

**‘BUT TRACTORS CAN’T FLY...’****A TRANSDISCIPLINARY ANALYSIS OF NEOLIBERAL AGRICULTURAL DEVELOPMENT INTERVENTIONS IN SOUTH AFRICA**

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***ABSTRACT***

Agricultural interventions in South Africa have failed to deliver the promised poverty reduction for rural smallholders. Ecological economics, livelihoods studies, complex system methodology and discourse theory were used here to investigate the underlying reasons. The mismatch between local realities and programme management was found to be a central cause of failure. Lack of responsiveness to local realities within the programme resulted in tractors being sent to plough fields across a river with no bridge, leading locals to comment ‘but tractors can’t fly.’ The neoliberal discourse in South African development policy was found to be a crucial factor behind such omissions.

***Key words:*** neoliberalism, energy, discourse, livelihood, South Africa

## **I. INTRODUCTION**

In the wake of apartheid, the democratic South African government has tried to tackle rural poverty among the African population in several ways, not least through extensive agricultural development programmes. In these contexts, rural smallholder production is often compared with South African large-scale commercial farm production, which is more productive according to a definition of efficiency based on yield per hectare (e.g. approximately 5-6 tons of rain fed maize/hectare, compared with 1-1.5 tons/hectare for smallholdings). Believing that technology transfer can adjust that yield gap, interventions have focused on introducing technology such as mechanisation and inputs such as fertilisers, pesticides and hybrids, as well as genetically modified (GM) seed, into smallholder farming. However, these programmes have often failed to deliver increased smallholder yields, indicating that technology transfer is not as straight forward as programs presuppose (Klara Jacobson, 2009).

In this study we used four theoretical approaches, derived from the social and natural sciences, to investigate the reasons behind the failure of these agricultural development programmes in South Africa. Use of a combination of several approaches was intended to help to investigate the issue from a broad perspective, taking in local perspectives, discourse and an understanding of agricultural systems, and to provide a synthesis and a systemic picture of the complex relations studied. We analysed data from fieldwork in two villages, interviews with NGOs, researchers and government officials involved in programme implementation, and policy documents to build an integrative understanding of micro-level and macro-level processes.

We begin below by briefly introducing the theoretical approaches used in the study, and indicate the way in which these approaches and their respective methods were combined. The case study is then introduced, together with the field study area. In the section on research design, we detail the methods used for field and literature studies. The analysis begins with a description of the local agricultural system and the effects of agricultural intervention on this system from a complex systems and livelihoods perspective. Problems related to the programme views of scale and efficiency are then analysed. Concrete examples of problems that have occurred locally are provided, and compared against the official understanding of the local livelihood resource base and social contexts. Finally, the interventions are placed in a wider national and global context and some conclusions are drawn.

## **I. COMBINING THEORIES TO UNDERSTAND A COMPLEX SYSTEM**

Four main theoretical approaches formed the basis for our transdisciplinary and systemic analysis: ecological economics, livelihoods studies, complex systems theory and discourse theory. These are transdisciplinary fields that stem from a frustration with reductionist and simplistic models and an ambition to gain a more systemic understanding of our complex world.

### **A. Ecological economics – critiquing neoclassical economic theory and its applications**

Ecological economics emerged as a critique of the rigid and simplistic economic theories that have guided much of development policy over the past half-century, at the core of which has been an assumption that economic growth has no absolute limits. Thus the economic system is modelled as detached from physical flows of material and energy, as well as from constraints stemming from social contexts (Eva Friman, 2002; Edward Fullbrook, 2008; Alf

Hornborg, 2009). With the help of growth theories, (neoclassical) economists came to dominate development theory, advocating a neoliberal development policy which proclaimed that a free market with free trade would create development for all and that governments should play a minor role in society (Richard Peet, 2002). This so-called Washington Consensus model for economic growth, which prescribes that developing countries liberalise trade, privatise and in various ways deregulate their economies (see e.g. Narcis Serra and Joseph E. Stiglitz, 2008), was disseminated throughout the world with the help of the International Financial Institutions (IFIs): the International Monetary Fund (IMF), the World Bank and the World Trade Organization (WTO). While the Washington Consensus has been criticised from within the neoliberal economic framework, the ‘Post Washington Consensus’ which emerged from this criticism has been accused by ecological economists and others of building on the same neoliberal ideas (Toby Carroll, 2009; Björn Hettne, 2009).

Neoclassical economics has been severely criticised for not taking global power relations or socio-ecological complexity into account (Friman, 2002; A.P. Thirlwall and Penélope Pacheco-López, 2009; Hornborg and Andrew K. Jorgenson, 2010). The widespread neoliberal application of neoclassical economics has had severe environmental effects, and has seldom led to increased welfare for the world’s poorest (Herman E. Daly, 1997; Roldan Muradian and Joan Martinez Alier, 2001; Hornborg, 2009; Stiglitz, 2010). Ecological economics, which has emerged as a reaction to this (Daly, 1997; Martinez Alier, 2002; Peter Söderbaum, 2008), highlights unequal power relations and shows that economic systems are dependent on socio-ecological systems. The nature of the economy is thus a dependent sub-system with social and ecological limits.

Global and local distribution is a crucial issue within ecological economics, as is scaling of economic activities according to the capacity of ecosystems. According to ecological economists, we are currently living in a ‘full-world’ scenario, i.e. our global economic activities are already too great for our global ecosystem. The unequal distribution of available resources and power globally can thus not be solved by increasing global income for all, but by redistribution, sustainability-informed new policy and changed social practices (Daly, 1997; Friman, 2002; Martinez-Alier, 2002). Hornborg (2009), for example, looks at the world system in zero-sum world terms, where there will always be losers if there are winners. He shows how rich countries appropriate time (embodied labour) and space (embodied land) from poor countries through an unequal exchange of goods, services and money – ‘time-space appropriation’. While the rationale of industrial technology is to *save* time and space, Hornborg’s global analysis reveals the extent to which this is done at the *expense* of time and space elsewhere in the world system. In the present study, we used the ecological economics understanding of neoliberalism as the departure point for our analysis of the South African development discourse, linking this understanding with the ‘micro’ perspective of livelihoods studies and the systemic understanding represented by complex systems methodology.

