



Czech University of Life Sciences Prague
**Faculty of Tropical
AgriSciences**

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE
Faculty of Tropical AgriSciences

Department of Economics and Development

**LAND AND WATER:
SPECIFICS OF NATURAL RESOURCE OWNERSHIP
IN UZBEKISTAN**

Doctoral Thesis

Ph.D. student: Ing. Lea MELNIKOVOVÁ

Supervisor: prof. Ing. Bohumil HAVRLAND, CSc.

Prague 2015

DECLARATION

I, Lea Melnikovová, do hereby solemnly declare that I am the author of the work entitled „Land and Water: Specifics of Natural Resource Ownership in Uzbekistan“, and the results reported here were carried out by me under the guidance and supervision of prof. Bohumil Havrlant of the Faculty of Tropical AgriSciences.

Date: May 7th 2015

Signature:

ACKNOWLEDGEMENTS

I wish to express my most sincere gratitude and appreciation to my supervisor, prof. Bohumil Havrland, for his guidance, patience and encouragement.

I would also like to extend my gratitude to the expert staff of the Tashkent State Agrarian University for all their help and hospitality, especially to the first vice-rector for educational affairs Mr Y. Saimnazarov, to Mrs Ch. Kashkabaeva, Mrs R. Pulatova, Mrs I. Rustamova, Mr T. Farmanov, Mr S. Khalikov and Mr Kh. Saidakbarov.

My sincere appreciation is extended to His Excellency Mr Hynek Pejcha, The Ambassador of the Czech Republic in Uzbekistan, and the former Deputy Chief of Mission, Mr Roman Masařík, for their invaluable help in organizing my research trip to Uzbekistan and their support during my stay there.

I would also like to acknowledge Mr Radim Valenčík, Mr Harold Houba and Mr Ilya Katsev who kindly helped me to penetrate the mysteries of game theory.

Special thanks go to my parents, sisters and brother, and to close friends for their unfailing support and encouragement.

ABSTRACT

Natural resources constitute the cornerstone of all economic activities in the country. This thesis concentrates on land and water resources as the crucial factors of successful agricultural development. The agricultural sector is of fundamental importance in Uzbekistan. Not only it significantly contributes to the country's GDP but it is vital in providing employment and livelihood in rural regions, food security and social stability. A well-functioning and sustainable agricultural sector and can hardly exist without an effective land and water management. In Uzbekistan, reforms of the agricultural sector started in 1991 and continue up to this day. However, the state has been controlling each step towards market-oriented agriculture. This applies to both land and water resources. Land is state owned, land tenure security weak, and agricultural production is to a large extent directed by the government. These factors pose difficulties for agricultural enterprises. Water is crucial: vast majority of the country's cultivated lands has to be irrigated. Water is distributed via state owned, inefficient irrigation system. Water use planning is rigid and water allocation depends greatly on socio-political connections. The perception of water use is another problem since it is treated as a free good. Uzbekistan also suffers from external threats which are represented by the ongoing disputes with neighbouring countries over shared water resources. The present thesis contains an analysis of the current problems linked to land and water resources in Uzbekistan, reveals the background of these problems and explains possible ways of solving them.

Keywords: land and water resources, agricultural sector, state ownership, gradual reforms, land tenure security, state control, irrigation inefficiency, conflicts over shared water resources.

ABSTRAKT

Přírodní zdroje jsou základním stavebním kamenem veškerých ekonomických činností v zemi. Tato disertační práce je zaměřena na půdu a vodní zdroje jakožto stěžejní faktory úspěšného rozvoje zemědělství. Zemědělský sektor je pro Uzbekistán klíčový. Nejen že významně přispívá k tvorbě HDP, ale je důležitý i z hlediska zaměstnanosti a živobytí obyvatelstva ve venkovských regionech, z hlediska potravinové bezpečnosti a sociální stability. Dobře fungující a udržitelný zemědělský sektor by těžko existoval bez efektivního řízení využívání přírodních zdrojů. V Uzbekistánu začaly reformy týkající se zemědělského sektoru v roce 1991 a pokračují dodnes. Stát však kontroluje každý krok směrem k tržnímu zemědělství. Toto platí jak pro půdu, tak pro vodní zdroje. Půda je vlastněna státem, jistota držby půdy je slabá a zemědělská výroba je z velké části řízena vládními institucemi, což způsobuje zemědělským subjektům nemalé potíže. Klíčovou roli hrají vodní zdroje, protože drtivá většina obdělávané půdy musí být zavlažována. Voda je distribuována neefektivním zavlažovacím systémem, který se nachází ve státním vlastnictví. Plánování využití vody je neflexibilní a přidělování vody jednotlivým zemědělským subjektům záleží ve velké míře na jejich sociopolitických vazbách. Vnímání vody je další problém, protože je považována za víceméně volný statek. Uzbekistán je také ohrožován vnějšími faktory, mezi které patří neutuchající spory o vodní zdroje se sousedními zeměmi. Předkládaná disertační práce obsahuje analýzu současných problémů souvisejících s půdou a vodními zdroji Uzbekistánu, odhaluje jejich pozadí a navrhuje možná řešení.

Klíčová slova: půda a vodní zdroje, zemědělský sektor, státní vlastnictví, postupné reformy, jistota držby půdy, státní kontrola, neefektivita zavlažování, konflikty o sdílené vodní zdroje.

TABLE OF CONTENTS

ABSTRACT	i
ABSTRAKT	ii
LIST OF FIGURES	vi
LIST OF TABLES	vii
LIST OF BOXES	vii
GLOSSARY OF TERMS	viii
LIST OF ACRONYMS AND ABBREVIATIONS	ix
INTRODUCTION	1
UZBEKISTAN OVERVIEW	4
1.1 GEOGRAPHY AND CLIMATE	4
1.2 POPULATION	5
1.3 POLITICAL SYSTEM	5
1.4 REGIONAL STRUCTURE	6
1.5 ECONOMY	6
1.5.1 Economic Overview	6
1.5.2 Economic Sectors	8
1.6 ECONOMIC TRANSFORMATION IN UZBEKISTAN	9
1.6.1 Specifics of the Transition Period	10
1.6.2 Main Goals of Transition	11
1.7 SUMMARY OF THE CHAPTER “UZBEKISTAN OVERVIEW”	12
AGRICULTURAL SECTOR	13
2.1 THE SOVIET ERA AND THE TRANSITION PERIOD	14
2.2 RECENT TRENDS IN AGRICULTURAL SECTOR	15
2.2.1 State Control over Production	19
2.2.2 Food Security and Change in Cropping Patterns	19
2.2.3 Cotton Production	20
2.2.4 Irrigation	22
2.3 ENVIRONMENTAL PROBLEMS	23
2.4 AGRARIAN REFORMS	24
2.5 SUMMARY OF THE CHAPTER “AGRICULTURAL SECTOR”	26
OBJECTIVES AND HYPOTHESES	27
3.1 OBJECTIVES	27

3.1.1 Main Objective.....	27
3.1.2 Specific Objectives	27
3.2 HYPOTHESES.....	27
METHODOLOGY.....	29
4.1 RESOURCES OF INFORMATION	29
4.1.1 Legislation.....	29
4.1.2 Statistical data	29
4.1.3 Literature.....	30
4.2 RESEARCH METHOD	30
4.2.1 Interviews.....	31
4.3 THEORETICAL AND CONCEPTUAL FRAMEWORK.....	34
4.3.1 Land Tenure	34
4.3.2 Economies of Scale.....	36
4.3.3 Common-Pool Resources Theory and the Tragedy of the Commons	38
4.3.4 International Water Law	40
4.3.5 Game Theory	43
LAND RESOURCES.....	46
5.1 DEFINITION OF LAND IN UZBEKISTAN	46
5.1.1 Legal Framework	47
5.2 AGRICULTURAL ENTITIES.....	50
5.2.1 Shirkats (Agricultural Cooperatives)	50
5.2.2 Private Farms	52
5.2.3 Dehkan Farms	53
5.2.4 Forms of Agricultural Production	55
5.3 CHANGES IN THE LAND TENURE STRUCTURE	55
5.3.1 Individualization of Farming	57
5.4 SPECIFICS OF LAND TENURE IN UZBEKISTAN.....	58
5.4.1 Customary Law	58
5.4.2 Factors Weakening Land Tenure Security.....	58
5.5 CHINA'S LAND REFORMS: A MODEL TO FOLLOW?	63
5.5.1 Concept of Chinese Reforms	64
5.5.2 Individual Phases of Chinese Land Reforms	65
5.5.3 Benefits of Land Tenure Security in China	68

5.6 SUMMARY OF THE CHAPTER “LAND RESOURCES”	70
WATER RESOURCES.....	71
6.1 DOMESTIC PROBLEMS OF WATER MANAGEMENT	71
6.1.1 Legal Framework	71
6.1.2 Water Resources of Uzbekistan	72
6.1.3 Specifics of Water Resources Management.....	74
6.1.4 Irrigation Scheme and its Efficiency.....	79
6.1.5 Concluding Remarks.....	87
6.2 REGIONAL CONFLICTS OVER WATER RESOURCES.....	88
6.2.1 Aral Sea Basin.....	89
6.2.2 Water Resources of the Aral Sea Basin	92
6.2.3 Concrete Case of Regional Transboundary Water Conflict.....	96
6.2.4 Concluding Remarks.....	102
6.3 SUMMARY OF THE CHAPTER “WATER RESOURCES”.....	103
RESULTS AND DISCUSSION	105
7.1 RESULTS	105
7.1.1 Land Issues.....	105
7.1.2 Water Issues	111
7.2 DISCUSSION	114
7.2.1 Land issues	114
7.2.2 Water issues	119
CONCLUSIONS AND RECOMMENDATIONS.....	125
8.1 CONCLUSIONS	125
8.1.1. Objectives	125
8.1.2 Hypotheses	127
8.2 RECOMMENDATIONS.....	130
8.2.1 Recommendations on Land Issues	130
8.2.2 Recommendations on Water Issues	130
LIST OF REFERENCES	132

