Cotton, Rice & Water

The Transformation of Agrarian Relations, Irrigation Technology and Water Distribution in Khorezm, Uzbekistan

Inaugural-Dissertation
zur
Erlangung der Doktorwürde
der
Philosophischen Fakultät

der

Rheinischen Friedrich-Wilhelms-Universität

zu Bonn

vorgelegt von

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aus

Wageningen, Die Niederlande

Bonn, 2008

Gedruckt mit Genehmigung der Philosophischen Fakultät der Rheinischen Friedrich-Wilhelms-Universität Bonn

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Tag der mündlichen Prüfung: 02.06.2008

Diese Dissertation ist auf dem Hochschulschriftenserver der ULB Bonn
http://hss.ulb.uni-bonn.de/diss_online elektronisch publiziert.

Abstract

This study is about the organisation of agricultural production and the distribution of water for agriculture in the post-soviet context of a slowly reforming authoritarian regime. The study is based on 12 months of field research conducted between February 2005 and October 2006 in the irrigation and drainage network of Khorezm province, Uzbekistan. Four WUAs were selected as case studies. The concrete methods deployed for the fieldwork were (1) direct observations of objects, events, procedures, and social interactions; (2) semi- and non-structured interviews with key informants; and (3) a household survey.

The studied situation is characterised by reforms that echo the sound of privatisation and neo-liberal reform, while in practice central planning and state control have shown to be persistent, though not unchanging. By moving from collective farming to household-based *fermer* enterprises, for the individual risks and benefits in agricultural production have increased. The logics of agricultural production are further discussed along the lines of the three *forms of production* that were distinguished in this study. They are the state-ordered form of production (of cotton and wheat), the commercial form of production (of mainly rice and fodder) and the household form of production (of a variety of food products for home consumption). Each form of production has its specific form of organisation of inputs, labour, state control, distribution of benefits, and marketing.

The main question addressed in this study is how the implemented land and water reforms affect the distribution of water. In Khorezm water is relatively abundant available, which eases the task of water distribution. In combination with a historic trajectory of collective agriculture and the continuation of a restrictive political regime this created a situation in which social dynamics between water users are not strongly articulated. The three *forms of production* each have their own 'logic' as regards water management; for state-ordered cotton *fermers* call on the state organisations, for commercial rice *fermers* depend on their personal connections, and for household production water uses are small and informal. The household production water users are politically 'untouchable' in a way as household production provides for the basic livelihood security of the majority of the rural population.

The Uzbek government has top-down established WUAs in place of the former collective farms. Formally they are user-managed organisations, but in practice they are strictly controlled by the state. Among other things the WUAs fulfil important roles in the implementation of (state) control over water distribution and agricultural production. Farmers strategise in different ways to secure their access to water, in which they makes use of their socio-political status and ties and of the spatial and technological situation of the field.

The way the irrigation system has been designed and constructed during the period of the USSR expresses the existence of unquestioned centralised managerial control and singularity of purpose, allowing a fully pragmatic and instrumental approach to layout and hydraulic design. The strict state control over cropping patterns and agricultural practices at field level, combined with authoritarian control of society and minimal personal interests in increased water use, and an abundance of water created a situation in which there was no need for irrigation technology that restricted water use. In the context of increased dynamics over water distribution at the WUA level, the role of technology is gaining in importance, not only in the dynamics between farmers, but also in that between the state on the one hand and farmers on the other.

Acknowledgements

There is a large group of people without whom this study would not have been possible. In the first place I think of the people of Khorezm that participated in my research; one-time-respondents to my survey, farmers and other key informants, neighbours. Khorezmians are proud people, friendly and incredibly hospitable. Many were helpful yet careful with what they would say, aware that what they would tell me could once be used against them. Some of them were courageous in their openness. Some of them became friends and yet there were things we could not talk about. Sometimes I asked questions that I maybe should not have asked. I have seen a little bit of what it means to live in fear and isolation.
I thank them for showing and telling me what they could, despite everything. *Khuda hahlasa* what they contributed to this study will eventually help to improve Khorezmian agriculture and water management.

This study has been conducted as part of the ZEF/BMBF/UNESCO project "Economic and Ecological Restructuring of Land and Water Use in Khorezm", funded by the German Federal Ministry of Education and Research (Project Number 0339970A). I am thankful for the support that I received in many respects. The dedication of Liliana Sin at the Urgench office should be mentioned by name – she is irreplaceable! Both Christopher Martius and John Lamers are exceptionally dedicated to the project and have invested time and effort beyond measure.
The daily interactions with colleagues from other disciplines, both during fieldwork and the weekly project meetings in Bonn, has been challenging and rewarding.
I especially want to thank Caleb Wall, Tommaso Trevisani, Ihthiyor Bobojanov, and Margaret Shanafield for their friendship and inspiration in Yangiarik, Urgench and beyond.
I thank Rahul Pillai and Arjen Zegwaard for conducting their field research within the frame of my study. First their questions and later their own fieldwork experiences were for me a source of new thoughts and ideas.
In Hikmat and Guzal I found two dedicated translators. I am grateful to Guzal for excellent translations, which were especially good due to her intuitive understanding of human interaction.
I am very thankful to Artur for driving me – he was always there when I needed him, reliable and trustworthy. His frequent unexpected laughs and simple yet unexplainable humour kept me sane in moments of despair.
Far away from home Bimat and his big family offered me a new home, for which I am incredibly thankful. They will always be in my heart.

I feel that I have been very privileged with my team of supervisors. Peter Mollinga was dedicated in his 'daily supervision' of my research project. He was always quick to read my drafts and gave excellent comments, full of suggestions of how to move forward. During the fieldwork period he visited me more than once and we spent several days together in the field. His ability to combine high (moral and academic) standards with optimism and pragmatism has been (and will continue to be) a source of inspiration.
As a co-supervisor Max Spoor has given more than I could have asked. I am pleased to have been able to benefit from his thorough knowledge on transition processes in general and developments in Uzbekistan in particular are exceptional and proved very helpful in

supervision of the work. His effectiveness in work and his strong orientation towards outputs are admirable. I am also grateful for his warm personal support and coaching.
Prof. Solvay Gerke has been supportive of my research project whenever needed and in every possible way, from the beginning till the end.

The Center for Development Research (ZEF) provided an excellent working environment which I gratefully made use of when in Urgench and Bonn. I am also thankful to the Institute of Social Studies (ISS) in The Hague and its Centre for the Study of Transition and Development (CESTRAD) for providing office space close to my home during the period of writing this thesis. After moving from The Hague to Wageningen I could use office space provided by the Rural Sociology Group at Wageningen University. I thank Dr. Bettina Bock and Prof. dr. Han Wiskerke for this opportunity.

Tommaso and Caleb generously shared with me their living space when I was in Bonn. Charlotte van der Schaaf and Bernd Kuzmits were always there. They were the ones who made me familiar with Bonn and ZEF when I first arrived and during the final year of writing frequently welcomed me in their flat as a guest and housemate.

Frau Zabel has taken care of numerous bureaucratic arrangements in a way that is admirable. I am indebted to Jenny Pannenbecker for her last minute translation of the German summary.

Finally I want to thank family and friends for showing me that there is life outside and life after the PhD. I am thankful that both my parents and parents-in-law came to visit me in Uzbekistan and thus became part of my experiences there.
Without the help of my *khatonem*, Nynke, I would not have been able to keep to my strict schedules. She is a continuous source of inspiration and encouragement. Spending considerable periods of time with me in Uzbekistan she made life more pleasant and helped to integrate two worlds that were sometimes far apart.

Katta rahmat!

Gert Jan Veldwisch

Bonn/Den Haag/Wageningen, December 2007

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Glossary of terms

AgroProm	Department of Agriculture (old name, but still used in colloquial speech)
Aparatjik	Member of the Communist Party
Arrienda	Rent (Russian)
Bil	Shovel (Uzbek)
Bog'	Garden (Uzbek)
Brigade	Formerly a labour/production unit within the Kolkhoz, later it referred more to the area managed by one *brigadir*; typically 150-200 ha
Brigadir	Manager of a brigade
Chikirchi-Angarik WUA	One of the case study WUAs in this research
Dekhan	Smallholder, peasant
Dekhanchilik	Arable farming
Fermer	Farmer with long term lease of land
Hokim	Governor, both at district and provincial level (Uzbek)
Hokimiyat	Goverrnor's office (Uzbek)
Ijara	Rent(al) land (Uzbek)
Karmish WUA	One of the case study WUAs in this research
Ketmon	Hoe (Uzbek)
Khorezm	Province in which this research is conducted
Kishlak	Village (Uzbek)
Kolkhoz	Collective farm enterprise (Russian)
Kolkhoznik	Worker of the kolkhoz
Ko'sumcha tamorka	Distant household plot (literally: additional plot; Uzbek)
Madir-Yap WUA	One of the case study WUAs in this research
Mahalla	Neighbourhood organisation (Uzbek)
Mirab	Water managers at the village level
Nasos Stantsiya	Pump organisation (literally: pump station; Russian)
Nomenklatura	Soviet ruling elites, literally 'the named' (Russian)
Oblast	Province, region (Russian)
OblVodHoz	Water Department at provincial level (old name, but still used in colloquial speech)
Oylik	Monthly wage
Pudrat	Worker on 1-2 ha of cotton on sharecropping-like basis with obligations to the (old) collective farm or (new) fermer (literally: contract(or); from Russian)
Raís	Head, chief, chairman; usually used for the head of the Kolkhoz, but also of the MTP and the WUA (Uzbek)
Rayon	District (Russian)
RayVodHoz	Water Department at district level (old name, but still used in colloquial speech)
Salma	Irrigation ditch (Khorezmian dialect)
Shirkat	Post-independence collective/cooperative farm (literally: cooperative, society, association; Uzbek)
Shora	Administration office at the level of the former LFE

Soum	The national currency of Uzbekistan (during the fieldwork 1US$ was approximately 1000 soum)
Sovkhoz	Soviet state farm
Tagalak-Yap WUA	One of the case study WUAs in this research
Tamorka	Household plot (literally: plot; Uzbek)
Tashkent	Capital of Uzbekistan
Tezim	Irrigation System Authority (literally: system; Uzbek)
Tuman	District (Uzbek)
Urgench	Provincial capital of Khorezm
Viloyat	Province, region (Uzbek)
Zaruzenya	Division structure (literally: construction; Russian)

Acronyms

ADB	Asian Development Bank
ANT	Actor Network Theory
BUIS	Basin Department of Irrigation Systems
BVO	Basin Management Organisations (*Basseynoe Vodnoe Ob'edinenie*)
CEE	Central and Eastern Europe
CIS	Commonwealth of Independent States
CPSU	Communist Party
ET	Evapotranspiration
HRW	Human Rights Watch
ICG	International Crisis Group
ICWC	Interstate Commission for Water Coordination
IMF	International Monetary Fund
IWMI	International Water Management Institute
LFE	Large Farm Enterprise
MCM	Main Canal Management
MMT	Mixed Method Triangulation
MTP	Motor Tractor Park
SCOT	construction of technology
SU	Soviet Union
TATE	Technological-Administrative Task Environment
UIS	Irrigation System Authority (= *Tezim*)
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UPRADIK	Administration of Amu Darya Delta Irrigation Canals (*Upravlenie Amu Darinsky Irrigatinonich Kanalov*)
WUA	Water Users Association
ZEF	Zentrum für Entwicklungsforschung (Center for Development Research)

Chapter 1

Introduction and Conceptual Framework

1.1. Introduction

Soviet planners consciously sacrificed the water of the Aral Sea for developing irrigated agriculture in the upstream areas of the Amu Darya and Syr Darya basins (Micklin, 1985; Zonn, 1999; Peachey, 2004). As a result the Aral Sea has been shrinking drastically at least since the 1960s, but (internationally) the alarm bells only started ringing in the late 1980s (Micklin, 1988). The diversion of this water has led to many adverse effects; the loss of fisheries and wildlife, frequent dust storms in the region causing respiratory and other diseases, and climatic change (colder winters, hotter summers and a shorter frost free period) (Glantz, 1999). Restoring the Aral Sea seems highly unlikely, and, even if restored, most of the caused damage will not be reversed. Now, if the diversion of irrigation water has caused and still causes so many negative effects that can not be undone, at least the water that is still being diverted is better used for good purposes.

The irrigation water used in Khorezm Province, Uzbekistan (see figure 1.1) is diverted from the Amu Darya, a few hundred kilometres upstream of the outflow into the Aral Sea. A large number of households make a living out of this. On satellite images Khorezm shows as a green spot in the desert, thanks to the Amu Darya, or Aral Sea, water. This study looks at water distribution processes between farmers and the state in Khorezm Province, Uzbekistan. The context is that of a slowly reforming authoritarian post-soviet regime. It is about continuity and change[1] in the Khorezmian agrarian structure. The politics of state control show continuity, while institutional arrangement of agricultural production are changing, i.e. 'private farmers' (*fermers*) and Water Users Associations (WUAs) have been established. These reforms lead to new dynamics in distribution of water and to new patterns of water use. Water distribution is strongly integrated with the organization of agricultural production and the two are studied together.

After the collapse of the USSR and Uzbekistan's independence, the country's government has been looking for new organizational forms for agricultural production. The individualization of farming through the formation of *fermer* enterprises, in combination with continuing state control of agricultural production, has led to changing demands on the irrigation system. Next to the production of cotton (under state control), which since long has consumed a lot of water, the production of rice (for private cash) and household production (for subsistence) have become consumers of large amounts of water.

The relation between cotton and rice production perfectly reflects the relation between emerging forms of private production and state controlled production. The study of water distribution processes provides a good entrance to studying this relation, as cotton and rice have very different and often conflicting water management requirements and different (private vs state) benefits. The state control over water distribution is firmly embedded in a set of control mechanisms that is wider than control over water in the strict technical sense. Without understanding the control mechanisms, the dynamics over water cannot be understood.

The irrigation technology in place reflects the state socialist way of production and has changed little to adapt to the gradually changing institutional situation. This complicates the distribution of water and the development of new water management institutions.

[1] This conceptualisation is based on Jones Luong (2002).

The main research question answered in this study is as follows:

> How is the network of relations around agricultural production and the distribution of water between rural workers, *fermers*, WUA managers, State actors and irrigation technologies changing in response to the recent and ongoing land and water reforms in Khorezm, Uzbekistan?

1.2. The frame of this study

The research has been conducted within the scope of three-party agreement between the German Ministry of Education represented by the Centre for Development Research (ZEF), the United Nations Educational, Scientific and Cultural Organisation (UNESCO), and the Givernment of Uzbekistan represented by the Ministry of Agriculture and Water Resources (MAWR). The project developed under this agreement is entitled "Economic and ecological restructuring of land and water use in Khorezm". The project started its work in 2001, and aims at increasing the efficiency of human and natural resource use in the Khorezm region (Vlek at al., 2001). In line with ZEF's objectives the project has explicitly adopted an integrated, multidisciplinary approach. This study is the main output of one of the modules within this project. The module has been organised as a PhD research within ZEF's Department of Political and Cultural Change. As such it builds on earlier project modules within the social sciences component (Wall, 2006; Zavgordnyaya, 2006; Trevisani, forthcoming 2008). It also aims to build links to the research on water management in the natural science component (e.g. Akramkhanov, 2005; Ibrakhimov, 2005; Forkutsa, 2006; Conrad, 2006) and the economic component of the project (Mueller, 2006; Bobojanov, forthcoming).

The research included 12 months of field research that was conducted in five periods between February 2005 and October 2006. The fieldwork location was the irrigation and drainage network of Khorezm Province (*Oblast/Viloyat*), Uzbekistan (Figure 1.1). Within this area four Water Users Associations (WUAs) were selected as case studies (Figure 1.2). The selection criteria and research methodology are discussed in Chapter 2.

The fieldwork for this study was conducted only in Khorezm Province. The analysis is based on the developments observed there. There will probably be many similarities with situations throughout Uzbekistan, as confirmed by responses of people with experiences in other parts of the country. For me it is not possible to assess what aspects of this study can and what aspects cannot be extrapolated to the rest of the country. Still, the identified mechanisms and processes are sometimes regarded and formulated as 'Uzbekistani developments'. For instance when I discuss how the WUA as a governance model is applied I refer to it as the 'Uzbekistani WUA'. It should be realised that this based on field research in Khorezm. The four WUAs that I studied in detail are possibly not representative for the whole of Uzbekistan, but still they are besides being Khorezmian WUAs, also Uzbekistani WUAs. On aspects where I was aware that the situation in Khorezm is clearly different from large parts of Uzbekistan I explicitly made this clear.

Figure 1.1 – Uzbekistan in Central Asia
Khorezm Province is located in the circle
Source: adapted from www.eurasianet.org/images/central_asia.jpg

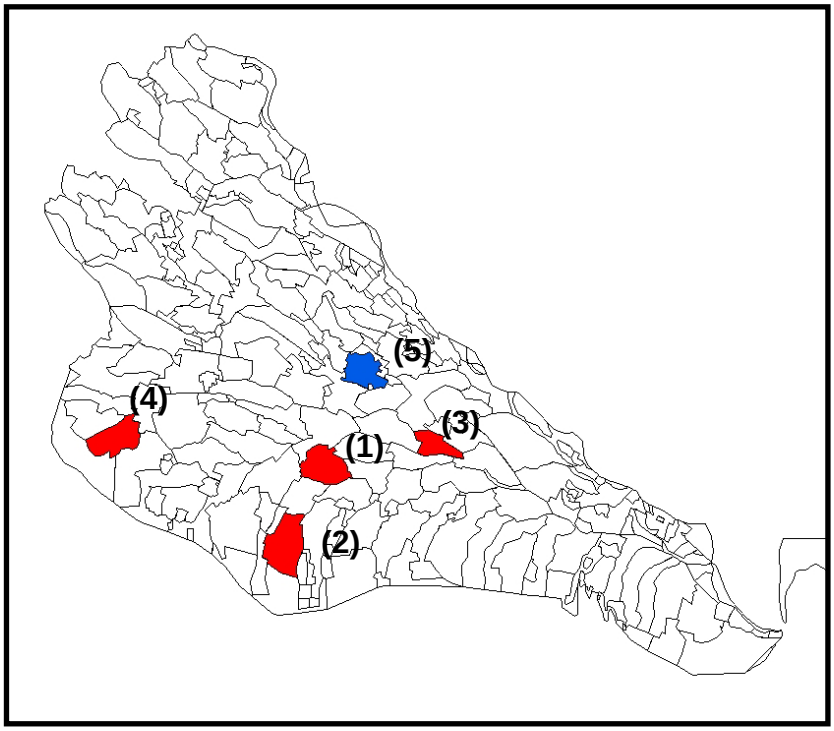

Figure 1.2 – The four case study WUAs and Urgench city in Khorezm Province
(1) Karmish WUA, (2) Chikirchi-Angarik WUA, (3) Madir-Yap WUA, (4) Tagalak-Yap WUA and (5) Urgench city
Source: own compilation from GIS data of the ZEF/UNESCO project

1.3. Conceptual framework

This section provides the conceptual foundation of this study by discussing the state of the art of relevant fields of research and distilling the concepts relevant for analysing the case under scrutiny. Also it can be seen as a description of my basic understanding of how things work, or in grand terms: my world view. It consists of three parts.

(1) Sub-section 1.3.1 is about the Uzbek state in transition, i.e. a broad discussion on the meaning of what is transition, the essence of state socialism and the trajectories of countries moving away from it. This transition process is both political and economic. Here the interest is in developing a useful set of concepts to interpret the Uzbek development model. This systematic application is done Chapter 3, but in all chapters that follow the topic of transition comes back.

(2) The second debate that I engage with is that of the organization of agriculture (and irrigation). Two theories are discussed; the labour process approach and the theory of the technological-administrative task environment (TATE). These are then applied to agriculture in transition. The debate is further operationalised at the start of Chapter 4 and elaborated into a model for understanding the agricultural production in Khorezm. The subsequent chapters all build on that understanding.

(3) In the third and last subsection (1.3.3) the subject of the socio-technical nature of irrigation and technology is addressed. It consists of the discussion of the technology debate, the elaboration of an interdisciplinary framework for the analysis of irrigation management, and the discussion of the theory of access. Chapters 5 to 7 all address issues within this.

1.3.1. Transition and transformation

Since the forced independence at the collapse of the Soviet Union Uzbekistan has been in a process of change from state socialism into something else. Analytically this process of transition can be split into a political and an economic process, which are however closely related. The usual term for this change process, 'transition', does not reveal much. The real question is to what kind of transformations of political and economic relations this leads. In many countries for years there has been only limited change, i.e. transition of terminology without transformation of social relations of production.

In this section first it is explored what the state socialist development model actually entailed, i.e. the initial conditions are determined. The changes since independence are analysed in separate sections on political and economic change. It seeks to characterise the Uzbek governance model and identifies in what ways it differs from the Soviet model. The section about economic change elaborates the different aspects of economic reform and the nature of a transition economy.

The regulation approach

Before turning to the defining of transition, I first look at the situation of departure, the socialist 'development model', a concept that stems from 'regulation theory' or the 'regulation approach' (RA). The RA is a set of approaches and ideas that emerged from Marxist studies on the development of capitalism (Jessop, 1990; 1995; 2001; MacLeod,

1997). There are three central concepts in the RA; 'accumulation regime', 'mode of regulation', and 'model of development'. An accumulation regime is "a complementary pattern of production and consumption that is reproducible over a long period" (Jesop, 2001:8). It mainly concerns the macro-economy. An accumulation regime is stabilised by a mode of regulation, which is "an emergent ensemble of norms, institutions, organisational forms, social networks, and patterns of conduct" (ibid.). When an accumulation regime and a mode of regulation for a long time constitute a stable situation this can be called a model of development. This is "a holistic concept that attempts to depict the economy in its most inclusive or integral sense" (ibid.). Added to these three concepts could be the 'labour process model' or the 'industrial paradigm'. This defines how labour is divided, both technically and socially. One example of such a paradigm is mass production.

The way in which the economy and production were organised in the USSR can be characterised as a 'state socialist development model'. It consisted of four essential elements.

> (1) Its *predominantly extensive* regime of accumulation;
> (2) Its bureaucratic mode of regulation based on central planning;
> (3) Its labour process model based on '*bureaucratic despotism*' and '*authoritarian paternalism*'; and
> (4) Its hegemonic bloc based on the *Communist Party hegemony* over political, social and cultural life to stabilize and protect the state socialist development model.
>
> (Pavlinek, 2003:103; italics in original)

The extensiveness of the accumulation regime lies mainly in the extensive ways in which production increase was sought, i.e. through a longer work day, expanding the size of the labour force and organisational transformations (ibid.). Furthermore it is characterised by a situation of labour surplus that is anyhow put to work (Burawoy, 1990:164). One of the articulations of authoritarian paternalism lies in the use of soft budget constraints, i.e. inputs and outputs are negotiable and enterprises cannot go bankrupt as arrangements will be taken to make sure that they can continue (Kornai at al., 2003). The stability of development model was aided by the glue of a communist ideology taking shape in a political party with strong hegemonic tendencies.

The nature of the socialist system comes out even clearer in comparison with the capitalist system. In figure 1.3 this comparison is made by Kornai (2000). The characteristics mentioned in the boxes 1 to 3 are the ones that determine the nature of the system, while those in boxes 4 and 5 are more the expressions and effects of the former.

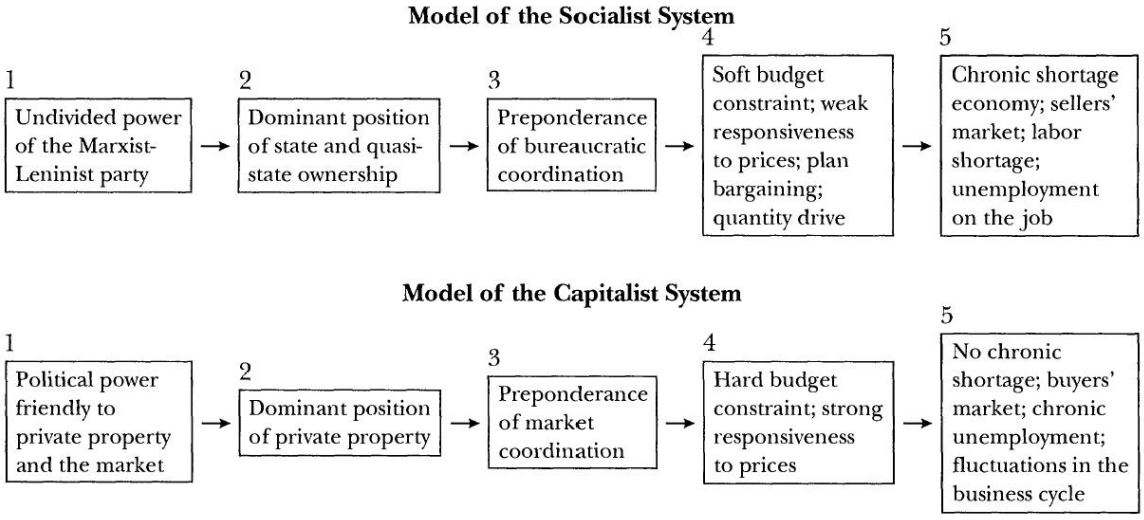

Figure 1.3 – Model of the Socialist and Capitalist Systems (Kornai, 2000)

The collapse of the state socialist development model has required a new political as well as a new economic order, which to different degrees indeed emerged in the former states of the USSR.

Political change

Even though the collapse of the Soviet Union created the potential for radical change in most of the Central Asian republics a change of ideology or "framing" took place, and not so much a change of the governance patterns. The leaders of the Central Asian states have not rejected, but rather strategically incorporated many of the mechanisms of the Soviet governance model. After all, the ruling elites came to power through the Soviet system and, with exception of the Kyrgyz leader Akaev, had opposed Gorbachev's efforts to reform and welcomed the reactionary coup attempted in August 1991 (Merry, 2004:31).

The Central Asian states can be characterised as 'hyper-stable'. In 2004 the only successor states of the former socialist block not to have changed regime once were all Central Asian states. In Kazkhstan and Uzbekistan still there has not been any regime change.

Jones Luong (2004) argues that the totalitarian state model has often been fit too easily on the Central Asian states. She especially opposes the typical dichotomization into 'state' and 'society', which either suggests complete social control or a suppressed 'traditional' society. The Soviet regime purposefully blurred the boundaries between and state and society; there was no separate sphere of the development of ideas or expectations, political and economic elites were the same and the distinction between public and private property was blurred. As a result the collapse of the Soviet regime could also not be celebrated as liberation from oppression, as was the case with the independence of colonial states, but rather the collapse was experienced as an internal crisis (Merry, 2004:31). The blurred boundary between state and society still plays an important role, especially because state officials usually have multiple roles in society (next to their official job they are for instance also *fermer*, prominent villager, and political party member). When they act it is not clear in what capacity they do that. Similarly, all businessmen are people that have a role in the political or state hierarchy too.

Part of the Soviet legacy are strong regionally based patronage networks. In the post-independence period regionalism has only become stronger. The power shifts between regional and central elites are directly related to the change in access to, and control over material resources, like land and water (Ilkhamov, 2004; Jones Luong, 2004). What Burawoy (2001) describes for post-Soviet Russia, is recognisable in Uzbekistan too "Regional taxes are often paid in kind so that the government recreates its own clearing house, a centre for the redistribution of resources, what one might call a return to a rudimentary and hidden planning system".

Uzbekistan inherited the mechanisms of a modern authoritarian police state from the USSR. Since independence Uzbekistan has used the existing structures and institutions to control developments in the country at various levels. For instance the creation of knowledge and its management (Wall, 2006) and the development and implementation of policies are firmly controlled by the state. The latter is clearly observable in the management of land and water (Zavgorodnyaya, 2006; Yalcin and Mollinga 2007a and b; Trevisani, 2007a; 2007b; forthcoming 2008).

All Central Asian states have created institutions that make them (at least on paper) constitutional democracies. In practice however governance is of a personalised and hierarchical nature – the position in the hierarchy is more important than the formalised rules and procedures on who decides what. Typically a regional governor can interfere in issues that actually fall under the jurisdiction of the branch offices of ministries. The regional governors are directly appointed by the president and thus generally stand higher in the hierarchy.

Soft budget constraints are used for keeping financial pressure on and control over businesses as well as state organisations. A similar sort of mechanism exists in the enforcing of rules, which is done seemingly arbitrarily; certain rules apply for some but not for others. There are so many and such strict rules that it is hardly possibly to operate fully legal. Whether this situation is used against a person depends on personal criteria rather than the rule of law. This creates relations of fear and forced loyalty.

Merry (2004) likens the Central Asian model of governance to what in Africa is called the "Big Man" regime type.

> Such regimes do not distinguish public from private wealth, transforming corruption from a form of social deviance into effective state policy. These regimes maintain political control by strictly limiting participation in the political process; by extending state authority over a wide range of civil institutions, including business, labor unions, organized religion and the media.
>
> Merry (2004:30)

We can call this type of statehood neo-patrimonial, after the concept of patrimonialism that was developed by Max Weber to describe a (feudal) system of personal rule in which the ruler dispenses offices and benefits to subordinates in return for loyalty, support and services (Weber, [1914] 1978:1031 in Ikpe, 2000). He discerned five characteristics of a patrimonial state:

1. The government is based on a personal ruler;
2. There is lack of separation between the public and private realms for state officials;
3. Political offices are regarded as fiefdoms and patronage by state officials;

4. The system operates primarily through numerous patron-client networks; and
5. The exercise of public authority is utilized to serve the rulers and officials on which the offices are bestowed.

Thus, post-Soviet Uzbekistan can be characterised as a neo-patrimonial state with an authoritarian regime and strong patterns of regionalism.

Economic change

Gorbachev in his speech to industrial executives in December 1990: 'property relations are the core of radical economic reform. It was necessary to awaken people's interest, to give them some motivation for increasing production … There is no other way. Therefore, by the way, planning had to be relaxed in order to give enterprises oxygen and economic freedom … Once there are owners, there must also be space in which they can operate … a market.' (cited in Clarke, 1992). This speech, which was given following a period of increasing internal pressure for economic reform in the USSR, was the starting shot for such reform. What followed was the hasty dismantling of the state socialist command economic system, and the collapse of the Soviet Union about a year after this speech was given.

Objects of change

The quote from Gorbachev's speech shows that right from the beginning of the FSU's economic reforms these aimed at changing property relations (i.e. the introduction of private property) and the introduction of markets as a regulatory system.

The reform of command economies does not automatically lead to modern style capitalism. Reforms can be partial and are usually mixed with patterns of the past. Transformation processes are strongly influenced by the past, i.e. existing patterns of organisation and behaviour are not suddenly changed (Pavlinek, 2003). Burawoy (2001) shows this for Russia's development. He discusses how the transition to a market economy in Russia is not accompanied by a transformation similar to that of England's *Great Transformation*[2], which is often considered to be the origin of modern capitalism. According to Burawoy (ibid.) there is transition to a market without the wider societal transformation that characterised the developments in 19th century England. The transformation of how production is organised is limited, there is a lack of the rise of a vibrant society and regional and informal systems remain important to the cost of the national system.

In a study on transitions in agriculture in Central and Eastern Europe (CEE), East Asia (China and Vietnam) and the Commonwealth of Independent States (CIS), Swinnen and Rozelle (2006) identify three main areas of economic reform that underlie agricultural transition; (1) shifts in price and subsidy policies, (2) property rights reforms and farm restructuring, and (3) market liberalisation. These areas of reform have been approached differently by the former state socialist states; reforms were different in form, combination and sequence. The dilemma in reforming centrally planned economies boiled down to 'shock therapy' versus guided (or 'gradualist') reform strategies (Ho and Spoor, 2006:580).

In comparison with the CEE and East Asian countries the CIS countries generally stand out as slow reformers. Shifts in price and subsidies in the CIS countries involved the reduction of subsidies on inputs and the lowering of output prices that had been artificially kept high. With regard to property right reforms and farm restructuring most CIS countries

[2] With reference to Karl Polanyi's seminal work *The Great Transformation: The Political and Economic Origins of Our Time*, 1944.

took a gradual approach[3]. As a first step state farms were transformed into collectives, which in a second step were supposed to be given to individuals. The latter step was often not taken and people only received "paper shares" that did not establish a direct link between the individual and a specific land plot. Regarding market liberalisation and the establishment of market institutions the CIS countries were also slow to start (especially in comparison to the CEE countries), but since the late 1990s change in some countries has picked up (Rozelle and Swinnen, 2004).

Could the CIS region be characterised as generally slow in adopting reforms, within that group of states Uzbekistan can be characterised as a particularly slow reformer (Pomfret 1999 and 2000; Spoor and Visser, 2001; Bloch, 2002; Auty, 2003; Gleason, 2004). Yet on economic performance Uzbekistan scored very well in comparison to the other CIS countries (Spoor and Visser, 2001; Ho and Spoor, 2006). In agriculture country-wide privatisation of land only took off in 2005, and then only partially (Trevisani, 2007a; 2007b; forthcoming 2008), the centralised planning remained largely intact, and prices remained heavily controlled (Macours and Swinnen, 2004).

The studies discussed above are mainly about economic measures underpinning transition of the economy. However, it would be naively simplistic to think that the introduction of markets and private property would by itself lead to the transition from state socialist economies to modern capitalist economies. Pavlinek (2003:87) correctly noticed that at the start of reforms many individuals, communities and even entire regions were locked in the pre-existing system of state socialist social and economic relations. "As a result, the state socialist social practices and attitudes were mixed with the post socialist present to create a hybrid that represented neither state socialism nor capitalism".

Diversities in the transition economy

This gradual change process has led to an economic situation that is atypical and reflects characteristics of both market and plan economies. For both the Soviet Union and post-Soviet states often a dual economy model is proposed as a framework of analysis. The economy is perceived to be separated in a state and household sector, or a formal and a black economy that is sometimes also referred to as a first and second economy.

Ilkhamov (2000 in Rasanayagam, 2002) for instance proposes to understand Uzbekistan through a dual economy model that is made up of a command-type economy aiming at export, which is controlled by central government, and a free market economy based on household production. Each sector would be operating according to its own logic while at the same time being interconnected. According to Rasanayagam (2002) even those that employ dual economy models usually recognise the mutual dependent relation between state and household production and that the one cannot do without the other. Of particular transactions it is often impossible to distinguish whether it was part of the formal or the informal economy, as they are only ideal types that do not make up two sectors. They are rather two aspects of one economy (Kotkin, 1995 in Rasanayagam, 2002).

Smith and Stenning (2006) presents a more complete and sophisticated framework to conceptualise the hybrid nature of transition economies. They "argue that capitalist development in postsocialist societies should be seen as one part of a diverse economy, constituted by a host of economic practices articulated with one another in dynamic and complex ways" (ibid., p.190). They pose that in post-socialist economies there are three sorts

[3] Armenia is a notable exception and even among the slowly reforming countries there were notable differences.

of economic practices; those involving market relations, those involving non-market relations and those involving quasi-market relations (see Table 1.1).

Transactions are organized through	**Labour organisation (forms of rewarding)**	**Organisational form/economic model**
Market relations - Traders - Local markets	Wage - Permanent employment - Day labourers	Capitalist - Demand and supply driven price equilibriums
Alternative market relations - Local trading systems - Alternative currencies - Black market	Alternative paid - Cooperative - Self-employed - Indentured	Alternative Capitalist - Environmental ethic - Social ethic
Non-market relations - Barter - Household flows - Gifts	Unpaid - Volunteer - Homework - Family care	Non-Capitalist - Communal - Self-employed - Feudal - Slave

Table 1.1 – A diverse economy
Source: adapted from Smith and Stenning (2006)

The 'model' as proposed by Smith and Stenning does not provide a separate category for rudiments of the socialist plan economy. In the case of Uzbekistan one could therefore add an extra row to the table, which would refer to 'state planning'. Formally this is a non-capitalist form of organisation and it could be brought under that heading. However, its rationale is different from what is understood as non-market relations in the model. This is elaborated in Chapter 4.

In their article Smith and Stenning (ibid., p. 208) conclude that "the market, the non-market and the quasi-market are complexly articulated, not as separate spheres, but […] in plural relationship with one another in the creation and reproduction of diverse economies". With the addition of 'state planning' as a form on its own, the principle is applicable to the analysis of the Uzbek rural economy. In the post-socialist society no longer the factory (or the LFE) is pivotal in production, but rather the household. Households engage in different relations at the same time and thus are a place of integration of the three sorts of practices. Smith and Stenning (ibid.) stress that besides the household there are other spaces of integration. In the case of Uzbekistan these could be recognised in the extended family, the neighbourhood, the village, as well as in the district and in rural-urban connections.

1.3.2. The organisation of agriculture

Agriculture is a production process where land, capital and labour by the use of technology transform natural processes into value-added products. The soviet organisation of (agricultural) production was radically different from that of a capitalist enterprise. Moreover, the soviet (collective) enterprise was not simply an economic institution, but it was the primary unit of soviet society, and the ultimate base of social and political power (Clarke, 1992).

The way in which production is organised can be conceptualised in various ways. In the selection of an appropriate theory the starting point was that it should help to gain insight in the political-economic nature of the process. One of the theories that are deployed in this thesis is the (neo-)Marxist labour process approach that puts the organisation of labour and the relations and forces of production central in the analysis. Another theory offering a relevant conceptual framework is that of the Technological-Administrative Task Environment (in short: TATE), which focuses on how relations external to the farm enterprise, through administrative mechanisms and control over technologies influence the production process.

Both theories, labour process approach and TATE, will be discussed in a sub-section below. In a final subsection these concepts are then applied to transition agriculture in order to point to the major relevant processes at work in the research area.

The labour process approach

Marx (1999/1867) recognised that labour is "a process in which both man and Nature participate, and in which man of his own accord starts, regulates, and controls the material re-actions between himself and Nature". And thus he conceptualises the (agricultural) labour process to consist of three elements: (1) human effort, i.e. work itself, (2) technology ("the instrument of labour") and (3) the objects that are transformed in the process. In the process the objects (or inputs) are transformed into valued end-products, i.e. the process of the production of an added "use-value". As Marx (1999/1867) puts it: "Labour has incorporated itself with its subject: the former is materialised, the latter transformed".

Marx addressed the question to what happens if a person works for somebody else. In capitalism labour-power is sold by the worker, whereas the capitalist (the owner of the means of production) owns the product and thus appropriates the created added value. Typically the product will be sold for a higher price than the costs for the inputs (including labour) and thus the capitalist abstracts surplus value and accumulates capital[4]. Also the Soviet state socialist systems had an organised 'regime of accumulation', which was related to the way in which the labour process was organised.

Tensions will surface between workers and controllers of the production process. In response people develop control systems so as to reduce the conflict. These control systems are the mechanisms utilized to organize work. Edwards (1979, as for instance discussed in Mitchell, 1981 and Garza Toledo 1996) recognised three functions; (1) the direction; (2) the evaluation; and (3) the discipline. In addition he argued that this took shape in three modes of control: (1) direct control in which an owner sought control through direct contact with the production process and the workers; (2) technical control, exercised through machines; and (3) bureaucratic control, exercised through rules, regulations and organisations.

These ideas partly overlapped with Braverman's (1974) systemisation of the functions of the organisation of the labour process in a capitalist form. He argued that there are three main functions: (1) "the separation of hand and brain", division of manual labour and intellectual labour, (2) alienation of worker from the product, the process, and other workers and (3) subordination to capital (including subordination to the instruments of work, i.e. machines).

Burawoy (1985) distinguished between *internal* and *external relations of production* (or as Burawoy refers to them: relations *in* production and relations *of* production). The *internal*

[4] This is very much a simplification of Marx' analysis, which by itself is very abstract. However, Marx' analysis is clearly written and provides for a fundamental understanding of the role of labour in the production process.

relations of production are the relations on the shop floor; the *external* relations are the relations to the market and the wider structures of surplus abstraction. Though exploitation is partly visible on the shop floor, to a large extent "the relations in production are dislocated from the relations of production" (ibid. p.32). And through this "the obscuring and securing of surplus value" (ibid. p.35) is accomplished.
The interactions at the shop floor (or at the agricultural field for that matter) take shape within the structural embedding of the production regime; i.e. labour processes under capitalist production are different from labour processes under state socialist production. However, the labour process is not merely an articulation of the production regime. There is not a capitalist labour process, but rather labour processes in capitalist societies (Burawoy, 1985: 14); relations *in* production also reflect other socio-political and technical realities.

Most of the work on the labour process and production regimes concerns cases under capitalism. The case under scrutiny in this study is agriculture in Uzbekistan in the period of transition from state socialism into something else. Therefore the comparative analysis of factory regimes under capitalism and socialism in 'The Politics of Production: Factory Regimes under Capitalism and Socialism', published by Michael Burawoy in 1985 (Burawoy, 1985), is a welcome exception to the bulk of work. On the state socialist enterprise he analyses (ibid, p.15):

> Instead of the private appropriation and distribution of surplus through a market, the state socialist enterprise faces central appropriation and redistribution. Instead of competition among firms in the pursuit of profit, state socialist firms bargain with central planning agencies.

The organisation of production in Uzbekistan is no longer of this socialist nature, yet there are still clear remnants of the system. Applying the labour process approach to 2005-2006 situations in Uzbekistan, as is done in the remainder of this study, resulted in similar characterisations of this post-socialist form of organisation, which is neither state socialist nor capitalist.

The early work on the labour process approach is all on production in factory regimes. Indeed, in some situations, agricultural production has strong parallels with the organisational patterns of factories, especially centrally planned production in Large Farm Enterprises (LFEs) (Rozelle and Swinnen, 2004) and irrigated agriculture in large-scale irrigation schemes (cf. Diemer, 1990; Bolding, 2004). But even when agriculture is not organised in a specific factory-like way the study of production relations and production forces in agriculture yields valuable insights (cf. Van der Ploeg, 1991; Mollinga, 1998).

At the start of Chapter 3 this conceptualisation is further elaborated and deployed to study different 'forms of production' within one and the same socio-political context, i.e. the 2005-2006 post-Soviet regulations in Khorezm, Uzbekistan. In one and the same agricultural enterprise there are often even three different 'forms of production', each characterised by its own 'forces of production' and 'relations of production'.

Socio-technical regulation and TATE

The notion of the Technological-Administrative Task Environment (TATE) was developed as a concept to analyse the 'strangulating impact of the institutional system surrounding and encapsulating farm holdings' (Benvenuti and Frouws, 1999:212) in the European[5] context

[5] Initially it was applied to the Dutch context.

from the 1950s onward (Benvenuti, 2005). Through a multitude of technological and administrative mechanisms the farm enterprise is connected to a wider environment of institutions. Among these are land controlling institutions, agricultural industries, agricultural input providers, banks, trading organisations, agricultural extension services, government organisations at different levels, labour organisation, etc. (Benvenuti, 1982; Benvenuti and Mommaas, 1985). Historically the concept has mostly been applied to the study of (family) farm enterprises in Europe that step-by-step are bound by state regulations and technological innovations that increase the dependence on the TATE[6]. In this predominant context of application of the concept the TATE strengthens and consolidates specific social production relations (Van der Ploeg, 1991:18-19), and limits the room of manoeuvre for independent decision making by the farmer (Benvenuti and Frouws, 1999:212). The institutions that form a technological-administrative relation with the farm enterprise are various in nature. These institutions constantly renew their advice, prescriptions and demands. In order for the farm enterprise to survive it needs to conform to the logic of the TATE (Benvenuti, 1991:12).

One of the classical examples stems from Dutch dairy farming. Dairy factories started to prescribe that dairy farmers have tanks with a cooling system to keep their milk till it is collected by factory. However, the tank is only economically viable from a certain number of cows. Many farmers had to face the choice: enlarge their enterprise or quit (Benvenuti, 1982). A technological change in the processes of the factory strongly affects the operations in farm enterprises. And thus, inextricably bound up with the analysis using the TATE concept is a socio-political interpretation of technology. Technology is seen as a 'language' for communication between the TATE and the agricultural enterprise. Technology requires a certain environment to function and thus serves as a structuring principle. Moreover people who cannot or do not want to speak the 'language' of the technology are excluded – the ideological dimension of technology (Benvenuti, 1991:21-22). As such the TATE concept operationalises the regulation of agricultural production in a socio-technical or interdisciplinary way. It is especially for this characteristic that I apply the concept to the analysis of post-Soviet Uzbekistan, which is rather different from the context in which the concept was initially developed.

In (post-) Soviet Uzbekistan the TATE has been strongly prescriptive, while the freedom and ability of the farmer/labourer to shape the production process has remained very limited. According to Benvenuti and Frouws (1999) acknowledging the influence of the TATE was not intended to lead to a structuralist approach. Farmers are actors, have agency, i.e. 'the individual actor [has] the capacity to process social experience and to devise ways of coping with life, even under the most extreme forms of coercion' (Long, 2001:16). Agricultural production and farming in the brought sense are shaped by farmers in response to and dialogue with the TATE. Such responses can be as diverse as identification, acceptance, distancing and rejection of various elements of the TATE (Benvenuti and Frouws 1999:217).

The autonomy of the primary agricultural producers is relative to the regulations by private and public institutions. Farm enterprises are 'points of production, within the wider relations of agricultural production' (Whatmore et al., 1987a: 22). In the context of analysing family farms under British capitalism Whatmore et al. (1987a and 1987b) use the concept of *subsumption* 'as a means of examining changing production relations on the farm' (Whatmore

[6] An example of analytic use of the TATE concept in a development context is Hebinck and Van der Ploeg (1997), which deals with changing farming practices of maize growers in Southern and Eastern Africa.

et al., 1987a: 27). In their analysis family farm enterprises step-by-step get subsumed into the wider relations of agricultural production, i.e. both the *external* and the *internal relations of production* are transformed. The internal relations of production are related to (1) the ownership of business capital, (2) the ownership of land rights, (3) business and operational management control, and (4) labour relations. Three typical spheres of external relations of production are (1) technological dependence, (2) credit relations and (3) marketing linkages.

In this study the relations of production of Uzbek farming enterprises are examined. They are not traditional family farms, as in the case of Whatmore et al.; they have been recently established. In Uzbekistan the wider relations of production are also very different from British capitalism[7]. In the first place the state of *subsumption* and the forms this takes are of interest for this study. Secondly it is also studied whether the state of subsumption is changing, i.e. whether farming enterprises are getting more subsumed, or maybe less.

The recent establishment of private (family-based) farm enterprises and the way in which external institutions control agricultural production through administrative and technological means can be interpreted using the concept of *subsumption* and aspects of the TATE approach.

The state socialist organisation of agricultural production

In light of these two analytical approaches to the organisation of agricultural production this sub-sections aims to outline the main changes in the organisation of agriculture in the transition process in the FSU. The principles of the state socialist development model were discussed above. I first elaborate what kind of production regime comes with transition. Burawoy (1985:159-160) concisely explains a few of the main mechanisms in the organisation of central planning:

> [C]apitalist firms face hard budget constraints. Under state socialism the *plan* guides the flow of inputs and outputs of production. The planners represent a class of teleological – that is, purposeful – redistributors whose interest it is to maximize the appropriation of surplus from the direct producers via the firm. A system of *plan bargaining* between the central redistributors and the enterprise determines the *plan targets* and therefore the eventual success or failure of enterprise production. The enterprise, however, does not have to meet stringent financial criteria of efficiency. Instead it faces *soft budget constraints*. Its performance is assessed by redistributors who are in *paternalistic relationship* to the firm.

Central planning was organised through targets that were centrally assigned to enterprises. These were, however, not fixed targets, but they were negotiable. Enterprises did not face hard budget constraints, but soft budget constraints, i.e. enterprises could not go bankrupt as they would be saved by negotiating lower demands and/or the levelling of accounts, which were mere nominal, administrative accounting systems. As a result enterprises depended on the (political) will of their superiors. Hence they kept paternalistic relations with their superiors and they were inclined to follow the orders transmitted through the hierarchy.

[7] This framework of analysis developed by Whatmore et al. (1987a and 1987b) has been applied to a transition context before by Vitunskiene and Buivys (2006). Their case (of Lithuania) is however also thoroughly different from the Uzbekistani case.

Central planning and administrative 'money'

By prohibiting private farming the USSR state socialist ideal favoured large, corporate organizations, which implied that farms were theoretically organized on the same principles as factory enterprises, and that farmers became workers on their land. The state made investments, set planting plans, supplied inputs through planning channels, and remitted profits up through the hierarchical system (Rozelle and Swinnen, 2004: 421). Even the money that served to pay wages and the allocation of labour was arranged centrally (Clarke, 1992: 7).

Also prices were administered centrally by the state. Goods and services were mostly allocated on the basis of quantity targets. The administered prices mostly just served for accounting purposes. The setting of prices was a political process that inherently involved the imposition of taxes on some product and the granting subsidies on others. Thus, prices were attached to products and transfers, and balances were adjusted correspondingly, but balances were only administrative since the 'accounting units' could not be exchanged for cash (Clarke, 1992: 6).

In the CIS nations farming enterprise typically faced low prices for agricultural inputs and relatively high prices for agricultural output (Rozelle and Swinnen, 2004: 418). The situation for Uzbekistan's premier product, cotton, was different: the output price was very low, implying an implicit taxation, even when compared to the subsidies on the input side (Spoor, 1993 and 1998).

Budget constraints and negotiations

Soft budget constraints are inextricably connected to not really being responsible for the results (Clarke, 1992: 9) – at least not through the budget, while of course there are political consequences of not reaching the targets. A recurrent issue in the reforms from a socialist to a market mode of operation is the hardening of budget (Kornai, Maskin and Roland, 2003:1114). This way financial incentives are introduced; both positive incentives (through benefits) and negative incentives (the risk to go bankrupt) (Clarke, 1992: 9).

The allocation of all resources was subject to negotiations, not only between enterprises and the ministry, but also within the enterprise; between the administration and shop chiefs, between shop chiefs and brigade leaders, and even between brigade leaders and individual workers. The negation over allocations were at the heart of an intentional system of surplus appropriation (Clarke, 1992: 8) i.e. the system was based on hierarchical, political control of resources.

Incentives and labour organisation

Principally there were few incentives for farm workers to work hard, as there was neither a big influence on their own income nor on the farms' profitability. Moreover it was difficult to manage agricultural labour as, different from factory production, it was "physically spread over a spatially dispersed area" (Rozelle and Swinnen, 2004: 421). Also the planning system increased worker control over production, as full-time workers, like everything else, were in short supply and it was difficult and counterproductive for managers to get rid of them (Burawoy, 2001). Labour incentives were typically ideologically shaped by heralding the most productive workers with prizes and medals (Wall, 2006b). Besides these official incentives managers sought compromises with workers by providing them benefits based on individual performance, which were informally made available from the surplus generated by the farm. As such some of the surplus was directly ploughed back into the enterprise, but it was

limited to just this as surplus was not used to reinvest in or transform the production process (Burawoy, 2001).

Transforming the organisation of agriculture

By the end of the 1980s the pressure to privatise steadily increased, which initially led to minor reforms, but eventually resulted in the major economic reforms that were initiated in the USSR by Gorbachev in 1991 (Clarke, 1992: 9). Privatisation consists of the *de facto* introduction of control rights and income rights. In most states these were introduced step-by-step and not always in combination with each other. Control rights are about who decides what to plant and what inputs to use, while income rights are about who gets the added value generated in the production process (Rozelle and Swinnen, 2004). Reforms that reduce the importance of central planning affect the distribution of control rights. In some former Soviet-states central planning in agricultural production was suddenly removed, while in others it still plays a significant role for certain crops.

In addition to the reforms in central planning and the privatisation of rights there are two other major dimensions of transitional reform. The first is the adjustment of the artificially regulated price structure of the economy with the aim to bring it closer to that of the rest of the world. Secondly, there is the organisation of free markets and the regulation of those through newly established market institutions. These institutions are typically concerned with ensuring competition, defining and enforcing property rights and contracts, ensuring access to credit and finance, and providing information (Rozelle and Swinnen, 2004: 429).

1.3.3. An interdisciplinary approach to irrigation management

This study adopts an approach to irrigation and irrigation management that can be labelled 'interdisciplinary and socio-technical'. In that respect it joins the rich body of literature that since the 1980s has been produced on this topic, mainly by the Irrigation and Water Engineering (IWE) Chair Group of Wageningen University. The framework can be summarised as in Vincent (1997 and 2001) and Mollinga (1998). The main aspects are the understanding of:

(1) Irrigation as an integrated socio-technical undertaking;
(2) The distribution of water as a socio-political process of contestation over a limited resource that affects socio-economic processes;
(3) Policy as a (socio-political) process;
(4) Agriculture and water management as practices embedded in wider structures;
(5) The access to water as a means for the emancipation of marginalised groups.

Technology is understood as the practical ensemble of knowledge, skills and objects by means of which people pursue particular goals in society. This definition follows Mollinga (1998), with the addition of 'objects'. The definition does not distinguish between techniques that have developed through practical experimenting by users and technological innovations that are based on the application of scientific knowledge. Rather the focus is on people and their objectives in society. Different people have different objectives, based on different understandings of situations, i.e. people have different problem definitions. People

consciously use knowledge, skills and objects to address their 'problems'. This is the essence of a political understanding of the technological process.

In this section the socio-technical nature of technology is first elaborated in general terms and then applied to irrigation. Finally it is discussed how access can be conceptualised in the study of irrigation management.

The socio-technical nature of technology

Williams and Edge (1996) describe the general drive behind the technology debate as to open the 'black box' of technology development, i.e. to expose and analyse both the content of technologies and the process of innovation in order to criticise 'technological determinism'. The underlying objective is 'to emancipate science and technology – to dismantle their privileging as inevitable, or standing outside or above society; and to view them as areas of social activity, subject to social forces and amenable to social analysis' (Williams and Edge, 1996:867). Winner (1986), in addition, argues that such analysis should not reduce everything to the interplay of social forces, but point us back to the things themselves, i.e. the study of technological objects and their characteristics.

The technology debate has resulted in a fundamental critique on the traditional technology-transfer paradigm, which is a 'linear model of technology development: invention-innovation-diffusion as separate stages' (Williams & Edge, 1996:874). Pinch and Bijker (1984: 411) formulated an alternative: 'the developmental process of a technological artefact is described as an alternation of variation and selection'. The implication is a 'multi-directional model' in contrast with the linear model. In reply to a critique by Russell (1986), they further elaborate: 'We think the argument against technological determinism can be made in the most compelling way by considering alternatives which were manifest, and then by attempting to explain why such paths eventually failed' (Pinch & Bijker, 1986:353). Thus, this model leaves room to analyse why a certain path is followed within the multiple directions possible. It is stressed that, in the process, choices are being made (though not necessarily conscious choices), which have implications for society and even more so: they have different implications for different social groups (Williams & Edge, 1996; Winner, 1986). As such technology is not neutral; 'Obviously, the sociocultural and political situation of a social group shapes its norms and values, which in turn influence the meaning given to an artefact' (Pinch & Bijker, 1984:428). It is therefore argued that it is not enough to establish that technologies are socially shaped; questions will have to be answered about the character and influence of the shaping forces (Williams & Edge, 1996:866) as well as about 'the characteristics of technical objects and the meaning of those objects' (Winner, 1986:22).

Two important schools in the technology debate that started in the 1980s are discussed here; the social construction of technology (SCOT) and actor-network theory (ANT). In the SCOT debate the reaching of *closure* is one of the processes under study. It entails the stabilising of a technology in a single form. This concept is borrowed from the social study of science, where it has the meaning of ending a certain debate or dispute (Pinch and Bijker, 1984).

One of the other roots of the technology debate lies in anthropology. Pfaffenberger (1988:245) even argues that 'Anthropology, at its best, is uniquely suited to the study of such a complex relationship between technology and culture.' He argues that anthropology is both strong in its local-level small-scale studies and in its holistic approach towards society as a system of more or less interrelated components. Pfaffenberger (ibid.) uses the concept *total*: 'any behaviour that is technological is also, and at the same time, political, social and

symbolic'. In his analysis of technological change he also uses the concept politically-constructed myth (p.247), which has analogies with the concept of closure in the sociology of science: they are socially accepted, simplified realities. In constructing a 'successful' technology, the construction of objects and myths goes hand in hand and 'its social origins disappear from view' (p. 250).

Also ANT fundamentally critiques single, simplistic, linear stories as well as the de-humanising of technological development. Yet it went a step further in the development of concepts for simultaneously studying technological and societal change. In ANT it is argued that the classical distinction between a 'social context' and a 'technical content' is of no use in the attempt to gain a better understanding of how human and non-human elements are connected. Latour (1991:116-117) for instance argues that there is no stable reference point, no fixed actor against which an innovation or social change might be measured. In the process of change all actors co-evolve into a new state of relation to each other. Latour argues that established technology only exists in the stability of social assemblages. Or to speak with the title of his article: 'Technology is society made durable'.

One of the central points that ANT argues is that the material and the social are not essentially different as elements in socio-technical processes. Robust networks consist of heterogeneous material, i.e. of both human and non-human elements. Latour (1991:110): 'We are never faced with objects or social relations, we are faced with chains which are associations of human (H) and non-human (NH). (...) Power is not a property of any one of those elements but of a chain'. This chain is the 'actor-network'. And Callon (1991:142) formulates it as 'For this reason I speak of actor-networks: for an actor is also a network', i.e. an actor always comes to us through intermediaries. The implication of this understanding is that we should study the linkages in these chains, especially how people chain themselves to objects.

The building of such a network requires that the various elements are *aligned* or attuned to each other. The prime mechanisms through which *alignment* takes place are *enrolment* and *translation*, respectively the processes of incorporating elements in the network and defining or inscribing these elements. And again, 'it does not matter whether [these elements are] human or non-human, a collectivity or an individual' (Callon, 1991:143). The point is that all elements are defined or governed by other elements in the network; they are products of their history, or as Callon (1991:154) phrases it 'they are 'acted' by the network that holds them in place'.

In the end Latour puts power relations forward as the object of research, i.e. the establishment and maintenance of domination, with special attention for the role of technology in these processes. It has been argued that the resulting 'thick descriptions' of the technological development process run the risk of failing to go beyond the black box that they aimed to open (Bolding: 2004). The improved understanding of the role of technology in processes of domination, which is the result of the technology debate, can be put to better use when adopted as part of research on societal change.

In later studies it has been shown that the development of a technology is not a single process, i.e. 'closure' is not a single, stable phase, as things 'rumble on and on, as it were, noisy and noisome' (Law & Singleton, 2000:775). Technology is re-appropriated and re-designed by the various actors involved, not in the last place by its users.

Irrigation as socio-technical process

The technology debate that started in the 1980s has had significant influence on the analysis of irrigation technology and the role of it in irrigation development and reform. A variety of irrigation studies adopted socio-technical approaches and thus provided valuable insight into the role of technology in the irrigation process. Pfaffenberger (1988) describes a case on irrigation settlement schemes in Sri Lanka, in which he analyses the formation of a tail-end problem that goes beyond 'the harsh facts of hydraulics'. Kloezen and Mollinga (1992) have published one of the first papers on the issue of the socio-technical nature of division structures. Bolding et al. (1995) describe a classical case of the social construction of a device, the modular outlet used in colonial Indian irrigation systems. Shah (2003) has a similar analysis of tank irrigation technology. Veldwisch (2006) uses a socio-technical framework to analyse the rehabilitation of smallholder irrigation scheme in South-Africa.

An early application of Actor Network Theory to irrigation can be found in Van Halsema & Wester (1994), while later applications can be found in Van der Zaag et al. (2001) and Bolding (2004). Rap (2006) uses ANT in his analysis of the development of a global policy model for irrigation reform based on experiences in Mexico, while Veldwisch et al. (forthcoming 2008) use it to analyse the top-down development process of an irrigation scheme in Malawi.

Also the understanding that technology design and construction are not restricted to the engineer's domain, but that it is just as well part of the users' domain, has also influenced the debates in irrigation literature. The notion of irrigation technology as a social construct has become the theoretical underpinning of participatory and interactive design (Ubels, 1989; Ubels and Horst, 1993; Scheer, 1996; Boelens and Davila, 1998; Chin-A-Fo et al., 2003).

Mollinga (1998) identified three different ways in which irrigation artefacts are social:

(1) they have social requirements for use, i.e. irrigation technologies influence the management demands,
(2) they are socially constructed, i.e. irrigation technologies are developed and designed with particular objectives and forms of management in mind, and
(3) they have social effects like income increase and changes in the ways of crop production are technology-dependent.

Within this understanding of irrigation as an inherently socio-technical activity new concepts and terminology were developed, technical concepts were re-interpreted and social theories were applied to processes in irrigation management. The following are a few examples to show that such an integrated socio-technical approach has a history and is firmly rooted in the analysis of irrigation management.

