in the project, rather than partners, is a distinction made, explicitly and implicitly, by the project itself[x]. It should, however, be noted that this research reports on an area of project activities that is very much in flux. Hence my treatment of the status quo at the time of research (2005) followed by an analysis of the project planning process for the Third Phase (which occurred from July 2005 – March 2006) and finally with a discussion of the plans proposed in the third project phase. It should be noted, as discussed in the methodology chapter (four) that I had a personal input into the planning process for the third phase. I would not claim to be an independent observer of facts, I was not. Rather, I have attempted to set out here what I believe to be a balanced description of the planning process. Likewise, in the pursuant section on the potential for change I am presenting my opinions, informed by research, on the projects *willingness* and *potential* to change the way in which it operates. What I show here is that the extension activities of the project which occurred during 2005 were limited in their scope and appeal. There was no systematic and direct contact with farmers in terms of a bi-directional knowledge sharing process. Limited, uni-directional knowledge transfer did exist, however this was intermittent. Yet this situation may well improve during the third phase of the project. For instance, the project documents for the third phase propose a move towards farmer-centric research and some members of the management team are clearly in support of this move, yet my field research was conducted during a phase of limited farmer contact. I conclude the section by discussing two very different experiences of farmer participation which I witnessed in Khorezm in 2005, as examples for the project.

[x] The literature on participatory rural development (Chambers, 1984; Gladwin, 2002) would suggest that farmers are key partners, not only stakeholders, however the ZEF project adopts a certain approach to 'development research' which tends to see farmers as end-users of technology, not partners in developing these technologies. The discussion in this section adopts the project's classifications.

1. Existing Extension

Project extension activities by the end of 2005 were minimal. By this I mean that efforts to transfer knowledge from the project knowledge system to the local knowledge system were not part of the projects main activities[xi]. This was keeping in line with the project design for the second phase (2004-2006) which specified the goal of this phase as 'Field Research and Development of a Restructuring Concept' (ZEF, 2003). This goal was interpreted in a way that led to a very static view of field research and a 'top down' approach to the development of a restructuring concept. The first issue is of how research was conducted and the extension, or knowledge dissemination, activities that were conducted as part of this. This is followed by a discussion of the project plans for the third phase, and I then present some examples of how knowledge can and should be made acceptable to the local community, comparing the work of German Agro-Action (GAA) with that of the Gurlan Farmers Association.

Case Study: Research and Extension

Most of the field research conducted during 2005 under the aegis of the project was carried out by doctoral students, both Uzbekistani and Western, studying towards a PhD from the University of Bonn[xii]. The details of this have already been discussed earlier in this chapter, under the section 'Knowledge Creation'. Pertinent here is the degree to which these research projects contributed to extension, the distribution of new ideas, techniques and concepts to farmers in Khorezm. None of the research projects studied had an explicit goal of sharing knowledge with the farmers. However, two research projects in particular had a stated goal of creating new technologies or options that could eventually be shared with farmers[xiii]. The first of these investigations was carried out by a

[xi] For instance there were no efforts to transfer technologies beyond the experimentation stage, using a development understanding of extension, as in Scarborough et al. (1997), Baxter et al. (1989) and Swanson et al (1997). This is not to say that contact did not occur, but that this was neither orchestrated nor monitored by the project. Whilst outside the scope of this research, Betru & Hamdar (1997) provide an interesting discussion on how to strengthen the linkages between agricultural extension and research in developing countries. See Chapter 2, section II for a fuller discussion of the literature.

[xii] Or in some cases from an Institution in Uzbekistan or another German University.

[xiii] Field notes; 14 & 25 August, Interviews 7 & 8 March, Vlek et al. (2001), ZEF (2003).

Western researcher and focused on fertiliser use in cotton and wheat farming systems in Khorezm. The second research project involves two local PhD students, each working on discrete aspects of a common technology, conservation agriculture.

The fertiliser experiment holds a special place within the project. It is often cited as an example of what can and should be achieved by the project in Khorezm (Field notes; 11 March & 14 May, 2005) and as an example of 'working with farmers' (Interview, 8 March, 2005). In addition the managing director of ZEF has a personal and professional interest in this research "he watches it closely and if you look at his publications he has always been about N-15, this <pointing> is <his> field site, he watches it but it remains my data" (Interview, 25 August, 2005). Indeed, when consultations for designing the restructuring concept did occur, it was the farmers involved in this research who were invited to the project guesthouse for a meeting. When interviewed, this student also stressed the importance of working in partnership with farmers, "You need to involve farmers, to discuss everything with them" (Interview, 25 August, 2005). Yet despite all this, there is no formal effort to distribute the findings of this research. Thus extension of the knowledge was not occurring in 2005. This was explained by stating that the research findings were not yet ready for distribution and needed further checking. What it does identify is the stage at which the project was at in 2005, which by its own planning was at a 'field research' phase – explicitly excluding any extension or 'implementation' of research, reserved for an external agency in the third phase . So whilst informal knowledge sharing was occurring to some extent (Field notes, 11 March & 25 August, 2005) there was no cohesive or formalised mode of knowledge dissemination, precisely because this was never part of the research design. This is perhaps a legacy of using PhD students, who are confined to certain types of 'academic' work by the university and their supervisors. But it also reflects what was envisaged in the project planning stage as the 'correct' way to conduct development research, from a very techno-centric perspective. Yet as we see below this is set to change with the third phase of the project.

The conservation agriculture experiment was in 2005 at a stage at which it was not yet ready for transfer to farmers. After an excellent wheat harvest, the maize and sunflower crop planted in the summer of 2005 had serious problems related to certain aspects of the technology (Field notes, 28 August, 2005). This was acknowledged by the external supervisor in charge of this research, who noted that "I don't know what will be in the 3rd phase - to me it is very clear what needs to be done in the 3rd phase. You need to perfect the machinery" (Interview, 14 August, 2005) suggesting that knowledge dissemination will come even later than initially planned. The actually technical merit or promise of the CA experiment is in fact quiet good, with the promising results of 2003-2004 standing in contrast to 2005, which can be seen as an aberration. Rather I would like to dwell more on the process by which this technology has been developed and researched. Whilst local students were involved as the main researchers, the local farmer 'partner' was seen very much as an employee rather than a active partner in the research process. When interviewed, on three separate occasions throughout the year, he discussed his opinions on the technology. In the case of the sunflower crop of 2005 he (correctly) identified that the press-wheel was the main problem which has caused the crop failure and had some suggestions on how this might be overcome (I was not and am not in a position to judge the technical adequacy of his suggestions). What I would point out however is that the CA technology was being developed without explicit input from local farmers and that this certainly runs counter to much of the participatory development literature discussed in chapter two. On a positive note I would refer to in the next section, which identifies the positive steps that the project plans to make towards more participatory, farmer focused, research.

So whilst some knowledge sharing between the researchers and local farmers no doubt occurred in both experiments (indeed, the fertiliser researcher is explicit about how much they learnt from farmers) there was no system to evaluate whether this research was of interest or applicable use to the farmers. Nor was there a clear process through which farmer perceptions could be integrated into the evolving design of the research or even of the machinery. What farmer contact did occur was with elites, for instance the fertiliser experiment which mostly (though not entirely) works with the elite class of new *fermers*

with land holdings often in excess of 80 hectares. These large holdings are only acquired by those with political connections and in fact set them as a landlord class, who in turn have *dekhans* and *pudrats* working for them on 8-10 ha allotments. From a research management and environmental impact perspective there are clear benefits to working with these well connected farmers, from a poverty reduction perspective the benefit is questionable. In this regard these two research projects could be said to be characteristic of a top-down approach to technology transfer, assuming that development will occur, *deus ex machina*. This approach to technology transfer, the assumption that the introduction of new improved technologies will, by their very merit, lead to improved ecological and economic outcomes, was dominant within the project proposal for the first two phases. I have discussed in section I. of this chapter how the design of the 'restructuring concept' represents an epistemology of science in line with this 'technology transfer' approach. Encouragingly, the third phase proposal was developed in a much more participatory manner and the outcome is a plan for farmer integration which holds some promise, as I explain next.

2. Project Plans

This research was conducted in the second phase of what has always been envisaged as a four phase project. The third project phase is planned for 2007-2010 and I base my analysis of the project plans on the draft of the official proposal (Martius et al., 2006: version 3.06 - July 2006) as well as on interviews conducted with the project management in 2005 & 2006. This 3rd phase proposal actually addresses many of the concerns raised earlier in this chapter, by adopting a stakeholder oriented approach to implementation (Martius et al. 2006: 48-50) and clarifying some of the ways in which the project aims to benefit local stakeholders. The overall project goal departs from earlier versions in introducing livelihoods (human well-being) as a key concern and identifies that this is to be achieved by way of providing "sound, science-based policy recommendations for sustainably improving the natural resource use in Khorezm" (ibid: 7). Thus it is science and research focused on eventually alleviating ecological problems and poverty, yet:

> "This approach should not be mistaken for an extension program. It represents a research program in which the FTI process organized by facilitators and trained staff will be the object of intensive ecological, economic and social "action" research" (Martius et al., 2006: 47-48)

So whilst the mechanism by which these policy recommendations will improve livelihoods relies on using research findings (sometimes relegated to a concern for the fourth phase; ibid: 7, 48) the ambiguity discussed earlier, about why the project exists seems to have been largely resolved. Likewise, I find the connection between the proposed research and local needs to be more credible than in the prior project proposals, and this should be seen as a progression with the project management modifying the approach, utilising experiences from the field. Yet there are implications of the project not adopting an 'extension' programme' (seeing it as outside of ZEF's mandate). Inherently this serves to perpetuate the disconnect between 'farmers' and the 'project' from a knowledge sharing perspective. Instead of being treated as partners, farmers become end-users, which implies lower levels of knowledge sharing and suggests that uni-linear (i.e. from the project, to farmer) knowledge transmission will continue. This said the farmer centric mode of research certainly holds some promise for enhanced knowledge sharing. In promoting this livelihoods approach to the research, there are two key issues that arise from a knowledge management perspective. The first is how knowledge sharing within the project, especially between disciplines, is going to change in the third phase. Secondly, how the links between research and extension (i.e. between scientists and stakeholders, the project and the local knowledge holders, as well as through a technical co-operation partner such as GTZ) are to be strengthened to promote greater knowledge sharing.

The project plans to adopt a rather different research methodology, with the explicit purpose of promoting greater interdisciplinarity. This inherently aims at promoting knowledge sharing within the project, especially between different disciplines, which this chapter has earlier shown to be sometimes limited. To quote at length from the proposal:

> "For each of the innovation-oriented packages, an implementation team (an interdisciplinary work group) will be formed that consists of a representative for the main topic plus representatives for the cross-cutting issues ... The innovation topics will be implemented in a step-wise manner … so that the representatives of the cross-cutting issues will be allowed to participate in all work groups. Each of the work groups will be responsible for the successful integration and implementation of the respective technology." (Martius et al., 2006: 51).

In addition there will be a facilitator to assist in the research and team building process. Such a work group approach would appear to have several advantages from a knowledge sharing perspective. Because it is a constant team which can gain identifiable credit of good work, and because social capital should exist within this grouping, the barriers to informal knowledge sharing should be decreased. This potentially should lead to greater collaboration within the team and presumably (although this proposal is silent on this point) the rather rigid data sharing policy can be eased to allow more-free formal sharing of information. It would be a strange situation if the formal mediation currently required for knowledge/data sharing were to be imposed within these implementation teams. Exactly how these innovation teams will operate remains to be seen, but based on the challenges to knowledge sharing identified in the current arrangement, these teams appear to present a viable and positive solution and should deliver greater levels of knowledge sharing within the project, especially for interdisciplinary knowledge sharing. Potentially this will also lead to enhanced knowledge sharing with the local knowledge system. In the third phase the project will adopt two approaches to connecting with the local knowledge system; innovation research and a research farm. The innovation research is described as an 'experimentation approach', to be executed as a work package (710) which aims to "Follow the Innovation" (FTI). The FTI approach requires innovation teams to work with local farmers at each step "actually embedding the research programme in the innovation process" (Martius et al., 2006: 48). In doing this, "field experiments will be managed jointly by farmers and researchers following the stakeholder-orientation approach" (ibid: 44). If this is done well, the possibilities for knowledge sharing between the two systems is considerable and the potential benefits, to both parties, are appreciable. One work package describes how:

> "Carrying out this study partly with rural focus groups provides a good instrument for participatory research, allowing villagers to identify the most urgent issues regarding their livelihood. It allows discussing the preliminary conclusions with them, testing their 'real-life validity', and to cooperatively formulating ideas for policy recommendations." (ibid: 35)

This is certainly in line with the idea of knowledge sharing as a two-way process and marks a departure from the transfer of technology approach which has been critiqued in the literature and in this chapter. Thus from a knowledge sharing point of view, the FTI approach holds promise.

The other approach is that of a research farm, which has existed in all three project proposals. As an approach to research, in discovering which technical solutions are technically viable, this research farm holds logic. Yet it appears that the research envisaged (conservation agriculture, pisciculture and trees) is to be conducted in a manner which is different from the FTI approach and more in line with isolated, individual, research that characterised the second phase. This is understandable in light of the need to 'get the technology right' before risking farmer livelihoods by extending it. Yet there are benefits to be gained from engaging in greater consultation even at this initial experimentation stage. This divergence is explained in the proposal in distinguishing between technologies "that have already been comprehensively researched … and are now in a stage where they can be … taken to the end-users" (Martius et al., 2006: 38) and potential technologies that have not been studied (e.g. livestock and novel crops). These are to be studied in "close collaboration with farmers of the region" citing as an example the fertiliser research discussed earlier in this section. In principle this is understandable, yet I would note that the benefits of bi-directional knowledge sharing that can accrue from the FTI could also be used at the research farm level. There is still scope for greater integration of farmer views and the FTI approach into the research farm. The gains from having farmer input from the very early stages of the research process are worthwhile, ensuring from the outset the research is relevant to local problems and early farmer engagement should lead to the technology being more appropriate. Conversely the artificiality of a 'research farm' (i.e. exemption from the state plan, guaranteed water provision, closer control of production decision) mean that local knowledge cannot be fully employed, as it is operating in a very different cultural context. In general the third phase proposal makes a significant departure from a pure research approach and seems to lay the foundations for enhanced knowledge sharing. Both within ZEF through the innovation teams, and with the local knowledge system through the FTI approach, knowledge sharing can be enhanced in the third phase.

3. Making Knowledge Acceptable to the Rural Community.

To inform the on-going discussion on the role of ZEF in knowledge dissemination, agricultural extension and training, I provide below a synopsis of two very different organisations working in Khorezm who are engaged in some form of knowledge transfer or 'extension' activity. Yet this is an exhaustive list of how extension can be conducted. Rather the intention is to demonstrate that other organisations are conducting extension within Khorezm, tackling many of the same issues as ZEF aims to. Neither case study is a full reflection of the possibilities for collaborative research in Khorezm, that mantle has been assumed by the project, rather these two examples provide some guidance on what is possible and what is not advisable.

Case Study: Gurlen Farmers Association

The Farmers Association of Gurlen stands apart as an effective example of local extension and farmer education programmes[xiv]. It is often cited by elites and farmers within Khorezm as an example of how other farmers associations should be organised and this view is present within the ZEF project[xv]. Whilst imperfect, I believe that providing a précis of the work of the association is useful as a framework for discussing any implementation activities which the project may seek to undertake. The association is a voluntary grouping of farmers, who pay 500 sum (US$ 0.50) per hectare of cultivated land, per annum, to belong. These funds are held by the association, which spends and invests them as decided by the Director and the management board for the benefit of the association's members (Interview, 10 November, 2005). Circa 50% of the private *fermers* in Gurlen rayon are members of the association, leading the director to describe it as a non-governmental organisation, working for the benefit of farmers. Whilst this may not be entirely the case as strong linkages remain between the association and the government, it is at least nominally independent, although operating within certain conditions, for instance supporting the state plans for cotton and wheat. The association

[xiv] Of course, success is subjective. The Gurlen farmers association is perceived as successful by local elites within Khorezm (because it assists in cotton and wheat production), by local farmers – evidenced by the high membership rates of such a voluntary organisation, and by the project.

[xv] Project meeting, 29 August, 2005; Interview, 9 August, 2005

works to benefit its farmers through providing machinery and advice on a competitive basis, responding to the pressures of post-Independence agriculture. It owns a privatised MTP where the machinery is based, which can be leased by members at a rate which is slightly below the market (i.e. state) price (Interview, 10 November, 2005). Likewise the association uses its network and infrastructure to arrange training in new technologies and farming techniques. This ranges from acting as a conduit for international training (in one example from Israel) or in providing books and educational materials directly to farmers, for instance regarding livestock breeding and health (Interview, 19 May, 2005)[xvi]. In many ways the association complements rather than competes with the activities of the state, *hokimyat* and various *kishlak* authorities. So, in one example cited by the director a '*Pakaz'* (see Chapter Four) was organised in Urgench, so the association arranged transport for some specialists working in the association and some lead farmers in order for them to attend. Then four days later these individuals organised a 'practical' seminar for the members, distilling the lessons from the 'theoretical' *pakaz* in Urgench (Interview, 10 & 14 November, 2005). Perhaps most useful of the lessons to learn from the perceived success of the Gurlen farmers association[xvii] is the pluralistic manner in which it works. By complementing and building upon the activities of the state, it can avoid allegations of subversion. Moreover because of its voluntary nature, it must provide a useful service if farmers are to join (the approximate figure of 50% in 2005 suggests that farmers do perceive a benefit). Farmers will only continue to pay the membership dues so long as they perceive that they are receiving value and the employment of staff relies on this (a marked difference from the Socialist system of lifetime employment, largely retained by the state post-1991, albeit with poorer pay and conditions). Likewise the major activity, providing machinery, could possibly be used as a mode through which to also introduce new technologies. This makes it an interesting model to consider adapting for downstream, implementation for the ZEF project.

[xvi] It is likely that the ZEF project will use such farmers associations in the 3rd phase (Martius et al., 2006: 20)

[xvii] In the view of local farmers who rely on it (Interview 9 August, 2005), of local elites (Interview, 15 August, 2005) and from the project perspective (Notes from meeting, 29 August, 2005).

Case Study: German Agro-Action

German Agro-Action (GAA) was an NGO working in Khorezm, conducting a range of knowledge dissemination and extension activities, with varying degrees of success. Some of these initiatives have had a real and positive impact on the rural communities in which I myself have worked. For instance the 'lamp' tomatoes and imported European cultivars of potatoes have been very well accepted by *dekhan* farmers in Yangiarik rayon (Field notes, 4 August, 2005). In this regard it shows how external knowledge can be introduced into the local system and how this knowledge is then 'localised'[xviii]. However, some of the introduced seed has also proven to be inappropriate to local conditions. For instance the seed potatoes provided were much larger than those typically used locally, which resulted in farmers cutting them in half or quarters, drying them for a day and then planting, which drastically reduced yields, yet was the local view of how best to plant the large seed potatoes (Field notes, 11 April, 2005). There is here an intersection of two knowledge systems; one which selects seed potatoes from the smallest (inedible) heritage seed, whilst the other is accustomed to mechanised production and using dedicated and specifically bred seed. In this way external knowledge is disconnected from local knowledge and the methods by which this knowledge is localised is by cutting the seed potatoes in half, a less than useful solution. This suggests that the seeds were sourced without sufficient reference to local knowledge and the outcome is in this regard unsurprising. When questioned on this point, the head of GAA commented that more education was required to "explain" the seeds to local farmers, but he did not consider that the technology or knowledge introduced might needed to be changed, because it was "superior" (Interview, 12 July, 2005). Despite these setbacks, the potatoes and other types of improved seeds could be seen to have a positive impact on the rural community, indeed the lamp tomatoes were well accepted and localised as knowledge. This was not the case with a 'Livestock Training Seminar' conducted in September 2005. This seminar, with an expert from Germany teaching the theory and practice of livestock rearing, was held during the busiest agricultural period of the year, during the cotton harvest. The organiser was aware of this fact, commenting to one male participant "This

[xviii] See the discussion of seed selection in chapter four

is not my first time here; I know that it is busy, but in Uzbekistan cotton is important, but where are the men? Only your wife picks cotton, not you" (Field notes, 27 September, 2005) yet this ignores the fact that the cotton picking period is the busiest period (it is heavily labour reliant) and that obtaining farmers attention and time during this time is very difficult. What it only ensured was that those not involved in agricultural labour (i.e. elites, mostly men) can attend training seminars. Sadly this points to one of the more concerning aspects of the training, the gender balance. My research in 2005 confirmed earlier research findings (Kandiyoti, 1999, 2002b; Wall, 2004) that livestock rearing, especially dairy cows and chickens on which this seminar focused, is the domain of women. Sociological research in Khorezm in 2005 by Tumani and Sudmann confirmed this point (Interview, 22 September, 2005). Despite this fact, no rural women were involved in the training seminars (Field notes, 27 September). Moreover those (male) farmers who did attend, were very large scale farmers (over 100 cows in some cases) very different from the norm. For whilst my sociological survey found that 91% of families in Khorezm kept cows[xix], those represented at the seminar were anything but 'average' farmers. The quality of the training may well have been high from a technical perspective, from an applied perspective it was somewhat irrelevant. Thus the ability for this to be translated into wider practice was limited. Put another way, the knowledge transferred was not appropriate to the situation, and was thus not able to be 'localised'. This was of course only exacerbated by the gender inappropriateness of the training. This is but one example and is not meant to critique any particular organisation, rather to illuminate the dangers involved in organising training seminars or other knowledge dissemination activities, in a manner that is incognisant of the local reality.