LIST OF FIGURES

Figure 1 - Real GDP growth 2000 – 2013	7
Figure 2 - Agricultural growth in Uzbekistan (1988 – 2012)	15
Figure 3 - Area sown with cotton and wheat 2010 – 2013 (thousand ha)	18
Figure 4 - Area sown with other crops 2010 – 2013 (thousand ha)	18
Figure 5 - Uzbekistan cotton production 2010 – 2013 (thousand tonnes)	21
Figure 6 - Uzbekistan cotton production, net exports and domestic use	22
Figure 7 - Land use in Uzbekistan	47
Figure 8 - Gross agricultural product by category	55
Figure 9 - Number of private farms in Uzbekistan 2001 – 2010	62
Figure 10 - Value of gross agricultural production, China 1978 – 1985	67
Figure 11 - Water use in Uzbekistan (%)	73
Figure 12 - Organizational structure of water resources management	76
Figure 13 - The Aral Sea Basin	90
Figure 14 - Use of water resources in agriculture in the Aral Sea Basin countries	91
Figure 15 - River basins in Uzbekistan	92
Figure 16 - Amudarya total average flow (km ³)	94
Figure 17 - Syrdarya total average flow (km ³)	95
Figure 18 - Nash bargaining solution	101
Figure 19 - Production of cotton lint and wheat 1992 – 2013	106
Figure 20 - Share of agricultural entities in total cropped area 1995 – 2007	109

LIST OF TABLES

Table 1 - Evolution of population and labour force in size	13
Table 2 - Evolution of rural population and share of labour force in agriculture	14
Table 3 - Top ten agricultural commodities – production value (2012)	19
Table 4 - Country area	46
Table 5 - Structure of production of main agricultural products in shirkats	51
Table 6 - Structure of production of main agricultural products in private farms	53
Table 7 - Structure of production of main agricultural products in dehkan farms	54
Table 8 - Permeability of soils in individual administrative districts of Uzbekistan	84
Table 9 - Land resources in the Aral Sea Basin	90
Table 10 - Surface water resources in the Aral Sea basin	95
Table 11 - Cereal import dependency	106
Table 12 - Limitation of land rights of private farmers	107
Table 13 - Characteristics of the individual stages of farm restructuring in Uzbekistan	108
Table 14 - Characteristics of the main types of agricultural entities	109
Table 15 - Land tenure rights of private farmers and dehkans	110
Table 16 - Forms of production and rights to sell	110
Table 17 - Problems arising from the individualization of farming	111
Table 18 - Factors causing water losses	112
Table 19 - Methods of settling interstate conflicts over transboundary water resources	113

LIST OF BOXES

Box 1 - Water wasting	86
Box 2 - The Aral Sea tragedy	87

GLOSSARY OF TERMS

Dehkan	Peasant, operating a household plot
Hokim	Governor of province
Hokimiyat	Local authorities/government of province
Kolkhoz	Soviet collective farm (Russian)
Limit	Volume of water designated for each agricultural entity per year
Mahalla	Neighbourhood committee, community of neighbours
Oblast	Province, region (Russian)
Rayon	District (Russian)
Schetchik	Meter (Russian)
Shirkat	Agricultural cooperative (Uzbek)
Sovkhoz	Soviet state farm (Russian)
Tomorka	Household plot (Uzbek)
Viloyat	Province, region (Uzbek)

LIST OF ACRONYMS AND ABBREVIATIONS

ASB	Aral Sea Basin
ATS	Absolute Territorial Sovereignty
BUIS	Basin Authority of Irrigation Systems; <i>Bassejnovoe Upravlenie Irrigacionnykh Sistem</i> (Russian)
BVO	Basin Management Organization; <i>Bassejnovoe Vodohozyajstvennoe Obyedinenie</i> (Russian)
CIS	Commonwealth of Independent States
FAO	Food and Agriculture Organization of the United Nations
FSU	Former Soviet Union
GDP	Gross domestic product
HSR	Household Responsibility System
ICAS	Interstate Council for the Aral Sea
ICWC	Interstate Commission for Water Coordination of Central Asia
IFAS	International Fund for Saving the Aral Sea
IMF	International Monetary Fund
MAWR	Ministry of Agriculture and Water Resources of the Republic of Uzbekistan
RLCL	Rural Land Contracting Law
SANIIRI	Central Asian Scientific Research Institute for Irrigation (Tashkent)
TGAU	Tashkent State Agrarian University
UN	United Nations
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
USSR	Union of the Soviet Socialist Republics
UTI	Unlimited Territorial Integrity
WB	The World Bank
WCA	Water Consumers Association
WFP	United Nations World Food Programme
WUA	Water Users Association

INTRODUCTION

Natural resources determine the initial conditions for development and its character in every country or region. Land and water, their quality, abundance and availability, constitute the key resources for successful agricultural or generally economic development; in this respect Uzbekistan represents a prime example of the indispensability of well-functioning system of land and water management for sustainable economic development. Uzbekistan has experienced rapid economic growth but its sustainability is questionable; it will take time, much effort and rethinking of chosen paths to accomplish the goals set by the Uzbek government.

The agricultural and rural sectors are of vital importance in Uzbekistan, and land and water play an essential role in both economic and social development. The agricultural sector not only contributes to almost one fifth of the country's gross domestic product but it is crucial for providing employment, rural livelihood, food security and social stability too. The sectors have to be considered as an indispensable part of the country's social fabric. Deteriorating of these sectors would have enormous negative consequences on society development; it can lead to human insecurity, social instability and endanger sustainable economic development. Nevertheless, there were other issues in the 1990s that were given a priority: market and price liberalization (albeit sluggish and partial), industry development with focus on extraction of natural resources, macroeconomic stabilization and partial foreign trade liberalization. Changes in the agricultural sector were overdue and their importance was mainly seen from the point of economic output. The importance of the sector is primarily the development of light industries, employment and a place to live for the majority of people.

Uzbekistan cannot be labelled as a market-oriented economy yet; its economy still remains at an early stage of transition and has to undergo a whole range of structural reforms. Although the agricultural sector has gone through reforms since the country's independence, they have not radically changed the mechanisms and institutions of the command economy yet. In this respect, Uzbekistan stays behind its neighbours, especially Kazakhstan and Kyrgyzstan, but also Tajikistan. Unlike Kazakhstan and Kyrgyzstan, Uzbekistan adopted a "gradualist" approach to reforms since the very beginning. The government wanted to avoid a rapid and often chaotic liberalization of markets without establishing necessary institutions. Absence of these could have led to collapse of the markets, which was the case of Kazakhstan and Kyrgyzstan. While the initial stages of transition were accompanied by economic recession

and rising unemployment in all Central Asian countries, the consequences were milder in Uzbekistan. Kazakh and Kyrgyz “shock therapy” reform measures led to a sharper economic downfall. Tajikistan cannot be included in this comparison due to a civil war that took place in the country in the 1990s. Uzbekistan benefited from another favourable circumstance: its main cash crop, cotton, could find alternative markets outside the CIS. Government control secured production and exports and therefore it also secured employment and decent living conditions for rural population.

In the present thesis, land and water use in urban areas will be left out of account. The focus will be on rural issues since the majority of land is used for agribusiness and 90 % of water is used in agriculture (TGAU, 2011).

The purpose of this thesis is to analyse processes that took place in Uzbekistan after gaining its independence, particularly on the land tenure reform, issues concerning effective land tenure and its consequences on livelihoods of the rural population. Attention will be paid to agricultural enterprise restructuring and its effect on land and water management reforms. Water issues are of extreme importance, therefore special focus will not be restricted only to domestic issues but will also involve interstate conflicts over transboundary water resources.

The goal of such analysis is to clarify the intricate and tangled relations in the core of the Uzbek agricultural sector. It will help to understand the power of law and the importance of informal ties within the sector. A deeper insight into international problems of shared water resources will reveal the country’s external threats.

This thesis is structured into eight chapters. The first chapter is devoted to a brief characteristic of Uzbekistan, mainly the country’s economy and transformation process.

Agricultural sector is described in a separate (second) chapter since it needs more space in order to fulfil the aims of this thesis.

The third chapter is dedicated to specification of objectives and hypotheses.

The fourth chapter consists of methodology where resources of information, research methods, and theoretical and conceptual framework are introduced.

The fifth chapter is larger in volume since it deals with one of the two main issues – land resources. Individual agricultural entities are introduced and respective legislation is examined. The main focus issue is the level of land tenure security and its consequences in the Uzbek environment. Another important issue is the land reform in Uzbekistan, which is

narrowly linked to the current land tenure system. The principal question regards the state ownership of land and the official rationale justifying it. The actual barriers for further development of the agricultural sector will be examined and factors that hamper the continuing improvement of welfare of rural workers. Such analysis can cast light on legitimacy of state control over agricultural sector. Arguably, there are not only negative sides of this system, as widely publicized, but also benefits.

In the next chapter, devoted to water resources, the effectivity of the water distributing system, water management and relations in the water sector will be examined. A significant part of this chapter will be dedicated to international issues as they are crucial for the stability of the Uzbek irrigation system. The questions will be linked to disputes between upstream and downstream countries, sharing a river.