#### **B. Livelihoods studies – a critique of development interventions from a local perspective**

Early development thinking often built on collaboration between ecologists, anthropologists, agriculturalists and economists and was informed by a deep field engagement (Ian Scoones, 2009). Yet, as economists rather than rural development generalists came to dominate development thinking, a mono-disciplinary economic perspective came to prevail. Research and rural development policies thus came to focus heavily on increasing the ‘efficiency’ of subsistence agriculture, as it was believed that rural families would be able to support themselves largely from agriculture if their farming techniques could be improved (Scoones

and William Wolmer, 2002; Jonathan Rigg, 2006). This belief comes from what Frank Ellis and Stephen Biggs (2001) call the ‘small-farm-first’ thinking, based on economic theory, which holds that rural smallholders should behave ‘rationally’ and therefore be positive towards, as well as able to use, technological improvements in agriculture. However, this assumption ignores the context dependency of technology. Most agricultural technology has been developed for large-scale, commercially orientated farming and new technology does not necessarily function in the same way in smallholder farming, a very different social and ecological context (Miguel Altieri, 2002). There are also problems in the smallholder context that cannot be solved by new technology – problems which are sometimes more central to improving rural livelihoods. For example, agriculture in southern Africa is often constrained by historical lack of land and labour (Deborah F. Bryceson, 2004), as well as lack of infrastructure, credit support and adequate connection to a larger market, making it impossible to compete on equal terms with large-scale producers (Thorvald Gran, 2009). Rural livelihoods are also increasingly recognised as consisting of a diversity of activities, some linked to agriculture, others not (Frank Ellis, 2000; Rigg, 2006; Benjamin Davis et al., 2010).

The ‘livelihoods’ perspective developed from a realisation that policies need to start by acknowledging the reality that people live in, their needs and the assets they possess, instead of providing ready-made interventionist instruments and imposing artificial disciplinary divisions on complex realities (Leo de Haan and Annelies Zoomers, 2005; Scoones, 2009). The definition of livelihood by Robert Chambers and Gordon R. Conway (1992: 7) as ‘the capabilities, assets (stores, resources, claims and access) and activities required for a means of living’ is used (with minor modifications) by many authors. Central to the perspective is an ambition to understand local realities from a transdisciplinary viewpoint.

Ecological economics and livelihoods studies are thus both born out of criticism of the same phenomenon, but from a theoretical/macro- and a practical/micro- level, respectively. The two perspectives combined provide a comprehensive understanding of why development interventions are designed as they are and how they affect local livelihoods. An added bonus is that the power and macro-level perspective of ecological economics counters a tendency in livelihoods studies to downplay the significance of macro-level political economics and global power relations (De Haan and Zoomers, 2005; Scoones, 2009).

### **C. Systems ecology – striving for an understanding of social and ecological systems**

The complex system theory applied in this study has its foundation in systems ecology (i.e. the ecology of self-organising systems), as developed by Howard T. Odum (1994). The theory builds on the phenomenon of self-organising systems, i.e. the formation of local ordered structures at the cost of increased disorder in their surroundings (also called ‘dissipative structures’ by Ilya Prigogine and Grégoire Nicolis, 1977). Systems ecology shows that this self-organisation, which can be observed in ecosystems as well as social systems, can be studied as energy transformations in hierarchical networks, where structures and processes with support from higher quality energy to some extent control structures and processes lower down in the energy hierarchy (Odum, 1994, 2007). This builds on the principle that all activities that create structures (i.e. reduce entropy) in the world need energy, but energy comes in different qualities. For example, one calorie of electricity can do more work than one calorie of wood. This is because while available energy decreases through every energy transformation, the quality of the energy and its ability to do work increases. To obtain e.g. one calorie of electricity, many calories of wood have to be used, and in the transformation most of the wood-energy (as ‘joules’ or ‘calories’) is lost as heat. While the theory focuses on studying systems, an important component is the acknowledgement that all self-organising

systems are open and interact with structures and processes outside the system, and that there is always an un-predictability component (called bifurcations by Nicolis and Prigogine, 1981) in all kinds of self-organisation.

To highlight the qualitative differences between types of energy, Odum (1988) created the concept *emergy* (with 'm', standing for energy *memory*), meaning all the available energy it has taken to create and maintain a structure or process in a system. Odum (1994) used the word 'transformity' to indicate the concentration of *emergy* (*emergy*/joule energy) in a structure or process, i.e. the amount of energy it has taken to create or maintain a structure or process divided by its current energy content (or more simply put: the *emergy* per 'unit' of a structure). Based on his theory of systems ecology, Odum developed a method called *emergy* synthesis where systems diagrams are drawn by mapping the self-organisation within a system through extensive calculations of energy support for all interlinked structures and processes in the studied system. In the diagrams, structures and processes are ordered according to increasing transformity, and interactions between structures and processes are described (Odum, 1994, 2007).

**Figure 1.** Photograph of a village in the study area. Systems components in the landscape are highlighted, and shown under the photograph in a highly aggregated systems diagram. Please refer to Figure 2 for a legend explaining symbols used in this diagram.