[xix] With an average of 4.07 and a mode of 3 cattle per household – from an 'N' of 457 respondent households.

V. SUMMARY OF PROJECT KNOWLEDGE MANAGEMENT

Illustrated above is the way in which knowledge, mostly academic knowledge and research data is created shared and used in the ZEF project. Here the dominant epistemology of science defines the process of knowledge creation, sharing and use. Knowledge sharing is determined by how the project chooses to establish formal mechanisms within the project setting, both policy wise as well as through the MDB. That the MDB only recognises quantitative data with specific characteristics is a reflection of this dominant epistemology, and serves to reinforce this dominant discourse. Likewise, how this epistemology plays out in terms of conducting 'development research' means that certain conceptions, especially 'transfer of technology' approaches are ascendant, although ambiguity and contest still exist in this. In a similar manner the project management policies confine and restrict knowledge sharing, through the mediation of knowledge. This occurs both internally within the project, as well in establishing the rules for collaboration with local partners, as illustrates in discussions with the Tashkent institutes. The knowledge creation process is also shaped by staffing choices, with PhD students conducting much of the knowledge creation, a situation which creates problems of knowledge loss and in some ways discourages knowledge sharing. The impacts of this on interdisciplinary collaboration are significant, as are the very different epistemologies which exist between the three ZEF academic departments. The dominant epistemological grouping of knowledge managers also plays a role in determining how collaboration occurs with local partners (UrDU and others) and with the international donor community. Evident in this chapter is how centralised management inadvertently coalesces with epistemological differences (which are problematic for knowledge sharing). This is especially the case in a lack of a common understanding of what constitutes science and no common understanding of why the project exists. Yet despite all these challenges, interdisciplinary knowledge sharing and local collaboration does occur within the project. The challenges faced in conducting developmental and interdisciplinary research are not unique to this project, yet the structures to deal with them could certainly be improved and indeed the 3rd phase holds great potential.

CHAPTER 7
PRACTICAL IMPLICATIONS

> "Without charity, knowledge is apt to be inhuman; without knowledge, charity is foredoomed, all too often, to impotence" (Aldous Huxley, in, Dolci, 1960: 11)

The research contained in this thesis was conducted not only with a view to producing academic work, but also with a hope of assisting in the alleviation of the poverty so prevalent in rural Uzbekistan, specifically, the contribution that agricultural knowledge can make to rural development. Thus I attempt to set out in this chapter the practical, developmental, implications of my research. This is not an exhaustive analysis of the constraints to development in Uzbekistan, it is not a complete anthropological portrait of rural life, nor is it a full 'consultancy' of the project in which I worked. Rather it is an uneasy compromise between all three of these fields, focused on the interactions between these three fields of knowledge.

It is from these interactions (or lack thereof) that I identify areas in which knowledge is not being effectively shared between these communities and contrast this with examples where knowledge exchange is occurring or where it holds real potential. Given that the research was conducted under the aegis of an existing project, many of the findings of this thesis could potentially find purchase within on-going project activities. As such I place considerable emphasis on ways in which the project could more effectively 'manage' its knowledge. Similarly, my commentary on the practical implications of the findings on indigenous knowledge intends to explain how best to work with the local community to achieve shared development goals in an appropriate and achievable manner. The third area, knowledge governance, is afforded less attention. I would not presume that any 'policy recommendations' would affect any influence over the GoU and the wider issue of liberal versus illiberal (control-based) knowledge governance is addressed more fully in chapter eight, as part of the theoretical implications of my research.

I. KNOWLEDGE SHARING BETWEEN THE KNOWLEDGE SYSTEMS

In setting out the practical implications of my findings, it is first necessary to surmise the areas in which knowledge is and is not effectively 'managed' within and between the three knowledge systems. How well knowledge is created by the different groups, how effectively this new knowledge is disseminated within and between the three 'communities of knowledge' (Peasant, Project and Post-Socialist Governance) and the eventual implementation or use of this knowledge. I begin this discussion with the appraisal that there is limited knowledge sharing between the three groups, in so far as the evidence collected in this thesis illustrates. Where knowledge linkages do exist, the transfers of knowledge are rather uni-directional. Whilst I did not study the 'interfaces[i]' of knowledge, many of the case studies illustrate examples of the knowledge systems interacting. This is not to say that knowledge sharing does not occur at the formal and informal levels, rather that this knowledge sharing process is heavily constrained by several factors, primary among these being the control based nature of knowledge governance, which sets the rules and norms for knowledge sharing in Uzbekistan. That this system of knowledge sharing is defined by the political system of Uzbekistan presents difficulties. Likewise, the project is constrained by internal checks against becoming 'too development focused' and there in an inherent pressure towards 'research' (in a very traditional, positivist scientific sense) which tends to view 'non-scientific' knowledge as less valid. Finally, the considerable cultural differences between rural and urban populations in Uzbekistan combine with the epistemic arrogance of local governors and academics, making for a difficult milieu in which to manage and share knowledge. The following discussion of knowledge sharing should be read in light of the difficulties of Khorezm. Many of these constraints are not unique, yet the manner in which they are manifest, is an important yet seldom discussed aspect of why knowledge is not shared and the practical implications of this.

[i] I use the term 'interface' with caution, I refer to the wider concept of interactions between individuals and groups, both through formal and informal social mechanisms, a deliberately open use of 'interface' (cf. Arce & Long, 1992: 211)

1. Peasants and the Project

The project management claims that ZEF/UNESCO research activities have an active contact with local 'farmers' (Interviews; 10 November, 13 & 15 December; 3rd Phase Project Proposal). The evidence from my research disputes this. The example consistently cited by those claiming the project has close relations with the 'peasant' knowledge group, is that of the fertiliser experiments conducted by one of the PhD students. Likewise two Uzbek project students, both working on their PhDs, were conducting some technology development activities related to resource conservation agriculture. In the first case the local 'farmers' who were partnered with were, in many cases, owners of over 80 hectares, placing them very much in an elite class of the politically connected. Furthermore the selection of these farmers was on the basis of anything but what would be considered developmental need. Rather, the *hokims* or other local governors were approached by the project to ask for suitable partners. Thus one must seriously question whether these partner 'farmers' can be considered to constitute an 'at need' section of society (as elites they are discussed in the next section). Even if we accept the conjecture that they are, then the evidence of knowledge sharing is weak.

Whilst the PhD student in question discusses the numerous practical lessons they learnt from the farmers, and has outwardly excellent relations with these farmers, there is no evidence of the 'local knowledge' of these farmers being incorporated into the research outputs, in academic papers, project publications or the like. The case of the conservation agriculture equipment is very similar, where even though the two staff are 'local' (one is from Khorezm, the other from elsewhere in Uzbekistan) interviews with their partner "farmer" identified that no effort had been made to involve them in the research process as anything but an employee (Interview, 14 August, 2005). At the heart of this disconnect is a fundamental misunderstanding by the ZEF project of the meaning of participation in a modern development studies context. The participatory development approach places great emphasis on the *process* by which participation is achieved[ii]. This literature suggests that farmers should become "agents of change" who must act with ownership

[ii] See for example Chambers (1984), Friedmann (1992), Okali et al. (1994)

and control of their own development "rather than as passive recipients of development assistance" (Rathgeber, 1990: 494). Yet, the consistent tenor of project proposals sees 'farmers' as end users of technologies, yet makes no reference to how the development of these technologies (let alone the identification of locally identified priorities for development) is to involve the rural poor[iii]. I would not be so naïve as to suggest that this participatory approach could be used 'cut and paste' in Uzbekistan. The manifold challenges of working in rural Khorezm, including a very different understanding of 'development' by local partners, means that this would not be possible. Moreover there are strong arguments for working with the elites, given their considerable control and large land holdings, which are unarguably important for attaining ecological improvements. So I am not simply setting out a criticism of the project's research. Rather, I posit that the lack of low level participation suggests that downstream 'extension' will be hindered by the lack of knowledge sharing between the project and the end users.

I would contest that the project needs to recognise the different classes of farmers that exist and adopt extension strategies which suit these different farmers. For instance, private *fermers* have the resources to adopt new technologies and have sufficient land holdings to allow for wide scale adoption. Existing engagements with this class of farmers is working well. Yet whether supporting this group will alleviate poverty or contribute to rural development is open for debate. Whereas *dekhans* and *pudrats* do not necessarily have the requisite resources to adopt new technologies, yet stand to benefit greatly from improved educational and extension activities. To access these farmers, a much more 'grounded' approach to research will be necessary, which engages with

[iii] For instance the first phase proposal (Velk et al., 2001: 5 & 7) describes a 'stakeholder approach' which will 'involve' farmers in the pilot research farm. Yet there is no discussion of by what process this is to be achieved or what ability farmers will have to influence decisions – let alone the level of consultation that will occur on the selection of research topics. This stakeholder approach is mentioned again in Vlek et al. (2003), but once again without discussion of how farmer knowledge or concerns are integrated into the research process. The 3rd phase, with the 'follow the innovation' approach promises that "farm-level technologies will be implemented by farmers throughout the region" (Martius et al., 2006: 8) but once again this seems to be a top-down transfer of knowledge rather which is then 'implemented' rather than co-development with knowledge sharing between partners.

farmers are joint developers of new technologies. In this regard my thesis findings on the structure of the local knowledge system suggests that strategic partnering with masters is important. This can include both state and non-state actors, for instance the *ex-officio* masters (rais, agronomist) are important figures to work with, and co-opting them can also reduce the risks to the project from being too 'subversive'. However non-state masters are also important, and by designing research in a way that it allows the knowledge of these masters to be tapped, as well as for these masters to be trained as key propagators of down stream technologies. In this regard we should see masters as the 'key' to accessing and working with *dekhans* and *pudrats*. Certainly the developmental impact of working with these farmers, who constitute the majority of households in Khorezm, would be much greater than the elite approach of working with *fermers*. It would not however deliver the same level of 'hectares converted to conservation agriculture' or other quantifiable indicator which may be taken as evidence of success by the donors. What can be said is that *dekhans* and *pudrats* would benefit greatly from interaction with the project, enhancing their knowledge and possibly leading to improved environmental and ecological outcomes.

2. Hokim and Dekhan – A vertical of power?

I have discussed at length in chapters four and five the mode of knowledge sharing between the knowledge governors and rural farmers. Essentially the knowledge sharing that exists is one way, from the top to the bottom, with knowledge governors at the top. This type of knowledge sharing is essentially a reproduction of the political system, which is autocratic and centralist. So whilst Trevisani (2006b) discusses the way in which political decisions on land tenure are handed from the top down, and Veldwisch (2007) analyses how water distribution is determined from above at each stage of the allocation process, so too is knowledge a centralised commodity. Because of the imbrication of politics and agriculture, the knowledge associated with agriculture is powerful. Thus because political accountability is towards superiors (still largely focused upon fulfilling cotton quotas) the flow of resources is upwards, whilst knowledge, or the regulations and norms which pass for knowledge, flow from the centre down.

It is perhaps worth noting that academics and local research institutes are subject to a similar system of knowledge control. The knowledge governors of Khorezm set rules and norms establish institutions and provide incentives, which govern knowledge within Khorezm. Be this within the governors group, in its contacts with local universities and research institutes, and especially in the contacts between *dekhans* and *hokims*. In each of these social relations power is being exercised by those who can use it (governors) over those who can not. The control of knowledge is a replication of the wider political and social environment in which knowledge is shared. In this regard the possession (or access to) hard power is reproduced in the control over knowledge, which can be termed as a form of soft power. Certainly we see in the case of cotton and the planned agricultural economy how "the production of knowledge and the exercise of administrative power intertwine, and each begins to enhance the other" (Foucault, 1980: 70). Thus it should come as no great surprise that the unidirectional manner of the 'vertical of power' (to borrow a phrase from Vladimir Putin) is evidenced in knowledge sharing between local actors seeking to reinforce and extend their power. This theme of power and knowledge is central to this thesis and to understanding how and why knowledge is controlled in Uzbekistan. In one respect the policy is effective in that knowledge is largely controlled, yet the unintended consequence is consistent economic underachievement in the agricultural sector, precisely because of the lack of knowledge and the slow rate of knowledge creation and sharing. The developmental impact of this type of knowledge governance is discussed in section IV of this chapter. The similarities and differences between this mode of knowledge governance and the relationships between the project and local elites are discussed below.

The practical implications that come from this are that foreign research projects, not only the ZEF project, need to be aware that 'research' and information, seemingly harmless and inoffensive things to the GoU, are in fact very important to the exercise of power. Because not only agriculture, but the control of agricultural knowledge is central to the exercise of state power (legitimated by the 'expertise' and specialised knowledge of the

state and its actors) research on agriculture is much more political than may initially be realised. Taking this view of research and knowledge, it helps to understand why projects which seemingly pose no threat to the GoU (such as seed potato distribution, promoting vegetable production) encountered difficulties and were in some cases closed down. Foreign research projects, especially those that work with the lower levels of society (*dekhans* and *pudrats* rather than *fermers* and *hokims*) pose a sever risk to the state monopoly on expert knowledge. In a society where knowledge is power and power is held centrally, introducing alternatives sources of knowledge also introduces competition for power, although this could be managed by also involving (and enriching) elites. This is not only the case at the national level, but also occurs in the replicated (capillary) power relations between *hokims* and *fermers*, and in turn with *dekhans* and *pudrats*. *Hokims*, through their network of expert agronomists and by the exercise of direct and indirect control over agricultural knowledge, (impeding innovation, controlling the labour process, selective interpretation of the state plan) control knowledge. For a foreign project to partner with a *hokim* thus reinforces their power (and through them state power) by increasing their power monopoly. However, to bypass the *hokims* and agronomists and work at the local level is to present an affront to the power structure, which has resulted in other projects being told to leave Uzbekistan. How to negotiate this dilemma is a practical implication for the ZEF project, which must determine how it hopes to define its relationship with the state and local elites.

3. The Project and Local Elites

Interaction between the elites of Khorezm and the project management certainly occurs, as does limited *ad hoc* interaction between these elites and project staff. The example given above of the fertiliser research is an apposite one, detailing how there is indeed interaction between the political elites and the project, within Khorezm. Likewise, study visits to Germany, essentially a sweetener for the elites (the pedagogical value of the visits is questionable[iv]) evidence interaction. However, the key question is the extent to

[iv] In the view of Uzbek participants themselves, when interviewed in October/November 2005.

which this interaction and friendly relationships deliver effective knowledge sharing and what the nature of this sharing is. The answer is somewhat mixed. In the early period of the project, maps and other 'secret' materials were provided by various local partners, and the political elites of Khorezm have on occasion provided support for the project. In 2005 concerted effort were made by the project to introduce senior political figures to the activities and technologies of the project. Such knowledge sharing is forecast for expansion in the third phase (beginning 2007) where the project documentation states:

> "The results from phase 2 will be compiled into jointly crafted reports and presented in an adequate manner addressing different target groups (e.g., scientists will be approached by the means of an international scientific congress; policy-makers will be presented with reports and asked to participate in hearings, and stake-holders will be offered training and extension services)." (Vlek et al., 2001: 9)

It is interesting to note that the consultation with local elites was not planned in the second phase of the project (on which this thesis focused) and that local academics interviewed in November 2005 expressed cynicism about the effectiveness of their consultations. Whilst some efforts were made to develop dialogue with the political elites of Khorezm during the first two stages of the project, I could find no evidence of a two-way transfer of information and knowledge. Rather, the project was largely consigned to the role of recipient of knowledge (and subject to some controls) within the *hokim's* vertical of power. So the challenge for the 3rd phase is firstly to agree how to define the relationship with the elites, in view of the preceding section, and then to pursue knowledge sharing (if it is deemed important) in a constructive manner.

4. Power and Knowledge in Khorezm

> "Knowledge is power" (Francis Bacon: Religious Meditations, Of Heresies, 1597)

The exercise of power in Khorezm is based on the possession of and control of knowledge. In the case of agriculture those in power are in possession of specialised knowledge and this 'rational expertise' allows them to remain in power. Built into this is the way in which the knowledge governors 'authorise' knowledge as acceptable or not by creating and enforcing state norms (direct control) as well as indirect control (impeding innovation and managing the labour process). These intertwined roles of power and knowledge, through the assumption of 'specialised knowledge' is a dynamic discussed by

Foucault (1980) where he argues that knowledge can be used to legitimate 'control societies' (and elaborated on in the theoretical implications chapter, next). I find this concept useful in its application to Khorezm, where we can see the importance attached to agricultural knowledge, not only by the knowledge governors but also by the project itself, which essentially is seeking to establish itself as a possessor of specialised knowledge. Likewise, the masters in the indigenous knowledge system utilise their specialised knowledge, if not to control others, but to extend their social and political influence. Knowledge is not neutral in rural Khorezm; rather it has value and can confer power onto those groups or individuals who possess specialised knowledge. For instance we saw in the case study of the *pakaz* how training seminars served a dual purpose: an explicit educational function as well as an implicit activity to reinforce the political hierarchy and controls over knowledge. My reflection on this in terms of the project is that downstream project activities need to be conducted in a manner which is aware of the power of knowledge. Decisions need to be made about if the project is to act in a way which reinforces the knowledge base, and therefore 'legitimacy' of the current knowledge governors? Or if the project will collaborate with those masters and *dekhan* farmers who are knowledge poor? Given that the project is acquiring knowledge, which if shared and implemented, will translate into power; this dynamic of knowledge and power must be acknowledged in the final phase of the project when it moves from research and into extension activities.

II. THE PROJECT – MANAGING KNOWLEDGE FROM RESEARCH TO IMPLEMENTATION

The sixth chapter of this thesis looked at how knowledge is created, shared, stored and used by the ZEF/UNESCO project. Most of the data for this chapter came from one year of field research (2005) and the documentary evidence was also read in light of this intensive research period. Yet the project had been operating for four years prior to this research and is forecast to run for a further five years. Thus the practical implications discussed in this section are very much time bound. Yet I still see merit in producing some practical suggestions based on the successes and problems researched during 2005.

I begin this analysis by looking at the Meta Data Base (MDB/CDB) which was roundly criticised in chapter six, using this as a means by which to discuss the need for a more open model of knowledge management, which does not so readily categorise (and thus (in)validate) information and knowledge. Secondly, I discuss the topic of project staffing and the issues that this raises in terms of research collaboration as well as the wider implications that having research focused PhD students makes on project activities and knowledge sharing with other groups. Then, having identified knowledge loss as a major issue in all three results chapters I discuss how knowledge retention within the project is working well yet can be improved. Fourthly, and most importantly, the wider issue of how the project can transition from a 'research' project to a 'development research' project is addressed. The issue of utilising research, of making use of knowledge, is a key challenge for the project as it moves into the 'implementation phase' of 2007-2010. Hopefully the practical implications of my research can be used by the project to better manage its considerable knowledge and to utilise this to affect positive development outcomes. This relates to section III of this chapter, where the wider issue of under-development in rural Khorezm is addressed. Specifically, how a poverty of knowledge is creating economic poverty and a paucity of opportunities for the rural population. These observations and recommendations are also pertinent for the project yet are discussed in a manner to make them accessible to a wider audience.

1. Managing an Inventory of Knowledge

The first phase of the project set out to establish an 'inventory' of information that already existed within Khorezm and to begin the documentation of this information. The management tool employed for this task was the establishment of the Meta Data Base (MDB) which is discussed critically in chapter six. What rapidly evolved was an information or data management tool, which categorised and ordered information and data; there was little recognition of the role that knowledge played in making this data intelligible and useful. The decisions made in how to categorise this data reflected an epistemology of science based on spatiality and frequency, in short, GIS mapping. Thus the MDB, meant as an inventory of information for the entire project, has evolved into a very large bank of GIS maps, with some supplementary information.

As an inventory of GIS data, the MDB functions in a satisfactory manner. Whilst new data inputs are infrequent and come from only a few project team members, there is evidence that the GIS data is well used by project staff as an aide to their research. The utility of this data could perhaps be increased by allowing more free access to the data, which is currently restricted by 'mediators' in the form of project management. There are justifiable reasons given for this data to be regulated, some of which I accept. Yet the vast bulk of the information could be provided to all project team members, with only the sensitive or potentially illegal data, requiring approval from knowledge mediators. Certainly the meteorological data, useful for almost all students, should be seen as a 'common' data set which can be freely accessed. This may necessitate some changes in who collects this data (it is currently one PhD student, who thus sees it in a proprietary 'my data' point of view) nevertheless there are no compelling reasons to mediate or control this information. Likewise, I would argue that the usage rules for the MDB need to be modified, with an assumption that data should be openly available unless there is a compelling reason for it not to be. Naturally, this would need to be governed by a policy framework to which project staff must consent. The current situation whereby all inventoried knowledge should be mediated (but in reality is not) through project management seems to be burdensome (on both staff and students) and can be seen to

restrict information (and knowledge) sharing, moreover informal arrangements prevail without the benefit of protections that a policy would allow for.