In the seventh chapter, Results and Discussion, the results will be presented and interpreted, mostly in the form of illustrative tables, and then contextualized in the general field.

In the final chapter, Conclusions and Recommendations, the hypotheses will be discussed and recommendations on the current problems in land and water management in Uzbekistan will be proposed.

The present thesis can be of use for organizations or enterprises that aim to penetrate the Uzbek agricultural market or launch a developing project; it may as well be helpful to Uzbek state officials since it offers a different view on problems of the rural sector. Also international organizations that are often called upon to play a critical role in international water disputes, may find this thesis useful.

CHAPTER 1

UZBEKISTAN OVERVIEW

This chapter briefly presents the country's key characteristics, such as geography and climate, population, political system and regional structure. It concentrates on the Uzbek economy and economic transformation. Such knowledge is essential for understanding information provided in the next chapters. Agricultural sector is characterized in an individual chapter since it lies in the centre of our interest.

1.1 GEOGRAPHY AND CLIMATE

Uzbekistan with 447.400 square km is slightly smaller than neighbouring Turkmenistan (FAO, 2013). For comparison, its territory is bigger than the combined area of Germany and the Czech Republic. Uzbekistan borders each of the four Central Asia republics (Kazakhstan, Kyrgyzstan, Tajikistan and Turkmenistan), as well as Afghanistan in the south. Uzbekistan is a "double landlocked" country, surrounded only by landlocked countries.

The physical environment is diverse, from flat deserts to mountain peaks. Flat terrain comprises around 80 % of the country (CA Water Info, 2013). The foothills of the Tian-Shan Mountains rise in the south-east.

Physiographically the country can be divided into three zones:

- the desert (Kyzylkum), steppe and semi-arid region covering 60 % of the country, mainly the central and western parts;
- the fertile valleys (including the Ferghana valley) that skirt the Amudarya and Syrdarya;
- the mountainous areas in the east with peaks of about 4,500 m above sea level (Tien Shan and Gissaro-Alay mountain ranges) (FAO, 2013).

The most fertile part of Uzbekistan, the Ferghana valley, is surrounded by mountains in the north, east and south. The northern lowland part of Uzbekistan, west of the Ferghana valley, is covered by the Kyzylkum, a desert shared with Kazakhstan.

Water resources are scarce; the most important rivers are the Amudarya and Syrdarya which virtually discharge into the dried-up Aral Sea. The Amudarya originates in Tajikistan, the Syrdarya in Kyrgyzstan. They are a fundamental resource of irrigation water.

Uzbekistan has an arid, continental climate that is characterized by cold winters, hot summers and limited precipitation in most regions. The western and central areas of Uzbekistan are

extremely dry and arid. Precipitation falls predominately in winter and spring; with precipitation being extremely sparse in the summer. From an agricultural perspective, the arid climate of Uzbekistan is highly challenging, as this sector is highly reliant on irrigation to overcome the country's natural water deficit (Baker & McKenzie, 2012).

Due to years of excessive irrigation and ecological mismanagement during the Soviet era, the Aral Sea (shared with Kazakhstan) has shrunk to minimum. The dry basin, covered with salts and chemicals, caused a rapid worsening of living conditions in Karakalpakstan. Severe environmental issues pose serious health risks. On the other hand, the region around Tashkent and the Ferghana valley are better off; they enjoy relatively temperate climates and are centres of agriculture. The population density is very high there. These regions supply fruit, vegetables, dairy products and other foodstuffs for Uzbekistan and neighbouring countries (FAO, 2014).

1.2 POPULATION

The total population was an estimated 30,241 thousand inhabitants in 2013 (of which 64 % rural) (World Development Indicators, 2014) which makes Uzbekistan the most populated country in the post-Soviet Central Asia. During the period 2004–2013 annual population growth rate was an estimated 1.7 % (WB, 2014). Population density is about 62 inhabitants / km², which is the highest of the five former Soviet Central Asian republics. Population ranges from more than 464 inhabitants per square km in Andijan province in the Ferghana valley to only eight inhabitants per square km in Karakalpakstan (FAO, 2013). The population is concentrated in smaller areas (such as the Ferghana valley and Tashkent oblast), while vast areas of the country were sparsely populated.

1.3 POLITICAL SYSTEM

The Republic of Uzbekistan declared its independence from the Soviet Union on 31th August 1991. Uzbekistan is a presidential republic and has had a bicameral legislature since 2004. The President, Islam Karimov, is the Head of State and, among other powers, he issues decrees, resolutions and orders (The Governmental Portal of the Republic of Uzbekistan, 2013). He was first elected in 1991 and subsequently re-elected in 2000 and 2007. Oliy Majlis, the parliament, exercises legislative power through the Legislative Chamber (the lower chamber) and the Senate (the upper chamber). The executive power is exercised by the Government (Vazirlar Mahkamasi). The judicial authority, composed of the Constitutional

Court, the Supreme Court, the Higher Economic Court and lower courts, exercises judicial power (The Governmental Portal of the Republic of Uzbekistan, 2013).

1.4 REGIONAL STRUCTURE

For administrative purposes, Uzbekistan is divided into 12 regions (viloyats): Andijan, Bukhara, Jizzak, Ferghana, Khorezm, Kashkadarya, Navoi, Namangan, Samarkand, Surkhandarya, Syrdarya and Tashkent region; Tashkent city and the autonomous Republic of Karakalpakstan in the far west near the Aral Sea. As a result of Uzbekistan's highly centralized form of government, the constituent regions have comparably little political power. A "hokim" (governor) is appointed by the President for each viloyat; hokims dispose of substantial socio-political power in the viloyat. Karakalpakstan has its own head of Government, who is subordinate to the President of Uzbekistan (The Governmental Portal of the Republic of Uzbekistan, 2013).

1.5 ECONOMY

1.5.1 Economic Overview

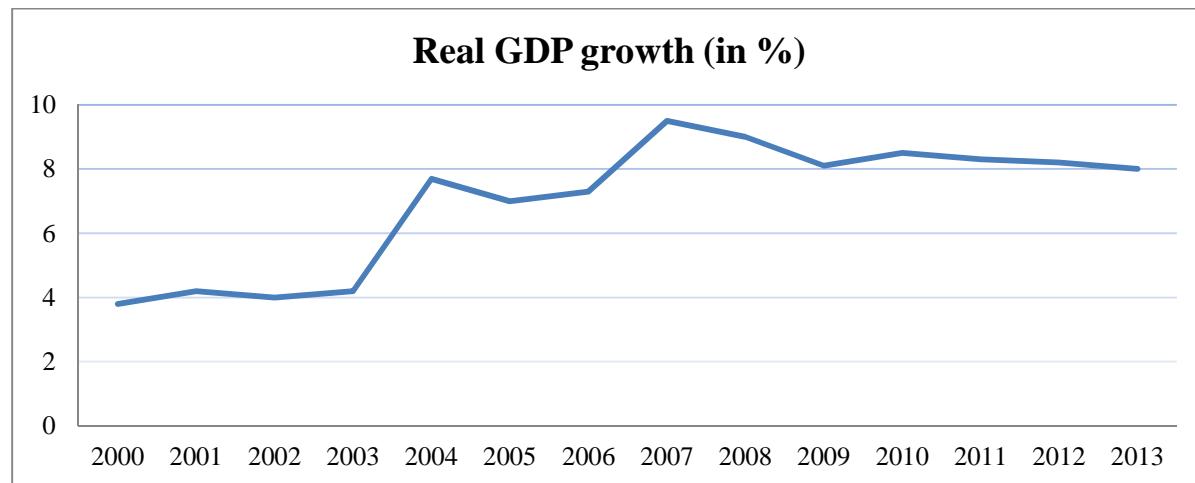
Uzbekistan is a country with a wide variety of natural resources. It is rich in gas, oil, gold, uranium, copper, silver, molybdenum, lead, zinc, tungsten, lithium and many others. It is also one of the world's biggest producers of cotton although its cotton production is decreasing (FAO, 2014).

The economy of Uzbekistan has gone through gradual transition since achieving independence in 1991. However, Uzbekistan has been reluctant to create a full-blooded market-oriented economy. Its transition has been slow and cautious. Unlike Kazakhstan and Kyrgyzstan, countries which chose the "shock therapy" reforms, Uzbekistan has maintained a high level of state directed economy.

Uzbekistan is a lower middle income country with GNI per capita of 1,880 USD in 2011 (WB, 2014). The country enjoyed strong economic performance between 2000 and 2013 with 7 % real GDP growth on average (author's calculation based on World Development Indicators, 2014); the growth has been robust since the mid-2000s thanks to favourable trade terms for its key export commodities. Overall growth for Uzbekistan is projected to continue at around 7 to 8 percent annually during 2015-2016 (WB, 2014), supported by strong domestic demand, net exports and a large capital investment program. The impact of any increases in global food and energy prices are expected to be limited given Uzbekistan's

policy of self-sufficiency in both food grains and energy (WB, 2013). Inflation rate remains quite high, above 11 percent in the last years (IMF, 2012). Despite the recent world financial and economic crisis, Uzbek economy did not suffer many symptoms, owing to the strong government involvement in banking and other strategic industries, its diversified economy and relative isolation from global financial markets. Oil and gas exports were moderately affected (Baker & McKenzie, 2012).