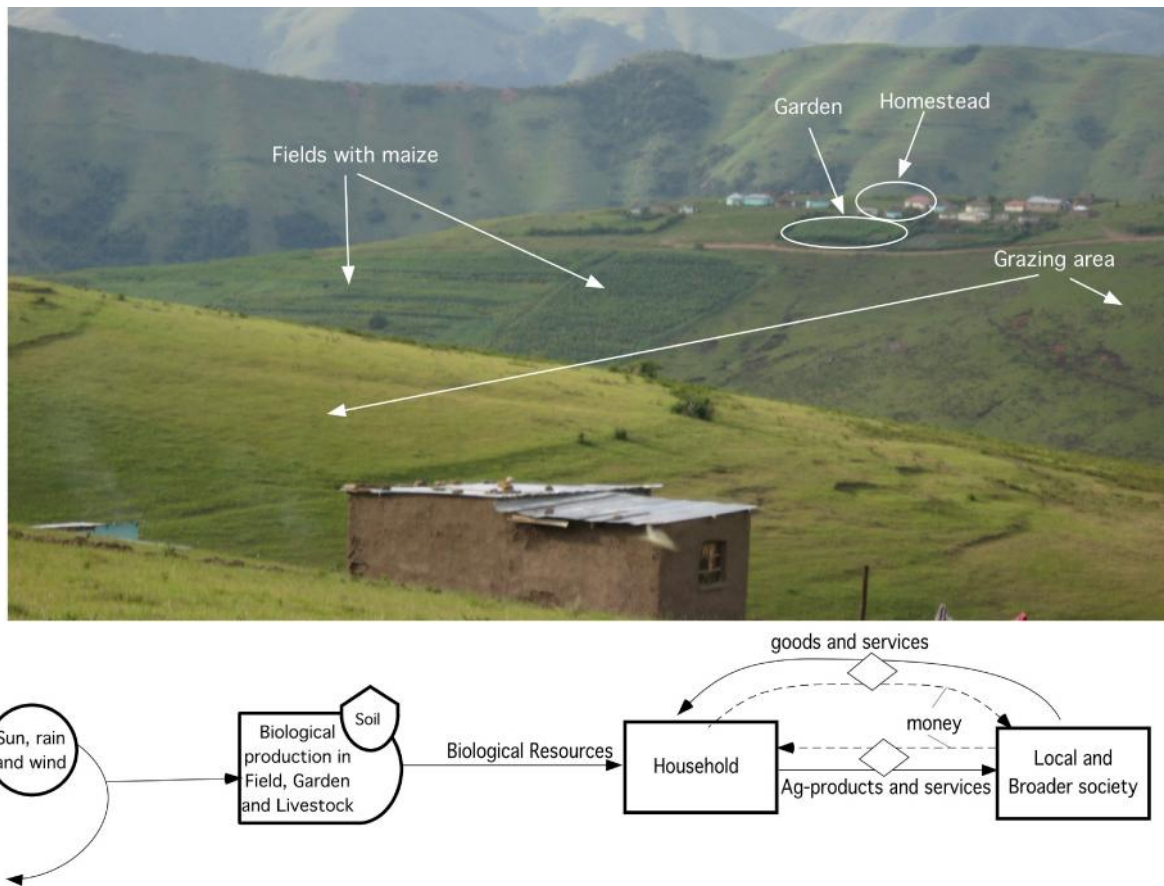


Figure 1 shows part of a village in the study area, with systems components highlighted. Under the photograph, an aggregated form of systems diagramming illustrates the flows in the system and shows how biological production (in the field, garden and by livestock) supports the households and how these in turn are connected to the broader society. Transformity increases towards the right in the diagram.

Adding systems ecology theory and the systems diagramming method to our framework provides the possibility to rank structures and processes based on their energy support, where structures and processes with higher transformity are ascribed more power. The concept of power as used in systems ecology should be interpreted as a force or potential that allows some structures and process possibilities to provide support for, or limit, the actions of other structures and processes. Social science theories can further help to explain

the dynamics and social relations behind these power differentials. Conversely, systems ecology can visualise otherwise evasive power relations. For example, the ‘time and space appropriation’ discussed above (Hornborg, 2009) can be visualised through systems ecology (see e.g. Cecilia Ferreyra and Brown, 2007) by quantifying the energy support behind all processes leading up to a new technology (e.g. GM crops).

#### **D. Discourse theory – analysing processes of power and knowledge creation**

Discourse theory and analysis has become a frequently used transdisciplinary approach within social sciences. Michel Foucault (1972) defined discourse as conversations with embedded meanings within a group of people who hold certain ideas (or world views) in common. There is a constant discursive struggle to define truths, in which each discourse aims to remove multiple meanings and thereby create a coherent way of understanding the world. The dominant discourse thus provides the frames for the thinkable, and constructs a specific version of the world as natural and inevitable (Friman, 2002). While any fixation of meaning is temporary and therefore at risk of being changed by surrounding competing discourses pushing for alternative meanings (Louise Philips and Marianne W. Jorgensen, 2002), the risk is smaller with more hegemonic discourse.

Lilie Chouliaraki and Norman Fairclough (2001) argue that it is essential to combine discourse analysis with other theories and methods that can help understand the social realities with which the discourse interacts. In line with this, our understanding of discourse is that it interacts with other discourses and with a non-discursive reality. By mapping the dominant discourse(s) in the context of smallholder farming and social practices, we can get a picture of how power is manifested, e.g. in agricultural development and South African

smallholder agriculture. Discourse analysis can help us to understand the dominant way of talking about and understanding smallholder agriculture, how this way of talking and understanding is reproduced, and how it influences policy.

## **II. THE SOUTH AFRICAN CASE: FAILED INTERVENTIONS IN SMALLHOLDER AGRICULTURE**

In this study we concentrate on agricultural intervention programmes in South Africa that focus on ‘historically disadvantaged populations’, i.e. those discriminated against during apartheid, most of whom still live in former homelands<sup>1</sup>. While commercial large-scale farming was exclusive to the ruling minority during apartheid, supported by state subsidies and agricultural extension services (Etienne L. Nel and Jack Davies, 1999), rural smallholder farming was practised on land inadequate for subsistence and was undermined by enforced labour migration and lack of infrastructure, market access and suitable agricultural extension (Bryceson, 2004). The history of inequality is still clearly apparent in agriculture, for example in the distribution of agricultural land, infrastructure and market access, not to mention income distribution as a whole. Since the rural poor in the former homelands have so little agricultural land (usually around 1-3 hectares per household) and farming is seldom the main livelihood activity, they are referred to here as ‘smallholders’, rather than ‘farmers’.

The study area is located in South Africa’s Eastern Cape Province, which is one of the country’s poorest, and includes two former homelands, Transkei and Ciskei (Office of the Premier, 2004). Homeland agriculture has historically been severely constrained by colonial and apartheid policies, which limited access to land, capital and labour (Colin Bundy, 1988). The low-yielding agricultural production in the homelands was targeted by various top-down

interventions focusing on ‘modernising’ farm equipment and practices and on introducing new breeds of crops and livestock (see e.g. William Beinart, 1992; Derick Fay, 2003). Due to their top-down approach and insensitivity to local realities, these interventions often had the effect of undermining smallholder farming rather than improving it (Chris de Wet, 1990). For example, subsistence production of maize, which is the staple crop, was targeted by top-down mechanisation schemes and the introduction of new hybrid varieties that were badly adapted to local conditions. This is a partial reason for other forms of livelihood often being more important than agricultural activities today (Flora Hajdu, 2006; Thembele Kepe, 2009). However, agriculture still plays an important role, not least as a safety net for many rural households (Fay, 2003; Jacobson, 2009).

The study was limited to two recent large-scale agricultural interventions that have taken place in the study area, within the Massive Food Production Program (MFPP) and the Accelerated and Shared Growth Initiative of South Africa (AsgiSA), both focusing on maize agriculture. The MFPP was designed and implemented by the Eastern Cape Department of Agriculture (ECDA), with the objectives of improving food security and reducing poverty through introducing ‘sustainable’ and market-orientated agriculture (ECDA, 2004). Whole villages were intended to participate in the programme and a village steering committee acted as the contact between the Department and the villagers. The plan in the MFPP was to increase maize yields through introducing hybrid or GM maize seeds, chemical inputs and mechanical assistance. To assist in the mechanisation of agriculture and benefit from ‘economies of scale’, the initial idea was that all village fields should be combined into one unit, but smallholders were highly reluctant to do this. Relocation and merging of fields both occurred through top-down intervention programmes before democratisation in South Africa and these programmes often resulted in reduced local autonomy and reduced flexibility in

land use, thus often undermining the possibility for households to build sustainable livelihoods (de Wet, 1990; Maura Andrew and Roddy C. Fox, 2004).