More generally, the MDB as a register of project data has serious restrictions. Because of the coding and categorisation that is inherent in how the database was established, various types of knowledge and data are effectively excluded. This data and knowledge is invalidated by the database in a manner prejudicial for both interdisciplinary collaboration and for the project in general. What is needed is a database which responds to the needs of users, and allows changes and re-classifications to occur within the system, rather than a database which imposes its own strict epistemology onto all project information. Thus the MDB must be made to 'learn' and to adjust to suit the needs to users. The current MDB fails to do this, which is reflected in the low utilisation of this inventory and the negligible knowledge sharing that occurs through it.

2. Research Collaboration and Project Staffing

In chapter six I discussed how the project in the first two phases has opted for doctoral students for the bulk of project staffing. Whilst professional management staff also conduct a small amount of their own research, and there is a growing number of post-Doctoral students, in 2005 the majority of staffing and knowledge creation was by PhD students. These students are excellent creators of new knowledge. Yet they are not necessarily excellent sharers of knowledge, nor does the structure of PhD study lend itself to wider collaboration or to attaining development outcomes. PhD research is essentially an individual effort, focused on a very narrow field of research, which must fulfil certain academic requirements. It is precisely these constraints that conspire against effective research collaboration within the project. Because students must produce unique research there is an inherent concern that collaboration could result in the loss of the novelty of their research. Likewise because PhD research, especially scientific publications, relies upon work being novel and unique, students have a justifiable apprehension to sharing their knowledge. The response from the project has been to implement mediators of

knowledge, who sit in judgement on what can and cannot be shared between students, with the data then shared through the MDB. Yet we know from chapter six that informal knowledge sharing also occurs between students, who in this case have few protections if their knowledge is misused. This helps to explain why informal knowledge sharing occurs within established friendships, because of the social capital (cf. Menkhoff et al., 2006; Bourdieu, 1985) and inherent informal enforcement mechanisms within these relationships.

I would recommend that an internal policy framework for the project is a more effective mode of allowing for, protecting and thus encouraging formal and informal knowledge sharing. Such a policy framework would need to specify what knowledge sharing is and is not acceptable, the reasonable protections inherent in this, and coercive measures to be taken against miscreants. This would of course include definitions of what is fair use of data, proper rules for citation and co-authorship and clear disciplinary guidelines for those who abuse the policy and plagiarise. Such a policy would reduce the burdensome administrative load on students and project managers (in their role as knowledge mediators) and would provide better protection for knowledge sharing, thus increasingly the likelihood of intra and inter disciplinary collaboration. Existing formal relationships could of course continue under the new policy regime, but more importantly it would provide protections and incentives for informal knowledge sharing to occur, defining for all actors the proper 'rules of the game' for knowledge sharing. Some changes in how the project is staffed may also encourage greater research collaboration. For instance moving towards a hybrid of masters, PhD and post-doctoral students would allow for greater flexibility in the knowledge creation and sharing process. For example post-Doctoral students could fulfil the role of "knowledge mules" (cf. Sen et al., 2005) carrying knowledge between different creators and users, assisting in the use of this knowledge, without the same pressures to produce novel research. Indeed, staffing of the third phase seems to move increasingly towards post-doctoral students. Besides the knowledge sharing benefits, the outcome of more varied staffing would be most evident in the ability of the project to affect development outcomes, as discussed in sub-section four, below.

3. Retaining Knowledge

Another feature of the PhD study is its inherent 'lumpiness' from a knowledge management perspective. As discussed in chapter six, the majority of the knowledge creation from a PhD only becomes apparent towards the end of the three-year (or more) study, with the publication of the thesis. Even this only provides some of the filtered data and often does not explain how the findings can be applied within the framework of the project. This raises the phenomenon of knowledge loss. Whereas the MDB has been shown to be insufficient as a knowledge 'bank' into which data and knowledge can be stored, it is my opinion that procedures and policies are needed to ensure that the knowledge of project staff is not 'lost' when that staff member is. Conversely, that the knowledge of a researcher is available in such a manner so that other researchers and staff (from the same or different disciplines) can access this knowledge.

In the case of direct data this is best achieved through a modification of the existing MDB. By moving away from the spatial and time-based classifications that exist in the database, the MDB is able to be reformed into a more useful archive of data. Likewise, by moving away from a mediated model of knowledge sharing towards an open system governed by appropriate policies, more knowledge sharing could occur, distributing knowledge within the project and thus retaining it in a decentralised manner. Yet the knowledge much more difficult to retain is the *aptitude* or know-how or students, the ability to operate in a difficult field setting like Khorezm, and the personal connections and social capital that this entails. The knowledge entailed in this is practical knowledge, from which theoretical knowledge and research outcomes spring. This practical knowledge cannot be stored in databases, it cannot be categorised, yet it is crucial to the project. To best retain this knowledge, it must be shared while in the field, between students and management staff. To retain this knowledge, and to encourage further collaboration, I would envisage students working on co-operative projects as one element of their research in the field. This could be on direct development activities, as discussed in the following sub-section, or it could involve elements of supervision of MSc students

or co-operation with local partners. Encouragingly, the innovation teams of work package 710, planned in the third phase of the project (Martius et al., 2006: 177) would seem to be a good example of how this could possible occur. Whatever form it takes, if practical knowledge and contacts are to be retained, this must occur by diffusing these within the project. This already occurs on an informal level (for example between a land-tenure sociologist and a natural science researcher) yet recognising and supporting such endeavours would enable the project to retain this crucial, if under acknowledged, knowledge.

4. Utilising Research for Development

The key challenge for the third phase of the project (2007-2010) is to transition away from conducting field research in Khorezm, towards applying the findings from this research and most crucially towards conducting participatory research. This will entail utilising the knowledge capital that exists and is retained within the project, as well as conducting new research in collaboration with local farmers and also on the development process itself. This is no small challenge. It will require ZEF as an organisation and the project management, to mobilise the (considerable) intellectual capital of the Khorezm project, and to utilise this in a real field setting. This challenge is compounded by inherent constraints placed upon ZEF (from Bonn University, not to become too applied) and from the donor (BMBF, to focus on research). Yet it would, in my mind, be a disappointing failure if the research outcomes of 2001-2005 were not employed to at least field test future opportunities for development[v]. Yet achieving this will require a number of fundamental questions to be addressed: the purpose of the project needs to be clarified and from this an epistemology of science needs to be engineered which can deliver research to meet the project goal. At present the confusion which is described in chapter six militates against achieving development outcomes. In stating this we should be aware that such a situation is not abnormal or even unexpected. It is a challenging ambition to conduct interdisciplinary development research in a country as problematic as

[v] Indeed, I would argue that failure to do so would raise serious ethical issues about such sustained research in a developing country. For an exposition of this argument, see Wall & Overton (2006).

Uzbekistan. For example Sillitoe (2004) writing from experience with English academic conducting research in Asia and Africa, that:

> "The problems of poverty are complex, and tackling them demands cooperation between specialists with diverse backgrounds in both the natural and social sciences ... Yet facilitating such interdisciplinary work … has proved difficult." (pp. 6).

The difficulties come from a lack of shared understandings of what the problem is and how best to address these problems. In the ZEF project this process occurs through the dominant epistemological group negotiating with other stakeholders to achieve commonly agreed solutions. There is no simple answer for how to achieve this: "It is more appropriate instead to think in terms of a balancing act, of accommodating different perspectives while facilitating interpenetration, of challenging narrow disciplinary views without threatening intellectual tumult" (ibid: 6). Similarly, the problems of knowledge sharing in a research project and the lack of cohesive effort towards a specific goal is well documented by Biggs and Matsaert (1999) who acknowledge how a "lack of systematic and usable methods for qualitative assessment" mean that quantitative assessment becomes the only 'valid' form, reinforcing the dominant paradigm, and that this can hinder knowledge sharing (pp. 231). Thus the ZEF project is not alone in facing real challenges when attempting to implement an ambitious agenda for interdisciplinary research. Yet these challenges need to be addressed.

Vital to utilising existing research for development in Khorezm is the proper management of the project's knowledge. This knowledge creation that does occur should take place in collaboration with local farmers and partner institutes. Isolated research, divorced from the realities of farming in Khorezm, is not helpful to achieving development outcomes. It misses out on the benefits that can be gained from accessing local knowledge and risks creating knowledge which is irrelevant to the needs of the rural community of Khorezm. Unless local farmers are involved in determining research priorities, in conducting research and are motivated as agents of change, then it is likely that the isolated research of the project will not be applied for development. Achieving this will perhaps necessitate internal changes within the ZEF/UNESCO project, especially with a move away from PhD students and through attempts to make the dominant epistemology more inclusive. Yet most crucially in my opinion is a paradigm shift away from seeing research outputs

and PhD publications as the goal of the project. These should more properly be seen as outcomes, which lead towards the goal of developing the agriculture, ecology and economy of Khorezm (or a different goal, if it is indeed clarified by the project leadership). If this is to be of benefit to those groups most at risk from the ecological and economic degradation, then the research and findings need to be channelled towards the most at-risk groups, with an ultimate goal of poverty alleviation. At present there is a confusion of objectives: project, social and personal objectives are conflated and the determination of the central goal changes with subsequent project proposals. The concept of 'development research' is not clearly explained or illustrated within the project. Without a clear idea why knowledge is being created, it is difficult to properly manage the research process towards a functional goal. If we accept that making a contribution to poverty alleviation is the end goal, and development research and interdisciplinary research are means to this end, then the projects research can be utilised for rural development. Yet, to do this will require much greater integration with the local society and local knowledge system, some perspectives on which I present in the following section.

III. A POVERTY OF KNOWLEDGE

The best word to describe life in rural Uzbekistan is poverty. In every sense of the word, be it the poverty of opportunity and the poverty of optimism, or poverty in an economic sense of an insecure food supply and the paucity of paid work. In a knowledge sense there is a poverty of understanding and it is fair to say that Uzbekistan in general and especially rural Khorezm is 'knowledge poor'. This is not to say that there is no indigenous knowledge, on the contrary the collective knowledge of the community and the specialised knowledge of the Masters illustrate what knowledge does exist. But much of this knowledge 'wealth' is being lost with little evidence of new knowledge filling the void. From a development perspective there are two external mechanisms through which indigenous knowledge could be accessed and utilised as a tool for rural development, in the process reducing the knowledge-poverty and socio-economic poverty of the community. These two avenues are internal government action and external assistance. For reasons discussed in the next section (IV) internal government action has been largely unsuccessful in the post-1991 period, and there is little evidence on which to base optimism that this will improve in the foreseeable future. This sad conclusion leaves quite an onus on the international community. Whilst I have discussed in the previous section ways in which the ZEF/UNESCO project could improve its immediate activities and knowledge management systems, I discuss here how the findings of this research can be utilised to improve the effectiveness of foreign assistance projects in rural Uzbekistan. Firstly, there is a general need to appreciate and access local knowledge, as a means to work towards the co-operative development of appropriate and accessible technologies. Secondly, these must address locally articulated desires and locally defined priorities for development. Thirdly, succession planning, whereby control over this process if gradually transferred from the external agency towards local groups and individuals, is crucial if the development process is to be sustained. None of this is unique; indeed it reflects well established developmental thinking (Swanson et al, 1997; Chambers, 1984; Cohen & Uphoff, 1977). Rather I set out below how these three tenets of development can work at the local level in rural Uzbekistan.

1. Appreciating and Accessing Local Knowledge

If local knowledge is to be utilised for development it must appreciated and valued. This local knowledge should then be tapped in a way that allows further local knowledge to develop. What I set out here are some key principles for dealing with local knowledge, based upon my reflections from a year in the field. These range from the need to accord dignity to local knowledge holders, respecting local specialists, understanding how local knowledge is culturally embedded and how accessing local knowledge requires a constant willingness to learn and accept. I argue that it is only once local knowledge, and its limitations, have been appreciated and accessed that a proper assessment of development needs can be made.

i. Accord dignity to local knowledge holders

If a scientific researcher or development practitioner wishes to engage with the local knowledge system, they must do so realising that it is they who are the outsiders. Coming from the exterior, from a very different epistemology of science and typically from a much wealthier homeland, carries with it a different perception of what knowledge is and on the relative value of different forms of knowledge. For instance a European expert on vegetable production has specific ideas on how their 'expert' knowledge relates to lay knowledge, with an assumption that scientific knowledge is superior knowledge. Yet in a local context the concept of superior knowledge is a dangerous one, as it often leads to scientists looking down on local knowledge practices as outdated, outmoded and antiquated.

I was certainly guilty of this from my early time in the field and I have observed such opinions in my colleagues on occasion. From the benefit of my field experience, I learnt during the year the importance of affording dignity to local holders of knowledge. I found that by respecting local knowledge, and by doing this, recognising local knowledge holders as capable individuals worthy of respect, I was more able to access the local knowledge which was so crucial for my thesis. Yet perhaps as important, once I had

established a position as an individual who was eager to learn (even if this sometimes meant that I was perceived an ignorant, for being so unaware of seemingly universal knowledge) I found myself in a situation whereby I could introduce new ideas and knowledge (for example improved potato varieties) much more readily. By respecting local knowledge holders and learning from them first, when I later introduced new ideas I was able to do introduce ideas more appropriate to the local knowledge system. In the same way so should research activities in the third phase explicitly seek to access local knowledge and work with local farmers at each stage of the research process. From the setting of the research agenda, determining their own goals for development, through the research and experimentation stages. Not only will the research be more relevant, but I argue it will be more effective, as it will be able to tap the local knowledge of the stakeholders.

ii. Respect local specialists

As I discussed in chapter four, Masters, or local specialists are key to understanding local knowledge in Khorezm. These masters are local individuals who are recognised within the community as holding superior, specialised, knowledge on various aspects of rural life. As discussed above it is crucial that these masters be respected for their knowledge and I would recommend that their participation in any research or development activity is essential. Doing this would empower these Masters to extend their role as 'knowledge brokers' (cf. Menkhoff et al., 2006). They already fulfil such a function advising others within the community and acting as a central source of information, as well as a conduit for new knowledge as it is passed down from the state. I would advise foreign projects working in rural Uzbekistan to collaborate with these masters, providing them with the training and skills required to disseminate throughout the community. This needs to be more that a formulaic 'training of trainers' approach. Rather masters, as local specialists, must be recognised and respected as thought leaders within their communities. This entails involving them in the research process, allowing them to form their own opinions on which technologies are appropriate and which are not. Crucially, foreign projects must accept these opinions as valid and act upon them. All too often the assumptions of

scientific superiority are made by foreign projects, resulting in ill-advised and undesired interventions in the rural community. Much better is to work with local masters and to allow them to continue and expand their role as knowledge brokers. There is an inherent risk in this approach if the masters selected are those who are seeking to extend their social position, especially if these masters are part of the knowledge governing system, for example agronomists in the *hokimyat*. This is in some ways the approach I have criticised elsewhere in this chapter. Rather I propose working with indigenous masters, who operate within the community, and are not part of the external power structure. Identifying such masters is necessarily difficult, it requires specific knowledge of community level social interaction, yet I see this is a necessary precursor to any knowledge sharing activity. Thus a deeper involvement in rural communities, working daily at the personal level, will be necessary for the project to begin extension activities in Uzbekistan. If such contacts do not exist before the 'extension' of technologies, then one must be very cynical how appropriate and well received these new technologies will actually be.

iii. Understand how local knowledge is culturally embedded

Local knowledge does not exist in a vacuum. Rather the system by which local knowledge is created, shared, stored and used, is determined by the cultural context in which it operates. I have explained in chapter four how certain aspects of Khorezm culture lead to certain social constructs, such as the primacy of the master and the gendering of agricultural labour, yet many organisations fail to account for the culture and society in which they seek to work. For instance a German NGO working in Khorezm in 2005 invited a German national to lecture local farmers on livestock and dairy production. Leaving aside the egregiously inappropriate nature of much of the training (which assumed access to a sterilisation plant) the training was organised during the cotton picking period (the busiest weeks in the rural calendar) and perhaps worst of all, involved only men. Without engaging in a down-stream study, one must be pessimistic about the chances of women (those who feed and milk cows) gaining much from this training seminar. This is just one example of the dangers of failing to recognise

that local knowledge is culturally bound and that any intervention into this system must be done in a manner, both cognisant and sympathetic, to the culture. In the Khorezm case this needs (at a minimum) to recognise the authority of agronomists, it must account for the risk of political interference (especially in the case of cotton and wheat) it must be aware of the important role that gender relations play in agricultural production and should have some knowledge of the historical 'development' of Khorezm during the Soviet period. From a project perspective, the greatest challenge to understanding local knowledge in its cultural context is the recognition that knowledge is culturally embedded. The positivist epistemology favour universalistic knowledge, scorning 'local' knowledge as 'unscientific'. The first step is thus an acceptance of the validity of local knowledge, followed by an effort to engage with local knowledge on an equal basis. Assuming scientific superiority may well be justified from an academic perspective, yet as a way of ensuring development outcomes, it will almost surely fail.

iv. Maintaining a constant willingness to learn and accept

My final reflection on this point is that when dealing with local knowledge it is vital that one remains constantly open to learn. The local knowledge of any community is a complex set of, at times conflicting, ideas and concepts, these are seldom explicitly understood by the entire community, rather local knowledge is constituted by all the parts of the community in which it is based. One should not under-estimate the complexity or depth of local knowledge. From my year of field research I found that for each discrete area of knowledge I researched, I found it interlinked with every other area of rural knowledge. It is not possible to define local knowledge into neat disciplinary areas and you just miss a great deal if you try. Thus it is insufficient to try and catalogue local knowledge in a short period. What is required instead is a 'process' of learning. To institutionalise this 'learning' approach to knowledge is not easy. It involves a culture shift within the project, engineering a culture of learning and openness which may sometimes seem inimical to 'scientific' research. This involves leadership, policy changes, staff training and most crucially a shared vision of why learning is important and how this contributes to a clearly articulated goal.

2. Working towards Appropriate and Accessible Technologies

Applying the four principals outlined above is very much in line with current development studies thinking, moving away from the 'Transfer of Technology' approach. This was the prevalent mode of extension used in the introduction of 'Green Revolution' technologies to the developing world in the 1960s, and much of the 1970s. Here technology was transferred by way of a "top heavy and top-down" approach of central governments (Swanson et al., 1997: 9) either national governments in the North, or post-colonial ministries run "under the aegis of their new administrators" in the South, funded by international donors (Swanson et al., 1997: 9). In either sense the assumptions made by the administrators was one of institutional superiority. That extension workers and officials were development plenipotentiaries, in possession of 'superior' knowledge, which (if properly applied) would solve the problems of 'backward' farming systems.

An almost identical approach was adopted simultaneously, if independently, in the Soviet Union. Elements of this approach still present themselves in development thinking today; certainly the first two ZEF project proposals reflect this uni-linear approach to technology development and transfer (ZEF, 2003: 9-10). Likewise institutes in Uzbekistan still adhere to this view. What I would argue for from a knowledge perspective, in line with contemporary development studies thinking, is a partnership approach which reflects the different types of knowledge held by the local users and foreign donors. For whilst external knowledge is 'universal' knowledge and reflects Western scientific values, local knowledge is concerned at the immediate level and is a reflection of the culture from which it stems. In conducting research and working to develop locally appropriate technologies, it is vital that both forms of knowledge are employed. To do this effectively will require the values of dignity, respect, cultural awareness and openness to learning. These values should be exhibited by both the local community as well as the foreign projects; however, as outsiders it is important to foreign projects to accept this is foremost their responsibility.

At a very practical level in Khorezm I would envisage research being conducted at a deliberately local level by teams of researchers. The first step of this approach would have to be a level of consultation with local *fermers, pudrats and dekhans.* It would be necessary to research what each different group hoped to gain from a joint research exercise and this would obviously have to be framed within the confines of what the project has the capacity and mandate to research. A joint decision would then need to be arrived at between these different groups, allowing for the possibility of having different research teams working with different local actors, if it was found (as is likely) that the interests of the *fermers* and *shirkat/hokimyat* authorities were inimical to the interests of *pudrats* and *dekhans*. Once the research agenda has been set, individual researchers would need to work in interdisciplinary teams, approaching the problem and testing solutions from different disciplinary perspectives (very similar to the work package 710 approach planned for the 3rd phase, Martius et al., 2006: 177).

This however could not be the simple solution of natural scientists conducting laboratory experiments and then consigning the tasks of consultation and farmer collaboration to social scientists. Rather, the epistemology or scientific culture of the project would need to recognise the contributions that each discipline is able to make and how these different contributions can be bought together towards a comprehensive development solution. The creation of this knowledge will then raise the questions of power and control discussed earlier in this chapter, which must encourage us to think but should not make us falter. Essentially the project must be prepared to extinguish exclusive control over the research findings and to allow farmers and local collaborators to use the research findings as they see fit. This marks a departure from traditional academic practice yet if the new knowledge is to be adopted and utilised in the long-term, then this is a necessary step, as discussed below.