Fig. 1. Real GDP growth 2000 – 2013



Source: *World Development Indicators, 2014*

While production levels have declined steadily in recent years, cotton remains one of the most important export products. Natural gas has recently become one of Uzbekistan's main export commodities thanks to its increased extraction. Gold, silver and copper are other significant exports (Czech Trade, 2013). The current account balance has been positive over a long period and its turnover has been steadily growing since 2003. Exports of goods and services account for 28 % of GDP and the projections oscillate around this value. Russia, China and Turkey were the main export partners in 2011 (IMF, 2012). The commodity structure of Uzbek trade remains stable. As of 2010, Uzbekistan exported mainly energetic resources, cotton, foodstuff, metals, machinery and vehicles and chemicals, and imported machinery and equipment, chemicals, foodstuffs and energetic resources (Czech Trade, 2013).

Trade policies in Uzbekistan belong to the most restrictive in the region. A range of tariff and non-tariff barriers to discourage imports is utilized. Uzbekistan is not a member country of the WTO yet but it has started its accession negotiations. Uzbekistan maintains exchange restrictions constraining imports. Uzbekistan also maintains export surrender requirements, which means that companies have to remit, on average, 50 % of their export earnings and

convert the remittance to local currency. These restrictions do not apply to selected import and export companies favoured by the state (IMF, 2012).

There are a few important issues that can affect the country's welfare and stability. The country faces increasing tensions with its neighbours over regional issues – especially the use of transboundary energy and water resources. Relations with Tajikistan and Kyrgyzstan are rather tense. The main reason is Uzbekistan's dependence on irrigation in its agricultural sector. The country gets over 85 % of water from Kyrgyz and Tajik rivers. Another important challenge that Uzbekistan has to deal with is to minimize the economy's vulnerability to possible external shocks that could affect commodity prices since export revenues from the above mentioned commodities are crucial.

1.5.2 Economic Sectors

INDUSTRY

On the eve of its independence, Uzbekistan was characterized by a low level of industrialization. Nowadays, industry substantially contributes to the country GDP and its importance is gradually growing. Uzbekistan has significant energetic resources, especially natural gas. Uzbekistan holds 8th position in world gas extraction (Czech Trade, 2013). The key economic sectors are energy, metallurgy, mining, telecommunications, agriculture (cotton processing), machinery and transportation. The fastest growing sectors are foodstuff production, machinery and metal procession, building materials production and petrochemical industry (SSCU, 2012). The oil and gas sector is state owned, managed by a state joint stock company Uzbekneftegaz. The country is also rich in coal and has a significant hydroelectric potential. Hydroelectric power stations are located especially on the Syrdarya River and its tributaries. Other important rivers that can serve for energetic purposes are the Chirchik, Agren, and Surkhandarya. The hydroelectric power stations are managed by the state joint stock company Uzbekenergo. Coal and hydroelectric resources count up to 5 % of the country's energetic balance (Czech Trade, 2013). Uzbekistan is also planning to use renewable energetic resources such as solar energy. Solar collectors have been installed in a wide range of sectors. Another source of renewable resources is biomass, namely cotton plant stems and sugar cane stems.

SERVICES

The sector of services has not been developing very well. According to the World Bank (2013), its share in GDP has remained more or less constant for the last decade.

One of the important sectors is transportation. It is dominated by railway. Train services quality is improving. However, the most important sector in terms of cargo capacity is road transport. It is also irreplaceable in mountainous areas. Pipeline transport is steadily growing but the pipeline network is not in a good condition and requires investments.

AGRICULTURE

Agricultural sector is discussed separately in the next chapter because its significance is crucial for the aim of this thesis.

1.6 ECONOMIC TRANSFORMATION IN UZBEKISTAN

To understand the variety of issues modern Uzbekistan has to deal with, it is necessary to investigate the reform processes that took place after gaining independence in 1991. Uzbekistan has chosen a specific path of transformation its economy and has adhered to its principles up to current day.

The abrupt disintegration of the Soviet Union led to a significant economic downfall in the entire post-Soviet area. Uzbekistan lost its traditional markets, financing from the central budget, and imports. The country had to deal with high inflation, ruining the population's savings which had been held in saving banks.

Uzbekistan, like other Central Asian republic after gaining their independence, did not have favourable initial conditions. Uzbekistan is rich in natural resources which represent profitable export commodities. This is true also for agricultural products such as cotton, fruit, vegetables, silk and tobacco. But the newly independent country lacked a high degree of industrialization and technological development. Before the break-up of the Soviet Union, Uzbekistan did not have a complete structure of production – the level of procession was low and most of the finished goods had to be imported from other Soviet republics. The technological level of production was unsatisfactory, industrial facilities were obsolete and the labour force showed low productivity (Saidova, 1998). Industry was not well developed in any Central Asian republic; Uzbekistan had somewhat better linkages between the agricultural and industrial sectors, although even there scarcely any textile industry emerged (Spoor, 1998). Most natural resources used to be extracted and then transported to the centre since there were few final processing facilities. The degree of poverty was comparatively high and the population was predominantly rural (60 %) (WB, 2014) and most of them were dependent on agricultural sector. Uzbekistan was also highly dependent on import of food which became

obvious after 1991 – the country did not produce enough grain to feed its growing population. The population growth was impressive and newly emerged problems of food shortage needed an urgent solution. The standard of living was one of the lowest among the Soviet republics and the degree of dependence on the central budget was rather high (Saidova, 1998). Uzbekistan also inherited severe environmental problems. One of the problems the newly independent country had to deal with was the desiccation of the Aral Sea. This catastrophe has led to severe environmental problems and their solution has been a heavy burden for the young country.

During the Soviet times, the economy was strictly planned and dictated from the centre. The Uzbek SSR was hence dependent on decisions of the central organs and on centralized system of economic administration. After gaining independence in 1991, the government did not immediately reject the mechanism of planned economy and its features such as wide range of state subsidies, strict control of production and price determination. This actually buffered the economy from the sharp falls in output experienced in other CIS countries.

1.6.1 Specifics of the Transition Period

The young country had no experience and no local experts to carry out a quick transformation of the quasi-planned economy into a full-blooded market economy. Uzbekistan, unlike Kyrgyzstan or Kazakhstan, did not choose the path of „shock therapy“, which was the Russian way of transformation. One of the reasons was the unusual demographic situation in the country and efforts to keep the social stability under control. Uzbekistan is the most populated in Central Asia, its population reached 30 million in 2013; in 1991 it was more than 21 million (WB, 2014). Around half the population are young people and children under 18 years of age. The Uzbek government had to find a path to achieve the economic goals and at the same time, not hurt the large population. The emphasis on social stability was evident; the “gradualist approach” to reforms put stress on social security. Such approach allowed both the economy and the population to adapt to the ongoing changes. Even the shock therapy would not enable the country to solve all tasks at once; the step-by-step reforms seemed to be the suitable option. It helped Uzbekistan to deal with less severe consequences of the fall in production.

During 1990s, several factors required to dynamise economic reforms and search for external financial resources. First, it was the efforts of integration in the international environment, second, symptoms of decreasing economic welfare, and third, high levels of inflation

(Saidova, 1998). In 1994 the liberalization of the national economy started which resided in a more strict monetary policy, privatization, decrease of the role of the state in economy and improving of conditions for foreign investors and their activities (Isadjanov, 1998). However, the state retained dominating positions and the reforms did not lead to substantial structural changes. In the end of the 1996, the IMF demonstrated its dissatisfaction with the depth and quality of liberalization by temporarily stopping its credits (Linke and Naumkin, 2009). The Uzbek government, however, kept its strategy of gradual reforms. They also tightened export and currency control as a reaction to negative conditions on the global level due to the Asian and Russian crises. The main efforts were aimed at securing the domestic market. Uzbekistan was the first country among the CIS to reach the “before-crisis” GDP in 2000 (Linke and Naumkin, 2009) which is a proof that the government managed to overcome the negativity of initial conditions of the economic transformation.

1.6.2 Main Goals of Transition

The main goal for Uzbekistan was to create conditions for economic growth. This was not possible without changing the structure of the Uzbek economy. It was based mainly on raw material extraction and cultivation of cotton monoculture. Such structure was not sustainable and had to be changed into a more diverse one, with new export sectors with a higher added value. On the other hand, agricultural specialization prevented the country from a higher level of dependence on circumstances on other post-Soviet countries’ markets.

The main economic objectives comprised of strict macroeconomic policy (aimed at financial stabilization and reducing inflation rates and GDP decline), gradual abolishing of centralized system and liberalization of prices, introducing market relations, transformation of the institutional system (introduction of private property, antimonopoly policies, banking and financial systems), creating of market infrastructure and competitive environment and of social protection of the population from negative consequences of the economic reforms (Saidova, 1998).

The main goal of the next stage of reforms was stabilization of the macroeconomic environment. Until 1993 Uzbekistan was part of the “rouble zone” so any independent monetary policy was hardly possible, the Central Bank had no levers to regulate monetary circulation. The rouble became increasingly devalued and trade became based on barter operations (Saidova, 1998). Financial stabilization was therefore difficult to achieve.

After the introduction of *sum* in 1994 the character of the inflation changed. The deregulation of domestic prices and the contraction in consumer subsidies are the factors of cost-push inflation. On the other hand, the fast rise of demand in 1992-93 and in the first half of 1994 gave way to demand-pull inflation in the second half of 1994 (Saidova, 1998).

The deficit of the state budget was limited too, thanks to a strict fiscal policy and measures aimed at improving the balance of trade and increasing the gold and hard currency reserves. These measures included especially active export promotion policy, increased production of grain and oil products and use of floating exchange rate for the currency (Isadjanov, 1998).