From a managerial starting point Uphoff (1986), Chambers (1988) and Huppert (1989) developed multi-disciplinary classifications of tasks and activities in irrigation management (typically about allocation, scheduling, delivery, irrigation, drainage, cost-recovery, etc.). Horst (1998) developed the idea of 'system flexibility' and its distributional effect on the tail-end, as based on the analysis of division structures with upstream and downstream control. Uphoff et al. (1991) working on the spatial significance of canal irrigation, developed the idea of hydraulic levels that are linked to organisational levels (discussed in Mollinga, [1998] 2003: 22-23). This was further elaborated on by Oorthuizen (2003: 298 and following) and Bolding (2004: 342). Van der Zaag (1992) introduced the study of 'street-level bureaucrats' to the study of irrigation management. This was further

elaborated through the study of everyday politics by among others Mollinga ([1998], 2003) and Oorthuizen (2003). Mollinga ([1998], 2003) developed the boundary-concept 'water control', which has provided a concept to think about heterogeneous networks of control in relation to the distribution of water, similar to the conceptualisation of power and control in ANT. Water control is conceptualised as to consist of three dimensions; (1) the technical/material dimension, (2) the managerial/operational/organisational dimension, and (3) the socio-political dimension. Narain (2003) elaborated for WUAs in India how spatial and technological layouts affect management and institutional development.

Thus there exists a rich body of literature and concepts that dates back to as early as the 1980s. The inherent socio-technical nature of irrigation processes is hardly a point worth making, as it has become a well-established notion. At this point in time there is rather need for frameworks and terminology that help to study processes of ordering, control and access in ways that inherently acknowledge this socio-technical nature.

The rights framework and a theory of access

From within the ZEF/UNESCO project it was initially suggested that I would interpret water distribution within a legal or normative framework, i.e. establish what is the formal and legal way of distributing water before studying the deviations (illegal or informal patterns). In that respect it is useful to explain why I deemed such an approach unfit for this study and instead focussed more on the actual practices. Above it was already discussed that there is hardly a 'rule of law' in Uzbekistan; rather the normative system is authoritarian and personalised. Thus the legal-normative domain is hardly separated from the exertion of power along lines of loyalty. Also there are no institutions through which rights are created, maintained and/or legitimised. This pertains to the state system as well as to traditional local systems that have almost completely been replaced by state controlled organisations. Thus, in Uzbekistan the legal normative domain does not offer mechanisms through which water distribution is influenced in any noteworthy way.

It seemed therefore more relevant to adopt a framework of analysis conceptualising the *ability* to gain access rather than a framework of analysis on the *right* to gain access. Or in other words: the 'rights-model' could have been forced on this situation, for instance by focusing on the materialisation of rights, but it seems that it would not have tackled the main issues at play. The 'theory of access' as developed by Ribot (1998) and Ribot and Peluso (2003) builds upon this notion. They distinguish three social processes that regulate access: access control, gaining access and access maintenance. It is somewhat a dichotomous model in which one actor (typically a state agency) deploys strategies to control access to a resource, while the users of a resource deploy both strategies to gain access and maintain their access to the resource. Ribot and Peluso define access as "the ability to derive benefits from things" or resources (ibid.: 153). In this context rights are only one set of factors in a larger array of influences on the flow of benefits; there are numerous institutions, social and economic relations, and strategies that shape the distribution of benefits. Hence, the analysis of access to benefits involves the study of (1) the nature and flow of benefits that can be derived from a particular resources, (2) the identification of the mechanisms by which actors gain, maintain and control benefit distribution, and (3) an analysis of the power relations that underlie the access mechanisms.

This theory of access has strong focus on *de facto* management of and control over natural resources. The concept of 'water control' in its three interrelated dimensions (Mollinga's, [1998], 2003) in a similar way conceptualises the ability to get or restrict access

to water. In a wider sense this conceptualisation builds on the understanding of irrigation activities as practices, i.e. social action in which actors strategically engage with each other in arenas (or domains) of interaction. These 'water control practices' can be connected to what Ribot and Peluso (2003) call 'access mechanisms'. They distinguish a whole range of these mechanism, starting with the rights-based mechanisms that can be legal or illegal and continue with a long list of structural and relational mechanisms. These include the role of technology, labour (organisation), knowledge, authority, and social identity. In any situation the particular access strategies have to be empirically studied, but clearly they will be of heterogeneous nature, as it requires many conditions to be fulfilled to be able to use a resource to produce a benefit.

1.4. Structure of the thesis

Chapter 2 discusses how the research methodology was adapted to working in the context of a post-communist authoritarian country. The nature of the Uzbek regime and governance system has had a strong influence on the research methodology and outcomes. In the Uzbek context official data, knowledge and opinions are often vague, distorted or unreliable. For reasons of security of the informants it was often difficult to triangulate findings with other informants. Direct observations of field activities therefore had an important place in the research methodology.

Chapters 3 and 4 set out to discuss the wider agrarian context. The chapters describe the relation between farmers, the state and agricultural planning, which is necessary knowledge to understand the dynamics in water distribution discussed in the subsequent chapters. **Chapter 3** discusses the basic structure of the Uzbek agrarian society. State actors, privatised farmers (*fermers*) and peasants (*dekhans*) each have their distinct roles and there are typical exchange patterns between them. Socio-economic differentiation in the rural area is taking place at a high speed.

Making use of a labour process approach, **Chapter 4** argues that the Khorezmian cropping system can be understood as being composed of three forms of production; (1) the state ordered production of cotton and wheat, (2) the commercial production of for instance rice and (3) the household production of primary needs. These production processes are characterised on the basis of their input and output relations, their terms of trade as well as their technical requirements. The emergence of commercial rice production in the sphere of privatised production is a major development and a possible nucleus for political change.

Chapter 5 shows how the control over agriculture takes a specific shape in the case of water distribution at district level. The Governor's office (*Hokimiyat*) maintains a highly centralised state management system. The state secures obedience and the fulfilling of production quotas through a system that with one hand puts pressure on farmers and with the other rewards them. The differences in water use between cotton and rice production play an important role in these dynamics.

After discussing the history of the introduction of Water Users Associations (WUAs) in Uzbekistan, **Chapter 6** looks at the actual dynamics of water management inside the WUA. Peasants (*dekhans*) and newly established farmers (*fermers*) struggle with each other over the access to a limited resource. While at some places the newly established WUAs strictly control access, at other places patterns of collective action start to emerge. The latter

always have an informal character and often take place around the operation and maintenance of pumps.

Chapter 7 shows that the agrarian change currently taking place puts different demands on the irrigation technology, both at micro-level and at system level. The developmental history of the Khorezmian irrigation and drainage network shows how its system characteristics have been shaped by the (historic) socio-political relations. It is shown that the fundamental changes taking place in the Uzbek agrarian structure put different demands on the irrigation and drainage network.

The conclusions of this research are presented in **Chapter 8**. It contains the main findings, a discussion of the implications for the theoretical debates discussed in Chapter 1 and a list of recommendations for both policy and future research.

Chapter 2

Methodological Issues in Researching Water Distribution in post-Soviet Uzbekistan

2.1. Introduction

This chapter discusses the research methodology used for this study. On a second level it is also about the wider issues of conducting research on the organisation of agriculture and water management in rural Uzbekistan. The methodological design was influenced by a variety of issues; the place of this study in a larger research project (the ZEF/UNESCO landscape restructuring project in Khorezm), my personal preferences and earlier experiences (research work in Africa and Latin America), the topic of research (irrigation and water distribution) as well as the circumstances in the field (the Post-Soviet context, Uzbekistan being a neo-patrimonial state with an authoritarian regime, and the large size of the irrigation network).

Methodology can conceptually be understood as consisting of three levels; (1) the scientific model, which constitutes the epistemological and ontological bearings (2) the research method or strategy, and (3) the research techniques (Burawoy 1998:6; Alasuutari, 1995; Bryman, 2004).

The ways in which these levels are "filled-in" are related to each other, i.e. there is coherence between the scientific model, the research strategy and the research techniques. Strategies and techniques of a certain scientific model can made to fit other scientific models. The basic methodological elements of this study are summarised in Table 2.1 below. In the third column of the table the main difficulties encountered in conducting the research are mentioned. Also here the issues between the different levels are somewhat linked; the post-soviet authoritarian regime resulted in the absence of a social science counterpart and fitting (applied) theories on the topic of research (first level), the absence of (empirical based) information to formulate reasonable hypotheses (second level) as well as high levels of distrust among the population and the absence of reliable secondary data (third level).

Though in the first half year of the field research an approach was developed that took notice of the expected challenges, in the course of the research process at each level adaptations had to be made in response to difficulties/situations encountered in reality. Not always were these conscious choices, there were also de facto implications of certain ways of doing that were followed for pragmatic reasons. The methodology discussed in this chapter is the result of three years designing and developing an appropriate methodological approach for this challenging environment and politically sensitive topic of research.

	Basic elements of this study	**Difficulties encountered**	**Emphases and adaptations made in response to difficulties**
Scientific model	Critical realist; reflexive; making use of constructivist and ANT concepts regarding technology	No social science history in FSU; lack of fitting theories; little context info; many problems in 'objectively' abstracting info.	Focus on identifying mechanism; engage rather than remain at a distance; develop theory rather than test existing; an integrated approach to the social and material dimension.
Research method/strategy	Extended case method; mix-method triangulation; technography	Issues not clear; lack of fitting theories.	Theoretical sampling; strong focus on empirical grounding; riddle solving/ defining integrated in the research process
Research techniques	(Participant) observations, household survey; non/semi-structured interviews; group interviews; field note diaries; acquisition of secondary data;	High levels of distrust; unreliable statistics.	Building rapport/ finding out slow; combine interviews with observations; acquire secondary data at field level;
(including strategic choices of operation)	Learning Uzbek, live in a village, own transport	Huge area/large distances, difficult language, no good research assistants	Learn Uzbek and live part-time in a village as well as live project's guesthouse and make use of my role as outsider and irrigation engineer.

Table 2.1 – overview of the three levels of methodology as applied in this study

Methodology concerns the entire research process, which can be conceptualised to consist of different phases. These phases could for instance be labelled research design, data collection, analysis, interpretation and write-up. In practice these 'phases' are not always clearly distinguishable, neither as time periods nor as activities. In this study different phases and functions were explicitly integrated. This is perceivable in the relation between defining the topic, formulating the research questions, production of observations, documenting of observations and processing them, i.e. all of this is an iterative, fluid process of going back

and forth between theoretic and empirical material. The process of analysis, or unriddling, did not wait until after the fieldwork. Rather it is an integral part of the field research process and of the preparation process (through reading existing material and formulating tentative research questions and hypotheses). Towards the end of the second year of fieldwork the main idea for the dissertation had already ripened and during the fieldwork I had already written a detailed outline of this dissertation. In my experience, the exercise of riddle solving in the first place is a creative process; unstructured writing, active brainstorming, discussing with colleagues and silent pondering all played a role in this ripening process. At the same time it required discipline in field note taking and systematic ordering of ideas that were taking shape during the fieldwork period.

The chapter is organised around the three levels of methodology as identified above. Each level is dealt with in a separate section. They address the reasons for the initially adopted methods/approaches as well as practical examples of adaptation. In a separate section the selection of case study areas is described, as well as a detailed description of the household survey. The chapter concludes with an evaluation resulting in some principles for an effective strategy/methodology to conduct social science research in contemporary Uzbekistan.

2.2. The scientific model

The scientific model underlying this research can be characterised as critical realist with an interaction process between the theoretical and the empirical that could be called 'retroductive'. It is different from both positivist and interpretivist epistemologies and is neither deductive nor inductive in its organisation of theory and observations.

Critical realism builds on the idea that there is a real world 'out there', but that we only know it through the constructions that people make of it – the objects of science, the things that we study (physical processes or social phenomena) form the intransitive dimension of science, the theories and discourses of science are part of its transitive dimension (Sayer, 2000:10). Critical realism distinguishes between the real, the actual and the empirical. The real refers to the structural possibilities as they exist, whereas the actual refers to the way in which things happen. Forces have different effects, that is: there is no linear relation between cause and effect. Rather the mechanisms of change need to be studied in-depth in order to understand social processes of change.

This sort of analysis process is like solving a riddle (Alasuutari, 1995:6-22) i.e. fitting all the clues together in a logical way. Critical realists advocate retroduction as a logic for moving between the empirical and theory. Retroduction goes through a 'mode of inference in which events are explained by postulating (and identifying) mechanisms which are capable of producing them' (Sayer, 1992). This is further elaborated in the next section.

The extended case method has a similar aim; it 'applies reflexive science to ethnography in order to extract the general from the unique, to move from the 'micro' to the 'macro' …' (Burawoy, 1998: 5). Furthermore Burawoy (ibid: 27) argues for a more prominent role of existing theory in the research process; 'the analyst works with a prior body of theory that is continually evolving through attention to concrete cases. Theory is reconstructed.' The researcher oscillates between theory and observations; theory guides the direction of fieldwork and observations redirect theory. This is different from for instance grounded theory, which ideally starts purely from observations and builds theory from

systematically working with the produced empirical material. Also Alasuutari (1995) emphasizes the importance of an integrated approach to working with empirical observations and theory, rather than starting with a theory and/or hypothesis and testing or verifying it through fieldwork.

This specific vision on the fundamental relation between the empirical and theory requires research strategies that provide for the possibilities of being guided by the instances in the field or for possibilities of moving between them. This is elaborated in the next section.

The topic of research, agrarian change and the socio-political aspects of irrigation management in post-independence Uzbekistan, was part of a largely unexplored field of work. Therefore there was a greater scope for theory development than for theory testing; there are good opportunities for theory refinement and reconstruction. Also, neither during the Soviet period nor in the period after independence social sciences have been established in Uzbekistan. Almost all relevant studies conducted in the field are by foreign researchers or by Uzbeks at foreign universities. As a result a natural Uzbek counterpart institute for the social science component of the ZEF/UNESCO was lacking.

The object of this study an irrigation network. Elsewhere this has also been called a 'water network' (Van der Zaag et al., 2002; Bolding, 2004; Veldwisch et al., forthcoming 2008). As in actor-network theory (ANT), the network is understood to be of heterogeneous nature, i.e. human and non-human (social and technical) elements are woven together (Callon, 1991; Latour 1991). This study builds on the notion that the social and the technical are dimensions of the same processes. This understanding has methodological implication, which are elaborated in the following two sections.

2.3. The research approach

Building on the scientific model as described above a research approach was adopted that focuses on the mechanisms of social and political change as expressed in the management of natural and technological processes.

Good analytic case studies of agrarian change processes in Central Asia are scarce, which makes it very important to first study the mechanisms of these processes before quantifying them (Kandiyoti, 1999). This is one of the important reasons for a strong focus on qualitative methods that identify such mechanisms. The absence of (applied) theories and analytic case studies also made it difficult to formulate precise research questions at the onset of the study. Based on general (not region or situation specific) theories and the (limited) available information on the research topic and research area it was imagined what could be the possible relevant issues. Working hypotheses were formulated to guide the direction of the research. During the study these hypotheses were frequently revised and renewed on basis of field experiences.

2.3.1. The basic elements

The approach builds on three different, yet related, schools of social science methodology; grounded theory approach (Glaser and Strauss, 1967; Strauss and Corbin 1998; Bernard, 2000:443-456), the extended case method (Burawoy, 1998 and 2003) and critical realism (Sayer, 1992; Downward and Mearman, 2006). They all have a strong emphasis on empirical grounding, the application of mixed methods and advocate an integrated process of the

production of observations and theory development. Without clear reference to any of these three approaches Alasuutari (1995) also deals with these three issues. He poses that the research topic is like a riddle that needs to be solved. Clues are gathered through a variety of qualitative and quantitative methods, but in the end they are all clues to the same riddle. Qualitative analysis is then the process of unriddling, i.e. fitting all the clues together in a logical way. Critical realists advocate retroduction as a logic for moving between the empirical and the theoretical and thus integrating existing theories in the process of riddle solving. Retroduction goes through a 'mode of inference in which events are explained by postulating (and identifying) mechanisms which are capable of producing them' (Sayer, 1992).

Both existing theory and produced observations are used for the development of ideas. Even though grounded theory advocates to build theory purely from observations and in that sense is rather different from the approach adopted in this study, some of its procedures were adopted with regard to dealing with large amounts of observations. Through working with the empirical material, re-reading it, contextualising it, interpreting it, and commenting on it, new ideas take shape. This is not reserved for the period after the fieldwork, but is rather an integrated process that also informs and steers the fieldwork. In grounded theory this is referred to as theoretic sampling, "the process of data collecting for generating theory whereby the analyst jointly collects, codes and analyzes his data and decides what data to collect next and where to find them in order to develop his theory as it emerges" (Glaser and Strauss 1967: 45). Alasuutari (1995:13-16) in this respect refers to the 'purification of data', i.e. finding common denominators and formulating rules that apply to all data. A single exception is enough to break the rule, to show that one has to re-think the whole thing or narrow the formulated rule.

Earlier observations informed the selection of subsequent cases to be studied. This applies to both the selection of farming families to be interviewed and the selection of case study WUAs (see the descriptions in section 2.5). Also it informed the choices of topics to be addressed and the choices of concrete situations in place and time to be attended and observed. Selections were made to shed light on a topic or concrete situation from a different point of view, or sometimes to explore new spheres, which were touched upon in earlier fieldwork and seemed relevant for the topic under research.

2.3.2. Unriddling, mixed method triangulation as a strategy

The objective of this study is to contribute analytical descriptions of the processes at play in water distribution in Khorezm. Partly such analysis could be derived by theorizing directly from the observations (as is done in grounded theory), but more commonly this was achieved by interpreting encountered situations through the lenses of existing theories. The latter also led to refining and restructuring exiting theory, similar to what was described for processes in the extended case method and critical realism. An example of theorising purely from observations was the development of an understanding of the Khorezmian agrarian system to exist of three distinct forms of production with each an own specific way of securing access to irrigation water. In later stages theories were found that fitted the observations, which enriched the analysis, but the idea emerged purely from observations. This topic is discussed in more detail in Chapter 4.

An example where the interaction between theory and observations played an important role was the re-interpretation of how irrigation structures are expressions of social relations. The specificities of (post-)Soviet collective agriculture created very different social relations

around water distributions. They did not so much affect individual water distribution structures as 'signposts of struggle' or 'material interfaces' between water users, as discussed in theory (Ubels, 1989; Kloezen and Mollinga, 1992; Bolding et al., 1995; Mollinga and Bolding, 1996; Mollinga, 1998; Veldwisch, 2006). In Khorezm the integration of the social and material dimensions in irrigation technology has a different constitution from what had been described before. On a deeper level the layout of the irrigation network of Khorezm and its technology can still be seen as an expression of a specific socio-political situation. Elements from existing theory were used to interpret the studied situation and at the same time the body of literature was enriched with the analysis of new case that sheds a different light. This topic is discussed in more detail in Chapter 7.

At the start of this study the concept of triangulation was merely used as in data triangulation, which basically is the cross-checking of data acquired in different situation and/or at different moments. Often data could not be cross-checked due to sensitivity of the information that could put people at risk if shared with others. Therefore I looked deeper into the idea of validation through triangulation. 'Mixed method triangulation' (MMT) was found to fit well to the already adopted approach. With the school of critical realism Downward and Mearman (2006) argue for mixed-method triangulation (MMT) as a prerequisite for a process of retroduction with ontological depth. They argue that combining methods that are connected to different ontological positions provides the opportunities of shifting between different interpretations of the same processes and thus generate understandings that transcend mere disciplinary perspectives. The combining of methods is by means of retroduction, which "is not so much a formalised logic of inference as a thought operation that moves between knowledge of one thing to another, for example, from empirical phenomena expressed as events to their causes" (ibid.). Therefore retroduction makes use of mechanism and relations known from empirical study as well as theoretical relations. When in new situations aspects are recognised from earlier encountered mechanisms or relations it is wondered whether this is similar to earlier encountered situations or phenomena, be it in theory or in empirical study. The explanation is suggested by a "concomitance", i.e. any type of similarity or co-occurrence (Thomson, 2007). Such a relation might be a happy coincidence and therefore does not validate a conclusion in the sense that it is highly trustworthy. However the approach makes it possible to move between different locations and informants and using the findings at one place as a hint for understanding what is happening in another situation. The objects of the research are used to shed light on the wider subject of research. Practically it implied distilling working hypotheses from one specific case and testing that in other situations. As a result the processes had to be formulated more precisely and/or the situation in which the process occurred was narrowed-down. On top of that the identified processes could be further tested and quantified.

To exemplify this approach I describe one small aspect of my research and how the topic, questions, and hypotheses developed. Going through the fields and following the canals I once came across an irrigation ditch that was directly connected to a drain. A lot of water was flowing unused to the drain. In the weeks that followed I paid special attention to this phenomenon and more often I stopped the car at places where this might also occur, walked the extra few hundred meters to check the end of an irrigation ditch and asked various people why water was flowing unused to the drain. I came across a number of similar situations and the only reason that farmers and farm workers gave me was 'carelessness'. I hypothesised that this would represent a major item on the (district) water balance and that it would only be happening in case when there was water abundance. This

has led me to investigate the situation of water shortage and water abundance in more detail – the follow up I discuss in Chapter 5. Besides I started to talk about this type of water wastage to the district level water management departments and found out that this is a major point of attention for their fieldworkers, something they had not told me in earlier interviews. In about the same period I coincidentally came across a district water manager who was following a large drain to close off any unnecessary outflows of canals. I was told this was done in order to increase the efficiencies on district level to have enough water available at the tail-end of the district. This reinforced my idea that in case of water shortage this type of water wastage would not occur. Going around with a water inspector I found out that these connections were 'illegal' and that the responsible farmers were fined for this, however, not in all cases. At two places where we found water flowing to the drain further downstream it was being used again. Drains were being used as irrigation system at places that could not easily be reached by irrigation ditches. In both encountered cases the water was used for paddy cultivation, which is often illegal. This could have been the reason why people were only telling me that it was due to 'carelessness'. In the proceeding weeks I systematically followed the drains that 'unnecessary' received water from an irrigation ditch. Only in a few cases I found that the water was actually being used. In areas and periods of relative water shortage I did not find situations of this direct water loss. This was also confirmed by the words and actions of the water inspector, who only checked such connections in areas and periods of relative water abundance.

Methodologically integrating the material and social dimension

The notion that the social and the material dimensions are closely related and often inseparable requires a methodological approach that acknowledges this and bridges the social-material divide. When studying processes of technological (re)design this is especially relevant. In this context Bolding (2004:111) defined his research methodology as a technography; "a methodology that describes and analyses the life of a technology as well as the various actors involved in (re)shaping it. Thus technography is a short hand for a combination of biography, technology and ethnography." Irrigation networks are composite technologies that often extend over large areas and which in various ways are integrated into agricultural production systems. Operationalising technographical research on a large scale irrigation system was done through an access strategy that could be called 'follow the water'. Basically this is the same as following the infrastructure. It implies following the water flows (canals, but also drains), looking for its sources and destinations. A good technical understanding of the various structures is imperative. This entails reconstructing the initial purpose of the structure by reconstructing the overall logic of the irrigation scheme and working out the hydraulic formulas, boundary conditions, flexibility and alternative uses of the structures. However, the interest is not reserved for just the hardware, also the connections to social and organisation structures are studied, and people encountered on the travelling along the canals are being interviewed.

Central in this access strategy is the combination of direct observations with interviews. Spending time with key actors during their daily activities entails the same combination of interviewing and observing. Examples of this are: joining the water guard on his patrol along the canals or assisting farmers in the work on their fields. Such a practical, on-site approach provided the opportunity to visually verify information provided by the informants, it increased trust, and allowed for issues to be observed that would not have surfaced in interviews.

2.4. Issues regarding research methods

This sections deals with a number of issues that played at the level of research techniques. It does not in detail describe the techniques. A separate section (2.5) describes the selection of case study areas, the way in which the household survey was conducted and the selection of a group of households that were followed during a complete cropping season.

2.4.1. Project and some strategic choices

At the start of my fieldwork (in March 2005) the interdisciplinary project of which my PhD research is part had been operating for about three years (since May 2002). During their field work periods in Uzbekistan most researchers were living in the project's guesthouse. From here they jointly commuted to the office building at the university campus of the collaborative State University of Urgench, the sole university in the region. Fieldwork was conducted in project cars, clearly marked with project logos and blue-coloured UN number plates and supplied with a driver. This mode of operation linked well to the natural science based experiments and approaches that formed the heart of the ZEF/UNESCO project during the initial years of research. It involved making long days and long distances with the main concern of solving practical issues. The economic research operated in a similar mode, while some of social science researchers without much success had struggled for a different regime.

Changing the mode of operation for at least the social scientists gathered momentum in the period that I started this study. Thus it was possible that, contrary to what was common, I decided to live in a village rather than in the project's guesthouse. During the first year the project rented a house in a *Kishlak* (village), where I stayed together with a colleague. During the second year I stayed in the same village, but then for a few days and nights per week with a host family. Even though most of my active fieldwork was outside that village, also during daytime I frequently spent time in the village – working at home on my computer, working in the garden or spending time relaxing with neighbours. Living in an agricultural community enabled me to observe social life and agricultural practices in a relatively unconstrained way; the longer I stayed, the less people seemed to be disturbed by my presence. Though very beneficial for my own research there was light pressure from within the project to spend more time in the office and/or the guesthouse for reasons of integration with other research team members and informal knowledge sharing.

In the first year the project hired a 'civilian' car so that I could to go around without a driver and blue-plated project car. This gave me more flexibility in deciding when and where to go. Moreover, we would only arrive with two people (me and a translator), instead of three (with the driver), which was a bit less of an invasion. However, the travel was often long and tiresome, which after a few months made me decide to again go around with project cars and drivers.

2.4.2. Entrance to the field and network building

Before I started my fieldwork various people had advised me to first get permission to do the research from the local authorities, especially from the district governor's office (*Hokimiyat*), as working without such a written permission people would not feel free to talk. Officially I did not need such permission, as our project had a 'blanket permission' to perform research on agriculture in Khorezm, as specified in the three-party agreement. Rather than working from the official offices downward, as others within our project had

done, I started with building up relations at the field level and moved my way up by getting introduction to their peers and bosses. A few people suggested to me that I should ask permission from their boss before they would talk to me, but in general it was well possible to operate under the radar of the authorities, i.e. I was noticed, but my activities did not raise suspicion. It also helped to be explicit about where I lived and worked, mention names of people that we mutually knew and to hand over a business card that they could show in case someone would come and inquire after me.

With time the number of informants at higher positions grew, as I frequently worked in their areas of jurisdiction and with their staff. I tried to be as open as possible to these informants, in order to gain their trust. In situations where I managed to do so they instructed their staff to be co-operative as well. On the other hand I did not want to tell them explicitly with whom I had talked about what, as that could bring those people in difficulties. I was walking the narrow path of on the one hand staying both critical and making my own choices on what to do and on the other hand being open about my activities and letting me be guided by people at strategic places. I am fully aware that due to this attitude I must have missed a number of interesting topics, but practically it was simply not possible to operate around these persons and yet get access to people and get reliable answers from them. In a similar way I avoided any unnecessary focus on illegal or highly sensitive issues, such as bribes. Paddy cultivation and related water use was such a highly sensitive issue and yet at the heart of my research – sometimes it was unavoidable to push a topic after all.

2.4.3. Distrust and participation

Is somebody free to decide whether to participate or not? In the Uzbek society the guest is considered to be 'king', who can not be denied whatever is requested (Wall and Overton, 2006; Adams, 1999). When approaching people with the question whether they are willing to participate, especially as a foreigner, you are almost always instantly hosted and served the best food and drink available. It rather requires sensitivity of the guest, in this case the researcher, to assess whether the possible informant is really willing to participate. From a pragmatic point of view this also makes sense, as continuing with an informant that formally consents to participate, but in practice is not willing to talk is a difficult source of information. The most important reason for not wanting to participate seemed to be fear of being negatively affected by participating. In many cases people tend to take a protective attitude. This was one of the main difficulties encountered in conducting the field research. Wall (2006a) reported similar difficulties. In interviews people often evaded questions, gave vague responses, produced plain lies or simply changed the topic. Often when people seemed to be afraid to talk it was not explicitly expressed. However, in a number of cases people hinted that the topic brought up was not appropriate to talk about, and in some cases explicitly told me so. When people did tell me about things that were obviously politically sensitive, after the interview they often asked me not to reveal the source to anyone, which made it difficult to cross-check the given account and present it a research finding.

The decision to keep quiet about issues of dissatisfaction can be interpreted as a decision to not discredit the state and/or powerful people. This situation of extreme "loyalty" seems to be a forced one, i.e. by the lack of other options. Hirschman (1970) analysed three possible responses to an uncomfortable situation: exit, voice and loyalty. Most people in Uzbekistan do not have the possibility to leave their country, region or social position, nor do they have the position to voice their discontent (except maybe among their

own family and friends). The only reasonable survival strategy is to accommodate, to be loyal no matter what.

During the field research I was followed and checked by people in authoritative positions (heads of state organisation, former collective farm managers, etc) or by their informants. Several people whom I interviewed mentioned that after contact with me they had been approached and were asked about my research and whereabouts. I had the impression that people in authoritative positions would have easily been able to block the research in case they would have felt it could be a threat to their personal position or to the state. Also I was warned by two individual contacts that my work was being monitored by the secret police, though seemingly not on a very intensive basis, as it was never openly obstructed and I could go and talk to whoever I wished.

Some topics were found to be more politically sensitive than others. Self-evidently corruption by informal payments was a sensitive topic to talk about. Some other sensitive issues were the land acquisition procedures, exact sizes and arrangements of land tenure, payment of the workers by the *fermers*, and the negotiations over crop quota. Above all, paddy cultivation is perceived as highly sensitive issue, as it requires a lot of water, competes with cotton cultivation, is not fully legal, but may provide a major source of income. When bringing up these topics more often a protective attitude was encountered.

2.4.4. Building rapport and identity

The main tactic of overcoming situations of distrust was an extra focus on the building of rapport. I tried to build up long term relations, with repeated visits in which I did not just focus on getting the data I was looking for, but also reserved plenty of time to listen and respond to the informant. The learning of the Uzbek language soon turned out a very effective tool to gain the positive attention and trust of the people. Foreigners are clearly expected to speak (or learn) Russian, not Uzbek. When I told people (in Uzbek) that I did not speak Russian, they often looked at me in disbelief. And it frequently happened that people kept speaking Russian to me even when I spoke Uzbek to them. Even though many people master basic Russian, it is perceived as the language of 'the centre'; older people, males, educated people, people from urban areas and especially if they come from Tashkent or abroad, speak Russian. Learning Uzbek helped me in shifting my bias to the people in the margin; the younger people, the women, the uneducated, and the people in the rural areas. Although I started studying the Uzbek language from the moment I arrived in the country, I never reached the level at which I could conduct interviews on my own. Therefore I permanently worked with a translator; over the whole period I hired four different persons, who translated between English and Uzbek. In the beginning I was hardly able to have a basic conversation, but even then it clearly helped to open up the relation. Later my Uzbek language skills improved and sometimes I was even able to discuss simple issues without the help of a translator. Also I was often able to get the gist of the story even before it was translated. This helped enormously to keep a more natural communication between me and the informants; even when I could not speak with them directly, still it was clear that I was interested and trying my best to communicate.

Besides learning a language also the adoption of cultural habits helped in gaining the trust of people. Living in a village helped me enormously to adopt such habits and to closely observe ordinary people and to get to know their habits. It made me feel more at home, even when I was working in other villages. Informants often expected that I was living in Urgench, the provincial capital and were amazed when they found out that I was also living

in a rural area. Often people did however not understand why I would stay in a village, if I also had the opportunity of staying in the city; there is clear cultural understanding that if you are doing well you move to the centre.
Besides assuming the identity of a villager, in some situations I also used other identities to gain trust or respect. Obviously I was always a foreigner. I stressed this sometimes in order to play the ignorant and inquired about the 'obvious'. Also it seemed that people were more inclined to trust a foreigner with particular sensitive information. In a similar way, in a few situations, I stressed my project membership, and connected to that, my status as a diplomat[8]. This always helped to settle difficult questions related to research permissions.

In encounters with engineers and water managers I often stressed my background as an irrigation engineer. Both the identity issue and my basic technical knowledge on water issues were beneficial to be able to talk about practicalities and understand the technicalities of their problems.

2.4.5. Conversational techniques

In situations where I noticed that informants were hesitant to talk about a specific topic, or when I was aware that the topic was sensitive to talk about, I often introduced it with reference to what I had heard before from other people in other situations. This obviously helped to break people's fear of talking about the topic, presumably with the logic that if others talk about the topic they can just as well also talk about it. Moreover, as it showed that I had more than one source for the information, they would run less risk of being exposed as the source of a particular view or comments. I was aware that my strategy might just as well distort the answer, as it would be easy for an informant to 'fool' me by giving an answer in line with the idea that I had sketched. I put up with this risk as otherwise people often would not talk about the specific subject at all.

In the beginning of the research a few times I made use of a dictaphone as some people had suggested to me that especially state officials would feel taken more seriously. I had the strong impression that it made informants feel uncomfortable. The difference between what was said during the running of the tape and what was said once the recording was stopped, however, gave interesting circumstantial information.

In the field I only made use of a small notebook in which I quickly noted down the most important information. In the beginning I was often making notes during the interview, but in later stages of the research I did it more and more directly after finalising the talk. The taking of notes during the talking obstructed the flow of the interview, partly because of the distractions and time needed for that and partly because people would be constantly aware that I was observing and writing down everything they said. Though moving the note taking somewhat out of sight of the interviewees I was not secretive about it. I always let people know that I was taking notes and using the information they gave me. Postponing the jotting down frequently led to the loss of some details and accuracy, but in my assessment the advantages were larger than the disadvantages.

In principle I tried to ask open questions and let people free in their responses. Often I did not get direct answers to my questions and it was difficult to assess whether people were on purpose avoiding the question or whether they wrongly understood the question[9]. I usually tried to clarify the question by phrasing it differently. Or when that also

[8] As researcher of the ZEF/UNESCO project I had an accreditation as diplomat of a UN-organisation.
[9] Possibly this was also under influence of sometimes precarious translations with field assistants whose English was sometimes far from perfect.

did not work sometimes suggested a few answers to choose from. Suggesting answers certainly made it easier to understand the question, but frequently I had the impression that people were trying to give socially desirable answers. In situations where I had the strong impression that people were purposefully sketching me a situation or argument that seemed highly unlikely to me, I sometimes suggested them my contrary opinion on the case or told them about earlier observations that refuted the presented picture. In only very few cases this led to a change of the story, so methodologically, it was not very effective. This definitely bears the risk of pushing people into a subordinate or defensive position, which increases the risks of socially desirable and evasive answers. On the other hand, doing this after all made clear that I did not just accept everything and that even though generally taking an attitude of listening and asking for clarifications, there were limits. I had the impression that in the long run this had the positive effect that some informants took me more seriously.

2.4.6. Moving between observations and theory

Being able to move between theory and observations (see sections 2.2 and 2.3) requires the production, storage and analysis of observations in a particular way. Taking field notes and working with them is at the centre of the qualitative research process. In the first place it is the storage of facts and observations, described as accurately and precise as possible. But one also "… tries to get 'behind' the observations, … they are not taken at their face value" (Alasuutari, 1995:41). Therefore also the contextual information and interpretations are added to the field notes. It is, however, important to keep these interpretations clearly distinguished from the observations. "The method is without doubt poor if it does not enable the data to surprise, if the empirical analysis cannot even in theory give the researcher feedback that shows the need for improvements in the hypothesis or the design" (ibid. p.42). This 'surprising' can be achieved by writing out the observations in detail, without jumping to interpretations. Doing this consistently takes time, effort and considerable length of writing, but in the end is rewarding as the field notes can be used as 'raw material' in which also new things can be discovered, on top of what was seen and interpreted at the moment of writing. Distinguishing between direct observations, contextual information (for instance from earlier fieldwork) and interpretations mostly shows from the writing style, but for clarity I often added straight brackets and accolades around the latter two.

The process of oscillating between theory and empirical material continued during the writing process. New codes and interpretations were added to the field notes, while existing literature was read or re-read with the objective to apply them to situations encountered in the field. Ideas were checked with the empirical material by searching through the field notes for good examples and situations that could refute or refine the arguments.

2.4.7. Two problems

The described methodology explicitly took into account the specific difficulties in rural Uzbekistan. In spite of this there are two problematic effects with regards to the validity of the results. Firstly there was the problem with cross-checking of data though different ways of triangulation. And secondly there are biases in the research due to certain groups of actors being over-represented.

The main problem with cross-checking data was the sensitivity of the information that people gave me. This could partly be overcome through working at multiple sites and

comparing the principles of individual cases with each other rather than fully cross-checking the details of reported stories. Also the mixed-method triangulation helped in getting different sorts of (contextual) information. However, also in mixed method triangulation problems were encountered. Especially the lack of reliable official data was problematic. Many researchers in Uzbekistan have reported to receive conflicting data sets as well as the suspicion of 'doctored' data (Mueller, 2006; Conrad, 2006; Wegerich, 2005). I am especially aware of examples of economic data and water discharge data, but this is probably connected to the sphere in which our project is active.

The use of such secondary data was limited and instead I relied as much as possible on data that could be cross-checked with own observations in the field. With regard to discharge data, which I did use on a wider scale, I used data from the lowest level in the state hierarchy. I camera copied this data at the offices where the data was actually collected. The people collecting the data were able to explain me in detail the procedures by which they collected and administrated data. This data was not of perfect quality, as these measurements were not always accurately done and frequently skipped. On basis of other research results, especially Conrad (2006) and Wegerich (2005), it was sometimes expected that the aggregated data at district level and above, was doctored to show lower water use or more equal patterns of water use between districts. On basis of the trust relation that I built up with the collectors of the data and the detailed knowledge of the procedures I could be pretty sure that the raw data that I received was not doctored in such a way.

The second problem is that of over representation of some views over others. People that have an informed insight on the inner workings of WUAs or the state organisation at district level are sparse. The people that also feel free to talk about these sensitive topics are even rarer. It soon turned out that many of the key informants are in a particular group, which leads to specific biases – in general they are male, they are relatively wealthy, well-educated and connected to the local elites, and many of them had a function in the state system. Often they had a close relative or other patron at a powerful position, which apparently gave them the ability to freely talk about such issues. Besides that it was difficult to cross-check the stories that they told (see above). Also, without an exception they represented the views of the *fermers*. Ordinary *dekhans* often had no insight in the processes under research, nor would they have felt free to share it with me. In the absence of a critical peasant or farmers' movement in Uzbekistan it is difficult to generate ideas and critiques informed by their insights.

2.5. Selection of case study areas and description of methods

This section describes some of the methodological procedures of which it is important to describe them in detail in order to be able to assess the validity and representativeness of some of the findings. Three elements are discussed; (1) the selection of case study areas, (2) the household survey and (3) the selection of a group of households that were followed during a complete cropping season.

2.5.1. Fieldwork locations

The overall fieldwork location is the irrigation and drainage network of Khorezm Province (*Oblast/Viloyat*), which is located in West-Uzbekistan (see also figure 1.1). At the 'village level' four locations within Khorezm were studied in detail. They are former collective farms,

now dismantled into numerous *fermer* enterprises (private medium-sized farms). At the level of the collective farms WUAs have been established to manage irrigation and drainage facilities in the area. Four WUAs were selected as case studies (see figure 1.2).

Karmish WUA and Chikirchi-Angarik WUA were studied during two consecutive summers (2005-2006), while Madir-Yap WUA and Tagalak-Yap WUA were added in 2006. The two locations selected in 2005 are both located in Yangiarik District, a district in which most of the district level work was conducted. Also in Kushkupir District and Khanka District, the districts in which the other two WUAs are located, research at the district level was conducted.

In 2005 Karmish WUA was still Khorezm Shirkat, a post-independence collective farm in the Northern end of the district, and therefore somewhat in the head-end area of the irrigation's sub-system. The primary reason for working in this location was the possibility of living in one of its villages. Chikirchi Angarik WUA was selected in addition, and in contrast. It is in the far South of the district and constitutes the tail of the system. The cropping season of 2005 was the second year in which it functioned as a WUA with privatised *fermers*. In 2006, after having chosen to in the first place focus on the WUA level, it became possible to add another two case study WUAs. These were purposefully selected outside Yangiarik District, in order to make the study better represent the diversity within Khorezm. With respect to earlier conducted and just starting research in the natural sciences domain within the ZEF/UNESCO project, WUAs within the Palvan-Gazavat system were selected that had relatively simple hydrographic boundaries, i.e. their water balances could be studied with minimal measuring points[10]. One of them was located very much upstream (Madir-Yap WUA) and one of them very much downstream (Tagalak Yap WUA). Both of them were functioning as WUAs for the second cropping season, i.e. the collective farms were dismantled round about 2004/2005. This was an explicit selection criterion. By this they were representative for many WUAs in Khorezm, as the majority was established in the period 2004/2006 as part of a country-wide programme to transform all remaining collective farms into *fermer* enterprises with WUAs responsible for water management (see Chapter 6).

2.5.2. The survey

In order to gather basic statistical data on household composition, land holding and land-use a household survey was conducted in the four selected WUAs. The survey served both the purpose of being able to compare the four WUAs as well as to generate numbers that would be representative for Khorezm as a whole. For the latter purpose the survey has the limitation that it was conducted in four concentrated areas (the WUAs), which together not necessarily comprise a representative share of Khorezm as a whole. On some aspects the variation between the four WUAs is only small and of these numbers it can be expected that they are representative for a larger area as well.

The survey form and methodology for sampling and interview were designed after consultation with various researchers in the ZEF/UNESCO project that had conducted surveys in Khorezm earlier. As a result the survey form and method of sampling was based on the principles of the survey as conducted by Caleb Wall (see Wall, 2006: 87-89). A few specific questions regarding agricultural knowledge (his research topic) were removed and some questions regarding land tenure and land use were added. The forms (see Annex) were completed by the enumerators during interviews with one of the household members. Ten

[10] The earlier work referred to is that of Christopher Conrad, the then planned work that of Usman Khalid Awan.

percent of the households in each WUA were sampled. In total the sample size is 684 households. They were selected by walking down the streets and approaching every tenth house. If nobody was found at home the neighbouring house was approached, if people were at home but did not agree to participate (either at the beginning or in the course of the interview) the household was counted in the sample as a refusal. Following Wall (2006) and Kandiyoti (1999) the household is defined as the people living together in one house and sharing a common household budget

Regarding the selection of enumerators Wall (2006) argued for selecting suitable students at the university in Urgench and let them survey their home village in a rural area. For his survey the exact location of the villages was not so important. The survey conducted for this study had to be exactly in the four WUAs where other research was already done. It turned out to be impossible to find suitable candidates in the four WUAs themselves. Hence the best four student candidates were selected without consideration to the location of their homes. They worked as a team of enumerators completing the four WUAs the one after the other. As a result the effect of the individual enumerators on the results could be filtered out. Especially questions referring to the vaguely defined concept 'enough' and politically sensitive issues resulted in differing responses depending on the enumerator and must therefore be considered invalid.

The four enumerators were trained in conducting surveys. In order to counter the expected high levels of distrust to be encountered a lot of attention was paid to how to create a comfortable setting in which people would give reliable answers. After initial training they were sent out for one day to conduct some interviews and their experiences were discussed plenary. This resulted in a few adaptation made to the interview form and some suggestions for how to create a comfortable setting. During the initial days of conducting the survey the filled-in forms were discussed one-on-one with the enumerators in order to clarify any possible misunderstanding and to make sure that they all had the same understanding of the questionnaire.

The basic descriptive statistics gathered from this survey are presented in Table 2.2. Further analysis of the data follows in the subsequent chapters.

WUA name	Karmish	Chikirchi Angarik	Madir-Yap	Tagalak-Yap
Former Shirkat	Khorezm	Ak Mechit	Yangi Hayot	Obod
Located in district	Yangiarik	Yangiarik	Khanka	Kushkupir
Irrigation sub-system	Tashaka, R8	Tashaka, R8	Palvan-Gazavat	Palvan-Gazavat
How long a WUA in 2006	1st year	3rd year	2nd year	2nd year
Studied during	2005/2006	2005/2006	2006	2006
Agricultural area (ha)	2055	2289	1652	1650
Total population (no.)	9116	10678	8739	6925
Number of households (official statistics)	2241	2589	1187	1364
Sample size (no. of households)	223	212	119	130
Number of fermers in the WUA	255	147	91	81
% fermers as part of total no of households	11%	6%	8%	6%
% of households with tamorka	100%	97%	93%	96%
average size of tamorka in these households (ha)	0.149	0.145	0.143	0.136
Average household size (no. of people)	6.3	7.0	8.0	6.9
Average available workers per household	3.2	3.9	3.8	3.4
% of households with member with paid employment	51%	31%	67%	47%
% of households with member working outside Uzbekistan	16%	21%	8%	28%
% of households with a member employed by a fermer	26%	35%	22%	44%
% of households with a car	30%	37%	50%	39%
% of households with a donkey cart	42%	35%	13%	48%
% of households holding cows	87%	85%	80%	82%
Average number of cows in these households	3.4	2.8	3.2	2.1
% of households holding sheep	18%	24%	12%	31%
Average number of sheep in these households	2.5	3.2	4.5	8.1

Table 2.2 – Descriptive statistics of the four case study WUAs

2.5.3. Series of interviews with selected farmers

At the beginning of the fieldwork period in 2006 in each of the four case study WUAs eight households were selected; four *fermer* households and four *dekhan* households. All these households were interviewed at least once by means a semi-structured interview. Of these initial 32 households about 10 were followed in detail throughout that season. Some of these people were visited more than five times, others just three times. Some of these follow-up interviews took half a day, others were only short incidental encounters. Sometimes these meetings were at the farmer's home, but mostly this was then combined with a joint visit to their fields. In this way the semi-structured interviews were combined with direct observations of agricultural practices. This was a great aid in overcoming the farmers' hesitance to talk and the frequent miscommunications due to cultural and language barriers. Being at their fields we could talk about very concrete agricultural practices like the depth of ploughing, the spacing of plants, the method of applying water, the boundaries of plots within a field. Indirectly this provided insights in the relations between *fermers* and their workers, between farmers and state organisations as well as between farmers in a certain area. Later such issues could sometimes be discussed more directly, but even then it remained easier to talk with concrete examples at hand by being at their fields. With the passing by of the agricultural season different issues were discussed, partly led by advancing insights and partly by the agricultural issues at play at that moment. Early in the season the interviews centred on topics like land preparation, leaching, and the seeding of cotton, later the first and second irrigation of cotton plants was more important while in May and June the planting of rice (and getting permission for it) was a major issue. Only in September/October it was easier to talk about yields of cotton and rice, the marketing of it and the negotiations for the cropping patterns of the next year.

Selection of the case study households was through theoretic sampling, i.e. following from the issues that were found in earlier fieldwork as well as following from expectations based on theories, households were strategically hand-picked. For instance I looked for a few large *fermers*, as I was aware that they have a different mode of operation than the medium-sized and small *fermers*. Moreover I especially selected households involved in cropping cotton and/or rice as I expected interesting interactions over water along these lines of division. Some *dekhans* were selected for their tail-end position in their WUAs and the expected possible effects on strategising for water.

2.6. Conclusion

On basis of qualitative fieldwork material conclusions can be drawn about the mechanisms behind the observed phenomena. It is not necessary to systematically follow all the drains in a particular area, nor to quantify how much water was flowing directly to the drains and for what purposes. The in-depth understanding of the underlying mechanisms makes it possible to formulate the general rules behind it, as well as the possibilities and the impossibilities. On this basic understanding of the system more pointed research questions and hypotheses were formulated that could be tested and/or quantified.

My experience with approaching a politically sensitive topic through an integrated approach and mixed methods triangulations results in a number of recommendations. First of all a bottom-up approach that starts with living in a village, learning Uzbek and slowly building-up rapport with ordinary people has proved effective – it seems unnecessary to start

with the authorities and work ones way down to field level. This is however only possible when permissions have been pre-arranged, for instance through working in a large research project. And still, it requires sensitivity in working with people in official positions. In my experience it is more useful to once in a while be sent around to places and people that tell the official story rather than to be seen as somebody working outside the set boundaries. In the latter case people do not feel free to talk and if they do they might bring themselves into trouble. Similarly I never explicitly sought to research illegal activities. Though at some point paddy cultivation did have my attention, I did not look into the issue because of its illegality, but because of its strong influence on water distribution.

The use of a professional identity proved very useful if I compare my work with that of some colleagues, who had difficulties in finding a credible excuse to 'hang around' in the field. Not only the identity, but also practical and thorough technical knowledge of the research topic are an enormous advantage. This also helps to position oneself in action situation, where interviews can be combined with direct observations. In general it is a big advantage to be able to do direct observations compared to just interviews, as people tend to be more at ease when engaged in activities, it often leads to practical questions that also have a deeper meaning and observation of the activities also lead to new insights.

Above all, the mixed method triangulation with a retroduction or riddle solving approach has proved particularly useful in a problematic research context. It provides the opportunity for trying a variety of methods and assessing the practical advantages and disadvantages of each in the particular setting. This flexibility is necessary to be able to respond to the many difficulties encountered in the field. Also the approach was apt to be deployed in a situation where only very little was known on the research topic. The approach allowed for theory development and restructuring rather than for theory testing. In the current environment it will be difficult to reliably quantify the identified processes. However, there are good opportunities for theory refinement and reconstruction.

Just as some topics were avoided during fieldwork, also in the written material (papers and dissertation) some topics as well as some concrete references will be omitted. Partly this is a result of lacking field material and partly because it might threaten my informants or the ZEF/UNESCO project of which this research is part. Such self-censorship is not strange to Uzbek media and society (Shafer and Freedman, 2003). For me, however, it is a new phenomenon. Within the ZEF/UNESCO project we have had recurring discussions on what we can and what we cannot write in order not create threats to the continuation of the project and/or the personal safety of the people that we work with. It is a sad thing that this must be an issue and it is a compromise to academic standards that even we have to conclude that in some ways we have to restrict ourselves. To me the bottom line is that it should at least be possible to publicly state that, to our own perception, we cannot write everything, i.e. we actively and consciously censor our work to keep it acceptable for the Uzbek government.

There are serious limitations to conducting social science research in Uzbekistan, yet this research has been able to gain access to issues and developments in Uzbek society that were unknown before. Among other things this research sheds light on state control in practice, socio-economic differentiation processes in agriculture and the practice of new institutions that are implemented under influence of worldwide neo-liberal agendas (such as Water Users Associations and water pricing). These are valuable findings that may have their effect on research and implementation processes and eventually they might inform rural transformation processes and in that way benefit the people of Uzbekistan.

Chapter 3

Land Reform and the Transformation of Agrarian Relations

3.1. Introduction

Since its independence in 1991, Uzbekistan's agricultural system has been in transformation. The moving away from a collective and command economy has been slow, but has had important effects. In agriculture the main changes took place through land reform and reforms in state planning of production. This has led to the formation of new agricultural production units, changed rural livelihood patterns and differentiation in the rural social-economic structure.

In this chapter the most recent phase of Uzbek agrarian reform is discussed. It consists of the dissolution of all remaining Large Farm Enterprises (LFEs)[11] and the allocation of land use rights to family based *fermer* enterprises. The following questions are addressed: who are the actors in agricultural production, how do their current positions relate to their position in former phases of agrarian reforms, and what are their relations *vis-à-vis* each other? The answers to these questions concern three actors (or groups of actors): the *dekhans* (which are peasant-like), the *fermers*, and the state. Also after the most recent agrarian reform the latter remains a strong regulator and driver of agricultural production.

The story presented in this chapter concerns a limited time slot in an ongoing process; i.e. the Uzbek agrarian system is still in slow, yet continuous, change. Even though this change process is frequently labelled as a transition process to a market economy it is not easy to distinguish where it is moving to. Certainly it was not a market economy in the period under study. Policies frequently contradict each other, as the government simultaneously aims at economic and socio-political stability through keeping a strong hold on agricultural production, and at improving efficiency through introducing market forces, which implies de-regulation (*cf.* Mueller, 2006:17). Easier than knowing where Uzbekistan is moving to, it is to see where it is coming from; i.e. a former Soviet republic with a collective agricultural system and a strongly plan-driven command economy.

Formally the Soviet Union had an egalitarian society, while in practice there were important differences in position and opportunities. Furthermore the collapse of the Soviet Union led to 'a significant increase in differentiation and stratification, growing inequality within and between different strata of the population, and rising poverty' (Wegren et al. 2006: 372). As a result there are 'winners and losers' in the rural economy. In their study, Wegren et al. (2006) address the question whether in rural Russia classes are developing. Subsequently they show that in Russia the upper and the lower strata differentiated substantially on five axes of analysis that they defined: income, land holdings, capital stock, class consciousness and shared attitudes and values. On the basis of this increased differentiation and stratification they argue that a new class structure is emerging in rural Russia.

The Uzbek path of transition has been quite different from that of Russia, yet the process is analogous and the question to class formation through socio-economic differentiation and stratification is relevant for Uzbekistan as well. In Uzbekistan this process has not evolved far enough to make similar assessments and interpretations as in Wegren et al. (2006). However, the distribution of the means of production (particularly land) is highly unevenly and this could provide the lines along which classes will stratify and differentiate.

[11] Here the term large farm enterprise (LFE) is adopted to cover the broad spectrum of types and terminology of agricultural enterprises in state and collective agriculture. In most situations these differences are unimportant and hence it is clearer to use just the term LFE instead of *kolkhoz*, *sovkhoz*, *shirkat*, collective, co-operative, etc.

Access to In section 3.2, on Uzbekistan's path of transition, the agricultural reforms are discussed along the topics of 'land reform' and 'command economy reform'.

Though the land tenure arrangements and accompanying regulations have a strong influence on how farm enterprises are organised the differentiation in the management of farm enterprises is not merely a bifurcation between *fermers* and *dekhans*. In section 3.3 and 3.4, respectively the practices and social relation of *dekhan*-families and the *fermer*-enterprises are described. These are formal categories that contain a heterogeneous set of strategies and forms of enterprise organisation. Farm enterprises have different ways of shaping their relations of production, both the *internal relations of production* (e.g. the control over business capital, land rights, operations, and labour relations) and the *external relations of production* (e.g. technological dependencies, credit relations and marketing linkages)[12]. On basis of this recognition a typology is developed (section 3.5). The concept of *subsumption* developed by Whatmore et al. (1987a and 1987b) is used to describe the reduced autonomy of farm enterprises in relation to wider relations of agricultural production.

In the concluding section (3.5) also the increased dependency of ordinary rural households (the *dekhans*) on the *fermers* is discussed. Socio-economic differentiation has become visible and is expected to further increase. This poses serious questions regarding equity and development that are relevant for both the Uzbek government and international organisations working in Uzbekistan.

3.2. Uzbekistan's path of transition

The new states that emerged from the Soviet Union have followed very different paths of agrarian transition (Spoor and Visser, 2001). There were early, late and non-reformers (Gleason, 2004). Uzbekistan is considered a late reformer. Others refer to the Uzbek model as 'step by step' (Bloch, 2002:5 in Conti, 2004:78) or 'gradual reform' (Pomfret, 1999 and 2000; Auty, 2003). 'Gradual reform' is not a euphemism for 'no change at all'. Especially in agriculture, reform has proceeded very slowly in the first decade after independence (Pomfret 1999: 7–8). This gradual reform has been a deliberate choice by the Government of Uzbekistan. In the first decade this resulted in a stable economy when compared to the more radical reforms initiated by other republics of the former Soviet Union (Spoor and Visser, 2001; Ho and Spoor, 2006).

The agrarian structure of Uzbekistan still strongly bears the marks of the Soviet era. The land tenure system until very recently reflected the remnants of collectivisation, while the input-output regulations resembled a partial plan economy. Firstly the history of land reforms and the current land tenure system are presented (3.2.1). This is followed by an elaboration of the remaining state regulations in agriculture (3.2.2).

3.2.1. Land reforms

The reforms after the collapse of the Soviet Union cannot be considered to be a 'restoration' or 'back to what was'; i.e.

> Private property arrangements have been disrupted for more than a century, first by Russian colonialism and then by 70 years of Soviet-style socialism. Indeed, in many areas there is no historical record at all of private property rights in water and

[12] See also the discussion in Chapter 1

> agricultural land. In most areas, geophysical and cadastral surveys of the land do not exist and may never have existed.
>
> (Gleason and Buck, 1993:522).

Over the first 15 years of post-independence the major part of the agricultural land in Uzbekistan was distributed as land use entitlements on basis of farming capability (technical, socio-economic as well as political). Only a limited number of households got such entitlements. Around the moment of independence all rural households received an additional household plot (*ko'sumcha tamorka*). As a result about 20% of the arable land is now in use as household plot. None of this land re-distribution was on the basis of former ownership[13].

Figure 3.1 shows that in the first 15 years of independence the shares of agricultural land that are cropped privately (in white) and semi-privately (in light grey) have both steadily increased. At the same time the area cultivated under a collective and state regime (dark grey) decreased. Below the transition from the Soviet *Kolkhoz* and *Sovkhoz* towards fully de-collectivised agriculture (in 2006) is discussed in three phases of reforms.

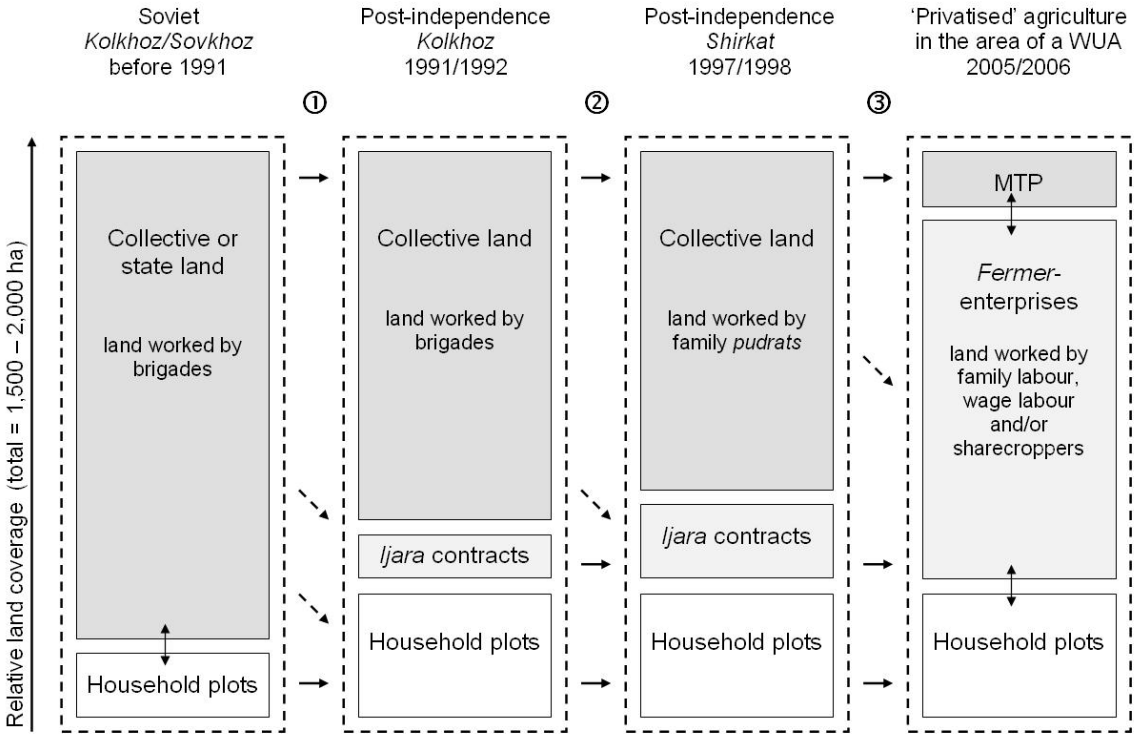

Figure 3.1 – Land use change in post-independence Uzbekistan
Source: own compilation on basis of a figure by Trevisani (forthcoming 2008)

[13] This is very different from the post-communist land reforms in most Eastern European countries, where land was often re-distributed on basis of historical claims (see for instance Rozelle and Swinnen, 2004).

The first round of reforms (in figure 3.1 marked by the symbol '①') consisted of three aspects.

(a) In the direct aftermath of independence, the 'large, inefficient' *sovkhozy* (state farms) were simply transformed into 'large, inefficient' collective or cooperative farms (World Bank 1994:39, cited in Spoor, 1999). The collective land was still cultivated by work brigades. Officially workers no longer received a monthly wage, but rather a share of the collective's production, but in practice these were only paper shares (Rozelle and Swinnen, 2004).