Furthermore, the MFPP sought to encourage smallholders to practise market-orientated and economically sustainable agriculture through a conditional grant scheme, where inputs for the subsequent year were only paid if the conditions of the previous year had been met. Initially, inputs were fully paid by the ECDA, but the plan was that villagers would pay back an increasing amount of the input costs for every year in the program (as yields were expected to increase). The MFPP administration believed that this conditionality would be the key to success, based on a belief that previous interventions had failed because they had made smallholders passive recipients of aid and hence irresponsible (ECDA, year unknown; ECDA, 2004). In other respects, the MFPP was a traditionally top-down planned and implemented programme with negligible possibilities for locals to affect its design (Jacobson, 2009). Eventually, substantial numbers of villages were expelled from the programme for failing to follow the payback plan of the subsidies. One reason that villages did not pay was that the MFPP administration failed to deliver inputs on time for planting, resulting in low yields. In addition, the information about the conditional grant plan was unclear to many participants.

AsgiSA was the overarching policy framework for the national government in South Africa during 2006-2009 and had the aim of halving poverty and unemployment by 2014 by way of rapid economic growth. The NGO Independent Development Trust (IDT) was chosen to coordinate and implement AgsiSA throughout the country. In Eastern Cape, however, AgsiSA was implemented through forming a company (AsgiSA EC Pty Ltd, hereafter called AgsiSA EC), financed by the provincial government and with agriculture and agro-processing as one focus area. AgsiSA EC was officially launched in May 2007 to target both

smallholders and farmers from 'previously disadvantaged groups' who had acquired larger pieces of land through land redistribution (often referred to as 'emerging farmers' in South Africa).

The AsgiSA EC agricultural interventions in smallholder settings, like those in MFPP, focused on mechanisation and input provision. However, a difference was that AsgiSA EC had the ambition to run and govern all the work in the villages, including harvesting and marketing. Village fields were to be combined into one, and the farmers organised into cooperatives. According to the plan, AsgiSA EC would take the produce and sell it, reinvest 90 per cent of the profits in the same village for next year's planting, and give the cooperative 10 per cent of the profits to share. While the design largely excluded the smallholders from all parts of the process, a stated objective was to gradually increase smallholder participation in order to gain support for the 90/10 model (interview with AsgiSA EC's CEO, October 2010). However, in our field study village, this model did not work entirely according to plan, as farmers kept their fields separate and harvested by themselves, without AsgiSA EC assistance or interference. Thus in practice, in the study village AsgiSA EC operated in a similar way to MFPP.

Our field studies were carried out in two villages, consisting of approximately 100 and 150 households each. One of these villages took part in the MFPP between 2003 and 2008, a process studied by the second author since 2006 through recurring research visits to the village. The other village has been targeted with AsgiSA EC activities since 2008, and we have followed developments through field visits between 2008 and 2010. The first author has studied rural livelihoods in this village since 2001. Both villages are located in rural settings,

away from tarred roads and commercial centres and, as of 2010, neither had household electricity or running water.

### **III. RESEARCH DESIGN**

Drawing on the theoretical approaches described above, we studied agricultural interventions in the two chosen villages through multiple methods. With a pre-understanding from ecological economics, discourse analysis was applied to official documents on AsgiSA (including AsgiSA EC) and the MFPP, and to policy interviews. Smallholder perspectives were explored through a livelihoods perspective using interviews and participatory activities, and provided information for the emergy synthesis. All material was gathered jointly and discussed together within the research group. This widened our perspective and led to useful cross-fertilisation between different theories and methods.

A systems diagram for the local agricultural system and its interaction with the agricultural interventions was created by mapping all the structures and processes in the system through village field work and by approximating the emergy support for each structure or process by combining fieldwork information with data from previous systems ecology studies and emergy calculations on similar systems. This was possible through using the literature on emergy analyses (see e.g. <http://emergysystems.org/>) and the National Environmental Accounting Database ([http://sahel.ees.ufl.edu/frame\\_database\\_resources](http://sahel.ees.ufl.edu/frame_database_resources)).

The thirteen policy actors interviewed were chosen on the basis of previous contacts and knowledge of the institutional structures in South Africa, but also through interviewees' contacts. A number of officials at the district and the provincial level of the Department of

Agriculture were interviewed, as was the CEO of AsgiSA EC. The NGOs interviewed included the Independent Development Trust (IDT), the Eastern Cape Rural Finance Corporation (ECRFC), the Promotion of Rural Livelihoods (RuLive) and the Transkei Land Service organisation (Tralso), all of which were involved in MFPP or AsgiSA implementation in various ways. Two MFPP mentors (commercial farmers who were employed to work with MFPP implementation) were also interviewed, along with researchers at three South African universities who work closely with local communities.

Our previous studies in the two villages (Hajdu, 2006; Jacobson, 2009) meant that contacts with the local communities and knowledge about local conditions were well-established from the outset. Three new field visits were made by the research team, where new perspectives and questions guided the fieldwork. We lived with local families in the villages and used local interpreters. Based on previous surveys, households with above-average engagement in agricultural activities, but otherwise varying capabilities and assets, were selected for interviews and participatory activities. The purpose of this was to select households that had a good potential to benefit from the programmes. During the first two field visits, we made repeated in-depth interviews with the same households, and used several adapted Participatory Rural Appraisal (PRA) techniques, including a seasonal calendar and a combination of a flow diagram and tools used in systems diagramming (see Karin Eksvärd and Torbjörn Rydberg, 2010; Daniel A. Bergquist et al., 2011). We also visited and measured the fields of the households, estimated harvests and observed various agricultural activities. Interviews were held with the local chiefs of both villages. To protect identities for ethical reasons, we have withheld the names of the villages and of individuals in this paper.



During the third field visit, preliminary findings were presented at community meetings in the two villages and people provided feedback on these. Villagers generated recommendations on agricultural interventions through participatory exercises. These were presented and discussed at a workshop with relevant NGOs, officials and researchers.