By the late 1990s, Uzbekistan entered a new stage of economic prosperity and growth, slowly reforming its economy. Social indicators have improved; poverty rate keeps declining: from 27.5 percent of the population in 2001 to 14.1 % in 2013 and is expected to have declined further to 13.7 percent in 2014 (WB, 2015). The reform process has not been completed and it keeps going – no revolutionary measures are expected but the economy is gradually moving towards more market-oriented environment. The process is sluggish and the country is still considered one of the least reformed of the FSU; on the other hand, these features helped Uzbekistan to mitigate the effects of the 2008 crisis.

1.7 SUMMARY OF THE CHAPTER “UZBEKISTAN OVERVIEW”

Uzbekistan is a double landlocked country in the heart of post-Soviet Central Asia, with arid to semi-arid climate. It is more populated than any other country in the region. Its growing, predominantly rural population has been posing challenges to the state in terms of food security and social stability. Agriculture is therefore a key sector of the economy. Uzbekistan is rich in natural resources such as gas, oil, gold or uranium, which represent important export commodities. Cotton production is still an important source of export revenues as well.

Uzbekistan is a lower middle income country. It has gone through a gradual transition of its economy since achieving independence; market principles have been introduced in a moderate manner. The first reforms were aimed at structural changes in order to boost the GDP growth, and at the newly emerged problem of food shortages.

Uzbekistan’s reform process is often a subject of criticism of western neoliberal economists who promote economic liberalization, privatization, deregulation, free trade and minimal government interventions. Undoubtedly, there is a price paid for achieving all kinds of goals; but taking into account the difficult initial conditions, the country has overcome multiple obstacles and managed to secure social stability and find its way to stable economic growth.

CHAPTER 2

AGRICULTURAL SECTOR

Uzbek agricultural sector is a very complex and sensitive sphere, and an important element of the whole economy. Its prosperity influences the welfare of majority of the population.

Despite Uzbekistan's rich natural resources, agriculture remains of fundamental importance to the country and its population, in terms of employment, rural livelihoods, food security and exports. Among other roles of the sector, it forms an essential part of the country's social fabric for the following reasons. The rural population constitutes over 60 % and agriculture accounts for around 19.8 % of employment (FAOSTAT, 2014) and 17.6 % of GDP (SSCU, 2013). The share of agriculture in GDP is slowly decreasing, while the share of rural population, on the other hand, is steadily increasing over time due to higher population growth rates in rural areas (Lerman, 2008; FAOSTAT, 2014). The following tables illustrate the ongoing trends. Table 1 shows the population growth and the decrease of labour force in agriculture. Table 2 demonstrates the growing percentage of rural population and the decreasing share of labour force in agriculture.

Tab. 1 Evolution of population and labour force in size

	Millions of people				Annual growth rate (%)		
	1998	2003	2008	2013	1998 - 2003	2003 - 2008	2008 - 2013
Total population	24.17	25.55	27.02	28.93	1.12	1.13	1.38
Total labour force	8.92	10.30	12.08	13.69	2.92	3.24	2.53
Labour force in agriculture	2.59	2.64	2.73	2.71	0.38	0.67	- 0.15

Source: FAOSTAT, 2013

Tab. 2 Evolution of rural population and share of labour force in agriculture

	Share (%)				Annual growth rate (%)		
	1998	2003	2008	2013	1998 - 2003	2003 - 2008	2008 - 2013
Rural population (% of total population)	62.30	63.02	63.69	63.75	0.23	0.21	0.02
Labour force in agriculture (% of total labour force)	29.04	25.68	22.58	19.78	- 2.43	- 2.54	- 2.61

Source: FAOSTAT, 2013

2.1 THE SOVIET ERA AND THE TRANSITION PERIOD

Soviet agriculture in Uzbekistan as well as in other Soviet republics was characterized by two farming structures. The first type were large-scale collective and state farms which coexisted with the second type, quasi-private, very small, subsistence-oriented household plots. Up to 1990 the agriculture in the whole Soviet Union was characterized by total dominance of the former, which began to fade away in the second half of the 1990s when land reform measures were taken. The household farms produced much in excess of their subsistence needs, and sold their surplus production to the large farms and on local bazars. While cultivating only 3 % of arable land, they accounted for 20 – 25 % of gross agricultural product in Uzbekistan in the 1980s (Lerman, 2008). This was mainly thanks to the highly concentrated livestock production. The household farms also specialized in horticulture and fruticulture. Scale crops requiring mechanization and costly inputs such as cotton or grain (wheat) were domains of large-scale farms.

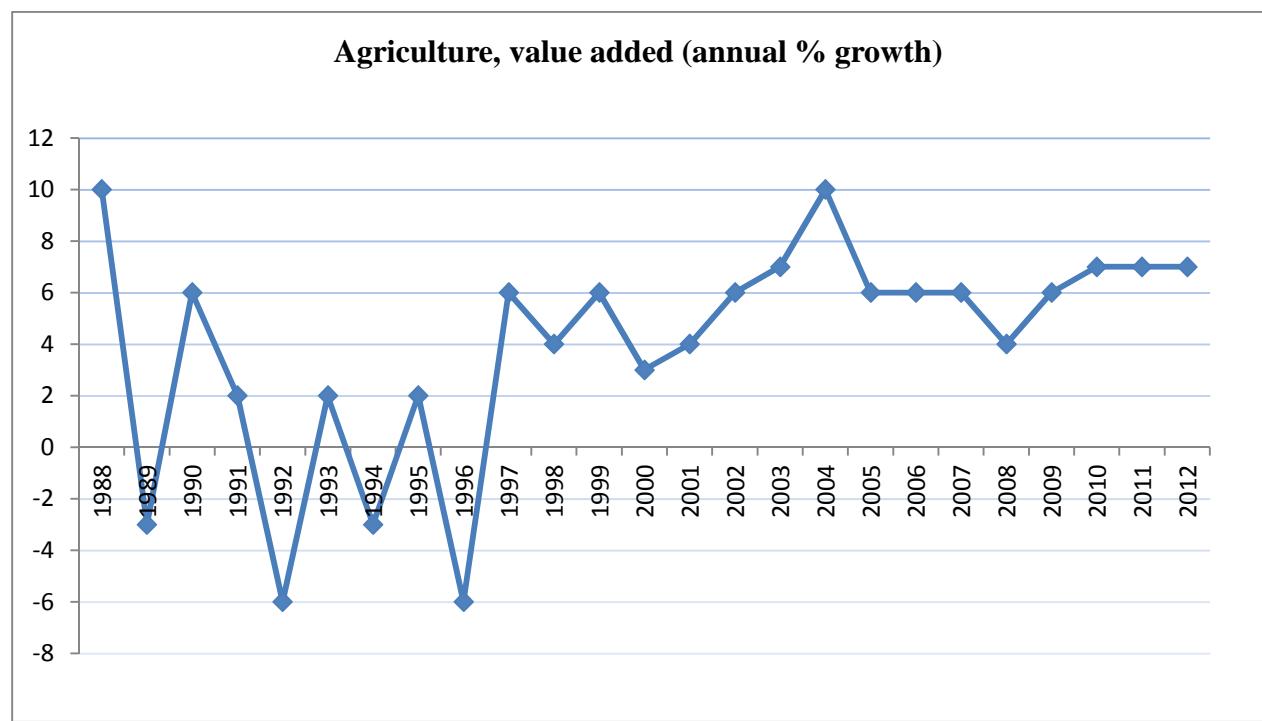
Agricultural development in Uzbekistan exhibits four different stages – 1) robust growth until 1980s, 2) stagnation during the following decade when the annual growth rates of agricultural output barely exceeded 2 % (IMF, 2008), 3) transition decline from 1991 to 1996 and finally 4) recovery since 1997 (IMF, 2008; Lerman and Sedik, 2009).

After Uzbekistan gained independence in 1991, the country's agricultural systems underwent significant structural changes resulting in total agricultural output dropping by 16 % by 1996 (WB, 2010). The decline after 1991 manifests features observed in other post-Soviet

countries. The disintegration of the Soviet agricultural system with its planned supplies of inputs and purchases of produce from large collective and state farms by the state at fixed prices caused a sharp drop in agricultural production after 1991. This decrease was largely due to the fall in the use of purchased inputs, including feed, machinery and fertilizers, and the shrinkage of the livestock herd as a production resource (Lerman and Sedik, 2009).

The state retained exclusive land ownership which was recognized in the Uzbek Constitution in 1992 and further reaffirmed in the 1998 Land Code.

Fig. 2 Agricultural growth in Uzbekistan (1988 – 2012)



Source: WB, 2014

2.2 RECENT TRENDS IN AGRICULTURAL SECTOR

With more effective land distribution and engagement of an increasing number of households in agriculture and crop diversification, outputs have increased significantly since the 1990s. Large collective and state farms have been restructured and transformed into cooperative enterprises. However, they did not prove to be more efficient. This process eventually resulted in the formation of smaller private farms which replaced most of the inefficient large enterprises, and the expansion of small household plots. Both have been main pillars of the growth in agricultural output in recent years. Over the years the three current agricultural

entities have developed: *private farms*, *dehkans* working on small-scale household plots and *shirkats* (former cooperative enterprises). Individual agricultural entities and their development are discussed later on.