3. Succession Planning and Sustainability

In engaging in the development process with a rural community and in utilising the local knowledge which it contains, it is necessary to be aware of the fact that the project will come to an end. The wider issue of sustainability in development is well discussed in the literature (cf. Baud, 2002; Jones & Blunt 1999; Chambers 1984). I do not seek to add anything to this here. Rather I would like to draw on the concept of sustainability to introduce the importance to succession planning in conducting research and development. Ensuring that at the conclusion of the project that local actors are equipped and trained to such a level that they not only continue using the new introduced technologies, but ideally that they are able to continue the development of new technologies.

Knowledge creation and the strengthening of local knowledge capacity should not finish with the conclusion of a project. Rather it is the responsibility of foreign projects to ensure that their local knowledge partners are able to continue developing their knowledge base, after the termination of the project. The planning required ensuring this must be part of the project from its inception, with constant and conscientious efforts at local capacity building. The rebuttal normally given to this suggestion is that certain technologies are not able to be used in the poor country. If this is so, then a case should be made to exclude the technology altogether. In these cases the project should not be afraid to disabuse itself of this technology, whilst it may be interesting for the external researcher, if there is no local interest then it will not be utilised in the long run. In stating this, I am not attempting to supplant the literature on sustainability in development (ibid) merely contributing my reflections on how local knowledge can best be used to aid the sustainability of projects in Uzbekistan. Evident from my research is the importance of adapting technologies to fit the culture of Uzbekistan, taking into account the history of forced technical adoption and the considerable issue of knowledge loss.

IV. DEVELOPMENT UNDER KNOWLEDGE CONTROL

It is customary at this point in a development studies dissertation to provide what is pretentiously called ‘policy recommendations’. I would neither be so naïve or precocious to presume that my policy advice will be followed by the Government of Uzbekistan. Rather I comment here on the impact of knowledge governance, as it is described in chapter five. The GoU governs knowledge in a manner which reflects the intersection of power and knowledge. Through the control over knowledge, political control (power) is also enhanced in a mutually reinforcing cycle. In a similar way as science, research and agricultural development were all controlled by Moscow during the Soviet period, so too does Tashkent control Khorezm, post-1991. Yet whilst Soviet science achieved some notable successes, the Uzbek state has been less adept at governing knowledge in productive manner. Herein lays a paradox, for whilst the Soviet scientific culture was one of repression (not normally associated with ‘good’ knowledge governance) it also achieved some outstanding successes. Yet no such paradox exists in Uzbekistan today.

I describe in this section the practical implications of ‘closed’ knowledge governance. These implications inform the wider theoretical perspective in knowledge governance which I elaborate in the following chapter. Knowledge control operates at three inter-locking levels within agriculture and the rural economy. Firstly, at the political level, the way in which the centre (Tashkent) controls the periphery (Khorezm). Linked closely with this is in the universities and research institutes of Khorezm, which are severely constrained by the state. I include in this section how foreign projects are also subject to similar interference. Finally there is the practical, farm level, where local knowledge and rural development are arrested by knowledge control. Here it becomes clear just how damaging the closed model of knowledge governance is. Yet as I stated in the introduction to this chapter, I do not presume that any practical suggestions to the Uzbek state are likely to affect change. Thus I focus on describing the mechanisms through which poor knowledge governance in Khorezm produces poor developmental outcomes.

1. Governance Structures and Knowledge

The dynamics of how power and knowledge are negotiated within the central (Tashkent) governance structures of Uzbekistan is an area outside of this thesis. Yet I do undertake to explain the interaction between the centre and periphery within Uzbekistan and how this impacts upon knowledge control. Uzbekistan is a centralised state with not only the political, but also the academic and research functions of the state based in the capital, Tashkent. Be this in the over whelming number of universities and research centres, all based in Tashkent, or in the large bureaucracy which exerts a centralising influence. The Uzbek state does not appear to believe in subsidiarity. What this means for knowledge is that new ideas, new rural technologies and any official data must be collected at the periphery and fed into the centre in Tashkent. An internal process of 'authorisation' (cf. Evers, 2005) occurs whereby new knowledge is judged and determined by the state. We saw in chapter five that the academies of science and central research institutes do play a role in determining this, yet that their role is subservient to that of politics, even for technical decisions. Unless new knowledge is authorised, it is not possible for other actors within the country (state or non-state) to utilise it. To do so and innovate, for instance by adopting farming methods outside of the state norms, is punishable by a variety of hard and soft measures. In this way the GoU establishes its governance over knowledge, by creating and commanding institutions which regulate the flow of knowledge. The particular approach taken can be labelled as 'closed'. By which I mean a lack of openness to critical thought or challenge, a triumph of the mediocre status quo over new developments and of ultimate political authority over science. In this way reform of the knowledge system of Uzbekistan is tied with the need for reform of the state and its functions. To date, the Uzbek has been outspoken in its approach of 'slow reform', yet this should more properly be read as 'no reform'. Indeed many 'reforms' such as land tenure changes should more properly be seen as an enhancement of the systems of control, as we see how the threat of removing land from *fermers* for failing to use the state norms is an indirect form of knowledge control by restricting innovation. Likewise, agriculture, education and research remain heavily controlled in Uzbekistan through a variety of direct and indirect mechanisms. The implications of this on rural development are significant, as shown below.

2. Universities, Institutes and Foreign Projects

Closed knowledge governance is having a negative impact on the universities, research institutes and foreign research projects that work of Uzbekistan. I have explained in chapter five how research and scientific learning is constrained by the state. Likewise, foreign projects have their activities stifled, to a lesser extent, by the knowledge control regime of the GoU. During my year in the field, the activities of foreign projects in Uzbekistan became most restrained, with visa cancellation, civil prosecutions (such as providing internet without a licence) and police inspections becoming more common place. For universities what is now occurring is that a generation of would-be scientists are graduating from Uzbek universities and institutes, woefully unprepared for international academia. A lack of critical thinking skills, an absence of training in conducting independent research and serious questions about academic honesty, pervade current graduates. Although it is difficult to distinguish between the negative impacts of state control of the economy and state control of knowledge, it is fair to say that these are cumulative and inseparable as a reflection of the control of power & knowledge. The relationship between power and the economy is similar, in that control over knowledge and economic resources is used to further increase state control, reinforcing the power structures of the centre. The most disappointing aspect of the state's control of education and research is the contradictory discourses of immense pride in the academic and cultural achievements of ancient 'Uzbeks' (for instance Al Khorezmi the inventor of algebra) contrasted with the stifling climate in contemporary academia. Whilst liberalisation of thought is surely not a panacea (under-funding is also an issue) for Uzbekistan's academia, it is increasingly pathetic to witness the disconnect between Uzbek's perceptions of their past greatness and a realistic assessment of their current contributions to world science. Yet both the imagined ideal of a great history and present failures in all fields of scientific endeavour are created and controlled by the state. The flow on effects of this for rural Uzbekistan are that economic development is being retarded by a lack of skilled graduates and useful research output, as explained next.

3. Rural Khorezm – Arrested Development

The impact of the knowledge control structure is particularly evident in the agricultural sector, given the importance of cotton and wheat to the state and the deliberate conflation of power and knowledge control. In chapter four I discussed how restraints on economic activity are retarding the opportunities for development in the rural sector. For example, the way in which smallholders discuss a 'ceiling' to their economic development, above which it is unwise to rise. Likewise, the persistent interference in every stage of cotton and wheat production militates against indigenous experimentation and the growth of local knowledge by impeding innovation. So too do the negative or perverse economic incentives lead to unfortunate development outcomes (cf. Wall, 2006b). In this way knowledge is being governed to reinforce the primacy of the state, as no competing paradigms are allowed to develop. Thus it is the institutions of knowledge control, established and maintained by the state, which account for the slow development of local knowledge and for much of the knowledge loss from the local knowledge system. It is perhaps not the intention of the state to retard development, rather more a misguided desire to 'control' the development, which is leading to this impeded knowledge growth. Yet slow knowledge creation is a result of controlling knowledge by the state to enhance its position of power. This has an identifiable impact on rural development, as it stops farmers from experimenting and developing their own, locally appropriate, methods of farming and thwarts academics (both domestic and foreign) in their research for better methods. Instead centrally determined norms and state plans persist, impeding innovation. It is this intersection of economic and educational illiberalism which characterises rural underdevelopment in Khorezm and rural Uzbekistan. The economic poverty and poverty of ideas persistent in rural Khorezm should be seen as a result of the closed knowledge governance approach of the GoU, which is preventing farmers, local academics and foreign projects from creating new knowledge and breaking the state's knowledge monopoly. New knowledge is resisted because state actors seek to consolidate their power by controlling knowledge, in turn arresting development. This is why I declare that rural development in Khorezm is arrested development, held back by restrictions on agriculture and knowledge which undermine the local knowledge system.

CHAPTER 8
THEORETICAL IMPLICATIONS

The findings of chapters four, five and six discuss three very different systems of knowledge. All three operate within the same country and focus on similar issues of agriculture and the economy. Yet the experiences and phenomena observed in this region are not necessarily unique to Khorezm or Central Asia. Rather there are similarities, and differences, with other knowledge systems in diverse regions. Thus I attempt in this chapter is distil theoretical implications from the three disparate knowledge systems, lessons which have applicability beyond the borders of Khorezm or Uzbekistan. In this way the findings of my research will hopefully find utility outside of the narrow confines of the project and of rural development in Khorezm. These theoretical implications are presented by looking at how the issues of knowledge dynamics, the interplay of power & knowledge and how knowledge operates within a cultural (and epistemological) context. For each of these I ask how adequate existing theory is for addressing these issues and proposing solutions, and whether this research can contribute something new to this literature. Firstly, there is the issue of how knowledge is governed and the contribution that this thesis makes to the emergent body of literature on knowledge governance, especially our understanding of knowledge/power dynamics. I then go on to consider the issue of knowledge loss, which surfaced as a key management problem in all three knowledge systems. Despite the importance of knowledge loss in my research, the literature on this phenomenon is limited, thus I attempt to set down a conceptual framework in which to evaluate knowledge loss. The third area of theory where I believe this thesis can contribute is that of ‘knowledge for development’, identifying the linkages between knowledge, at all its levels, and rural development. Finally, I discuss the contribution of this thesis to the growth of ignorance, i.e. the questions which are raised as a result of this research. These include the new realms of theoretical enquiry and the implications for future studies in Khorezm and Uzbekistan.

I. KNOWLEDGE GOVERNANCE & POWER

Knowledge governance is an emerging issue in the sociology of knowledge, which is concerned with understanding how the rules and institutions (both formal and informal) are established and how these influence knowledge flows. This is both within nation states (the orthodox meaning of governance) as well as within organisations and corporations (witnesses the growth in 'corporate governance' as a concept). In the case of knowledge literature, the governance concept is applied to both large corporations and to nation states, although seldom at a global level. Knowledge governance is 'the rules of the game' (to borrow from institutional theory) for how knowledge is created, shared, stored and used. This intersects with the significant literature on governance, more specifically on the developmental issue of 'good governance'. What I seek to examine here is the linkage between notions of 'good governance' in a wider sense and the issue of 'good' knowledge governance versus 'poor' knowledge governance.

> "While "Governance" is basically about how to govern a country or organisation through laws, rules and regulations and through instilling values and beliefs in the procedure of governing, "Knowledge Governance" refers to: (i) enacting and creating the institutions necessary for the development of a knowledge society; (ii) facilitating the development of an epistemic culture of knowledge production; and (iii) regulating the flow of knowledge, as well as safeguarding intellectual property rights" (Evers, 2005: 62)

What Evers is setting out above is the orthodox conception of knowledge governance in a normative sense, in the way it should be. Thus the definition above is actually for 'Good Knowledge Governance" situated within a certain conceptualisation of development as progress from under-development towards a certain goal of development. This is useful, yet my research relates to the less explored example of a country with 'poor' knowledge governance, which is simultaneously 'knowledge poor' and which is not necessarily developing towards a modernist trajectory. To analyse such situations we need a less normative conception of 'knowledge governance' and more in the way of analytical tools to describe 'good' and 'poor' knowledge governance. I propose adapting the criteria for 'good' versus 'poor' governance that already exist in the literature and discussing these in light of the interplay of knowledge and power, situated within a governance structure. Likewise, I draw upon New Institutional Economics to explain why formal and informal institutions matter and how knowledge governance influences these institutions. Finally, I

address the issue of universities and the State, attempting to explain the crucial role that universities play in the knowledge governance system and why having governance structures in place, which simultaneously protect knowledge rights yet also, promote knowledge sharing and the serendipitous interplay of idea, is so important.

1. Good and Poor Governance

The dominant discourse on governance revolves around implementing institutional and governmental reform to ensure improved developmental outcomes. The concept being that how a country is 'governed' has a large impact on the development outcomes that it achieves. Those countries which implement effectively 'good governance' reforms are touted by organisations such as the World Bank to outperform poorly governed countries, delivering improved human development and poverty alleviation (Neumayer, 2003:8-18). As a discourse in development policy, good governance has been influential, despite a lack of specificity or prioritisation, of which good governance principles should be implemented (Grindle, 2004: 525). However, it is possible to distil some of the key tenets of good governance, and I believe it is useful to apply these to the issue of knowledge governance, to establish some criteria by which we can evaluate knowledge governance. Picciotto (1995) provides an orthodox list of requirements for good governance (i.e. those requirements adopted by the World Bank and major donors) which I adopt here as; re-orientating government, accountability & the rule of law, and, participation, each of which is applied below to the specific issue of knowledge governance. Crucial to understanding how 'knowledge governance' is so similar to 'good governance' is the interplay to power and knowledge. As we have seen in this thesis, power over knowledge and the control of knowledge, in turn serves to reinforce existing power relationships. Likewise, the possession of 'expertise' and specialised knowledge allows the state to legitimate its power relationships, using a 'rational' approach to justify state power and control (Foucault, 1980). The question this then poses is what is the 'correct' relationship between power and knowledge within a 'good governance' discourse, yet we see that this is more complex than the literature suggests.

i. Re-Orientating Government

Especially in post-Communist countries, the good governance literature requires first of all a re-orientation by the government in why it exists (McFaul, 2002). Whilst in the Soviet Union, citizens existed to serve the state, liberal (Western) notions of good governance reverse this to the state serving the needs of its citizens (Cornwall & Gaventa, 2001). Inherent in this is an assumption that the economic system is essentially capitalist and that knowledge and information flows within this system are essential to the capitalist economy. In this respect knowledge becomes a commodity, a factor of production, which is essential to the smooth operation of the capitalist system. This connection between governance and a certain type of economic system is inherent, yet often unacknowledged, aspect of the governance discourse. It is also a departure from the Soviet, closed, system of knowledge governance where knowledge was not a factor of production but rather an element of state control and legitimated state power. We see in chapter five the way in which the GoU deliberately sets itself as the sole possessor of expert and specialised knowledge, using this as a rationale for control (direct and indirect) over agricultural production. Thus there is a significant difference in why knowledge is being governed between the 'closed' and 'open' systems. In the 'closed' system knowledge secures the state's relationship to power and is governed in a way which restricts knowledge flows to maintain central control. This is very different from the 'open' approach to knowledge governance which aims at:

> (i) enacting and creating the institutions necessary for the development of a knowledge society; (ii) facilitating the development of an epistemic culture of knowledge production; and (iii) regulating the flow of knowledge, as well as safeguarding intellectual property rights" (Evers, 2005: 62)

So, just as the 'good governance' perspective calls for a re-orientation of the state, the move from a closed to an open system is also a paradigm shift for the state. It requires the state to govern knowledge, not with a view to controlling knowledge as a way of ensuring power over the citizenry and the economy, but with a view to better developing the knowledge economy of the nation state. In a country like Uzbekistan, this is a significant shift for the state to make and one could question whether this is indeed possible. Still without this initial re-orientation of the state, the agenda of good knowledge governance cannot be pursued. This is certainly a key problem with the governance discourse, as this reorientation can in fact not occur instantly and reform programmes often ignore the

internal dynamics and contests within the state. Yet this is one of the key criteria of good knowledge governance, that the state (or organization) be committed to managing knowledge, not for its own interest, but in the interests of the population. If a regime is interested predominantly in self-perpetuation and the preservation or extension of privilege, it must be considered to be a 'poorly governed state', if it controls knowledge as a way of ensuring wider state power, it can be said to be a 'poor' governor of knowledge. This is neither to deny the state a role in the governing of knowledge, nor to advocate a completely *laissez faire* approach to knowledge governance[i]. On the contrary states must be actively engaged in establishing the rules and institutions under which knowledge is governed. The discerning aspect is the motivating reason why the state makes these rules; often these changes have historically been historically imposed by external actors and implemented under duress. I contest that if, as in Uzbekistan, the state controls knowledge as a way of maintaining social control, then knowledge will necessarily be poorly governed, this is not to overstate the relationship between power and knowledge, rather it is a commentary of how 'poorly' the state manages both power and knowledge. The question is not so much what the level of state control is, indeed there are examples of states which are deeply involved in governing knowledge which are 'good' knowledge governors[ii], rather the concern is what motivation the state has for governing this knowledge. Is it to promote knowledge development or to increase state power by controlling knowledge?

We see in chapter five how the GoU does not act in a disinterested manner regarding agricultural knowledge, and, in doing this restrains the development of new knowledge through direct and indirect mechanisms. It is when the state seeks to control knowledge

[i] Indeed, such an approach risks supplanting a state monopoly over knowledge (and thus power) with a private monopoly or control over knowledge, which would possibly have a similar impact on knowledge creation and sharing (Gaventa, 1993)

[ii] For instance war time economies (especially the USA from 1940-45) which developed considerable scientific output. Likewise the examples given in chapter five of the successes of Soviet science can be read as the state deliberately not involving itself in the atomic sciences. Modern examples could include Singapore (Evers, 2005) which actively governs knowledge, yet for the (primary) interest of prompting knowledge creation.

for its own ends that knowledge becomes politicised and it is this which distinguishes a state as 'closed'. This does not always mean that scientific enquiry will not occur, in fact significant advances were made in the sciences in the Soviet Union and in other 'closed' knowledge systems, rather that society will be unable to utilise these scientific findings in an appropriate manner[iii]. For this knowledge to be governed effectively, the state must re-orientate itself towards governing knowledge in the interest of society rather than itself. This is a critical departure from the idea, pervasive in the Soviet planned economy, that knowledge could be micro-managed by governors. Rather knowledge governance is about setting the 'rules of the game', the institutions and rules which allow knowledge to be created and shared in unexpected and unplanned ways (cf. North, 1990, 1993). It is not possible to control or plan these knowledge exchanges, which is precisely why the Uzbek state is not prepared to allow this to happen. Relinquishing 'control' of knowledge reduces the power of the state, yet it is a necessary step towards governing knowledge effectively. It is here that we see the issue of power and knowledge emerging once more as important. The Uzbek state possesses and controls much of the knowledge of rural Uzbekistan, those parts which it does not control (indigenous knowledge) it discards and devalues. In doing this the political and social power of the Uzbek state is maintained, prestige of its officers is enhanced and further economic and political controls are presaged by the control of expert knowledge. At one level this is a workable system for the Uzbek state, as it mutually reinforces knowledge control and power. Yet from a development perspective (or even from a long term perspective) this is not a workable solution, as it creates a situation in which current knowledge is not properly employed and new knowledge is not created, leading to persistent economic and social underachievement. Thus from a development point of view, it can be described as 'poor governance', for whilst it suits the interests of an elite it does not render rewards to the majority, which is why a re-orientation of the government is so crucial. It is only with a paradigm shift in the purpose of the state that 'good knowledge governance' is possible.

[iii] The Soviet Union is a good example of this, as the scientific establishment did produce useful knowledge but the process by which these could be utilised for 'material advancement' (a main aim of the Soviet state) was retarded by the state maintaining control over the knowledge.

ii. Accountability & the Rule of Law

Essential to the cause of good governance is the accountability of state actors, to take responsibility for their actions and decisions. This is the mechanism that ensures that the state, and its officers acting ex officio, execute their actions in the benefit of the people they are intended to serve (Shah, 1998). This requires a process, be it democratic, technocratic or otherwise, which ensures accountability for the success of "enacting and creating the institutions necessary for the development of a knowledge society" (Evers, 2005: 62). That the state, once it has decided to re-orientate itself towards creating a knowledge society is held accountable for the efficacy of its policies, yet once again this reorientation is a somewhat tenuous concept as it is not possible for 'the state' to simply re-orientate, rather it is a gradual process involving various actors. This could foreseeably occur through both internal processes (i.e. within the apparatus of the state) as well as through external process (i.e. through popular elections as well as through normal democratic practices which occur on an ongoing basis). What we see in the example of Uzbekistan is that no external process exists to hold office holders to account for their policies. One could argue that an internal process does occur; but it is more likely that the internal accountability processes are based more on ensuring fulfilment of the cotton plan than on the successful development of a knowledge society[iv]. In fact these systems of internal accountability are quite strong and effective, the point is that they are wrong-minded, focused on fulfilling an antiquated measure of production (tonnes of cotton) and not on promoting knowledge creation and sharing, thus the orientation is towards cotton and state power, not the development of a knowledge economy. Central to the issue of accountability is a legal framework which protects the rights of knowledge creators against 'theft' and expropriation by the state acting *ultra vires*. In ensuring this rule of law, good governance seeks to make the state subject to the same laws at its citizens and to ensure that these laws are equally applied across all members of the community. So too must the laws of intellectual property right protection be evenly applied as part of good knowledge governance. Once again this assumes a certain economic system is in place

[iv] This is a reflection of the orientation of the state. Indeed, strong rules of accountability to exist – with responsibility for the fulfilment of the state plan defining 'capillary' relations within rural Uzbekistan.