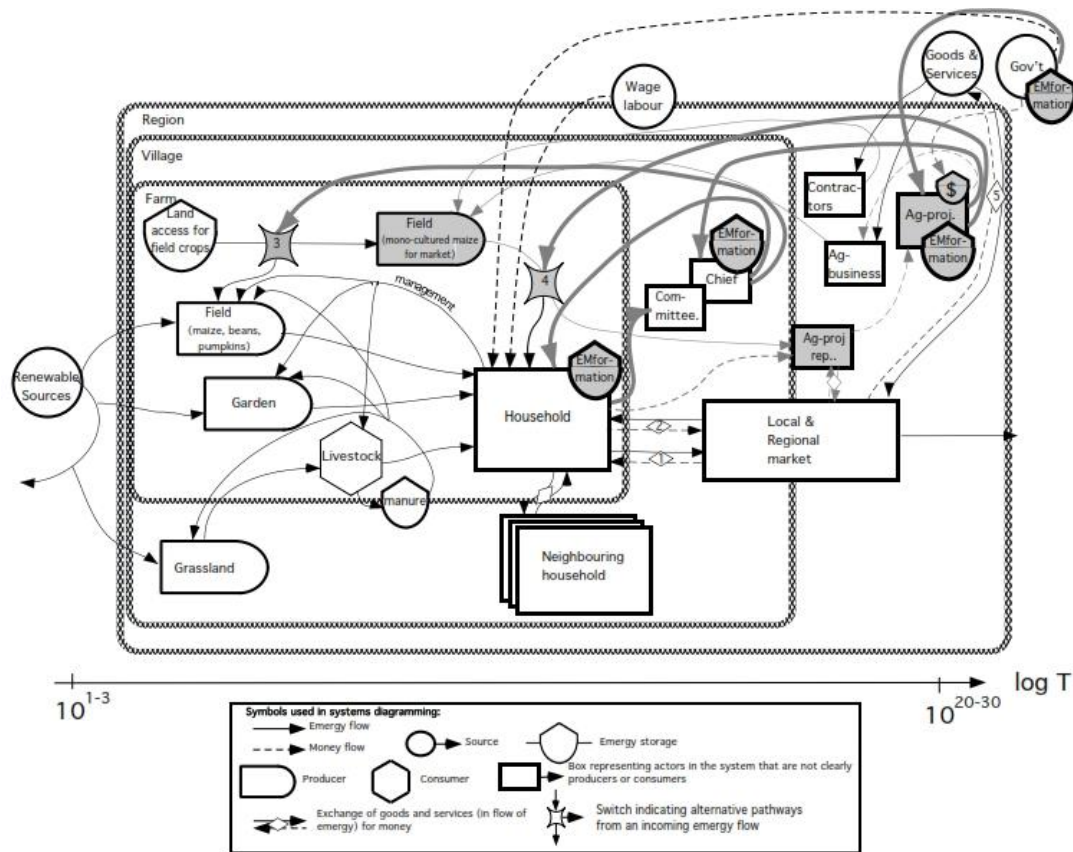
#### **IV. FAILED AGRICULTURAL INTERVENTIONS IN SOUTH AFRICA: A TRANSDISCIPLINARY ANALYSIS**

The analysis below combines the different theoretical approaches and methods described above.

##### **A. The smallholder agricultural system**

Figure 2 shows a systems diagram for a typical smallholder farming system in the study villages. White boxes represent the standard components of the farming system, while grey boxes and arrows represent the effects of MFPP/AsgiSA EC-type agricultural intervention. The three different systems levels, 'farm', 'village', and 'region', are situated on a scale of increasing transformity from left to right, i.e. an increasing need for support from working processes as well as increasing power/influence in the system (as discussed previously). The chief in the diagram is thus to the right of the household, indicating that the chieftaincy role has higher transformity than the individual household. The scale is logarithmic, spanning roughly from  $10^{1-3}$  up to  $10^{20-30}$  solar emjoule/joule (but single items should not be interpreted as firmly placed on a fixed scale).

**Figure 2.** Generalised systems diagram of a smallholder farming system with standard components represented by white boxes and components added through an agricultural intervention shown with grey boxes and arrows. Approximate transformity scale is indicated at the bottom.



The agricultural system typically contains a garden within the homestead boundaries, grazing animals on communal grazing land and fields located at some distance from the homestead. Gardens are commonly planted with a variety of vegetables and maize, and fields consist of maize, frequently intercropped with beans and pumpkins. Figure 2 presents this in a systems diagram. Separate production symbols are used for the field, garden, grassland and a consumer symbol for the grazing livestock. The products created in these spheres flow into the household, with arrows in the opposite direction indicating work invested in management. After harvest, livestock is let into the field to graze the remaining maize stalks, thereby

contributing manure to the fields, as also indicated in the diagram. Manure is also used as a building material and livestock have the additional purpose of serving as a banking system. Cattle in particular are rarely slaughtered for food for the household, but rather saved for bridewealth payments, ceremonial purposes or dire emergencies (see e.g. James Ferguson, 1990).

The harvest from the field is mainly used for subsistence, but occasionally households sell agricultural products locally in the village or the nearest town (transaction symbol 1 in Figure 2). Money generated in this way or through wage labour or welfare payments is used by the household for buying groceries and agricultural inputs (transaction symbol 2) from local shops in the village or supermarkets in the region. Sharing of agricultural work occurs between households on a reciprocal basis (discussed in detail by Patrick McAllister, 2005), as indicated by transaction arrows in Figure 2.

The smallholder agricultural system is thus a complex web of ecological, social and economic functions on different levels, where entities are multifunctional (e.g. livestock as described above). When each entity has several functions and processes are interwoven as in this system, outside intervention invariably has multiple and unintended effects.

When the agricultural intervention enters the smallholder farming system, aiming to introduce mechanisation through contractors and inputs from the agricultural business, the field of the household switches (the switch symbol, labelled 3 in Figure 2) from low transformity ‘field (maize, beans and pumpkins)’ to higher transformity ‘field (monoculture for market)’<sup>2</sup>. Field production is now supported by goods and services such as more machinery and contractors, hybrid or GM seeds, fertilisers and pesticides, which depend to a

larger extent on non-renewable resources. The flows of these goods and services to the field are paid by the agricultural project, with money from the government.

The decision to take part in the agricultural project is taken by the chief (with more or less involvement by individual households), which is indicated by a decision arrow from the ‘chief’ to the ‘switch’ symbol in Figure 2. This in turn affects the management of the field. In addition, the harvest flow from the field to the household can be interrupted by a ‘switch’, where some of the harvest goes to a project representative or is sold at a regional market and given back to the ‘Ag-project’ in the form of money. This switch is controlled by a decision from the project.

In general, the diagram shows that the whole system is changed through the intervention, to being more controlled by, and dependent on, levels higher up in the transformity hierarchy, with decisions and resources flowing into the system from the far right in the diagram, indicating that decisions are powerful and resources costly. The multifunctionality in the system is also reduced, as the project creates a more simplified agricultural process.