A large area of land is used for agricultural production in Uzbekistan – 6.2 mil. ha where about 4212.8 thousand ha are irrigated (SSCU, 2013). This irrigated land comprises approximately 10 % of the land area of the country. Natural pastures occupy 40 % of the country and rain-fed and irrigated cropland account for an additional 12 % (Centre of Hydrometeorological Service, 2008). Agriculture in Uzbekistan is critically dependent on water. Crop production and most livestock production (with the exception of the karakul sheep grazing in the desert) are located mainly in irrigated areas. All cotton is grown under irrigation, and in the 1970s, grain production was moved to irrigated lands too. The irrigated area has remained constant at 4.2 million hectares since 1990 (the area increased from 2.2 million hectares in 1953; Lerman, 2008). Water is drawn from reservoirs and directly from the two major rivers, the Amudarya and the Syrdarya.

Agriculture has traditionally been a strong and relatively stable contributor to Uzbekistan's economy, making up between 20 – 35 % of GDP since 1995, though its share of the total economy has decreased over the past few years (WB, 2013). Despite this, the percent of rural population has increased and now accounts for about two-thirds of the population. Although the agriculture sector has been growing, between 2000 and 2012 the sector expanded at an average annual rate of 6.1 %, the sector's share of GDP declined from 34 % to 19 % between 2000 and 2012, while other sectors of the economy, such as industry, grew at a faster pace (WB, 2013). However, Uzbekistan is still an agrarian society with the agriculture sector providing an important share of the country's employment. Even with the declining share of agriculture of the country's GDP, a large share of Uzbekistan's exports still come from the agricultural sector and demonstrate the importance of agriculture to Uzbekistan's economy. The main exported commodities are milling products and starches (44 %), fruit and vegetable products (32 %). The major exported agricultural commodity is cotton accounting for around 10 % of total exports (FAO, 2012).

By area, cotton and wheat are by far the two major crops grown in Uzbekistan. Smaller areas are occupied by vegetables, fruits, rice, potatoes, tobacco and fodder crops. Although crops such as cotton and wheat are grown extensively (on 36 % and 40 % of cultivated land in 2012 respectively) (SSCU, 2014), they provide a relatively small share of revenues. Although

cotton accounts for almost 40 % of cultivated lands, its share in total farm revenues is just 8 %. Other field crops garner a higher price (Sutton et al., 2013).

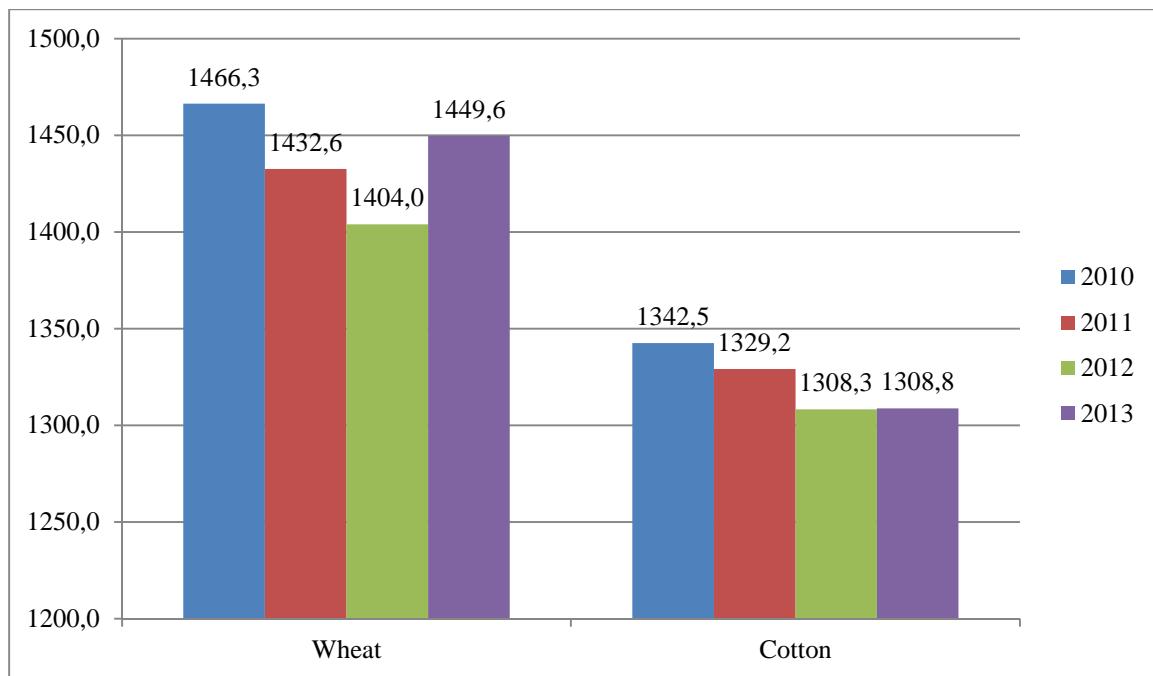
In 2012, the annual and perennial crops made up 53.4 % of the value of agricultural production, while the livestock sector accounted for the remaining 46.5 % (WB, 2013). Since independence, nearly all livestock has shifted to dehkan farms. The sector produces meat, diary products, eggs, and also raw materials such as cocoons of mulberry silkworms and karakul sheep that are in high demand on the world markets (WFP, 2008). Today, the animal production sector is clearly dominated by the small-scale sector – 95 % of livestock is bred on dehkan farms, which use only 11 % of cultivated lands (Sutton et al., 2013). The amount of domestic animals, including cattle, chickens, goats and sheep, has continued to increase over the past decade, possibly as a result of the growing rural population.

The private farms have less flexibility in their choice of production and are mainly focused on cotton and wheat production since they have to meet the state quotas, with inputs being received from supplying organizations. A small numbers of private farms are engaged in cultivation of vegetables, melons, orchards, grapes and livestock production. Accordingly, it will be important to provide greater flexibility for private farms to choose cropping patterns.

Livestock production, just like horticulture, functions within the framework of a free market economy. There are only a few government interventions and the government does not provide any significant level of support. The dehkan production is sold either fresh at local markets (bazars) or to small processing enterprises.

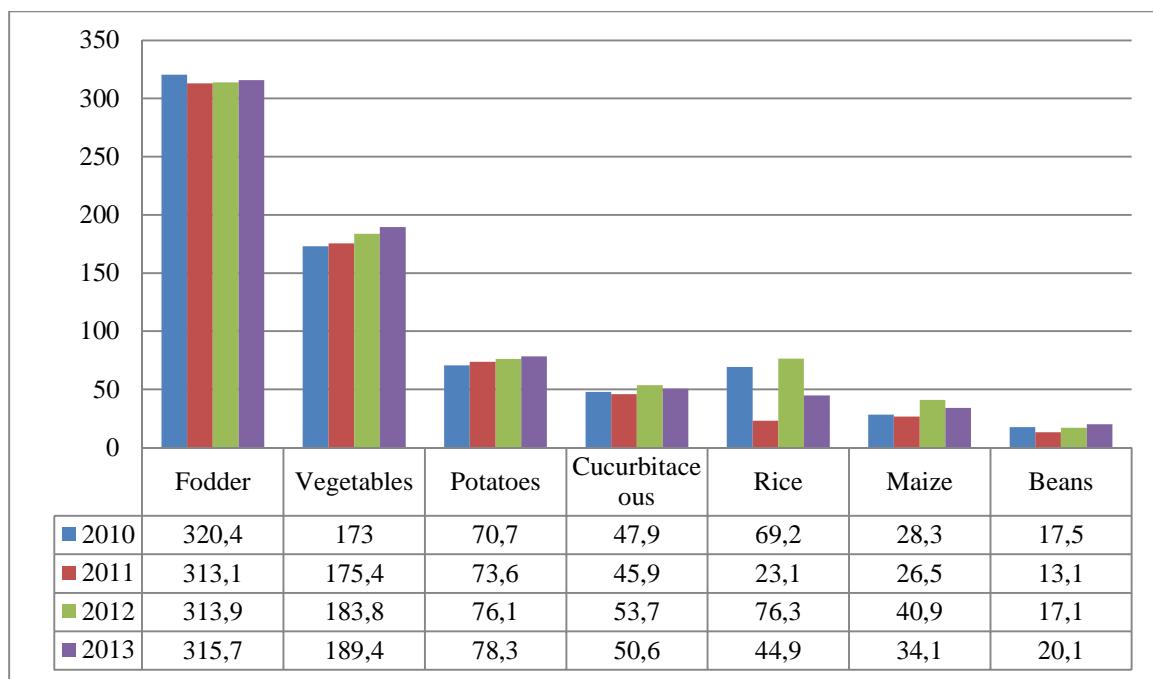
The next two figures demonstrate the area sown with main crops. Wheat takes up 39.6 % and cotton 35.8 % of the total area sown (SSCU, 2014).

Fig. 3 Area sown with cotton and wheat 2010-2013 (thousand ha)



Source: SSCU, 2014

Fig. 4 Area sown with other crops 2010-2013 (thousand ha)



Source: SSCU, 2014

Figures 4 and 5 show a low level of crop diversity. The dominance of cotton and wheat in the current agricultural system makes Uzbekistan's agricultural sector highly susceptible to price fluctuations of these commodities. This, combined with restrictions on exports of other crops,

suggests that farmers have limited means to adapt to changing yield and price conditions. There is also low participation in currently available crop insurance programmes.

Table 3 shows the top agricultural commodities measured in production value; except for cotton and wheat the commodities are typically produced by dehkans (small-scale farmers).