(capitalist or market driven) and that 'rights' to intellectual property are accepted at all[v]. There is a considerable debate, outside the realm of this thesis, about the 'correct' level of IPR protection versus the benefits from non-proprietary knowledge sharing[vi]. This ranges from a belief in knowledge as a universally marketable good which should be traded freely like other factors of production, to a view of knowledge as a form of common property which should be freely available for all, patent and IPR regimes tend to balance between the costs and benefits of both approaches. This all assumes that the state is actually orientated towards knowledge creation and that the knowledge governance structures are orientated towards this. Yet what we can say is that the accountability mechanisms of Uzbekistan are focused on cotton tonnage and the state plan, not on knowledge and that no IPR protection seems to exist. Knowledge control exists but this is proprietary only to the extent that the state 'owns' or controls all knowledge and does not accept threats to this monopoly. So whilst the 'correct' level of intellectual property right protection is open for discussion in the literature, with opposing sides of the debate advocating differing levels of protection, this is at this stage irrelevant to Uzbekistan. Were Uzbekistan to adopt IPR protection (premised by a re-orientation of the state, as above) then the extent of these rights would need to be considered. More important than the level of these protections is the accountable application of knowledge rights, which can be seen as a chrematistic of good knowledge governance. Yet in the case of Uzbekistan this debate is largely irrelevant, the state does not promote knowledge creation because it poses a threat to its power, thus the actual level of property right protection (nil) is in the current interest of the state. Thus in the Uzbek case we see how political decisions on knowledge, for example state norms, are not open for accountability or challenge under the rule of law.

[v] Intellectual property rights as a legal concept is based primarily on the role of knowledge as a factor of production in a capitalistic system. Thus the ownership concept of IPR stems from market based perceptions of rights, which evolved from property rights on land, labour and capital (Andersen & Konzelmann, 2006). Once again we see how good governance is actually situated within certain (cultural) assumptions about market led development, which may not be case in Uzbekistan (Quéau, 2002).

[vi] Some contest that excessive protection actually stifles innovation (Vaidhyanathan, 2001) whilst others posit that insufficient protection reduces the incentives to innovate (Gallini & Scotchmer, 2002). For a useful précis of this debate see Brousseau & Bessy (2005).

iii. Participation

A hallmark of good governance theory is the call for popular participation in the governing of a country; it is in fact an assumption that 'good' governance is democratic governance (Piccioto, 1995). So too should good knowledge governance be characterised by high levels of participation, meaning that knowledge should be diffuse and that a knowledge society has high levels of educational attainment (Evers & Menkhoff, 2005). This is not necessarily the involvement in a democratic process (although the liberal ideal of knowledge flourishing only in democratic states is discussed in subsection three, below) but rather that the knowledge creation and sharing processes are open to the wider population. A knowledge society is distinguished by high levels of educational attainment, which in turn positively influence 'productivity' and 'innovation' as drivers of economic development (Drucker, 1994). This is not to discount the role of experts and specialised researchers, rather increasing percentages of the population engaged in these roles is likewise an indicator of a 'knowledge society' (Evers, 2005: 92-95). However, I would argue that just as the 'massification' of education in post-WWII Western Europe and America enabled the transition of these economies away from industrial and into knowledge based economies, so too must popular attainment of knowledge be a criteria of good knowledge governance[vii]. Important in this is Evers' (2005) concept of developing an epistemic culture which supports knowledge development. This requires formal and informal mechanisms by which innovators and knowledge brokers are recognised and rewarded within the society. To achieve this, and the above mentioned criteria, institutions must be established to implement the knowledge governance system. These institutions matter a great deal, as discussed below. Whereas we see in the Uzbek situation that whilst high levels of educational attainment does formally occur, the level of popular participation in the knowledge system is low. This is not because of any lack of education *per se* rather it is because of the control of the state over education, politicising science in a manner which does not allow for an 'epistemic culture' to develop which promotes novel research and the unfettered flow of new ideas.

[vii] The issue of social equity in knowledge societies and the importance of having equitable access to knowledge as a factor of production, which ensures enhanced aggregate output, is well discussed in, Mansell & Wehn, 1998: 204-224.

At the most practical level farmers do not now ‘participate’ in the knowledge economy of Uzbekistan. Farming methods are forced upon them through the state plan system, there is little room for ‘feedback’ mechanisms by which their suggestions can be utilised and their local knowledge is disregarded by the state. The direct control of the state plan over agriculture, and agricultural knowledge, is but one mechanism by which participation is prevented. Indirect restrictions, such as state norms, ensure that innovation is not able to occur at the local level and this in was the capacity of local farmers to ‘participate’ in the creation and transfer of knowledge is retarded. Those actors, such as *ex officio* masters, who do possess expert knowledge, are co-opted into the state power/knowledge system, whereby their expertise is used to rationalise the control of society. It is somewhat of a paradox that an ‘expert society’ has been created in Uzbekistan, where most expert knowledge is captured and controlled by the state. Yet rural Uzbekistan is not a ‘knowledge society’ in the common understanding of an advanced (post-industrial) economy where the most important factor of production is knowledge (cf. Hayek, 1945; Gerke & Evers, 2005, 2006). In fact, knowledge is an important factor of production in most economies and in rural Uzbekistan this is also the case. This distinguishing feature is rather the lack of popular participation which is allowed, with the state governing knowledge in a way which reduces participation. This relates to the discourse on power and knowledge, and we see that popular participation in the knowledge system is stifled in the same way that popular political participation is not allowed. The state of Uzbekistan demonstrates its monopoly over knowledge, with farmers through the *pakaz* and through other control mechanisms, and with academics through the formal and especially informal mechanisms which define the ‘scientific culture’ of Uzbekistan. Exclusion, or the way in which participation is prevented, plays an important role in allowing this power-knowledge system to continue. Similar to Foucault’s (1980) understanding of how power (re)creates its own fields of exercise through knowledge. In Uzbekistan, preventing participation in the knowledge system is one mechanism by which knowledge is (poorly)governed and controlled.

2. Institutions Matter

Knowledge creation, sharing, dissemination and use are social activities. Because knowledge is a human creation, the social processes through which knowledge passes are culturally situated and the outcomes are determined by social structures, institutions, inherent in the culture. By institutions I am adopting North's definition of institutions as "the rules of the game" for knowledge creation, sharing and storage (North, 1990: 219). These rules of the game are formal and informal institutions which govern human interaction. The argument made by New Institutional Economics (NIE) is that "Institutions are formed to reduce uncertainty in human exchange" which leads towards reducing transaction costs and thus towards more efficient economic markets (North, 1993: 2). I find this same argument useful for understanding how knowledge is transacted as a valued commodity within a marketplace of ideas. The merit of such an approach is explained here. Transaction costs in neo-classical economics are concerned with the costs and risks associated with conducting trade. Any trade carries with it accompanying costs and risks, be these transport costs of getting goods to market or currency risks of trading across borders. In terms of knowledge transfer the real costs are often very limited, with information and knowledge flowing relatively freely across borders. However, there are very high risks associated with knowledge sharing; most prevalent is the ability for knowledge 'theft'. That is, where someone uses another's knowledge without paying or attributing the owner for that knowledge. This is exactly why intellectual property right protection is an essential element of knowledge governance, as it provides certainty for knowledge exchange, yet this must always be balanced against the 'public good' potential of knowledge as a public and free commodity. It is also why knowledge systems adopt formal rules to prevent theft, for instance the 'mediated' approach to knowledge sharing within the ZEF project (chapter six). In advanced capitalist nations these legal protections take the shape of formal institutions which govern knowledge flows and protect knowledge creators, combined with limits on IPR (expiry of patents and large provision of public information). Within communities of knowledge, say the ZEF/UNESCO project, the institutions for reducing the transaction costs are more fluid, being both formal and informal. Formal institutions include the data exchange policy which establishes the project management as knowledge mediators, regulating knowledge

flows. Yet in doing this at additional transaction cost, similar to insurance, is being placed on knowledge flows, thus making knowledge sharing more 'expensive' and thus less likely, even though the uncertainty has been reduced. Hence why informal knowledge sharing also exists and why informal institutions have been established to share knowledge at a lower transaction cost[viii]. It is thus not surprising that knowledge is shared within existing social relationships. The risk in these informal arrangements is managed by enforcement mechanisms which are grounded in social capital and enforcement. This is different from formal regulation, suggesting that the mediated and centralised exchange system is not always a practical device. Thus explaining why sharing between established friendships or within sub-groups is more frequent than for sharing to occur through the formal method of mediation. These formal and informal knowledge interchanges should be seen more as continuous (rather than 'discrete') and 'combinative' (rather than mutually exclusive) because each knowledge transaction is to some extent governed by both the formal and informal institutions (Grandori, 2001: 389). If we apply this lesson to the wider issue of good knowledge governance, a state needs to establish the formal institutions which guarantee knowledge transactions, without unduly escalating the transaction cost of this knowledge sharing or of excessively impinging on the benefits that accrue from the public interchange of ideas[ix]. More difficult is for the state to develop the epistemic culture or "social infrastructure" (cf. Hall & Jones, 1999) of informal institutions, which ensures the openness and transparency of the formal institutions, in this regard 'culture matters' and institutions play a role in developing this culture. There are limitations on how much impact knowledge governance can have upon creating a 'knowledge society' and the attendant epistemic culture of such a society. But governance structures can influence the informal mechanisms. In countries such as Uzbekistan, with poor knowledge governance, state actions certainly increase the transaction cost of knowledge sharing, by failing to provide adequate protections and by politicising science, a constraint I elaborate on next.

[viii] This is described as the 'relational' dimension to knowledge sharing by Menkhoff et al. (2006), incorporating the levels of trust in social relationships as a driver of knowledge sharing.

[ix] Adopting the view of knowledge rights as extensions of other property rights (land, capital) this also becomes an issue of the enforcement of contract and legal certainty, relating to the 'rule of law' point made earlier in this section.

3. Universities and the State

Modern notions of the proper relationship between science, the state and ideology are heavily informed by Karl Popper. Popper was writing, in exile from Nazi Europe, at Victoria University in New Zealand as he established his theory that for the normal functioning of science, political democracy was a necessity (Popper, 1962). What is now a widely accepted liberal notion was for a time highly contentious, as the Soviet Union claimed considerable progress in several fields of scientific endeavour. Yet these scientific achievements, including great accomplishments in areas such as physics, took place during a time that was "neither democratic nor liberal, nor economically prosperous, and definitely unsafe" (Kojevnikov, 2004: xiii). Indeed it can be argued that state control or influence in academia is necessary to avoid "isolation and a narrow minded search for socially irrelevant truths" by scientists (Roll-Hansen, 2005: 11). Yet the Soviet period also bought with it the nightmare of Lysenkoism and it is well discussed in the literature how political repression and a lack of free speech were causal factors in allowing vernalization to assume, and maintain, political primacy (Joravsky, 1970; Wall, 2006a). Thus the debate for knowledge governance is a question of extents, of how much and which forms of social liberalism and governmental non-interference is appropriate in governing a knowledge society. In this regard the example of Uzbekistan serves best as a cautionary case, of the negative impacts that excessive state control of research, education and agricultural production (as well as information flows) can have on research and science. The politicisation of science in Khorezm is evident in the cult of presidential personality, the primacy of cotton, a lack of independence and a total inability for the university to act as a critic or conscience for society. Together these factors determine the 'scientific culture' of Uzbekistan. This, combined with acute under-funding (politicisation by proxy) conspires to deliver negligible research outputs and questionable science. Such an extreme example is perhaps of less use to the theory than the more ambiguous paradoxes of the Soviet period, yet it is a useful reminder of the dangers of an improper relationship between universities and the state, which is one feature of knowledge governance which failed to deliver either material progress (which the Soviet model promised) or a real growth in science and knowledge.

II. KNOWLEDGE LOSS

All three knowledge systems studied in this thesis suffer from a phenomenon I describe as ‘Knowledge Loss’. This is when knowledge within these systems disappears or ceases to be available. The displacement of old knowledge with new knowledge is a natural, indeed essential, aspect of a dynamic knowledge system (cf. ‘normal science’, Kuhn, 1972). This is not the type of loss I wish to discuss here, indeed I distinguish between this process of ‘normal science’ where new knowledge displaces the old, and genuine knowledge loss. Rather when I conceptualise knowledge loss, it is it the destruction or leakage of knowledge from a discrete knowledge system. This form of knowledge loss is not replaced and thus is distinguished from displaced knowledge. So when old knowledge is improved upon and new lessons learnt this form of loss is not of concern, it is only when knowledge is lost and not replaced, that I consider this the concern of knowledge management. I theorise here that knowledge loss is an area of crucial interest for knowledge management and knowledge governance literature, because it demonstrates a failure in a knowledge management (or governance) system. That is to say that whilst some level of knowledge loss is probably unavoidable (through leakage into other systems) it demonstrates a failure to adequately manage and utilise the knowledge of a community, organisation or nation state. Thus it merits greater attention in the literature. Moreover, the phenomenon of knowledge loss does not appear to be restricted to any one system of knowledge. All three knowledge systems studied in this thesis suffered to some extent from knowledge loss. The local knowledge system (chapter four) certainly provided the most extreme instance of systematic knowledge loss, related to the downfall of the Soviet Union and the impediments to innovation that the governance structure enforces. However the post-Soviet knowledge governance structure (chapter five) also experienced knowledge loss, largely due to the movement of staff back to Russia, a loss which was the state has been unable to reverse. Finally, the ZEF project (chapter six) also experienced knowledge loss, mostly because of staff turnover

I theorise that there are various causes for the loss of this knowledge, ranging from the death of a knowledge broker, through to an attrition of knowledge due to misuse. I explore these drivers of the knowledge loss phenomenon in greater depth in subsection one below. However I would caution that the term 'knowledge loss' does not necessarily mean that the knowledge is destroyed or is irretrievable, as there are cases in which knowledge is not so much lost as 'leaked' to another knowledge system (or partially stored in PhD theses). Thus the knowledge still exists, just not in the same knowledge system. This 'leakage' is discussed as one of the drivers of knowledge loss, along with the other drivers of displacement and misuse. What I also find is that each knowledge system does have a tacit awareness of the risks of knowledge loss, even if there are not mechanisms to proactively manage this knowledge loss. These existing retention strategies and how they differ are examined in subsection two below. Such strategies range from training within the system as a way of disseminating knowledge, to more formal databases and knowledge banks, through to coercive measures designed to ensure against knowledge loss. Finally, I discuss the theoretical aspects of knowledge loss, attempting to establish some criteria for how to classify knowledge loss as a phenomenon worthy of study in knowledge management and knowledge governance. Knowledge loss is certainly an important area of study for KM theorists, as we attempt to better manage existing knowledge resources. Thus I suggest some strategies to improve the retention of knowledge.

1. Drivers of Knowledge Loss

Knowledge is lost from a community in a number of different ways. Detailed here are the most common forms of knowledge loss as experienced in my field research and presented in chapters four to six. Whilst some of these modes or drivers of knowledge loss may be unique to my field setting, many are not. Likewise, different communities of knowledge (e.g. the corporate world) may experience different manifestations of knowledge loss, although I suggest that the drivers may be similar, even if the form they take is different.

i. Death or Displacement

Because knowledge is communicated between and carried by humans, when an individual dies or leaves a group, the knowledge they once held can be lost to the group or community. We saw in chapter four how the death of one key individual, especially if they were a master or held unique knowledge, had a deleterious impact on knowledge in the community (e.g. kolkhoz Communism cattle farm). Certainly in local knowledge systems, where most knowledge is held personally and in an unwritten form, the risk of a master dying has implications on the knowledge of the community. In more narrow communities of knowledge, for instance within the ZEF/UNESCO project, the role of knowledge mediators who hold a considerable amount of project knowledge, places the project at risk of knowledge loss. For it is not only death that can cause knowledge loss, but also simply an individual leaving the group, say, to take up alternative employment. This process occurs in a predictable manner in the case of PhD students who normally leave the project after the conclusion of their studies, taking much of their accumulated knowledge with them. It is thus predictable that knowledge is 'lost' to a system of knowledge (e.g. a project) because most knowledge is held by individuals, not databases. Yet I find it surprising that the issue of key staff moving (or dying, somewhat more dramatic) is considered more of a human resource management than a knowledge management issue. Thus I would argue for a greater recognition in the literature of the risks of death and displacement for knowledge loss.

ii. Misuse and Misplacement

Knowledge can also be lost if it is misused or misplaced. That is, if knowledge is not applied and utilised, then it can be lost altogether. Certainly practical know-how, *aptitude*, is lost if it is not used and transmitted (shared) in its use. We see in the local knowledge system how collectivisation and the centralisation of post-harvest processing meant that local knowledge was lost precisely because it was not able to be utilised. This was not necessarily through any attempts at indoctrination or through wilful misplacing of the knowledge. Rather the indigenous knowledge on these topics was not used, thus it was not passed on from generation to generation, and it has been 'lost' to the knowledge

community. The issue of unique indigenous knowledge being ‘destroyed’ is discussed in the literature, especially in cases of the medicinal uses of plants and of indigenous methods of conservation (cf. Stevens, 1997; Benz et al., 2000). However, in the case of Khorezm this indigenous knowledge has been lost or destroyed for some time and it is only now (with the paucity of knowledge in the post-Soviet agricultural system) that this loss is acutely felt. As lamentable as the loss of indigenous is, the more important issue now is preventing the continued knowledge loss which is not being matched by developments in the rural economy or local knowledge system. The converse aspect of this being how indigenous innovation can be used to recreate knowledge which has been misused and misplaced, whilst preventing further knowledge loss.

iii. Leakage

Knowledge loss does not always mean that the knowledge has been destroyed or lost entirely from the universe of knowledge. Rather from a systems perspective, all it denotes is that knowledge has been lost from the community or knowledge system. Thus an academic moving from one project to another carries with them a great deal of knowledge which is ‘lost’ to one project, yet which contributes to the other project (thus it is displaced). I label here this as ‘leakage’ a form of knowledge loss which is perhaps less dramatic from knowledge ‘destruction’. The impact on the community (or potentially corporation) is perhaps similar in that their access to the knowledge is lost. Yet leaked knowledge is potentially retrievable (though it may not be) and does continue to exist in another knowledge system, with which knowledge sharing should still be possible. Thus leakage is the least dramatic form of knowledge loss, yet it is still an important driver. Preventing this loss is discussed in the next section, where, because the immediate impact on the knowledge system is so similar, I discuss ‘knowledge loss’ as a general phenomenon caused by the number of drivers. In building retention strategies there may be some differences depending on the importance of different drivers, yet managing the risk of knowledge loss is important, regardless of the drivers of knowledge loss.

2. Existing Retention Strategies

Whether or not a community of knowledge is consciously trying to manage or govern their knowledge resources, they are usually aware of the risk of knowledge loss and take some measures to prevent knowledge loss, although it may not be explicitly stated. In the local community in Khorezm this was an awareness of lost knowledge of post-harvest processing. In the case of the project there was a more explicit understanding of the knowledge lost when a PhD student moves on. Whereas in the post-Soviet governance system, knowledge retention was an expression of state attempts to control knowledge by preventing staff movement.

i. Training and Knowledge Transmission

One strategy to reduce the risk of knowledge loss is to encourage training and knowledge transmission. This distributes the knowledge of an individual between more community members, making wholesale loss of a specific area of knowledge less likely. We see this being conducting consciously and deliberately in the local knowledge system, with generational knowledge transfer as a way of ensuring continued familial livelihoods, and in doing so removing the risks of death and displacement. For instance the building masters and the chicken hatching business, both from the local system, in chapter four. Knowledge sharing is of course not without its risks to the holder of the knowledge, who could worry about the loss of their exclusivity (and thus earning power) of knowledge which might also impact on their power status. This concern counts as a transaction cost as discussed in section I above, hence why knowledge transfers so often take place within the institution of the family. By occurring within a social institution, the risks of sharing are diminished. Yet it would be simplistic to underestimate the social capital or personal fulfilment which is gained by an individual in educating their neighbours or family members, which is done not only to maximise their personal profit. Likewise, individuals may, rightly, perceive there to be a benefit in sharing their knowledge in the interests of

promoting general economic development, which they expect to benefit from[x]. Thus effective managers and governors or knowledge should find ways to reduce this transaction cost and to build a 'culture' of knowledge sharing. This combination of providing the right institutional framework for knowledge sharing combines with the epistemic culture to determine the levels of knowledge sharing, which is one of the more effective mechanisms to prevent knowledge loss. However, the benefits are not only in terms of reducing the risk of knowledge loss, but accrue directly through the gains from greater knowledge sharing and distribution, causing greater knowledge creation and use.

ii. Databases

More explicitly the ZEF project has identified how knowledge loss and knowledge sharing are intertwined issues, instituting a database (the MDB) to manage this risk. Certainly databases can be an excellent repository of information and data, what they are not however are knowledge banks. My critique of the MDB is discussed in previous chapters (six, eight). Pertinent in terms of knowledge loss are the seminars, study sessions and project discussion papers which are conducted by project members. Together these constitute artefacts, carriers, of the knowledge that has been developed within the project. In this regard knowledge loss is being retarded to some extent by archiving and storing knowledge in accessible forms; however these contributions alone are insufficient. They must also be accessible for future project members. Achieving this requires a change in the epistemic culture of the project towards greater knowledge sharing (formal and informal) and this change requires both institutions (policies) to be changed as well as a more innocuous cultural (epistemological) shift in how research is conducted. Moreover, what knowledge is stored within the project must, at some stage, be accessible for local project partners and should ideally be developed in collaboration with them. The challenge of ensuring this occurs after the termination of the project is considerable and databases are a useful, but incomplete, response to the risk of knowledge loss.