In systems diagramming, information is recognised as having a great impact in the system, since it has high transformity (it takes a lot of *emergy* to build and maintain information, but it holds little *energy*). We therefore use the term ‘*emformation*’ (Odum, 1988; Brown, 2004) to indicate the emergy flow that creates and maintains information. The bold arrows indicate flow of *emformation*, which also includes discourse. Actors create, maintain and reproduce *emformation* in their talk and actions. Actors higher up in the transformity hierarchy are associated with *emformation* of higher transformity. As smallholders and their

information are lower down in the transformity hierarchy, the theory predicts that smallholders' priorities will have limited influence on the agricultural project, unless it actively decides to be influenced by the smallholders.

### **B. Mismatches in scale and views of 'efficiency'**

The position of the two alternative fields in Figure 2, where the field created by the 'Ag-project' depends on high cost and high energy inputs, shows that the large-scale, commercially orientated rationale is fundamentally different from the multifunctional smallholder farming system. Commercial farms in South Africa (and other large-scale commercial farms around the world) are designed to produce cost-effective food by extensive use of external (non-renewable) inputs, as well as low paid human labour and machinery. To provide sufficient profit, production is simplified (for example by planting in monoculture on large fields) and the high monetary costs of external inputs are shared over a large production unit. Scale is thus of the essence, and yet this system is transferred to smallholders who only have a hectare of land per family. There are only a few examples of industrialised small-scale farming systems (of a few hectares) in the world today (e.g. Norway, Japan and Switzerland), and these have been formed and are maintained by heavy national agricultural subsidy schemes with a rural development and/or national food security objective. Without such support systems, it is not viable for smallholders to use high-cost inputs, and yet the MFPP was built on the principle that smallholders should pay for their own inputs eventually.

The MFPP and AsgiSA development projects both tried to get smallholders to agree to merge their fields into larger units in order to tackle this challenge of scale. As discussed above, smallholders strongly opposed merging of fields, mainly due to a worry that this would be a first step towards taking their land from them. In addition, different smallholders

invest to varying degrees in their farming and, for example, a highly dedicated smallholder would not want to merge with a neighbour who was not planting his or her field due to labour constraints.

Some fields have been merged in past interventions to benefit from economies of scale. Merged fields in a village mean that inputs and mechanical assistance can be bought at bulk price, which could slightly increase the profit for each smallholder. However, studies on previous agricultural interventions in the region show that while smallholders are able to make a profit in good years, they become indebted to the programmes during bad years, as yields fluctuate between years due to various environmental conditions (de Wet, 1990). However, the smallholders studied here do not have the economic buffer to deal with a bad year, even if merging fields were to bring an increase in mean productivity. The households in our study commonly have very little money, and it is therefore extremely difficult for them to accumulate the money needed to invest in the inputs suggested by the programmes, even if such investment were to lead to increased profit.

Due to the idea of rationalisation through mechanisation, monoculture maize production was promoted in the projects and only fields located in the 'field area' (created during the villagisation programmes under apartheid) were ploughed. Solitary fields, situated outside the main field areas, and fields located in too steep or too rocky areas were not planted by the projects at all. Smallholders did what they could to make it possible for agriculture to continue meeting food security needs, for example by sharing inputs from the projects with households that owned fields in inaccessible areas, and by continuing to intercrop fields despite the recommendations. However, the fact that the project management refused to plough inaccessible fields also led to tension within the communities, which the projects made

no attempts to resolve. Project designers and implementers instead often interpreted smallholders' various attempts to make the programme fit better with their realities as a lack of economic rationality or lack of gratitude for 'help'. In our dissemination workshop, several MFPP implementers expressed the view that it was foolish of people with steep and rocky fields to expect assistance from tractors. This demonstrates the common absence of an understanding of local perspectives and realities, which in itself might include deficient knowledge about the capabilities of tractors.

The understanding of 'efficiency' within the projects also clearly did not include an understanding of how smallholders reason regarding their production. For a variety of reasons (droughts, rains, storms, theft, cattle eating the crops, draught animals dying, sickness in the family, equipment failure at critical times, etc.), crops can fail in any given year. Furthermore, as market prices for maize have been low, maize production gave low returns and buying maize meal for food has been comparatively cheap. It therefore makes little economic sense for households to spend a large portion of their meagre income on agricultural inputs that give a small net return if successful, but a major loss if unsuccessful.

Other studies have also shown that smallholder cultivation often seeks to optimise output in relation to scarce availability of resources (Robert McC. Netting, 1993) and that it has an important role for subsistence and for spreading risks in the household (Ellis, 2000). The multi-functionality and diversity of smallholder agricultural practices, as illustrated in Figure 2, have been shown to be flexible and directly responsive to surrounding social and ecological circumstances. Andrew and Fox show that when smallholders in the homelands shifted from extensive cultivation in fields towards intensive cultivation in gardens during apartheid, this was interpreted by outsiders as 'under-cultivation' of land, rather than an

‘effective intensification strategy adopted by rural households to maintain yields’ (2004: 687) as they were constrained by labour shortages due to the forced labour migration.

The view of efficiency in the intervention programmes not only lacks an understanding of social context, but also represents a very narrow view of resource efficiency. Systems ecology shows that agriculture, including livestock, concentrates the diluted solar, wind and rain energy available both in time and space into energy qualities that can serve as human food. This concentration work can be continued further in space (higher yields) and time (faster crop/meat development) by using various external inputs such as fossil energy sources, (which represent resources concentrated over time) through using machinery, pesticides and fertilisers (which have been developed by using resources and work) (Odum, 2007, see also discussion about time-space appropriation in Hornborg, 2009). This large ‘support area’ of historical time and space needed for industrialised agriculture is not commonly taken into consideration when agricultural experts talk about how ‘modern’ agriculture can use the landscape more efficiently. However, as our natural resources, including fossil fuels, are becoming scarcer, this view of efficiency needs to be broadened. In energy terms, the output of smallholder agriculture might even be better than that from commercial agriculture, if the whole value of inputs used were to be subtracted.

### **C. Problems arising due to lack of social contextualisation**

Many of the problems that occurred during implementation of the agricultural intervention programmes in our study villages were rooted in a lack of consideration of local social contexts when designing and implementing the programmes. Some of these problems are described below.



Lack of training was a major problem in both villages. Despite the fact that a core idea of the projects was to produce maize for the market, no training at all was provided on the business side of farming. Some agronomic training occurred in the village targeted by MFPP, but this was limited in scope, only theoretical, and many smallholders did not take part. The mentors that were appointed halfway through the programme had the possibility to give direct advice in the field, but since they came into the programme late, the trust and engagement of the communities had already been affected. In the AsgiSA EC programme, the training component was even less apparent and there had been no training at all in the village we studied. This was intentional and only for the first year, as AsgiSA aimed to show the communities that the project worked and to get them to understand that ‘we meant business’ (interview with AsgiSA EC CEO, October 2010). This approach was highly criticised by the NGOs we interviewed on the counts that the people were left out of the process, did not learn anything and were not empowered. An NGO representative commented that: ‘it’s patronage politics, it’s like Father Christmas coming’ (interview with NGO, November 2009).