(b) At about the same time each rural household was given an extra household plot of about 0.13 irrigated hectares (*ko'sumcha tamorka*). This was in addition to the 0.12 ha housing plot or garden (*tamorka*). The new household plots were established on former collective land; large fields were taking out of collective production and divided into small plots. These distant household plots were therefore located as aggregated groups throughout the Kolkhoz. The allocation of extra household plots was a move in response to the shortfall in grain (and other food products) right after the break-up of the Soviet Union and was meant to secure enough food production on the household level (Kandiyoti, 2003a:228) and as a compensation for the shortcomings in payment by the state and collective farms (Patnaik, 1995:156; Trevisani, 2007b). In 1989 between one third and half of the population in Central Asia lived below the poverty line (Patnaik, 1995:154). By the enlargement of the households plots rural households moved towards self-sufficiency, which helped to counter this poverty. The enlargement of the household plots formed the basis on which the Uzbek government in later periods renamed the *kolkhoznik* a *dekhan* (lit. small farmer or peasant). Trevisani (forthcoming 2008) states that this specific wording has been chosen 'for its ideological reference to the 'historical' sedentary Uzbek oasis dweller, who used to make his living out of agriculture'.

(c) Since 1991 long-term private leaseholds on pieces of collective land were slowly introduced (*ijara*-contracts; lit. 'rent'). In the following rounds of reforms these sorts of contracts gained importance and the area which they covered slowly increased. In the academic literature till about 2000 they are referred to as 'independent farmer', 'private farmer' or '*dekhan*'[14]. The family-based agricultural enterprises that were built upon these *ijara*-contracts are in this study referred to as '*fermers*'. Officially the land remained state property while *fermers* got land leases or partial usufruct rights. The allocation of land went through the powerful governors and mayors, a process which at the onset especially benefited the rural elite (Spoor, 1999:10; Trevisani, 2007b).

The second phase of reforms (in figure 3.1 marked with '②') confirmed the direction of development and took it a step further:

(a) In 1998/1999 all *kolkhozy* were renamed into *shirkats* ('association' in Uzbek), while the work on collective land was reorganised from work brigades into family *pudrats* (after the Russian-Uzbek root for 'contract'). A *pudrat* is a small work brigade organised on family relations; each family bearing the responsibility for (part of) a field. The same people continued to work on the same collective fields. However, as *pudrats* they entered directly into a sort of share-cropping arrangements with the *shirkat* rather than being brigade members, i.e. workers.

[14] The latter should not be mistaken with came to be known as *dekhan* after about 2000, i.e. a rural household with only a household plot.

(b) The number of *fermers*, with leased land as enclaves within *shirkats*, slowly increased.
(c) In the same period some of the most unprofitable *shirkats* went through a 'sanitation programme', which aimed to reform unproductive agricultural enterprises. It consisted of a period of two years in which the creditworthiness and economic viability were re-established. The enterprises that showed improvement remained *shirkats*, while the rest were liquidated and transformed into 'Associations of Private and *Dekhan* Farmers'. The former collective land was distributed among *fermers*. Such areas *de facto* already reached a situation as depicted in the fourth column of figure 3.1.

In the third and most recent round of reforms (in figure 3.1 marked with '③') the path of de-collectivisation was continued.

(a) All the remaining collectives followed the liquidation path. Almost all land was redistributed to *fermers*, while a small share of between 10 and 20 percent initially remained on the accounts of the 'Motor Tractor Parks' (MTPs). It was intended that the major part of this would also be distributed to *fermers* in the years following.
(b) In the collective farms many functions had been integrated. After liquidation of the farm these functions were partly transferred to the *fermers*, partly transferred to government organisations at district level and partly continued in separate organisations like the MTPs. Within the MTPs the major part of the heavy machinery that remained of the collective farms was accommodated.
(c) Water Users Associations (WUAs) are bestowed with the responsibility to manage and maintain the irrigation and drainage infrastructure. The institutional aspects of water distribution at this level are elaborated in Chapter 5. In Yangibazar District (Khorezm Province), this third phase of reforms already took place in 2001/2002 as part of a nation-wide pilot study. On basis of these (and other) experiences, similar reforms were implemented in the whole country during 2005 and 2006.

This chapter, and in fact the major part of this study, is about the third phase of reforms and the socio-political dynamics of water distribution in the situation as represented by the fourth column (Figure 3.1).

3.2.2. Regulation by the state

Above it was explained that land under state/collective production was slowly but surely transferred to private and semi-private forms of production. This is transformation through de-collectivisation. One of the other axes of transformation is the de-regulation of state agricultural production.

As a continuation of Soviet planning in a command economic mode the Uzbek government still prescribes fixed quotas for crop production of wheat and cotton. Wheat is deemed essential for national grain self-sufficiency, while cotton has been a favoured cash crop for at least two centuries.[15] Prior to the collapse of the Soviet Union, grain was delivered to Uzbekistan from other areas within the Union. At independence Uzbekistan

[15] In the first half of the 19th century Russia important cotton from Central Asia. The American civil war (1861-65) caused a drop in American cotton delivery and stimulated Russia to find their cotton elsewhere (Pierce, 1960 in Wegerich 2002). Cotton was also one of the main reasons for Russia to conquer Central Asia between 1864 and 1885 (Lipovsky, 1995 in Wegerich, 2002).

started aiming at, and meanwhile has achieved, self-sufficiency in grain production, partly at the cost of cotton production.[16]

The break-up of the Soviet Union and the cut-off from Soviet budgetary grants pushed the Uzbek government to seek its own revenues. Initially these revenues were generated through continuation of the state order system for the production of cotton: production quotas for *shirkats* and *fermers* were set by the government and raw cotton was to be sold for a fixed (or negotiated, but *de facto* fixed[17]) price to the state (Kandiyoti, 2003a; Pomfret, 1999:9). The system functioned through pre-financing of subsidised inputs and cheap credits to LFEs and *fermers,* while at the end of the season these debts were deducted from the amounts paid for the yield. The height of the payment for the raw cotton was very low in comparison to what the government got for sale of the processed cotton and by-products after processing. Overall a net flow of value out of agriculture was taking place, especially because of the arrangements around cotton production (IMF, 1998 in Spoor, 2004; Djalalov, 2005; World Bank, 2005). These regulations actually put strong disincentives on the production of cotton (World Bank, 2005).[18] Thus there were high economic costs to maintain the system, which were borne by the tillers of the land, not by the controlling elites or the state organisations. The financial margin for the actual producers is very small and sometimes even negative, yet producers also profit from a stable and therefore predictable 'market'.

Meanwhile the 'implicit taxation' of agricultural production has decreased, among others due to increased cotton prices that the *fermers* receive. The IMF (1998, in Spoor, 2004) in 1995 estimated a net outflow of resources from agriculture at $0.9–1.2 billion. In the following two years (1996–1997) transfer out of agriculture dropped to somewhere between $250 and $550 million. The WorldBank (2005) estimated that in the period from 2000–2004 this number fluctuated between $285 (2000) and $150 (2003) million.

3.3. Dekhan livelihoods

By referring to the pre-collectivised term *dekhan*, the Uzbek government stressed the independence of the rural households as well as its ability and need to sustain itself. The term *dekhan* could possibly be translated with 'peasant', which has a connotation of small and production for subsistence. The nature of the peasantry has been hotly debated in academic literature. Bernstein and Byres (2001:6) explain how in different ways peasants have been defined, though they themselves are critical of such definitions.

> The qualities of an essential 'peasantness' can be constructed in formal theories of peasant behaviour […] and in sociological and cultural(ist) conceptions of what makes peasants different and special (contrasted explicitly or implicitly with proletarians on one hand, market-oriented and entrepreneurial 'farmers' on the other). Such essentialist constructions acknowledge the relations of peasants with

[16] As earlier noticed by Spoor (2000) the area grown to cotton decreased from 1,666,680 ha to 1,487,300 ha between 1992 and 1996 while the area grown to grain increased from 626,990 ha to 1,328,600 (FAOSTAT, 2007).

[17] Prices are *de facto* fixed as the State functions as monopolistic buyer.

[18] The World Bank estimates that with a change in tax structure an increase of 50% in the output of cotton would be possible, which would result in the same revenue for the state.

other social groups and entities – landlords, merchants, the state, the urban in general – and typically view them as relations of subordination and exploitation.

At this place I do not intend to analyse the Uzbek *dekhan* in the very broad literature of the peasant debate. Therefore the issue is not so much about the definition of the peasant and its role in agrarian change, but rather the focus is on the actually existing (and changing) social relations of *dekhan* families, which have some likening to what in ordinary speech is understood as a peasant. Also I do not argue that *dekhans* are a social class, as it is not clear to what extent this group of households share values and have similar income strategies. Certainly their relations to markets and other forms of trade are not uniform, neither is the income from paid labour and sharecropping arrangements. In this study, all rural households that are not *fermers*, are considered *dekhans*, no matter whether they are officially registered as such or not. Thus it is a very large group of households that is certainly not homogeneous.

In the four case study areas *dekhans* accounted for 89–94%[19] of the rural households. They are the tillers of the land and provide the workforce for all agricultural production, also on the fields of the *fermers*. All rural households have been granted household plots[20], which in Khorezm province make for about 15% of the arable land[21]. The produce from these plots provides for a basic living. Surplus production is bartered with neighbours or sold on local markets (*cf.* Djanibekov, forthcoming 2008). In addition people take paid jobs outside the village and engage in small-scale animal husbandry, sharecropping, long-distance trading and labour migration. These livelihood activities are discussed in more detail in this section.

3.3.1. Defining the household

A household can be defined in a variety of ways. For the survey conducted as part of this research it was defined as the people living together in one house and sharing a common household budget. The official number of households is much higher than the number of households that qualifies under the adopted definition. The reason for this is that newly wed couples are registered as separate households as soon as possible in order to get assigned a housing plot as well as an (agricultural) household plot[22]. However they remain part of the

[19] Karmish WUA 89%; Madir Yap WUA and Tagalak Yap WUA 92%; Chikirchi-Angarik WUA 94%.

[20] The survey results also show a very small group of households (3%) that does not have (or use) an additional household plot (*tamorka*).

[21] The numbers for Yangiarik District, which I know well and was able to cross-check on the ground, showed that it is almost 20%. The official number for Khorezm is 14%, which makes a fitting calculation with the average households size from my survey (7 persons), land sizes of 0.25 ha/household, a total population of 1.4 million people, 80% of the people living in rural areas, and a total arable area of 275,000.

[22] The number of households registered in the village's office (*shora* office) was higher than the number of actual households. To estimate the real number of households the average household size of the official statistics and that of the survey were compared with each other. This ratio can be assumed to be the same ratio as between the registered and the real number of households. In the total survey the average household size was for instance 6.9 persons, while the official numbers reported an average household size of 4.8 persons; a difference of a factor 1.4. An average household therefore consists of 1.4 registered households.

In an interview this was confirmed to my by a former kolkhoz manager.

GJV: There is also a difference as a result of the official households being more than the real houses. People get assigned a new plot, but still live together. [Respondent]: Yes, there are about 200-250 households that are actually part of another household. I know this very well, as for a long time I was the one handing out these plots to new households. Now the *Shora* office together with the *Hokimiyat* has become responsible. They will do this on *fermer* land when there is need. In that case the *Shora* will tell the *Hokimiyat* that there is need for new

household of the parents of the husband until a house has been built. This can take years. The family of the youngest son usually remains in the house and takes care of the parents and inherits the house.

Kandiyoti (2003a) defined the household on the basis of the sharing of the *kazan*, the cooking pot, i.e. a common food budget; if people share their food it is one household. Even when a couple moves out of the natal house the food budget remains partly linked for some time. This leads to an understanding of households as extended families, which historically are large and culturally strong (*cf* Patnaik, 1995). The survey that was conducted as part of this research shows an average household size of 6.9 people (varying between 6.3 and 8.0 between the four case study areas), with on average 3.6 people available as workforce. The extended family is a unit of consumption, distribution and production (Trevisani, 2007b). The patriarch manages the family budget, assigns labour tasks and decides about all matters of economic and social importance. The wife, sons, daughters (if living in the house) and daughters-in-law are expected to hand over their salaries and ask for money in case of 'special spendings', while they usually also have some pocket money.

Agrarian labour tasks are often divided along gender lines. Women are typically responsible for gardening on the household plots, weeding, silk production, milking cows, and the processing of food. Co-ordination of these tasks takes places by the *mater familias*. Task that are typically in the male domain are the arranging of contracts and inputs, arranging irrigation turns and irrigating the household plots. Women represent a large part of the workers on the fields of the LFE and *fermers*, which *dekhan* families crop under share cropping arrangements (see below). Feminisation of agriculture is taking place as an effect of temporary labour migration by men (see below) and increasing unemployment, which affects women more than men (cf. Trevisani, 2006a; Wall, 2006).

From when children are about ten years of age they frequently work along with the adults in the fields (*cf.* ICG, 2005). At even younger ages the boys herd animals and girls assist in gardening, processing of food and domestic work. Elderly parents living in the house often look after the very young children and provide extra cash income through their pensions.

Trevisani (forthcoming 2008) reports that to live a respectable life in the rural areas means: to eat meat once or twice a week, to be able to serve guests a bottle of vodka, to give parties at the important life events, to be able to build a house for the sons. *Dekhans* are the rural poor and among them a number of families struggle to even fulfil these basic conditions.

3.3.2. The household plots

The household plots provide a basic livelihood for almost all *dekhans*. The area usually consists of two (or more) separate plots; there are *tamorkas* and *ko'sumcha tamorkas* (i.e. plots and additional plots). *Tamorkas* are situated around the house and are fenced off with clay walls. In Khorezm they are often referred to as the backyard garden (*bog'*). The *ko'sumcha tamorka* is usually some distance away from the house.

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land and they will decide which land will be used. (…) The *Shora* might give you a number of 1,200 households, but in reality it could be 900. [from field notes on 12/06/2006]

At that place the official number of households was 1,364, and the correction factor 1.36, which would imply that actually there are only 1,003 households. This is very similar to the account by the former kolkhoz manager.

The attached plots are intensively cropped with potatoes and a variety of fruits and vegetables. The layout of beds is planned in detail, based on knowledge of the local conditions (soil quality, water availability, and light conditions)[23]. The soil is completely tilled by hand, shovel (*bil*) and hoe (*ketmon*). People use a variety of double cropping systems, which involve the early (sometimes over winter) cropping of potatoes, onions and garlic combined with the late cropping of mung beans, carrots, (green) tomatoes, onions and mixtures of maize, sorghum and millet as animal feed. From interviews and observations it showed that the distant plots were typically double cropped with wheat (over winter) and rice or maize (in summer). Of the respondents that provided data on the use of their distant plot 88% reported to crop wheat, while 60% reported to grow rice and 38% reported to crop maize[24]. Mostly also these distant plots are tilled by hand, though sometimes they are ploughed by tractor.

The production on the *tamorka* plot provides for the basic needs of an average family, but it is a fragile base as the margins are narrow.[25] Potato, vegetable, fruit and bean production in the gardens provides for food diversification. In addition to that, about half of the households have access to other sorts of land, as discussed in the following sections.

3.3.3. Animal husbandry

The survey that I conducted in the four case study areas shows that 84% of the households hold cows, 76% chicken, and 21% sheep. Wall (2006: 107), in his survey, even reports a number of 90.8% for households holding cows.

A large proportion of the animal products come from the household smallholdings. Ilkhamov (1998) reported that in 1995 76% of the total meat production, 81% of the milk production and 66% of the eggs in Uzbekistan came from household smallholdings. Animals are indeed kept for provision of dairy and meat products for home consumption, sharing with neighbours and for selling to a butcher. Especially the rearing of cows is considered a lucrative business (*cf.* Wall, 2006:99). Besides, animals serve as capital stock. One of my informants referred to cows as 'walking money'. Though there are (health) risks associated with the maintenance of this capital (*cf.* Wall, 2006), this way of stocking is generally preferred over bringing money to the bank. Animals are turned to cash or used as direct payment in case of large investments, such as the building of a new house and the major life-cycle expenditures, such as the dowry and wedding celebrations (Trevisani, 2007b). A sheep that we had left as present of thanks to our host in the village was later passed on to a neighbouring family that had to organize a funeral, and which otherwise would have lacked the money to provide for a decent meal.

As the household plots for most families are too small to produce animal fodder in addition to food production for home consumption, fodder has to be acquired elsewhere. Cows used to be taken grazing on the fields of the collective, which was considered a benefit

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[23] Wall (2006) elaborates on local knowledge in relation to household agriculture.

[24] All these three are planted on (almost) the entire plot (on average 0.14 ha); i.e. the average area for wheat and rice is 0.14 ha and for maize 0.13 ha. The total is more than 100% as most of this land is double cropped; after the wheat grown over winter people plant rice or maize.

[25] An estimated production that is possible on the distant plot gives: 0.13 ha x 4 ton wheat/ha + 0.13 ha x 3 ton rice/ha = 910 kg/year. The average household consists of 4.8 persons (the average from official statistics from 4 WUAs). The production on the distant plot would then amount to 190 kg/person/year, which is less than the 230 kg per year that the World Food Program uses as the minimal cereal requirement (WFP, 2007). The backyard garden can provide some additional energy, especially through the production of potatoes, which is cropped by 85% of the households in the survey and grown on 35% of the total backyard garden area.

that belonged to workers of the collective farm. In the de-collectivised situation of 2006 *dekhans* usually bargained grazing rights with a *fermer* (Trevisani, 2007b). Also cotton cakes that remain after pressing oil from the cotton seeds is used for fodder (Mueller, 2006). These cakes partly return to the *fermer* after his yield is processed and through that channel become available to the *dekhans*.

Dekhan generally keep their animals at the back of the house, where there are animal sheds and storage of dry fodder. Cows and sheep are sometimes temporarily pegged in the fields or taken out grazing along the roads and canals, generally by children. The dung that the cows produce is in the first place used as organic fertilizer on the household plots. The surplus dung is provided to *fermers* as part of multiplex relations that are maintained between *dekhans* and *fermers*. Jozan et al. (2006) report a similar situation for the sharing of dung in the Uzbekistani part of the Ferghana Valley.

3.3.4. Sharecropping and rental land

Dekhans engage in various forms of sharecropping, i.e. they provide labour in exchange for other benefits. Until the third phase of reforms this used to be with the LFE, in the de-collectivised situation this is with *fermers*. Characteristic for these sharecropping arrangements is that the mutual conditions are not cast in concrete, but that they are negotiable during the advancement of the season. Some relations can almost be characterised as pure wage labour, but in most of these labour relations cash payments played only a secondary role, i.e. the in kind payments and indirect benefits are more important (*cf.* Kandiyoti, 2003a).

Though according to the government *fermers* should provide work to the *dekhans* who were the tillers under collective agriculture, upon de-collectivisation immediately a tendency to hire family members, neighbours and friends occurred. This 'familiarization' of the *fermer*'s workforce means the loss of opportunities for some. Under the third phase of reforms the plot of mulberry trees that for years had been cultivated by a *dekhan* family that I knew well was privatised in 2006 and given to a *fermer*. This *fermer* did the work on that plot with household labour and thus the *dekhan* family lost their access to silk production, which for years had been an important source of income. The change also provided new chances for others, especially those who were well connected to *fermers*. For example, a poor female-headed *dekhan* household that I worked with, in 2006 gained access to a lucrative sharecropping arrangement when a somewhat distant relative became a *fermer* and mainly employed relatives, neighbours and friends.

Some *dekhans* indicated that the ability of *fermers* to decide whom to employ also had a positive effect on the benefits they could negotiate in return for their labour and knowledge. Especially in the first year of full de-collectivisation *fermers* had difficulties getting qualified personnel. Some experienced and skilled *dekhans* used this situation to bargain a better position and payment. In the spring of 2006, just after the third phase of reforms was implemented in the area where I lived, I observed that *fermers* were actively looking for workers and that *dekhans* were finding out and discussing amongst each other where they could get the best deals. The following quote from an interview with a well-respected and experienced *dekhan* touching upon some of these issues.

> GJV: Is there a shortage of workers […]? Do *fermers* have difficulties finding enough workers? [*Dekhan*]: Well, the problem is that all *fermers* want the qualified and well experienced workers. The people who were the first to become *fermers* took all the good workers and now the others have difficulties finding good workers. GJV: Who for instance took the good workers? [*Dekhan*]: [mentioned two very large *fermers* in his area]. GJV: and which *fermers* are the least lucky ones? [*Dekhan*]: Workers will change their

> employer if they will not pay well. Sometimes they also give pieces of land in exchange for working for them.[26]

This implied higher payments for some and seemingly a strengthening link between performance and merit. Another change that was frequently mentioned by *dekhans* was the improved actual (cash) payment of their work; not the height of the payment, but the reliability of payment.

3.3.5. Trade, barter and solidarity exchange

During fieldwork I found three different forms of exchange of agricultural products; trade (selling for money), barter (in kind exchange for something else) and solidarity exchange (cultural forms of sharing without direct return benefit). The first two categories were included in my survey, while on the latter I have anecdotal evidence.

On average 40% of all the surveyed households reported to sell at the market themselves. This ranged between 25–50% in the four case study areas. 25% of all the surveyed households sold products through traders that come to purchase agricultural products in the villages. Only 8% of the surveyed households reported to engage in barter, while this ranged between 4–15% in the four case study areas.

The survey results show a high variance between the four case study WUAs where it comes to barter and trade. There are slight indications that this maybe connected to the distance to markets; i.e. in areas close to markets barter plays a smaller and trade a larger role. Chikirchi-Angarik WUA is the case with the largest deviations from the average; 15% of the households barter goods while only 25% sells directly at the market. Chikirchi-Angarik WUA is an isolated area in the tail-end of the irrigation system. Tagalak-Yap WUA is possibly even more isolated, at the border with Turkmenistan. However there is a weekly market very close which is of importance for regional and even cross-border trade. In this WUA the numbers are deviating in the other direction; 6% for barter and 50% for market sales.

After observing the frequent exchange of fresh agricultural products between households in the village where I lived, I expected the numbers on barter to be much higher than the 8% that showed from the survey. However, many of the exchanges that I had observed were not barters in the strict sense. If a household would have an abundance of fresh fruits, vegetables, milk, or meat this was generally shared with neighbours, friends and family. No direct return favour was expected, but of course the other households would return the favour when they had plenty. In some situations it was more formalised, for instance through an (informal) rotational schedule of slaughtering a cow and sharing it within a fixed group of households. Rasanayagam (2002) observed that also in the Uzbek Ferghana Valley reciprocal exchange through informal networks of kin, neighbours and friends function as strategies for coping with material hardship as well as a strategy to gain access to scarce resources.

[26] Field notes 14/03/2006

3.3.6. Wage labour

About half of the surveyed households (46%) reported to have at least one person in their household with a paid job outside agriculture. On average these households each have 1.5 person with such a job. On the percentage of households with access to paid jobs the variation between the four case study areas is high, ranging from 31% to 66%. The numbers indicate that this could be connected to the degree of urbanisation and the distance to urban centres.

3.3.7. Labour migration

The Soviets stimulated people living in rural Central Asia to migrate to areas with better job opportunities. Patnaik (1995) showed that at that time these people were among the ones most difficult to get migrating in the USSR. Currently, many people from Khorezm seasonally migrate for employment. They are almost without exception males that travel to Kazakhstan or Russia where they mainly work in agriculture and construction. Even though this sort of labour migration can be quite profitable, the activity is connected to poverty and shame. People frequently talked badly about others sending their son for work outside the country or proudly told me that they did not send their sons to work in Russia.

For instance at the start of interview with a *dekhan*, just after introducing myself and my research he started explaining his view on the connection between water shortage, poverty and labour migration as a means to cope with poverty.

> *[Dekhan]*: We have problems with water. If we have water and artificial fertilizer we work well in this area. Especially water is a problem. It is a month since I watered my garden. And it is not only me, but also the people in the village {indicating in the direction of the asphalt road}. Without water it is difficult to make a living here and that's why our younger generation has left to work outside Uzbekistan. If there would be water there would be no need to leave.[27]

People explore other options first before engaging in labour migration. A medium-sized *fermer* for instance explained it to me as follows.

> GJV: I heard from many people that they have household/family members working outside Uzbekistan, do you have that as well? [*Fermer*]: Ah, you know about such practice?! No, I do not have. GJV: Why not? [*Fermer*]: Think for yourself, it's not difficult to understand; if you can have work here, why would you leave?

Clearly he was indicating that households that have to send their sons for labour migration are the people without other opportunities.

Trevisani (forthcoming 2008) also reports that ordinary people do not like to talk about migration, while a police officer indicated to him that this is because migration is perceived to be shameful for the government, as it would imply that Uzbekistan is not able to feed its people. Wall (2006:89) mentions the issue of labour migration as one of the sensitive aspects of household economics and puts doubts on the number that he found from his survey. Though I agree that the issue has some sensitivity, my survey results do not indicate this. On sensitive topics (e.g. land titling and informal subleasing) there were high variations between the answers that the four enumerators retrieved. It was quite apparent that some of them were better able to gain trust of the interviewees than others. However,

[27] Field notes 01/06/2006

all enumerators reported very similar numbers on labour migration.[28] Also in discussing afterwards with the enumerators they reported that this was not a difficult issue to get clear answers on. The number of households with at least one member working outside Uzbekistan that Wall reported for Khorezm (16%) comes very close to what I found in my survey (19%). What does stand out as remarkable is the high variation between the four case study areas, ranging between 8 and 28%. The highest number occurs in the area furthest away from a regional centre (Tagalak-Yap WUA) and the lowest occurrence is in a place which is almost grown together with one of the large district centres (Madir-Yap WUA). The lack of paid employment opportunities in the vicinity of a village might bring people to look for opportunities further away.

3.4. *Fermers* and *fermer* enterprises

Only 5–10% of the rural households have become *fermers*. Yet these families manage the production on 70–80% of the land. Formally the state distinguishes the following three *fermer* types, as laid down in their business plans: (1) animal husbandry farms, (2) crop farms and (3) horticulture and orchard farms (*cf.* Mueller, 2006:18). *Fermers* in the first two categories range from intermediate size to large size (in my case study areas this ranges from about 5–50 ha, with exceptions up to 100 ha). *Fermers* in the last category are generally small (from 1–3 ha, incidentally up to 5 ha). These usually produce fruits or silk, making use of their own household labour. Underneath the trees they plant other crops, typically wheat followed by vegetables. As such the land use is very similar to that on household plots, though the legal status of these small *fermers* is essentially different. Their business model is that of a commercialising peasant, i.e. the major part of the yield is sold through markets and traders. In the collective farm period these *fermers* were sometimes ordinary farm labourers. Though their sizes are small, in some former collectives they make up for over 50% of the total number of *fermers*[29].

The animal husbandry farms must have a minimum of 30 animals. They are not just *dekhans* with a lot of animals, but privatised parts of the former collectives. Because of their small number and minimum effects on water distribution they do not receive special attention in this study. Rather the focus lies on the crop farms; i.e. those *fermers* that subject to the state order on cotton and wheat. In general they employ *dekhans* as wage labourers and quasi sharecroppers on their land. It is in this sense that they could be considered 'landlords', i.e. they are gatekeepers for the access to land that often they do not till themselves. The relation between the *fermer* and the tillers has characteristics of that of a patron-client relation. However, it is clear that the position of the Uzbek *fermer* is essentially different from for instance the Latin American landlords. In the first place they have a very different level of operational freedom; so far the Uzbek *fermer* enterprises have remained heavily regulated by the state. Secondly the Uzbek *fermer* is the (active) manager of an agricultural enterprise,

[28] All four conducted different numbers of interviews in the different case study areas. As there were big differences between these four areas I calculated the percentages that they each reported for each area. Then I averaged these four percentages per enumerator according to the weight of each WUA in the total number of households in the survey. The resulting weighted average per enumerator was now comparable with the overall average, which was 18.6%, while those of the enumerators varied from 18.3 to 19.6%.

[29] In Karmish WUA this even amounted to 166 out of the 255 *fermers*, i.e. 64%. The area covered by these small *fermers* is only 247 ha out the total 1697 ha assigned to *fermers*, i.e. 14%.

i.e. the fermer is not primarily a rent seeker over managing the access to land (absentee landlordism).

Within this group of crop farms there are the really big ones, which have a distinct management pattern as compared to the smaller ones. They are almost exclusively held by people who have an important role in the state hierarchy; mostly heads of district or provincial organisations (*cf.* Trevisani, forthcoming 2008). Often they are practically managed by somebody else; in all cases encountered this was a close relative, typically the younger brother or eldest son. Sometimes the leaseholds are formally registered on the wife's or a son's name, as people employed by the state cannot officially hold a land lease (Trevisani, 2006b: 8). Also for accumulation of even more land this sort of proxy leaseholds are created, making the actual farm size sometimes even larger (Pillai, forthcoming; Trevisani, 2007b).

The tables and figures below (3.1 and 3.2) show the distribution of land over different categories of *fermer* enterprise sizes of two of the case study WUAs. For the other two WUAs it was not possible to get detailed enough information to construct similar tables and graphs. The most striking difference between the two cases is the number of small *fermers* (almost a factor four). The majority of the *fermer* land belongs to enterprises between 10 and 40 ha; this is the case for 70 and 71% of all the *fermer* land in these two WUAs. Land holdings above 50 ha are exceptional.

In my survey income generation by *fermers* and *dekhans* have not been assessed on such a scale that they could be the basis for statistical analysis. However, there are clear indications of the differentiation between *fermers* and *dekhans*. For instance I observed that many *fermers* have been quick to renovate their houses, acquired cars and new television sets, and sometimes agricultural machinery. The control over a part of agricultural production has put the *fermer* in a position where he can control flows of benefits. At the same time some *fermers* perceive their acquired land as a liability as it puts them in a vulnerable position vis-à-vis the government and at risk of going bankrupt.

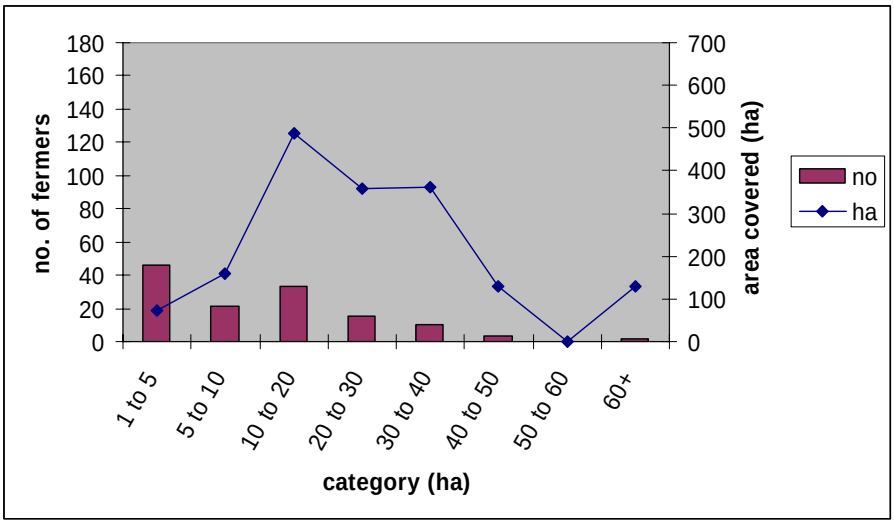

Figure 3.1 – Land distribution of *fermer* enterprises in Chikirchi-Angarik WUA
Source: own compilation on basis of data provided by the WUA

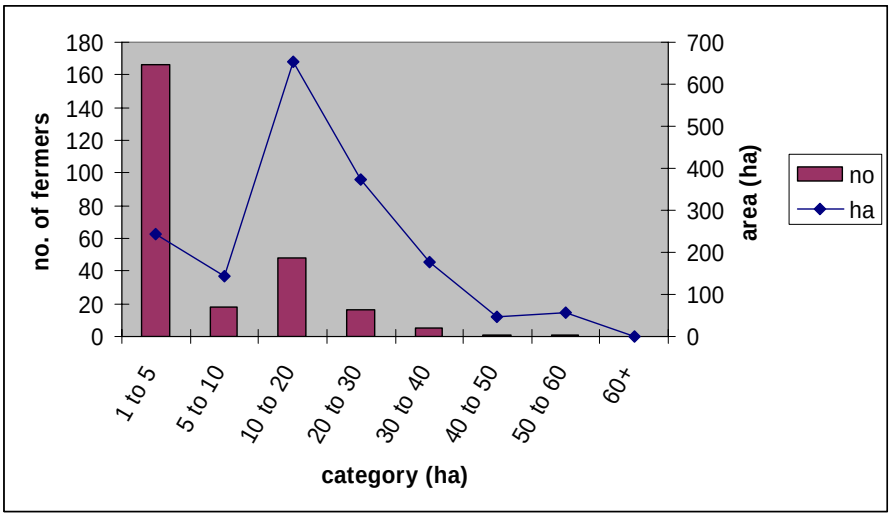

Figure 3.2 – Land distribution of *fermer* enterprises in Karmish WUA
Source: own compilation on basis of data provided by the WUA

category (ha)	no.	% of fermers	total area (ha)	% of land
1 to 5	46	35%	73	4%
5 to 10	21	16%	158	9%
10 to 20	33	25%	487	29%
20 to 30	15	12%	357	21%
30 to 40	10	8%	360	21%
40 to 50	3	2%	131	8%
50 to 60	0	0%	0	0%
60+	2	2%	129	8%
total	130		1695	

Table 3.1 – Land distribution of *fermer* enterprises in Chikirchi-Angarik WUA

category (ha)	no.	% of fermers	total area (ha)	% of land
1 to 5	166	65%	245	14%
5 to 10	18	7%	142	8%
10 to 20	48	19%	653	38%
20 to 30	16	6%	375	22%
30 to 40	5	2%	177	10%
40 to 50	1	0%	48	3%
50 to 60	1	0%	57	3%
60+	0	0%	0	0%
total	255		1697	

Table 3.2 – Land distribution of *fermer* enterprises in Karmish WUA

3.4.1. The land allocation process

Various people explained the land allocation procedure that was used to distribute the major part of the collective lands among new *fermers* to me. The quote below is from an interview with the head of an agricultural department at district level.

> GJV: Now, with the introduction of WUAs, and the complete land distribution to *fermers*, there was need for 2–3 times more *fermers* than last year. Was it difficult to find suitable people? [Respondent]: No, not really. There were competitions between candidates. Every shirkat made maps of its areas and composed contours [borders] around fields, making a 'lot of fields'. This was done by the shirkat disbandment committee that was established for every shirkat and consisted of 5–6 people. All the lots were given numbers and the map was presented to the group of people interested to become a *fermer*. People could than hand in small papers stating their interest in certain lots. For each lot there had to be at least 3 candidates, otherwise the procedure would start again. Then all candidates were given points according to various criteria, for instance education, agricultural experience (if any, at least 10 points), available technical material, ploughing tractor (10 points), lorry (5 points), funds in the bank, etc. All the points were then added-up. The best two went for examination. They were tested on all kind of knowledge; agricultural, business management, finance, etc. The one who scored best [at the exam] got the plot of land.

There were highly contrasting accounts on the practical implementation of these procedures. Many new *fermers*, district officials and members of the allocation committees stressed the high degree of transparency, while in other interviews it was hinted that many contours were simply sold to people willing to pay. It was impossible to discern what had happened in reality and whether the processes were essentially different from what Trevisani (forthcoming 2008) reported for the pilot process in Yangibazar District, implemented a few years earlier. He analysed that behind the official complicated procedure there was a very straightforward process of allocation that secured that the social ranking inherited from the kolkhoz remained intact. Moreover he analysed that the number of capable applicants was very small; many people were simply not able and experienced enough to run a farm. Therefore the people that made the old system work (i.e. *brigadirs* and other *Kolkhoz* managers) were identified and transposed into the new system. Wegren et al. (2006:373) describe for Russia that 'the transition from a communist economy has been marked by the rise of new classes on the basis of position, skill, income, ownership of economic resources and economic power'. The same could be said about Uzbekistan (cf. Trevisani, forthcoming 2008).

Also in my four case study areas the majority of *fermers* had been involved in agricultural management, had a good educational level, were socio-politically well connected and had money to invest[30]. These were the people that were considered to be able to make a *fermer* enterprise 'work'.

3.4.2. Labour organisation

Most households in the rural areas depended to a large extent on the collectives for their livelihoods; the collectives provided both jobs for money as well as secondary benefits. Now *fermers* partly fulfil this role, mostly in exchange for work on the land of the *fermer*. Before the

[30] A survey among almost 50 *fermers*, conducted by Zavgorodnyaya (2006: 116), shows that at least 66% of the respondents was highly educated. At least 43% of the respondents had been involved in agricultural management or had a technical specialisation in agricultural operation, while of another 34% (accountants, engineers and economists) it remains unclear whether they were professionally involved in agricultural management or administration.

third stage of land reform the common way for a *dekhan* to work on the collective fields was through a *pudrat*-contract. In the four case study areas these contracts usually concerned 1–2 ha of cotton, as part of a larger field. Except for the labour, the collective provided all inputs, including the ploughing and mechanical sowing. All the manual work was done by the *pudrat* and his household members.

Many *fermers* have propagated this form of labour organisation. Formally the *pudrat* contract does not longer exist, but in colloquial speech people still refer to such contracts as *pudrat*. The *pudrat* is paid a wage of typically 7–10 US$ per hectare per month for the period that his household takes care of the growing plants. During the harvest period the wage is stopped and the payment limited to a payment per kg of harvest. Many *fermers* indicated that they prefer such a labour organisation above full-time workers, especially because of the difficulty of mobilising labourers during the cotton-picking period. In case of a *pudrat* this responsibility is transferred and a whole household will work together for a single income. In addition or in substitution of this income the *fermer* provides other benefits. Among these other benefits I observed: cotton stalks (which are used as firewood), payment with rice, wheat or other basic food, granting of a use-right for a piece of land, lending of money, gifts on special occasions and prizes for accomplishments at work.

Frequently it was observed that *fermers* continued with the *pudrats* that used to work on the fields that they acquired, also because of their detailed knowledge of those fields. However, in some cases *fermers* started hiring their own family members, neighbours and/or friends. Also when *pudrat* positions became vacant they were often filled in by trusted people. Trevisani (2007b) reports a similar process.

These networks of trusted people around a *fermer* could easily develop into strong patron-client networks with multiple links of exchanges and mutual dependencies, in which the *fermer* of course maintains the strongest position. The quote below shows a little bit of how such relations can become multiplex.

> GJV: What about your sons, for who do will they now work? […] [*Dekhan*]: One of them will work here [in the village, in agriculture], my youngest son, but I haven't let him sign up with a *fermer* yet. But he will probably work for [the *fermer* that] is also the owner of the rice field at which I always work. We made an oral agreement about this. […] In exchange for that [arrange on the rice field] my son will work at his [cotton] fields and we will get 1–1.5 ha of wood [cotton stalks, which are used for cooking].

Later in the season this deal was indeed made. Moreover I observed that the *dekhan* frequently assisted in work to be done at the household of this *fermer*. Probably also the surplus dung produced by the cows of the *dekhan* was applied at the cotton fields of the *fermer*, as was reported in many other cases.

Analogous with this, *fermers* are pushed into positions in which they become the benefactors of the village (*cf.* Kandiyoti, 2003a; Rasanayagam, 2002). In one case a *fermer* explained that the Shora office assigned all the *fermers* in their village a number of poor families to look after.

> [*Fermer*]: Also I give part of the harvest to the Shora office for poor people; every *fermer* has 5 families to take care of. (…) GJV: Is it a change from [how it worked] before? [*Fermer*]: Yes, before the state was taking care of this.

Similarly Trevisani (forthcoming 2008) reported that *fermers* in Yangibazar were pushed to take responsibility for the renewal of school buildings and the enlargement of the district hospital, for which the local government lacked budget.

3.4.3. *Fermers* and the state

The limited reform of the command system makes that even though the jargon is about privatisation, *fermers* are not free entrepreneurs. Formally *fermers* lease the land from the state, but in practice they are subordinates who have to comply with instructions by the state hierarchy (Trevisani, 2007b), i.e. they are 'state-steered, but privately-owned and family-managed enterprise' (ibid:14). This directing by the state in practice means setting strong boundaries of what a *fermer* can and cannot do on his fields. This starts with the decision on what to plant and where to plant for all crops, but for the 'state strategic crops' also includes agricultural management decisions like the depth of ploughing, the planting date, the amount and way of applying fertilizer, and many others. This is checked by the government through a scheme of frequent visits to all *fermer* fields throughout the agricultural season.

A high official within the department of agriculture explained the purpose and organisation of such visits to me. In colloquial speech they are referred to as 'groups'.

> GJV: [With regard to] 'the group' that you were talking about […], at what different moments, for what crops do you actually go to check the fields? [Respondent]: Well, we start in winter, when we begin the leaching. We are divided in groups, each responsible for a different area. The main task is to check whether leaching is done in a proper way, whether the drains around the fields are dug properly. We also check whether the lands are level. If one side of the fields is higher than the other side it is not good, otherwise there will not be an equal distribution of water over the field. Also we check whether people leach 3 times.[31]

Further in the interview he explained that these groups are put together by the district level representation of the department of agriculture (what used to be *AgroProm*), by order of the *Hokimiyat*. Groups usually consist of four to five people, but sometimes only two, depending on the issue to be checked. Those are representatives of the different government departments; the biological laboratories, the department for fertilizers, the department for pests and diseases, the water department, etc. They are made responsible for the area of a former LFE, i.e. the area of one WUA.

The main focus is on checking the cultivation of cotton and wheat, as these are state 'reserved' crops. In every phase of the growing period of these crops the fields are checked on all management aspects[32] according to the state norms and specific orders by the *Hokim*.

Fermers run the risk of going bankrupt and thus of being expelled from their (leased) land and left behind with debts. The profit of *fermers* very much depends on the terms of trade that they manage to negotiate with various governmental organisations. The allowances to grow rice and other favourable allowances play a crucial role in this. Examples on the input side are for instance the share of diesel and fertilizer actually delivered. On the output side the grading, weighing and valuing of the harvested products is exemplary. These mechanisms are elaborately discussed in Chapter four, in the section on the state ordered form of production.

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[31] Field notes 29/05/2006

[32] For various periods the informant gave a long list of aspects being checked, similar to the example for the leaching period given in the quote; see also table 4.1.

In essence there are still soft budget constraints in the sense that the *fermer*'s budgetary balance is determined by the negotiations with various governmental organisations over the terms of trade. *Fermers* that followed the procedures, the state norms and the instructions by checking government 'groups' did not get into trouble, even if the yields were bad. For people the trouble starts when they operate outside the norms and control of the state. The head of an agricultural organisation at district level made the difference between *fermers* that did not fulfil the plan, but had 'arranged everything officially' by early reporting difficulties to the authorities, and *fermers* that simply did not make the plan. The latter category of *fermers* was expelled from their land[33]. I also observed a case in which a *fermer*, without permission, changed his cotton to rice and got cut off from water deliveries. Until he had informally arranged the permission with the district authorities, he irrigated the field with drainage water[34].

As many *fermers* have held management positions in the former LFEs or even higher in the state hierarchy, they are the continuation of what in the Soviet era were the rural *nomenklatura*, i.e. 'the named ones', the rural elite. Officially people with a governmental position cannot at the same time be *fermer*. However, through proxy arrangements many people in governmental management positions control a *fermer* enterprise.

In principle the re-distribution of land provides the opportunities to further de-regulate and privatise agricultural production. Thus far it has largely been a re-regulation of the agrarian relations without turning around the classes that were present in the Soviet era; *kolkhozniks* became *dekhans*, the rural *nomenklatura* became *fermers* and the *aparatjiks* became managers in the state political system.

The control that the state exerts over *fermer* enterprises partly functions to control people that since long have been part of the rural elite, but at the same time it can be seen as the long-time rural elite setting up boundary constraints for people to join this group of elites. It is clear that both for the government as well as for the old rural elites it is a threatening social development if ordinary rural households through *fermer*-enterprises could emerge as autonomous and economically capable entrepreneurs that could challenge the political status quo (*cf.* Trevisani, 2007b).

3.5. Conclusions

Two themes have been discussed here. The first one is that of newly established agricultural enterprise and their relation to the wider political-economic systems of production. The second theme is that of socio-economic differentiation and the consequences for social safety nets and future developments.

3.5.1. The subsumption of newly create farming enterprises

Since independence, and especially since the third phase of agrarian reform, there is clearly socio-economic differentiation in rural society. This differentiation is somewhat along the same lines of division between *dekhans* and *fermers*. However also within these structural categories there are big differences. Some *dekhans* have benefited from the reforms while

[33] Based on field notes 11/03/2006

[34] Interviews with this fermer (25/08/2005), another fermer (08/08/2005), the responsible district official (18/08/2005) and the Mirab (18/08/2005), as well as own observations. This example has also been discussed in Veldwisch (2007).

others run the risk of falling through the social safety net. At the same time some *fermers* struggle to run their enterprises profitably while others are earning huge amounts of money. In terms of income and standard of living *fermers* are not per definition better off than *dekhans*. The structural position of farming households is not linearly connected to empirical characteristics like income. Therefore comparing households on just income or land holding is not enlightening in itself, analysing the mechanisms of changing relations of production does give us new insights in the drivers of change.

I use the framework of analysis on subsumption of internal and external relation of production to look at the integration of farming enterprises (points of production) into the wider systems of production. As a result I describe five 'ideal types' of farming enterprises with different degrees of subsumption of internal and external relations of production. The context of recently de-collectivised land use and the establishment of individually managed 'family farms' is quite different from the process studied by Whatmore et al. (1987a and 1987b), which looked at 'tradition family farms' getting subsumed into British capitalism. There are two other important differences. Firstly, the wider system into which farm enterprises are subsumed is itself in transition; from a socialist plan economy into a hybrid economy with some capitalist characteristics developing. And secondly, there is not only integration, but also disintegration from the system, i.e. the establishment of individual farming enterprises has increased the degree of control and ownership of the various elements of the relations of production by individual households. In the developed typology I try to give both a discussion on the current state of subsumption as well as the observed direction, i.e. the parameters on which further subsumption or dissociation is taking place.

The division between *fermers* on the one hand and *dekhans* on the other is not only as a formal category, but also on basis of land holding sizes and the forms of regulations. Furthermore I consider two sorts of *dehkan* enterprises and three sorts of *fermer* enterprises.

1. Marginal or 'closed' *dehkan* households

These are households that limit their agricultural activities to production in their backyard garden and distant plot; they do not work on land under fermer leasehold, neither as a worker of a *fermer*. The survey showed that 47% of all non-*fermers* fall in this category. The land tenure is secure and inheritable, while the *dehkan* is free to decide how he/she uses the land. Labour is almost purely provided by the household itself, with exchange with neighbours playing a small role. The way in which production on the household plots is organised requires minimal cash, while seeds are often re-produced on the own plots or exchanged with neighbours. The produce is almost exclusively consumed within the household. If there is excess it is sold at small local markets, but only 29% of the households reported to do so. In 45% of these households there is somebody with a paid job (apart from agricultural labour), which is a similar number as for the other group of *dehkan* households (44%). The average available labour per household is 3.0 person.

Neither direct subsumption (of internal relations) nor indirect subsumption (of external relations) is observable. Though the base for subsistence is minimal, many of these households will continue these practices, as a provision for basic living.

2. Partially subsumed *dehkan* households

The difference with the marginal *dekhan* category is mostly on the subsumption of external relations that do not directly affect the internal relations of production. The difference is almost exclusively due to expansion of their cropping activities onto fields under *fermer* leasehold, be it through wage labour, sharecropping arrangements or renting. These land

tenures are far less secure and frequently only for a period of a year. In the case of sharecropping-like arrangements the control over operation lies partly with the *fermer*. When it concerns cotton and wheat cultivation the *fermer* himself is in turn checked and controlled by state organisations. In these situations *dekhans* are also technologically dependent and not fully free in their choices and operations. In the case of rice cultivation on rental land *dekhans* often have to borrow money for the capital intensive inputs. The produce is marketed for cash money at fluctuating prices. Their internal decisions remain relatively autonomous although when choosing to engage within some activities they are restricted in the way they operate.

More often than the marginal dekhans these households sell produce at the bazaar; 47% of these households reported to do so. The average available labour per household is 4.2 person, 1.2 more than in the marginal dekhan households. The availability of labour could be one of the important aspects that influence the engagement in agricultural production on *fermer land.*

When using *fermer* land these *dehkans* enter a different domain, which is more subsumed into the system. When the wider system of production would be further de-regulated, for instance by abolishing the state order, this would increase the room available for arrangements with *fermers*, both in terms of area and in conditions. A part of this group would further commercialise on basis of their entrepreneurial use of their detailed agricultural knowledge.

Though the group of *fermer* households is much smaller than that of the *dekhan* households, the differentiation within this group is much larger. On basis of their degree of subsumption I distinguish three categories.

3. Small, indirectly subsumed *fermer* enterprise

These are the small fermers (1-5 ha) that mostly have business plans for fruits, silk (mulberry leafs) and/or vegetables. They have long-term leaseholds which are relatively secure when compared to *fermer* leaseholds for cotton. The owners are also relatively free to operate their land as they want, though the production is monitored by the state. Sale of the produce is through market channels, but these *fermers* are also forced to sell part of their produce to (state-owned or -controlled) processing industries. State control is principally restricted to the external relations of production. Depending on the size of the land holding and the available labour within the household the work is either completely done by family labour and/or a few permanent workers. In peak periods extra labour is hired. Capital investments are small so that these enterprises are not dependent on credit systems. Also technological dependency is low.

Through the forced sale of produce (implicit taxation) and the threat of loosing the land, these enterprises are indirectly subsumed into the system of bureaucratic control and surplus abstraction. Internally these enterprises are relatively free, except for the fact that their crop is prescribed in their business plan. These enterprises have better and more secure access to land than *dekhans* depending on access to *fermers* land. However they only gained this in exchange for a restricted freedom of operation.

4. Medium-sized cotton/wheat *fermers*

This group of enterprises is to a very high degree integrated in the wider political-economic production system, both through direct and indirect subsumption. In almost all respects they are limited in their control and ownership over agricultural production, both regarding the

external relations of production (they are dependent on the state for credits, marketing and technology) and the internal relations of production (their land tenure is insecure, they have little own capital and in cotton production even the cultivation procedures are forced onto them). Only in the organisation of labour they are free. Some of these enterprises manage to do the work purely on basis of family labour, but most of them work with a number of *dekhans* through sharecropping like arrangements. The somewhat larger ones often also employ one or more permanent labourers. Also the cropping schedule is externally controlled, though some enterprises manage to arrange larger portions of land to be free to choose what and how to crop than others.

The very high degree of subsumption of these enterprises into the bureaucratic system of control and surplus abstraction also implies that these are the ones that will mostly feel the transition in the wider context of agricultural production. With ongoing re-regulation of agricultural production it is unclear whether these enterprises will keep their high degrees of subsumption or whether they will dissociate from the wider system. Many of these enterprises will probably keep a high degree of subsumption with a privatised and commercialised cotton industry that manages its supply through contract farming arrangements. It could become easier to switch to alternatives, and the internal relations of production could become less strictly regulated, but the indirect controls through dependence on technologies, credits and markets will probably remains strong.

5. Large partially dissociating *fermers*

These enterprises are not merely distinguished on their area size, but rather on their ability to accrue substantial capital that is reinvested into the enterprise. Partially this is connected to size, but to quite some extend it also depends on the success of the *fermer* to negotiate profitable terms of trade and the production that he is able to make. Size of the land holding and successfulness to negotiate are both in some way connected to the socio-political position of the *fermer*. By increasing (productive) capital the fermer reinforces his position and increases his freedom of operation. Especially the ownership of pumps, tractors, and sometimes even combines, increases the ability to operate independently. Though external relations of production remain strongly subsumed in the system these enterprises increase their control over internal relations of production and dissociate from the wider system of agricultural production.

Marginal *dekhans* are relatively least subsumed by the system, while medium sized cotton and wheat producing *fermers* strongly face subsumption of both external and internal relations of production by the state bureaucratic regulation system. Both the very small (economically insignificant) and the very large (socio-politically powerful) enterprises are somewhat outside the state control system. When in a diagram we would project the degree of subsumption against farm size it would result in an inverse U-shaped graph.

3.5.2. Socio-economic differentiation, dependencies and changing safety nets

Research results presented in this chapter show that in the four case study WUAs 89–94% of all rural households are peasant-like households (*dekhans*) rather than *fermers*. The mutual dependency relation that earlier existed between collective farms and rural households has been replaced by a mutual dependency relation between *fermers* and some *dekhan* households. With the final abolishment of the LFE the tripartite structure of rural society (collectives,

fermers and dekhans), as discussed by for instance Ilkhamov (1998) and Kandiyoti (2003b) no longer exists.

Regarding the situation in that earlier period both Ilkhamov (1998) and Rasanayagam (2002) stressed interrelatedness and the mutual interdependence of household production and production by the collective farms. In the third wave of agrarian reforms the collective enterprises have fallen away and only the *fermers* and the *dekhans* remain. With a monopoly on large-scale production, *fermers* have become the single gatekeepers to a variety of income possibilities of *dekhans*; e.g. agricultural wage labour, cotton stalks and grazing areas. At the same time *fermers* are somewhat dependent on the *dekhans*; e.g. as workers in the labour-intensive agriculture and as providers of manure. The tendency observed is a strengthening of these relations and the formation of strong patron-client networks with multiplex relations between the two parties. A large number of *dekhan* households (46%) does not engage in these relations, at least not by providing labour to *fermers*.

For the dekhan these strengthened dependency relations are important as safety net constructions, which replaces a variety of social security services that used to be provided by the state and/or by the collective farms. The degradation of the welfare state has led to a situation of increased vulnerability for the *dekhans*. Their reliance on strengthening their relations with *fermers* means a personalisation (and informalisation) of social security provision.

Patron-client networks often bear a component of demand for political support from below, i.e. patrons need their clients for political support. In Uzbek society political legitimacy is almost exclusively granted from above and hardly depends on the support from below, unless the mechanism of 'fulfilling the plan' would be seen as politically legitimating the position of the *fermer*, for which the *fermer* partly depends on the co-operation of his workers.

The relations between *fermers* and the state apparatus have strong parallels with the relations between *dekhans* and *fermers*. Like *fermers* are gatekeepers for many opportunities of *dekhans*, the state agricultural apparatus strictly controls the access to (cheap) inputs and profitable terms of trade. For this reason *fermers* cultivate their relations with (people in) these agricultural government organisations. On top of that they confirm their loyalty to the state system by complying with the instructions they receive and by fulfilling the state plan.

Both the *dekhan-fermer* and the *fermer*-state relations are unequal in their power-balance and in both relations produce/surplus is handed 'upward' in exchange for money and the granting of other benefits. Partly these benefits are channelled through by-products and left-over land. In both sets of relations the terms of co-operation are ill-defined or flexible, which implies that they are negotiable throughout the season. This regards both the production targets and the benefits. This flexibility of terms is often detrimental to the weaker party in such arrangements.

However, similar to the dependency of *fermers* on their labourers, local state authorities and the heads of agricultural organisations are dependent on the *fermers* for the fulfilment of the state plan, which is crucial for reproducing their (political) position. To some extent also the state-*fermer* relation qualifies as a patron-client relation.

The transition away from a communist/collective production system has increased the risks of individual rural households. In this context personal relations have become more important as providers of social security. This leads to reinforced relations of mutual dependence on an unequal power basis. It is well perceivable that patron-client relations will be further strengthened around *fermer* enterprises that for dekhans will remain the prime access channel to land.

3.5.3. Differentiation and implications for development

The land reform has led to very unequal distribution of arable land with about 70% of the land concentrated in the hands of 6-11% of the rural households. The large majority of households only have small pieces of land that are barely sufficient for feeding the household. For additional agricultural activities they depend on access to fermer land.

The Uzbek government chose this path of land reform that concentrates the land in the hands of few over a redistributive land reform that would have distributed the land more or less equally among rural households. According to some, one of the main reasons for this was the objective to keep control over production, which is easier with a limited number of *fermers* and substantial farm sizes[35]. With a redistributive land reform it would have been very difficult for the state to maintain the degree of control over agricultural planning and production that it has been showing to date. The command system still plays a central role in agricultural planning and production. An abolishment of the command system or even a further reform of it would signify a structural change away from the path of development that the Uzbek government has followed so far. It is an imaginable step if one thinks of the Uzbek agrarian reforms as the step-by-step transformation to a market economy, but quite unimaginable if one thinks of the Uzbek state striving after control over agricultural production.

However, it is difficult to interpret the Uzbek model on basis of its intentions. In the first place I did not study this, secondly the state is fairly inaccessible and finally it is not singular in its objectives, i.e. there are both reformist and conservative forces. Even though the objectives and the dynamics underlying the reforms remain opaque still the structural effects and the reality of the reforms can be assessed. I summarise this as follows.

(1) State control over production and the abstraction of surplus remains to play an important role.
(2) The reforms favoured the formation of farm enterprises with considerable sizes over an equal distribution of land and the large majority of the people have become near-landless agricultural labourers.
(3) For these *dekhan* households the land is just about enough to produce sufficiently for home consumption, but the land is not enough for making a business of, neither is there active state support for this small-scale farming sector. As a result these people need to work either elsewhere in agriculture or outside of the sector to provide for a decent living.

Almost a fifth of the land is held by *dekhans*. Per household this is a small area, but altogether it is a substantial part of the agricultural system. In this respect it is surprising how both the Uzbek government as well as international organisations have largely ignored this part of the agrarian economy when looking at issues of development and poverty alleviation. Both Griffin et al. (2002:300) and Wall (2006) have made similar observations. This emerging pattern of social differentiation raises serious concerns about equity and livelihood security.

[35] Personal communication with Max Spoor, following his insights as a member of a UNDP mission in 2003-2004 that advised the Uzbek government on its land reforms policies.

Chapter 4

The Agricultural Forms of Production

4.1. Introduction and conceptual framework

In Chapter 3 it was shown that the post-independence tripartite agrarian system of collective farms, private farmers and household production has transformed into a dual system of just *fermers* and *dekhans*. The state still plays an important role, but does not directly run its own agricultural enterprises anymore. From the discussion it has become clear who the main actors in agricultural production are: *fermers*, *dekhans* and the state; the latter in the form of various governmental organisations that control agricultural production. With the state withdrawing from running its own agricultural enterprises one could hypothesise that water distribution is shaped by the competition over water between the primary water users/producers (*fermers* and *dekhans*), while the state assumes a regulatory role. This research however shows that water distribution follows different lines of division. It is not so much the users that compete with each other over water, but rather the different 'uses'. This chapter discusses three 'forms of production'. They can be seen as three different logics of productions. Each form of production has a different rationale, its particular functions, its own economic characteristics and its typical socio-political control systems. Also they each have their specific water distribution arrangements, but this is only discussed in Chapter 5.
I distinguish the following three forms of production for the Khorezmian agrarian system.

(1) *state-ordered production*, which includes the production of cotton but also some of the production of wheat;
(2) *commercial production*, which is very obvious in the production of rice, but to a lesser extent also observable in the production of vegetables and fodder; and
(3) *household production*, which primarily aims at home consumption, but which also includes barter arrangements and small scale selling at local markets.

Such an analysis is based on 'the labour process approach', which is the study of the 'forces of production' and the 'relations of production', as discussed in section 1.3.2. The appropriation of surplus from direct producers is one of the main subjects of the labour process approach. Burawoy (1985) argues that such studies should be wider than just looking at the process of exploitation and thus propagates to look at all the different *relations of production* between actors involved in the production process.

Burawoy (1985), and other labour process authors, speaks of 'modes of production', which are characterised on the way in which surplus appropriation takes place. Thus he recognised a capitalist mode of production, a state socialist mode of production, and a feudal mode of production. There are essential differences in the rationale and organisation of these production processes. In the initial understanding the concept 'mode of production' referred to production under a certain political economic state system; i.e. capitalist, state socialist or feudal. Burawoy (ibid.) however also distinguished two modes of production that take place within the socialist state, but which have characteristics that distinguish them from the state socialist mode. These two are *petty commodity production*, which is based on self-employment and production for small-scale sale, and the *domestic mode of production*, which aims at self-sufficiency. These economic activities also depend on the state sector in a number of ways. Later the concept was also extensively used for a '*peasant mode of production*'. This developed into lengthy debates on the nature of a 'mode of production', which address whether a mode is a separate system, how they reproduce and how different modes relate to each other and depend on each other. As a result the concept 'mode of production' can no

longer be used in a non-complex way, i.e. without answering the list of difficult conceptual questions raised in this respect.

This chapter presents a strongly empirically based account of the organisation of agricultural production. I look at how systems of production are configured, at the internal logic of organisation, i.e. the links between the organisation of inputs, land, management, labour and outputs. In this study they are referred to as 'forms of production'[36]. In this chapter the three forms of production that were identified during the fieldwork are analysed on their logic of production, their practical organisation and the connections between the different forms.