[x] See for example the case study of the rice miller, who provided advice on rice growing – in competition with his share cropping and consultancy arrangements – because he knew he would benefit in the long term from better rice production.

iii. Coercion

The method adopted to prevent knowledge loss by the Uzbek state is coercion. For example those students sent abroad to study in foreign universities are then bound to return to Uzbekistan and work for the government for a set period. Likewise the necessity to obtain exit visas means that some scientists have been unable to leave the country, in the same way that economic torpor and the 'work book' requirements for pensions, mean that movement to the (barely extant) private sector seldom occurs. This may well be an excellent way to prevent knowledge loss. More likely it is an excellent way to prevent knowledge creation or sharing. We saw in chapter five how knowledge sharing was hindered by a culture of fear and by the uncertainty inherent in the social control systems on academics. Coercion of academics only serves to increase the formal and informal restrictions on knowledge creation and sharing, probably outweighing any benefits gained from stemming knowledge loss. The scientific 'culture of fear' has been shown to prevent knowledge sharing and to slow new knowledge creation. This coercion as an option of knowledge governance it is far from enlightened and hardly effective.

3. Knowledge Loss as a Theory

Knowledge loss is not a remote phenomenon, unique to one knowledge system. Rather I found the loss of knowledge to be an issue for all three of the knowledge systems in this research. Likewise, knowledge loss is certainly a concern for anthropologists working on indigenous knowledge, fearful of 'losing' indigenous knowledge entirely as a result of modernisation (cf. Cox, 2000). Equally, staff movements within the corporate world probably lead to a large amount of knowledge displacement, yet staff (and thus knowledge) retention is more often seen as a human resource than a knowledge management issue. Similarly in academia, which thrives on the wide interchange of knowledge and ideas and openly promotes the exchange of knowledge, much of this knowledge can be 'leaked' (i.e. it leaves academia for another knowledge community, say, a corporation) or it can be 'lost' altogether. Thus I attempt here to explain in theoretical terms how knowledge loss operates, what are the drivers of knowledge loss and how these can be ameliorated. I suggest that knowledge loss is a failure of knowledge

management insofar as it demonstrates a lack of knowledge sharing, dissemination and use. The central argument being that knowledge must be reproduced (or stored in a repository) for it to be used and to continue to exist. Because knowledge resides in individuals, who are apt to move to different knowledge systems (leakage) their doing so carries with them a considerable amount of knowledge. Key to reducing this is effective knowledge sharing during the time they are within the community or organisation. This provides the inherent benefit of greater knowledge utilisation through greater knowledge sharing, as well as reducing the risks of knowledge loss. Yet, individuals do not always share knowledge, when they do this sharing can be partial. In many cases this is because of the high transaction cost (and risk) associated with sharing their knowledge, which is discussed in the earlier part of this chapter. I argue that knowledge management and knowledge governance theory needs to inform institutions (informal and formal policies) which can introduce better protections for individuals to share knowledge, in order to reduce the transaction costs of knowledge sharing. These transaction costs can be lowered by guaranteeing continued ownership of intellectual property, by establishing a proper policy framework for academic honesty and by enforcing these rules in a transparent manner. In the case of local knowledge the transaction costs are somewhat reduced by knowledge sharing within the family, shown in generational transfer of mastership. In the same way should projects, corporations and ultimately nation states develop structures which allow for enhanced knowledge sharing, by reducing the transaction cost of sharing this knowledge. Part of these systems must allow for knowledge which is no longer relevant, which is not useful or which is simply wrong, to be replaced by more appropriate knowledge. In this regard simple databases are somewhat counterproductive as they do not encourage the dynamic displacement and replacement of knowledge, which whilst it involves some knowledge ‘loss’ is actually a knowledge creation and sharing process. Thus I theorise knowledge loss as a phenomenon to be evidence of poor knowledge management. In its own right it is a failure of management and governance to allow knowledge resources, expensively produced within the community, to be lost. On a wider level it evidences a lack of knowledge reproduction and retention, which can be seen as a result of excessive transaction costs and risks to knowledge sharing.

III. KNOWLEDGE FOR DEVELOPMENT

The idea that knowledge contributes to development is well established, it has been 'authorised' (cf. Evers, 2005) as knowledge by the World Bank with the 1998 World Development Report subtitled 'Knowledge and Information for Development'. Certainly the literature on indigenous knowledge makes a clear case for the importance of local and indigenous knowledge in promoting sustainable development (Richards, 1985). This acceptance has grown in the past decades, with greater emphasis placed on accessing local knowledge as part of the development process. This should be read as part of the wider move away from the transfer of technology approach, towards more participatory methods of agricultural development. The findings and practical conclusions of my research reinforce such an approach and I find the existing theory adequate. Likewise the body of literature on knowledge governance is certainly growing, although it is less well developed than that of indigenous knowledge for development. Earlier in this chapter I have introduced the concepts of 'good' versus 'poor' knowledge governance, co-opting the 'good governance' debate which is ubiquitous in contemporary development debates. Instead what I want to discuss here is the role that a development research organisation such as ZEF, and projects such as the Khorezm project, can play in promoting development. The role of 'development research' organisations is poorly defined in the literature, with their research being an uneasy compromise between 'conducting research on the process of development' to 'using research for development'. Moreover the extant literature on participatory development is not well applied to development research, so I attempt here to clarify how this literature can be utilised, with a focus on rural development. This is not so say that doing this is easy, it is not easy; rather it is a considerable challenge. I believe it a worthy challenge, and thus I provide some of the compelling ethical and academic justifications for addressing this challenge. These points are made on the basis of existing theory and of my specific research in Uzbekistan, however I stress that as conceptual commentary, they can be applied well beyond the Khorezm project and in more development research organisations than ZEF.

1. Defining 'Development Research'

Conceptually, 'development research' is a difficult notion. It requires us to bring together two divergent schools of thought, paradigms, which are not immediately reconcilable. I provide here a working definition of each concept in order to provide an insight into what 'development research' can mean.

i. The Hydra of Development

By 'development' we are talking specifically about third world development and the discourses that come with this, not the other uses of development as in 'research & development' or 'human resource development'. Rather a specific understanding of 'development' in the poor (or developing) world. These discourses are recent academic constructs, as prior to the Second World War there existed "an almost absolute absence of systemic theories which attempted to understand and explain the process and trajectory of change from 'underdeveloped' to 'developed' societies" (Baber, 2001: 73). What did exist prior to WWII, was interest in the social and economic structure of colonies, and it is this discipline which became the hydra of 'development'. Yet 'development' has always been an inherently politicised discipline, with contests between modernisation and dependency theories, and others, largely informed by the political persuasion of the theorist, all set against a cold war backdrop. In the post-1989 period of the 'Impasse in Development Studies' these debates only grew, between those who promoted a 'teleological' view of development as a movement towards greater similarity with the Western 'developed' countries and those who promoted working towards locally identified priorities (Arn, 2002: 171). Despite the ideological debate, development has always been a practical phenomenon, observing and commenting on change in the third world. The discipline of 'development studies' vacillates between studying development and the application of these findings, usually through normative publications or more latterly through 'action research'. Thomas (2000) defines three main senses or contemporary meanings of the term 'development':

(i) "as a vision, description or measure of the state of being of a desirable society;
(ii) as an historical process of social change in which societies are transformed over long periods;

(iii) as consisting of deliberate efforts aimed at improvement on the part of various agencies, including governments, all kinds of organizations and social movements". (Thomas, 2000: 777, emphases in original)

Thus the development studies discipline is by its nature on the constant cusp between conducting research on development and utilising research for development. These different senses of development are important in understanding the divergences in view over development research, discussed below.

ii. Researching Development

Development studies and its contributory disciplines (geography, political science, economics etc.) all conduct research on the process of development in poor countries and communities. Thus critical studies of how different countries have and have not developed have lead to the emergence of theories to explain the phenomena of development and under-development. From this theory, development studies and development economists have set out normative frameworks on how to develop poor regions. The successes (and more often) failures of these frameworks are in turn studied, reflected upon, and improved. This could be said to constitute 'normal' science (cf. Kuhn, 1996). What is somewhat more difficult to conceptualise is the conduct of natural science research in developing countries. In projects such as the ZEF project, whereby natural scientists play the major role as researchers and managers, there is some question as to what research is being conducted and for what purpose. Generally speaking research on specific topics is being conducted by scientists. The choice of these topics is partially on the basis of scientific interest and to varying degrees on the perceived importance of this problem to the poor country. Despite this there is sometimes a disconnect between the ecological problems identified by scientists and those identified by the local community. Moreover there is very often a lack of clarity about how the research findings will assist in promoting development. Instead what occurred in my field setting of the ZEF/UNESCO project was a wide range of (agreeably high quality) research being conducted, with little explicit explanation of how this research either related to development problems in Uzbekistan or how this could assist in the development process. Thus one is prompted to question whether such research actually constitutes

'development research' (i.e. research on or for development) or whether it is scientific research which just so happens to be conducted in a poor country. The justification given for such an approach was that this research could be utilised later on for the purpose of 'development'. The argument being that first an understanding of the problems is required before proposing solutions. This 'research for development' concept is addressed below.

iii. Using Research for Development

I do not dispute the importance of high quality scientific research in promoting development, especially in rural development where improved technical solutions necessarily constitute part of the solution to underdevelopment. Nor do I have a problem with research that just so happens to be conducted in developing countries so long as it is labelled honestly, does not harm and does not use extant poverty as a justification for funding. Rather, I suggest that if research is to be utilised for development, and is thus to be labelled 'development research' it must learn from the lessons of development studies. One of the key concepts to emerge from development research, in all its guises, has been the importance of *process* in development. That is to say, how research is conducted is as important as what research is conducted. Thus if research is to be used for development, this research must be carried out in a way which itself promotes development. The consensus on this issue within the literature is that development interventions must promote participation and empowerment. This requires that the central actors in development research are the intended 'end-users' of the research, and that these "agents of change" act with ownership and control of their own development "rather than as passive recipients of development assistance" (Rathgeber, 1990: 494). Central to understanding this conception of development research is that the two factors are in fact linked. The research is not only on development but also for development. Doing this requires the participation of the developing community in partnership with researchers, certainly no easy task. Exactly how this participatory approach can be applied to development research is discussed here in light of knowledge theory.

2. Applying Participatory Development to Development Research

The literature on participatory development and the need for agricultural research in the developing world to implement participatory practices is considerable (Swanson, 1997; Richards, 1985). Of interest in this thesis are the theoretical implications of this for knowledge management practices within a development research project setting. The immediate application of this is a need to recognise indigenous and local knowledge, and its holders, as key partners in the research process. As Richards (1985) points out, it is no longer sufficient to identify farmers as 'end users' of technology, but rather they must be recognised as partners. This means that their local knowledge must be integrated into the knowledge system of the project and that research findings are developed in co-operation with them, not simply 'transferred' to them from the top down. Doing this requires an alteration of the epistemic culture of the project, towards one which is more accepting of different types of knowledge, as well as creating a greater openness to sharing this knowledge. Such an epistemic culture is not easily created nor changed, yet effective knowledge management should employ existing management tools (such as policies, formal processes and through demonstrating leadership) to affect incremental change. Similarly, knowledge sharing between different project partners needs to take account of the different 'cultures of science' that exist. This is more than a practical step towards greater interaction with farmers, although this is also necessary. Rather, a paradigm shift away from 'top-down' research towards participatory research is required. To affect this, the knowledge management of a project must be re-engineered away from seeing 'research' as discrete activity, instead viewing it as a process which is grounded in a certain environment and cultural situation. There is an inherent tension here between universalistic scientific knowledge and localised knowledge, a challenge discussed in the following section. I do not accept that the two are irreconcilable. Instead I would suggest that integrating local priorities and knowledge can also serve to improve the efficacy and accuracy of research. This is actually the greatest challenge from a knowledge management perspective. That is, being able to utilise different forms of knowledge which source from very different epistemologies and scientific cultures, without valuing the different forms of knowledge differently. It is too easy to discount local knowledge as 'un-scientific' and local perceptions on development as 'un-informed'. It is immensely

more difficult, yet immensely more rewarding, to utilise these different forms of knowledge and to integrate these into the research process. I see this challenge as being very similar to the debate on 'interdisciplinary' research, whereby the different scientific cultures of very different disciplines need to be integrated into one co-operative effort. All too often interdisciplinary research projects fail to adequately account for the real differences in 'science' (or epistemology) between the disciplines. Thus, in conducting development research, across borders and epistemic cultures, and incorporating different disciplines and local knowledge, a system of knowledge management is required which can adequately value, sort, share and utilise these different 'knowledges'. This is no simple task and poses real challenges for knowledge management theory.

3. The Challenge of Development Research

Conducting genuine 'development research' is an immense challenge. It requires researchers from a variety of academic fields to work in an interdisciplinary manner towards a collective research effort. Moreover this research is conducted in a developing region which, aside from the practical challenges involved, requires the project team to take responsibility for the *process* by which they operate. This process must be one which works directly with local partners, not as end-users or recipients of the research, but as active partners in the research project. For researchers accustomed to laboratory conditions this can be a considerable problem. Indeed, for all those involved it requires dexterity in the methods of research of adopted, as it is not acceptable to simply supplant Western methods of research into developing countries. Doing so wilfully excludes the local community from the development process. Such an approach is often justified as it is important that 'world class' research is carried out which 'should not be undermined' by adapting to local methods. There is a certain legerdemain to this argument as what it ensures is that the findings of this research will often be inappropriate to the conditions in the developing country. Yet sacrificing research and adapting a purely practical approach is also unacceptable, as it discounts the benefits of critical reflection and scientific analysis of the developmental problems. Thus development research, by working on the constant cusp between practical development and high-quality research, presents a real

challenge. I present here some detail on the academic pressures involved, followed by an ethical case for 'development research'.

i. Academic Pressures

There are pressures on every academic researcher, regardless of their discipline, to produce work which is novel and unique. Their work must provide new insight or research a previously unexplored area or phenomenon in order to be classified as 'new' knowledge. Likewise, whilst they may work in collaboration with others, there must be evidence of individual effort and achievement. In producing this work, researchers are aware that their work will be judged against established standards for their discipline. Thus in conducting any form of interdisciplinary research, academics must confront several barriers. Firstly, the collaborative research project needs to allow sufficient scope for individual research to express 'the state of the art' and to research something new. Whereas the nature of interdisciplinary research often has a senior and junior partner, whereby the senior partner establishes the research agenda and the junior partner contributes to this aim, which does not allow much scope for advancing their discipline. Similar pressures exist within disciplines, as different approaches are favoured and senior partners pursue their research interests through junior partners (cf. Knorr-Cetina, 1999). In development research this pressure is exacerbated, as the junior partner often has to 'bridge' between the local community and foreign science, leaving them in a situation whereby they are looked down upon as 'less scientific' because they are conducting 'low' science[xi]. Equally the requirement for evidence of individual contribution to science makes it difficult for researchers to operate in a development context, as traditional rules on collaboration become blurred. When working between disciplines, indeed between entire cultures, divergent expectations and differing norms on academic collaboration strain the research process. Internal pressures within disciplines remain and indeed can be exacerbated by the need to collaborate with other disciplines. This places pressure on

[xi] The exception is anthropology, which values this bridging skill, yet this discipline has traditionally frowned upon 'impure' anthropology which seeks to change (develop) the community which is studied. Here there is another, although different, challenge to interdisciplinary collaboration.

individual researchers, aware that they will be judged according to the standards of their own discipline, with many retreating into their own 'disciplinary seclusion'. That is continuing to conduct research as they would were they in the home country, treating the developing country more as an applied laboratory than as a practical challenge. From this disciplinary seclusion the researcher can more safely conduct their own research, knowing that their discipline will accept their work as conforming to the shared rules and norms of understanding which are established. In cases where there are junior and senior (dominant) disciplines (scientific cultures, epistemologies) it is the dominant discipline which defines the research agenda and establishes what is valid and scientific. Thus the challenge in conducting development research is firstly an interdisciplinary challenge, of managing the knowledge resources of a project in such a way as to harness the potential of each discipline. These pressures considered, it is then necessary to balance between the requirements of each discipline and the developmental obligation to affect positive outcomes through local collaboration. This requires flexibility and openness to learning by both sides (closing the 'gap') and in this regard there are perhaps benefits that come from working in an interdisciplinary centre over traditional university departments. As development research requires equilibrium between academic pressures and developmental need, yet it is a crucial balance to strike.

ii. Ethical Case

Aware of the challenges of conducting development research, it is often easier to simply conduct research in a developing country, leaving the 'development' aspect for 'experts' to implement at a later stage yet justifying the research on the potential benefits if the findings are applied. I believe that such an approach is ethically unjustifiable. If we accept the ethical principals of Justice and Beneficence (outlined in chapter three) and the principal that academics need to ensure that the beneficiaries of their research are, by the large, the subjects of their research, then simply leaving development for the 'experts' at some indeterminable future date, is unacceptable. Of course this need for a connection between the subjects and beneficiaries of research is somewhat more complex, as often elites in developing countries play a role in arresting development. It would be wrong to

not study this group out of a fear of reinforcing their position, yet in practice this problem can be surmounted by recognising that elites are not a vulnerable group as such and thus do not necessarily need to benefit from research. This issue can also be resolved by funding decisions by donors. Development research projects are funded both of the rationale of good science, because of the perceived developmental needs in the field site, as well as pragmatic political decisions and *real politik*. Were it not for these needs, be they poverty or ecological degradation, then a 'development research' project could reasonably be placed in any country or region, regardless of developmental need. In fact we see in the project proposals (Vlek et al., 2001: 4-11, ZEF, 2003: 5, 23) considerable discussion of the poverty levels and that these are used as a justification for the Khorezm project. Yet the main beneficiaries of development projects tend to be the scientists, PhD students and 'development research' organisations that advance their own careers and academic standing on the basis of the project.

To a lesser extent local institutes have their research capacity improved, yet this is no guarantee of development outcomes in Uzbekistan where research is largely disinterested from the problems of poverty. If the research findings from the project do not lead to an appreciable improvement in the livelihoods of vulnerable groups, whose very vulnerability was used as justification for the research, then the 'development research' project could be accused of a cynical manipulation of this vulnerability to gain donor funding. This is not to say that development researchers need to take responsibility for all poor regions, rather, that when they use this poverty as a justification for funding, then they must reasonably contribute to the alleviation of this poverty. Likewise, I support the need for excellent quality scientific research and would oppose a move towards the abandonment of research in favour of uninformed development. Rather development research projects take on a mantle of responsibility to the regions in which they conduct research, especially if they use the extant poverty to gain funding. To not contribute to the development of these communities, means that they are in fact not development research organisations, but rather research projects that just so happen to conduct research in poor countries.

IV. NEW IGNORANCE

As part of the reflexive process, new learning and new research in turn produce a growth of ignorance (cf. Evers, 2005). I hope that my thesis has created new knowledge and thus a growth in relative ignorance, contra the growth in real ignorance witnessed in chapter four. Yet either way we become aware of new areas of ignorance and gain a greater appreciation of those realms of enquiry not yet fully explored. This growth in ignorance allows us to investigate new areas of research which were not identified before. In fact this is a very normal process of science. Certainly from my field research period there are a number of phenomena which fall outside of the scope of this thesis but which, I believe, merit further research. Agriculture in Khorezm was in a state of flux during my research. To reflect the social implications of agricultural restructuring I would like to see more research on the issue of changing gender relations in rural Khorezm (and Uzbekistan). Likewise the land reform process and our evolving understanding of this (cf. Trevisani, 2006, 2006a) means that much more work is required on how changes in land tenure are leading to changing labour relations. I also believe that the ZEF/UNESCO project needs a fuller investigation of its work so far, documenting the research that has been conducted and critically examining how this research can be utilised for development, a study which would go beyond the scope possible in my analysis of knowledge management, because it would look at knowledge implementation and use. Likewise a greater understanding of how knowledge governance functions at the centre in Tashkent, would add depth to my analysis of knowledge governance at the periphery, on the farm level in Khorezm, as well as informing the knowledge governance literature with more depth. At a theoretical level the issue of knowledge loss will increase in importance and I would like to see theoretical work based on research in systems of knowledge governance more ‘open’ then Uzbekistan. Finally, I believe that the concept of ‘epistemic cultures’ and scientific culture is a fascinating point, which informs and grounds knowledge management theory. Had I more time than a thesis allows for, I would engage in a more thorough cultural grounding of knowledge management within the rural community of Khorezm.