Tab. 3 Top ten agricultural commodities – production value (2012)

	Commodity	Value (mil. USD)
1	Meat indigenous, cattle	2102.747
2	Cotton lint	1503.523
3	Milk, whole fresh cow	1178.966
4	Tomatoes	979.345
5	Grapes	640.211
6	Wheat	573.916
7	Cottonseed	544.559
8	Carrots and turnips	324.349
9	Meat indigenous, sheep	314.474
10	Apples	310.842

Source: FAOSTAT, 2012

2.2.1 State Control over Production

Not only the state retained exclusive land ownership, it also retained control over production of certain crops. Since cotton and wheat production is crucial for the state, the government wants to maintain its supervision. State orders on cotton and wheat have to be fulfilled by most private farmers. They are obliged to sell their production at low, state-directed prices. Cotton is the most important cash crop and wheat is of essential importance to maintain food security. On the other hand, as compensation, these farmers state technical support and other benefits from the state.

2.2.2 Food Security and Change in Cropping Patterns

Food security is a key issue for the country's government. Since the early 1990s the state has been taking measures to secure the rapidly growing population with food. The most important step was the change in cropping patterns where vast areas sown under cotton were sown with wheat to ensure food security of the population. The result of these measures was an

expansion of the winter wheat area from 620.000 ha in 1991 to 750.000 ha in 1996 with a respective decline in the cotton area; wheat production increased substantially, from 1 million tonnes in 1991 to 5.2 million tonnes in 2004 (Abdullaev et al., 2009). Growing other food crops was also encouraged.

Large and growing population, poor irrigation practices and high prices of wheat and wheat flour keep raising concerns about food security. Despite relatively stable cereal production in recent years (2009 – 2013) and anticipated record production this year, Uzbekistan is still dependent on imports of high-quality wheat from Kazakhstan, and exports lower grade wheat to Iran, Afghanistan and neighbouring CIS countries. Uzbekistan needs to import almost 50 % of wheat for food consumption (FAO, 2014).

2.2.3 Cotton Production

Ever since the Russian conquest of Central Asia, cotton cultivation has played a crucial role in the region. When the Russian Empire temporarily lost its main cotton supplier, the United States due to the US Civil War, the Russian reliance on Central Asia as a cotton producer increased. By 1890, the Central Asian region became the key supplier of cotton to Russia (Tursunova, 2014). After 1922, the Soviet (former Russian) textile mills that had been inactive during the Civil War began to operate again. As Soviet relations with major cotton exporters became strained, the Soviet regime looked to Central Asia to make up for the shortfall in supply and to save hard currency needed for imports (Kandiyoti, 2002). After the process of collectivization in the Soviet Union the cultivation of cotton was constantly increasing at the expense of grain crops (Tursunova, 2014). Under Stalin, one of the main goals pursued in the Central Asia was cotton independence, and imports of foreign cotton were therefore cut down (Kandiyoti, 2002).

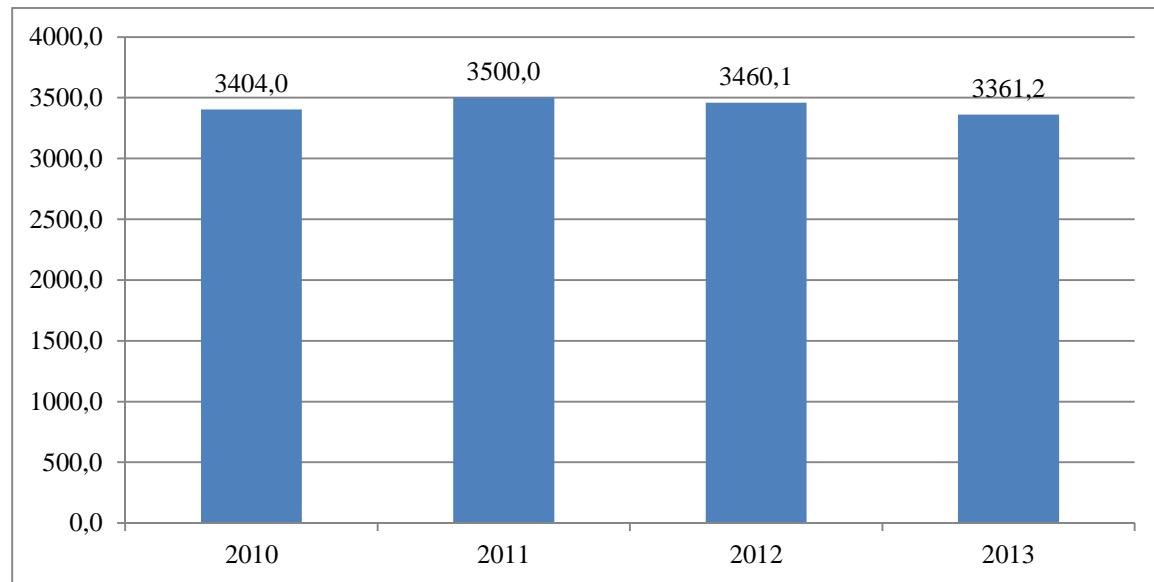
The land devoted to cotton was gradually expanding and it reached its peak in the 1980s. Between 1960 and 1990, the area of irrigated land in Uzbekistan increased by two million hectares, representing about 60 % of all irrigated land in Central Asia. By 1986, irrigated lands as a percentage of all sown areas had expanded to 85.8 %, and the importance of grain dropped from 57 % of the sown area in 1940 to 35 % in 1979 and 22 % in 1986 (Craumer, 1995). Yields were continually forced up through a massive use of chemical fertilizers and pesticides. However, they started declining in the 1980s. By the late 1980s, the water resources of the Amudarya and Syrdarya rivers basins were fully utilized. It led to a disastrous drying up of the Aral Sea (Spoor, 1998). Soil exhaustion due to inadequate crop rotation was

also beginning to affect the cotton crop. Besides the partial loss of soil fertility the crop was affected by unsustainable growing technologies which led to increased soil salinity (especially due to wrong irrigation practices when too much water was used).

Despite the above mentioned problems, cotton has been the cash crop in the Soviet Union and Uzbekistan for decades, and a significant source of employment and export revenues. After the disintegration of the Soviet Union in 1991, in spite of various structural reforms implemented in the agricultural sector, the government has still maintained tight control over all aspects of cotton production including planted area, production targets, prices, inputs, procurement and marketing of nearly all of the cotton in Uzbekistan.

Uzbekistan holds 6th position in cotton production in the world and cotton lint is still a number one Uzbek agricultural export commodity, followed by fruits, vegetables and wheat. Cotton linter, cottonseed oil and cotton waste are among the top 20 export commodities too (FAOSTAT, 2014).

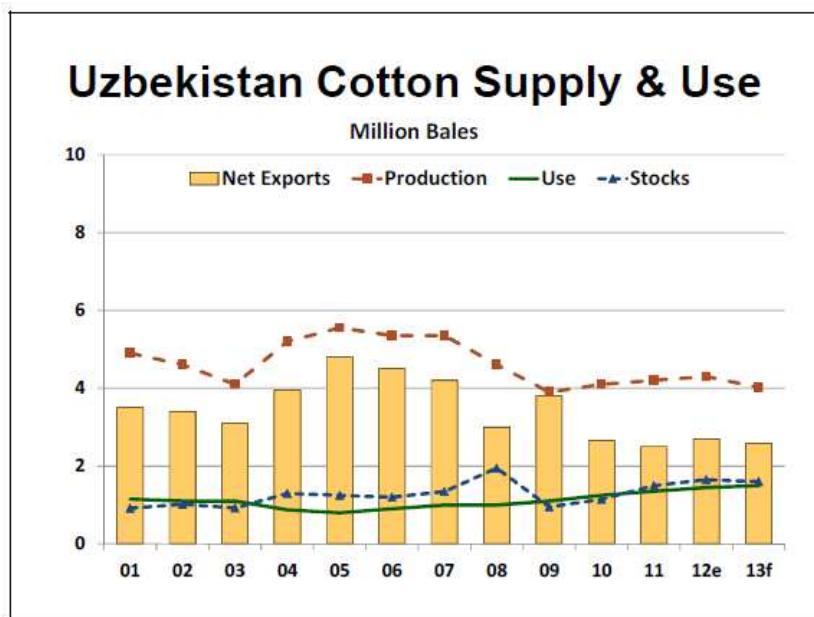
Fig. 5 Uzbekistan cotton production 2010-2013 (thousand tonnes)



Source: SSCU, 2014

Figure 7 gives an idea about cotton production in Uzbekistan, its cotton exports on the world markets and domestic use of cotton.

Fig. 6 Uzbekistan cotton production, net exports and domestic use



Source: Adams et al., 2013

2.2.4 Irrigation

Agriculture in Uzbekistan is critically dependent on irrigation. 79 % of land under wheat is irrigated and similar figures apply for cotton production (Sutton et al., 2013). 93 % of freshwater withdrawals go to agriculture. Most agricultural areas are within the Amudarya and Syrdarya river basins. The share of dry farming declined over the years and today it accounts for less than 20 % of arable land. The total area under irrigation increased from 2.2 mil. ha in 1953 to 4 mil. ha in 1985. The expansion of irrigation accelerated after 1970 and peak growth was achieved in the decade 1976 – 1985, when the irrigated area was growing at an average rate of 90,000 ha per year (Lerman, 2008). Such process resulted in excessive water takeoff from the two rivers and caused the desiccation of the Aral Sea, increasing water and soil salinity, and other adverse environmental effects. The irrigated area has remained stable at 4.2 ha since 1990 (FAOSTAT, 2014).

The irrigation network in Uzbekistan is extensive and obsolete, but in recent years investment in maintaining this infrastructure seem to be decreasing. It is difficult to assess technical status of the system and on-farm efficiency is also hard to estimate; but it is, by most accounts, unsatisfactory. There are only a few incentives for application of water saving technologies due to the absence of payments for water depending on the volume used.