4.2. Three forms of production

The forms of production, which are discussed in separate sections below, have strong parallels with what Ilkhamov (1998) coined the 'tripartite agrarian structure'. In his model this referred to three different enterprise models: the large farm enterprise (LFE), the privatised farmer (later referred to as *fermer*), and the *dekhan* (the peasant). Now the LFEs have been dissolved, but the essence of the production processes has remained. Though distinctly different on the rationales, the three forms of production can not be understood without each other. There is integration within agricultural enterprises, as well as within the wide structures of for instance agricultural regulation and the organisation of labour. This is especially apparent in the relation between state-ordered and commercial production, which are both produced on *fermer* land, under management of the *fermer*. State-ordered production is driven by state interest, and commercial production driven by private economic benefits. Furthermore in all three forms of production *dekhans* do the hard manual labour and thus the majority of households are involved in all three forms of production.

Table 4.1 presents a summary and overview of the three forms of production on a number of aspects.

[36] This has similarities with what Burawoy (1985) labeled 'modes of production'. However, modes of production refer to the wider political-economic system of production, for instance the capitalist mode of production or the state socialist mode of production. Forms of production exist more or less at the level of 'faming systems'.

Form of production	*State-ordered*	*Commercial*	*Household*
Main crops	Cotton, winter wheat	Rice, vegetables, fodder	In the garden: fruits and vegetables On the distant plot: winter wheat and rice
Crop schedule	Cotton from March/April to September/October Winter wheat from October to June	Rice from May/June to September/October Vegetables and fodder mainly in that same period	Winter wheat from October to June Rice from June to October
Land tenure	Long-term leaseholds; insecure as these can be withdrawn at will by the state	Long-term leaseholds; *fermers* grow it in their 'free' area; insecure as can be withdrawn by the state	Full fledged ownership of gardens around the house and distant plots
Management decisions	*Fermers* under strict state control (field checks)	*Fermers*; or when rented out: the renting *dekhan*	*Dekhans* are free to make decisions
Organisation of inputs	Subsidised inputs through state controlled networks	Through informal and commercial networks; capital intensive	Minimal capital investments
Labour organisation	*Pudrat*; sharecropping-like system on typically1-2 ha	Hired workers and/or renting out of small plots to *dekhans*	Household labour
Possible net profit [37]	For cotton 0-250 US$/ha, also negative profits	1500-3000 US$/ha for paddy	Negligible - not for money
Role of the state	Forcing centrally determined quotas onto individual *fermers*	Mandated by important individuals within the state hierarchy	Allocation of plots; securing enough available land
Economic rationale	Administrative/plan economy	Cash economy	Home consumption and barter economy
Technological-administrative task environment (TATE)	Detailed system of state rules and norms for agricultural management; inputs and technologies are selected and prescribed by the state; enforcement through field checks and control over settlement accounts	Strongly restricted by system of permissions to grow, enforced by field checks; it is easier to get permissions for water-logged and saline land	By definition small areas that require manual operation; seeds are often reproduced and exchanged locally
Political and ideological apparatus of production	Production is ordered and controlled by the state. Surplus extraction takes place through fixed low prices and compulsory sale. Threat of going bankrupt or land lease being withdrawn. Used as gateway to more profitable farming	Patrimonial; allocation on basis of loyalty and position in the socio-political hierarchy; parts of the benefits are passed onward	The household production has been given the role of social security safety net. As such it provides socio-political stability. Commercialisation is limited by taxation at markets and in transport.

Table 4.1 – Summary of the three forms of production
Source: own compilation on basis of fieldwork

[37] These possible net profits have been calculated on basis of interviews with a small number of *fermers* regarding their inputs, costs, yields and marketing. The numbers in the table are indicative and in reality heavily depend on a number of parameters, not in the last place on soil fertility and the ability of the farmer to negotiate the terms of trade.

4.3. State-ordered production

Though a form of production is not per definition linked to the production of a particular crop, the state ordered form is limited to cotton and wheat. Although the state also controls cropping areas of other crops, only for cotton and wheat there are assigned quotas and forced sale to the state at fixed prices. All of the produced cotton has to be sold to the state, while of the wheat yield only a part has to be sold to the state (typically 50% of the expected yield). Also in the labour requirement, the need for (and organisation of) inputs and the characteristics of the produce there are difference between the production of cotton and wheat. In this section the production of cotton is discussed, as a typical type of the state-ordered form of production.

4.2.1. The planning process

Fermers that are characterized as *dekhanchilik*[38] *fermers* in principle (by state order) have to grow 60% of their area to cotton. However, the exact area depends also on the soil characteristics, and the crop rotation schedule.

In reality the areas are negotiable. *Fermers* individually have to arrange permission with the branch office of the Department of Agriculture for their cropping plan. The (yearly) cropping plan is based on the long-term business plan of the *fermer* and can only contain crops mentioned in the business plan. The cropping plan does not only concern the state order crops, but all crops the *fermer* grows.

In the agricultural state hierarchy quotas are assigned to provinces and from there down to the districts. Therefore there is some flexibility in assigning quotas to individual *fermers*. In practice the district *Hokimiyat* plays an important role next to the branch office of the ministry of agriculture.

I found that some *fermers* actively made plans and negotiated with the district authorities for their cropping plans. Other *fermers* indicated that they are just told what to grow and that their wishes did not play any role in the decision.

> The cotton [ginnery] makes a contract with [the Department of Agriculture] about how much cotton is needed. If the mill needs 80%, [the Department] tells 80% to the *fermers*. GJV: What did [the Department] tell you to plant this year? [*Fermer*]: [They] told me to plant 12 ha of cotton and I did so[39].

And in another situation:

> GJV: You said that you have to plant 70%, but actually you planted much more, maybe even 90%. Why is that? [*Fermer*]: I wasn't told to plant 70%, I was told to plant minimum 70%, 75-80% is also fine. I myself made the plans to plant such a large area with cotton and then went to [the Department of Agriculture] to ask for permission[40].

The quota specifies both the area and the expected yield. The production target per area largely depends on the soil quality, which for each field is determined once every five years. Some *fermers* were told on what plot to grow the cotton, but mostly *fermers* were free to decide where to plant what, although the field should be suitable for the chosen crop.

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[38] Arable crop *fermers*; this separates them from *fermers* dealing with animal husbandry and orchard *fermers* (explained in more detail in Chapter 3).

[39] Field notes 10/05/2006

[40] Field notes 08/05/2006

4.3.2. Organisation of inputs

Almost all inputs for cotton cultivation are subsidised by the state and supplied through state owned (or at least state-controlled) chains. *Fermers* pay for these inputs through bank transfers from bank accounts that are very similar to the Soviet's settlement accounts; they are strictly state-controlled and in principle the amounts on these accounts cannot be turned into cash money.

Subsidised fertilizer for cotton is rationed according to area and soil quality. The fertilizers acquired through this subsidised system are about half the price of those not destined for cotton. They are distributed by the Agro-Chemicals Department, which has branch offices in all former LFEs.

Seeds are multiplied in state research centres and on land of selected *fermers*. The types of cotton that will be grown by each province and district are centrally bred, selected and imposed. *Fermers* can usually choose between two or three different types and are supplied with these seeds by the Department of Agriculture.

For tractors most *fermers* still depend on the state-owned (or at least state-controlled) Motor Tractor Parks (MTPs), which prioritise activities for the production of state ordered crops over activities for other forms of production. Also *fermers* are entitled to a certain amount of subsidised diesel when growing cotton. The storage of this as well as the actual use or supply is also controlled by the MTPs.

Regarding the supply of these subsidised input various *fermers* mentioned that usually not all allocated inputs actually reach the *fermer*; a certain amount is kept by the supplier. This especially happens with fertilizers and diesel, which can easily be sold again and thus provide an extra source of income for the state official.

For cotton cultivation special credit is available at very low interest rates through a specialised 'cotton bank'. Just for this special credit some *fermers* prefer to grow state-ordered crops over private, commercially grown crops. This is illustrated by the following quote from an interview with a *fermer* growing far more cotton then he would need to according to the state order.

> GJV: Why did you want to plant such a large area? [*Fermer*]: Because it is better for my farm. For planting cotton you can get a lot of support from the state; you get credits from which you can pay diesel, fertilizers, laboratories, the WUA and even the salaries of the workers. The total costs [of production] were 7 million and 20 thousand soum and I took a credit of 3.5 million. You see, you can use state money to make a business with. This is the advantage of planting cotton. Also for planting wheat you can get these benefits. This year again I took credit, for both wheat and cotton. For other crops they don't give credit[41].

Water is, of course, another important input, but in this chapter it is left out of the picture, as the organisation of water management is separately dealt with in Chapter 5. Here it can be mentioned that also water is subsidised, in the sense that all water is essentially supplied for free. Most of the costs for operation and maintenance of the infrastructure are carried by the state. With the recent establishment of WUAs the operation and maintenance at this level are now to be carried by the users, i.e. the *fermers*.

4.3.3. Management decisions

The timing of crucial actions in the cotton cultivation process are centrally announced by the Department of Agriculture. This particularly pertains to the periods for planting and

[41] Field notes 08/05/2006

harvesting. Even though these mandated periods are not strictly adhered to by everybody, this resonates that the state is still the driver behind the cotton production.

During the cultivation period the *fermers* are continuously checked on their actions at the cotton fields. Groups consisting of agricultural experts from a variety of state organisations regularly go round through the area that have been assigned to them in order to check various aspects of agricultural management. The groups are co-ordinated at district level by the *Hokimiyat* and the department of agriculture, to whom they also report (see section 3.5.3.). Each period of the season the checklist is different, and the groups are composed of experts of the organisations that relate to the topics to be checked. Most of these checks refer to a state norm, which play important roles in state control over agricultural practices (*cf.* Wall, 2006). For a list with some examples of the things being checked see Box 4.1. The checks are not limited to those listed.

One of the specific things to be checked is whether the subsidised inputs are indeed being applied to the cotton. This especially concerns the fertilizers. These are typically distributed on the day of application and a state official remains at the field to see to it that the fertilizer is indeed applied at the cotton fields. This story was told to me by various *fermers* and following to that I also observed this in the field. There are many people needed to supervise this and therefore various people are temporarily employed that are not fully committed to enforcing the fertilizer application. It can be assumed that due to this still a lot of the subsidised fertilizer is diverted to other forms of production, while the temporary workers get some side-benefits.

Leaching
- Check whether the drains around the fields are dug properly
- Check whether the fields are level; for equal water application
- Check whether people leach 3 times.

During the wheat season
- Check whether irrigated at the right moments and whether not over-irrigated
- The chemical department divides the fertilizer among *fermers*
- Checks whether the application of fertilizer is done properly
- Check for the weeding and the irrigating with dung
- Just before harvesting: check whether there is any grass in between the wheat

Land preparation and sowing of cotton
- Check whether the soil is ploughed deep enough
- Check whether ploughed at the right time; otherwise the soil will be hard
- Give advice on how deep to plant the cotton seeds
- Check whether rightly 'thinned'; every meter there should only be 4-5 plants

During the cotton season
- Check furrows and ridges; often the ridges are too wide
- Check the weeding and the work with the 'cultivator'
- The chemical department divides the fertilizer among *fermers*
- Check whether the application of fertilizer is done properly
- Check whether irrigated according to the norm
- Check whether level for homogenous water application, otherwise divide the furrow in shorter parts

Box 4.1 – Some of the checks executed by 'groups' of governmental organisations on fields of *fermers* with state-ordered production.

Though not all fields and not even all *fermers* are checked on all aspects, at the moments that they are checked in detail this means that the fields are almost directly managed by these governmental organisations. Still it is the *fermer* that is (held) responsible for the management of agricultural production on his fields. He is instructed and warned to follow the state norms, and held responsible if his decisions have adverse effects on the yield. Examples of the *fermer*'s room for management are the exact planting date, the number of water applications for leaching, the moment of thinning, the application of defoliant or not, the timing of water gifts, and the moment of topping the cotton plants. There are plenty more examples possible. The exact room also depends on the *fermer*'s relations to state officials and his level of experience and agricultural knowledge.

Beside being limited in their decision-making over management of the production on their fields, *fermers* are maybe even more limited in their management by the ability to mobilise the right resources at the right time. This pertains especially to tractors and other agricultural machinery, which at crucial moments are only very limitedly available. *Fermers* perceive the early planting of cotton as a big advantage, as this assures an early harvest, i.e. starting late summer. If the cotton is planted later the harvesting can be delayed into

November, when it is much colder and as a result the cotton bulbs do not open well, the cotton quality is lower and the work on the fields harder. In order to harvest early, *fermers* have to plant early, and therefore be early with land preparation. The few *fermers* that have their own tractor do not have to run after the tractors of the MTP, but can prepare and plant at the time that they want, while they rent out their tractor afterwards.

> [*Fermer 1*]: I planted on the 27th of April and will start picking after Independence Day, on the 2nd of September[42]. My planting is quite in the middle; there are also *fermers* who are 1 month later than I. There were no tractors available at the right time, and therefore I got a bit late. But I am a committed *fermer* and take care of the land as I would take care of my own [household plot]. I will find a tractor and when I find it I will bring it back with me to the field[43].

And in another situation:

> GJV: Once the planting will start will you be late or early in the schedule? [*Fermer 2*]: I do not depend on the schedule as I have my own tractor. It's a Kazakh tractor with caterpillar mechanic[44].

The mechanisation of large scale agriculture during the soviet period never reached high levels in Central Asia (Patnaik, 1995) and Khorezm was no exception to this (Wall, 2006: 168-172). Since independence investment in agricultural machinery has been very low. High import taxes on machinery moreover created an unfavourable situation to renew the existing machines. As a result the number of tractors, as well as their capacity has slowly declined. Still, in cotton cultivation ploughing, sowing and spraying with pesticides continues to be done by tractor. Other activities are done manually.

Parallels with contract farming

The state-ordered form of production has a number of parallels with production under contract farming schemes. Contract farming is the co-operation between farmers and processing industries through contracts that specify the duties and obligations of both parties. Through such contract farmers often get access to credits and inputs, the costs of which are settled when delivering the yield to the processing industry. Table 4.2 is copied from a FAO manual on contract farming. It specifies the advantages and problems often experienced in contract farming, separated according to those experienced by farmers and sponsors (processing industries). Most of these are the same in state-ordered cotton production in Uzbekistan. The ones that do not match the Uzbekistani situation are put in *Italics*.

[42] The expected 'official start' of the cotton picking season, which actually turned out to only start on the 8th of September.
[43] Field notes 23/08/2005
[44] Field notes 06/04/2006

	FARMERS	'SPONSORS'
Advantage	- Inputs and production services are often supplied by the sponsor - This is usually done on credit through advances from the sponsor - *Contract farming often introduces new technology and also enables farmers to learn new skills* - Farmers' price risk is often reduced as many contracts specify prices in advance - Contract farming can open up new markets which would otherwise be unavailable to small farmers	- Contract farming with small farmers is more politically acceptable than, for example, production on estates - Working with small farmers overcomes land constraints - Production is more reliable than open-market purchases and the sponsoring company faces less risk by not being responsible for production - *More consistent quality can be obtained than if purchases were made on the open market*
Problems	- *Particularly when growing new crops, farmers face the risks of both market failure and production problems* - *Inefficient management or marketing problems can mean that quotas are manipulated so that not all contracted production is purchased* - Sponsoring companies may be unreliable or exploit a monopoly position - The staff of sponsoring organizations may be corrupt, particularly in the allocation of quotas	- Contracted farmers may face land constraints due to a lack of security of tenure, thus jeopardizing sustainable long-term operations - Social and cultural constraints may affect farmers' ability to produce to managers' specifications - Poor management and lack of consultation with farmers may lead to farmer discontent - *Farmers may sell outside the contract (extra-contractual marketing) thereby reducing processing factory throughput* - Farmers may divert inputs supplied on credit to other purposes, thereby reducing yields

Table 4.2 – Advantages and problems faced by farmers and 'sponsors' in contract farming
In *italics* the ones that are not applicable to state-ordered production of cotton in Uzbekistan
Source: Eaton and Shepherd (2001)

The five indicated differences between contract farming (in general) and state ordered production (of cotton in Uzbekistan) can be reduced to two main differences.

Firstly, state ordered production of cotton has a long history and is conservative rather than innovative. Farmers do not profit from the introduction of new crops and new technologies, but they are rather restricted in their room to innovate. Rather than helping to overcome production problems this rigid approach preserves production problems. Whereas

in contract farming quality management is often one of the main objectives, in state ordered production of cotton this has remained largely unexplored.

Secondly, both the marketing of cotton and marketing relations in Uzbekistan are different from many other markets. Due to the share volumes of the produce and the specific requirements for processing, in combination with strong state control over business and trade, cotton cannot be sold to others than the state processing industries. Except for filling a few cushions, cotton can hardly be used directly by the producers. As a result extra-contractual marketing hardly happens. Also, the processing industry wants every last bit of cotton, rather than finding ways to evade the contract and not buy the agreed amounts.

4.3.4. Labour organisation

Cotton in Khorezm is cultivated in a labour intensive way, i.e. many tasks are performed manually. Especially the cotton picking by hand requires a lot of manual labour in a limited period of time. This puts *fermers* in a difficult position, as they are responsible to mobilise this labour force. Most *fermers* follow the strategy of organising the labour through *pudrat* contracts with *dekhans*. These *pudrat* contracts bear strong resemblances with sharecropping arrangements. In Chapter 3 it was already discussed that these labourers are neither wage labourers nor tenants. They are responsible for the manual labour on part of a cotton field (typically between 1 and 2 ha). Their payment is partly in cash, partly in kind and partly in social capital that can be cashed in cases of need. The payments and other benefits are often not clearly pre-defined, they are negotiable and to some extent depend on performance (yield).

Both *fermers* and their *pudrats* consistently explained that the *fermer* is responsible for all mechanised work, the arranging of inputs, the maintenance of external relations as well as making agricultural management decisions. The *pudrat* is only responsible for manual labour. The differences in yields between the *pudrats* on one field are minimal, and both *fermers* and *pudrats* often perceive this to be mainly the effect of difference within the field/soil rather than in the operation by these *pudrats*.

> GJV: How did you divide the work on cotton fields between your workers? [*Fermer*]: The 10 pudrats that worked for me each got 1 to 2 ha of which they took care. GJV: What do you give them in return? [*Fermer*]: I give them a monthly wage, according to the labour contract. They work from March till December. But if the worker comes with his family he will finish the work in 1-2 days and during the rest of the time he will do work on his own land. GJV: Do you mean that you give a piece of land to a pudrat and that he can decide for himself how and when he works on it? [*Fermer*]: No, I control them and tell them when to work. I usually tell them to finish particular tasks in 2-3 days. I gave them 8,000 soum/month for 4 months. After that I gave water melons as a payment. I also award prizes for the first person to finish weeding, making rows {… mentioned another few activities}, the first flower, the first cotton picked and the highest amount of cotton[45].

4.3.5. Marketing

The estimated yield from each cotton field is several times re-assessed during the cropping season and in accordance the state order for the field is adjusted when necessary. The latter is a process of negotiation which some *fermers* are better at than others. The fact that the expected yield is closely monitored during the season makes it difficult to sell part of the yield somewhere else, as this would be noticed. Another difficulty is the absence of a free

[45] Field notes 08/05/2006

market for cotton. Even though some cotton gins have been privatised there is basically still a state monopoly, as the prices throughout the processing chain are centrally set (Rudenko, forthcoming). Also there is not much use for raw cotton, which would allow for side marketing. This is one of the characteristics that makes the wheat production process different from the cotton process: wheat is also produced outside the state-ordered form of production and used on a wide scale in every household. Therefore there is a market price for wheat flour, which makes it easier and more profitable to try and market the produce through other channels than the state (*cf.* Bobojanov and Lamers, forthcoming 2008).

Fermers get different prices for different qualities of cotton, but otherwise the prices are fixed, i.e. there are no market prices. This grading is based on the quality of the cotton fibre as well as the pollution with other materials. Besides, the price is adjusted for the moisture content. The process of cotton delivery at the ginnery, the weighing, the grading and determining of the moisture content is not a very reliable process. *Fermers* stressed the importance of being physically present at the moment of these measurements in order to avoid manipulations of the result and hence the value of their produce. Overall this makes that also the output prices are negotiated prices that depend on the *fermer*'s ability to get a good price.

The payment from (state) ginnery to *fermers* is through state controlled bank accounts. The money on these accounts can be used for paying for the inputs on cotton, as described above. It is very difficult to withdraw money from these accounts, which makes that the cotton production forms a somewhat separated, administration-based economic system. *Fermers* do find ways to withdraw cash from these accounts, but this is to a cost of about 5-10% of the value[46].

4.3.6. Final remarks

The profitability of cotton cultivation for *fermers* depends on a variety of conditions that need to be negotiated; e.g. the actual delivery of the assigned inputs (especially fertilizer and diesel), the ability to mobilise tractors at the right moment, the ability to get water at the right time, and the negotiation over recognition of the cotton weight, quality and moisture content. This form of production is strongly integrated into the wider relations of production and the autonomy of farmers is very low. The Technological and Administrative Task Environment (TATE) consists of an integrated network of state institutions that regulate all aspects of the production process – from seed selection and credit provision to method of ploughing and control of marketing channels.

Depending on their field characteristics and the negotiated boundary condition many of the *fermers* that I interviewed made some money out of cotton production, while only a few *fermers* were able to make good profits. Some *fermers* reported that almost every year they loose money on cotton production. One of the main benefits of growing cotton seems to be that it provides access to commercial production on the area not used for state-ordered production. Also this benefit is negotiable and the ratio between state-ordered and commercial production differs hugely between *fermers*.

The economic surplus generated by the production of cotton through the use of knowledge and labour of *fermers* and *dekhans*, and state-coordinated supply of inputs, is

[46] Money is transferred to the bank account of a business that is entitled to provide services or goods to *fermers*, but instead of providing the goods or services 90-95% of the cash money is paid out to the *fermer*. *Fermers* themselves considered this an illegal practice.

extracted through an economic-administrative system. Thus the economic benefits are mainly for the state through implicit taxation.

4.4. The commercial form of production

The Uzbek agrarian *commercial form of production* is a variation to the *capitalist mode of production*. Through the slowly implemented privatisation, opportunities are created for making private profit through the use of private capital, and employment of wage labourers. There are many aspects of the capitalist mode of production that are non-existent in present-day Uzbekistan; there is no private ownership of land, there is no free output market, and there is a strictly regulated input market.

The core of the commercial production form is an orientation to relatively free markets, the taking of private risks, the investment of money with chances on high returns, and production relations that are characterised by cash exchanges. Concretely the commercial form of production is what *fermers* produce next to their state-ordered production. This includes the production of vegetables (melons, potatoes, carrots, cabbage) and fodder (maize, sorghum, alfalfa), but is especially apparent in rice production. In Khorezm rice represents a larger area than fodder and vegetables[47], it is the preferred crop of *fermers* and has a very clear link to the cash economy. Chapter 5 shows how the production of rice puts demands on water management that are very specific. As rice production is exemplary for commercial production in post-independence Uzbekistan, and as it represents a large area in Khorezm, I have studied it in detail. In the remainder of this section rice cultivation is discussed as an example of the commercial form of production.

Rice cultivation is not limited to the commercial form of production; also in the household form of production rice plays an important role. This is discussed in section 4.5.

4.4.1. Rice land

Commercial rice is grown on two different types of *fermer* land.

1. Land that is suitable for nothing else but rice
2. As a second crop on land that during winter was cropped to wheat

Land in the first category is colloquially referred to as 'lake land'. Often this is land that has recently (less than 10 years) been reclaimed from a lake. The ground water levels in these areas are naturally high and the soils are said to be very saline in the first years of use. When these soils can be drained well and are systematically leached they are said to become good soils in about 10 years. However, due to their situation at low places the drainage of these soils is often difficult, which means that the ground water and salinity levels remain high. This makes them unsuitable for cotton and wheat cultivation and they are therefore not considered for state ordered production. These lands are either sown to rice in early June or left fallow all together. Within this category there are also fields that during some years are too saline for anything else but rice, while during other years the situation is much better.

[47] It is difficult to assess the exact area cropped to rice, as it heavily depends on the availability of water and therefore fluctuates over the years. Moreover, rice cropping is somewhat secretive and areas are not centrally administrated, or at least not openly available. In wet years the (commercial) rice area in Khorezm possibly constitutes about 20% of the total area (Veldwisch, 2006).

During the rice cultivation there is, due to the growing in standing water, almost always a downward movement of water. The side effect of these percolation losses is the leaching of salts, which makes that the next year the soil is much less saline. The choice whether to grow a state order crop or rice on such fields is subject to disputes between *fermers* and the Department of Agriculture.

In a typical case a *fermer* had been told to plant cotton on a medium saline field. After a few weeks it became apparent that the cotton was growing badly due to high salinity level. This well-connected, but not experienced *fermer* arranged with the Department of Agriculture that he could destroy the young cotton plants and plant something else instead. He was instructed to plant maize. Instead he planted rice, without permission. As a result he was got cut off from water deliveries and, until he had (informally) arranged the permission with the district authorities, he depended on drainage water for irrigation of his rice.

Land in the second category becomes empty by the end of June, when the wheat has been harvested. This is late for rice sowing, but transplanting is still possible. Usually after the wheat harvest a second crop is planted. In the cropping patterns that are decided before the season starts a second crop is not included. This implies that *fermers* have to arrange special permissions for this second crop, be it maize, melons or rice. Most *fermers* prefer to plant rice, as it is in the current situation it provides the most profitable option.

The growing of wheat provides a good option for afterwards using the land for commercial production later in the season. This is essentially different from cotton cultivation, which spans the full period in which rice is grown. Pillai (forthcoming) shows that *fermers* already early in the season opt (and negotiate) for a state plan for wheat in order to avoid cotton and have the land available for a second crop in June.

Some researchers suggested that rice is sometimes grown on fields destined for cotton cultivation. The only case that I encountered was the situation described above on saline land and where the cotton was initially planted and only destroyed with the consent of the Department of Agriculture. This does not imply that it does not happen at all. Similar situations were indirectly referred to in interviews. It was unfortunately not possible to verify these accounts. It is possible that this does happen, but it must be on a very small scale and/or very well kept away from public discussion. Even in the one case encountered people were very hesitant to talk and it was often stressed that this was an illegal activity. In this situation I had observed that first cotton had been planted on this field, otherwise I might never have heard about this case at all. The fields destined for cotton, but actually cropped to rice are probably left fallow until the sowing of rice. In that case it is even more difficult to observe this in the field.

Due to the very well elaborated system of checks and control over agricultural production it is unthinkable that rice could be grown instead of cotton without getting noticed. Therefore if indeed this happens at some level it has to be 'legalised', i.e. somebody in a government office will have to agree in one way or another. The payment of bribes could play a role in such sorts of agreements (as for instance suggested by Wegerich, 2006), but when a *fermer* wants to arrange permission to grow rice, long-term relations with people at key positions in the Department of Agriculture seems to be of greater importance.

Also for land in the first and second category the final permission has to be arranged to plant rice on this available land, but even this process remained misty to me, as people did not like to talk about the issue. In a few cases people did expand on the issue when asked. In those cases the reliability of fulfilling the production quota for state-ordered crops was frequently mentioned as a beneficial factor, as for instance in the following quote.

> GJV: I understood that different land needs different permissions to grow rice, how is that for you? [*Fermer*]: On the wheat field I didn't plant, because it is too close to my cotton fields; that would be bad. At the other fields a person from [the Department of Agriculture] came to have a look and gave permission. GJV: How much do you pay for that? [*Fermer*]: I don't pay for that. If you make your cotton targets there is no problem planting rice. Some people might be paying, but I never did[48].

Also it has become clear that the total area that can be permitted to grow rice on by the governmental organisations is connected to water availability from the Amu Darya. The discharge of the Amu Darya partly depends on rainfall, which is irregular and difficult to predict, but to a larger extent it depends on melting water from the Pamir Mountains, and thus can be reasonably estimated from snowfall over winter. Moreover there are many storage reservoirs in river by which its flow can be minutely regulated[49].

In May and June 2006 through different channels in the agricultural hierarchy messages were coming across to the WUAs and via them to the *fermers* regarding the availability of water for the ensuing agricultural season. These messages were combined with advice on whether or not to plant rice. Most of these messages were stressing that not much water would be available and thus aimed to limit the expectations of *fermers* with regard to rice production. These messages seem to somewhat refer to a situation of anticipated water shortage, but clearly also serve the purposes to limit the rice growing area. The 2006 agricultural season eventually turned out not to be water short at all.

In May and June *fermers* were waiting to get the permission to plant rice. A few of them I repeatedly visited in this period and monitored their success in getting permission. Eventually these permissions never came in writing, but rather as vague indications that it would be alright and most of them at some point were confident enough that they could plant rice without afterwards getting trouble.

4.4.2. Organisation of inputs

The inputs for rice cropping are not supplied through the state system. *Fermers* need to organise these either outside the state system or through 'leakages' within the state system. Subsidised inputs, which are meant for the state ordered form of production, are sometimes diverted for commercial rice cultivation. Well known is the example of cheap fertilizers that do not end up at the cotton field, but rather at the *fermer*'s rice field (Trevisani, forthcoming 2008).

As the profits on rice are bigger and in cash, the *fermer* usually has more cash available for arranging the inputs for rice cultivation as well. For instance investments for hiring a tractor are done easier for rice than for cotton.

4.4.3. Labour organisation & management decisions

The labour demand on rice cultivation is concentrated during the planting and harvesting period. The nursing of the upcoming crop requires minimal effort if the water level in the basins is kept high enough. If rice is sown (in May) it is broadcasted by hand (see figure 4.2). When grown after wheat this is not possible, as the rice would ripen too late. Therefore in June rice is only transplanted from seedlings that were first raised in beds. These beds are often prepared in a corner of the wheat field.

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[48] Field notes 25/07/2006

[49] The regulation of the Amu Darya and the intake of irrigation water into Khorezm is discussed in more detail in Chapter 5.

The harvesting of rice mostly happens by hand and after drying it is threshed by a stationary combine. Occasionally harvesting combines are employed directly at the field.

Figure 4.2 – Transplanting seedlings and broadcasting rice seed by hand

Fermers organise the labour for commercial rice production in different ways. I identified at least three basic types.

In the first sort of set-up the *fermer* remains strictly in control over all management decisions, while employing labourers to do the job. They are paid money for their labour and in addition usually receive some rice. In this set-up the *fermer* usually employs *dekhans* that also work as *pudrats* on his cotton fields. It is possible to employ the workers as labourers rather than as sharecroppers because the labour requirement on rice is much lower than on cotton. The exception is when the rice needs to be transplanted. This is usually done by labourers that are paid per day. It is a hard job and the wages for this are relatively high; about 50,000 soum for 1000 m^2, which takes 3 people about 3 days, which thus amounts to 5,500 soum per person per day.

In the second sort of set-up there is a real sharecropping arrangement between a *fermer* and a *dekhan*. The *fermer* supplies all the inputs; seeds, fertilizer, tractor for ploughing, combine, and water. The *dekhan* household does all the work and in return gets a fixed percentage of the yield. This is typically 30-50%, while the remaining 50-70% goes to the *fermer*. A variation to this is the setting of a threshold; e.g. the *fermer* gets the first 3 ton and all that is produced extra is for the *dekhan*.

In the third set-up the *fermer* does not crop the fields himself, but rather rents them out divided into small plots of typically 1000 m^2 each. The rent is net profit for the *fermer*. The prices paid for this differed per case, depending on the location, the soil, the relation to the *fermer*, and the moment of arranging. For rice plots this varied between 40 and 60 thousand soum per 1000 m^2 plot. This sort of arrangement also takes place for other crops than just rice; especially for large fields of carrots planted after the wheat harvest this was frequently observed. Rental prices for such plots were about 25 to 40 thousand soum per 1000 m^2.

4.4.4. Marketing

Rice is sold for cash money, either at the market or to traders that travel to Khorezm from various parts of the country. The rice is sold throughout Uzbekistan. Rice from Khorezm is

considered to be of a good quality and specifically marketed as Khorezmian rice, especially in Tashkent (see figure 4.3).

The market price of rice highly fluctuates, both throughout the year and between the years. Based on weekly market surveys Bobojanov (2004) showed fluctuation in the Urgench market price of 1 kg of rice between 250 and 1000 soum between 2002 and 2004. The price of rice seems to have a strong negative relation to the availability of water; in water scarce years the rice price goes up, in water abundant years the price goes down.

Besides the relative ease by which rice is exchanged for cash money, it also functions as a currency in itself. Labourers frequently are paid their wage in kilograms of rice instead of cash and various *fermers* mentioned that big purchases (for instance tractors) are paid in bags of rice. In explaining the importance of rice for the welfare of Khorezm, a high level government official even literally told me that 'rice is the currency of Khorezm'[50].

Figure 4.3 – Khorezmian rice is sold throughout Uzbekistan as a high quality product
The pictures was taken at a market in Tashkent

4.4.5. Final remarks

The production of rice has since long played an important role in Khorezmian agrarian production. In the soviet period this was produced on specialised rice *sovkhozy* and on marginal land within the other LFEs. Since independence the production of rice has proved to be very lucrative, and even more so when the state order for rice production was lifted. Many of the 'rice fields' in the LFEs were informally leased out to *fermers* and well-off *dekhans*. In the latest phase of the land reform also these rice fields were privatised and divided among *fermers*. The access to the commercial form of production is the metaphorical carrot that drew people into starting *fermer* enterprises that would in the first place manage state-ordered production.

The Department of Agriculture is merely the controller of the area planted to rice. Different from cotton production the government does not get involved in the management

[50] Field notes 02/05/2006

decisions of rice production, neither into the input supply or the regulations of the output markets. The extraction of surplus from rice production is primarily in the hands of the *fermers*; they control the distribution of benefits. These are sometimes shared with their workers, but in those cases it is considered as payment or reward for other duties.

4.5. The household form of production

Agricultural production in the 'household form of production' is part of the *dekhan* livelihood, as described in Chapter 3. Here the focus is purely on the production on the *dekhan*'s own fields, not on all the additional activities and sources of income. Rural households have a house with an adjacent plot (the *tamorka* or 'garden') and a plot further away from the house (the *ko'sumcha tamorka* or 'distant plot'). The total area is about 0.2 ha per household, typically divided in 0.06 ha as a garden and 0.14 ha as a distant plot. On the garden fruits and vegetables are grown, while the distant plot is used for double cropping to wheat and rice.

There is no mechanisation in the household form of production, so both land preparation and harvesting are done by manual labour. Labour is provided by the household itself, or sometimes through help by the wider family and/or neighbours.

Also the selection of seeds to a large extent takes place within the household and/or through exchanges within the village. Wall (2006) for instance describes how certain tomato seeds spread primarily through mother/daughter meetings, and in this way moved between villages. Both manure and (artificial) fertilizers are applied, whereby fertilizers represent a major capital investment compared to the otherwise very low investments in this form of production.

The produce from the two plots provides for a very basic living. Often there is no surplus to what the household will be eaten itself. Surpluses and shortages of particular products are settled through informal sharing/exchange networks with neighbours, bartering and small scale sale at local markets. The rationale of the household form of production is that of basic food provision, and hence, livelihood security. Money plays a subordinate role in organisation of inputs, in labour and in use of the produce.

4.6. Rice-cotton interactions

The three forms of production can be seen to be in competition with each other over the limited available resources. This is particularly clear in the land use planning and land allocation procedures. Especially the relation between cotton produced under state order and the commercial production of rice can be seen as a relation that is shaped by conflicting interests and contestation over resources. The discussions above have shown that the rice and cotton production processes have very different benefits for different actors. Moreover, the labour demands are different and to some extent conflicting. Therefore the conflict is not expressed as a conflict between agricultural enterprises; after all, there are no separate state enterprises and commercial enterprises. Rather the conflicting interests show throughout the agrarian structure as a whole; it is an issue for the state, the *fermer* as well as the agricultural labourer. The position of each is discussed below.

The state ordered production is strongly linked to the interest of the state, and therefore to state officials, who for their position in the agricultural (and political) hierarchy depend on their ability to deliver the requested cotton quotas. Though delivering cotton is not the only criterion, the accountability mechanisms for state officials are almost only upward; i.e. even *Hokims* (Governors) depend on their superiors rather than on constituents. Still, it is also in their interest to allow for substantial areas of rice to be planted. This is because they have a role as benefactor and patron in their communities and at the same time it creates opportunities to gain some personal benefits.

The state hierarchy is not easily accessible for research and people are not inclined to talk about either issues of upward loyalty or issues of personal benefits through rice allowances. Therefore it is difficult to be certain about the exact processes steering the balance between cotton and rice production. It seems, however, logical that the *Hokim* more than the Department of Agriculture is interested to increase the rice area cropped in his district. The somewhat conflicting messages in May and June 2006 over whether it was allowed to plant rice or not followed directly from the differences between the agricultural hierarchy and the *Hokim*[51].

In the *fermer* enterprise the two forms of production come closest together. In practice the *fermer* manages both the commercial and the state-ordered production processes. However, the *fermer's* management capacity is limited on the one side by checks and controls imposed by the state and on the other side management responsibilities are partly contracted out to labourers.

Some *fermers* limit themselves to cotton production, as they have a lot of practical experience with its cultivation, the concomitant credits provide good opportunities for investment without own capital, it has a rather stable output price and builds socio-political capital with the state authorities. However, in general *fermers* also try to get permission to cultivate some rice. The socio-political capital accumulated through reliable cotton delivery can be used as leverage to acquire such permission. *Fermers* with socio-political power that is vested in their job position, network or descent are often able to acquire rice permissions for relatively large areas.

Both for the Department of Agriculture and for the *fermer* crop planning is central to agricultural production strategy. Controlling the cropped areas is the main mechanism of governmental control over agriculture. The organisation of all other agricultural inputs is subordinate to the crop planning procedure. Still, also in the distribution of inputs there is interaction between the two forms of production. A *fermer* who grows both cotton and rice has to balance the investment of inputs between the two processes. Above the classic example of diverting subsidised fertilizers was already mentioned. Also the subsidised (cotton) credit can be used for investments in rice production. In a similar way *fermers* have to distribute their time, tractor use, and labour allocations over these processes.

Whilst almost all of the *dekhan* households are working in cotton cultivation only a limited number is involved in the commercial production of rice. Working in cotton cultivation serves as the entrance to other benefits to which the *fermer* is a gatekeeper. Granting access to commercial rice cultivation is perceived as on of the best rewards, especially when the *dekhan* household has a great degree of freedom over the rice cultivation, which results in good economic returns. This can take place either through permanent employment contracts or profitable sharecropping arrangements. This sort of access to land is very limited for *dekhans* and in principle only available to households closely connected to

[51] For a more elaborate discussion of this see Chapter 5

a *fermer*. Beside the control over land, there are a number of other benefits that were previously distributed through the collective farms, but which are now only accessible through *fermers*. This involves for instance the cotton stalks that are used as firewood, access to grazing areas, and provision of informal credits.

Thus, *dekhans* for the access to various benefits depend on *fermers*. On the other hand *fermers* are very much in need of labourers in cotton cultivation, which is perceived as hard labour for a minimal wage. This situation leads to the formation of dependency or patronage networks in which the production of cotton serves as an upward delivery, which is compensated with access to commercial rice production. This pattern exists both in state-*fermer* and in *fermer-dekhan* relations.

The dynamic interactions between the rice and cotton production processes are an expression of the relation between private and state interests. This is not to say that there is an interface between the state and the 'society'. It has been argued before that the distinction between state and society does not really exist in post-Soviet Uzbekistan (Jones Luong, 2004). This blurring of boundaries was an explicit aim during the Soviet reconstruction of society. In the current organisation of agriculture it is still visible that all agrarian actors are mobilised in the exercise of state production. Conversely, the state does not operate as a single body, but is subject to internal dynamics and personal preferences of actors within it. By the change of agricultural production from LFEs to household-based enterprises like the *fermer* enterprise, there is an increased sense of private ownership.

4.7. Conclusion

When analysing the roles of different actors in agricultural production from independence till 2006 only little transformation is discernable; co-ordination of agricultural production is still in hands of the state, agricultural management rests with the rural elites (those who had management positions in the *kolkhoz*), and manual labour is still done by the same households – in the past they were called *kolkhozniks*, now they are *dekhans*. However, as shown in Chapter 3, the units of enterprise and governing principles between these groups of actors have considerably changed. In this chapter it was shown that the dynamics between these three groups of actors take shape in the three forms of agricultural production. That is, the state controls household production differently from commercial rice production and yet differently from state-ordered cotton, yet in all forms of production the state is in a position of control. In the same way labour relations (often between *fermers* and *dekhans*) are organised differently in each form of production, yet in each form of production the *dekhans* are the labourers.

The way in which agricultural production is organised reflects the diverse economy of post-Soviet Uzbekistan. The Uzbek economy is not a transition economy in the sense that step-by-step its economy is transforming from a state-socialist economy into a capitalist economy. Rather it is constantly transforming and in that sense it could be called a 'transition economy' after all. Characteristic for this economy is its diversity of (production) rationales rather than the transition from one ideal-type of economy into another. Moreover the current diverse situation is a situation to stay. At this moment all three strands of the agrarian economy have a reason for existence and the stability of the system is created by the interaction and exchange between the three forms of production. Sooner then that this interrelated system is going to change each form of production in itself might change.

The household form of production. For most rural families there is no outlook on a stable source of income that would reduce their dependability on production for home consumption on their household plots. However, with additional sources of income from labour, either in or outside of agriculture, the room for experimenting and investing in intensified and commercialised practices could develop. The share of production that is traded at local and regional markets (or even internationally) could then increase.

The commercial form of production. When state control over cropping would be further reduced, large-scale commercial production could be extended to a larger share of the arable land. Paddy cultivation which is currently the dominant practice of commercial production will probably not increase much because of the high water requirements. Commercial production could diversify to include other potentially profitable crops like potatoes, dry land rice and more fodder crops. As long as the state order for cotton remains the commercial form of production will probably remain controlled as well. Access to the commercial form of production would then keep the role of reward for loyalty and the stable fulfilling of quotas.

The state ordered form of production. With a reduction of the quota for cotton and wheat this form of production could become less dominant. However even with abolishment of crop quotas for cotton, its production will probably remain. Production on the fields of farmers is only one link in the value chain of cotton production. Currently the chain is regulated by the state. With further privatisation and less regulation this role could be taken over by the processing industries that depend on a stable production by farmers. In other parts of the world this is often organised through contract farming arrangements in which the processing industries offer credits and other support in exchange for guaranteed sale of the produce. This form of organisation has strong parallels with the state-ordered form of production as described for Uzbekistan in this study. If the state order falls away there is good change that cotton production will be organised in a contract farming set-up. Cotton production would probably become more profitable for farmers. Still they would heavily depend on external institutions for credit and guaranteed output channels. Farmers would probably increase their control over the internal relations of production, i.e. the exact ways of operation on field level will no longer be checked and enforced, while the external relations of production would remain heavily regulated. This external regulation could extend to the choice of variety and demands on the quality.

If the state order would disappear, and cotton production would be organised in a contract-farming sort of set-up, *fermers* will probably further diversify along the lines of the ability to invest own capital and the willingness to take risk. Those who can invest money and are willing to take risk will then focus more and more on commercial production for dynamic markets, while those who don't have money to invest and/or are less willing to take risk will turn to the privatised cotton processing industries that provide credits and guaranteed output prices.

This study shows that many *fermers* successfully tapped into the commercial form of production next to their necessary production under the state order. The delivery of outputs in the state-ordered form of production is an important requirement for being allowed to develop the commercial production. Though the management of agricultural production within the commercial form is in principle free, indirectly it is still strictly controlled by the state. Commercial production is only attainable through showing loyalty in production for the state. Socio-political capital created through state-ordered delivery is transformed into cash money through the commercial production of rice. This position of forced loyalty in which *fermers* are kept by the state is very similar to the situation that *fermers* keep their

workers in; when they are loyal and work hard on the cotton fields they get better rewards. The access to land on which rice growing is allowed plays an important role in this reward system.

This chapter on the three forms of production, together with the preceding chapter on *fermers* and *dekhans* in relation to the state, provides an analysis of the dynamics of agricultural production in Khorezm. The organisation of labour and agricultural inputs, the different economic systems, the output relations, and the systems of control and surplus abstraction have been analysed. The role of water in this system has explicitly been kept out of the picture. The next chapter analyses how water distribution patterns relate to the discussed dynamics around the three forms of production.

Chapter 5

Water Allocation, Adaptation and Distribution

5.1 Introduction

The preceding two chapters show that important parts of agricultural production in Uzbekistan are still under strong state control, in which cotton production plays a central role. The subject of this chapter is the effect of this state control on water distribution processes at the district level (*rayon/tuman*), i.e. the interactions between state organisation, the newly established Water Users Associations (WUAs), *fermers* and *dekhans*.

In this chapter it is shown that Khorezm has an authoritarian, top down system of irrigation management. This system is deployed to strengthen the state's control over agricultural production, especially that of state-ordered cotton. However, also commercially produced rice and household production, the two other forms of production, are satisfactorily supplied with water. The three different forms of production each have their own typical feedback loops that inform the water managers about water demands at field level. A situation of relative water abundance combined with strict state control over cropping patterns, makes it possible that the water distribution largely follows the demand signals.

This chapter is based on research conducted on district and provincial level and interviews with state organisations operating at these levels. During the fieldwork period in 2005 once every two weeks I travelled to about 20 different division points at provincial level. Mostly I was accompanied by a water manager; sometimes I travelled alone. This was complemented with a number of interviews at offices in Urgench, the provincial capital. At district level I conducted interviews with state organisation officials throughout the research period. Sometimes these took place in the offices and sometimes we went to the field together. Many processes going on at these levels are difficult to observe and often informants were hesitant to talk. Because of this, after the first year of research I doubted whether it was not wiser to complete focus my research at WUA level and below. In 2006 I got access to better sources than I had hoped for and due to the long period of interaction with a number of informants and the variety of sources it was possible to construe this chapter.

Section 5.2 describes the various levels in the irrigation and drainage network and the organisations that are active at each level. Also the essentials of irrigation and drainage in a delta are explained. In section 5.3 it is argued that both the physical and the administrative infrastructure are well functioning systems that make it possible to effectively control water flows. In section 5.4 the water requirements of current agricultural production patterns are analysed and compared with the water availability from the Amu Darya. It is concluded that there is a situation of relative water abundance. In section 5.5 it is discussed how allocation and scheduling of irrigation is arranged, as well as how the system responds to the day-to-day demands from field level.

5.2. The water distribution network

5.2.1 The wider organisational network

Three different types of organisations are involved in the distribution of water; the administrative branch offices (the *Homiyats*), and the branch offices of MAWRwater department and the branch offices of the agricultural department. Until 1997 water and

agriculture had their separate ministries, but these were then merged into a joint Ministry of Agriculture and Water Resources. This also entailed the merging of the branch offices at the lower administrative levels (province and district). In 2003 Irrigation Management Authorities were created on hydrological boundaries within the joint Ministry. The branch offices of the water department are now organised on basin principle and therefore separated from the branch office of the agricultural department.

Wegerich (2005) coined this process the de-merger of two ministries. However, it was not so much a de-merging of the two departments, but rather an attempt by the Ministry of Agriculture and Water Resources to distance the water department from the influence by the *Hokims* (Yalcin and Mollinga, 2007a). In spite of this strategic re-organisation *Hokims* still have a strong influence on water distribution, as discussed later in this chapter.

A fourth line of organisation is constituted by the international co-ordination of water distribution between the former soviet republics that share the Amu Darya and Syr Darya Basin. The Interstate Commission for Water Coordination (ICWC) was created soon after independence (in February 1992), while the two Basin Management Organisations (the BVO Amu Darya and the BVO Syr Darya) already existed since the 1980s (Spoor and Krutov, 2003). The BVOs are inter-state organisations responsible for allocation and management of international water.. Within each irrigated region the BVOs have an executing organisation that manages the inter-state canals. For Khorezm this is UPRADIK (Administration of Amu Darya Delta Irrigation Canals).

Only the organisations marked in blue in figure 5.1, physically handle water; the thick blue arrows signify the flow of water. The other organisations in the figure are involved in supporting, checking and/or instructing these organisations.

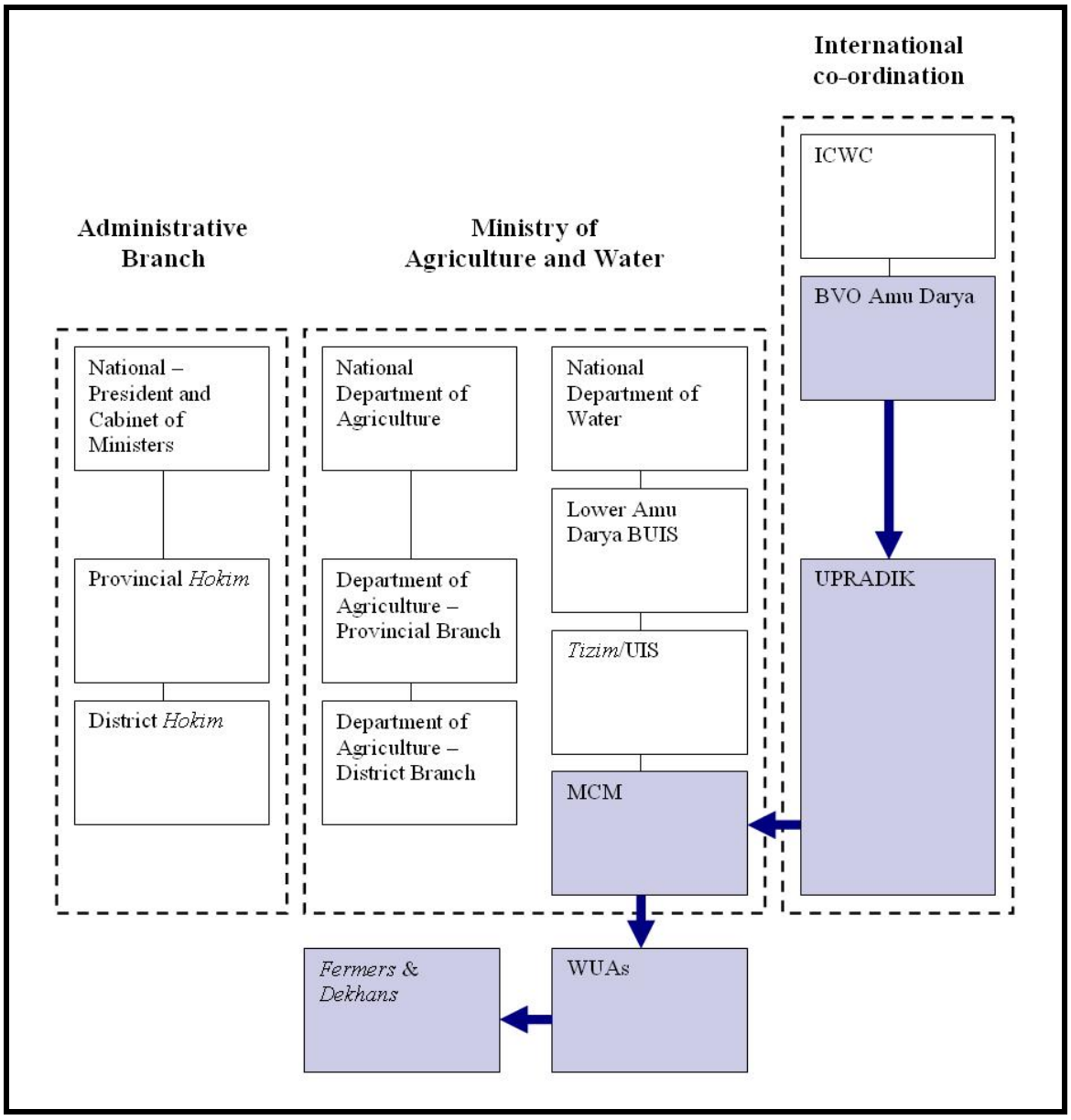


Figure 5.1 – The main organisations involved in the organisation of water for agriculture in Khorezm
BUIS – Basin Department of Irrigation Systems
BVO – Basin Management Organisation
ICWC – Interstate Commission for Water Coordination
MCM – Main Canal Management
UIS – Irrigation System Authority
UPRADIK – Administration of Amu Darya Delta Irrigation Canals
Source: own compilation

5.2.2. Khorezm Province

In Khorezm Province (*Oblast/Viloyat*) there is a total of about 270,000 irrigated hectares. At the provincial level there are three main organisations involved in water distribution, (1) the Administration of Amu Darya Delta Irrigation Canals (UPRADIK), (2) the Lower Amu

Darya Basin Organisation (BUIS – a branch office of the Water Department, and (3) the Department of Agriculture (provincial branch office).

UPRADIK is responsible for operation and maintenance of all inter-state and most inter-district canals within Khorezm, as well as for the off-takes from the river and for the water division structures in these canals. UPRADIK is part of the BVO structure. For its activities in Uzbekistan the BVO Amu Darya receives its money directly from the Uzbek Ministry of Finance. UPRADIK receives its funds from the BVO and therefore is not part of any Uzbek ministry. In Urgench UPRADIK shares an office with the BVO branch for the lower Amu Darya. The responsibility of UPRADIK is basically to carry out the allocations by the BVO to the water managers at district level (MCMs/UISs, see below). Figure 5.1 shows a map of the canals that are managed by UPRADIK, while figure 5.2 shows pictures of a river off-take and one of the main water division structures managed by UPRADIK.

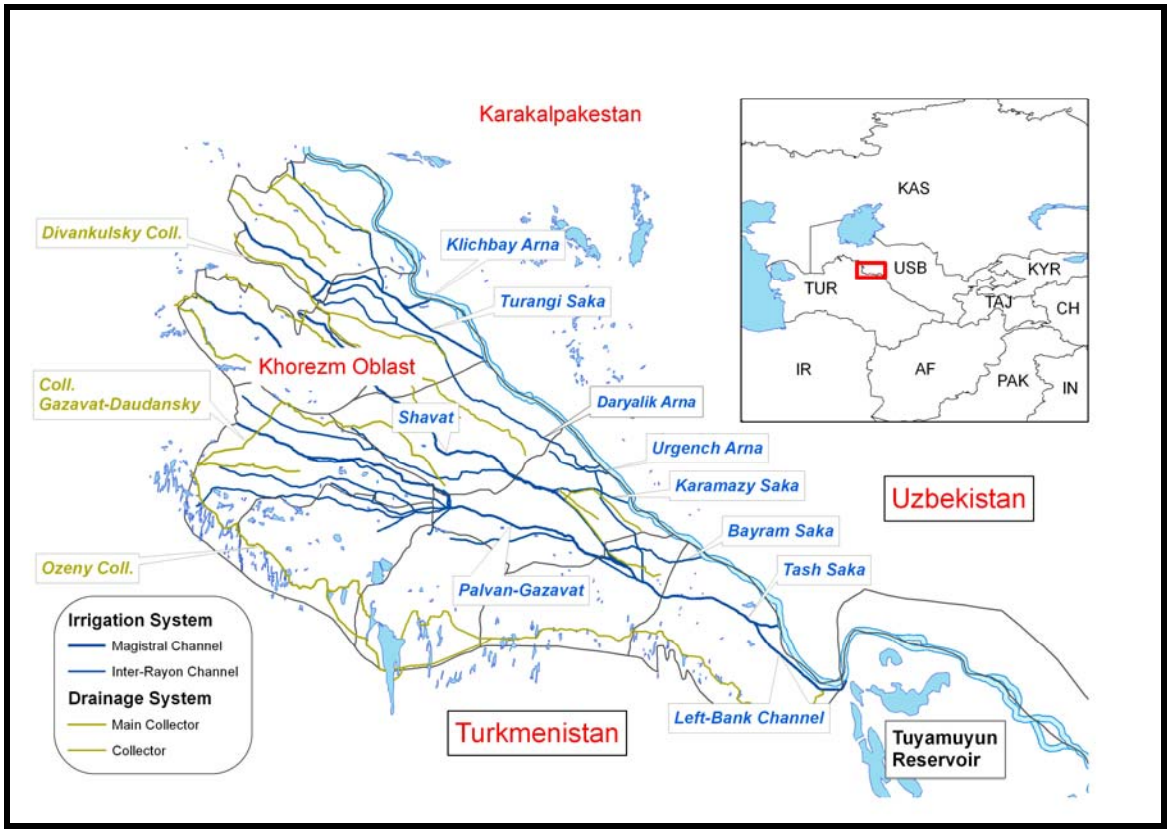


Figure 5.1 – The main canals and collectors of Khorezm Province
Source: Conrad (2006)

Figure 5.2 – One of the river off-takes (at Tashsaka) operated by UPRADIK

Figure 5.3 – Tashsaka *Zaruzenya* one of the main division points operated by UPRADIK. The inflowing canal has a design capacity of about 500 m^3/s (1st till 3rd picture) and splits into canals with capacities of about 250 m^3/s (4th picture) and 200 m^3/s (5th and 6th picture) plus a few smaller ones. The pictures were taken by Jan Sendzimir

The Lower Amu Darya Basin Department of Irrigation Systems (BUIS), responsible for agricultural water distribution in both Khorezm and Karakalpakstan has its head office in Nukus, Karakalpakstan. The Urgench branch office in popular speech is still referred to as *OblVodHoz* (the former Provincial level Water Management Organisation). The BUIS co-ordinates the tasks of its lower branch offices; i.e. the division of budgets, the planning of major maintenance works and the water allocation process. The water allocation process is closely linked to the planning of agricultural production, which is co-ordinated by the Department of Agriculture. At provincial level the BUIS and the Department of Agriculture therefore closely work together.

Beside co-ordinating agricultural planning between the districts, the provincial branch office of the Department of Agriculture also gives institutional support to the newly established Water Users Associations (WUAs). Neither the UIS, nor the Department of Agriculture at provincial level are organisations that actually handle the water themselves. The canals at this level are managed by UPRADIK. UIS is the support and control organisation for the MCMs that distribute water within the districts (i.e. the delivery-side), while the Department of Agriculture at this level is the supporter of WUAs and the Departments of Agriculture at district level (i.e. the request-side).

Beside these three organisations also the Provincial *Hokim* probably sometimes interferes in decisions of water distribution between the districts. Yalcin and Mollinga (2007a) analyse that one of the main reasons to re-create separate organisation of the Water Department at the district and provincial level is to reduce the influence of the *Hokims*. Despite this change in organisational structure, *Hokims* influence the water distribution at these levels. Also there are the support and control organisations called the *Nasos Stantsiya* (lit. 'pump station'), which supervises and controls the use of (state owned) pumps throughout the province and the Water Inspection Department, whose tasks are discussed in section 5.5.5.

5.2.3. *Tezim*[52]

The *Tezims* (Uzbek for 'system') are branch offices of the Lower Amu Darya Basin Department of Irrigation Systems (BUIS). Their working areas are based on hydrographic boundaries and consists more or less of three to four clustered districts. This type of organisation has been formed in 2003, as part of the re-organisation of the Water Department to hydropgraphic boundaries. In Khorezm there are four *Tezims* (see figure 5.4). By the creation of this new organisation an extra level has been established in the Water Department's hierarchy. This is similar to the organisation that existed in the Soviet period. The *Tezims* took office in existing regional offices buildings of the Water Department; the main office of Tashaka *Tezim* is for instance located in the former office of Bagat's Water Department.

By the formation of the *Tezims* tasks that were executed by the district office have now been clustered, especially where it comes to heavy machinery. One of the advantages frequently mentioned by the people working in these offices are the economies of scale; the same work is done with fewer people and less equipment. Besides, also the (administrative) budgets and cash flows are controlled by the *Tezim* main office. The *Tezims* do not practically distribute water themselves; this is done by their lower level branch offices (see below). At the inter-district level UPRADIK is the organisation responsible for the operation of structures, the measurement of canal flows, maintenance of structures and canals.

[52] This is also referred to as UIS - Irrigation System Authority

Figure 5.4 – The four *Tezims* of Khorezm Province
The red lines are district boundaries; pink: Tashaka-system; bright green: Palvan-Gazavat-system; light green: Shavat-Kulavat-system ;and yellow: Karamaz-Klichbai-system.
Source: picture taken from a map at an office in Khorezm (Christopher Conrad)

5.2.4. District level and MCM

For the discussion of the district level Yangiarik District is used as a case. It covers about 17,500 cultivated hectares spread over ten WUAs and a few other water users, which include a fish farm, a bee farm and a cotton ginnery. The district capital (*Yangarik Centre*) has a branch office of the Water Department. In popular speech this office is referred to as *RayVodHoz*, which is the old Russian acronym for 'District level Water Management Organisation'. Officially they are now organisations for Main Canal Management (MCM). With the 2003 reforms according to hydrographic boundaries the district is no longer a water management unit. However, in Yangiarik the changes were minimal as the district is almost completely supplied by one main canal, the 'R8' canal. The responsibility of the R8 MCM is therefore almost equal to that of the former Yangiarik *RayVodKhoz*[53].