1. Changing Gender Relations in rural Khorezm

I have identified in chapter four how knowledge is also a gendered phenomenon. For instance the way in which silk production reflects clear gender roles as well as how vegetable production on the *tamorka* is gendered. My research only captured a 'snap shot' of the situation during my field research, but from what I have observed, gender roles are changing rapidly in rural Uzbekistan (see also Wall, 2004, for my earlier opinions). The transition away from Soviet ideals of 'equality' and the particular view on women's rights that come with this, are giving way to a 'rediscovery' of 'Uzbek-ness'. This includes a movement towards more cultural conservatism, the infusion of Islamic ideas into gender relations within with household and the elimination of women in high positions such as *hokims*. As the culture of Khorezm continues to change away from a post-Soviet model and into a 'rediscovery' of Uzbek-ness, the role of women stands to be reduced and renegotiated. Whilst my comments in this point are far from new (see for example Kandiyoti 2002b; Adams, 1999) my particular work on agricultural knowledge does identify a need for greater research on how rural gender roles inform livelihood strategies. Methodologically this will almost certainly require research by a woman, accessing areas of family and gender life which are excluded to the male researcher.

2. Land Tenure and Labour Relations

The changes in land tenure which overshadowed my research period were certainly a key concern for farmers and the rural community. There is considerable doubt in the literature of the impact that these reforms will have on the rural economy (Kandiyoti, 2002b, 2003; Ilkhamov, 1998; Trevisani, 2006a&b). Yet whilst the rural economy may not be fully reformed by land tenure changes, what is evident from my research is that there will be significant changes in labour relations. Because rural labour is artificially abundant (rural people cannot move to the city legally) and required on an inconsistent basis (large amounts during certain periods, at other times very little required) privatisation of land is leading to the end of full-time labour engagements that were the norm during the collective period. Rather, land holders now seek temporary workers for a low wage. The early indications are that this will lead to the strengthening of patron – client relationships

between rich and poor members of the same extended family. Indeed local informants complained that this was becoming the case. Likewise, because the local knowledge system is indirectly controlled by the state control over labour relations (chapter four) this will directly impact the knowledge governance and local knowledge systems. These changing labour relations will have a lasting impact on community interaction and it is important that the dynamics of this change are captured and recorded by science.

3. The ZEF/UNESCO project – knowledge for development

In conducting my research on knowledge management within the ZEF/UNESCO project, I have become convinced that after five years of continuous project activities, the project would benefit from a full academic study of itself. This would need to critically assess the operations of the project thus far, considering which research strategies have succeeded and which have not. Likewise there needs to be more, external, assessment of the effectiveness of local partnerships and how successful the project has been in partnering with local organisations. This includes, but goes beyond knowledge sharing relationships, encompassing power dynamics and staffing decisions. I see this as a crucial requirement for a reflective development research project, which should be open to learning the lessons from an external study. The project has accomplished a number of successes in its operation thus far; it is important that the project studies the causes for these successes and assesses some of the failures. Most importantly, as it moves towards a third phase of 'implementation' the project needs to understand what technologies are able to be 'transferred' to end users and which require more research, and this new research should make greater use of local knowledge. Part of this reflexive process will involve questioning the useful of some research as well as dedicating more resources to promising research, but most importantly it will funnel research towards locally articulated goals and priorities. The findings of such a study would be necessarily a hybrid of academic and practical findings and may not fit a PhD study like this one. However, such a study could be an eloquent example of reflexive development research and could improve the project's research if it was embraced.

4. Power & Knowledge Governance from the Centre

One aspect of knowledge governance in Uzbekistan which I did not study was how knowledge is governed from the centre. Because my research was focused almost entirely within Khorezm, and even then mostly at the farm level, I have not been able to fully explain the functionalities of knowledge governance within Uzbekistan. Whilst having evidence that the governance system is one of central control, it remains somewhat of a 'black box' how this works. Conducting research on how knowledge is controlled, given the politicisation of science and agriculture discussed in chapter five, would be methodologically challenging. Given the nature of political control it would require a dedicated study in Tashkent, to begin to understand and document the social processes within the knowledge governance structure. Yet I believe that such a study would hold considerable academic merit, as it would inform both political analyses of the Uzbek state (which are limited in the literature) as well as providing greater understanding of how 'poor' knowledge governance is conducted in a repressive state. In terms of the 'knowledge governance' debate this would probably not tell us very much, the assumptions of that literature are focused too much on a certain conception of market and political relations which do not hold in Uzbekistan. Yet as a study in how power and knowledge interact, it would certainly be an instructive example of an almost obsessive policy of centralisation by the political elite. It would be interesting to know how deliberately the state is controlling knowledge to further its own power, or if this is an unintentional result of the control over agriculture. Moreover, as a post-Soviet system some insights could possibly be gleaned into the, at times patchy, historiography of how science and politics interacted in the communist period. I have argued in other articles (Wall, 2006a) for a centre-periphery analysis of how Moscow and the satellites (e.g. Tashkent) related in the scientific spheres. This historical account would only be enriched by further work on the present day machinations of the new centre, Tashkent, and how knowledge interrelates with power.

5. Knowledge Loss

Whilst I have set out a conceptual outline for understanding knowledge loss earlier in this chapter, I believe that further research is required to better inform knowledge management theory. Especially, research which is conducted within a governance structure which is more 'normal', in terms of being more open and with less politicised science and agriculture. Likewise, the post-Soviet transformation of Khorezm may be similar or very different from other post-Soviet regions. It is worth examining if the phenomenon of knowledge loss occurred in a similar or different manner in other regions. In a more general sense I believe that knowledge loss is not restricted to the three knowledge systems studied in this research. Rather I can envisage how the corporate world (about which most knowledge management literature is focused) experiences the same problems of knowledge loss and leakage. It would be useful to have access to more literature on this subject, to provide greater conceptual clarity and to open up new avenues for research, especially for a better understanding of the different drivers of knowledge loss. Central to this extant theory is to better understand how culture and knowledge interact, because it is in the sharing and reproduction of knowledge that its loss is stymied. Having seen in all three knowledge systems how deeply the cultural context situates knowledge (see below) it would be useful to see to what extent this cultural situation determines levels of knowledge loss. Because knowledge sharing occurs in a large part informally, through interactions which are socially controlled and situated within a specific cultural context, we need to examine both the institutional and epistemological/cultural determinants of knowledge loss. Be this an indigenous, scientific or corporate culture, as explained below.

6. Local Knowledge in its Cultural Context

Finally, local knowledge needs to be placed within its cultural context. I have endeavoured to do this to the greatest extent possible for each of the three knowledge systems. However, because of the growth of ignorance it is never possible to be fully satisfied with the cultural contextualisation of local knowledge. Indeed, the more I understand about the complexity of cultural interaction in a given field environment, the

less I feel I know about the field setting. Yet this is a natural outcome of the growth of ignorance, typical for anthropological enquiry, indeed for any scientific or learning endeavour. That which once appeared simple appears more complex and certainly cultural contexts become more confusing the more one knows. Despite this, I am convinced from my experiences and findings in this research that knowledge is defined by its cultural context (more on this in the next chapter) and that local knowledge in Khorezm exhibits specificities because of this. For instance the definition of masters and expertise within the local system is closely related to specific understandings of authority in Khorezm linked with the *joshuli* concept. Similarly, it would be naïve to consider the knowledge governance structure of rural Uzbekistan without recourse to the powerful historical forces at work (post-Soviet impacts) as well as the current political-economy of state repression, such as the presidential cult, cotton primacy and the complex interplay of power and knowledge at every level of society. In the same manner, the ZEF project has a dominant (and discordant) epistemology, or scientific culture, and the knowledge which is created, validated and shared (and as importantly, that which is not) is situated within the epistemology or cultural context. I have attempted to set the three knowledge systems within their cultural context, with caveats as necessary, however this task is never fully complete. Thus whilst my knowledge of rural Khorezm has grown, so too has my ignorance of it. Likewise the governance of rural Uzbekistan is too large an issue for any one thesis. Finally the ZEF project is a research object of which I was part and this may have coloured my research, so further studies would be most welcome and informative. I can offer nothing but my apologies for any omissions or mistakes that I have made in situated knowledge in these three cultural contexts, and would encourage any other researcher to study Khorezm and improve on my research.

CHAPTER 9
CONCLUSIONS

Presented in this thesis is a range of evidence relating to the knowledge systems of Khorezm, Uzbekistan. Much of this evidence comes from observation, interviews (formal and informal) data gathering and archival research, cross checked and triangulated to ensure accuracy. Yet the breadth of the study and the choice of three very different knowledge systems (peasant, project and post-Socialist) mean that many of the results may initially seem unrelated. It was the intention of this research to take these disparate case studies, observations and results and to distil some useful lessons on how agricultural knowledge operates within the context of Khorezm, both within the systems as well as between these three systems. I provide in the following section some reflections and lessons on the functioning of agricultural knowledge in Khorezm at the peasant, project and post-Socialist levels and of how the three knowledge systems contact and interact. Then I return to the three main themes introduced in this thesis and enter into a detailed discussion of how this thesis helps us to illuminate the issues of:

1. Knowledge dynamics: how knowledge is made, lost and destroyed,
2. Power and Knowledge: the interplay of knowledge and power,
3. Knowledge and Culture: why culture matters in knowledge management,

For each of these a detailed discussion is provided of how the evidence presented in this thesis relates to our evolving understanding of these three themes. This in turn links back to the theoretical implications of the research which are discussed in the previous chapter. Finally, I provide some concluding remarks on the ways in which the findings of this thesis can be used to enhance practical activities in the field in Uzbekistan and of why it is that agricultural knowledge is important in Uzbekistan.

I. AGRICULTURAL KNOWLEDGE IN KHOREZM

The development of agricultural knowledge in Khorezm is severely restrained by 'boundary conditions' imposed by the state and historical forces. What we see is that local knowledge has been purged to a large extent of the indigenous knowledge that is typically found in traditional societies. Communist rule, collectivisation and the centralisation of post-harvest activities have displaced a large amount of indigenous knowledge. Other forms of indigenous practice, such as the pseudo-religious 'first seeds' *pakaz*, have been co-opted by the state to extend its own control. Yet this knowledge has in many ways been replaced by modern modes of agricultural production and even though certain conditions are imposed upon this (e.g. the state plan, impediments to innovation) local knowledge exists on how to use and manipulate this production system. In this regard local farmers are knowledgeable, exhibiting an ability to utilise regulations to their own benefit and to adapt to changing state regulations. Equally, the collective knowledge of the community is adequate for most tasks required, such as house building, and self sufficiency in agricultural production. This local knowledge is also in a state of flux, as many of the post-1991 changes have led to knowledge loss and (to a lesser extent) new knowledge creation. These changes are framed within a cultural context, explored in depth below, which favours a certain form of specialisation (masters, informed by *joshuli*) and specific modes of knowledge reproduction (familial along gender lines). However, this local knowledge does not exist in isolation. Many of its characteristics are influenced and in some cases stipulated by the knowledge governance structures. Because the state plays such a large role in agricultural production, many agrarian functions are determined and delimited by the GoU. We see how the state establishes itself as the sole possessor of 'expert' knowledge, which is used to legitimate and enhance central state power, a theme elaborated on below (subsection III). Likewise, the state influences local academics and researchers, inculcating a 'culture of fear' which militates against the development of new technologies at the local level. This interaction between the knowledge systems is explained next.

1. Interactions between Knowledge Systems

As we see above, the knowledge systems of Khorezm do not exist in isolation. Rather a set of social processes, formal and informal, establishes the 'rules of the game' by which all actors play. This institutional framework is largely, although not totally determined by the Government of Uzbekistan. The knowledge governance structure of Uzbekistan was characterised as 'closed' in this research, because of its lack of openness to ideas from outside or to sharing within the system. There are few feedback mechanisms to allow the local knowledge system to feed into the knowledge governance system. Equally, because science is directed by the state, the findings of research cannot contradict or challenge the states 'accepted wisdom'. Foreign projects occupy a similar, if privileged, position within this mechanism. They enjoy greater freedom to research unique topics than their local counterparts, yet the likelihood of this research being adopted by the state, if it runs contrary to state goals, is slim. The foreign project studied in this research chose, for a number of reasons, to have limited contact with the local knowledge system. There was little evidence of cases where local priorities, development goals or farming knowledge was accessed, except at a rather elite level of *fermers* who were also part of the knowledge governors group. To an extent this reflects the limitations placed on foreign projects by a government that seeks to maintain its monopoly on power and knowledge (see section III, below). Thus when we discuss the interactions between knowledge systems in Khorezm, these interfaces must occur within a certain institutional framework which is set by the GoU. This knowledge governance structure ensures that new knowledge must be verified or authorised by the centre, with horizontal knowledge sharing (unmediated, between actors) being actively discouraged. Intentionally or not, this has led to a situation in which knowledge sharing and interactions between (and within) these communities of knowledge is low. Resultantly, new knowledge creation is limited by the impediments to innovation, the restrictions on research, negative incentives for local academics and the direct & indirect restrictions on the local knowledge system. What interaction does occur tends to be top-down 'technology transfer' from the state to the local system, which disregards local knowledge and favours technologies which suit state determined goals (cotton and wheat) rather than local interests. The impacts of this type of knowledge sharing are elaborated in the following three sections.

II. KNOWLEDGE DYNAMICS

This thesis has shown how knowledge is not static or rigid, but dynamic. This dynamism is exhibited by the way in which knowledge is constantly changing, with new knowledge replacing old knowledge, and with knowledge constantly being exchanged between actors. This exchange then leads to the additional creation of new knowledge and the displacement of old knowledge. However, knowledge loss is also shown as an important, and often unacknowledged, problem for knowledge management and a part of the knowledge dynamic. This is where knowledge is lost without being replaced by new knowledge; it is either destroyed or 'leaked' to another knowledge system. We see, for instance in chapter four in the discussion of familial knowledge reproduction, how the reproduction of knowledge is crucial to preventing knowledge loss. I explain below the dynamics of knowledge loss; followed by an exposition of how knowledge creation and sharing are inextricably linked, with a final comment on how knowledge systems can be made more dynamic.

1. The Dynamism of Knowledge Loss

As explained in chapter eight, the process of filtering and displacement, whereby old information is replaced by new information is a normal part of the knowledge process. Whether it is at the local level, with new technologies being adopted or localised, or in the progress of 'normal science' (cf. Kuhn, 1996) the replacement of new knowledge with old is a positive and normal aspect of a dynamic knowledge system. What is not 'normal' (in Kuhn's sense) is the destruction of knowledge, when old knowledge is lost without being replaced by new knowledge. Equally important for a discrete knowledge system, say a research project or company, is when knowledge is leaked to another system and thus 'lost'. I argue that this knowledge loss is only possible when knowledge ceases to be dynamic. That is when a knowledge system does not have the requisite levels of knowledge reproduction to prevent knowledge loss – knowledge must be used and shared to be retained. It is only by constantly using and sharing knowledge (and thus creating new knowledge) that knowledge loss can be prevented.

2. Knowledge Sharing and Creation

What distinguishes a static knowledge system from a dynamic one is the levels of knowledge sharing and creation. These are linked processes as the sharing of knowledge in turn raises new questions and new solutions. We see in the local knowledge system how in cases such as domestic vegetable production, new knowledge is being created and shared constantly within the community, through seed sharing and selective breeding. This stands in contrast to the static knowledge of cotton growing, where uniform knowledge is enforced from above. Likewise, we see how the state-led attempts to control knowledge sharing before and post-1991 have retarded not only the sharing of knowledge but also the creation of new knowledge, because serendipitous exchange is not possible under the mediated system, which in turn has impeded agricultural development. This is in contrast to much of the informal knowledge sharing (though not the formal, mediated sharing) of the ZEF project, where students discuss the mutual benefits of knowledge sharing and how this leads to knowledge creation. The important lesson to learn from this is that knowledge sharing is vital to dynamic knowledge systems; it brings the reward of new knowledge creation and staunches knowledge loss. Yet creating dynamic knowledge systems is not simple, as explained below.

3. Making Knowledge Systems Dynamic

Dynamic knowledge systems are social and cultural in nature; as such they cannot easily be ‘engineered’. But institutional frameworks can be established which enable them to flourish, for instance by reducing transaction costs (risk) by allowing for informal knowledge sharing, protected by a policy and enforcement framework which respects knowledge rights. This does not preclude formal knowledge sharing and mediation, but these must be used in tandem with the informal methods. Likewise, by designing formal repositories which reflect the needs of users and which can be adapted to suit evolving knowledge inputs. Yet perhaps most important is establishing a ‘culture’ of knowledge sharing within the community. This is not easily inculcated and requires leadership, in taking risks and demonstrating the mutual benefits of knowledge sharing, yet this culture of knowledge sharing is crucial to ensuring dynamic knowledge systems.

III. POWER AND KNOWLEDGE

All three knowledge systems demonstrate the interplay of power and knowledge, in subtlety different ways. Thus it is important to move beyond the cliché that ‘knowledge is power’ and unravel how this power is exercised, by whom, and to what effect and how knowledge contributes to the exercise of power. Equally, how power can come from knowledge, through its use and by guarding access to knowledge. Those within the local knowledge system exhibit relationships to power communally, and I discuss in chapter four how power and knowledge interrelate in this system. I then look at the knowledge governance structure (chapter five) very much one of exercising power ‘over’ others and I focus on how ‘expertise’ is captured and controlled by the political system. Finally, the ZEF project is considered as a separate entity. Whilst power relations do exist with the other two systems, and these are discussed, this example shows how power is exercised within a small group through a dominant epistemology. Yet in all three systems the conclusion is that knowledge and power are not separate facets for analysis. Rather they are inherently intertwined and the access to or control over power of knowledge, contributes to access/control of the other. This linkage between power and knowledge exists not only within the functioning of the state as an abstract concept, rather it is evident in capillary relations, replicated at every level of society in Khorezm. We cannot separate the cultural context of control over knowledge at the local level (*joshuli, ex officio* masters) from the way in which knowledge is governed at the state level (direct and indirect controls over agriculture, an academic climate of fear). This is because power (and as I show in the subsequent section) knowledge is situated within certain cultural constructs. Power only exists in relationships between people; it is not an absolute, but rather a result of social relations and human decisions. Likewise knowledge is an inherently human activity, it is much more than information, but exists in social interaction. In this way power and knowledge operate in rural Uzbekistan in unique ways, but the linkage between power and knowledge is a common factor in all knowledge systems.

1. Power in the Kishlak

Within the local knowledge system we see how those in possession of expert or specialised knowledge are able to capitalise upon this. For instance, 'masters' who increase their social and financial capital by providing their expertise to other members of the community, which is at the same time a reproduction of a specific understanding of authority in Khorezm (*joshuli)*. This mastership permits them a certain 'soft' power or enhanced prestige within the community, but this is not an explicit form of power 'over' others. Conversely, with the case of silk worm production and other gendered activities, men (who have power over women, through *joshuli*) exercise their power to control certain areas of knowledge, such as in dealing with bureaucracy and the state, yet the mastership of women over the more technical aspects of silk worm production enables them some power through expertise. We saw also in the case of the agronomist in my *kishlak*, an *ex officio* master, how he used expert knowledge to profit from his negotiations with the *shirkat* authorities in gaining exemption from the state plan. It is the possession of this knowledge, and the exercise of it, that allows the knowledge holder to enhance their prestige within the community and to cement their social position. This includes improving their relationship to power, assisting in the accumulation of social and financial capital, which in turn provides them with political opportunities. This exercise or relation to power and made possible by their possession or access to knowledge and it grants further opportunities for power. Yet it is not explicit control, as discussed next.

2. Knowledge and Control

The governance structure of Uzbekistan is one of centralised control and what we have seen clearly in this thesis is how knowledge control and political control converge. I have demonstrated the direct and mutually reinforcing link between controlling knowledge (through the monopoly on expert knowledge, by restricting science, creating a 'culture of fear', impeding innovation) and the exercise of political control (the state plan, land redistribution, coercion and the threat of force). In the case of agricultural knowledge this is acute, as political control in the Uzbek countryside is legitimated and maintained by

the state control over cotton and wheat production. This ‘rationalism’ of the ‘control society’ (cf. Foucault, 1980) is internalised at every level of the social and bureaucratic system. It exists not only at the top, but in capillary relations between every level of society. By monopolising the knowledge inherent in agricultural production (expertise) and through a coercive regime to prevent experimentation or alteration of this knowledge (impeding innovation, controlling the labour process) the state ensures its primacy in the rural economy. Farmers have no choice but to accept cotton and wheat production and to do so using mandated methods, which prevents the development of local knowledge. It is by utilising political control over knowledge, that knowledge is used in such a way that it reinforces political control. In this knowledge is power and indeed power is knowledge.