As mentioned previously, the intention with MFPP was that households would pay back an increasing amount of input costs over the years. In practice, this process failed more often than not. There were several reasons for this. During initial years, the MFPP administration failed to pay input distributors and contractors on time and the products and services were therefore delayed, something which also happened in the AsgiSA projects later. Delayed planting resulted in late harvest, which reduced yield and increased the risk of frost damage. Furthermore, cattle are usually allowed into the fields to graze the maize stalks at the normal time of harvest, which coincides with the grazing lands drying up as winter

approaches. When harvests were delayed, cattle damage to fences and to the standing crop increased.

On occasions, villagers managed to negotiate a delay in the payback plan due to these problems. However many villages, including the one studied here, did not manage to pay back the inputs even when the payback plan was delayed. A key reason for this was the lack of planning for storage, milling and marketing within the MFPP, which consequently led to problems with realising profits. The lack of good quality storage and access to value adding through milling meant that the harvested maize could not be sold at prices that would sufficiently make up for the high input costs. For example, bags of seed were often kept in people's homes, without protection from damp or animals, reducing the quality of the seeds. The lack of storage also made it essential to sell directly at harvest, resulting in a low price due to the local surplus of maize at harvest time.

The failure to provide storage, processing and marketing was an especially striking omission in a programme that aimed to decrease poverty through producing a surplus for the market. It is also remarkable in view of the fact that the importance of factors such as storage, milling and marketing was highlighted by people in the villages, MFPP mentors, NGOs and Department of Agriculture officials, as well as in previous studies (e.g. Andrew and Fox, 2004). This failure of MFPP was acknowledged by AsgiSA EC, which decided to govern the marketing process in the villages. However, in our study village, this was not done during the first two years of the project.

The value of using expensive seed technology in the smallholder context can also be questioned, especially considering that the full potential of the technology was often not

realised. In one year Roundup Ready® maize seeds (GM seeds resistant to the broad spectrum weed killer Roundup®) were delivered to the AsgiSA study village, but the chemical was never delivered or applied and thus the investment in the very expensive seed was unnecessary. In the MFPP village, smallholders were using insect-resistant GM seeds without being aware of it or its consequences, e.g. that they should plant so-called refugia around their fields. This is likely to eventually lead to a decrease in the effectiveness of the seed as insects develop resistance.

Local consultation and information regarding the projects were also highly problematic. In the village targeted by AsgiSA EC, there was no community meeting where people could be informed about the project. People were wondering whose fields were going to be ploughed, when the fields would be planted, with what types of seeds, if weeding was going to be done mechanically or not, and whether the harvest would be split between the project and the field owner, and in that case how. While village meetings were held in the MFPP village, the adequacy of the meetings can be questioned, as many smallholders still had similar questions.

Some people in the AsgiSA village did not even know that there was a new project coming to the village: ‘We didn’t hear anything about a new project, we just saw tractors with some new white guys who were not the same guys as before....’ (interview with male field owner, March 2009). Community meetings with a genuine intention to have a dialogue with villagers would not only have cleared up some of this confusion, but would also have given the contractors a chance to adjust their plans to the local context. Instead, contractors showed up in the village, only to notice that most of the fields were located on the other side of a river that could be crossed by cattle but not by tractors, leading a local to make the comment ‘but

tractor's can't fly...' at a community meeting. There was not only a lack of understanding of local contexts, but also an apparent lack of willingness to acknowledge that such an understanding could be useful, thus neglecting potential in local knowledge processes, as well as local initiative capacity and creativity. This attitude relates to the wider discourse within which the programmes were designed, as discussed in the final section of this analysis.

#### **D. South African agricultural interventions in a global neoliberal discourse context**

The African National Congress (ANC) won the first democratic elections in South Africa in 1994 with their Reconstruction and Development Programme (RDP), which focused on returning land to previously disadvantaged (mainly rural) people (Kepe, 2001). However, already during negotiations concerning the formation of the new government, the ANC largely abandoned its original visions for an essentially standard neoliberal economic programme (Adam Habib and Vishnu Padayachee, 2000). Strong capital forces within and outside the country were important for this change. As the ANC had the majority of votes but not the majority of economically powerful actors behind them, the party felt pressured to meet the demands of these actors (Tony Binns and Etienne L. Nel, 1999; Peet, 2002; Gran, 2009). Habib and Padayachee (2000) show that the negotiations resulted in the ANC putting even more emphasis on creating an enabling environment for foreign capital than dictated by the Washington Consensus. This rather drastic change in policy was made without the force of conditionality and has been argued to show the full strength of a hegemonic neoliberal discourse at work (Habib and Padayachee, 2000; Peet, 2002). Following this neoliberal reframing of development, the RDP was quickly abandoned for GEAR (Growth, Employment and Redistribution), launched in 1996 (Kepe, 2001). This was later replaced by AsgiSA, the Accelerated and Shared Growth Initiative of South Africa, launched in 2006, i.e.

‘redistribution’ was replaced step-wise by ‘growth’. Since this initial change, South Africa has kept to neoliberal policy – in a 2009 survey, the IMF stressed that South Africa had been ‘prudent and successful’ in its macroeconomic policies, but urged for even more structural reforms to ‘remove barriers to growth’ (IMF, 2009).

An analysis of documents from AsgiSA and MFPP shows how these neoliberal ideas permeate South African policies from national to regional level, with a strong ‘development equals growth’ rhetoric also present in provincial and programme-specific documents (Office of the Premier, 2004; Provincial Government of the Eastern Cape, 2008; AsgiSA, 2009). For example, the MFPP programme stated that growth in the Eastern Cape Province relies on successful ‘transformation of the rural areas into a productive economic engine’ (ECDA, year unknown), while AsgiSA held that ‘accelerating and sharing growth is essential to improve the lives of all, especially the poor’ (The Presidency, 2007).

Inherent in a hegemonic discourse are forces working against attempts to criticise or undermine it (David Howarth et al., 2000), and exclusion of criticism is indeed a strong element of the neoliberal discourse in South Africa. The most common criticism of the neoliberal discourse is directed at its claims to universality, a concept which is central to the very core of the neoliberal world view (Friman, 2002). Negative effects of lack of contextualisation are therefore downplayed or ignored, many examples of which we encountered in the policy level interviews, where the importance of local contexts were often dismissed. A view of the participation process as a waste of time rather than an important part of design and implementation could often be sensed in the interviews: ‘should we plant or hold meetings?’ (interview with AsgiSA EC’s CEO, October 2010).