The R8-MCM receives its water from UPRADIK at the place where the R8 canal connects to the main canal system (see figure 5.5). First the R8 flows through Khanka district for a distance of about 20 km without irrigating much land around it. At its start the R8 canal has a capacity of roughly 60 m^3/s. When it reaches the boundaries of Yangiarik District it branches off in many smaller canals (see figure 5.6 and 5.7). This makes that the

[53] An area of about 1,000 ha of the district is supplied by another canal system, while the R8 canal also supplies about 1,500 ha of Khanka district. This is not the case for all districts and the reforms of 2003 required more changes in those areas. Still, each district has an MCM office.

systems consists of twenty different canal stretches. For each section a *hydrometer*, who is employed by the R8-MCM, is responsible for daily management. They measure the water flows and control the outflows to the WUAs. For each delivery point from the MCM managed canals to the WUAs, a diary is kept in which both the delivering and receiving party sign for each water measurement (see figure 5.8). There are gravity off-takes and pumped off-takes (see figure 5.9).

In total the R8-system has about 100 employees, of which the majority are employed at the four field offices at the main division structures. The majority of these are water managers, both *hydrometers* and *hydrotechnicians*. The first bear the prime responsibility for flow management and measurements, while the latter are responsible for operation of minor structures and for small repairs. Besides, each MCM has a Maintenance Department that is responsible for cleaning of canals and repairs, and a Mechanical Department that is responsible for its machinery.

The head of the R8-MCM frequently travels between Yangiarik and Bagat, where its *Tezim* office is located. The MCM depends on this office for budget regulations, cash handling and co-ordination of some of the larger maintenance machines. During the fieldwork period for this study there was still frequent contact between the MCMs and the office in Urgench, similar to the situation before the reforms.

Besides the MCM also the Department of Agriculture and the *Hokimiyat* are involved in the distribution of water at district level. As with agricultural planning in general (see Chapter 4), the Hokim strongly guides the distribution of water, especially where it possibly affects state ordered production. Officially water distribution is outside the jurisdiction of the *Hokims*, but even people at the lower reaches of the water hierarchy seemed to 'know' that the influence of the *Hokims* is often strong. However, many people were not well informed about this and/or did not feel free to talk about it. A pensioner with a life-long experience in the water department at district, and still somewhat involved in the operation of a large division structured did elaborate to me on the topic. In the context of talking about the merger between the ministry of Agriculture and the ministry of Water Resources this man explained that

> their tasks remained the same, but they had to pay more attention to agriculture. The *Hokim* started to tell them [of the MCM] what to do. Before the merger this was not so. Further he told that they [of the MCM] mostly do what [the Water Department] tells them. In the *Rayon* also the deputy *Hokim* gives orders, even though he officially has no authority. He comes himself or sends his people to the [MCM] office to tell that they have to take more water for the *Rayon*. But in the end [the MCM] is responsible for monitoring "the limit"[54].

Some managers from within the Department of Agriculture and MCMs explained that the various agricultural organisations at district level in general work as one 'team' under the guidance of the *Hokim*. These short links in many respects seem to be more important than the more distant links to the head offices within the departments.

A high level official of a Department of Agriculture at district level explained it to me as follows.

> GJV: Now who is the head of [the Department of Agriculture at district level], is it [the Department of Agriculture] at *Oblast* level or also the *Hokimiyat*? […]. [Respondent]: The *Hokimiyat*. [Translator]: And further? [Respondent]: Also to *Oblast* level. Officially we fall under Urgench, there is a representative

[54] "The limit" is the allocated amount of water, see explanations in section 5.4.2.

from [the Department of Agriculture] in Urgench, but the *Hokim* can order us as well. Also [the MCM] falls officially under the *Tezim*, but the *Hokim* can also order them, because he is the head of the *Rayon*. If the *Hokim* orders to let water flow to […] the very last area in our *Rayon*, we let the water flow there. He can order. We [of the different departments] have to collaborate with each other[55].

In another district the head of an MCM explained me the following.

GJV: Since when are you the head of this office? [Respondent]: Since 6 months. GJV: What did you do before that? [Respondent]: I worked at the [Agricultural] department, that is *Agroprom*. (… some questions from his side [directed at my translator] about what is better: being a teacher or a translator …). GJV: What is better: being the head of the [MCM] office or working at *Agroprom*? [Respondent]: It's the same. *Agroprom*, *Tezim*, mechanisation department, etc. we do not really make distinctions between these organisations. GJV: In practice do you then still have the same boss? [Respondent]: No, also at *Agroprom* I was the head myself. Then I was asked to become head of the *Tezim* office. GJV: Who asked you? [Respondent]: The *Hokim* did. I was planning to leave for Tashkent, but he asked me to stay. I think because I am doing a good job and he wanted me to improve the functioning of the [MCM] office. GJV: But are you then not asked for this position by the head of [your] *Tezim*? [Respondent]: No[56].

Figure 5.5 – The start of the R8 canal
At the background Tashsaka Canal flowing from right to left.

[55] Field notes 29/05/2006
[56] Field notes 02/05/2006

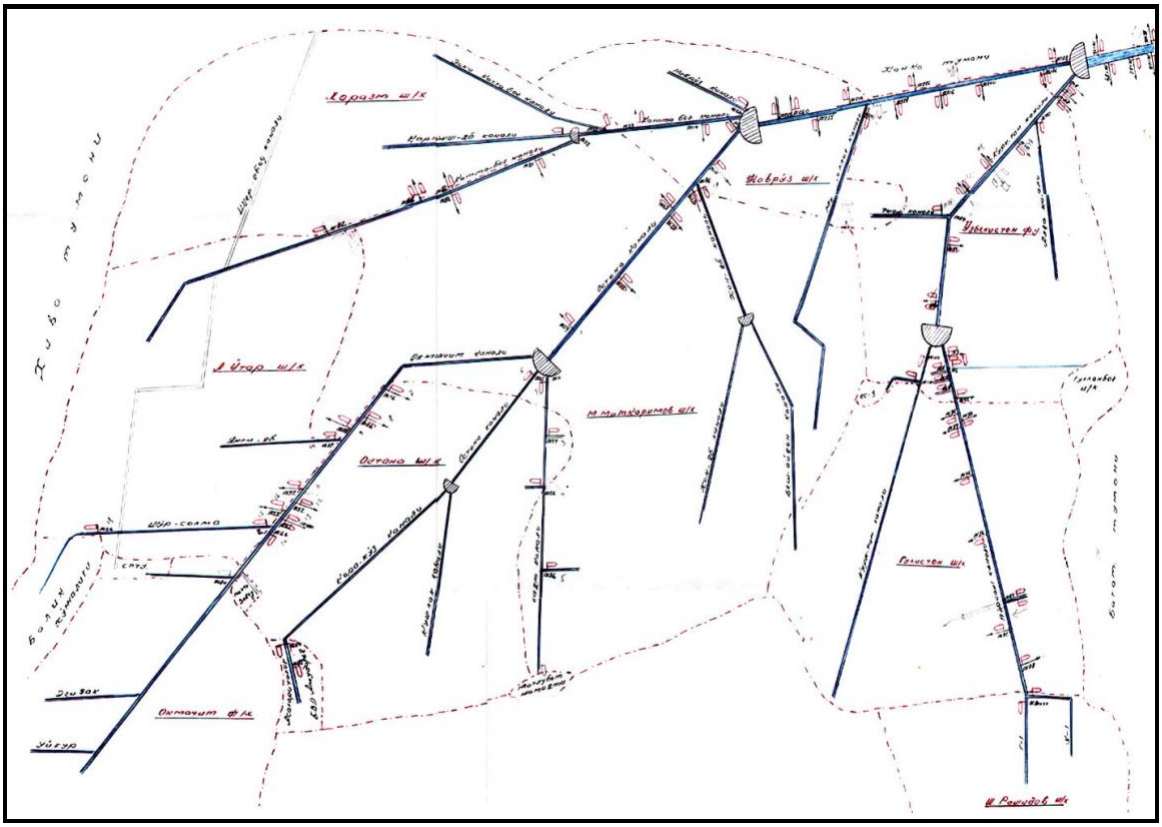


Figure 5.6 – Schematic overview of the R8 MCM area.
The blue lines are canals; the half circles are water division strictures and the small flags along the canals are off-takes from the canals to the WUAs. The dotted lines are the WUA boundaries.
Source: R8 MCM – scan of original drawing

Figure 5.7 – One of the larger water division structures in the R8 system ('Navruz *Zaruzenya*').

Figure 5.8 – Booklets with registration of water supply to WUAs

Figure 5.9 – Gravity and pumped off-take from main R8 system to WUAs

5.2.4. Drains, collectors and groundwater

The Khorezm area is very flat with slopes of on average 0.00015 (Dzhabarov, 2005), due to which natural drainage is minimal. Since the 1940s an elaborate network of drains and collectors was constructed in Khorezm. The saline and polluted excess water flows to desert sinks where it evaporates. This construction of a drainage system followed on a period of increasing groundwater levels that eventually led to extensive water logged and salinised areas. This water logging was the result of the construction of large division structures in the main canals in the period 1939-1942 and the consequent expansion of the irrigated area (ibid.). By means of the structures the water levels in the main system could be kept at a high level, which made it possible to irrigate large areas by gravity. In earlier periods the main canals were constructed relatively deep in the soil, making it necessary to lift the water when putting it onto the fields. This was done by water wheels, either by animal traction or automated on the speed of the water flow. As the irrigation canals were constructed at a deep level they functioned at the same time as drains for the excess water supplied to the field (see figure 5.10).

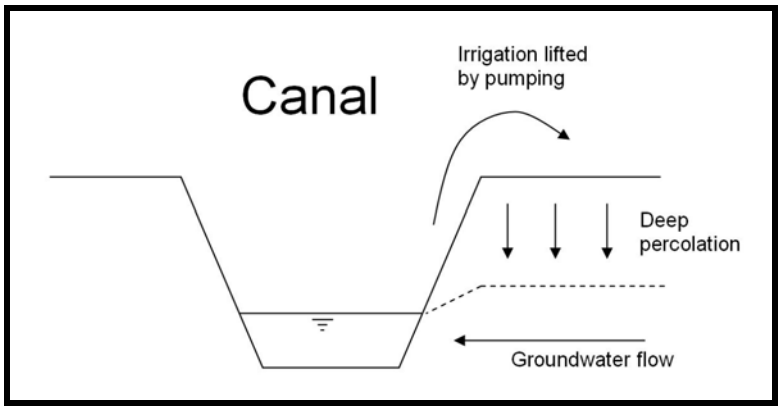


Figure 5.10 – Schematic of deeply constructed irrigation canals that also fulfil a drainage function
The arrows indicate the flow of water, the dotted line the groundwater level.

In the current situation most of the irrigation canals are relatively shallow, which implies the need for an extensive network of drains and collectors. Water that is transported through the irrigation canals and onto the fields leaves the area again as both water vapour (evapotranspiration, (ET); both through the plant and directly from the soil) and as drainage water. Possibly there is also a small amount that disappears as deep percolation. For a schematic overview see figure 5.11.

The inflow (irrigation) and outflow (drainage) are in balance with each other, with the storage in the soil (groundwater) as buffer. Irrigation water reaches the groundwater through direct seepage losses from the canals, as well as through the soil when more water is applied than can be held by the soil. Partly this is done on purpose in order to create a downward flow that takes away the salts that would otherwise accumulate in the soil. Also there are direct (not sub-surface) contributions of irrigation water to the drains (operational losses).

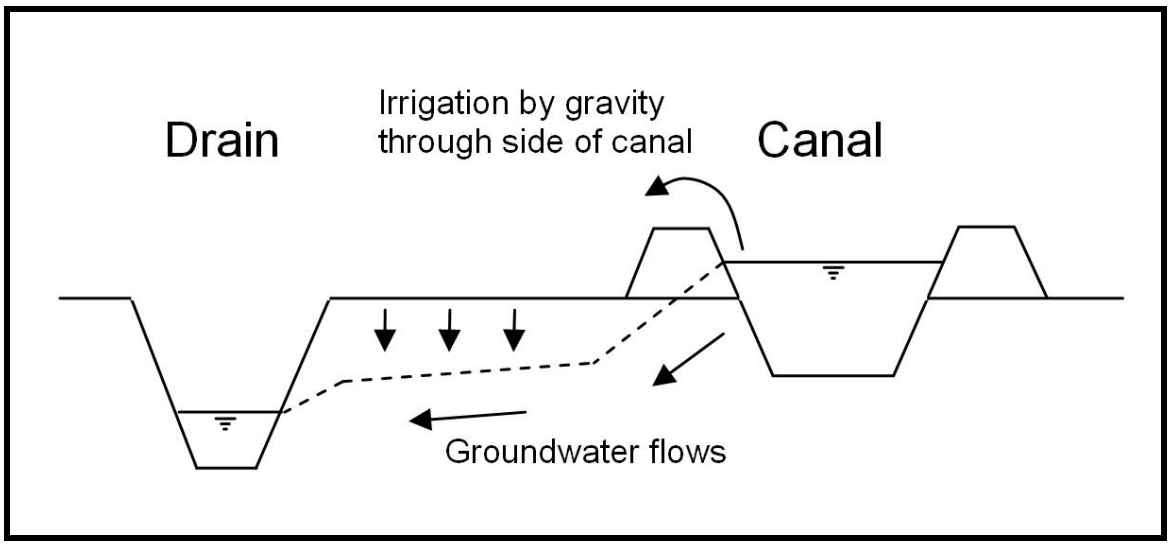


Figure 5.11 – Schematic of irrigation canals that can supply by gravity
The arrows indicate the flow of water, the dotted line the groundwater level.

Through capillary rise the groundwater contributes to the soil moisture that is available to the plant, and to evaporation at the soil surface. The rising height and amount of capillary contribution depends on the soil type. The groundwater level is in certain periods kept high on purpose so as to contribute water available to plant growth. This is called sub-surface irrigation and is widely practiced in flat, deltaic areas, also outside Uzbekistan.

During the germination and initial growth of cotton farmers keep the groundwater levels high by keeping the irrigation and drainage ditches full with water by blocking their outflows. Later in the season, when temperatures are higher and thus the risk of salinization is greater, the small dams are removed and the groundwater is lowered.

Forkutsa (2006) monitored actual irrigation practices at field level by a farmer. She showed that the contribution by subsurface irrigation in one of the fields was as high as 277 mm. In another field cotton was even grown completely on the ground water contribution, i.e. without surface irrigation. The number of water applications to a cotton field during one growing season highly depends on the groundwater contribution. Some fields are only irrigated ones or twice while others are irrigated up to five times. Beside the beneficial effect of a high groundwater table, it also increases the risk of salinization. For the Khorezmian situation Ibrakhimov (2005) identified that the groundwater level should be between 1.2 and 1.5 m below the ground surface in order to avoid the risk of severe salinization. Akramkhanov (2005) for Khorezm states that 80% of the irrigated soils in Khorezm are estimated to be saline, ranging from slightly saline to highly saline. The UNDP (2007) reports an increase of the saline land area in the Amu Darya basin of 57% between 1990 and 2000. The groundwater level is not always kept high on purpose.; there are also other reasons for a high groundwater table in Khorezm. Firstly the capacity of the drainage system is a reduced due to irregular cleaning. Secondly many drains are not deep enough due to unstable sides, which is related to the soil characteristics (Dzhabbarov, 2005).

When compared to other systems the outflow of drainage water in comparison with the inflow of irrigation water into the Khorezm network is very high. Conrad (2006) reports that during the agricultural season the outflow from different sections of the water network is between 45 and 60%, while the total outflow from Khorezm over 2004 and 2005 was 50% compared to its total inflow. This corresponds with what Dzhabbarov (2005) reports for each year in the period from 1970 to 1990, which for the whole of Khorezm fluctuated between 48 and 64%, with an average of 56%.

The amount of outflow partly depends on the 'leaching fraction', i.e. the amount of water that on purpose should be supplied on surface in order to generate a downward flow that washes away the accumulating salts. This leaching can be done in a separate period (when there is no crop on the field) or during the cropping period as part of the normal water supply[57].

[57] There are many models to calculate the leaching fraction, which generally depend on the salinity of the applied water, and the salinity of the drainage water (Corwina et al., 2007). The 50% of outflow in Khorezm is much higher than what would be needed to maintain a steady state of salinity in the soil if all the water would drain through the soil. The difference can be accounted to seepage losses from the canals as well as operational losses. Why and where these losses occur is further discussed in section 5.3.1.

5.3. Maintenance and measurements

Investment levels in the large-scale irrigation systems of Central Asia have dramatically dropped since independence of its five republics. "From 1991 to 2001, the state share of investment in agriculture was reduced from 27% to 8%, and capital investment in the water sector was reduced by almost 5 times" (UNDP, 2007: 39). With respect to Turkmenistan, O'Hara (2000:365) describes how "Problems emerged almost immediately with lack of funds virtually halting maintenance programmes and the system rapidly deteriorating." O'Hara and Hannan (1999:38) expected that (in Turkmenistan) "a gradual deterioration through neglect" would lead "to widespread failures in the system". Wegerich (2003:15, 21-2) suggests that in Khorezm staff and fund reductions had big implications for the possibilities of operating the irrigation and drainage system at a local level, which are leading to water management problems and water wastage. Conti (2004:144-6) describes how the state of the irrigation and drainage systems in Central Asia was already very low at independence, but only worsened since then. This has even led to "the complete abandonment of many secondary and tertiary canals." In a recent study the UNDP (2007) assessed the maintenance level of the irrigation and drainage infrastructure throughout Uzbekistan and concludes that both for the on-farm as well as the main canal more than 50% is in need of reconstruction or repair.

From these descriptions it could easily be understood that irrigation systems in Uzbekistan are on the verge of total collapse. However, my findings in Khorezm give a rather different picture; both the infrastructure and the managerial system are fully functional, though probably under more pressure than in earlier times.

5.3.1. The state of the infrastructure

The whole system is an open canal system with almost only unlined canals. Dzhabbarov (2005), reviewing various studies on water efficiencies of canals in Khorezm, reports losses in the canals operated by UPRADIK of about 4-8%, losses in Main Canals of 5-15% and in irrigation ditches losses of about 11-15%. When using the average of each level this would amount to an overall conveyance efficiency of 74%. This excludes operational losses and losses at field level.

At the division points in the main canals concrete division structures were built, mostly dating back to the period 1939-1942, but which were upgraded since then. Usually these structures have sliding gates. Some were constructed as half-automated gates, but currently they are all operated manually. They are controlled by workers of the MCMs, who have small field offices next to these structures. The managers use their own rules of thumb[58] to set the gates to the discharges for which they get instruction from the main MCM office. Regularly they check whether their gate settings indeed result in the ordered discharges by measuring the discharges in the canals downstream of the division point.

The dramatic reduction of the budget available for maintenance after the collapse of the Soviet Union is clearly felt at the MCM level. Still, the various water managers whom I interviewed did not report any major collapses due to this. Neither did I observe any such sort of incidence in the period of two agricultural seasons that I intensively travelled along the canals. At small division points sometimes the gates are missing, which makes it more difficult to regulate the inflow (see for instance the gravity off-take in figure 5.9). In such situations, branches, pieces of wood and bags of sand are sometimes used to regulate the flows.

[58] For instance: turn the handle 5 times round to increase the discharge with 1 m^3/s.

The major burden on the maintenance budget is cleaning the canals from settled silts (*cf.* Zavgordnyaya, 2006). Canals at the MCM level are scheduled to be dug out by excavator every year, but most of them are now cleaned every second year. Still, in general, they appear to be relatively clean from weeds and excessive siltation. The cleaning of the canals clearly is prioritised over the cleaning of the drains and collectors, which can be easily observed from the state of many drains and collectors (see figure 5.12).

Yearly a maintenance plan is made for every district by the end of the summer season. This is then executed in the fall and early winter, when water demand is low and temperatures not yet below freezing. Money for the maintenance programme is allocated through the Water Department. Especially repairs at the large division points are prioritised, together with the reconstruction of collapsing canal banks.

Figure 5.12 – The maintenance state of many drains and collectors is bad

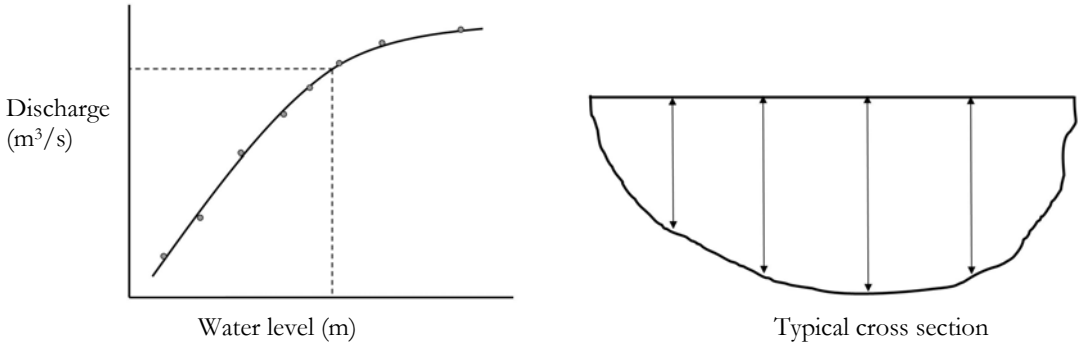
5.3.2. Measurements

Throughout the district water flows are being measured at all division points as well as at all points where irrigation canals flow into or out off a WUA. For each of these places a small notebook is kept, which contains a description of the situation (often with technical drawings), and always a table and/or graph to convert staff gauge readings into discharges. These Q-h curves are produced on the basis of detailed discharge measurements, which are conducted by the use of a current meter. At district level there are only a few people who know how to do these measurements, but they seem to be conducted correctly and

accurately[59]. At most places the measurement are conducted a few times per season, much less than the suggested (or sometimes even claimed) frequency of every 10 days during the growing season. With stable canal shapes, Q-h curves should hardly change. However, the measurements should regularly be repeated to keep the curve accurate. Three times per day (in the morning, at noon, and in the evening) the water level in the canals is measured by means of fixed staff gauges. With the Q-h curves these readings are converted to discharges. See figure 5.13 for an example Q-h curve as used in Khorezm.

A Q-h curve (or rating curve) shows the typical relation between the water level in a canal and the discharge flowing through that canal. Reliable Q-h curves can only be used when water flows freely through the canal; i.e. there are no obstructions or bends in the canal close by. Also the profile of the canal should be stable over time; i.e. no siltation or growing of weeds should take place.

To construct a Q-h curve the profile of the canal is determined and the velocity of the water measured at different depths and different widths (see the typical cross section below). This is usually done by means of a current meter, a propeller that is placed in the water flow. With the velocity and profile the discharge can be calculated. This procedure has to be repeated at a number of moments with different discharges. Each time the determined relation between discharge and water level is set out in a graph. In the graph below each dot corresponds to such a procedure and the procedure has been repeated eight times. The curved line is fitted through the determined points. With a measured water level the discharge can now be read from the graph (see dotted lines), without every time having to repeat the complicated procedure with the current meter.



Box 5.1 – The Q-h curve; procedures and use

[59] My numerous interviews and observations concerning the use of the current meter and construction of Q-h curves at Oblast level showed that the workers at the division points at this level were knowledgeable and capable.

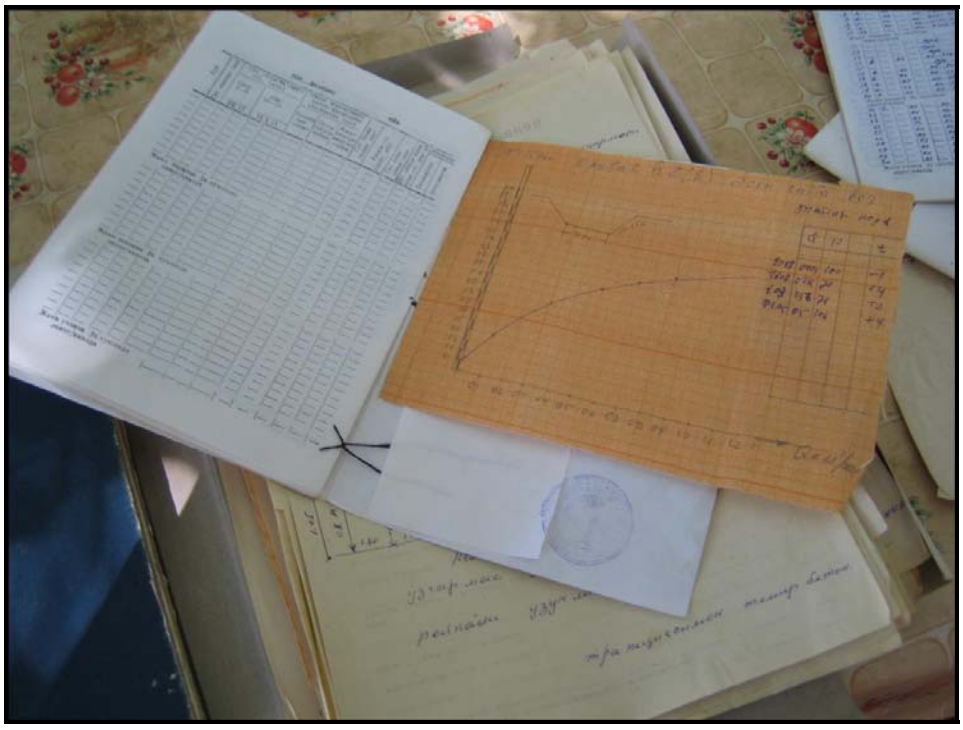


Figure 5.13 – Q-h curve as made and used in Khorezm
At the bottom of the booklet you can see the sealing with a thread, pasted paper and stamp.

5.3.3. Communication and administration

The measurement data is noted down in the small notebooks that exist for each measurement point, and which are kept at the four main division points in the district (see figure 5.8). It is clear that not all measurements are actually done, nor are they always done accurately. Yet there are no blanks in the booklet; i.e. people fill in numbers that they did not actually measure. It seems that frequently numbers are simply copies of the previous measurement or a number corresponding to what the discharge ought to be.

The fluctuations in the discharges over the day are high; at night the discharge is typically higher than during the day, as then less water is taken out by pumping. The three times a day measurements do not completely cover these fluctuations. Due to this the estimates that field workers once in while fill in at the blanks are possibly more reliable then the actual staff gauge readings would have been.

There are some checks in place to guarantee a basic quality and to keep an overview of flows within the district level. The field offices at the main division points are in regular radio contact with the head office in the district centre. Instructions are given concerning the scheduled discharges for each canal. Also the discharges in the main canals are then reported. Water that flows from one division point should reach the next division point. The comparison of these numbers provides a strong check on the accuracy of the measurements and forms an obstacle for taking water without authorisation. The room of manoeuvre of fieldworkers to divert water different from what they are told is only small, as explained by one of my informants.

> [The informant] draws different canal stretches on a piece of paper and tells about the different discharges in them. KP: 300 m^3/s is the total intake [from the river], 200 reaches Tashsaka *Zaruzenya*, 30 is going into R8 canal and 28 reaches till here. If 30 m^3/s is coming, they must have put 32 m3/s. We give our numbers to [the MCM], they give to *Tezim*, they to [BUIS], who talk to UPRADIK. The numbers have to match otherwise it will be noticed[60].

Next to the daily reporting of discharges by radio contact, every ten days the measurements are submitted in writing to the district office. Also the binding of the notebooks in which the measurements are administrated are sealed and stamped by the district office. This is done to prevent tampering with the books. Such a seal and stamp can be seen in figure 5.13.

The water department releases water from the main infrastructure into the WUAs. At the same time the main canals also flow right through some WUAs, on to other WUAs. The water that leaves the canals within the boundaries of a WUA is accounted as water use by that WUA[61]. Much to the dissatisfaction of the WUAs this includes unauthorised water taking, but also seepage losses of these big canals. The latter is water which in practice cannot be put to use.

As WUAs have administrative rather than hydrographic boundaries there can be numerous inflows and outflows. Also there are often many off-take points between the water department and a WUA. Many of the off-takes are operated by pumps that take water from the big canal and put it in slightly higher situated irrigation ditch (*salma*). Such off-takes are generally 'measured' by means of the electricity meter. At places with diesel pumps and broken electricity meters the water flows are estimated on basis of time administration and an estimated discharge from the pump. In any case these off-takes are monitored for their discharges, and the numbers are administrated in the same small notebooks as described before. Both the responsible district water manager and the concerned WUA chairman sign behind the measurements for each day. In this way the measurement sometimes become the subject of discussion and negotiation. A former WUA chairman for instance explained it to me as follows.

> GJV: How much has the reform to fermers and the WUA changed your work? [Former WUA chairman]: Before, other people told us what to do, now the WUA is independent and can decide itself, but the calculations have now become more difficult. For instance every day we had to sign for the water use with *RayVodKhoz*. If they wrote more than we had taken I didn't sign, but in the kolkhoz time I just signed.

He went on to explain that frequently it happened that the MCM office charged water to his WUA that was actually seepage water from a large canal flowing through the area of his WUA.

Even if the measurements are technically not very accurate, by making the numbers subject to approval by the water receivers, it has become a functioning accountability system.

In case of doubts more frequent measurements are being conducted, sometimes under pressure by the WUAs to which the water is accounted, or when higher authorities do not trust the numbers[62]. Such a situation was for instance described by a fieldworker of the MCM.

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[60] Field notes 27/07/2006

[61] Field notes 31/05/2006

[62] Field notes 27/07/2006

> The hydrometers […] come to places every 10 days to check whether there is really flowing 4 m^3/s. GJV: Do they really do that every 10 days? [MCM worker]: They should, but they don't. Recently they measured again because the *Kolkhoz Raís*[63] said that it was not 4 m^3/s flowing. [The head of the MCM] said it was. In such a situation they measure it again. At that time there was indeed a little bit less than 4 m^3/s, but not much[64].

5.3.4. Functional management

It is clear that neither the physical infrastructure, nor the measurement system is in a perfect state. Yet the water department is both technically and organisationally capable of dividing and measuring the water flows in such a way that they can be used for a functional accountability system between the department and the WUAs.

Furthermore, from the descriptions above it is clear that both technically and managerially the irrigation system is designed for top down control. Water users can request water, yet will have to go through the water department in order to get it. The central office has to instruct the managers of the division points to release more water.

5.4. Water requirement and availability

To make an assessment of the scarcity or abundance of water in Khorezm in this section the balance between availability and requirement is examined. Both the requirements and the availability depend partly on natural circumstances and partly on human action. As a consequence they both fluctuate and balancing between the two is a dynamic process.

5.4.1. Water requirements

The low humidity in Khorezm combined with high temperatures in summer, causes very high evapotranspiration (see figure 5.14). In the peak period from June to August the reference evapotranspiration is around 7 mm/day. As rainfall is very low, especially in the summer period, all the water needed for crop growth needs to come from irrigation. Conrad (2006) shows that about half of the total water intake for Khorezm is concentrated in July and August.

Table 5.1 shows the state norms that are used by the water department as the water requirement per crop. The allocation and scheduling procedures are based on these norms. From the table it is clear that the water requirement of paddy production is much higher than that of any of the other crops. The differences between water requirement for cotton and rice can almost completely be attributed to seepage losses in rice cultivation as the difference in actual ET was only 176 and 44 mm for 2004 and 2005 respectively (Conrad, 2006: 5).

The crop norm for household plots is high as it takes into account that most of this area is double cropped. However, real consumption is much higher as it is not considered that in summer about half of the area is cropped to paddy.

Cotton is often thought to still be the main crop and the main water consumer of Khorezm. However, the area cropped to cotton is less then 40% of the total irrigated area[65] and its

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[63] This must have been either the chairman of the WUA or the chairman of the MTP, as *kolkhozy* did not exist anymore at that time, and even other forms of LFEs no longer existed.

[64] Field notes 26/07/2006

[65] With 54% and 46%, respectively for 2004 and 2005, Conrad (2006) reports a higher share of cotton in the total agricultural area of Khorezm. For the R8 system, which is almost completely made up by Yangiarik

water requirement is only about 30% of total official agricultural water requirement. Household production, which is only practiced at about 20% of the area, uses more water than cotton, and is also officially allotted more water[66] (see table 5.2).

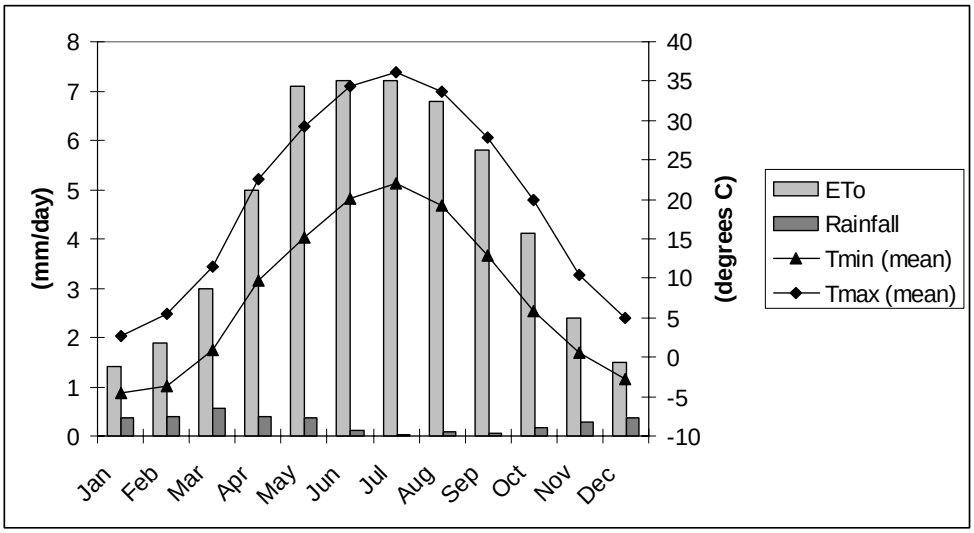

Figure 5.14 – Climatic conditions in Khorezm
Source: own calculations on data from three meteorological-stations in Khorezm, from ZEF/UNESCO project database.

Crop/land use	Crop water norm (m^3ha^{-1})
Rice (paddy)	26206
Household plots gardens	9500
Vegetables and potatoes	8467
Alfalfa	8333
Cotton	5533
Maize	5233
Orchards	5133
Melons and gourds	3933
Wheat	3600

Table 5.1 – Crop water norms for the main crops of Khorezm
Source: Ministry of Agriculture and WUA workers

district he reports 49% in 2005. His numbers are based on remote sensing data. By (1) not recognizing household production as a separate land use, (2) not considering villages as agricultural area and (3) a bias towards large fields through pixel sizes of 1000x1000m, his numbers are considerably skewed towards large scale and state ordered production.

[66] This holds even true when calculated with the official water norm for household production, which in reality is on the low side.

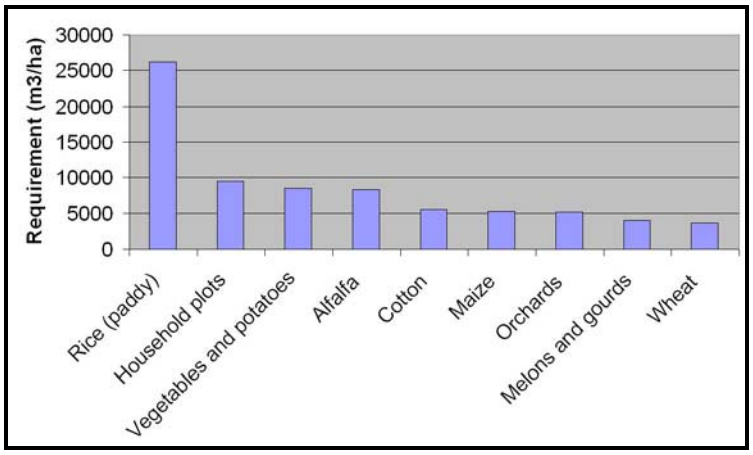

Figure 5.15 – Crop water norms for the main crops of Khorezm
Based on Table 5.1

	Area (ha)	% of irrigated area	Crop water norm (m^3ha^{-1})	Water req. (10^3 m^3)	% of total official water req.[67]
Total Irrigated area	17734			119065	
Cotton production	6517	36.8	5533	36064	30.3
Household production	3427	19.3	9500	39924	33.5

Table 5.2 – Comparison of water requirements for cotton and household production in Yangiarik district (2005)
Source: Ministry of Agriculture

Water requirements do not only concern the total amount, but also the timing and the way of application. For this reason the water use practices of the main forms of production (see Chapter 4) are discussed here. A summary can be found in table 5.3.

In Khorezm rice is grown in basins with standing water. This leads to a very high ground water table around the fields where it is cropped. The application of water does not need continuous supervision and it can therefore flow freely, which makes it easy to irrigate rice fields during the night. The inflow is simply opened at the end of the day and only in the morning the water is diverted again for other uses.

Cotton is not a specifically high demander of water when compared to the other production processes here discussed. However, cotton has its specific requirements regarding the timing of irrigation. Cotton requires water from May till August, but especially in the period around July water application has to be accurately timed. Farmers even prefer to irrigate on the exact right day, i.e. the plant should start to experience water stress, but not to such an extent that it drops its flowers. The cotton is grown on ridges and the water is

[67] It is important to realise that this calculation is based on the official requirements in which water use by paddy cultivation is not considered. In reality the total water consumption is higher; in 2005 by about 37% for Khorezm (Conrad, 2006) and thus the share of cotton in that is even lower.

supplied in the furrows in between. As the fields are generally not well levelled, it is difficult to apply the water evenly.

Furthermore cotton generally requires a low water table and therefore good field drainage. However in the period of germination the ground water table is artificially kept high by filling the irrigation ditches with water and blocking the drains. Wheat is basically the only crop grown over winter and it has its peak water requirement in spring, different from the other crops and therefore not directly competing over water. This is the main reason that wheat remains somewhat out of the picture in this chapter.

In household production a clear distinction between adjacent and distant plots is important. The adjacent plots, which are very heterogeneously cropped, are irrigated frequently throughout the growing season. Often only parts of the adjacent plot are irrigated, i.e. the crop that needs water is irrigated. The consequence is that *dekhans* irrigate their adjacent plots often more than once a week. The distant plots, being cropped to wheat over winter and to rice over summer, are irrigated in a similar fashion as described above for these two crops.

Form of production	***State ordered***	***Commercial***	***Household***
Main crops	**Cotton**, winter wheat	**Rice,** vegetables, fodder	**Garden**: fruits and vegetables **Distant plot**: winter wheat and rice
Crop schedule	**Cotton**: planting in March-April, main irrigation period in July-August harvesting in September-October	**Rice**: planting in May or transplanting in June, Main irrigation period July-August harvesting in September	**Garden**: various fruits and vegetables with a number of double cropping systems **Distant plot**: winter wheat (Oct-June) and rice (June-Oct)
State water norm per hectare	**Cotton**: 5533 m^3/ha	**Rice**: 26206 m^3/ha	Household production: 9500 m^3/ha
Irrigation method	**Cotton**: furrow irrigation	**Rice**: basin irrigation	**Garden**: mixed, depending on the crop **Rice on distant plot**: basin irrigation
Irrigation timing	**Cotton**: specific timing (interval); mostly during day time	**Rice**: continuous; mostly during night time	**Garden**: Specific timing per crop; several times per week **Rice on distant plot**: continuous; mostly during night time
Ground water management	**Cotton**: high groundwater during germination, lower during vegetation	**Rice**: standing water in the field	**Garden:** otherwise not specific **Rice on distant plot**: standing water in the field

Table 5.3 – Summary of water use practices in the three forms of production
See table 4.1 for an overview of other characteristics per form of production

5.4.2. Water availability

Khorezm is in general not short on water. The qualification 'in general' refers to both space and time; if equally spread, throughout the whole province there should be enough water during most of the years. Conrad (2006) on the basis of own measurements of inflow into Khorezm concludes that during the vegetation period of 2005 the total intake was 5.38 km^3, which corresponds with a water availability of 2278 mm/ha.

Water availability is fluctuating between the years as result of the stochastic variability of rainfall and snowmelt. As a rule of thumb irrigation engineers often design schemes on an 80% probability. This implies that on average in one out of five years there is less water than what is required within the irrigated area. The other four years there will be more water available than what is required. Thus when assessing the situation of shortage/abundance it should be understood in terms of probability. Moreover, in practice there is variation within the irrigated area; i.e. some areas and some people experience shortages more often and stronger than others.

The 80% probability of river discharges is calculated from long time series of water flows, typically over a period of 50 years. As the discharges in the Amu Darya have considerably changed in this period due to increased water abstraction and increased storage capacity in reservoirs, long-term data is not directly usable (see figure 5.16).

Mueller (2006) made a probability analysis of the officially reported intake of irrigation water into Khorezm. This shows that the 80% probability corresponds more or less with an intake of 5 km^3 per year (see figure 5.17). This figure is not comparable with the reported 5.38 km^3 reported by Conrad (2006), as Conrad's number is limited to the vegetation period (excludes leaching). On the other hand Mueller's numbers do not take account of the actual intake, which is presumably always higher and possibly even as high as 37%, as reported by Conrad for 2005. Overall it can be concluded that 2005 was certainly not a water short year, but that it is neither an exceptionally water abundant year either.

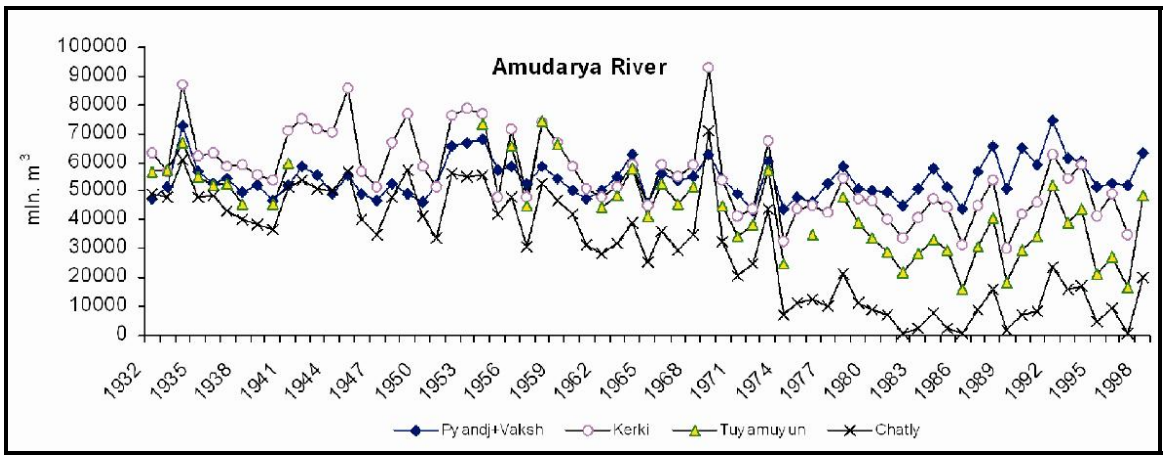

Figure 5.16 – Long-term Trends of River Runoff Variations at Tuyamuyun for 1932-1999
Tuyamuyun is just upstream of Khorezm
Source: UNDP (2007)

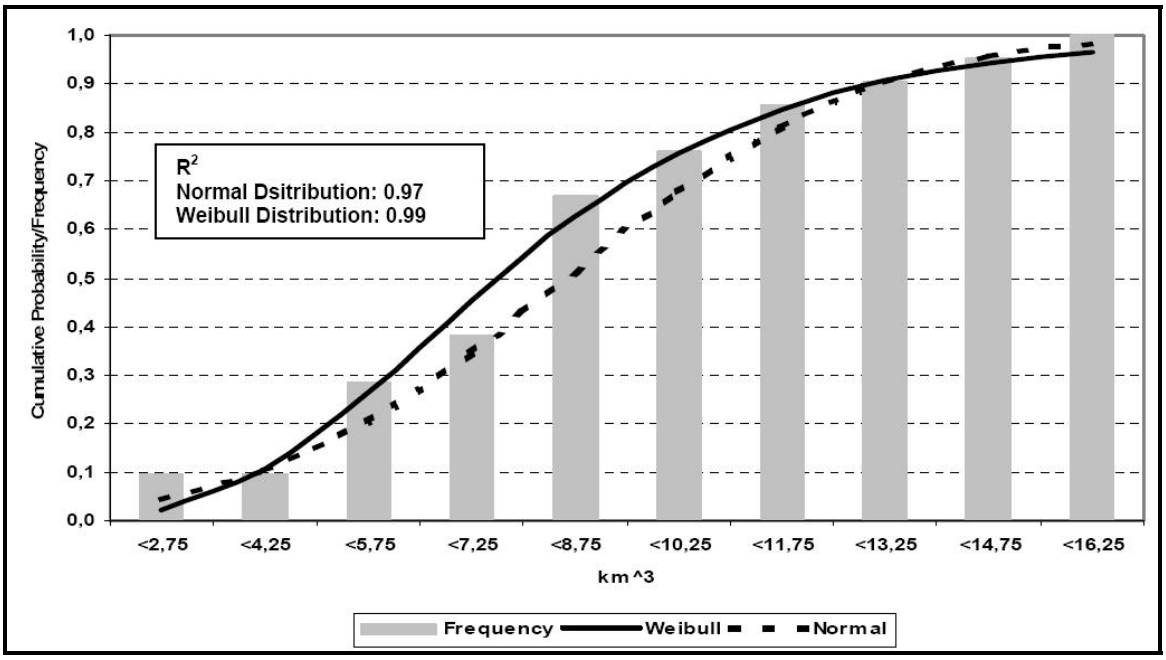

Figure 5.17 – Cumulative frequency of Amu Darya flow at Tuyamuyun and approximated probabilities, April to September, 1982 to 2001
Source: Mueller (2006)

As 2005 can be considered a normal year with regard to overall water availability, the observed practices in that agricultural season can be used to give an impression of normal water availability. The water abundance in such an normal year is illustrated with numbers and observations from the R8 system, which covers both an up-stream and a down-stream area of Khorezm province. There is no reason to believe that water use in the rest of province will be essentially different from that in this area[68]. Also from the work that I did at provincial level there were no indications that this part of the network is treated differently from the rest. I therefore extrapolated the observations from this one district (which covers about 7% of the total irrigated area in the province) and cautiously draw conclusions for the whole of Khorezm.

The flow of water into the R8 system during July 2005 was around 50 m^3/s at continuous flow, which corresponds to 24 mm/day[69]. Yet, the reference evapotranspiration (ETo) for this period is only 7.3 mm/day, and the absolute peak requirement is about 18 mm/day (for rice). Thus, even when the whole R8 system would have been cropped with rice, if carefully applied, still there would have been more than enough water. In reality 70-80% of the area is under other crops, which only require about a third of the requirements for rice. Thus there are high losses. These are not only deep percolation losses from canals and fields, but also plain wastage of water. Frequently it was observed that water went straight from the irrigation ditches into the drains. In various situations I observed (or

[68] Conrad (2006) reports slightly higher than average water availability per ha for this area (24,898 m^3/ha compared to 22,782 m^3/ha), but he puts his findings regarding unequal distribution within Khorezm in perspective by pointing out that the boundaries of the systems are unclear and in reality they are at some places considerably different from the ones reported in the GIS database of the ZEF/UNESCO project.
[69] Or 2.8 l/s/ha; a rule of thumb for irrigation design is an overall intake of 1 l/s/ha, losses included.

people told me) that one of their tasks was to close the flows directly from the ditches into the drains. This concerns workers of the MCMs, of the WUAs and of the Water Inspection.

In the operation of the irrigation and drainage system water managers in Khorezm follow the rule of thumb that it is completely acceptable that up to 50% of the irrigation inflow leaves the system again as outflow. This was for instance explained to me by a water manager at the *Tezim*.

> If less than 50% goes to the drains the water use efficiency is ok, if it increases above 50% it is not. Last week the inflow into Yangiarik was 39 m^3/s and the outflow 16 m^3/s; that's acceptable[70].

And in an interview during the next year.

> GJV: Last year you mentioned that if 50% of the water flowing into an area is coming out of the drains, it is still alright, but if it comes above this number actions should be taken. Is that correct? [Respondent]: Yes, that's correct. GJV: At what level do you know this proportion, and how often do you calculate this and who is responsible to do something about it? [Respondent]: Well we [of the *Tezim*] know how much water flows into an area, and the drainage department knows how much is flowing out. We do not sit together to calculate the numbers, but we both report to Urgench, where they compare the numbers. […] If over 50% is coming out, they will strengthen the control over this area. GJV: What does that mean, what concrete action can be taken? [Respondent]: they will check all the *fermers* in this area, whether they are not wasting the water. If they find that they do waste water they will make a report and the *fermer* has to pay a fine. GJV: Whose responsibility is it actually, that of the WUA or that of the *Tezim*? [Respondent]: The direct responsible is the 'water control organisation' in Urgench. They have an inspector for each district[71].

The 50%-rule that is mentioned by water managers in the field corresponds with the actual numbers reported by Conrad (2006) and Dzhabbarov (2005); see section 5.2.4. If effectively applied as a leaching fraction in combination with field drainage these could be reasonable values, but in the absence of subsurface drainage pipes there is no sense in applying such amounts of water as the excess water will only damage the crop.
This was for instance illustrated by an inspector of the Department of Agriculture.

> We are sent to check whether the fields are watered according to the norm. Usually people irrigate too much. The plant will be with its stem in the water. When this happens the cotton will not grow well. GJV: Why do people put too much water? [Inspector]: Because the fields are not level; one side is high and the other low. When this happens the higher part grows well, because it is watered according to the norm, but the lower will not grow well, because the plants will be in the water.

That is: he is more worried about over-irrigation due to the field not being level than about water shortage that could occur due to the same reason.

The dramatically low water use efficiencies at this level can be easily increased by closing the connection points between canals and drains, as all the water flowing this way is by definition lost. This is also exactly what happens in case of imminent water shortage, as in this way quickly water can be made available. Also during normal situations these unnecessary outflows are a point of control: district water managers frequently go around in the WUAs to close unnecessary outflows and therewith increase the overall efficiencies.

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[70] Field notes 23/08/2005

[71] Field notes 11/03/06; the process water inspections and fining is explained later in this chapter.

5.5. Adapting to demands

In section 5.2 and 5.3 it was shown that the technical and managerial aspects of the irrigation system have strong characteristics of upstream and top-down control. In section 5.4 it was shown that the different crop production systems put very different demands on water management. Not only in terms of quantity and timing, but also in managing groundwater and salinity. Besides that it was shown that Khorezm is relatively water abundant. This fourth section will show how this water abundance affects the actual water distribution process. Firstly, the formal allocation and scheduling process will be described. Then it is discussed how day-to-day water needs at field level influence the re-allocation and re-scheduling process.

5.5.1. The effect of abundance

The high availability of water (as explained in section 5.4.2) creates a situation in which people can simply take water from a close-by canal any time they need water. Or when they cannot take it immediately, for instance because their neighbour is irrigating at that moment, at least they can take it very soon after that person. When there is little pressure on the water availability there is also little pressure to develop detailed rules and regulations to make sure no water goes lost. Being used to work in situations with more water scarcity I was often amazed by how easy people in Khorezm talked off sharing the water.

Especially in 2005 farmers almost always expressed that if they needed water, they could simply take it. And if it was not there they would ask either their neighbour or the WUA worker and then get the water. Also the WUA workers explained that in principle they would get the water they asked for; if on a certain day the water in their WUA was not enough, they requested more water and usually such a request was granted. Later during the research it showed that it is not always as easy as that. Especially in 2006, when the water availability was lower and when I put more systematic attention to the tail end of the system it showed that there are big differences between users as well as between purposes of water use.

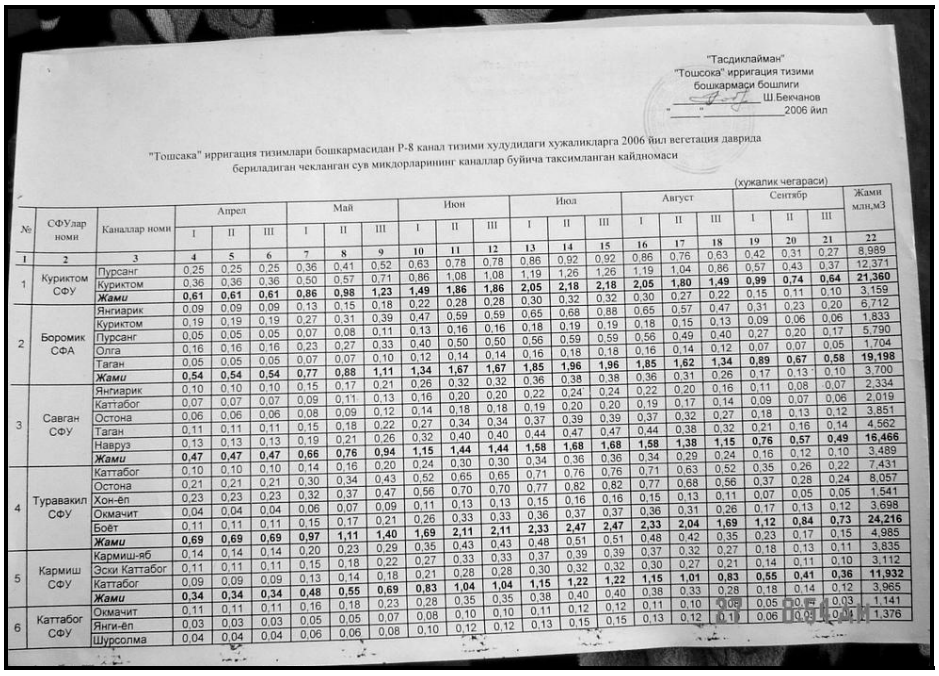
5.5.2. Allocation & scheduling

Water distribution can conceptually be understood as consisting of the three complementary processes of allocation, scheduling and delivery. Allocation is concerned with the distribution of rights and entitlements, scheduling is about the planning of how water is distributed and delivery concerns the practical distribution of water from source to user. These three processes often correspond with three steps consecutive in time.

In Khorezm it is difficult to distinguish the allocation and scheduling processes from each other as they come together in what is called the determining of 'the limit'. It is an irrigation schedule for six months that provides a list of discharges for each 10-day-period, for every canal and every WUA (see figure 5.18). This is based on the planned cropping pattern for that period. There is a schedule for the 'leaching period', which runs from October till March and one for the 'vegetation period', which runs from April till September. Crop planning takes place between the Department of Agriculture and the *fermers*. At the WUA level these areas are aggregated. The planned cropping areas are multiplied by crop water norms, which are determined constants for every 10-day-period of the year. At the end of February the WUAs have to submit their final plans for the vegetation period and at the end of August they have to submit the requests for the leaching period. The request are all

forwarded to the Department of Water in Tashkent. The water allocated to Uzbekistan by the ICWC is here divided among the provinces, districts and WUAs. Various people in the water hierarchy told me that these allocations are normally 80-100 percent of the requested amounts, depending on the prognoses of available water.

Thus water allocation and scheduling is almost a direct expression of the cropping patterns that are largely determined by the Department of Agriculture at the district level, following the quotas for cotton and wheat that they received from Tashkent.



"Тасдиклайман"
"Тошсока" ирригация тизими
бошкармаси бошлиги
_____ Ш.Бекчанов
"___" _____ 2006 йил

"Тошсака" ирригация тизимлари бошкармасидан Р-8 канал тизими худудидаги хужаликларга 2006 йил вегетация даврида бериладиган чекланган сув миқдорларининг каналлар буйича таксимланган кайдномаси

(хужалик чегараси)

№	СФУлар номи	Каналлар номи	Апрел			Май			Июн			Июл			Август			Сентябр			Жами млн.м3
			I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	Куриктом СФУ	Пурсанг	0,25	0,25	0,25	0,36	0,41	0,52	0,63	0,78	0,78	0,86	0,92	0,92	0,86	0,76	0,63	0,42	0,31	0,27	8,989
		Куриктом	0,36	0,36	0,36	0,50	0,57	0,71	0,86	1,08	1,08	1,19	1,26	1,26	1,19	1,04	0,86	0,57	0,43	0,37	12,371
		Жами	**0,61**	**0,61**	**0,61**	**0,86**	**0,98**	**1,23**	**1,49**	**1,86**	**1,86**	**2,05**	**2,18**	**2,18**	**2,05**	**1,80**	**1,49**	**0,99**	**0,74**	**0,64**	**21,360**
2	Боромик СФА	Янгиарик	0,09	0,09	0,09	0,13	0,15	0,18	0,22	0,28	0,28	0,30	0,32	0,32	0,30	0,27	0,22	0,15	0,11	0,10	3,159
		Куриктом	0,19	0,19	0,19	0,27	0,31	0,39	0,47	0,59	0,59	0,65	0,68	0,88	0,65	0,57	0,47	0,31	0,23	0,20	6,712
		Пурсанг	0,05	0,05	0,05	0,07	0,08	0,11	0,13	0,16	0,16	0,18	0,19	0,19	0,18	0,15	0,13	0,09	0,06	0,06	1,833
		Олга	0,16	0,16	0,16	0,23	0,27	0,33	0,40	0,50	0,50	0,56	0,59	0,59	0,56	0,49	0,40	0,27	0,20	0,17	5,790
		Таган	0,05	0,05	0,05	0,07	0,07	0,10	0,12	0,14	0,14	0,16	0,18	0,18	0,16	0,14	0,12	0,07	0,07	0,05	1,704
		Жами	**0,54**	**0,54**	**0,54**	**0,77**	**0,88**	**1,11**	**1,34**	**1,67**	**1,67**	**1,85**	**1,96**	**1,96**	**1,85**	**1,62**	**1,34**	**0,89**	**0,67**	**0,58**	**19,198**
3	Савган СФУ	Янгиарик	0,10	0,10	0,10	0,15	0,17	0,21	0,26	0,32	0,32	0,36	0,38	0,38	0,36	0,31	0,26	0,17	0,13	0,10	3,700
		Каттабог	0,07	0,07	0,07	0,09	0,11	0,13	0,16	0,20	0,20	0,22	0,24	0,24	0,22	0,20	0,16	0,11	0,08	0,07	2,334
		Остона	0,06	0,06	0,06	0,08	0,09	0,12	0,14	0,18	0,18	0,19	0,20	0,20	0,19	0,17	0,14	0,09	0,07	0,06	2,019
		Таган	0,11	0,11	0,11	0,15	0,18	0,22	0,27	0,34	0,34	0,37	0,39	0,39	0,37	0,32	0,27	0,18	0,13	0,12	3,851
		Навруз	0,13	0,13	0,13	0,19	0,21	0,26	0,32	0,40	0,40	0,44	0,47	0,47	0,44	0,38	0,32	0,21	0,16	0,14	4,562
		Жами	**0,47**	**0,47**	**0,47**	**0,66**	**0,76**	**0,94**	**1,15**	**1,44**	**1,44**	**1,58**	**1,68**	**1,68**	**1,58**	**1,38**	**1,15**	**0,76**	**0,57**	**0,49**	**16,466**
4	Туравакил СФУ	Каттабог	0,10	0,10	0,10	0,14	0,16	0,20	0,24	0,30	0,30	0,34	0,36	0,36	0,34	0,29	0,24	0,16	0,12	0,10	3,489
		Остона	0,21	0,21	0,21	0,30	0,34	0,43	0,52	0,65	0,65	0,71	0,76	0,76	0,71	0,63	0,52	0,35	0,26	0,22	7,431
		Хон-ён	0,23	0,23	0,23	0,32	0,37	0,47	0,56	0,70	0,70	0,77	0,82	0,82	0,77	0,68	0,56	0,37	0,28	0,24	8,057
		Окмачит	0,04	0,04	0,04	0,06	0,07	0,09	0,11	0,13	0,13	0,15	0,16	0,16	0,15	0,13	0,11	0,07	0,05	0,05	1,541
		Боёт	0,11	0,11	0,11	0,15	0,17	0,21	0,26	0,33	0,33	0,36	0,37	0,37	0,36	0,31	0,26	0,17	0,13	0,12	3,698
		Жами	**0,69**	**0,69**	**0,69**	**0,97**	**1,11**	**1,40**	**1,69**	**2,11**	**2,11**	**2,33**	**2,47**	**2,47**	**2,33**	**2,04**	**1,69**	**1,12**	**0,84**	**0,73**	**24,216**
5	Кармиш СФУ	Кармиш-яб	0,14	0,14	0,14	0,20	0,23	0,29	0,35	0,43	0,43	0,48	0,51	0,51	0,48	0,42	0,35	0,23	0,17	0,15	4,985
		Эски Каттабог	0,11	0,11	0,11	0,15	0,18	0,22	0,27	0,33	0,33	0,37	0,39	0,39	0,37	0,32	0,27	0,18	0,13	0,11	3,835
		Каттабог	0,09	0,09	0,09	0,13	0,14	0,18	0,21	0,28	0,28	0,30	0,32	0,32	0,30	0,27	0,21	0,14	0,11	0,10	3,112
		Жами	**0,34**	**0,34**	**0,34**	**0,48**	**0,55**	**0,69**	**0,83**	**1,04**	**1,04**	**1,15**	**1,22**	**1,22**	**1,15**	**1,01**	**0,83**	**0,55**	**0,41**	**0,36**	**11,932**
6	Каттабог СФУ	Окмачит	0,11	0,11	0,11	0,16	0,18	0,23	0,28	0,35	0,35	0,38	0,40	0,40	0,38	0,33	0,28	0,18	0,14	0,12	3,965
		Янги-ён	0,03	0,03	0,03	0,05	0,05	0,07	0,08	0,10	0,10	0,11	0,12	0,12	0,11	0,10	0,08	0,05	0,04	0,03	1,141
		Шурсолма	0,04	0,04	0,04	0,06	0,06	0,08	0,10	0,12	0,12	0,13	0,15	0,15	0,13	0,12	0,10	0,06	0,05	0,04	1,376

Figure 5.18 – Picture of "the limit"
The water allocation and scheduling on basis of centrally planned cropping patterns and state water norms; second column: names of WUAs, third column: names of supplying canals; columns 4 till 21: discharges in the canals during the indicated 10-day-period.