3. Scientia Potentia Est?

Compared to knowledge governance in Uzbekistan, the ZEF research project adopts a much more enlightened attitude to knowledge control and the exercise of power. Yet the evidence in this thesis does illustrate how control over the research agenda (through management control) leads, inadvertently or not, to the establishment of a dominant epistemology of science and how this leads to certain forms of knowledge being authorised as more valid. This epistemology or scientific ‘culture’ is negotiable and fluid (we see the changes between the different proposals) yet the impact of it is that certain types of knowledge are considered more valid than others. This is one reason why interdisciplinary knowledge sharing is difficult in any research project, because of different understandings of what constitutes knowledge. Interestingly, this has not led to a reinforcement of management control, as above, but rather to a broadening of the epistemology to confront new challenges in the third phase of the project. In the same way the mediation of knowledge sharing, whereby management exercises a gate-keeper role, could be loosened to encourage greater knowledge sharing and I would recommend this. Within the project knowledge and power are related, yet because of the judicious exercise of power, the negative implications of this are not as evident as in the knowledge governance system of rural Uzbekistan.

IV. KNOWLEDGE AND CULTURE

The divergences between the three knowledge management systems show how important it is to consider knowledge within the cultural context in which it operates. Knowledge exists in relationships between individuals, in how it is shared & used and how new knowledge is developed to meet certain problems faced. These human interactions and the problems which they address cannot always be seen as global; rather they are determined by certain social and cultural practices. This meaning of culture can range from a specific locality and set of social norms, particular to that area (the traditional understanding of 'indigenous knowledge') through to cultures which are not geographically but philosophically defined (for instance in the epistemology, or scientific culture of a group of researchers). In this way 'universal' knowledge which is promoted by positivist science is only one expression of a cultural context of knowledge, it is global knowledge but it does not apply to all situations. Likewise we should not neglect the powerful role that the state (and non-state actors) combined with historical forces, plays in establishing the institutional framework for knowledge, which both determines and reflects cultural practices. These institutions can be formal and informal and both define the context in which knowledge operates, a context which is inherently cultural.

In seeking to understand how knowledge is created, shared, stored and used, it is crucial that we understand the cultural framework in which this takes place. For instance, in explaining why Uzbekistani scientists operating in the post-Soviet system do not actively share their research results or seek to develop linkages with end-users, we must understand the scientific (epistemic) culture in which they operate. I have described in chapter five how the 'climate of fear' creates incentives for academics not to share their results, because of a constant uncertainty about whether their results will be politically acceptable and because of a lack of knowledge protection (intellectual property rights) to ensure that they benefit, should be knowledge be deemed politically useful. This is why local academics see their role as providing 'recommendations' to the political authorities. Likewise, in the case of the masters in rural Khorezm, it is important to realise that this is

not simply ‘specialisation’ in the form seen in most knowledge systems. Rather it is a certain type of ‘expert’ society which is heavily influenced by Khorezmi cultural ideas about power and a specific understanding of authority (*joshuli*). This context involves gender dynamics and the way in which the knowledge of masters is accessed and paid for, both of which also result from cultural practices. Within the local system we see how local authority is also determined through knowledge, whether this is the official masters (rais, agronomist), in labour organisation (Korean pig farmers, at the MTP) or through informal masters (builders, seed experts). These authorities then validate knowledge in Khorezm. So too in the ZEF project a certain conception of ‘development’ and what constitutes ‘valid’ research has led to a research agenda with a particular focus. The knowledge created from this agenda (and that which is not researched) is a reflection of the cultural context (epistemic or scientific culture) in which it was developed and I have analysed in chapter six the ‘dominant’ epistemology. Why some research was conducted, what knowledge was shared and what forms of research are validated, are all defined by the scientific culture of the project which favours quantitative data which can more easily be made ‘sense of’ and validated by the project. In this way it is not possible to look at knowledge in an a-cultural and a-historical manner, rather to see the knowledge created in the ZEF project as a result of management, personal and epistemological considerations. Knowledge is rooted in, defined by, the cultural context in which it operates. Thus researching it requires a cultural grounding and understanding, to assist future researchers and ‘development research’ projects, I provide below some pointers on how to conduct research in the cultural situation of Khorezm.

1. Culturally Grounded Research in Khorezm

Aware of the cultural circumstances of Khorezm, foreign research projects can make use of this cultural context to enhance their work. I have argued in chapter seven how doing this necessitates an acceptance of the value of local knowledge, a departure from universalistic conceptions of scientific knowledge. Yet, this departure is worthwhile as it allows a foreign research project to understand how technology and agricultural knowledge operate at ‘farm level’ in Khorezm. Agricultural production is not a

laboratory experiment. Rather it is a social and technical process, involving (amongst other aspects) labour organisation, bureaucratic expertise (especially important in Uzbekistan) external knowledge sources (e.g. seeds) *aptitude*, knowledge on how to use certain methods and how to respond to the exigencies of managing a natural process (weather, disease etc). Working effectively in Khorezm means recognising that labour organisation is in a state of flux, that the bureaucracy is suspicious of outsiders and is jealous of their knowledge/power monopoly. To confront these risks, 'local knowledge' can be accessed to great benefit by foreign projects. The direct benefit allows for more effective research to be conducted, whilst the indirect (yet more important) benefit is that it allows the research to focus on locally relevant and appropriate topics. Local definitions of the economic and ecological problems in Khorezm are different from foreign definitions, and the solutions developed should reflect this. Developing such 'appropriate' technologies required foreign projects to tap into the rich knowledge of the local community which can in turn lead to further knowledge sharing and creation, yet knowledge loss in Khorezm means that there is room for considerable capacity building. In conducting research, having local knowledge on managing the natural process of crop production (which is never a pure laboratory environment) labour mobilisation and bureaucratic negotiation, as well as *aptitude*, could all improve the efficacy of research. Likewise, if a research project does decide to move towards implementation then this local, culturally grounded, knowledge becomes not only useful but essential. If newly introduced technologies and methods are to find purchase in rural Khorezm, then they must complement existing agricultural production (which is state led) and must be able to operate within the existing legal/bureaucratic context. They must be not only technically appropriate, but also social appropriate. Education and extension can be used to improve local *aptitude*, technical knowledge and external knowledge (seeds etc.) but this must be done from a cognisance of what exists already and how to introduce this new knowledge (i.e. through masters). Culturally grounding a projects activities and knowledge is thus not only useful for improving the efficacy and efficiency of research, but is essential for succeeding at implementation. It is, as with most knowledge management for development, not an easy task, but it is an important and rewarding one.

V. FINAL REMARKS

Agricultural knowledge is important in rural Uzbekistan. It is important to the state, which profits from it and uses it for political control, it is important for the rural population who reply upon their knowledge for their livelihoods, and it is important for the ZEF project in Khorezm, with development research as a central goal. I have shown in this thesis how this agricultural knowledge operates in three knowledge systems. Local knowledge is defined by local authority figures and delimited by knowledge loss, yet it remains a dynamic knowledge system. Whereas the ZEF project has an epistemic culture which favours a certain 'dominant' view of what knowledge is valid. Knowledge governance in Khorezm is monopolistic and uses agricultural knowledge to legitimate and cement state authority. This discourse of knowledge and power has emerged as important for understanding how knowledge is shared and used in rural Uzbekistan, with the knowledge governance function of the state, exhibiting a desire to retrench power through knowledge control. Equally, power relationships within the project and the local knowledge system determine the type and level of knowledge creation, sharing & use. These power relationships occur within a cultural context of Khorezm, which has an understanding of authority based upon a rationalistic understanding of 'senior' people (men) having authority through their superior knowledge. I have shown in this thesis why new agricultural technologies need to take account of masters (official and unofficial) when working to development new technologies. Thirdly, we have seen how knowledge is dynamic; it is constantly changing forms and changing hands. This sharing of knowledge creates new ideas and refutes old ones. This knowledge is not always in the ascendancy, and we have seen how knowledge displacement (positive) occurs concomitant with knowledge destruction and loss (negative) in all three knowledge systems. This area of knowledge dynamics has been under-valued in the literature and I have provided some criteria and evidence on how we can better theorise knowledge loss. Finally, it is hoped that some of the new knowledge documented in this thesis is of use, not only to academic and to knowledge management theory, but also to the ZEF project operating in Uzbekistan and, ultimately to the people of rural Khorezm who contributed so much to the enjoyment and learning I derived from this research.

APPENDIX A
APPENDIX A: KHOREZM SOCIOLOGICAL SURVEY FORM

Khorezm Sociological Survey – May 2005. Name of Surveyor:_____

Rayon:_____ Shirkat:_____ Kisklak:_____ Ethnicity: _____

Question	№	Question	YES	NO
№ People in Household		Enough Vegetables or need to buy?		
- 1st Generation		Enough Wheat or need to buy?		
- 2nd Generation		Enough Rice or need to buy?		
- 3rd Generation		Keeps Silk Worms?		
- 4th Generation		Makes own kafir?		
- Other		Makes own cheese?		
№ Available workers in House		Makes own butter?		
- male		Makes own kaymak or muzkaymak?		
- female		Sells milk products?		
№ Household members involved in:		Makes sheep wool into clothes?		
- paid employment off farm		Uses sheep wool in other way?		
- only working on farm		Sells produces direct to bazaar?		
- family business		Sells goods to trader who then sells?		
- works outside Uzbekistan		Have a Parnik?		
- works outside of Khorezm				
- mix of above				
Area: land beside house (Hectares)				
Area: tamorka away from house (Ha.)				
Area: cotton (Ha.)				
Area: wheat (Ha.)				
Area: rice (Ha.)				

All crops grown	Hectares	Animals	№ Male	№ Female

Other Comments:

Khorezm Sociological Survey – May 2005. Name of Surveyor: Qurbanov

Rayon Urgench Shirkat: S. Kalandarov Kishlak: Gaybu Ethnicity: Uzbek

Question	№	Question	YES	NO
№ People in Household	5	Enough Vegetables or need to buy?	✓	
- 1st Generation		Enough Wheat or need to buy?	✓	
- 2nd Generation	2	Enough Rice or need to buy?	✓	
- 3rd Generation	3	Keeps Silk Worms?		✓
- 4th Generation		Makes own kafir?	✓	
- Other		Makes own cheese?	✓	
№ Available workers in House	3	Makes own butter?	✓	
- male	2	Makes own kaymak or muzkaymak?	✓	
- female	1	Sells milk products?	✓	
№ Household members involved in:		Makes sheep wool into clothes?		✓
- paid employment off farm	1	Uses sheep wool in other way?	✓	
- only working on farm	2	Sells produces direct to bazaar?		✓
- family business		Sells goods to trader who then sells?	✓	
- works outside Uzbekistan		Have a Parnik?	✓	
- works outside of Khorezm				
- mix of above				
Area: land beside house (Hectares)	0,1			
Area: tamorka away from house (Ha.)	0,2			
Area: cotton (Ha.)	-			
Area: wheat (Ha.)	0,2			
Area: rice (Ha.)	0,1			

All crops grown	Hectares	Animals	№ Male	№ Female
sunflower	0,05	cow		3
corn	0,01	ox	4	
wheat	0,2	hen	3	26
rice	0,1	dog	1	
potato	0,03	duck	2	6
corn	0,005	donkey	1	
onion	0,005			
tomato	0,005			
cucumber	0,005			
pumkin				
peach				
grapes	0,003			
apple				
pea				

Other Comments: R. tal

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Khorezm Sociological Survey – May 2005. Name of Surveyor: Qurbanov

Rayon Urgench Shirkat: S. Kalandarov Kishlak: Gaybu Ethnicity: Uzbek

Question	№	Question	YES	NO
№ People in Household	4	Enough Vegetables or need to buy?		✓
- 1st Generation	-	Enough Wheat or need to buy?	✓	
- 2nd Generation	2	Enough Rice or need to buy?	✓	
- 3rd Generation	2	Keeps Silk Worms?		✓
- 4th Generation		Makes own kafir?	✓	
- Other		Makes own cheese?		✓
№ Available workers in House	2	Makes own butter?		✓
- male	1	Makes own kaymak or muzkaymak?		✓
- female	1	Sells milk products?		✓
№ Household members involved in:		Makes sheep wool into clothes?		✓
- paid employment off farm		Uses sheep wool in other way?		✓
- only working on farm	1	Sells produces direct to bazaar?		✓
- family business	1	Sells goods to trader who then sells?	✓	
- works outside Uzbekistan		Have a Parnik?	✓	
- works outside of Khorezm				
- mix of above				
Area: land beside house (Hectares)	0,05			
Area: tamorka away from house (Ha.)	0,13			
Area: cotton (Ha.)	-			
Area: wheat (Ha.)	0,13			
Area: rice (Ha.)	0,1			

All crops grown	Hectares	Animals	№ Male	№ Female
corn	0,003	cow	1	1
wheat	0,13	donkey	1	
rice	0,1	hen	2	13
sun flower	0,03			
potoata to	0,01			
tomato				
onion				
cucumber	0,01			
carrot				
grapes				
alwa	0,005			
apple				

Other Comments: Unk.

APPENDIX B:
APPENDIX B: LIVESTOCK SURVEY

LIVESTOCK FARMERS SURVEY

Code	Questions
A	Date:
B	Farmer's Name(s):
C	Gender:
D	Rayon Name:
"E"	district/city
a	District
b	City
"F"	How many cattle do you have?
"G"	Cow
"H"	Bull
"I"	Calve
"J"	How many hectares of land do you have?
"K"	What crops do you grow for feeding the animals in your land?
a	Wheat
b	Rice
c	Cotton (for seeds and shroud)
d	Maize
e	Clover
f	Rye
g	Barley
"L"	How did you learn about farming or livestock?
a	Mother
b	Father
c	Brother
d	Sister
e	Mother-in-law
f	Father-in-law
g	Everyday Practice
h	Training
i	College
j	University
"M"	(If farmer) Who takes care of cows?
a	Workers
b	Family members

"N"	How many farm workers do you have?
"O"	(If not farmer) Who takes care of cows?
a	Mother
b	Father
c	Brother
d	Sister
e	Mother-in-law
f	Father-in-law
g	Daughter-in-law
h	Son-in-law
"P"	Can you tell me about how cows digest the food?
	The function of digestion organs:
a	Mouth
b	Stomach
c	Long Intestine
d	Thin Intestine
"Q"	What is the life expectancy of cows?
"R"	What is the life expectancy of bulls?
"S"	For what do you keep cow?
a	For meat
b	For Milk
c	For selling to make money
"T"	For what do you keep bull?
a	For meat
b	For selling to make money
"U"	How do you milk the cows?
a	By hand
b	By mechanism
"V"	When do you milk the cows?
a	Morning
b	Evening

"W"	What kind of hygienic rules do you use before and after milking?
a	Washing the hands with soap
b	Washing the hands without soap
c	Washing the dishes
d	Washing the udder
"X"	How do you store the milk?
a	In pails, pots
b	Tanks, cistern
c	In jars
d	In fridge
e	In room
"Y"	How long do you keep the milk by keeping the quality?
a	12 hours
b	24 hours
c	36 hours
e	48 hours
"Z"	After which period of birth do you get more milk?
a	After first born
b	After the second
c	After the third
"AA"	When do you stop milking the cow while pregnant? And why?
a	6 months
b	7 months
c	8 months
d	9 months
f	It depends on cow
g	It depends on owner
"AB"	What are the ingredients of one-liter milk?
a	Fat
b	Protein
c	Minerals
d	Lactose
e	Calcium
"AC"	What kinds of plants and forage do you use for feeding the cattle in summer?
a	Wheat glume
b	Wheat straw
c	Rice glume
d	Rice straw
e	Cotton (for seeds and shroud)
f	Maize
g	Clover
h	Broom corn
i	Silage
j	Barley
k	Grass
"AD"	What kinds of plants and forage do you use for feeding the cattle in winter?
a	Wheat glume
b	Wheat straw
c	Rice glume
d	Rice straw
e	Cotton (for seeds and shroud)
f	Maize
g	Clover
h	Broom corn
i	Silage
j	Barley
"AE"	How do you judge the nutrition of forage and plants?
"AF"	Do you know the feeding planning of cattle?
a	Yes
b	No
"AG"	What do you do to prevent diseases of cows?
"AH"	What kind of animal (cow) diseases do you know?

1

Исми: Гавҳар она — Мол боқиш чорвачилик бўйича савол жавоб анкетаси — Маҳалла: Ҳамза ж/х

[illegible]
1 сигир.

[illegible] 3000 м² бир моллга, бўшлиғида ёзғаги бўлса
5000 м² (1200 м² → ижарадаги ери)

[illegible]
оқ жўхори, буғдой 2 марта ҳосил

[illegible]
бозордан, ошнамдан чорвадор бўлиб

[illegible]
қўй, болаф б-н

[illegible]
Ҳаводан дори сепилса, ўт ёки ўтлаб олади. Хасталик тўғри к-к, „айло", тоза туғиш

[illegible]
тўғри хил, боқади ва сотади.

[illegible]
семиз, 6-7 — 6-7, рефлекс эмасини ташиб олади.

Ҳамакни ювиш дозаси бўлинади — овқат қолдиғи қолмаслиги к-к, тозалаш ва ўзи ювилган, идиш тоза бўлиш к-к. Тарбиячи бог айбда бўлиши к-к.

иссиқда чириди, бошқарда сақланади, вақтда бошқа нарсалари, тайёрлаш к-к, тоза

6 ойт кейин туғилади, 6 ойт ажралмайди. Боқиш тузилмасига сотқиради, кейин бошқа нарса ҳисоби.

→ 28-26 35-

(ёзда ва қишда) 4 тўғ энгроди, ёпиқча пол тоқири бўлади → куннора б-н қоқсат ва.

Қишда → сечка, қопқоқ б-н кунсара қайнатиб беради. Беда қуритилган.

мол қуруқ замон ёса 10 л. Қўй бўлса — 6-7 л. кунда 2 марта
2 йилгача ўсади
ўнсакка бир ой сут бериш к-к
1 ёшгача 2 ёшгача ривожланиш даври, 2 ёшт кейин тишлари тушиб, чиқади 4 ёшгача ўзгариш бошлади.
150 — минг мол олиниш 3-ойт кейин 380.000
80.000 олди. Ҳозир 350.000
қассоб тайёрланади 1/3 чиқим, 2/5 фойда
суткада туғилмасини керак.

Қассоб учади, даъва қилмаса, тери ранги ўзгариш бошланади, бу тошқари бориш, ички касаллиги тозалиги бўлса бўлади.

Бағир қурти бўлади, вет врачт ўтказиш к-к, 6 ойт курсатиб туриш керак, тишда ёғ, тери қоқар, юқумли тери касаллиги, соларига суртилади ёки савдобийга мазали фойдаланилади. Қанорга қарши таракан дори ишлатилади.

Отравления бўлса, 3-4 кун сув ичилади ва тюкозга сақланади, температура чиқса бўйни оғриқли бўлса бўлади.

сечка, қорамал қайнатиб берилади, чунки юқумли ва ҳазм қилиши кам бўлади

ўтганки вақтт олдин юбориб олинади, сут бериш оғир туриш ҳамма эътибор бериш керак.

⇒ қишда ноль градус паст бўлса, мол касалланади.

⇒ қишда елинига ёғ тушмаслиги учун систематик смазь суртилади. ~~[illegible]~~ ўғлак ва сутини тўймаса, ўзи ўсади.

⇒ ёғини мурожаат қилиш керак, сотишт олди мол аъзоси ва озодмон салт кўради.

⇒ сутни тарқаби 10 минутт к-н ўзгариб бошлайди. 10 минут сониш қайнатиш керак

⇒ мол боқиш кўпинча доимо, учётовки, тўғри мол б-н боқиш

⇒ молни тигинасига эътибор бериш к-к, назорат қилиш

⇒ овқат егант кейин кўриш к-к.

⇒ соғилиши қанақа вещества қараб билдиш? (сут таркиби бузилади, жирность камаяди, сут озайди)}

⇒ ~~вет~~ бегона ўтт саклаш к-к, сассиқ ўтт сақлаш керак.

⇒ беда, макатўқди, шакар қамиш, кўк арабаб лавлаги, кўкат сутни таркиби ва ~~[illegible]~~ тиниши кўпайтиради.

⇒ борасон касаллиги, юқумли касаллик, Отзит кўриш чиқади, фойда зарари.

⇒ гладой касаллиги.

⇒ дўнгиз ўт (исириқ ўти) молга зарарли ва ўлими мумкин, ёзда бор, қишда қуриғдан.

→ ит узум борми ёрдами?

→ сентябрь, август, ~~[illegible]~~ декабрьгача.

→ сомон буғдой, илон сомон

→ касалликни тўғри биласизми? гемтор касаллиги, юқумли касаллик, тозалаш оғриш ўтади.

~~→ [illegible]~~

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