There is also a tendency to place responsibility with the rural smallholders for failures in the programmes, instead of questioning the suitability of the project idea. The smallholders are often portrayed either as lazy: ‘[They] could produce two tonnes of maize entirely by hand. Why don’t [they] do it? Because they don’t need to because they’ve got child care grants and pensions and it is easier to buy it’ (interview at the Eastern Cape Department of Agriculture, June 2008) or just unskilled and ‘not driven’: ‘The skilled and the entrepreneur people largely went out [i.e. left the villages], but the unskilled ones and basically the population that didn’t have that opportunity, that didn’t have that drive [stayed], and those are the people we are dealing with.’ (interview at the Eastern Cape Department of Agriculture, June 2008). This tendency to blame poverty on the poor, together with a belief that aid causes dependency and an inclination to see problems in the local culture or the ‘minds of the people’, are all well-documented aspects of a neoliberal discourse (e.g. Peter Dorey, 2010). It is also striking that representatives of a programme that is intended to target the poorest people would be surprised that these people are not particularly skilled or entrepreneurial.

Several frustrated NGOs and implementing agencies mentioned that real evaluations of failed projects were seldom made. Researchers were also frustrated and pointed out that there is no platform for them to communicate research results to government and no resources for project evaluation at universities. There was a feeling among NGOs and researchers that when evaluations are indeed made, there is a tendency to cast the blame for failures on a few easily amendable issues, and launch a new programme based on the same basic principles. People felt that this had been the case when MFPP was evaluated and AsgiSA EC launched: ‘If it doesn’t work, there will be a new sexy programme’ (interview with NGO, November 2009). These NGOs and researchers do usually represent a different discourse that has competing understandings of several central concepts, such as ‘development’. However, the

hegemonic neoliberal discourse undermines and excludes this competing discourse, which is felt by its frustrated representatives.

In contrast to the neoliberal discourse, many researchers, NGOs and even MFPP mentors that we interviewed had an understanding of the social and cultural problems arising in relation to the agricultural projects. They told us about different alternative ideas and small-scale approaches: ‘Communities could engage in small-scale selling of crops. (...) There is a big gap between subsistence and big commercial farms, you can be medium scale, or specialise for the organic market...’ (interview with NGO, November 2009). Other alternatives mentioned were no-till or conservation agriculture, permaculture, live cactus fencing and a focus on vegetable gardens. The fact that these ideas were unable to permeate into project design and implementation shows the strength of the discourse at work.

Our analysis shows that the neoliberal discourse in relation to agricultural development interventions in South Africa is dominant, not to say hegemonic, and that it produces a set frame for what will bring development. It follows that involvement or empowerment of smallholders in the sense of allowing them to question the basic setup of the project is not desirable. Instead, participation is redefined to mean that smallholders should be trained to better agree and cooperate with the existing model – to ‘buy the idea’ (interview at the Department of Agriculture, November 2009). Even if some officials aim for real empowerment, the dominant approach is still to ‘sell’ the project idea to the people rather than ask about and listen to people’s realities and rationality. The Chief in one of our study villages explained:

‘If you want a project to be sustainable, let the people do their own thinking, do the project themselves. Then you *assist* them with whatever you want. But [...

the programs] don't want the people. People [from the programs] are coming telling "and we are doing *this* at *this* time" rather than 'which time is suitable for you?' That is the main problem that we are facing' (interview with Chief, November 2009).

The projects thus ended up doing the opposite to the ideal of true participation – a very top-down imposition of a 'techno-fix' solution with a set rationale. However, the fact that smallholders have not bought the idea wholeheartedly, that they have adapted the intervention to suit their own realities, and that a number of people working in the programmes also have alternative ideas on development shows that challenging discourses exist, even though these are currently being excluded by the neoliberal discourse.

## V. CONCLUSIONS

This transdisciplinary analysis found that agricultural development interventions in South Africa fail because they do not take local social contexts into account, resulting in mismatches with local realities when programmes are implemented. Interventions may have unintended consequences, since the systems in which they intervene are complex, and they meet with resistance since they have not been formulated in a participatory manner to fit local contexts. The power-differentials between project designers and smallholders shown by the emergy analysis are so large that true participation by smallholders is a challenge to achieve. The neoliberal discourse that governs development thinking in South Africa and globally further disables participation since it downplays the importance of understanding local contexts. The local resistance that the projects have met has consequently often been interpreted as local inability or laziness.



The view of current smallholder agriculture in South Africa is that it is inefficient, an assessment based on its significantly lower yield/hectare compared with commercial agriculture. However, the neoliberal definition of a productive and efficient agricultural system overlooks the absolute dependency of industrialised agriculture on finite resources that have been accumulated over time and space elsewhere. In contrast, smallholder agricultural systems are largely based on local, renewable, resources (visualised in Figure 2). Taking into account the true cost of inputs, smallholder agriculture is therefore much more efficient than portrayed by the neoliberal view of current agricultural development programmes.

The view of efficiency in intervention programmes also misses the whole point of smallholder farming, which is more efficient when assessed with consideration to the limitations existing in the local context. Smallholder use of gardens and fields is a strategy to improve household food security, i.e. to maximise food output yields in relation to the scarce money and labour available, instead of maximising yields per unit area using purchased inputs and borrowed money. This aspect was not acknowledged by the intervention programmes studied here.

The theoretical approaches combined in this study complemented each other well and helped identify complex local realities and the reasons for the problematic mismatch between smallholder agricultural systems and techno-fix type agricultural interventions developed for fundamentally different agricultural systems and social contexts. Systems analysis confirmed the conclusions from livelihoods and discourse analysis showing that the local level is so far removed from the level at which the projects are designed, institutionally and in terms of

transformity and power, that feedback loops from the village level are destined to be weak and powerless.

The knowledge generated through this non-reductionist transdisciplinary approach is complex and integrated, reflecting a reality with similar characteristics. We want to highlight that this complexity needs to be taken into account if sustainable solutions to improving local livelihoods and reduce rural poverty are to be found. To do this, the decontextualised neoliberal framework and the simplistic economic models that have guided so many previous interventions must be abandoned.

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<sup>1</sup> The 'homelands' of the apartheid era were a continuation of colonial policies of marginalising the African majority population. The homelands to which the majority population was forced to relocate



comprised only 13 per cent of the area of South Africa, resulting in environmental, social and economic problems that have not been erased since democracy.

<sup>2</sup> This description is a simplification and indicates the most common situation. Gardens are not included in agricultural interventions