5.5.3. No limit

But 'the limit' is not the limit; water use can without any problem exceed the set limit. In the actual delivery process 'the limit' plays a very limited role, if any at all. Though the papers are distributed among district water managers at the main division points, the gates are set and water is deliveredaccording to the daily instructions from above rather than to the provided schedule. This is not strange at all, as the real demand of course differs from the calculated requirements on basis of climatic averages. The actual windiness, temperature and humidity determine the real water demand. The water hierarchy responds to these real demands. One way of doing this could be by re-calculating the crop water requirements. Instead the Water Department responds to the demands voiced from below. The heads of the MCMs coordinate the different demands between the WUAs and instruct their workers through the radio communication system (see section 5.3.3) to distribute the water accordingly. If a WUA asks for more water, the responsible MCM manager in principle tries to get more water to that WUA.

'The limit' is not only a schedule with discharge settings for each 10-day-period, but also becomes a lump volume allocation that can be used with some flexibility. During the advancement of the season the used volumes are added up and compared with the original 'the limit'. Both the MCMs and the WUAs are aware of this advancement, but it seems never a real argument to dramatically cut down on water supply or use; they all go over their limits. Foremost because the water needed for the commercial production of rice is not accommodated as such in the initial calculations process; the real need for that is about five times higher than what is initially allocated for that area.

5.5.4. Differences between users and purposes of use

These descriptions show that actual water distribution is informed from below. Primarily this demand information flows from the *fermers* and *dehkans* through the WUAs to the district level and higher. Especially when water availability tends to get lower, the process becomes more articulate. Then it also becomes clearer that for each of the three earlier described production processes the strategy for getting water is different.

Even though the overall water consumption by household production is substantial, individual *dekhans* need only small amounts of water, as production takes place on small plots. People are mostly able to simply take this water, even when it is not abundantly available. Both peasants and farmers seem to be convinced that the basic production of peasants has priority over state and commercial production. Also various state officials mentioned that household production has this priority. If it would happen that for a long period there would be no water available people would start to complain through the ordinary community channels, i.e. to the village elders and the state-connected elites in their village.

Only in an exceptional case it was found that distant household plots were being left unused for the (claimed) reason of poor access to water. In other situations, water needy *dekhans* used weapons of the weak and simply took the water they needed. Most rural households are *dekhan* households (90-95%), these are the poorest people and withholding water for their basic production would dramatically affect their livelihoods.

This implies that if too little water is coming into the WUA, it is not the household production, but the other two production forms that experience this shortage. It has already been mentioned that the state is so much concerned with a good cotton yield that they strictly control the cultivation by farmers. This also concerns appropriate irrigation, both in terms of timing and quantity. There is a constant pressure on the primary producers (the *fermers*) and the supporting (state) agencies. Also the WUAs take well care of the cotton and they defend the state's interests as they are made co-responsible for a good cotton yield. Both *fermers* and WUA staff testify that it is easier to get water for cotton than for other crops. Besides it was observed that WUA workers irrigate cotton fields for the farmer when ordered to do so by the district authorities (*cf.* Veldwisch, 2006). During daytime irrigation of rice fields is often not permitted and in crucial periods it was observed that WUA staff was instructed to only provide water to cotton.

Even though in general WUA staff is willing to provide water for cotton when needed, it happened that cotton fields were occasionally without water even though in need. *Fermers* were quick to complain at district level; often first to the water management department, but if that didn't help, directly to the district *Hokimiyat*. In a few cases it was observed that this led to interventions from above, but mostly the mere threat was enough to release the water

for necessary cotton irrigation. In the case described below it still took a lot of effort to get water for cotton.

> [*Fermer*]: I came to ask water from [the WUA Chairman]. I still haven't irrigated my cotton even for the first time. Yesterday a group with all kind of experts came from the *Hokimiyat* to check the irrigation of cotton fields. They said that the fermer before me should release water to me, so that I can also irrigate. I went to him, but still he doesn't release water. GJV: How many hectares do you have? [*Fermer*]: 1.5 ha. GJV: That's very small for a cotton field isn't it? [*Fermer*]: Last year I have planted mulberry trees and they are still very small. In between the trees I have to plant either cotton or wheat. I have chosen to plant cotton because it is better for the land; it is well fertilized and cultivated, which is also good for my mulberry trees. GJV: Do you take your water from a Salma? [*Fermer*]: Yes. GJV: How many other fermers are there on your *Salma* [irrigation ditch]? [*Fermer*]: Only one other, he planted 10 ha of rice. GJV: How many hectares does he have in total? [*Fermer*]: 25 ha of cotton and 10 ha of rice. He is taking all the water for his rice and not releasing to me. I am still waiting for the first time to irrigate. I went to the *Hokim* before to complain, but still the water didn't come. Now I am here again to complain to [the WUA Chairman] and to ask him to bring water to my field. […][The WUA Chairman] greets us and leaves us sitting talking with the other men, while he takes [the fermer] a few meters apart. [My translator] picked up parts of the talk. Basically [the WUA Chairman] promised to get him water after we would have left.[72]

It is clear that this is an 'insignificant' cotton producer. The 1.5 ha that he has are meant for mulberry leave production for feeding silk worms, only as long as the mulberry seedlings are small the *fermer* has to plant cotton (or wheat) in between. The other *fermer* with whom he shares the irrigation ditch is apparently a very rich and powerful person, indicated by his total land area, as well as the size of his paddy fields. Whether or not the smaller *fermer* in the end got his irrigation turn on that day I have not found out.

Formally water for commercial rice production comes at the bottom of the list, only after the basic needs for the majority of the people and after the well protected state interests. Farmers who are trying to make their primary source of income flourish need to secure their water through other channels. People are very well aware that rice production is big money. Everybody wants to share in the profits, family and neighbours (e.g. as workers), the institutions controlling the cropping areas, but also the controlling water institutions. The fact that the extra water needed for rice production are not allocated in the original 'limit', implies that this water has to be arranged in the second instance. The topic is surrounded by secrecy, but it is clear that people have to make use of their informal networks, their socio-political as well as their economic power to ensure that they get enough water for their rice fields. Often the big farmers are people with an extensive network, who also fulfil (or previously have fulfilled) roles in the state apparatus. The people that in case of need are approached for extra water are sometimes the same for cotton as for rice, but the nature of the relation is different. Small, weak farmers can ask the district governor to make sure their cotton field will get water without offering anything in return, as a good cotton yield is also to the benefit of the *Hokim*.

Thus, also where is comes to water distribution, there are strong differences between the three forms of production. Cotton primarily depends on the state network through which it is easy to get water when needed. Water for commercially produced rice is mobilised through private relations and informal networks of the *fermer*, in which also money and transfer of other benefits play an important role. The peasants are by default only weak players in the struggle over water, yet they are with many and thrive on the generally

[72] Field notes 18/7/2006

accepted norm that basic production has priority over commercial and state production. Besides they are with many and only divert small flows, which makes it difficult to control their water consumption.

5.5.5. Keeping things in check

At district level the main interests in controlling both state cotton and commercial rice production lay with the political elite. The governor is in the end held responsible for the cotton yield in his area and at the same time is able to profit from the rice production in his area. Both the state control and the informal, elite control are in his hands. The water department is bound hand and foot by the district authorities. In one of the districts where I worked the head of the water department made no secret of *de facto* being appointed in that position by the district governor and being primarily responsible to him[73].

The check system to limit overall water use consists of three elements:

1. Controlling the cropping areas (of especially rice)
2. Checking misuse and wastage and fining the offenders
3. Afterwards check the used amounts with the allocated amounts and charge the overuse

The demand on water can easily be limited by restricting the area that can be cropped to rice. By doing this the margin between allocated water and really available water stays the largest, which makes it easier to have enough water available to irrigate the cotton fields at the right time. At the same time limiting rice growing makes it easier to keep the ground water at an acceptable level throughout the area and as such prevent water logging and salinization of surrounding fields. The allowances for cropping rice are only given informally and strictly controlled by the (agricultural) district authorities.

In each district there is a water inspector, who is employed by the Water Inspection Department at provincial level. They check day-to-day water use, but do not compare the actual use figures with the earlier allocated figures, as then they would quickly end up fining all the rice growers. Instead they focus on the avoiding of misuse/wastage of water, e.g. fields not being level and irrigation water unnecessarily flowing to the drain. The water inspectors state that as long as the water is used productively there is no problem and no need to write out fines. They explicitly keep out of crop planning, as this is deemed the area of the (agricultural) authorities at district level. The water that is used over 'the limit' needs to be paid for at the end of the season. However, actual water consumption by farmers is not measured. The costs are charged to the WUAs, which consecutively collect it from the farmers that have planted large areas of rice.

Water flows are measured and administrated not only to determine the overall use, but also as a means of giving account. Water managers at various levels in the hierarchy are held responsible for supplying water to the level below them; i.e. district water managers to the WUAs and WUAs to the farmers. Especially when farmers could not fulfil their cotton quotas the water suppliers have to show that it is caused by insufficient water supply. The system developed at district level is highly detailed and fairly accurate for this task, but the WUAs generally struggle to get such an administrative system running. Therefore in case of accusations the WUA has a weak position. In some WUAs the staff is well aware of this and at those places administrative systems are being developed.

[73] Quotes from field notes are left out for reasons of safety

5.6. Conclusion

In this chapter the Khorezmian water management system was discussed, both from an institutional, managerial and a technical perspective. Contrary to what was expected on basis of existing literature it was found that the irrigation infrastructure is functional and manageable. Moreover, in combination with the management procedures and practices water is measured, distributed and accounted effectively, i.e. the state is in control over water distribution. Deliveries from the main system to the WUAs is measured by the state and signed for by the WUA. The elaborate system of checks and (water) balances implies that water cannot easily 'disappear' from the system unaccounted. The water department is able to enforce control through a combination of technical and managerial mechanisms.

Existing literature suggests that this control by the water department would be contested by the water users in their attempt to access water. There are three reasons why in Khorezm this technical and managerial control is not fiercely contested.

In the *first* place the high availability of water makes it a less scarce resource and thus access to it is less contested. In this chapter it was established that 2005 was rather normal year in terms of water availability. During this growing season inflows of more than two times the crop water requirements were observed, as well as various signs of over-irrigation and excess irrigation water flowing straight into the drainage system.

Secondly, contestation by water users is subdued by general socio-political control by the state. If WUAs and *fermers* would infringe on the distribution activities of the water department this could have serious consequences in other areas of life. The socio-political control by the state is also observable in the control over cropping patterns. This is concentrated in the department of agriculture and the *Hokimiyat*. Through this control the state manages the water demand. Especially the restriction of rice cultivation is a form of 'demand management'. With demand and supply broadly matched, water distribution to a large extent can follow the actual demand in the field.

The *third* reason is the way by which acute need for access is mediated is through the large influence of sub-surface irrigation. Groundwater is actively used as a buffer that is filled with each leaching and irrigation event and contributes through the capillary rise to water consumption by the crop. Though the variance between fields is high, the capillary rise of shallow groundwater in many situation enlarges the margin in water application, both in time and in quantity.

Sub-surface irrigation is of great influence because the very flat topography due to which natural drainage is minimal and groundwater levels can be easily kept high. The shallow ground water does also constitute the danger of killing crops when the ground water reaches the root zone (water logging). Moreover, the capillary contribution of saline ground water that evaporates at the soil surface can lead to severe salinization of the soil. Thus groundwater levels need to be accurately managed; they should be shallow enough to contribute to growth when necessary and deep enough to avoid dangerous levels of salinization. The drainage system is not functioning optimally. Drains are often too shallow and the capacity of the main collectors seems to be hampering a quick removal of water from sub-systems.

Different crops have different requirements regarding groundwater management. This is especially observable between paddy and cotton cultivation. The standing water on rice field causes the groundwater levels in the surrounding fields to rise. Cotton is damaged by groundwater in its root zone. Growing paddy next to a cotton field can therefore be

damaging the cotton yield. This is one of the water related aspects of the interaction between two forms of production (the state-ordered production of cotton and the commercial production of rice). More directly the three forms of production interact with each other by competing over the available water.

The three forms of production, as defined in Chapter 4, each have a distinct way of communicating their demands and securing their access to water. State-ordered cotton depends on the state network, to which *fermers* can easily appeal when their cotton is in need of water. Contrary to this, commercial rice production, which is primarily lucrative for *fermers*, and less so for the state, depends on the private/informal network of the *fermer*. The household production by *dekhans* is responsible for about one third of the total water use in Khorezm. Household production is general accepted as a higher priority than state-ordered cotton and commercially produced rice, both by the state and by *fermers*. The situation of relative water abundance makes it possible that water distribution largely follows the various demand signals without causing any substantial social tension. *Fermers* are very interested in increasing the area cropped to rice. For the state authorities this is also attractive as it brings in money for both to their district and to their own wallets (through informal payments). Yet, increasing the rice area puts extra pressure on the available water and as such threatens both the cotton production that needs to be delivered upwards and the basic needs of the rural masses.

Chapter 6

Issues of Access: Farmer Strategies and State Control in Uzbek Water Users Associations

6.1. Introduction and framework of analysis

The dissolution process of collective farms into private, family-based enterprise (the *fermer*) through full-scale land reform was accelerated in 2004–2005, land and water management were structurally adjusted. In spite of the partial privatisation of agricultural production since independence the agricultural sector in Uzbekistan is still heavily regulated by the state. Water Users Associations (WUAs) were established that are given the responsibility to operate and maintain the irrigation and drainage infrastructure of the former collective farms (see Chapter 3).

Formally the WUAs are non-governmental organizations, i.e. associations of *fermers*, but in practice they have remained under strict control of the government and play an important role in the control over agricultural production. Hence, water management at the WUA level has become one of the arenas where *fermers* meet the state.

This chapter addresses two issues. The first is the introduction of the WUA as part of wider framework of neo-liberal and neo-institutional reforms. This is done by an assessment of project documents, policy documents from international organisations and existing academic literature on the early period of WUA establishment. The second issue is the practical functioning of the established WUAs as organisations functioning in between official state organisation on the one hand and newly privatised *fermers* on the other.

Framework of analysis

The policy of establishing WUAs is analysed as a dynamic process in which actors strategically interpret and adapt concepts and models to fit them to specific, contextualised objectives. Through analysis of policy documents and academic studies on WUA establishment it is analysed how the international heralded model is adapted to fit the objectives of the Uzbek state. In a next step the actual dynamics over water distribution at WUA level are studied. For this a conceptual model of *access* in the context of natural resources management is adopted, as developed by Ribot (1998) and Ribot and Peluso (2003) and discussed in section 1.3. Ribot and Peluso define access as "the *ability* to derive benefits from things" or resources (ibid.: 153). They recognise a broad spectrum of access mechanism, which include the role of technology, capital, markets, labour (organisation), knowledge, authority, and social identity.

The activities of the WUA are primarily analysed as *access control*, i.e. the WUA's "ability to mediate others' access" (ibid.:158). The *fermers* and *dekhans* (smallholders) employ a range of strategies for both *gaining access* to irrigation water and *access maintenance*. The specific strategies depend on both the social position of the farmer, the spatial and technological situation as well as the form of production (see section 4.3). Joint private action among water users, which appears to be slowly emerging, are analysed as a special access strategy. I argue that the state only permits these new forms of local institutions when they save money for the state and do not threaten its *access control*.

From the analysis of the internal dynamics of the WUAs it becomes clear that neither the WUA, nor the joint private initiatives are the carriers of democratic change, as was expected by the international organisations pushing their formation as part and parcel of a broader water reform agenda.

6.2. Introduction of the WUA

Both the history of WUA introduction in Uzbekistan and the current formal position of WUAs in water management are discussed in this section.

6.2.1. Discussion of previous studies

The first WUAs of the Republic of Uzbekistan were established in the year 2000, while the ideas for introduction at one of the leading research institutes on land and water (SANIIRI) emerged in the late 1990s (Wegerich, 2000:4). Zavgorodnyaya (2006:34) indicated that the ideas for WUA establishment came both from international donors as well as local administration, as is discussed in more detail below (section 6.2.2.).

The experiments with the introduction of WUAs went hand-in-hand with the land reform experiments in which the Large Farm Enterprises (LFEs) were dismantled and divided among privatised *fermers* (Wegerich 2000:3; Zavgorodnyaya, 2006:80). These land reforms created chaos and uncontrolled water use at the level of the former collective farm (Abdullaev et al. 2006; Zavgorodnyaya, 2006:80). Khorezm Province has been a region of early experiments, with various phases of pilot testing. Between 2000 and 2002 four LFEs were dismantled and pilot WUAs established in their place. In mid-2003 all LFEs in Yangibazar district were dismantled and land redistributed among *fermers*[74]. WUAs were established along hydrographic boundaries. In the period from 2005 to 2006 all remaining LFEs throughout the country were dismantled and WUAs established in their place. The WUAs were again established with administrative boundaries, i.e. largely with same boundaries as the former LFEs. Figure 6.1 shows where and when the WUAs in Khorezm Province were established.

Zavgorodnyaya (2006:14) notes that WUAs "were established as a 'bridge' between state irrigation management organisations and [privatised] water users". The government presents WUAs as *fermer*-run organisations, though they are established by the state in a top-down fashion (Zavgorodnyaya, 2006:35), and in practice the "WUA becomes a place in the strongly hierarchical structure that still is controlled by government" (ibid. p.79).

Various issues of concern with respect to the introduction of WUAs as bodies of local water governance in Uzbekistan have been identified earlier. The most important are listed below.

- WUAs experience problems in fee collection, which makes it difficult to cover the costs of services. People were used to receive water for free and beside that people sometimes refer to Islamic law that determines that water is a free good. As a result of the non-payment by water users WUAs cannot pay their workers[75], which makes it difficult to provide the required services. *Fermers* become even less inclined to pay the water service fees – a negative spiral (Zavgorodnyaya, 2006).
- There are frequent discussions about the fairness of the height of water service fees, especially the fee differences between people that depend on pumped water and people taking gravity water (Wegerich, 2000; Zavgorodnyaya, 2006).
- The participation of members in the management of WUAs is minimal. Often there are no WUA meetings being held and the state-established WUAs strongly built on personal leadership, rather than on transparent management with rules and regulations (Wegerich,

[74] For an extensive discussion of this process see Trevisani (forthcoming).
[75] Some WUA staff had not received their salary for many months (Zavgorodnyaya, 2006:103)

2000; Zavgorodnyaya, 2006). The WUA chairman is appointed by the regional governor (*Hokim*) rather than elected by the members (Wegerich, 2000).

- WUAs become part of the hierarchical government system of control over agricultural production, rather than being independent non-governmental organisations (Zavgorodnyaya, 2006:79). As long as the state order system regarding cropping areas and production quotas remains, free decision making in the WUAs will remain problematic (Wegerich, 2000; Zavgorodnyaya, 2006).
- Property rights (regarding land) are insecure, which makes it more difficult and less interesting for *fermers* to actively engage in management of the WUA (Wegerich, 2000).

The existing literature on WUAs in Uzbekistan mainly tries to define characteristics for success. Those studies analyse the gap between an (often implicit) ideal model and the reality they see on the ground. The objectives and models of change underlying the WUA establishment policies are often not critically examined. Though these models often remain implicit they can be reconstructed from the various project documents. This is done below.

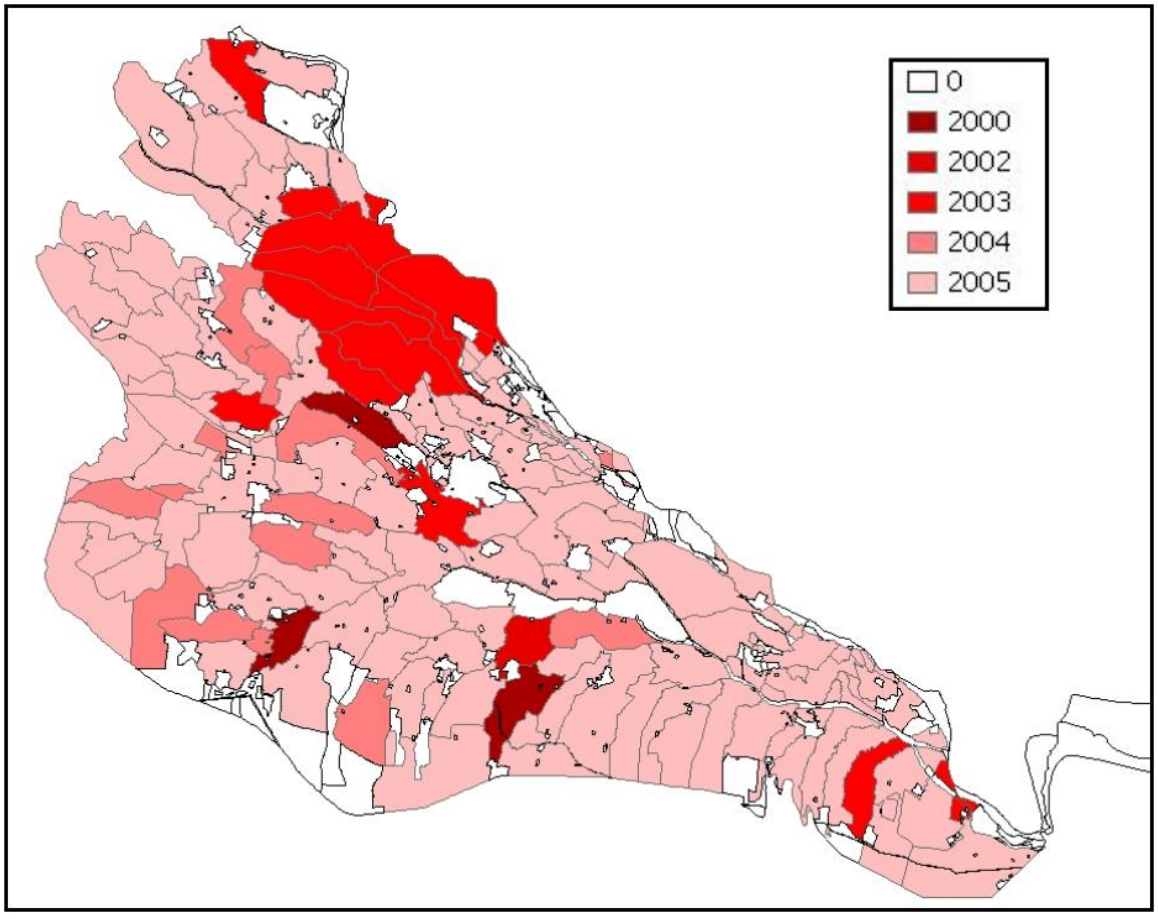


Figure 6.1 – WUA establishment in Khorezm Province (0 = no data)
Source: own presentation on basis of data of the ZEF/UNESCO Khorezm project

6.2.2. The policy process

The international literature on WUAs can be understood to consist of four groups; (1) the ecological basis of collective action, (2) the characteristics for success literature, (3) the new institutional economics literature, and (4) the control and empowerment perspective (Narain, 2004). The literature cited in 6.2.1. fits under the second category, i.e. it primarily analyses the characteristics for success, while being slightly influenced by the literature in the other categories. Most of what is written about Uzbek WUAs aims at their establishment and "success" without properly defining what a successful WUA would be. Meanwhile the authors advocate change, without explicating what this change would entail. The implicit models of change can however be reconstructed from this literature when read attentively. This is done in this section.

In the same article Narain (2004) voiced the critique that policy is often perceived as a simple prescription rather than as complicated process which it in practice often is. This critique connects to a larger body of literature on the analysis of policy processes. The introduction of WUAs as a model for local water governance has been pushed by international organisations as a 'one type fits all' solution. In reality in the Uzbek case only some aspects of the model are taken aboard, while on many other aspects the model is adapted to fit the wider Uzbek governance structure. The recent work by Yalcin and Mollinga (2007a and 2007b) is a welcome addition to the literature on the Uzbek policy process. Their analyses provide valuable insights on how the Uzbek government uses international terminology to present the Uzbek reforms as a slowly joining of the neo-liberal ranks, while in reality these policy models are thoroughly adjusted to fit them to the objectives of the Uzbek government.

The introduction of WUAs is directly connected to the experiences with water management at the former LFE level after dismantling the first collective farms and restructuring them into hundreds of *fermer* enterprises. The water department was responsible for water delivery up to the border of the former LFE. This left a gap from the border of the former LFE down to *fermers*. Not surprisingly, *fermers* were not able to manage the water between themselves. Yalcin and Mollinga (2007b) report that it 'increased frictions and conflicts over water distribution between individual farmers'. At first the water department was expected to fill the gap and start delivering water up to the *fermer* enterprises.

Yalcin and Mollinga (ibid.) describe that in 1998 some people within the Ministry of Agriculture and Water Resources visited countries with local water management by WUAs. Only in 2000, working through informal connections, pilots could start under responsibility of the provincial *Hokim* of Khorezm, who was convinced that an alternative organisation for water management would be needed at the LFE level when the land would be distributed among *fermers*.

On basis of positive experience with these first WUAs in Khorezm, with especially good performance in the drought years 2000 and 2001, in 2002 the government decided to also start experiments in other areas of the country (ibid.). Full scale reforms happened in 2004–2006, in which the remaining LFEs were dismantled into thousands of *fermer* enterprises.

A number of international organisations (donors, NGOs, research institutes) have offered support and pushed for Uzbekistan's adoption of the 'WUA-policy-model'. Their ideas about WUAs have very much been influenced by 'a neo-liberal and neo-institutionally informed global water discourse' (Bolding, 2004: 13; Mollinga and Bolding, 2004). The topics addressed by these international organisations as well as what they wrote about the

Uzbek process reveals to a great extent the underlying models of development they had in mind.

Quotations from some of these policy support documents can be found in Box 6.1. These organisations expected that the WUA-model of governance would have the following main results: the democratisation of water management at the local level (collective action, self-governance), the improvement of water use efficiencies, cost recovery of operation and maintenance and a more equitable water distribution between water users.

The (academic) research that was conducted since the early years of WUA establishment, to a large extent, have followed the issues of expectation. For instance, the work by Wegerich (2000) typically addresses the issues of free WUA formation by farmers, the willingness to pay water charges, and empowerment of farmers. In his conclusion Wegerich notes that 'old institutions have taken control [and] it seems that this process is not helpful in terms of democratic development of the WUAs'. Still he expresses the hope that 'WUAs could become a participatory bottom-up movement'. The expectations are somewhat hidden between the lines, but clearly reflect the international model discussed above.

The study by Zavgorodnyaya (2006) clearly aims to identify the obstacles to be overcome in order to reach the mentioned objectives. It is observed that the Uzbek way of implementing WUAs *de facto* deviates from the international model, but this is rather seen as a failure to implement it in the right way. This becomes clearest in Zavgorodnyaya's comparison of WUAs that are 'supported' by international organisations and WUAs that are 'unsupported'.

The International Water Management Institute: "However, by transferring water management at on-farm level to the WUAs, [Central Asian] states [..] are demonstrating their commitment to the worldwide-recognized standards. There are already good examples of *sharing water management responsibilities, improved self-management, economical independence and incentive for collective action* in the existing WUAs in Central Asia" (Abdullaev et.al., 2006:14; italics added)

Memorandum of understanding on a rehabilitation project funded by the Asian Development Bank (ADB): "The Project will support the strengthening of the water resources management through installation of a modern control and communication system, capacity building and improved Operation and Maintenance procedures, the establishment of Water Users Association's (WUA) and development of an integrated Water Resources Management Model. The improved water resources management component would *optimize the utilization of the available water resources* in the Surkhandarya Basin and will result in reductions in water abstractions from the Amu Darya River. The overall efficiency of the system because of these measures will be increased by at least 5%, resulting in *water savings* of about 60 million m3 annually". (ADB, 2003a:3–4; italics added)

The ADB in a study on irrigation in Central Asia: "Despite the obvious need for rehabilitation, governments will waste any efforts directed at it, unless they complement it with institutional strengthening and (especially where state orders for output remain intact) agricultural policy reform. Farmers must earn enough to be able to finance operation and maintenance of irrigation and drainage structures. They also need to have a stake in decisions that relate to water distribution and infrastructure maintenance. This calls for the establishment of *participatory forms of organization* for maintenance, such as Water User Associations (WUAs)" (ADB, 2003b:29; italics added).

The Handbook on how to establish a WUA in Uzbekistan, published by IWMI and the SIC-ICWC: "A Water Users Association (WUA) is a *non-profit organization that is initiated, and managed by the group of water users* along one or more hydrological sub-systems […] regardless of the type of farms involved" (IWMI and SIC-ICWC, 2003:2; italics added)

Some benefits of WUAs mentioned in the same handbook:

- "Equitable water distribution among farmers [...]
- More reliable water supply
- Water supply becomes more responsive to crop needs
- Quick dispute resolution at the local level
- Well-maintained canals […]
- Less water theft/ stealing" (IWMI and SIC-ICWC, 2003:3)

Some obligations of a WUA mentioned in the same handbook:

- Ensure full involvement of all WUA members in setting up and managing a WUA
- Make fair and democratic decisions within WUA
- Ensure just and equitable water distribution among all WUA members

(IWMI and SIC-ICWC, 2003:13)

Box 6.1 – Quotations from documents by international organisations showing elements of their underlying models of reform

Rather than focussing on how the Uzbek 'errors' could be overcome to fit the international heralded WUA model, this research focuses on identifying the mechanisms and drivers behind the inventions of new models of local water management. This helps to create the understanding that the Uzbek government has an idea of the WUA that seriously differs from the international ideal model. By using the same terminology as the international celebrants of the WUA-model, the Uzbek government to a large extent has been able to convince international organisations that it is pursuing neo-liberal reforms through WUA establishment. Instead the international community should realise that there is not just 'the WUA', but a multitude of interpretations and attribution of meaning. The Uzbek government has been very apt in fitting the idea of the WUA to their own objectives of control over agricultural production. Section 6.2.3 is an attempt to give such an analysis.

6.2.3. The formal position and internal organisation

The WUAs in Uzbekistan have been based on (provisional) decrees by the Cabinet of Ministers. Decree no.8 of 5 January 2002 specified

> '(i) the procedure for establishment of WUAs on the territory of agricultural enterprises which are being reorganized; (ii) the management structure of the WUA; (iii) the standard agreement about water users integration and establishment of WUAs; (iv) the standard charter of the WUA; and (v) the standard agreement between the WUA and farmers for provision of chargeable water delivery services and works' (UNDP, 2007: 66).

Among other things it defines that the WUA operates on a budget based on user fees, that the general assembly is the central body for decision making and that the chairman is elected by this body. For the organisational structure see also figure 6.2 hereunder.

The decree was in the first place about the break up of the unprofitable *shirkats*, rather then specifying the structures on which the WUAs should be established. Still it provided a (provisional) legal basis for the establishment of WUAs in the country (Yalcin and Mollinga 2007b: 11). In practice WUAs were established by decree of the *Hokims*, with reference to the decree on national level. Still formal law on WUAs is lacking (*cf.* Zavgordnyaya, 2006:82), but currently under development by a commission of parliament together with governmental agencies and stakeholders (UNDP, 2007: 75).

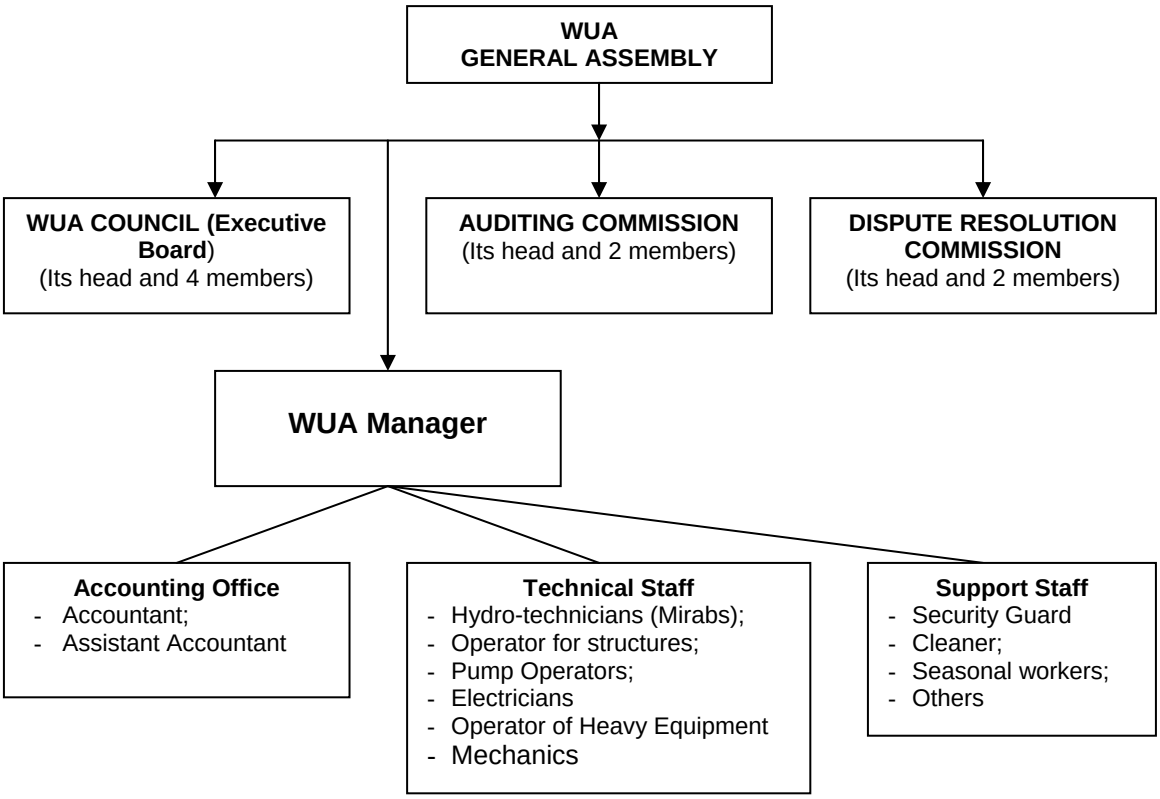


Figure 6.2 – The organisational structure of a WUA in Uzbekistan
Source: Re-drawn from Yalcin and Mollinga (2007b:15), based on information obtained from the Ministry of Agriculture and Water Resources in Tashkent, July 2005

6.3. The WUA, the state and access control

From earlier studies and the understanding of the Uzbek WUA-policies as a top-down, state-induced establishment process it is clear that the WUAs are not free associations of water users (*fermers*) who organise water distribution among themselves. Possibly one could label the WUA as a 'semi-state organisation' or as a 'state-controlled organisation'. This section sets out to characterise the WUA in relation to the state. To this end, first the *de facto* relation between the WUA and various state actors is discussed. Secondly the WUA's different roles and activities within its own area are analysed. The latter shows the different strategies to control the access to water.

6.3.1. The WUA and the state

State control over WUA establishment and its functioning is not just a deviation of how it is intended to be; this is even part of the formal policy. Yalcin and Mollinga (2007b:23) refer to a decree by the cabinet of ministers of 2003 that states that

> the water departments and on-farm hydro and reclamation organizations of the Ministry at the region and districts have the following functions: a) to make proposals on the WUA development and provide assistance in implementation of the development programs, b) to arrange the activities on the WUA establishment and operation and c) to monitor the WUA performance.

This study shows that the state's strategy is a combination of (1) active interfering in (or overruling off) internal WUA political processes, (2) setting strict boundary conditions on inputs, outputs and what the WUA is allowed to handle on its own and (3) the handing over of difficult tasks and responsibilities that are costly to the WUA (yet even then they remain under monitoring by the state). In the following sections various instances of these three wider strategies are described.

District level water management meetings

The main points of contact between the state and the WUA are the meetings at the former offices of RayVodKhoz and those at the *Hokimiyat*. The head of the Main Canal Management (MCM) weekly calls a meeting with all the WUA chairmen in his area. In these meetings the chairmen report on their activities of the last week and get instructions for the next week (see the quotations below). Also these meetings are an important means for information dissemination by the state; firstly regarding water issues, but also regarding broader agricultural issues. During the fieldwork period I was allowed to sit in on a few of these meetings and could observe closely the dynamics and sort of information exchanged[76].

In one of these meetings some WUA chairmen were reprimanded that they had not yet made contracts with all *fermer* in their area.

> [The head of the MCM]: When there are 187 *fermers* why did you only make a contract with 106?! You will probably come up with the one or the other foolish reason. I gave you 3 days to make it the full hundred percent, but you did a bad job!
> Reply [by the addressed chairman]: I tried to make it the 100%, but many *fermers* do not have their administration in order, they are new *fermers*, and many of them don't even have their stamps yet. [The head of the MCM]: That's nonsense, if there are 187 *fermers* there are not 80 without stamps![77]

The next weekly meeting started with remarks that show how water provision still follows central planning on crop production and continued with instructions following on to the ones mentioned before.

> [The head of the MCM]: Till Monday we will finish the 4th time irrigation of wheat and then finish the 5th irrigation by [the] 30th [of May]. […] Have you finished registration? Have you made all the contracts now? I remind you: if *fermers* will not produce enough cotton and wheat it will be your fault because these *fermers* will say that they didn't get water and you will not be able to show that you did.[78]

Also WUA chairmen were addressed regarding specific failures in providing water to certain *fermers*.

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[76] I am aware that the meetings were also affected by my attendance; not everything was said while I was there. At one meeting I was explicitly asked to leave the room before the meeting ended. Apparently there was something to be discussed that was not meant for me to know. Also I only attended meetings in one Main Canal Management area, but I know from interviews that very similar meetings were being held in the other areas where I worked.

[77] Field notes 13/05/2006

[78] Field notes 20/05/2006

> [The head of the MCM]: One of the sheets[79] in [a particular WUA] is broken, why didn't you fix it?! People have come to me to complain because the sheet is broken, why didn't you do anything with it?! Now this might go to the *Hokim* himself when he has his office hours on the 15th of May. Also one man from [another WUA] did not get water, why didn't you give him?[80]

In another meeting it also showed how much the water department is still involved in central crop planning and in managing what is happening within the WUAs.

> [The head of the MCM]: The first problem is wheat. We should finish the last irrigation of wheat fields in 2 days from now. Do you have wheat that is not soft? {I understood that he meant the soil under the wheat, i.e. the soil is recently irrigated and thus moist}.
> After this [he] checked with each WUA chairman how is the state of their wheat fields, whether they have already finished. Some of the responses:
> - [chairman 1]: no problem,
> - [chairman 2]: we will finish in 2–3 days,
> - [chairman 3]: we have problems irrigating all wheat fields. [Response by the head of the MCM]: Why don't you turn on both pumps instead of one? [chairman 3]: Yesterday there was not enough water in the canal for two pumps,
> - [chairman 4 (of a tail-end WUA)]: We need more water. {[The head of the MCM] tells [a person] to help [chairman 4] with that}. [chairman 4]: Can we get an extra sheet? [The head of the MCM]: No, there is a big chance that the extra sheet will be stolen or been cut into smaller pieces for something.[81]

These quotations illustrate that the work by the WUAs is being checked and controlled by the water department at MCM level. Moreover in a number of ways the WUA is treated as a state-extension into the domain of the former LFE, especially where it comes to agricultural planning and production. Indirectly these quotations also show that this control does not take place only through these meetings, but also by field visits, checking the administration of WUAs and by directly receiving complaints of *fermers*.

Meetings and activities of the Hokimiyat

Similar co-ordination meetings were held at the *Hokimiyat*, the district governor's office and the centre of agricultural planning and control. In the period of main agricultural production such meetings were held (almost) every day. My information on these meetings comes from interviews with people who attended them, as I was not allowed to join such meetings.

Representatives of many agricultural organizations attended these meetings. The exact invitation list depends on the crop phases; experts and managers for the most important aspects of that period are invited to attend. Almost during the whole period the WUA chairmen were present at these meetings[82]. The sort of information and instructions are similar to those in the MCM meetings, but then relating to all aspects relevant for agricultural production, with special attention for cotton and wheat. Also the influence of the *Hokims* is not limited to these meetings. Frequently they visit agricultural areas and then give instructions on what action to take. This sometimes also includes the management of

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[79] This refers to a metal sheet that is used at water division points to block off the flow to one canal so that all the water will flow to the other canal(s).
[80] Field notes 13/05/2006
[81] Field notes 27/5/2006
[82] Even more frequently then the heads of the MTPs. This was somewhat to my surprise as the heads of the MTPs are often the former head of the LFEs and it was frequently suggested that these people still play an important role in co-ordinating agricultural production in their areas.

water at field level. The direct effect is very fragmented and the fields and farmers are selected arbitrary. The indirect effect is much more important, as such instructions also have the effect that people will be aware of what is important for the state (and/or the *Hokim*).

The chairmen of the WUAs are supposed to be elected by the general assembly, i.e. by all the *fermers* in the WUA. In reality they are 'appointed' by the District *Hokim*. Or at least they are by local officials 'in advance prepared candidates' (Zavgorodnyaya, 2006: 42). This was confirmed in a number of interviews with *fermers* and WUA staff. In general this was perceived as the normal situation, not a deviation of how it should be. In an interview with a *fermer* it was for instance explained to me as follows.

> [*Fermer*]: The *Hokim* came here and had a meeting […] GJV: With whom was the meeting, just with a few people or with all *fermers*? [*Fermer*]: With all *fermers*, but I didn't go because I had a lot of work. My brother went and informed me afterwards. GJV: What about WUA meetings, do they also happen regularly? [*Fermer*]: No, maybe when the *Hokim* comes, but otherwise not. The workers of the WUA come to our land and to our houses, but we do not have meetings with all *fermers*. GJV: But I understood that you elect the WUA chairman, do you have a meeting for that? [*Fermer*]: Yes, but we have no problems now, so we do not want to change the chairman. GJV: But in case you would, who would be calling the meeting in which a new person would be elected? [*Fermer*]: *Fermers* would be going to the MTP chairman or to the *Hokim* and complain and they could then change the WUA chairman. GJV: So, it doesn't really go through elections? [*Fermer*]: No, it is through complaining to their higher bosses and they can then change[83].

Also it happened that the District *Hokim* was travelling through the area and ordered specific cotton fields to be irrigated. For instance, I encountered a case where WUA staff was irrigating a cotton field even in the absence of the *fermer*, just because they had been instructed to do so by the *Hokim*[84].

Also the District *Hokim* has access to the budgets and bank accounts of the WUA. The fee payments by *fermers* are mostly through the state controlled settlement account system, which is accessible by the District *Hokim*. Zavgordnyaya (2006: 90) reports on the influence of *Hokims* on these accounts. In addition I encountered a case in which the District *Hokim* used money from the WUA accounts in his district to (temporarily) finance a project that had nothing to do with water management.

> GJV: How does it work with meetings, do you have such meetings with the WUA workers and/or with all *fermers*? [Respondent]: Yes, we meet every morning at 8 o'clock with all WUA workers. Also the *fermers* that have problems will then come to the office. GJV: Did you also have a meeting this morning? [Respondent]: No, because this morning [the WUA chairman] and the others left early for the meeting at the *Hokimiyat* to buy seedlings according to the decree by the *Hokim*. [Translator]: what kind of seedlings? [Respondent]: All kinds of trees, mostly fruits, but also poplar. GJV: Is this the task of the WUA? [Respondent]: Well no, but maybe the *Hokim* thought that now the WUA is the organisation closest to the *fermers*, which also has money in its account. Therefore it is possible to do it in this way. GJV: Would it not have been more logical to do it through the MTP? [Respondent]: The MTP has a [large] debt, because last year they could not fulfil the cotton plan on their own land. They got a credit, but couldn't pay back the loan. If now the *fermers* would pay for their seedlings through the MTP, all the money would go into the debt and not go to the *Hokimiyat*. You see, we are not free to do with our money what we want; the [WUA] budget is just taken for these seedlings[85].

[83] Field notes 25/05/2006
[84] This case is also described in Veldwisch (2006)
[85] Field notes 28/03/2006

The WUA as defender of local interest

Even though on basis of the above there is little basis to argue that the WUA is an (interest) organization of water users, in their relation with (higher level) state organisation the WUA chairmen also protect the interests of the water users in their areas.

Frequently WUA chairmen came to ask for more water at the MCM office. Especially the chairmen from tail-end WUAs were active in maintaining a good relation with the head of the MCM. When there were difficulties within the WUA to supply all the fields with sufficient water, the WUA chairmen sometimes tried to get the head of the MCM to these areas to see it with their own eyes[86]. Moreover these tail-end WUAs frequently sent one of their workers along with an MCM employee to check the district canals upstream of their own WUA and the outflows to upstream WUAs, as for instance explained to me by one of the MCM employees.

> GJV: How often do you go up and down the canal? [MCM worker]: Three times per day; at 6 in the morning, at 2 in the afternoon and in the evening at 6. Then I take the gauge readings and I calculate the average amounts of water use. […] One of the WUA workers of [the tail-end] WUA comes with me every day to check how much water is flowing[87].

Also the WUA chairmen actively lobbied to get allocated a large part of the money available for major maintenance as well as for the excavator to come to their WUA to clean out the canals and drains.

6.3.2. Activities of the WUAs within their own areas

Style of management and transparency

In the four case study WUAs management styles were observed that were similar to the ones noted by Zavgorodnyaya (2006); the personal style of the chairmen played a very important role, general assemblies were not held, and decisions were made in a personalised top-down manner. However, it was also observed that some WUAs had implemented measures that improved the transparency of the organisation. In a few WUA offices list were put up the walls with all *fermers* in the WUA according to the areas managed by water guard (see Figure 6.4). Also the total cropped area, the cropping patterns, and the allocated water of each *fermer* were put up. In one WUA office they also put up a work plan with the (operation and maintenance) activities of the WUA complemented with the name of the person responsible for completing the task. In that same WUA office there were job descriptions for the various positions within the WUA (see Figure 6.4).

[86] E.g. in field notes 25/05/2006
[87] Field notes 26/07/2006

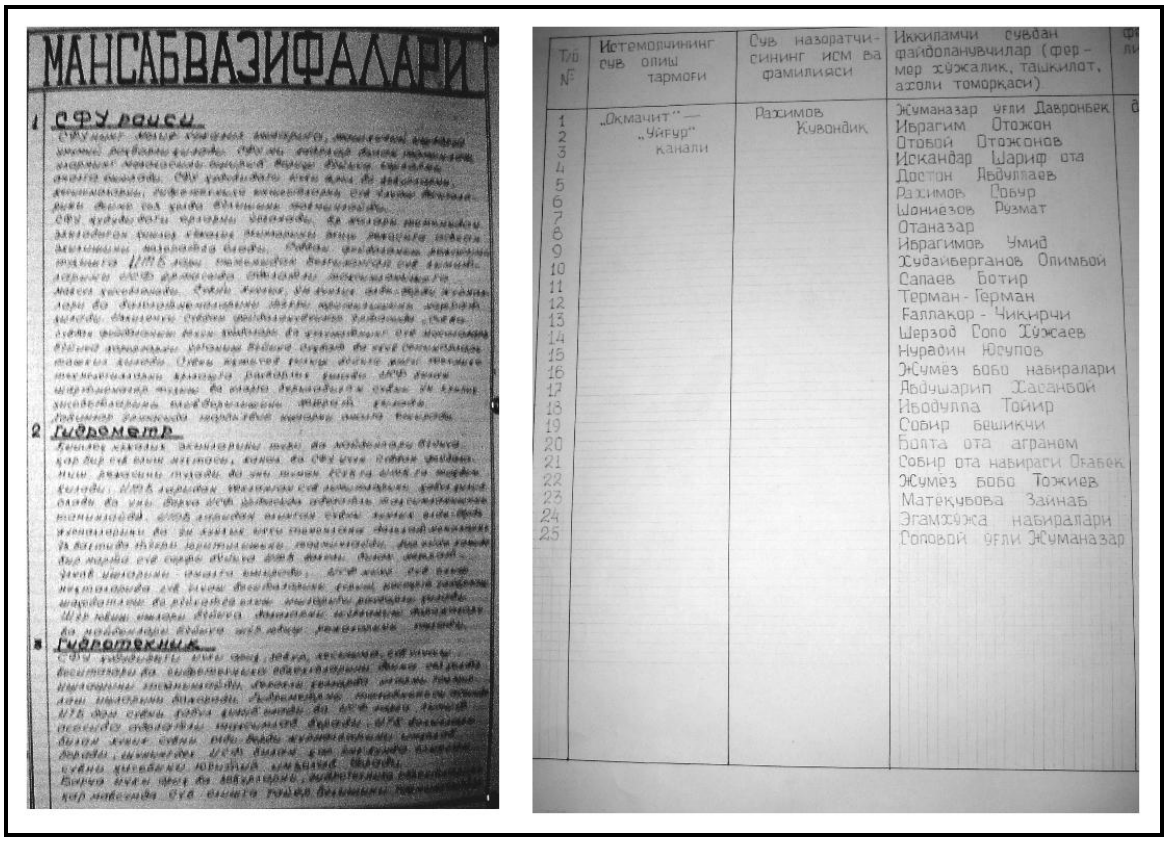

Figure 6.4 – Job descriptions with responsibilities (left) and a list of *fermers* in one water management area (right)

In one WUA the chairman showed a clear philosophy of the need to build-up trust with the *fermers* in order to be able to manage a WUA effectively, especially with regard to fee collection.

> [WUA chairman]: The [water guards] should do a good job, then *fermers* will pay the WUA and we can pay the [water guards]. And if you will pay them in time they will do a good job. The most important is that they establish good relations with both the chairman and the *fermers*. It is all about building trust. […] It is not difficult. If you have the wish to work well, everyone can organise this. The first thing is that you should not lie to *fermers*. If you tell them that you will supply their land with water the next morning you should actually do so and not think that you can also do it one day later. If you don't lie to *fermers*, they will also not lie to you. If they start to trust you, they will pay. If 2 or 3 times you do something wrong, you lose the trust of the *fermers* and it will be very difficult to make them pay. (…) In the very difficult cases I go to those *fermers* myself or I send the lawyer to go and explain. In some cases I also go to the fields myself to see whether people get the water that we are promising them. For instance yesterday [your translator] saw this. I could easily have sent one of my workers, but instead I went myself[88].

This quote touches upon the idea that there would a circular causal connection between the service level provided by the WUA and the fee collection rate[89]. The circle would read as follows. When WUA staff does a bad job at distributing water and maintaining the

[88] Field notes 25/05/2006

[89] Based on Zavgorodnyaya (2006) and discussions with Jan Sendzimir.

infrastructure, farmers are not inclined to pay their WUA fees. As a result the WUA has difficulties in paying its staff and with badly paid staff it is difficult to provide adequate services. The initial situation is not very helpful to break the cycle; farmers are not used to pay for water and WUAs are not used to maintain infrastructure and distribute water. This idea does not take into account the influence of political pressure (to pay), creative motivation (to do a good job or to pay) and of the possibility to do things jointly. Neither farmers nor WUA staff are (only) rational economic human beings. The three mentioned aspects all influence the dynamics at play within the WUA.

Little access control

Though the larger part of my fieldwork took place along the canals (or at the fields, which is practically the same) it was rather seldom that I met workers of the WUA in the field. If I met WUA workers along the canals it was most often at (or near to) the places from where the WUA takes its water from the main system. The activity was then mostly to arrange enough water to flow to the WUA rather then the distribution within the WUA.

Farmers frequently mentioned the absence of WUA staff in the field. The quotation below is from an interview with a *fermer*, just after a worker of another *fermer* had left us to arrange more water to come to their end of the canal.

> GJV: How will he [arrange more water]? [*Fermer*]: He will negotiate with the other *fermers* who are irrigating now. […] GJV: And what about the worker of the WUA, is he not the one to decide about where the water is flowing and at what discharges? Is he not going to talk to this person, instead of to other *fermers*? [*Fermer*]: No he will talk to the fermers. GJV: And where is the WUA worker now? [*Fermer*]: Do you really think he is coming here? They never do. We arrange the water distribution among ourselves[90].

My observations suggest that the WUA is generally not physically controlling the water flows in its area. This is further supported by the stories about access strategies by *fermer*, discussed in the next section.

During some periods WUA staff was observed to frantically go around and arrange water distribution to go the way they wanted it to go. In one case the WUA chairman was waiting a full afternoon next to a minor division point to make sure that water would be flowing in the branches that he intended. There was a lot of tension between the farmers around that place and it seemed that only with the physical presence of the chairman the water was flowing in the planned direction[91].

There were huge differences between the studied WUAs, often without apparent reasons. This is partly due to the highly personalised management styles that result in big differences and partly due to the newness of the sort of the institution that makes that procedures have not yet crystallised in their final form. The direction in which these will develop is difficult to assess.

[90] Field notes 06/07/06
[91] Field notes 28/07/06

6.4. *Fermer* strategies for gaining & maintaining access

The gaps in the WUAs control system provide a lot of room for *fermers* to secure their access to water. The various farmer strategies for accessing water are analysed here. It was found that three things are of strong influence.

(1) The farmer's socio-political position (use of (political) ties, status and money).
(2) The spatial and technological situation of the field (water in the tail-end area is arranged differently from water in the head end area; farmers have different strategies for pumped water than for gravity water).
(3) The form of production practiced at the field (one and the same farmer arranges the water for his cotton production differently from water for his rice).

Hereunder they are analysed as separate mechanisms on basis of cases. In reality, however, each field that needs to be irrigated can be characterised on each aspect. The identified mechanisms do not tell us how a specific *fermer* will act in a specific situation; different characteristics influence the *fermer*'s strategy, but this relation is not linear.

6.4.1. Socio-political position

In this sub-section I describe four cases of how farmers adopted strategies in accordance with their specific socio-political position in order to gain and/or maintain access to irrigation water.

Case 1

One *fermer* in the far tail-end area of a WUA where I worked was the only person in that part of the WUA who was able to access water in periods of shortage. He was a friend of the WUA chairman and besides being a *fermer* he was also the manager of the nearby petrol station He used his resources (a car) and his strong political position to gain access to water. The following fragment describes the moment that we met the first time and in which the *fermer* spontaneously explained his strategies to gain access to water. Early in the morning I was waiting in front of the WUA office.

> [The WUA chairman] arrived in a sand-coloured Russian jeep. Another man was driving. […] GJV: Who are you, I don't think I have met you before, have I? [*Fermer*]: No, I haven't met you before either. I am *fermer* with land on the other side of the collector. There is no water there. GJV: Is that your car? [*Fermer*]: Yes, since yesterday I have been driving around with [the WUA chairman] to close down pumps and other outflows in order to get water to my fields. GJV: And are you also the one who is paying for the petrol? [*Fermer*]: It drives on diesel, but yes, I pay for it. GJV: Why does the WUA not do this work themselves? [*Fermer*]: They don't have the power to do this. {Implicitly saying that he does have the power to do it}. But anyway, when I come with [the WUA chairman] they turn off the pumps, but as we leave they turn it on again. Only when people would get fined a few times for misusing water they will start to listen[92].

A week later we sat down to have lunch and after the situation got somewhat informal we came to talk again about the water availability in the tail-end, where he has his land.

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[92] Field notes 18/7/2006; I am aware that my questions were directive, but I am confident that this *fermer* understood what I asked when he agreed to my suggestion. The remark on the borrowing of tractors from other *fermers*, in the next quotation, also confirmed this analysis.

> [*Fermer*]: I was the first person to take land in this kolkhoz. Then this land was fine, but now I am in big trouble [because it is difficult to get water to this place] GJV: You can get water; [the WUA chairman] is your friend, you can go around with him in your car, and you control diesel distribution. [*Fermer*]: Yes! GJV: But for smaller *fermers* around you it is much more difficult… [*Fermer*]: Yes indeed. I also easily borrow tractors from *fermers*. [If] I ask they don't deny me[93].

Later the WUA chairman told me that this *fermer* is from an influential family, with a number of uncles at important positions in the state hierarchy. He used his position, ties and money to arrange the water he needed.

Case 2

One *fermer*-household that I worked with had 23 ha of land in the head-end area of a WUA. The enterprise was practically run by two sons, but officially it was on the name of their father, who had an important position at a state organisation in the district capital. They had about 10 ha of paddy land. This was possible because the soil in that area was saline and nothing else would grow there.

> [Son]: there is nothing else that grows here so we can only plant rice. The *Hokim* in a meeting once said that all the land has to be used so if we want to use it we have to plant rice.[94]

Also it was of influence that this land could be reached by gravity flow, so that even though the paddy needs a lot of water, the costs would be low.

> [Son]: Our fields are relatively low and therefore we can take water by *ayak suv* [i.e. by gravity flow]. In that case you can plant rice, if you need to use a pump it becomes too expensive to plant rice.

The two mentioned aspects relate to the spatial and technological situation. There is however good reason to also use this example to illustrate the role of socio-political position. In the land redistribution process many people opted for the pieces of land with a good soil quality. This *fermer* explicitly chose for land with a bad quality and access to gravity water, as he was aware of the possibilities this would create for paddy cultivation, which would become highly profitable.

> [Son]: We took the bad land, but it has turned out that actually on the bad quality lands you can make the best profit. I and my brother were also telling my father to take the good land, but he wanted to take the worse land that takes water by [gravity flow]. […] My father has very good connections and knew what [land/crops] would be doing [economically] well.

Not only did this *fermer* have a socio-political position that gave him access to the right sources of information, as well as the right connections to be able to arrange the allowances to grow (such a large area of) rice.

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[93] Field notes 25/7/2006
[94] Field notes 30/5/2006

Case 3

A medium-sized *fermer* (15 ha of which 6 planted to cotton) has his land in the tail-end area of a WUA. This is an area that frequently experiences water shortages. Both *fermers* and *dekhans* have problems getting their fields irrigated in time. Some distant household plots in this area are not even cultivated because of this reason. Also this medium sized *fermer* experiences these problems. His strategy to gain access to water is to coalesce with the strongest actor in this area, a *fermer* with over 100 ha of land, of which a large part is planted to rice. The large *fermer* has a very important state job at district level and his wife is the farm manager, the person who manages the work on the day-to-day basis. The medium-sized *fermer* acts as one of the clients of this patron.

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> [We encountered the medium-sized *fermer*] at the side of the street. {The car of the medium-sized *fermer* was parked at the beginning of the dirt road at which the wife of the large *fermer* was levelling the land by tractor] and on top of the medium-sized *fermer*'s car there was a 30–40 litre drum that was used for petrol or diesel}.
> […] GJV: We were at your house early this morning, but your wife told that you had already left. [medium-sized *fermer*]: Yes, I left early this morning. GJV: She said that you went to get diesel. [medium-sized *fermer*]: Yes. GJV: What are you doing here, do you have your fields here? [medium-sized *fermer*]: No, I am helping [the wife of the large *fermer*]. Yesterday she helped me[95], so today I help her.

The 'help of yesterday' probably referred to providing machinery for digging an on-field drain, while it seems that the 'help of today' refers to providing a drum of diesel. The medium-sized *fermer* was also allowed to make use of the pumps of the large *fermer*, something that other people in that area were not allowed.

The relation between the medium-sized and large *fermer* is very unequal in terms of power and status. There are services provided back and forth, but they are of unequal nature.

Regarding the water access strategies of the large *fermer*: he simply takes water when he needs it, even if this is to the loss of many others in that area, as reported by a number of people from that area. Even the wife of the large *fermer* said this herself. The next fragment is from an interview at their place, following an appointment that we had made a week before. Upon arrival they had changed their mind and with vague excuses tried to no longer participate in the research. The following quote reports on my last attempt to get a conversation going.

> [My translator]: An interview just means that we talk about water distribution. [Wife]: I am too busy to talk. Also you shouldn't be talking with me but with the WUA, the mirab. {Ending her speech like the interview was over} GJV: I also talk with the WUA, [and other water organisations], but I also talk with *fermers* and *dekhans*. For me it is interesting to know how *fermers* organise that they get water with organisations like the WUA. [Wife]: We don't have anything to do with those organisations, we just take the water from the canal when we need it. {Again ending her speech like the interview was over}.[96]

[95] This possibly referred to the borrowing of small excavator for the construction of an in-field drain.
[96] Field notes 8/6/2006

Knowledge, favours and threats
Socio-political positions of farmers are of influence in water distribution in a variety of ways. Through their connections farmers with strong socio-political positions have access to knowledge that is not available to others (case 2), they are able to mobilise favours for their allies (case 2 and 3) and to withhold these favours from others, or threaten them in other ways (case 3). When people are not able to mobilise water through their connections they depend more on other strategies, for instance through intelligently making use of their spatial and technological position.

6.4.2. The spatial and technological situation

Water distribution is besides a socio-political issues also an organisational issue; i.e. water has to be practically distributed in space and time. Therefore farmer strategies to access are also influenced by their spatial characteristics; for instance by their position in the WUA, the number of farmers along their canal, the irrigation and drainage infrastructure, the sizes of fields and the soil type.

Case 1

In one of the case study WUAs I frequently met with particular medium-sized *fermer*. Socio-politically he was not particularly strong, but he was highly skilled and entrepreneurial. As a result he was able to achieve good yields. His fields were supposed to receive water by gravity directly from a canal flowing along his fields, i.e. without passing though a shared irrigation ditch. However, the water level in this canal is often too low to make the water flow onto the fields. In this case he was supposed to use pumped water supplied from another direction. This would lead to additional costs. Instead this *fermer* bought a metal sheet to partly block the water flow in the canal flowing along his fields. As a result the water level n the canal was raised and the fields could be supplied by gravity water. The *fermer* could do this because of a culvert just downstream of his fields where he could easily fit the metal sheet. Moreover his fields were in an area somewhat isolated from the rest of the WUA so that it would not be noticed[97].

Case 2

One of the *fermers* with whom I frequently met had his land in the tail end of a WUA, where it was difficult to get water. In real difficult situations he rented a private diesel pump and made the water flow from a distant feeder canal, not even meant to supply his area. The place at which he had his fields this was basically the only solution to get water. The water in the main canal from where he would normally take his water would not be high enough to flow into the irrigation ditch. Moreover, if it would flow into it, first two large areas with distant household plots would use the water. By the time they finished, the water level in the main canal would often already be low again. By using another supply ditch the *fermer* was able to by-pass the two large areas with distant household plots.

This case illustrates what I have seen and heard at many other places; people who can afford to rent a diesel pump will do so in case of extreme drought. Also there is need for some political power, as it is not accepted of all that they place a private diesel pump in an upstream canal.

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[97] Eventually it did get noticed by a governmental organisation and the *fermer* was told that the sheet was illegal and had to remove it and pay a fine.

6.4.3. Final remarks

It may be clear that the strategies for getting water of *fermers* and *dekhans* are also different for each of the three production forms, as described in Chapter 5. State-ordered cotton depends on the state network, to which *fermers* can easy appeal when their cotton is in need of water. Contrary to this, commercial rice production, which is primarily lucrative for *fermers*, and less so for the state, depends on the private/informal network of the *fermer*. The household production by *dekhans* is general accepted as having priority over state-ordered cotton and commercially produced rice, both by the state and by *fermers*.

In this section it was shown that in addition to the attempts of the WUA to control access to water, water distribution is also shaped by farmers' strategies. Depending on the situation *fermers* and *dekhans* have different possibilities for gaining and maintaining access to water. The actual strategies that farmers deploy are of course always of an integrated socio-technical nature, i.e. actions in the material/technical dimension also have socio-political meaning and actions that initially act upon the socio-political dimension eventually are expressed in material terms. In some situations there is an apparent full control by the WUA, in other situations there seems to be hardly any control by the WUA. In the latter case the resulting situation is one of apparent anarchy in which water is contested between its users without any institutional regulations.

6.5. Joint private initiatives

In situations where the WUA does not effectively exert access control farmers sometimes develop sets of rules and enforcement systems. In some situations they organise maintenance, and jointly hire pump operators. Some of these co-operations have histories that date back to at least a decade, especially when it concerns groups of *dekhans* that share a former collective field as distant plots. In this section various examples are presented in which there is some form of joint management of water or water infrastructure directly between farmers, i.e. outside the WUA structure, but within the area of a WUA.

Acute maintenance requirements are often the immediate cause for such joint initiative. In one of the case study WUAs maintenance is explicitly left to *fermers* themselves and the expenses for maintenance are even no longer part of in the WUA budget. WUAs sometimes transfer their pumps to the accounts of *fermers* or rent them out in order to ease the work load of the WUA.

Case 1

In one of the WUAs where I worked there was an area of about 20 ha with mainly orchards for fruit production. The land is distributed among about 10-15 small *fermers*. Many of them only recently (in 2006) became *fermers*, but they had been cropping these plots before in a similar sort of arrangement with the collective farm. During those times they paid a rental fee (*arienda*) to the collective farm and were relatively free in their production. The farmers in this area jointly bought a pump, which they also maintained and operated themselves. In response to a changed cropping pattern upstream, which lowered the water availability for their area, they decided to buy a pump. Through this pump they were able to access water from a canal that has a water level too low to access without a pump. Each by themselves

they were not able to provide for the pump and its maintenance, but together they could easily carry the costs.

> GJV: Where do you take your water from? [*Fermer*]: Water comes from the pump. We also pay for the pump and for water. GJV: Which pump is this, where is it? [*Fermer*]: It is just behind the field here, close to the [canal]. It takes water from the [canal] and puts it in the [irrigation ditch]. GJV: Who is the pump operator? [*Fermer*] (laughs a bit): He is also a tractor driver [and] lives behind here in the village. GJV: How big is the area that takes water from this pump? [*Fermer*]: It is about 20 ha {pointing out at the area around us}. The owners of the land put money together and put the pump there. GJV: When was this done? [*Fermer*]: It's more than three years. It was already there when I got my land. GJV: But in that time there were no private owners of the land, but only collective land, not so? [*Fermer*]: Then we rented {*arienda*} the land, now it is given to *fermers*, it is very similar. […]
> [*Fermer*]: We go turn by turn, we make a queue. The pump gives a lot of water so 5–6 people irrigate at the same time. The turn for water then comes every 3–4 days. Because we have a pump it is good, there is enough water. GJV: Can you also take water by gravity to your field? [*Fermer*]: It is possible, but difficult as people upstream have planted rice. [...]. [*Fermer*]: Before water was coming from that side, but since they started planting rice upstream the water is not coming to here anymore. Then another canal was dug and now water comes from that side {the other direction and indeed another main canal system}.
> {Observations about the pump: The pump is an electric pump, but seems smaller than the 500 l/s pumps. Possibly it is around 200 l/s. At the electricity pole there is box with a red and a black button}. GJV: Are those buttons to turn the pump on and off? [*Fermer*]: Yes. GJV: Can anybody just turn it on and off? [*Fermer*]: Yes, but often there is simply no electricity. If there is electricity the pump is working.[98]

Case 2

At various places I found that the pumps that were officially under the operation and maintenance of the WUA, were actually maintained by the group of *fermers* dependent on that pump. In some cases the operator was even paid directly by the *fermers*. The following fragment describes such a situation.

> At the pump close to the main road, on the northern side of the canal, about 10 men are standing/sitting around the pump. We stopped there for about 10-15 minutes and talked for a while with those men. Especially one man was talking with me. He told me he works for the MTP, organising spare parts. They were doing maintenance/repairs on the pump. The people around are people who depend on this pump, as well as [the pump operator]. The money needed for operation and maintenance of this pump is being paid by the people who depend on this pump. The income is 360,000 soum per 10 ha (total about 70 ha) and is paid directly to [the pump operator], who keeps the accounts. Also his *oylik* [monthly wage] is paid from this money. GJV: But isn't this supposed to go through the WUA? They: Yes, but they don't do it, so we do it ourselves. GJV: And before, in the *shirkat* time, did the workers of the fields then also take care of it themselves? They: Before the *kolkhoz* used to take care of this, we didn't have to contribute ourselves[99].

The next week I asked the WUA chairman about this and he confirmed that in his WUA all the pumps either were or soon would be transferred to the direct management of the *fermers* dependent on the pump.

Case 3

In a tail-end area of the case study WUAs there were many distant household plots. These *dekhans* worked together in constructing obstructions in the canal with the objective of

[98] Field notes 10/6/2006
[99] Field notes 12/07/2006

raising the water level and thus increase the outflow into their irrigation ditch. They would also jointly defend their constructions from demolition by downstream water users.

> [*Dekhan*]: This is high land. If there is a lot of water it is possible to grow rice here, but if there is little water not. GJV: What can you do to get water if there is only little? [*Dekhan*]: I can for instance irrigate at night. Also we block the yap by using a sheet and the water level will become higher and flow unto our fields. We agree with the people who are even further downstream along the canal. We do this when they don't need the water. GJV: Did you organise yourself as a group here and do you communicate with the group further downstream? [*Dekhan*]: Well, if people downstream have irrigated for 3-4 days, 4 or 5 of us come together and block the water and will irrigate our *tamorkas*[100].

Another *dekhan* in that area explained that these obstructions need to be guarded.

> In the area on the other side of the road we stopped at various smaller off-takes. At one place sand bags have been dropped in the canal, apparently to higher the water level in front of it. There is a man sitting next to it. GJV: Are you taking water now? He: yes, I'm irrigating my wheat field. […]. GJV: Why do you put these sand bags, is the land to high for the water to flow unto it? He: No, the land is not high; just there is very little water here. GJV: Yeah, you are completely at the end of the WUA isn't it? He: yes, before it reaches our field many people have taken water. GJV: The sand bags here do they stay in permanently or do you take them out when you are finished irrigating? He: The person who is irrigating his field should keep watch at this place, because the people from downstream always come to take away the sand bags[101].

Frequently these joint actions seemed to entail not more than two to three neighbours organising one incidental intervention. The people working together to construct or demolish an obstruction did not do this on a regular basis or in exactly the same group setting.

Case 4

During night-time observations in the tail-end area of another case study WUA I encountered a group of *dekhans* that at night went around arranging water to come to their area of distant household plots.

> They explained that they were organising water for their tamorka's. During the daytime it is impossible to get water for the tamorka's. 'The *fermers* take all of the water'. During the nigh we go along the main canal and check whether all the off-takes are well closed and the check structures open. Now still a lot of pumps are still working, but later they will shut down and then we will finally get some more water. Our field of tamorka's is very large [actually said 20 ha, but I find it hard to believe this]. Every night 8 of us irrigate, we have schedule for that. During that night those people have to organise their own water. We will stay the whole night in the field and if necessary we will go up and down the canal once in a while to check[102].

This case is similar to that described in case 3. However, it seems that in this situation the cooperation is slightly more institutionalised. There is a sort of a rotational system between the various *tamorka* plots within one field. Going around on bicycles at night requires more organisation and coordination than making and incidental obstruction in a canal. This reflects the difficult situation of these dekhans in the tail-end area of a tail-end WUA. Various tamorka plots in the same area were not cropped at all. During daytime these

[100] Field notes 09/06/2006
[101] Field notes 05/06/2006
[102] Field notes 20/07/2006

dekhans were not able to get water at all and at night they had to go around in groups in order to arrange water to come to their plots.

Final remarks

People in post-communist settings are often said to have an aversion to collective initiatives and the formation of cooperatives. In this section it was shown that joint actions have developed and are developing in water management in Khorezm. However they hardly ever have a permanent character and they are rather responses to incidents. They mostly arise around acute maintenance problems, notably the breakdown of pumps. The direct interest for all the dependents and the clear demarcations of this group make it relatively easy to organise action.

6.6. Conclusion and discussion

The Uzbek WUAs in 2005–2006 were still very much state controlled organisations that serve an important role in the control over (state) agricultural production by privatised *fermers*. The WUAs are controlled through direct government interventions in specific issues, and by being highly contained by the boundary conditions under which the WUA is allowed to work. Both the local government (*Hokimyat*) and the local branch offices of the Water Department are involved in this. The WUA is an organisation fixed between state and *fermer* interests.

Within the boundaries of the WUA there is a socio-political dynamic over water that can be characterised as the WUA employees aiming to control the access to water and farmers aiming at gaining access and access maintenance. The balance between the two differs per WUA and even per area in a WUA.

There is a large variety of farmer strategies to gain access to water. They can be understood as being influenced by three important situational features; the socio-political position of the farmer, the spatial and technological situation and the production form.

At the dissolution of the LFEs most of the controls in the agricultural production system have moved to the district level; i.e. they are arranged directly between *fermer* enterprises and the responsible district-level organisations. Different from this model, the organisation of water has remained at the level of the former LFE. This is related to the nature of the resources and the transport network; i.e. water is voluminous and fluid, while its distribution depends on an open canal network that is complicated and expensive in its operation and maintenance. The control over this resource requires close attendance at field-level. Apparently the state has realised at an early moment that water distribution is (to become) a social-political process between primary users. In response to (and anticipation of) these developments, WUAs were created as state controlled institutions. The WUAs have essentially different roles than the former LFEs; i.e. they are not production units themselves, but merely supply and control organisations for the agricultural enterprises (the *fermers*).

Currently there is a feeble balance between re-regulated state control and emerging forces of privatisation, which create individualised risks and benefits. The situation observed in 2005–2006 is not static. One of the central questions for the future is whether the state will eventually leave water distribution in the domain of the WUA to local actors or whether it will increase its control. The experiments with water pricing in 2006 indicated that the state

might be seeking to increase its control on water flows through a detailed and structured system of measurements and decision-making (see Chapter 7). The observed trends over the past years of reform consists of the privatisation of risks and benefits and the handing over of administrative and financial burdens to *fermers*, while the state firmly keeps its hands on the overall agricultural production system. If this trend continues the costs for maintenance and operation will eventually be left to the *fermers*. Also it would be a surprise if the state would let the collective action patterns develop into a serious alternative for arranging water distribution among farmers.

Chapter 7

Irrigation Technology in Transition

7.1. Introduction

People and water are linked to each other both through institutions and technologies. The previous chapter dealt with changing institutions, this chapter deals with the issue of technological change in the context of the irrigation and drainage network of Khorezm. This is the last chapter with empirical material; it is only followed by the conclusions. It is not intended to convey the message that the technological story is of lesser importance and hence put at the end of the book. Rather the technological process is understood as inherently reflecting the wider socio-political processes of change. As the general process of agrarian transition is quite different from similar studies on irrigation technology, it was deemed necessary to first discuss this before analysing its relation to the change of irrigation technology.

This chapter starts with a discussion of the conceptual framework used for the analysis in this chapter (section 7.2). Among other things it discusses how technology is the result of social processes. This is especially the case if we look at water technology, which is generally about controlling a limited (and/or contested) resource. Therefore both the technology and the institutional framework often show the results of contestation between users. Also the irrigation technology in Khorezm is an example of how technology is shaped and re-shaped by social and political processes. In this case it was a centralised communist command economy aiming at the maximisation and the forced transfer of surplus of cotton yields that defined the technological form. Section 7.3 is an analysis of development and use of irrigation technology in Khorezm during the early years of independence, i.e. the period before complete de-collectivisation.

Though remnants of the state socialist production system are to some extent still in place, other essential elements have been subject to change. It can be expected that in the context of privatisation of risks and benefits in agricultural production, also the demands on irrigation technology will change. Section 7.4 looks into the question to what extent the water technology of the irrigation and drainage network of Khorezm is changing as a result of these changing demands and production relations.

7.2. Conceptual framework

This section builds upon the wider discussion about technology and society as presented in the conceptual framework (Chapter 1). The practical ensemble of knowledge, skills and objects by means of which people pursue particular goals in society is considered technology. This definition leads to a focus on people and their objectives in society, which are based on different understandings of situations. People have different problem definitions and consciously use knowledge, skills and objects to address their 'problems'.

The technological process is understood as a socio-technical process, which implies that it has at the same time a social as well as a technical dimension. The proponents of such an understanding have criticised technocrats, technological determinists and propagators of the transfer of technology paradigm, pointing out that they have failed to understand the intrinsic socio-political nature of science and technology. In the same way social scientists almost always overlook the material aspects of what are seen as socio-political processes.[103]

[103] See also Mollinga (2006)

Yet, The exertion of power, the building of control, and the reproduction of social relations are all inextricably connected with technological objects.

The social and the material need to be studied as elements of one and the same process. Both the Social Construction of Technology (SCOT) school and the Actor Network Theory (ANT) school have recognised this and propagated ways to study these integrated processes. Later in this section the core concepts of these schools are discussed and applied to the study of irrigation systems.

This chapter does not deal with technology in general, but rather with irrigation technology, or even more specific: it deals with large-scale open canal irrigation. In the irrigation process water is distributed according specific crop demands with regard to time, space, quantity and quality (the physical dimension). At the same time water is understood as essentially a limited resource and as such as a resource that is contested between users and uses (Vincent, 2001). Moreover an irrigation system is a network technology[104], i.e. irrigation systems are transport networks that connect places to each other. Places, fields, are inhabited and used by people, who for their water delivery depend on what happens elsewhere in the network. This type of technology is radically different from more individual oriented technologies like e.g. ground water pumps, tractors, and farm implements. In an irrigation system 'the particular layout of the canal system is important, as it structures the ways in which different groups of water users relate to each other, both in spatial and temporal sense' (Oorthuizen, 2003).

Technologies have different forms of appearance. The three main categories are (after Mollinga, 1998):

1. Material artefacts and technological landscapes (like dams, canals, division structures, polders and cultivated desert areas)
2. Human labour power (in skills like field level water application, technical drawing and management skills)
3. Texts (like in irrigation textbooks and manuals)

In this chapter the main focus is on the first category, i.e. the hardware of the irrigation and drainage network. Man-made landscapes are explicitly included in this category. The concept of a technological landscape fits better to a network technology than the idea of single artefacts. It is the wider environment, the landscape that has been shaped by the cultivation/civilisation/reclamation process. The technology of large scale irrigation systems is to a large extent formed by the layout of the canal network.

Technologies not only have different forms of appearance, but in these appearances they have different dimensions of meaning in a socio-technical framework. Around the concept 'water control' Mollinga (1998) and Bolding et al. (1995) have developed a three-dimensional understanding of water distribution processes. These dimensions are the following three:

1. The technical/material dimension
2. The managerial/operational/organisational dimension
3. The socio-political dimension

[104] This idea/term is taken from Mollinga (2007).

As a result of the very broad definition of technology, the achievement of water control for agricultural production is understood as a technological endeavour; it is the pursuance of a particular goal using knowledge, skills, and objects. This implies that the three dimensions of water control are also three dimensions of (irrigation) technology. Some processes have a pure technical cause, yet almost all these processes and events have effects in the managerial dimension and carry a meaning in the socio-political dimension. The events and processes around water control are never restricted to just one dimension; they happen in a three dimensional world. Natural scientists should realise that natural, material processes carry a socio-political meaning that is different for different stakeholders. This has almost become a mantra for people in the field of philosophy of science and technology, yet it is still a relevant point to make in the field of water resources studies.

Irrigation systems are composite technologies with multiple linkages to the social world (Bolding, 2004). Moreover they are multi-interpretable by different stakeholders. Theory tells us that stable technological networks are formed by strong linkages between human and non-human elements; i.e. usually the management of irrigation artefacts is embedded in the livelihoods of people through elaborate systems of rules and regulations. The rules and regulations are a means to deal with conflicting interests over a limited resource. Contestation over water is partly expressed as the contestation over technology, but also contestation over the system of rules and regulations. Moreover, especially in state managed irrigation systems, these (local) property regimes are limited the control strategies of the irrigation department.

The conceptual framework elaborated will be used to look at the socio-technical nature of the processes of transition. The knowledge that the social and material are closely interrelated leads to pressing questions, especially in the context of the economic and political transition since the collapse of the Soviet Union. In the next section first the Soviet technological legacy is analysed.

7.3. Post-independence collective agriculture[105]

The situation described in this section refers to the situation as it existed from independence till the most recent phase of reforms (1991 till 2005). In this period there was central planning from Tashkent, the organisation of production was still primarily through Large Farm Enterprises (LFEs)[106], the household plots had been doubled compared to the Soviet period and the first private farmers (*fermers*) were established within LFEs, however without seriously affecting the agrarian structure[107]. During the fieldwork in 2005 some of the LFEs were not yet dismantled. Interviews and observations made in that period show how the water distribution process worked. With the abandonment of the LFEs and the establishment of *fermers* and WUAs instead (completed in 2006) also the water distribution process has changed substantially. The hardware of the irrigation and drainage network however was shaped in the USSR period and the layout had changed only little since then.

The signs of contestation over water as a limited resource were not directly apparent and therefore also the irrigation technology was not contested in its essence. This was partly

[105] Some of the material presented in this section has earlier been published in Veldwisch (2007).
[106] These were mainly *Shirkats* – from the Uzbek 'shirkat ho'jaliki', which literally means 'collective enterprise'. It is a legal enterprise status that after independence basically supplanted the *Kolkhozy* and *Sovchozy*.
[107] This period of transition is discussed in Chapter 3.

due to the high availability of water[108] and partly due to the nature of the state control system over water and agriculture. Also the exact technological design was somewhat irrelevant because of the strong institutional control on agricultural production by the state. These characteristics made the situation different from most other cases around the world. In line with this also the organisation of irrigation was rather different from what could be considered 'normal'. And, perhaps not surprisingly, also the physical infrastructure was different from studied systems around the world. This section sets out to explain the relation between the typical technological layout of the irrigation and drainage network of Khorezm in relation to its situation of relative water abundance and its development history in the context of a state socialist system with a plan economy.

Both at field level and at brigade level the technology was highly flexible and susceptible to frequent changes; irrigation ditches could change their flow direction, earthen connections were constructed and closed again on daily basis, temporary weirs were constructed, and water was delivered on basis of subjective estimates. Overlaying such a flexible physical dimension was a very stable socio-political dimension that demanded and enforced compliance. Control over the agricultural system did not in the first place take shape through strict control over the hardware of the irrigation network. Land control and concomitant control over crop quotas and permissions, combined with strict controls over output markets put a firm basis for control over the physical side of the production process. This was strengthened by a socio-political system of field-checks, rewards on loyalty and punishments on disloyalty.

Technological objects and systems are often means of exerting control in the absence of the controller – a traffic light is the simplest example. Socio-political control can thus be substituted by technological objects. This is often one of the functions of water division structures that represent rules, rights and regulations cast in concrete. In early post-Independence Khorezm this was not the case; the exertion of socio-political control over water flows was not substituted by the specific designs of division structures.

7.3.1. Networks of ditches

The irrigation ditches that connect the main canals to the fields formed networks rather than linear connections. Most fields could be reached via different paths through the network (see figure 7.1). As the slope of the landscape, as well as the slope in these ditches was very small, the water can run in both directions, depending on which connections were opened and closed.

[108] See Chapter 5, in which the availability of water is discussed.

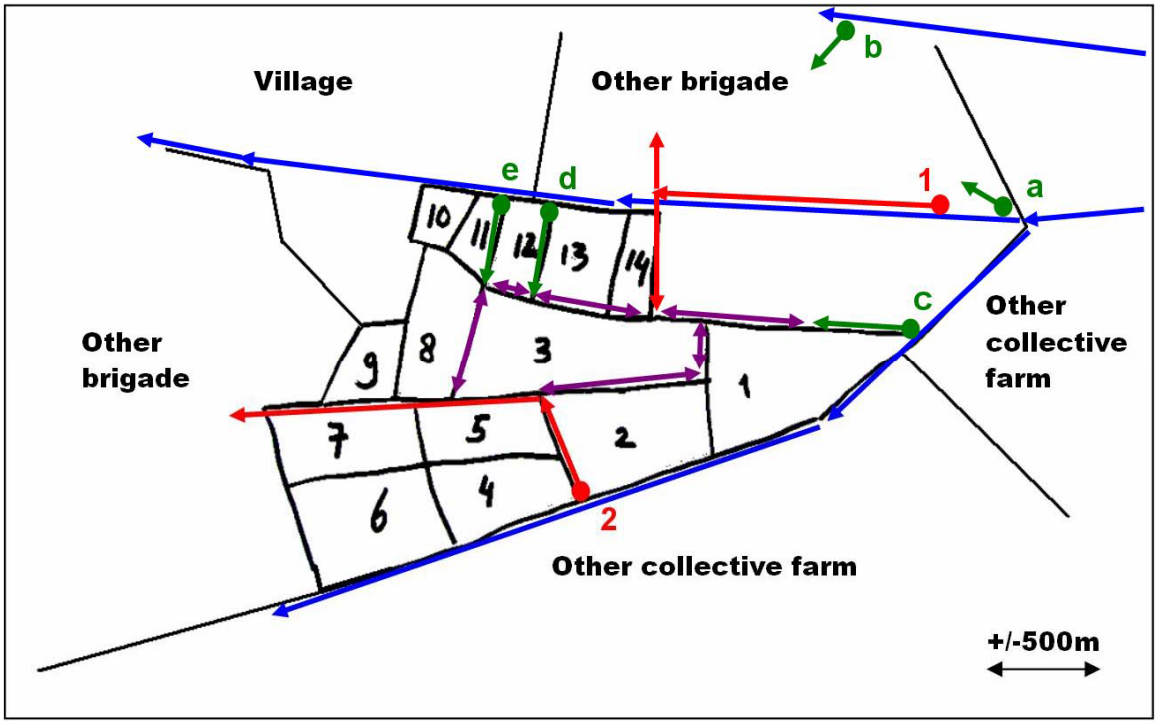

Figure 7.1 – A network of ditches in a brigade with 14 fields in Karmish WUA
The (handwritten) black numbers (1/14) refer to fields, as listed in table 7.1. The blue arrows represent the main canal system. The red and green balls signify off-takes from the main canals. The green balls (marked a/e) are gravity off-takes, the red ones (marked 1 and 2) are pumped off-takes. The red arrows stand for ditches flowing with pumped water and the green ones ditches with gravity water. The purple lines with arrows on both sides are ditches that flow in both directions, sometimes with pumped water, sometimes with gravity water and sometimes with a mix of the two.

Field	Owner/user	Use/crop	Area (ha)
1	Shirkat	Cotton	13
2	Fermer	Maize + rice + cotton	12
3	Tamorka	Double cropped with wheat and rice	12
4	Shirkat	First wheat, then rice for pudrats	8
5	Shirkat	Cotton	8½
6	Shirkat	Fallow	10
7	Shirkat	Cotton	8½
8	Fermer	2 ha rice, 3 ha cotton, 1 ha wheat	6
9	Fermer	Cattle feed	3
10	3 Fermers	Mulberry for silk	1
11	Housing + gardens	Various	unknown
12	Shirkat	Cotton	3
13	Shirkat share cropping	Rice	4½
14	Shirkat + tamorka	Various	9

Table 7.1 – The fields of a brigade in Khorezm Shirkat (later Karmish WUA), their ownership, land use and size during the summer of 2005

In some areas, the gravity flows and the pumped flows were disconnected from each other, thus creating two ditch-networks that overlapped each other. The water level in the pumped ditch network was independent of the water level in the main canal system, while the water level in the gravity-fed ditch network was largely determined by the water level in the main canals. The latter depended on the discharges in the main canals and was sometimes influenced by making obstructions in the main canal. The height difference between the two networks was typically about 20–100 cm. Some of the high fields could never be irrigated with gravity water, as the water level would never be high enough to flow onto these fields. Many fields could be irrigated by gravity water when the water availability (and water level) in the main canals was high, but could not be irrigated in this way when the water levels were low. Pumped water was kept separate from gravity water in order to maintain the gained height. This created situations as depicted in figure 7.2, where irrigation ditches cross each other. Van den Dries (2002), for cases in Portugal also describes crossing irrigation ditches for keeping apart different streams of water. In those cases they signal differences in ownership of developed sources of water. The crossing ditches observed in Khorezm have nothing to do with ownership or water rights, but are (historic) expressions of practical solutions to problems with water levels and field levels under collective management.

Figure 7.2 – Crossing ditches; one with pumped water and one with gravity water

7.3.2. Irrigation scheduling

Many fields could be reached by both networks. The decisions about which fields were to be irrigated from which ditch and in which order the fields were to be irrigated were made by the *brigadir*, who was responsible for the agricultural production in one brigade[109]. The ground for decision-making was essentially production maximisation within the brigade. The implication of this was that mainly practical considerations informed the decisions. For instance there were small differences in height between the fields and the highest fields could often only be reached by pumped water. Therefore these fields were irrigated with pumped water and the lower fields by gravity water.

Not all fields were irrigated simultaneously; the irrigation turn rotated within the brigade. There were no fixed irrigation schedules, but there was an order in which the fields would normally be irrigated. Again this was connected to the topography of the area; irrigation started at the highest fields and ended with the lowest. This order was maintained with the idea to create a downward flow that would wash out the salts with the drainage water.

All fields within the brigade were used for state production and were managed by the *brigadir*. The *brigadir* decided which field got water from where and at what moment – water distribution at the brigade level followed the optimisation of production at that level. There was a single water user and the scale of management was different. As a result, water distribution between fields was primarily a practical issue and not subject to contestation between different users.

Also when *fermers* started to have 10-20% of the land within the LFEs the *brigadir* still was the primary water manager, the one who decided on the rotational schedule within the brigade. The actual tillers of the fields, the *pudrats*, were told when to irrigate their field. The following fragment from my field notes is exemplary for how *brigadirs* experienced their role in water distribution.

> GJV: Do you decide or do the *pudrats* decide when to irrigate? [*Brigadir*]: I decide. GJV: is there anybody you ask for advice? [*Brigadir*]: no, [I decide] just by myself, maybe with some other *brigadirs* I consult (field notes 12/08/2005).

Since independence (privatised) *fermers* have been allotted lands within the area of the LFEs. Their fields were enclaves in the middle of collective farms. These *fermers* were dependent on the irrigation schedule as operated by the collective farm. They had to agree with the *brigadir* on when they could irrigate their fields.

> I asked [the *brigadir*] how *fermers* get their water. [The *brigadir*] explained: *fermers* have to request water from me and then I tell the pump operator to turn on the pump. *Fermers* have to pay for the electricity to the *Shirkat*. However, most *fermers* get the water straight from the canal and are not dependent on the pump (field notes 27/06/2005).

[109] The brigade, as used here, is a spatial unit that typically covers about 100– 150 ha of cultivable land divided over 10– 20 fields. However, it used to refer (and still does to some extent) to a labour and production organisation. Members of a collective farm were part of a 'work brigade,' which, headed by a brigadir, had the responsibility for a cropping area.

7.3.3. Flexible connections

The two ditch networks were (or could be) connected at a number of places. These were often just temporary earthen connections in which a few shovels of earth and mud were taken away or put back. Water from the pumped network could thus be let into the gravity network, which was done if the gravity network did not supply enough water. Also the connections from the ditches to the fields were typically of the earthen type, i.e. they appeared and disappeared by moving a few shovels of soil. Also reversing the flow direction in irrigation ditches is an example of the flexibility and pragmatic management of water that existed at the level of the brigade.

Figure 7.3 shows a place where such a connection is made. The ditch marked with the dotted line is an ongoing, gravity fed irrigation ditch. The connection that is close to the place from where the picture was taken, flows through a pipe underneath the road and can supply water from a ditch with pumped water. This connection was only incidentally used. The outflow on the other side of the ditch connected to a drain. It was used as an emergency outlet for in case to much water would be coming this way. Furthermore the water in that drain was further downstream sometimes utilised for irrigating a paddy field.

The following quotation from my field notes illustrates how flexible both farmers and water managers dealt with the construction of irrigation ditches and off-takes to fields. Together with two fellow researchers we arrived at a cotton field that was in the process of being irrigated. Besides the *fermer* there were workers of the WUA and a worker of the MCM present at the field.

> The *fermer* came with us to show the intake of water. He dug a small ditch right through a road. [Fellow researcher]: Do you always take your water like this? *Fermer*: Normally I take from the ditch that flows here along the field, but it has not been properly maintained before it was handed over to me and I haven't had the time yet to clean it. This is the best entry point to irrigate this field, as it is the highest point; from here it flows to the rest of the field[110].

[110] Field notes 24/07/2006

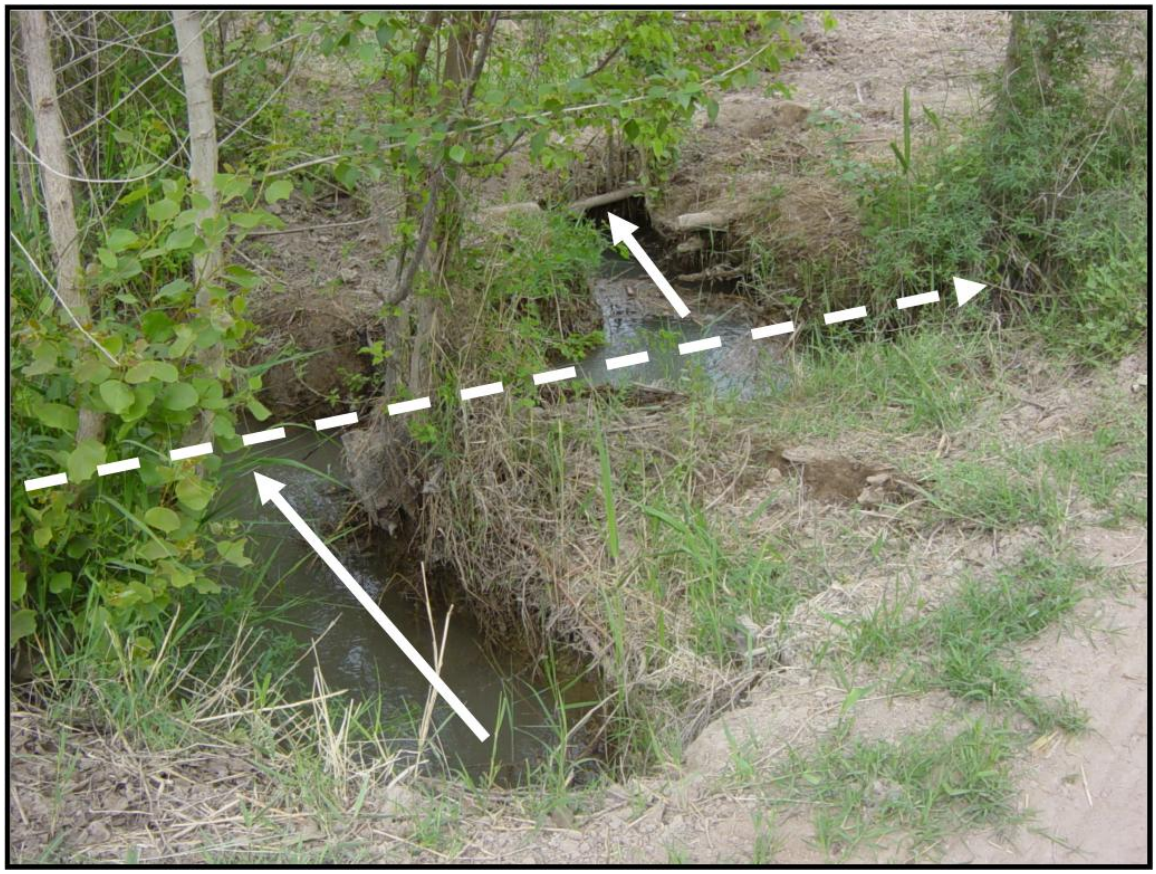

Figure 7.3 – Flexible connection in the ditch network

7.3.4. Measurements

Within the LFEs, water distribution was not accounted, i.e. the water delivery to fields was not measured. Therefore water measuring structures were never constructed for use at LFE, brigade or field level. Knowledge on where water was needed at what moment was not put down in schedules, but rather vested in persons through practical experience. The detailed system of state norms for water application to different crops, which was used for allocating water to the different LFEs, is not used within the LFEs. A *Mirab* confirmed this in the following way:

> The crop norms are only used for outside, that is: getting the right amount of water to the *Shirkat*. Within the *Shirkat* they don't play a role. Within the *Shirkat* people simply request water and then get it[111].

The last remark conveys both the message that water distribution in the LFE was quite unproblematic and that water distribution followed requests rather than a pre-determined schedule. Water demand (and application) at field level followed crop-physiological characteristics and rules of thumb. In cotton the colour and shape of the leaves, as well as the distance between the side branches was used as an indication for the soil humidity and irrigation requirement. During an irrigation turn the water was not measured. Rather rules of

[111] Field notes 9/6/2005

thumb were indicative for the amount to be applied, e.g. 'the water needs to reach the end of the furrow before closing the flow', or 'the furrow needs to be filled completely, but the water should not touch the stem of the cotton plants'.

Only at the point of hand-over from main system level (District Canals) to the LFEs water measuring devices were constructed. Water was measured at these outlets and was used for determining whether LFEs had remained within their assigned limits. LFEs were fined on the basis of this information. However, neither these fines (at the end of the season) nor the water delivery during the season fully depended on the measurements. Water distribution and the fining procedure were also very much connected to relations between the *Raís* (head of the collective farm) and the Department of Agriculture.

7.3.5. Concluding remarks

The pattern of water distribution as set out by the state was not seriously contested by its users, as contesting water distribution (technology) implied that one also contested the state. That is: the water distribution was firmly linked to an extremely stable governance system and as such forms a robust chain. Irrigation technology was employed for mainly technical and managerial control.

The relative abundant availability of water and the nature of state-controlled collective farming meant that competition between brigades was minimal. By supplying enormous amounts of water the task of distribution was eased. This solution, however, led to other problems; in the first place to quickly rising ground water levels (water logging) and salinization of the soil. The construction of a large drainage system and the operation and maintenance thereof were needed to address these problems. Secondly, the over-supply of water in Khorezm aggravated problems further downstream along the Amu Darya. The Aral Sea was in the first place sacrificed for the production of cotton, but its quick drop was also caused by over-irrigation at a large scale. Thus the costs of distributing water were externalised.

The stability of the Khorezmian system did not so much built on institutionalised arrangements between users and irrigation objects. Neither was the physical system cast into concrete. Rather the political control system provided top-down stability under which strict control over the water distribution system was not necessary to bring about compliance. People were kept obedient citizens in other ways. Together with relative water abundance this kept the social forces minimal and the technological system stable without using it to enforce control.

7.4. Moving towards privatisation

Also in 2007 the irrigation and drainage technology of Khorezm still reflects the logic of the Soviet state and its organisation of agriculture. As the physical technological layout is quite inert it did not (immediately) adapt to the new situation of de-collectivised agriculture. Being developed to match a situation of strong state control and collective agriculture now, in order to remain stable, the inherited technological set-up seems to require the continuation of a strong state and weak private interests of users.

It is important to assess how changes in the organisation of agricultural production and state control, as described in the preceding chapters, will affect the (operation of the) irrigation technology. The introduction of market principles and land distribution along

household lines has strongly increased the forces of private benefits. This brings in new forces into the process of the shaping of technology. The political control seems to remain tight as ever, also in agricultural planning. Still, the individualisation of production increases the forces of competition through introducing personal risks and benefits. Does the technological system then still fulfil the demands of actors that are able to mobilise their influence, are users going to open the black box, and does this indeed imply that they contest the state in its control? How do people deal with that sensitive issue?

With the wide-scale implementation of the new framework, in which *fermers* have become the main agricultural enterprises and WUAs the water supplying organisations, new forces are introduced that influence the shaping the irrigation technology. This process is described and analysed in the first sub-section (7.4.1). In response the state also takes measures that affect the irrigation technology. This is the subject of the second sub-section (7.4.2).

During the fieldwork period the studied processes were still in a very early phase. They were purely studied in a qualitative manner. The result is an understanding of some of the mechanisms at work, i.e. they are processes that are possible in this new situation. It has not been possible to quantify these processes. However, the studied situations give a good indication of the direction of development and how this is dealt with by both *fermers* and the state.

7.4.1. Re-appropriation of irrigation technology by *fermers*

Above it has been discussed that at the level of the former brigade two overlapping ditch-networks exist. What used to be pragmatic management between pumped water and gravity water is re-interpreted in the current situation. *Fermers* themselves have to pay for the electricity used in pumping the water from the main canal into the ditch. The running costs for gravity ditches are much lower, but their water provision is less secure in case of droughts; due to low water levels in the main canals the water does not always run by itself. In that case pumps can still lift the water into the ditch. *Fermers* prefer to have access to both sources; they want to use gravity water when possible, but want access to pumped water to guarantee access in times of low water levels in the canals (see Box 7.1).

> [Son of *fermer*]: Our fields are relatively low and therefore we can take water by *ayak suv* [gravity]. In that case you can plant rice, if you need to use a pump it becomes too expensive to plant rice. For 24 hrs of pumping you pay 70-80,000 soum [this is between 1.6 and 2.3 soum/m3]. Those people have enough water for cotton and wheat, but not enough to plant rice. (…) Also in summer the electricity gets shut down to prevent people from using the pumps. GJV: Who shuts of the electricity? [Son of *fermer*]: There are these water organisations. If there is water needed in the last kolkhozes the head of the water organisation calls to the head of the electricity organisation and he then shuts down the electricity for maybe 5 hours. GJV: Do they shut down electricity for those pumps or for the whole Rayon? [Son of *fermer*]: Not for the whole Rayon, just for the areas upstream. From this point upstream there are 20 pumps in the canal, so if they don't work the water will come to the downstream end. In the upstream they cannot take water during those periods so they sometimes just don't have water.
>
> (Field notes 30/05/2006)

Box 7.1 – The costs of pumping

The relation between gravity and lift irrigation is not new; also in the collective farming era this situation existed. The difference is that *fermers* personally carry the risks and benefits of agricultural production. Therefore the push for both risk aversion and profit maximisation is

much greater than under collective production[112]. In various situations *fermers* were observed to invest in new infrastructure to guarantee cheap and reliable access to irrigation water. This included both the construction of new (gravity-fed) ditches as well as the purchase of private pumps.

Most of the government and WUA owned pumps are now electric pumps, which compared to diesel pumps, are cheaper to run, easier in maintenance and relatively easy to meter. However, when *fermers* buy pumps they generally choose diesel pumps, as they do not depend on the availability of electricity and are easier to move around. WUAs and state managers try to limit water consumption in certain areas by switching off the electricity for whole branches of districts. The use of diesel pumps circumvents this central control strategy. Moreover these diesel pumps can be placed anywhere. This also provides the opportunity to rent out the pumps to other people (see Box 7.2).

GJV: Does this [wheat] field get water from the same place as your tamorka field? [*Fermer*]: Yes, but it is very difficult to get water here. This big field is full with tamorka plots that need water and on the opposite side of the road there is another 6 ha field of tamorka's. Therefore it is difficult to get the water here. (…) [*Fermer*]: This is [almost 2 ha] of wheat. Right in front of the house I have [just over 3] ha of cotton […]. [*Fermer*]: This year I irrigated this wheat field only once and it cost me 60,000 soum. GJV: Why, to whom did you pay this? [*Fermer*]: To the tractor driver, for pumping. GJV: With a mobile pump? [*Fermer*]: Yes. GJV: At what canal do you put it then? [*Fermer*]: […]. GJV: But that is very far from here. [*Fermer*]: Yes, 1.5 km. GJV: And you make the water go through all the [irrigation ditches] between there and here? [*Fermer*]: Yes. GJV: And nobody takes this water on the way to here? [*Fermer*]: No, I make sure they don't take. GJV: And do you also pay to the WUA for water? [*Fermer*]: Yes, 49,000 for the whole area. GJV: And you have to pay this even though the WUA cannot supply you with water? [*Fermer*]: Yes. […] [*Fermer*]: We get diesel from the state to do the works on our fields, but it is not enough. There are 4 main periods of activities, but after the second one our diesel is finished. We certainly don't have enough diesel for pumping all the water to our fields, but sometimes we also use the mobile pump to irrigate the cotton field. It costs 4,000 soum/hr plus the diesel. Luckily the cotton doesn't need a lot of water. But because the pumping is so expensive we cannot afford to grow rice just by pumped water. Rice needs water every third day. GJV: Is it not more profitable to buy your own pump? [*Fermer*]: Yes, but at the moment I don't have the money for it. Once my farm starts making more profit I will certainly buy my own pump.

(Field notes 16/06/2006)

Box 7.2 – Quote from an interview with a *fermer* on the use of mobile pumps

Other investments that are done by *fermers* include the maintenance of drains and canals that officially have to be maintained by the WUAs. In an interview a *fermer* explained that he invested 400,000 soum (about 400US$) in the cleaning of the drains around his cotton fields, as he was confident the salinization caused by not cleaning the drains would reduce his cotton yield with a value possibly ten times as high. At first he wanted the WUA to take care of this maintenance, but upon finding their excavator broken and their budgets empty he decided to provide the money for hiring an excavator himself[113].

This case illustrates that the privatisation of risks and benefits has created shorter feed-back loops from opportunities at field level. *Fermers* signal opportunities for investments if they see risks and/or benefits that could affect their yield. At first they will try to get the government to invest, but if the government fails to do so, the concern is high

[112] Risk aversion and profit maximisation are often considered contradictory strategies. Here it is just stressed that they are both responses to the privatisation of risks and benefits. Usually at first the increased private risk is dealt with and only later the opportunities of the increased benefits are explored.

[113] Field notes 7/4/2006

enough, and the *fermer* has money to invest, eventually *fermers* invest themselves. It is clear that the mechanism is there, though it is not known on what scale it is currently affecting maintenance practices in Khorezm. It can be assumed that such investments are also connected to the socio-political situation of the *fermer* and his assessment to the chances that he will personally reap the benefits of the investment.

There is also the mechanism that rich/important people are expected to take responsibility for public interest, to show off their richness and use it for the benefit of the community. In this example the action could simultaneously fulfil this role, but the *fermer* explicitly presented the investment as economic rationale for personal benefit.

Individual investments in land/water management are also made where it concerns the cropping of cotton and rice next to each other. The crops are only allowed to be grown next to each other if there is a drain in between, as otherwise the high groundwater table under the rice field might negatively affect the cotton yield. Especially middle sized *fermers*, who often only have one or two fields, dig in-field drains to split-off part of a large field as separate water management units to be used for rice cultivation.

The investments in land and water by individual *fermers* in the first place aim at direct economic benefit for the *fermer*. These investments are responses to inefficiencies that existed under the state/collective production system. Only with the privatisation of risks and benefits through the establishment of *fermer* enterprises these incentives have started to gain weight. It is striking that they are all short-term investments. Longer term investments into land development and soil fertility are limited, possibly insecure land tenure arrangements are of influence on this. An exception is the investment in private pumps, which in general only pays off after a few years. The important difference is that these investments remain mobile; i.e. they are not inextricably connected to a field and therefore are less susceptible to (state) capture.

Furthermore the development of gravity off-takes and the purchase of diesel pumps represent attempts to circumvent state control over water through its control over electricity. Therefore it can also be understood as contestation of state control. Still the state is firmly in control over the socio-political domain. However, as individual control in the technological/ material dimension is slowly increasing some people start to challenge the overall state control.

In a number of cases around the world it has been shown that both labour and capital investments form the basis for water rights[114]. Thus it could be hypothesised that investments in the maintenance and/or development of water infrastructure will influence the water rights system. In the Khorezmian case *fermers* who invest in maintenance of a canal, irrigation ditch, or pump, would claim to have the first right to water. Thus far such patterns were, however, not yet observed. It should be realised that the Uzbek society is not so much regulated by rights and the rule of law, but rather follows clientelistic patterns. However, the rich, well-connected *fermers* are the ones currently investing, and thus patterns of investment will to a great extent overlap the patterns of the socio-political network.

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[114] This is referred to as hydraulic property. Gerbrandy and Hoogendam (1996), in an article about hydraulic property in two irrigation systems in Bolivia, analyse that the essential element of hydraulic property "is the relations among people that arise from people's relations to these objects. The investment process entails not only creating people-object relations but also creating relations between the actors/investors. Hence, during the investment process, the relative position of individuals with respect to property objects and the use of these objects are defined, and thereby the position of each investor relative to the others are defined. These relations are called property relations."

7.4.2. State implementation of a new control framework

Due to the agrarian reforms a situation has arisen where the rationale of the existing irrigation technology (strong state control, collective agriculture) and the rationale of agricultural production (privatisation) are no longer well matched. The Uzbek government is seeking ways to deal with this. A path of development seriously explored is the introduction of 'water pricing'. This would be a package in which water delivery up to field level will be measured, combined with adapted institutional arrangements for water allocation and (volumetric) pricing as a means of cost recovery. In this chapter it is discussed as a technological change, as there would be huge implications for the division and measurement of water. The introduction would radically affect the infrastructure. Besides there are of course also institutional implications integrated with this.

The agrarian reform processes that have been implemented before are consistently framed in neo-liberal terminology and policy models. For the land reform process and the establishment of Water Users Associations it has been shown before that the Uzbek practice differs significantly from how these policy models internationally are understood[115]. In line with the neo-liberal policy direction the Uzbek government in 2006 started talking about introducing (volumetric) water pricing. In every province two WUAs were appointed as pilot cases. In the two pilots of Khorezm province the policy change largely remained rhetoric. The state realises that if volumetric pricing is to be introduced on individual basis water delivery measurements must be done at each field, or at least at each 'block' of fields. State water managers envisage that 'hydroposts' (water measurement devices) will be installed in the form of parabolic-shaped canal stretches that function as flumes. With a correctly functioning flume only measurement of the water level just upstream of the structure is necessary to accurately determine the discharge (see box 7.3 and figure 7.4).

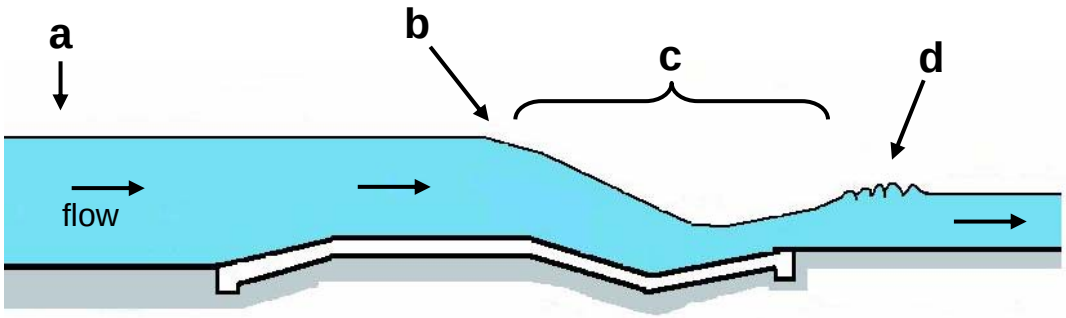
At a few places such hydroposts are already installed. The construction is co-ordinated and supervised by the *Tezim*. The costs were estimated by various WUA and *Tezim* workers to be 80– 100 US$, and are to be covered by the *fermers*. The responsible people in the *Tezims* have very limited knowledge on how these structures technically work. Within the WUAs this knowledge is even far more limited. As a result the hydroposts are frequently constructed in such a way that they do not cause a hydraulic jump to occur. The result is that a single water height measurement upstream of the structure does not longer suffice – either the velocity of the water or the water height downstream of the structure need to be measured as well.

[115] For the process of land reforms see Trevisani (forthcoming), for the process of WUA establishment see Chapter 6 and Yalcin and Mollinga (2007b).

A flume is a stretch of canal that is constructed in such a way that the velocity of the water flow increases. The velocity should reach a speed that is higher than the speed by which waves are transported through water; i.e. it passes through the state of 'critical flow' to 'super critical flow'. In a cross-cut this would be visible as a decrease in water level, while the total discharge remains the same. After the flume the velocity of the water is reduced again resulting in a water jump, which is visible as highly turbulent water.

As long as there is super-critical flow in the flume, recognisable by the water jump afterwards, the discharge through the flume is only a function of the water level in front of it. The function can be plotted in a graph (*Q-h curve* or *rating curve*) or put in a table. Once a Q-h curve is available the discharge can be found by reading it from the curve at the water level that is read from the staff gauge.

In the sketch below the following things are indicated:
a) the place for measuring the water level, for instance by use of a staff gauge;
b) increasing velocity and decreasing water level,
c) critical flow occurs somewhere in this stretch, and
d) an hydraulic jump.



Box 7.3 – The functioning of a flume

Figure 7.5 – Two hydroposts in Khorezm
The picture on the right shows one that functions as a real flume, with a staff gauge ('a'), a decreasing water level (at 'b'), critical flow (in stretch 'c'), and an hydraulic jump (at point 'd'). The picture on the left shows one of the concrete canal stretches that has been installed to measure water delivery to individual *fermers*.

In one interview it was suggested to use the floating method to determine the velocity. Practically this mean dropping a floating object in the canal and clocking the time needed to travel a known distance. In this case the known distance would be the length of the concrete canal stretch. Then the stretch would not be used as a flume, but merely as controlled canal stretch (see Box 7.5). Technically this could solve the problem, but the problems are larger, as volumetric water pricing also requires much greater managerial attendance.

In a controlled, or relatively stable, canal stretch the discharge (Q) is a function of the water level (h) and the velocity of the water (V). Q = C * V * h, in which C is a correction factor.
In the floating method the velocity is determined by letting an object float in the water over a measured distance (e.g. 10 m). The time it takes to cover this is distance is clocked by using a stopwatch. The average velocity is calculated (distance/time). By using a correction factor to compensate for the velocity not being equal throughout the profile and multiplying it with the h and the average width, the discharge is calculated.

Box 7.5 – The floating method

To determine the water use by a *fermer*, both the application time and the average discharge need to determined. This requires frequent observations by a fieldworker – both to determine the start- and end-time as well as the fluctuating discharge. Typically this work will have to be done by the water guards of the WUAs. In the previous chapter it has already

been discussed that many water guards are not actively controlling water division in their areas. The requirement to quantify all the discharges and keep detailed water accounts would mean a tremendous increase in work load for the water guards, especially if this would have to be done through the labour intensive floating method.

Water pricing can be implemented in a variety of ways and with a variety of objectives[116]. Thus far, the Uzbek government has been stressing the option of volumetric water pricing, with the main objective to improve efficiencies. Water pricing that is done in this way is a technology that presupposes a very different managerial and socio-economic system than the current Uzbek system. As argued in Chapter 5, the drives behind water distribution process are diverse and closely linked to the three modes of production. Moreover, water is not distributed without respect of person; rather the contrary: some people get water much easier than others. The distribution system is obscure and personalised. Water distribution is connected to established political stakes and benefits. Rules apply differently for different people and different production processes. It is not likely that the volumetric pricing of water can become a transparent guiding principle in the division of water[117].

It is well possible that the Uzbek government will change its mind to an area based system of water charging with cost recovery as the main aim. This would mean a simple elaboration of the system by which WUAs are already expected to cover their costs. Still it is possible that the volumetric water pricing will be pushed through. The requirement of water guards continuously going round and accurately keeping a water administration would certainly increase the hold on water flows within the WUAs. Even if discharges are not quantified through measurements, but through estimates by the water guards the system could lead to a significant increase of efficiencies; if not as a response to the water price, then at least through reduction of careless wastage by an increased attendance.

7.5. Conclusion and outlook

In this chapter Khorezmian irrigation and drainage technology was looked at; both its development history and its current use. First the system was analysed in the context of its development history. The irrigation technology of the old (Soviet) agricultural production system is geared at large-scale, collective agriculture with strong, uncontested central management. In the early post-Independence period this changed only little. For users it would have been very easy to manipulate the irrigation hardware for personal benefit, but users did not pursue this because of other (socio-political) reasons. Water control mainly took place through socio-political control of the command economic system (see figure 7.5a). The technology development process is an essentially different from what has been described for other systems around the world, yet it clearly reflects the socio-political context in which it was developed.

As a second step it was analysed how the demands on the technology have changed under the agrarian change process that has taken place since the collapse of the Soviet-

[116] See for instance DFID (2004).

[117] This fundamental discussion leaves the question aside whether charging the real costs of water would influence the distribution of water. There are various studies that show that the marginal costs of an extra cubic meter of water are less than the marginal benefit of that cubic meter (Molle and Berkoff, 2007). Through a modelling exercise, Bobojanov (forthcoming) shows that also for Khorezm this holds true.

Union. The recent reforms that aim at privatisation of risk and benefits of agricultural production have led to the strengthening of mechanism of optimisation at farm enterprise (household) level. This includes the drive among farmers to secure their access to water (see figure 7.5b). Both the Soviet-time hardware and the Soviet-time mechanisms of indirect socio-political control through the command economy have largely remained in place, though the latter have been re-regulated. In their attempt to secure access to water, local actors (especially *fermers*) have started to redefine/redesign socio-technical relations. As a result practices are emerging that could counter the (economic) inefficiencies of the system. This is for instance apparent in the investments being done by farmers on the maintenance of drains and optimising the use of water supplied by gravity and the use of pumps. The current situation is a fragile balance between forces of remaining state control and privatized forces seeking individual benefit through securing access.

Thirdly it was analysed how the government responds to the arisen situation of misfit between irrigation technology and the agricultural production system. It is unclear in what direction the government's response will develop, as within the government there are both forces pushing further reform and forces that want to strengthen state control. The experiments with water pricing taking place, and its foreseen country-wide introduction in 2008 or 2009, indicate that there is a good chance government will further increase its control within the WUA. The technology and procedures needed for introducing volumetric water pricing imply a system of very firm checks and controls. In combinations with possibilities to go around very strict rules highly depending on the person this means that for the poor there will be new restrictions, while the rich and well-connected will probably find ways to get around them.

The years 2005 and 2006 have been relatively water abundant years. If a drought year would come it can be expected that it leads to acute problems, exposing the misfit between irrigation technology and a privatized agricultural sector as well as the non- or under-developed institutions regarding water distribution at the WUA level. Such an event could be dramatic, but might be necessary to create clarity among *fermers* and the government regarding the impact the privatization of agriculture will eventually have on the organization of water distribution processes.

If within the WUAs local processes of governance are to be given a chance to develop, they would be served better by a technological change that would give them insight in allocation, scheduling and delivery of water rather than the volumetric water pricing system that is currently pilot-tested. Possibilities for this are proportional division methods and time-based allocations[118]. Such a technological change should not just be a change in hardware, but even more a local process of making rules and deciding on procedures. Just providing insight on where the water actually flows does certainly not guarantee that excluded people get empowered, but it would provide a basis for opposing unequal distributions.

[118] The International Water Management Institute has summarised its experiences with such approaches in Abdullaev et al. (1999 and 2004)

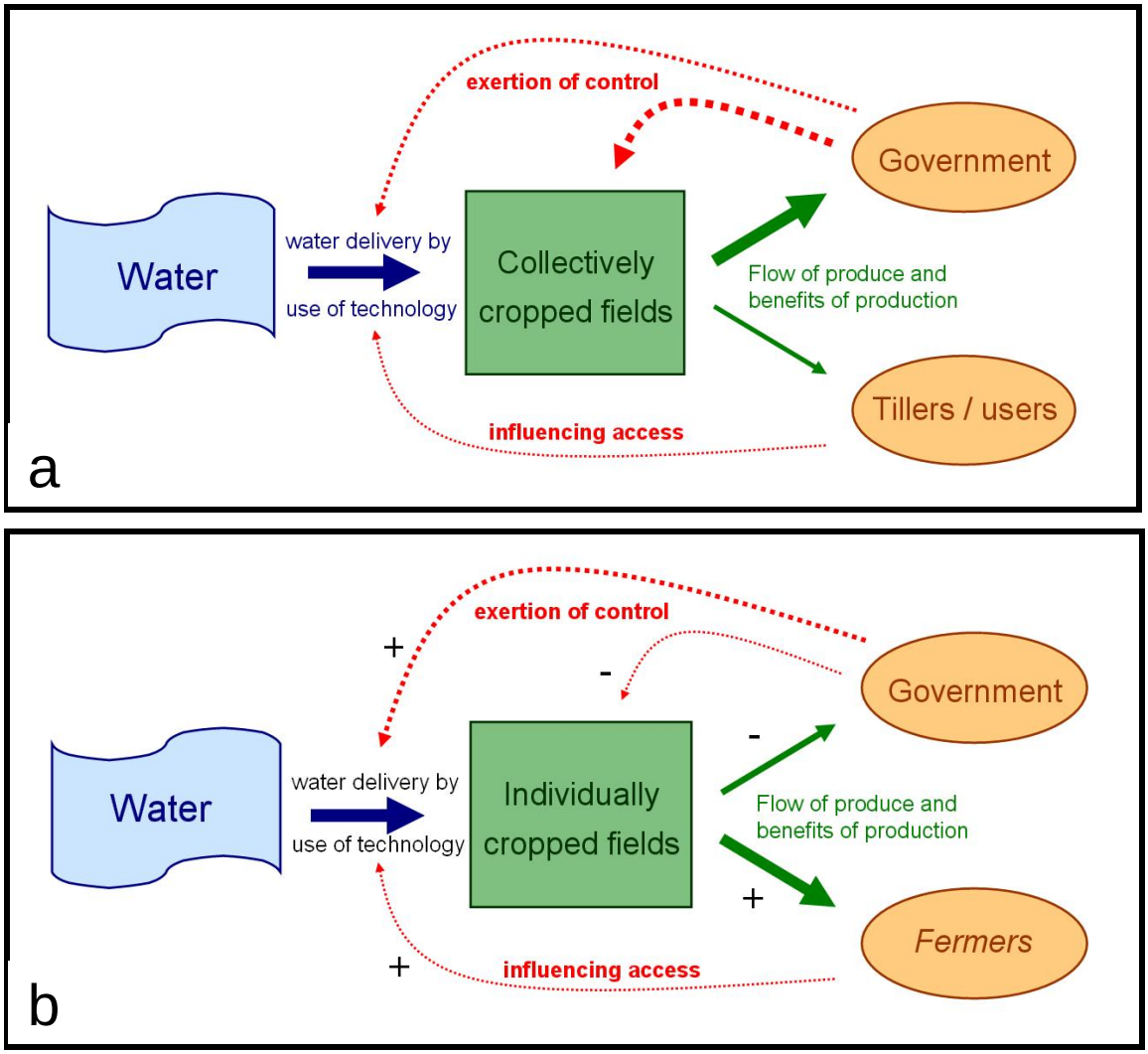


Figure 7.6 – Comparison of the state regulations and influencing of irrigation technology by its users
Schematic 'a' represents the situations from the Soviet period till the latest round of land reforms in 2005. Schematic 'b' represents the situation as encountered during the field research in 2005-2006.
The thick arrows symbolise the flow of resources and benefits, while the (red) dotted lines symbolise socio-political mechanisms of influencing the distribution of these resources and benefits. The thickness of the arrows symbolises the relative volume of importance of the flow or mechanism. The 'plusses' and 'minuses' in schematic 'b' indicate an increased or reduced importance of the mechanism as compared to the situation in schematic 'a'.

Chapter 8

Conclusions

8.1. Introduction

This study is about the organisation of agricultural production and the distribution of water for agriculture in the post-soviet context of a slowly reforming authoritarian regime. The current situation is characterised by reforms that echo the sound of privatisation and neo-liberal reform, while in practice central planning and state control have shown to be persistent, though not unchanging. Reforms in land and water management are presented by the state as de-regulation, but in practice it is rather a re-regulation. By moving from collective farming to household-based *fermer* enterprises, the role for the individual in agricultural production has become larger. Households have become subject to increased risks and benefits associated with more individualised agricultural production. Meanwhile the state has re-arranged its control over agricultural production by strictly controlling cropping patterns, by ordering *fermers* to produce cotton and wheat to be sold for a fixed price to the state and by actively monitoring and interfering with agricultural management at field level.

The question addressed in this study is how these reforms that comprise both continuity and change, affect the distribution of water. In order to give a satisfactory answer to that question first the content of the reforms was studied as well as their effects on the wider regulatory system of agricultural production. Furthermore, water distribution processes are shaped by the availability of water, by water requirements at field level and by the spatial and technological characteristics of the irrigation and drainage network. These aspects form an integral part of this study.

8.2. Transition and socio-economic differentiation

The transformation of agricultural production systems in Uzbekistan is a step-by-step process, which is closely orchestrated by the state in order not to let the developments get out of control. In order to assess the influence of these reforms on water distribution processes we first need to understand what these reforms entailed, what they aimed for and what in general terms their effects have been. It seems attractive to interpret the developments in Uzbekistan on a linear scale from a communist plan economy to a liberal market economy. There is international (economic and political) pressure on Uzbekistan to develop in the direction of a market economy and liberal democracy. The de-collectivisation through land reform, the reduced regulation of state planning in agricultural production, the liberalisation of some markets and the establishment of Water Users Associations (WUAs) could then suggest that Uzbekistan is moving along that line in the direction of a liberal market economy. Certainly Uzbekistan has left behind its communist ideology and economic system and it has adopted some aspects of what can be called a liberal market economy. It seems, however, that the government of Uzbekistan has a different development model in mind. This development model borrows both from state planning and market economy models, in such a way that state control is maintained and at the same time productivity and efficiency are increased. It shows that moving away from a state-socialist economy and governance system is not by definition a transformation into a market economy and a liberal democracy. The transformations have been gradual and continuous. Fifteen years after independence Uzbekistan has its own system of governance and its own economic system. There are various similarities with how things were organised in the Soviet period, yet these

elements are embedded in new relations. Uzbekistan is walking its own path of development. Its current system cannot simply be defined in relation to the Soviet and capitalist systems. Though it is difficult to discover the aims and intentions of the state and the groupings within it, the effects of the chosen path are becoming clear. The creation of two types of farming enterprises (*fermers* and *dekhans*) gives away that the agrarian reforms aimed at the establishment of large scale agriculture operated by a minority. The de-collectivisation created agricultural producers at the scale of the household that were subject to individual risks and benefits. These risks and benefits worked as incentives for increasing productivity and efficiency. The de-collectivisation process also had the effect that only 5-10%[119] of the rural households (the *fermers*) got control over 70-80% of the arable land. The majority of households (the *dekhans*, about 90-95% of all rural households) only got small plots on which they produce primarily for home consumption. Production on this land does not constitute a suitable business model that a rural household on which a rural household can base a sustainable livelihood. The reforms implemented imply that the majority of rural people (the *dekhans*) cannot make a living purely on their own land. They either have to find employment with *fermers* or outside of agriculture. Many *dekhans* work on the fields of *fermers*. The relations between *fermers* and *dekhans* are developing in the direction of strong patron-client networks that built upon mutual dependencies. The terms of trade within such relations are ill defined, which is often to the detriment of the weaker party. The dissolution of the Large Farm Enterprises (LFEs) and the establishment of other forms of enterprises has created two distinct categories of rural households; those who control areas of land that could make for a viable enterprise and those who only have small plots that can barely provide enough to feed a household. Beside this economic differentiation also a socio-political differentiation is taken shape. In various settings *fermers* meet with each other and with state authorities. These meetings are important arenas for sharing information and building networks. It can be expected that this strengthens the development of a joint norms and value system that contributes to *fermers* becoming a social class. *Dekhans* are excluded from these arenas and networks. The way in which land has been distributed among the rural population (a small group of households manages the major part of the land) in combination with the centralised control over agricultural production (creating arenas for social interaction between *fermers* and between them and the state), has created fertile ground for growing socio-economic differentiation and the formation of class. This emerging process of socio-economic differentiation poses serious questions regarding the government's strategies regarding poverty and development.

8.3. The subsumption and dissociation of new agricultural enterprises

In the process of balancing control over agricultural production and loosening the leash some households and farming enterprises remain firmly subsumed in the wider system of production regulation, while others have dissociated from the system and increased their control over their own production and economic activities. *Dekhan* households that do not work for *fermers* are relatively furthest dissociated from the system, while medium sized cotton and wheat producing *fermers* strongly face the process of subsumption of both external and internal relations of production by the state bureaucratic regulation system. The very small (economically insignificant) and the very large (socio-politically powerful) have

[119] The exact numbers in the 4 case study WUAs varied between 6 and11%

moved somewhat outside this control system. When subsumption would be projected in a diagram against farm size it would result in an inverse U-shaped graph. This has parallels with what Rasanayagam (2002:55) in more general terms observed about enterprises in Uzbekistan: "there are no medium sized businesses in Uzbekistan, only large and small ones". In this context it is important to notice that actually most of the fermer enterprises are 'medium sized' enterprises. The state has intentionally created them with this size, and has so far kept them under strict control.

The current mechanisms of control are different from those under state socialism and collective farming. People who are now fermers were mostly middle cadre agricultural workers. Their freedom of doing business was zero, as no enterprises existed at that level. The creation of individual farms has put the individual entrepreneur (in this case the *fermer*) at the centre of the (agricultural) enterprise and consequently experiences more of the risk and benefits associated with their acts. But the *fermer*'s freedom of operation is limited by a wide range of control mechanisms, both in the political-administrative and economic spheres and through technological arrangements and restrictions. The fermer enterprise is at the centre of a web and surrounded by a range of links to the technological-administrative task environment (TATE). In the Uzbek case the TATE is to a large extend still the state – in a variety of manifestations (bank, agricultural service providers, processing industry, etc.). It seems that the state wants to remain firmly in control (of agricultural production) and yet overcome the inefficiencies associated with the state-socialist mode of operation in collective agriculture.

8.4. Water distribution and three forms of agricultural production

In this study agricultural production in Khorezm, Uzbekistan was found to consist of three coexisting forms of production. They are the state-ordered form of production (of cotton and wheat), the commercial form of production (of mainly rice and fodder) and the household form of production (of a variety of food products for home consumption). Each form of production has its specific organisation of inputs, labour, state control, distribution of benefits, and marketing. In the state-ordered form of production the fulfilling of quotas is the central objective. Production takes place on *fermer* land, but the role of the state in control over agricultural production is very strong. The commercial form of production is the main cash earner and source of investment capital for *fermers*. The areas used for rice cultivation are however strictly controlled by the state and allowances to grow are used as rewards. Through controlling this production process the state controls emerging agricultural entrepreneurship. And finally the household form of production fulfils the main role as provider of basic livelihoods and food security. It is in the state's interest to provide enough room for this as to control the social stability of the country, which indirectly influences the political stability.

One of the main findings of this study is that the three forms of agricultural production each have their own 'logic' as regards water management. This means that in each of these three forms of production water is acquired and managed in a different way. In case water is short each of the three forms of production has its own typical way of securing its access to water; state-ordered cotton *fermers* call on the state organisations, commercial rice *fermers* depend on their personal connections, and household production water users rely on local exchange mechanisms. The household production water users are politically 'untouchable' in a way as

household production provides for the basic livelihood security of the majority of the rural population.
The wider structures of regulation in agricultural production thus highly influence the social dynamics of the distribution of water at all levels, from field level up to system level. It is striking that the form of production for which the water is used has such a strong effect. This is because the forms of production are tied to specific socio-political structures and institutions. In case of state-ordered cotton these are strictly organised and expressed in formal rules and regulations. In the other two forms of production this is arranged more informally. These forms of production are highly influential through the (formal and informal) aligning with socio-political structures.

8.5. Governance structures and water abundance

Various governmental organisations are involved in agricultural water management of the irrigation and drainage network of Khorezm. The division of responsibilities is often unclear or in practice not adhered to. Their social interactions are not primarily defined by the official relations between the organisations, but often reflect historic patterns of governance. Especially the administrative branch (the *Hokimiyat*) in practice plays a much more important role then officially assigned. Their interference in the procedures of allocation, scheduling and delivery of water is politically driven and an articulation of the centralised governance model. This can be seen as a legacy of the Soviet period, which in contemporary Uzbekistan it is still firmly present.
The deterioration and possible collapse of maintenance and water distribution systems that is often described in existing literature about irrigation in Uzbekistan and Central Asia (see section 5.3), was not found to have dramatic proportions in Khorezm. Both the state of the infrastructure and the procedures to allocate, schedule and deliver water are sufficient for effective water management. Initial water allocations are made on basis of the official (centrally controlled) crop planning patterns in combination with crop water requirement calculations on the basis of average climate data. The allocated schedule is called 'the limit', but in practice it is not the maximum amount of water to be delivered. Water delivery from system level to the WUAs is measured and accounted, and at the end of the year over-use has to be paid for by the WUA. In day-to-day management 'the limit' only plays a minimal role. In practice discharges are adapted on the basis of feed-back information from the field; when WUAs request more water they usually get it. Delivery then follows competing requests for water, which are based on observations in the fields.
The relatively abundant availability of water in Khorezm (as shown in Chapter 5) eases the task of the government agencies to supply sufficient water to everybody. Water is here not so much a "limited resource" as it is often seen in the analysis of irrigated agriculture. This situation of limited social dynamic between irrigators is reinforced by both the historic trajectory of collective agriculture and the continuation of a political regime of a restrictive state with "obedient" citizens.
Not only are the dynamics between water users less clearly articulated, they also take different shapes. Instead of tail-enders suffering continuous water shortages, as it is seen elsewhere, in the tail-end areas of the Khorezmian irrigation network water excess and associated problems of water logging and salinization frequently occur next to periodic water shortages. A second difference in the form of dynamics between water users is the use of

technology. The history of collective agriculture under strict state control has left an irrigation network that is not cast into concrete, but enables flexible use and adaptation. The stability of the system was guaranteed by political force rather than sturdy technology. Partly this political force still consolidates water distribution, especially on the levels above the WUA. With the dissolving of the collective farms this control is partly falling away within the WUAs.

8.6. WUAs between farmers and the state

The newly established Water Users Associations (WUAs) are the arenas in which *fermers* enterprises and *dekhans* households have to share their irrigation water. WUAs have been established in place of the former collective farms with reference to the internationally heralded policy framework of self-management by farmers. The Uzbek government, international organisations and academics have all presented these new institutions as a solution for increasing water use efficiencies and improved participation of farmers in decision making. The WUA is presented as the bearer of democratic principles. In practice the Uzbek WUAs are state-managed organisations, or at least they are strictly controlled by the state. Among other things the WUAs fulfil important roles in the implementation of (state) control over water distribution and agricultural production. With the WUA the Uzbek state has not brought in a Trojan horse that once implemented rolled out its scheme of democratic transformation, as was maybe thought by the international water management community. In practice the Trojan horse turned-out to be an empty shell. Rather the Uzbek state has intelligently reinterpreted the WUA model to suit its own objectives of control over agricultural production. By using the same (or similar) terminology and formal structures as used internationally for WUAs the Uzbek government has been able to throw dust in the eyes of the international water management community.

WUAs are not only local bodies controlled by the state, they are also semi-autonomous bodies that aim to get enough water to the WUA and effectively distribute it among the farmers in their area. In this social arena WUAs aim at access control, while *fermers* (and to a lesser extent also *dekhans*) deploy strategies to gain access to water. Their strategies depend on (1) the form of production, (2) the socio-political status and ties of the farmer and (3) the spatial and technological situation of the field. Due to the relative abundance of water also these patterns are not strongly articulated, though more so in water short periods. Mostly these are individual strategies, but in some cases people engage in forms of joint action. This organisation is usually incidental and formed around concrete maintenance or distribution problems. Moreover, it is characterised by low levels of formalisation. This happens in situations where the WUA is absent, for instance when it restricts itself to controlling those aspects most relevant to cotton production. Even though these patterns of joint action are only incidental they are somewhat remarkable for two reasons. In the first place, in post-soviet societies 'collective activities' in general are not heralded by the people. And secondly, the Uzbek state generally does not allow for forms of self-organisation to develop as they might pose a threat to the political stability in the country. When these, currently incidental, patterns of joint management would solidify into stable systems of rules and regulations they could develop into alternatives to the WUA system. In light of the government's current policy not to let such spontaneous bottom-up organisations develop, it remains to be seen whether this will actually happen.

8.7. Technological change in a transition context

The spatial layout of the irrigation and drainage network of Khorezm and the deployed technology have been strongly shaped by the socio-political context in which Khorezmian irrigated agriculture was developed and expanded. The specific socio-political context was that of agricultural production and irrigation during the period of the USSR, which was characterised by collective production, aiming at maximum output through cotton mono-culture while centrally and bureaucratically managed. These aims and this mode of operation are reflected in the technologies and layout still present. In the words Bruno Latour: "technology is society made durable" (Latour, 1991). Technological objects are made to perform roles, i.e. social tasks are delegated to artefacts. These roles are partially fixed in an artefact, which implies that merely changing institutions and management relations is sometimes not enough – also the technology might need revision in a changed socio-political context. In the early years after independence the aims and forms of organisation in agriculture in Uzbekistan did not change a lot. The 2005-2006 phase of reforms introduced more far reaching changes. Individual risk and benefits on a wide scale made their entry, while also the size of agricultural enterprises changed substantially. This changed the demands on water management technologies.

The irrigation technologies that resulted from the period of the USSR are not so easy to characterise. The irrigation systems are large-scale canal systems and dimensioned for cotton monoculture. The main canals were strongly over-dimensioned with the perspective to further increase the irrigated area. But the characteristic that is most influential with regard to water control is the fact that the exact technological layout was somewhat irrelevant. Irrigation technology was functionally used to divide water, but the function of control in the socio-political sense was not delegated onto artefacts. The strict state control over cropping patterns and agricultural practices at field level, combined with authoritarian control of society and minimal personal interests in increased water use, and an abundance of water, created a situation in which there was no need for irrigation technology that restricted water use. Water division structures in Khorezm are not expressions of contested allocation and distribution of water in the way this has been analysed elsewhere, expressing complex social relations between water users and managers (see for instance Ubels, 1989; Kloezen and Mollinga, 1992; Bolding et al., 1995; Mollinga and Bolding, 1996; Mollinga, 1998; Veldwisch, 2006). The irrigation technology and spatial layout are, however, still strongly related to the socio-political characteristics of the soviet and post-soviet collective production systems. The way the system has been designed and constructed expresses the existence of unquestioned centralised managerial control and singularity of purpose, allowing a fully pragmatic and instrumental approach to layout and hydraulic design. The irrigation and drainage system as found in Khorezm could only have been developed there and then.

In the 2005-2006 reforms individual water users were created and the interest in profitable yields increased. As a consequence the interest in reliable access to water also increased. Social dynamics over water distribution between these users arose. As part of their strategies to secure access to water farmers have started to manipulate and adapt the irrigation and drainage technology. In the relative absence of the state in maintenance and improvements at the level of the WUA and below, farmers themselves invest in technological changes. Claims on access to water are connected to these investments, similar to the creation of

hydraulic property, which is the establishment of water user rights through investments by water users.
In the dynamics over water distribution at the WUA level the role of technology is gaining in importance, not only in the dynamics between farmers, but also in that between the state on the one hand and farmers on the other. If the state wants to stay in control over water distribution, even if it is through WUAs, it will have to come with new control strategies. The experiments with volumetric water pricing can be seen as response to the arising situation in which water is becoming the subject of contestation. Volumetric water pricing requires detailed water measurements at field level, which itself requires, among other things, the installation of measurement structures, specified measurement procedures and a close observation and control of flows.

8.8. Implications for research and policy

The findings of this study were summarized above. Besides giving answers to research questions, the study also results in a number of new questions and the refining of earlier defined research questions. These questions do not only emerge from the empirical findings, but are also driven by particular aims. Both for formulating the relevant areas for further research and for formulating recommendations for policy change it is necessary to first define the objectives. With regard to Uzbekistani (agricultural)development it is my view that besides aiming to increase efficiency of resource use, to increase agricultural production and to reduce environmental damage, the aim should also be to reduce poverty, to increase equity in access to resources and to improve transparency of governance. The following recommendations should be seen in light of these aims.
As someone concerned with developmental issues, working through an institute for 'development research' in a 'pilot project in development research' I take the stance that development has to do with the (re)distribution of benefits and with emancipation of those who are denied equal access to benefits. I realise that these objectives are not necessarily shared by the ZEF/UNESCO project, let alone by the Uzbek state.
When development intervention are understood to include the redistribution of power and benefits, both as means and outcome, the research conducted within the project does not always contribute to development, sometimes rather to the contrary. For instance delivering improved advice on fertilizer application in (state-ordered) cotton production primarily benefits a small (already advantaged) proportion of the rural population and the (state owned/controlled) cotton processing industries. Also the development of tools with which crop production and water distribution can (almost real-time) be monitored at regional scale on basis of remote sensing data could lead to reinforced state control rather than that it leads to redistribution of control and benefits to people so far excluded. Thus, research has socio-political implications that affect development, even if it is technical research that is understood as belonging to the domain of the natural sciences. When not being clear on what we understand by development, our research may have unintended effects on the distribution of resources and power.
The recommendations for future research and policy change given below are (inherently) politically loaded. It is realized that the Uzbek state is not a homogeneous body and that in the ministries both conservative and reformist forces are present. This latter group of people

may have similar visions for the development of Uzbekistan and may find inspiration in the recommendations given below.
A recurrent theme in the recommendations is the importance of household production in Uzbek agriculture, which has remained severely under-exposed in the academic literature, state policies as well as in development oriented (international) projects. In line with the stance taken as described above I give ample attention for the socio-economic differentiation caused by, among other things, the land reforms by which many *fermers* have started to accumulate wealth and status on basis of the primary access to land and resources, while others were excluded.

8.8.1. Future research

- This study shows that in 2005-2006 WUAs in Khorezm were a combination of state-run organisations and farmer-run organisations. State organisations justified their strong involvement with reference to the WUAs being new organisations and thus requiring external support. The fact that this support was often more of a forced nature than a response to requests by WUAs leads one to suspect that state involvement could remain strong. It is, however, clear that the WUA, as a governance model of local water management, will practically develop and thus change in various aspects over the coming years. The WUA as an object for monitoring change is a strategic choice for studying changing agrarian relations, as the WUA is one of main points of contact between *fermers* and the state.
- Chapter 6 shows that farmers may organise themselves where the WUA does not adequately fulfil its tasks of maintenance and operation. The cases encountered during this study were incidental, triggered by the break-down of pumps or other essential infrastructure on which a limited group of farmers depended. Where (small) groups of farmers jointly invest in maintenance and/or jointly hire a pump operator it could be expected that rule and decision making processes will emerge. These could develop into collective action regimes. Studying these emerging patterns at such an early stage of development in a post-soviet context where 'spontaneous' collective action is rather exceptional (*cf.* Mearns, 1996), will probably result in valuable insight on how such initiatives develop. Moreover, it would be strategic to study these processes as they might present an alternative for the lack of increase in user participation and control so far through the top-down establishment of WUAs.
- The main processes of water distribution were identified and described in this study, both at district and WUA level. Now that the basic processes are identified it is possible to quantify them in order to show their relative importance. For instance the amount of water used in household production could be quantified, as well as its productivity, and compared with the other forms of production. A former brigade could be studied in detail by systematically following (and measuring) all water deliveries to fields while simultaneously the socio-political processes are monitored. Such an integrated approach will deepen the knowledge of the processes identified in this study and connect them to problems identified (and sometimes quantified) by studies in the natural science domain. Examples of the latter are water logging, over-irrigation, salinization, strategies for using the contribution by ground water, and difficulties in timely water delivery. The simultaneous study of farmer strategies and bio-physical processes in their fields will help to evaluate the (un)intended effects of these farmer strategies. This could lead to

identification of approaches that could be effective in changing farming practices because they take into account both the intentions and the effects of farmer strategies. At the same time it will result in deepened knowledge about the bio-physical processes of field level water application, in a way that represents actual practices.

- Research that would go even a step further would constitute participative development of water distribution systems (both technical and administrational). IWMI and the ICWC have used such an approach in the Ferghana Valley. Working together with WUA staff in the processes of allocation, scheduling and delivery of water is at the core of such a study. Developing simple 'models' to monitor the three processes, for instance by automated Excel sheets, will help the WUA to keep better track of what happens in its own area. The objectives of the model to be developed need to be formulated by the WUA, facilitated by a researcher (or small group of researchers) that will be able to build such a model. This first step is an important research tool as it helps to identify the objectives of WUA staff. If they believe that the model can result what they want to know, they will probably be highly interested to develop it and fill it will relevant data. The data collected by the WUA staff is valuable for quantifying certain processes. These could for instance be frequencies of irrigation, actual rotational schedules, differences in water application within the area of the WUA and actual cropping patterns.
- Finally increased attention for household production by the *dekhan* households would have the potential of delivering knowledge that is beneficial for the majority of the rural poor. In spite of its importance in agricultural production, *dekhan* agriculture has too long been neglected. In order to be able to come up with relevant policies and agricultural extension that is aimed at the *dekhan*, more research needs to be done on the current agricultural practices and the contribution of agricultural production to livelihoods. The further study of *dekhan* livelihood strategies in general will result in knowledge on how the process of socio-economic differentiation develops under influence of the ongoing reforms. Preferably this process of differentiation should be studied in connection to autonomy versus control by the wider structures that regulate agricultural production, i.e. the processes of subsumption and dissociation.

8.8.2. Policy

The recommendations given here are both aimed at reformist forces in the Uzbek government and at international organisations aiming to influence the Uzbekistani policy reforms.

- During the period of field research experiments with volumetric water pricing were initiated by the Uzbek state. Though measurements and pricing did not happen in practice, there was a lot of talk about its introduction. One of the main expectations from this change of procedure and technology was that it might lead to water saving on basis of an economic rationale. Both the technical and the procedural implications for introducing volumetric water pricing are huge and costly. In the existing plans *fermers* will have to bear the cost for construction of water measuring structures at each field. Moreover, the framework cannot be effectively enforced unless management and/or technology are radically changed. A water pricing framework which is easier to introduce is pricing on basis of crop and area. This is already widely practiced in many WUAs for covering the internal costs of operation, with a dual tariff system for rice on the one

hand and all other crops on the other. WUAs could be charged volumetrically (i.e. on basis of their real use), while costs are incurred on farmers on basis of their cropping areas. This way of water pricing could be an effective tool for cost recovery as it links very well to the existing practices of control in which cropped areas are closely administrated, while water delivery to individual fields is not measured, but controlled by putting fines on wasteful practices.

- Water distribution at the WUA level has so far remained quite opaque. This is partly due to the water distribution technologies that make it difficult to visualise, let alone quantified, how water flows are divided. Organisational practices and procedures do not make rotational schedules any more transparent. This obscures the understanding by farmers of how much water is available and how they could access it. If procedures and technologies would be more transparent, it would be easier to identify inequalities, misuse and opportunities. This could be improved by stimulating both institutional measures as well as technical measures that make it easier to see where the water is flowing to. Making (rotational) irrigation schedules publicly available and providing easily understandable water measurement structures at some strategic places in the WUA are examples of such interventions.
- One of the ways of addressing the increasing socio-economic differentiation along the lines of division between *fermers* and *dekhans* would be to increase the support for household production. This study shows that in the studied areas 89-94% of the rural households in the first place depend on their household plot. About 20% of the arable land is used for household production and roughly one third of water use comes to its account. Despite of this it has lacked government support and has largely been outside the scope of research and international development projects. Agricultural extension services for household production are lacking. Agricultural input supplies have so far been purely directed at large scale agriculture. Moreover, there is ample room to improve post-harvest processing and market development for household production.

8.9. Cotton, rice and water…

This study shows that in Uzbekistan water distribution can not be understood separate from central state control over agricultural production. Through a set of ongoing agrarian reforms the Uzbek social landscape is changing. The complete switch from large farm enterprise to *fermer* enterprises, which was country-wide implemented in 2005-2006, is a jolt in an otherwise gradual process. In the period of study the privatisation of agricultural production advanced, but state regulation did not diminish. The interface between privatised commercial agriculture and state agriculture is clearest observable in the numerous contrasting aspects of cotton and rice production. *Fermer* enterprises in Khorezm are often engaged in both, agricultural state organisations as well. Rather than between *fermers* and the state, the watershed quite literally lies between cotton and rice. In the study of water distribution processes the precarious relation that exists between cotton and rice production became apparent. This is not only because of conflicting water management requirements, but just as well because the distribution of water between cotton and rice stands for the sharing of benefits between privatised commercial and state production.

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Annex

Khorezm Sociological Survey – April 2006 Name of Surveyor: _____

Rayon: _____ Shirkat/WUA: _____ Kishloq: _____ Ethnicity: _____

Question	№	Question	YES	NO
№ People in Household		Enough vegetables (or need to buy)?		
- 1st Generation (pension)		Enough wheat (or need to buy)?		
- 2nd Generation (oldest worker)		Enough rice (or need to buy)?		
- 3rd Generation		Sells goods direct to bazaar?		
- 4th Generation		Which goods?		
- Other:		Sells goods to trader who then sells?		
		Which goods?		
№ Available workers in House		Barters goods for other goods?		
- male		What for what? (gives ¦ receives)		
- female		Has a car?		
		Has a tractor?		
№ Household members in:		Has a donkey cart?		
- paid employment off-farm		Has a bicycle?		
- only works on the land		**Animals**	**M**	**F**
- own family business		Cow		
- works outside Uzbekistan		Sheep		
- works outside of Khorezm		Chicken		
- mix of above		Donkey		
- 14-16yr or student		Horse		
Land holding	**ha/m²**			
A. Household plot (excl. house)				
B. Tamorka(s) away from house				
C. Ijara / fermer leasehold				
D. Ishchi (worker of fermer)				
E. Sharecropping (1ha cotton/wheat)				

Crops grown (ha/m²)	A	B	C	D	E
Cotton					
Wheat					
Rice					
Potatoes					
Vegetables (incl. melon, onion etc.)					
Corn/maize					
Fruit trees					
Mulberry trees					
Other:					

Comments:

Deutsche Zusammenfassung

1. Einleitung

Diese Studie handelt von der Organisation landwirtschaftlichen Produktion und der Wasserverteilung für landwirtschaftliche Zwecke in ein sich langsam veränderndes autoritäres Regime in einem post-Sowjetischen Kontext. Die gegenwärtige Situation wird gekennzeichnet von Reformen die den Klang der Privatisierung und der neoliberalen Reform räsonieren, während Zentralplanung und staatliche Kontrolle sich in der Praxis als hartnäckig gezeigt haben, sich aber gleichzeitig auch ändern. Reformen im Land- und Wassermanagement werden vom Staat dargestellt als eine Deregulation, in Wirklichkeit aber handelt es sich eher um eine Reregulation. Durch die Umstellung von kollektiver Landwirtschaft auf *fermer*-Unternemen, mit dem Individuellen Haushalt als Basis, hat sich die Rolle des Individuum innerhalb der landwirtschaftlicher Produktion vergrößert. Haushalte werden bloßgestellt an den vergrößerten Risiken und Vorteile die zusammenhängen mit einer mehr individuell organisierten Agrarproduktion. Mittlerweile hat der Staat seine Kontrolle über landwirtschaftliche Produktion neu Arrangiert durch eine strenge Kontrolle über Gewächsplanung, durch *fermers* aufzutragen Baumwolle und Weizen anzubauen die zu einem festen Preis an den Staat verkauft werden, und durch die aktive Überwachung und Einmischung in die landwirtschaftliche Betriebsführung auf den Feldern.

Die Frage die in dieser Studie zur Diskussion steht ist wie diese Reformen, die sowohl Kontinuität als auch Veränderung beinhalten, die Wasserverteilung beeinflusst. Um eine befriedigende Antwort auf diese Frage geben zu können wird zuerst der Inhalt der Reformen studiert als auch deren Effekte auf das weitere regulierende System der landwirtschaftlichen Produktion. Auch werden Aspekte der Wasserverfügbarkeit, der Wassernbenötigung in den Feldern so wie die räumlichen und technologisch spezifischen Merkmale des Bewasserungs- und Drainagenetzes studiert, da diese alle Wasserverteilungsprozesse beeinflussen.

2. Der Rahmen dieser Studie

Diese Untersuchung wurde innerhalb des gemeinschaftlichen Projektes des Zentrum für Entwicklungsforschung (ZEF) und der United Nations Educational, Scientific and Cultural Organisation (UNESCO) ausgeführt, getitelt "*Economic and ecological restructuring of land and water use in Khorezm*". Das Projekt wurde in 2001 gestartet und richtet sich auf die vergrößerung der Effektivität von menschlichen und natürlichen Hilfsquellen in der Region Khorezm (Vlek et al., 2001). Gemäß den Zielsetzungen der ZEF ist die Arbeidsmethode des Projektes explizit multidisciplinar. Die unterliegende Studie ist das wichtigste Output einer der Modulen innerhalb dieses Projektes. Dieser Modul wurde als Doktorarbeit eingerichtet innerhalb des ZEFs *Department of Political and Cultural Change*. Als solches baut es weiter auf frühere Modulen der Sozialwissenschaften (Wall, 2006; Zavgordnyaya, 2006; Trevisani, bevorstehend). Auch werden Querverbindungen hergestellt zu Untersuchungen auf dem Gebiet des Wassermanagements in der Naturwissenschaft (z.B. Akramkhanov, 2005; Ibrakhimov, 2005; Forkutsa, 2006; Conrad, 2006) und zum wirtschaftlichen Teil des Projektes (Mueller, 2006; Bobojanov, bevorstehend).
Die Untersuchungen enthielten 12 Monate Felduntersuchung in fünf Terminen, in der Periode zwischen Februar 2005 und Oktober 2006. Der Standort der Felduntersuchungen war das

Bewasserungs- und Drainagenetz der Provinz Khorezm (*Oblast/Viloyat)* in Usbekistan (Figur 1.1). In dieser Region wurden vier *Water User Associations* (WUA's) als Kasusobjekte gewählt (Figur 1.2). Die konkreten Methoden für die Feldforschungen waren (1) direkte Observation von Objekten, Ereignissen, Prozeduren und sozialen Interaktionen; (2) semi- und unstrukturierte Interviews mit Slüsselinformanten; und (3) eine Haushaltsumfrage.

3. Struktur des Buches

Der konzeptuelle Rahmen für diese Doktorarbeid wird im **1. Kapitel** ausarbeitet und enthält drei Teile.

(1) Der Usbekische Staat im Übergang, eine weitläufige Diskussion über die Bedeutung des Begriffes Übergang, das Wesen des Staatssozialismus und welche Wege Staten folgen die sich davon fortbewegen. Diese Transition ist sowohl politischer, als auch Wirtschaftlicher Art.
(2) Die zweite Diskussion handelt von der Organisation der Landwirtschaft (und Bewasserung). Zwei Theorien werden präsentiert; die *labour process approach* und die Theorie des *Technological-Administrative Task Environment*. Diese beiden werden angewendet bei Landwirtschaft im Übergang.
(3) Der sozialtechnischen Charakter der Bewasserung und der Technik wird besprochen mittels einer Diskussion zur Technologiedebatte, einer ausführlichen Beschreibung eines interdisciplinären Rahmen für eine Analyse des Bewasserungsmanagements, und einer Diskussion über die *Theory of access*.

Das **2. Kapitel** beschreibt wie die Untersuchungsmethode den Arbeidsumständen in einem post-Sowjetischem autoritären Land angepasst wurden. Methodologie kann konzeptuell verstanden werden als bestehend aus drei Ebenen; (1) das wissentschaftliche Model, das die erkenntnistheoretischen und ontologischen Erkenntnisse darstellt; (2) die Untersuchungsmethode oder –strategie und (3) Untersuchungstechniken (Buraway 1998:6; Alasuutari, 1995; Bryman, 2004). Jede Ebene der Methodologie wird beeinflusst durch den Kontext in dem sie angewendet wird. Der Charakter des Usbekischen Regimes und Verwaltung haben einen starken Einfluß auf die Untersuchungsmethode und deren Ergebnisse. Im Usbekischen Kontext sind offizielle Daten, Kenntnisse und Meinungen oft vage. Um die Anonimität der Informanten zu schützen war es oft nicht möglich Befindungen bei anderen Gesprächspartners zu überprüfen.

Das **3. und 4. Kapitel** erläutern den breiteren landwirtschaftlichen Kontext. Diese Kapitel beschreiben die Beziehungen zwischen Bauern, dem Staat und landwirtschaftliche Planung. Diese Beschreibung ist unentbehrlich wenn es darum geht die Dynamik der Wasserverteilung zu verstehen die in den weiteren Kapiteln diskutiert wird. Im **3. Kapitel** wird die elementäre Struktur der Usbekischen landwirtschaftlichen Gesellschaft beschrieben. Staatliche Aktoren, privatisierte Bauern (*fermers*) und Kleinbauern (*dekhans*) haben alle ihre eigene Rolle und es gibt zwischen ihnen spezifische Austauschbeziehungen. Sozialwirtschaftliche Differenzierung im ländlichen bereich findet in einem raschen Tempo statt.

Im **4. Kapitel** wird an Hand des *labour process approach* gezeigt welche drei Weisen der landwirtschaftliche Produktion das Khorezmenisch System kennt; (1) die staatliche Beauftragung der Produktion, (2) die kommerzielle Weise der Produktion und (3) die haushaltliche Weise der Produktion. Diese Produktionsprozesse werden unterschieden auf Grund ihres In- und Outputs, ihren Tauschverhältnissen, als auch ihrer technischen Forderungen. Die Entwicklung einer

kommerziellen privatisierter Reisproduktion ist eine gewaltige Veränderung und möglich ein Mittelpunkt einer politischer Wendung.

Im **5. Kapitel** wird gezeigt wie die Kontrolle über die Landwirtschaft seine besondere Form annimmt im Bereich der Wasserverteilung auf regionalem Niveau. Das Gouvernementsambt (*Hokimiyat*) erhält ein sehr zentralgeleitetes Staatsmanagementsystem in Stand. Der Staat bewahrt Gehorsamkeit und das Einhalten Produktionsquoten mittels ein System das mit der einen Hand Druck ausübt auf Bauern und sie mit der Anderen belohnt. Die Unterschiede im Wassergebrauch zwischen Baumwoll- und Reisproduktion spielt eine wichtige Rolle in dieser Dynamik.

Nach einer Auseinandersetzung der Geschichte der Einführung der *Water Users Associations* (WUAs) in Usbekistan, besieht das **6. Kapitel** die wirkliche Wasserverteilungsdynamik innerhalb der WUAs. Kleinbauer (*dekhans*) und neue Landwirte (*fermers*) ringen um den Zugang zu einer begrenzten Hilfsquelle. Während an einigen Stellen die neugestalteten WUAs strenge Zugangskontrolle üben, bilden sich an anderen Stellen Formen kollektiever Handlung. Diese haben immer einen informellen Charakter und formen sich anläßlich der Arbeit um den Unterhalt und den Gebrauch der Pumpen.

Das **7. Kapitel** zeigt daß die landwirtschaftlichen Änderungen die momentan statt finden einen anderen Anspruch haben auf Bewasserungstechnik, sowohl auf der Micro- als auf der Systemebene. Die Entwicklungsgeschichte der Bewasserung und der Drainage in Khorezm zeigt wie das System geformt worden ist von (historischen) sozialpolitischen Beziehungen. Es zeigt welche wesentlichen Änderungen in der Struktur der Usbekischen Landwirtschaft ihren Einfluss haben auf das Bewasserungs- und Drainagenetz.

Die Schlussfolgerungen der Studie werden in Kapitel 8 präsentiert. Hier stehen die wichtigsten Befindungen, eine Diskussion der Folgen für die Theoretischen Debatten die im 1. Kapitel präsentiert worden und eine Liste von Empfehlungen für sowohl Verwaltung als zukünftigen Forschungen.

3. Zusammenfassung der Befindungen

3.1. Übergang, Ordnung und Aufteilung neuer landwirtschaftlicher Betriebe

Die Veränderung der landwirtschaftlichen Produktionssysteme in Usbekistan ist ein schrittweise Prozess, der haarscharf vom Staat arrangiert wird damit die Entwicklungen nicht steuerlos statt finden. Um den Einfluss dieser Reformen auf die Wasserverteilung messen zu können, müssen wir zuerst verstehen was diese Reformen auf sich haben , welchen Zweck und welche generellen Effekte sie (gehabt) haben. Es scheint attraktiv die Ereignisse in Usbekistan zu interpretieren an Hand eines Spektrums das reicht von kommunistischen Planwirtschaft einerseits bis zu liberalen Marktwirtschaft andererseits. Die Dekollektivierung durch Landreformen, die verringerte staatliche Regulierung der landwirtschaftlichen Produktion, die Freigabe einiger Märkte und die Errichtung von *Water Users Associations* (WUAs) würde dann den Eindruck geben dass Usbekistan sich bewegt in Richtung liberale Marktwirtschaft. International wird (wirtschaftlicher und politischer) Druck auf Usbekistan ausgeübt um sich in Richtung einer solchen Wirtschaft zu entwickeln, insgesamt einer liberalen Demokratie. Bestimmt hat Usbekistan seine kommunistische Ideologie hinter sich gelassen und auch einige Aspekte einer so genannten Marktwirtschaft übernommen, allerdings hat es den Anschein das Usbekistan ein anderes Entwicklungsmodel in Gedanken hat. Dieses Entwicklungsmodel entleiht Elemente der staatlichen Planwirtschaft als auch der Marktwirtschaft, in einer solchen Weise das staatliche

Kontrolle erhalten wird und Effektivität und Produktivität gleichzeitig erhöht werden. Es zeigt das Abstand zur staatlichsozialistischer Wirtschaft und Verwaltung nicht unbedingt eine Transformation in Richtung einer freien Demokratie und einer liberalen Marktwirtschaft mit sich bringt. Die Transformationen fanden stufenweise und unaufhörlich statt. Fünfzehn Jahre nach der Unabhängigkeit hat Usbekistan seine eigene Verwaltungsform und sein eigenes wirtschaftliches System. Es gibt verschiedene Übereinstimmungen mit der Organisationsweise zur Zeit der Sowjetunion, aber diese Elemente sind eingebettet in neue Beziehungen. Usbekistan bewandelt seinen eigenen Pfad der Entwicklung. Sein heutiges System kann nicht einfach nur definiert werden in Beziehung zum Sowjetischen oder dem kapitalistischen System.

Obwohl es schwierig ist die Ziele und die Absichtes des Staates und Gruppen im Staat ausfindig zu machen, sind die Effekte des gewählten Pfades deutlich sichtbar. Die Schaffung von zwei globalen Typen von landwirtschaftlichen Unternehmen (*fermers* und *dekhans*) zeigt das die agrarischen Reformen sich richten auf eine großflächige Landwirtschaft die von einer Minderheit bebaut wird. Die Dekollektivierung schaffte landwirtschaftliche Produzenten auf dem Haushaltsniveau. Diese werden bloßgestellt an individuellen Risiken und Vorteile die wiederum dafür sorgten das Produktivität und Effektivität gesteigert wurden. Dem Prozess der Dekollektivierung folgte auch das nur 5-10%[120] der ländlichen Haushalte (die *fermers*) 70-80% der Ackerböden in Hände bekam. Die Mehrzahl der Haushalte (die *dekhans*, ungefähr 90-95% aller ländlichen Haushalte) bekam nur ein kleines Grundstück wo hauptsächlich Produkte für den eigenen Verbrauch angebaut werden.

Produktion auf diesen Flächen ist kein wirtschaftliches Model wovon ein ländlicher Haushalt leben kann. Die Reformen die durchgeführt worden sind haben zur Folge dass die Mehrzahl der ländlichen Bevölkerung nicht leben kann von ihrem Land allein. Sie muss entweder bei den *fermers*, oder außerhalb der Landwirtschaft Arbeit finden. Viele *dekhans* arbeiten auf den Feldern von *fermers*. Die Beziehungen zwischen *fermers* und *dekhans* entwickeln sich in Richtung einer starken *patron-client*-Beziehung, die gebaut ist auf gegenseitige Abhängigkeit. Das Tauschverhältnis innerhalb solcher Beziehungen ist oft schlecht definiert, was die schwächere Partei oft benachteiligt. Die Teilung der *Large Farm Enterprises* (LFEs) und die Gründung andersartige Betriebe haben zwei unterschiedliche Sorten von ländlichen Haushalten geschaffen; jene die Grundstücke kontrollieren und die einen lebenskräftigen Betrieb halten könnten und jene die nur kleine Parzellen haben worauf sie kaum genug für die eigenen Bedürfnisse anbauen können. Diese sozialwirtschaftliche Differenzen werfen Fragen auf in Beziehung zu Armut und Entwicklungsstrategien.

Im Prozeß wobei Kontrolle über landwirtschaftliche Produktion in Balance ist mit dem teilweise loslassen, bleiben manche Haushalte und landwirtschaftliche Betriebe eng eingeordnet im größeren System der Produktionsregulation, während andere sich losgemacht haben vom System und in zunehmendem Maß die Kontrolle haben über ihre eigene Produktion und ihre wirtschaftlichen Aktivitäten. *Dekhan*-Haushalte die nicht für *fermers* arbeiten sind relativ am weitesten entfernt vom System, während mittelgroße *fermers* die Baumwolle und Weizen anbauen, die Prozesse der Einordnung der internen und externen Produktionsbeziehungen der bürokratischen staatlichen Regelungen am härtesten spüren. Die sehr Kleinen (wirtschaftlich uninteressanten) und die sehr Großen (sozialwirtschaftlich mächtig) haben sich etwas außerhalb dieses Kontrollsystems platziert.

Wenn staatliche Kontrolle im einem Diagram projektiert würde, würde das eine umgekehrte U-förmige Linie ergeben. Dies hat Parallele mit dem was Rasanayagam (2002:55) im Algemeinen feststellt in Bezug auf die Usbekischen Unternehmen: "Es gibt keine mittelgroße Betriebe in

[120] Die exakten Zahlen in den vier Kases betrugen zwsichen 6% und 11%.

Usbekistan, nur große und kleine". Dennoch sind die meisten heutigen *fermer*-Betriebe von mittlerer Größe. Sie wurden ursprünglich von Staat gegründet, und das hält sie unter strenger staatlicher Kontrolle.

Außer der Schaffung zweier Kategorien landwirtschaftlicher Betriebe haben die Reformen auch die *Water Users Association* (WUA) als neues Verwaltungsinstrument auf dem Niveau des ehemalige kollektiven Bauernhöfe geschaffen. Diese Institution wird hier unten weiter diskutiert.

3.2. Wasserverteilung und die drie Formen der Agrarischen Produktion

Zuerst wird die Logik agrarischer Produktion weiter erläutert an Hand von drei Produktionsweisen die in dieser Studie unterschieden werden. Diese sind die staatlich angewiesene Produktionsweise (von Baumwolle und Weizen), die kommerzielle Produktionsweise (meist Reis und Viehfutter) und die Haushaltsweise (einer Vielzahl an Gewächsen für den eigenen Verbrauch). Jede Produktionsweise hat ihre eigene Form für die Organisation von Input, Arbeit, staatliche Kontrolle, Verteilung von Gewinnen und Marketing. In der staatlich angewiesenen Weise ist das Erreichen der gestellten Quoten das zentrale Ziel. Produktion findet auf *fermer*-Land statt, aber die Kontrolle des Staates über die landwirtschaftliche Produktion ist sehr stark.

Mit der kommerzielle Produktionsweise wird das meiste Geld verdient. Auch ist es eine Art von Investition für *fermer*. Gebiete zum Anbau von Reis werden streng vom Staat kontrolliert und die Zuweisung dieser Gebiete wird eingesetzt als Belohnung. Durch die Kontrolle dieses Produktionsprozesses behält der Staat auch die Kontrolle über neu aufkommende landwirtschaftliche Betriebe. Letztens die Haushaltsweise. Diese erfühlt eine wichtige Rolle als Erwerbsquelle und als Nahrungssicherung. Es ist im Interesse des Staates um genügend Platz zu lassen für diese Weise der Produktion da sie direkt zusammenhängt mit sozialer, und damit auch politischer Stabilität.

Eine der wichtigsten Folgerungen dieser Studie lautet das alle drei Weisen ihre eigene Logik haben in Beziehung auf Wassermanagement. Das heißt das innerhalb jeder Form Wasser anders zugeführt und anders verwaltet wird. Im Falle einer Wasserknappheit hat jede Weise ihre eigene Manier den Zugang zu Wasser zu sichern; die baumwollproduzierenden *fermer* fallen zurück auf staatliche Organisationen, kommerzielle Reis*fermer* sind abhängig von ihren persönlichen Beziehungen und für die individuellen Haushalte ist der kleine Bedarf informell geregelt. Die häuslichen Verbraucher sind politisch 'ungreifbar' da die häusliche Produktion eine wichtige Erwerbsquelle ist für die ländliche Bevölkerung.

Die weiteren Regulationsstrukturen in der agrarischen Produktion haben einen großen Einfluss auf die soziale Dynamik der Wasserverteilung auf allen Niveaus, vom Feld bis zum ganzen System. Es ist bemerkenswert das die Produktionsweise einen solchen Einfluss hat. Das hat damit zutun dass die verschiedenen Weisen verknüpft sind mit spezifischen sozialpolitischen Strukturen und Institutionen. Im Falle der staatlich angewiesenen Baumwollproduktion sind diese sehr streng organisiert und kommen sie zum Ausdruck in formellen Regeln und Regulationen. Bei den anderen zwei Produktionsweisen ist dies eher informell arrangiert. Gerade durch diese Verbindung zwischen (formellen und informellen) sozialpolitischen Strukturen und den verschiedenen Formen sind sie so einflussreich geworden.

3.3 Verwaltungsstrukturen und Wasserüberfluss

Verschiedene verwaltende Organisationen sind beteiligt am landwirtschaftlichen Wassermanagement. Die Scheidung der verschiedenen Verantwortlichkeiten ist nicht immer klar

oder wird in der Praxis nicht befolgt. Der soziale Verkehr wird in erster Linie nicht definiert von offiziellen Beziehungen zwischen den Organisationen, sonders reflektiert öfters historische Verwaltungsmuster. Das gilt vor allem für die administrative Abteilung (die *Hokimiyat*), die in der Praxis eine viel größere Rolle spielt als sie offiziell hat. Ihre Einmischung in der Zuweisung, Planung und Lieferung von Wasser ist politisch eingegeben und eine Äußerung des Zentralverwaltungsmodels. Dies kann gesehen werden als eine Erbschaft der Sowjetzeit, die im heutigen Usbekistan immer noch deutlich anwesend ist.

Die Verschlechterung und der mögliche Kollaps des Unterhaltssystems und des Wasserverteilungssystems, wie oft in der Literatur beschrieben, hat kein dramatisches Ausmaß in Khorezm. Sowohl der Zustand der Infrastruktur als die Prozeduren der Wasserzuweisung, Wasserplanung und Wasserlieferung sind ausreichend für effektives Wassermanagement. Erste Wasserzuweisungen werden gemacht auf Grund der offiziellen (zentral kontrollierten) Anbaupläne, zusammen mit dem Wasserbedürfnis des verschiedenen Gewächse und Berechnungen auf Grund durchschnittlichen Klimadaten. Dieser Zuweisungsplan wird 'das Limit', aber in der Praxis ist es nicht die Höchstmenge an Wasser die geliefert werden kann. Wasserlieferung vom System zu den WUAs wird gemessen und berechnet und am Ende des Jahres muss Mehrgebrauch bezahlt werden. In der täglichen Verwaltung spielt 'das Limit' nur eine seht minimal Rolle. In Praxis wird Wasserzufuhr angepasst an Informationen aus dem Feld; wenn WUAs mehr Wasser fragen bekommen sie es meistens auch. Lieferung findet statt an Hand der verschiedenen Anträge, die beruhen auf Feldobservationen.

Die relative reichliche Verfügbarkeit des Wassers in Khorezm (wie geschildert im 5. Kapitel) erleichtert die Aufgabe der Behörden um genügend Wasser an alle zu liefern. Wasser ist hier keine "begrenzte Hilfsquelle", wie sie oft beschrieben wird in Analysen der Bewasserungslandwirtschaft. Der Streit über Wasserverteilung ist darum weniger ausgesprochen als in vielen anderen Teilen der Welt. Diese Situation von limitierter sozialer Dynamik zwischen verschiedenen Wasserverbrauchern wird verstärkt durch sowohl den historischen 'Weg' der kollektiver Landwirtschaft und der Fortsetzung eines politischen Regimes eines restriktiven States mit 'gehorsamen' Bürgern.

Nicht nur ist die Dynamik zwischen Wasserverbrauchern weniger klar formuliert, sie nimmt auch verschiedene Formen an. Erstens, dank einer Situation mit relativen Wasserüberfluss, leiden 'Endgebiete' nicht unter Wassermangel, ungleich der Situation in anderen Bewasserungsgebieten in der Welt. Durch relativen Wasserüberfluß leiden auch diese Enden an typischen Bewasserungsproblemen wie Staunässe und Versalzung in den Böden (nebst periodischen Wassermangel). Ein zweiter Unterschied in Dynamik zwischen Wasserverbraucher ist die Nutzung der Technologie. Die Geschichte der kollektiven Landwirtschaft unter strenger staatlicher Kontrolle hat ein Bewasserungsnetz hinterlassen das nicht statisch ist, aber eins das flexibel geblieben ist. Die Stabilität des Systems wurde garantiert durch politischer Macht, an statt robuster Technik. Zum Teil beeinflusst diese politische Macht immer noch die Wasserverteilung, vor allem in den Niveaus über den WUAs. Mit dem Auseinanderfallen der kollektiven Bauernhöfen verfällt diese Macht aber auch teilweise an die WUAs.

3.4 WUAs zwischen Bauern und Staat

Die ehemaligen kollektiven Bauernhöfe sind die Bühne auf der die neuen *fermers* und die *dekhans*-Haushalte ihr Bewasserungswasser teilen müssen. WUAs wurden errichtet an Stelle der ehemaligen kollektiven Bauernhöfe, als Verweisung an den international gepriesene Politiken Rahmen der Bauernselbstverwaltung. Die Usbekische Verwaltung, internationale Organisationen und Wissenschaftler haben diese neuen Institutionen dargestellt als die Lösung für de steigende

Effektivität des Wasserverbrauchs und als eine verbesserte Weise um Bauern Mitbestimmung zu geben. Die WUAs werden dargestellt als die Träger demokratischen Prinzipien. In Praxis aber sind die WUAs vom Staat verwaltete Organisationen, oder jedenfalls von Staat kontrolliert. Unter anderem spielen die WUAs eine wichtige Rolle in der Anwendung von (staatlicher) Kontrolle über die Wasserverteilung und über agrarische Produktion. Der Usbekische Staat hat mit den WUAs kein Trojanische Pferd in die demokratischen Reformen eingebracht. Eher hat er das WUA Model so interpretiert das es passt in den Plänen für die Kontrolle der landwirtschaftlichen Produktion. Durch den Gebrauch einer gleich(lautenden) Terminologie und formellen Strukturen, ist es dem Usbekischen Staat gelungen Sand in die Augen der internationalen Wassermanagementgesellschaft zu streuen.

WUAs sind nicht nur lokale vom Staat kontrollierte Körper, sondern auch halbautonom. Ziel ist es so viel wie möglich Wasser zu bekommen für die Bauern im eigenen Gebiet und dies dann Effizient zu verteilen. In dieser sozialen Arena richten die WUAs sich auf die Kontrolle des Wasserzuganges, während *fermers* (und zum Teil auch *dekhans*) Strategien entwickeln um Zugang zu Wasser zu bekommen. Diese Strategien sind abhängig von der (1) Produktionsweise, (2) das sozialpolitische Ansehen des betreffenden Bauers und seine Beziehungen und (3) die räumliche und technologische Situation auf dem Feld. Dank dem relativen Überfluss an Wasser sind diese Positionen nicht seht ausgeprägt (mehr in Zeiten der Wasserknappheit). Die meisten Strategien sind individuell, aber in manchen Fällen organisieren Bauern sich und nehmen Teil and Formen der gemeinsamen Aktion. Dies ist meist beiläufig und findet statt rund konkreten Sachen wie Unterhaltwerk oder Verteilungsprobleme. Darüber hinaus werden sie charakterisiert durch einen niedrigen Grad der Formalisierung. Es kommen vor in Situationen wo die WUA nicht anwesend ist, zum Beispiel wenn diese sich selber begrenzt auf die Kontrolle der Aspekte die für Baumwollproduzenten am wichtigsten sind. Obwohl diese gemeinsamen Handlungen nur beiläufig sind, sind sie aus zwei Gründe bemerkenswert. Erstens werden solche Aktionen im Algemeinen nicht von der Bevölkerung eingeläutet. Und zweitens, der Usbekische Staat erlaubt solche Formen der Organisation meistens nicht da sie eine Bedrohung bilden könnten für die politische Stabilität des Landes. Wenn diese, jetzt noch gelegentliche Formen sich konkretisieren und feste Systeme bilden würden, dann könnten sie sich zu einer Alternative für die WUAs entwickeln. Angesehen der derzeitigen Staatspolitik, die eine solche spontane Entwicklung von unten herab nicht zulassen wird, ist es unklar ob diese Entwicklung tatsächlich statt finden wird.

3.5. Technologische Veränderung im Kontext einer Transition

Die räumliche Einteilung des Khorezmisches Bewasserungs- und Drainagenetzes und die gebrauchte Technik sind stark gestaltet worden durch die sozialpolitischen Umstände in den diese Bewasserungslandwirtschaft entwickelt und erweitert wurde. Der spezifische sozialpolitische Kontext war der einer agrarischen Produktion und Bewasserung in der Sowjetzeit. Diese wurde gekennzeichnet durch kollektive Produktion und richtete sich auf maximalen Erlös durch Baumwollmonokultur und zentraler bürokratischer Verwaltung. Dieses Ziel und diese Handelsweise werden reflektiert in der noch anwesenden Technik und in der Einteilung des Systems. Mit den Worten von Bruno Latour: "Technologie ist eine fest gemachte Gesellschaft" (Latour, 1991). Technologische Objekte werden gezwungen bestimmte Rollen zu spielen, d.h. soziale Aufgaben werden an Artefakten weitergeleitet. Diese können diese Rollen fortdauernd erfüllen, auch wenn die Gesellschaft sich drastisch ändert. In den Jahren direkt nach der Unabhängigkeit änderten die Ziele und Formen der agrarischen Organisation in Usbekistan sich kaum. Die Reformen in 2005-2006 brachten weittragende Änderungen ein. Individuelle Risiken und Vorteile kamen überall im Bilde, und auch die Größe der landwirtschaftlichen

Betriebe änderte sich beträchtlich. Das änderte auch die Anforderungen an Wassermanagementtechnologien.

Die Bewasserungstechniken aus der Sowjetzeit sind nicht leicht zu charakterisieren. Es sind riesige Kanalsysteme für Baumwollmonokultur. Die Hauptkanäle wurden überdimensional gebaut, mit Hinblick auf zukünftige Erweiterung des Bewasserungsgebietes. Aber das wichtigste Merkmal der Wasserkontrolle ist, dass die Exakte technische Einteilung irrelevant ist. Bewasserungstechnologie wurde funktionell genutzt um Wasser zu verteilen, aber die Kontrolle im sozialpolitischem Sinne wurde nicht an Artefakten delegiert. Die strenge staatliche Kontrolle des Anbaus und der agrarischen Praxis auf den Feldern, zusammen mit eine autoritären Kontrolle der Gesellschaft, ein Minimum an individuellem Interesse an mehr Wasser, und einen Überfluss an Wasser sorgten für eine Situation in der es keinen Grund gab für eine Bewasserungstechnik die Wassergebrauch einschränkte. Strukturen der Wasserverteilung in Khorezm sind kein Ausdruck umstrittener Wasserverteilung und –zuweisung wie das anderswo der Fall ist, und sie den Ausdruck komplizierten sozialen Beziehungen zwischen Wassernutzers und Verwaltern sind (siehe auch Mollinga, 1998). Die Bewasserungstechnologie und die räumliche Einteilung sind, wie dem auch sei, noch immer stark verbunden mit den sozialpolitischen Merkmalen des Sowjetischen und des postsowjetischen Produktionssystems. Die Weise in der das System entworfen ist, gibt Ausdruck an einer unbestreitbaren zentral verwaltende Kontrolle und Eigentümlichkeit des Zwecks. Dabei bewilligt es der Einteilung und dem hydraulischen System eine ganz pragmatische und instrumentalistische Arbeitsweise. Das Bewasserungs- und Drainagesystem wie es in Khorezm angetroffen wird, konnte nur dann und da errichtet werden.

Die Reformen in 2005-2006 schafften individuelle Wasserverbraucher und das Interesse in gewinnbringende Erlöse vergrößerte sich. Damit vergrößerte sich auch das Interesse an zuverlässigem Wasserzugang. Eine soziale Dynamik zwischen den Verbrauchern entwickelte sich. Bauern fingen an die Bewasserungs- und Drainagetechnik zu manipulieren und zu verändern um so ihre Wasserzufuhr zu sichern. In der relativen Abwesendheit des Staates in Sachen Unterhalt und Ausbesserung auf dem Niveau des WUAs und darunter, investieren Bauern selber in technologische Änderungen. Ansprüche an Wasser ist auf Grund dieser Investierungen, ähnlich der Entstehung hydraulisches Eigentum, und die Gründung Wassergebrauchsrechte durch eigene Investitionen.

In der Wasserverteilungsdynamik auf dem WUA-Niveau wird die Rolle der Technik immer wichtiger. Nicht nur in der Dynamik zwischen den Bauern, sondern auch zwischen dem Staat und die Bauern. Wenn der Staat die Kontrolle über Wasserverteilung behalten will, auch mittels den WUAs, sollte er mit neuen Kontrollstrategien kommen. Die Experimente mit volumetrischer Wasserpreisung kann gesehen werden als eine Reaktion auf eine sich neu entwickelnde Situation in der Wasser Streitthema wird. Volumetrische Wasserpreisung setzt detaillierte Wassermessung in den Feldern voraus. Das erfordert, unter anderem, die Installation Mess-Strukturen, spezialisierte Messprozesse und eine scharfe Beobachtung des Wasserstroms.