The main problem of the Uzbek irrigation system is thus very low efficiency of water use and immense losses of water due to both the worn out irrigation system and incorrect irrigation practices. One of the main reasons for the excessive use of irrigation water is the significant filtration losses from canals at all levels. Only 35 % of the canals' total length has anti-filtration cover. More than 15,000 km of primary and secondary canals (60 % of the entire length) require rehabilitation (IMF, 2008).

2.3 ENVIRONMENTAL PROBLEMS

Because of its geographic and climatic specifics, desertification and land degradation are two major issues in Uzbekistan. The most severe environmental problems in Uzbekistan include salinization (around 53 % of irrigated lands suffer from secondary salinization) (Fazylova, 2010), wind and irrigation erosion, decrease in fodder productivity of pastures, deforestation and waterlogging. They are directly connected to incorrect water and land management, deterioration of infrastructure and production facilities. In addition, climate change and increasing periods of draught result in degradation of environment and decrease of standard of living.

Processes of land degradation and desertification have already affected large areas and have resulted in deterioration or even destruction of ecosystems. Almost all natural ecosystems in the country have gone through significant changes. The most significant disruption of ecosystems and the biggest anthropogenic disaster in Uzbekistan is the drying out of Aral Sea and the Amudarya delta. Today, hundreds of thousands ha are affected by water erosion due to poor field planning, incorrect irrigation and other factors.

Salinity costs Uzbekistan one billion USD per year (Sutton et al., 2013). Soil salinity is very high, irrigation leaches and deposits salts into groundwater or further downstream. Reusing water in lower flow for irrigation and rising groundwater cause problems with secondary salinity. Secondary salinization of lands is thus a result of factors such as the high underground water table and the use of drainage water for irrigation. Salinized lands then require substantial amounts of water for leaching, which makes up 20 % (Sutton et al., 2013) of all water used in the fields.

Anthropogenic effects that accelerate erosion and contribute to land degradation include poor agricultural practices at the farm level (improper crop rotations, poor fertility management) and overgrazing. More than 3 mil. hectares of land are suffering from soil erosion – the

average losses of fertile layer in a season reached 80 tons per hectare. Area of pastures subject to erosion due to overgrazing and technical reasons constitutes 7.4 mil hectares, while more than 5 mil. hectares of pasture land is affected by desertification. Issues of water and wind erosion are worsening due to a reduction in the forest area, which fell from 8.5 mil. ha in 2000 down to 8.1 mil. ha in 2004. About 54 % of land is polluted by pesticides, and more than 80 % has a high content of pollutants (IMF, 2008).

The quality of agricultural land is deteriorating. Low land quality is typical for Karakalpakstan, Tashkent, Jizzakh, Kashkadarya, and Navoi oblasts.

Speaking of losses, it is necessary to mention high energy costs – outdated electric pumping equipment, used for pumping irrigation water, consumes substantially more power than modern facilities. The efficiency of pumps is also lowered due to unstable energy supply, as well as water supply and low water level in primary canals (Veldwisch, 2008).

The Uzbek agriculture definitely needs more investments in improving land quality and in modernization of irrigation facilities and new technologies. Otherwise the yields will tend to decrease.

2.4 AGRARIAN REFORMS

The initial stages of transition in Uzbekistan have been accompanied by economic recession and rising unemployment, as well as greater reliance on the domestic economy for basic goods and on informal social networks like the mahalla. In the less industrialized countries of Central Asia, which are heavily reliant on agriculture and primary extraction, restructuring of the rural economy presents special challenges (Kandiyoti, 2002).

The reforms began actually already in 1989 as an adaptation of Gorbachev's centrally initiated attempt to increase food production and improve farm efficiency (Lerman, 2008). As a result, the total area in the household sector significantly increased. Uzbekistan needed to establish a policy of food security because in the early 1990 food shortage was of country's menaces. Enlarging household plots in rural areas and giving plots to those families who did not have any before was therefore a logical solution. Starting in 1990, the land holdings of 1.5 million families were enlarged, and more than half a million families received new lands. As a result, more families moved closer to food self-sufficiency and were able to sell some surplus production on local markets (Tashmatov et al., 2000).

The second major step to secure food self-sufficiency, besides the enlargement of subsidiary household plots, was the reform of cropping patterns. The area sown under cotton has been decreased and this area has been dedicated mainly to wheat. The break-up of the Soviet Union meant that the trading links with other republics were disrupted leading to a shortfall in grain. The government made a decision to significantly expand the area devoted to wheat and to increase household plots. As a result of the increased cropping area of wheat (from 627 thousand hectares in 1992 to 1,328 thousand hectares in 1997 and to 1,451 thousand hectares in 2012) (SSCU, 2013), Uzbekistan achieved self-sufficiency in wheat by 1998. This increase took place under mandatory state orders – fulfilled by large cooperative enterprises throughout the 90s and later on, by private farms. The state orders are the main factor of low yields in cotton and wheat production, together with subsequent lack of producer incentives, deteriorating land quality, insufficient access to machinery, lack of good quality fertilizers and other resources.

Grain independence allowed Uzbekistan to reduce imports. At the same time, another objective was to stabilize the cotton export revenues since cotton remains the most important cash crop and significantly contributes to the budget revenues.

The first stage of reforms culminated with the adoption of a new Land Code in April 1998. Exclusive state ownership of all land was reaffirmed while introducing significant measures of land tenure and farm structure reform (Lerman, 2008). The respective major policy decision was introducing and implementing the Presidential Program for deepening the economic reforms in agriculture, by diversifying the type and number of owners and expanding their rights to dispose of and sell their production. In 1998, four key legal documents were adopted: The Land Code and three specific laws: “On Farms”, “On Dehkan Farms” and “On Agricultural Cooperative (Shirkat)”. These legal documents have become the basic legislation to initiate liberalization of economic relations, gradual introduction of market principles and development of competition in agrarian sector.

The process of agricultural reform encouraging transition from the traditional large enterprises to individual farms (private farms and dehkan farms) has resulted in remarkable growth in agriculture. This effect caused by individualization of agricultural production has been observed also in other CIS countries where individual farming has been advanced.

The government has, however, maintained state monopoly on supply and marketing of agricultural input, and restricted trade by banning exports of key agricultural commodities

(grain, livestock) and importing most key foodstuffs (vegetable oil, sugar) in a centralized manner through a state trading company (WFP, 2008).

A more detailed characteristic of agrarian reform in Uzbekistan and a description of individual agricultural entities will be provided in the fifth chapter.

2.5 SUMMARY OF THE CHAPTER “AGRICULTURAL SECTOR”

The agricultural sector in Uzbekistan is crucial in terms of rural employment and livelihood of the rural population. It provides a wide range of food products and also a cash crop, cotton, which is an important export article and source of state budget revenues. The sector is partially market-oriented but some branches like cotton and wheat production are heavily influenced by state interventions.

After gaining independence, agriculture in Uzbekistan was quite specialized and cotton monoculture represented the main agricultural commodity. Due to food shortages, vast areas dedicated to cotton were newly sown under wheat to eventually ensure food sufficiency of the country. Today the production is a lot more diverse although cotton remained an important cash crop. The export revenues are however cashed by the government, not by the farmers themselves; they are obliged to sell their cotton production for state-dictated prices.

Uzbek agriculture is highly dependent on irrigation which, in its present form, is not sustainable. The anticipated climate change and conflicts with neighbouring countries over water resources require reconsideration of current water management. The agricultural sector is also linked to several environmental problems, mainly due its poor irrigation practices which bear the sins of the Soviet times.

Chapters 5 and 6 will provide a more detailed view on two basic production factors in agriculture: land and water.

CHAPTER 3

OBJECTIVES AND HYPOTHESES

3.1 OBJECTIVES

3.1.1 Main Objective

The main objective of the present thesis is to analyse, identify and assess specifics of natural resource ownership in Uzbekistan with special focus on agriculture and its main input resources, land and water.

With regard to the main objective, a set of specific objectives was defined:

3.1.2 Specific Objectives

FIRST SPECIFIC OBJECTIVE

The first specific objective is to identify and analyse the rationale of the current model of state ownership of land.

SECOND SPECIFIC OBJECTIVE

The second specific objective is to define the actual land and water management problems, especially analyse the farm restructuring process and its consequences, and water distribution and irrigation efficiency.

THIRD SPECIFIC OBJECTIVE

The third specific objective is to examine and suggest possibilities of resolving conflicts over shared water resources.

3.2 HYPOTHESES

FIRST HYPOTHESIS

The state ownership of land in Uzbekistan does not represent the main impediment to further development of the agricultural sector.

SECOND HYPOTHESIS

The main factor causing inefficient water use is the technical imperfections of the irrigation system.

THIRD HYPOTHESIS

The existing interstate conflicts over transboundary water resources in the Aral Sea Basin pose a serious threat and require seeking new methods of solving them.

CHAPTER 4

METHODOLOGY

This chapter defines the research methodology used for this study. The methodological approach for this challenging topic has been formulated in harmony with the objectives and hypotheses of this thesis which are based on previous literature studies.

To answer critical questions more fully, an interdisciplinary approach to the issues analysed in the current thesis has been chosen. It is justified by the complexity of the issues which bear economic, legal, social, political, cultural and environmental aspects.

4.1 RESOURCES OF INFORMATION

4.1.1 Legislation

A fundamental resource was the legislation of the Republic of Uzbekistan; a detailed study enabled more profound understanding of the evolution of land and water management in the country. Special attention was paid to comparing wording of the laws with actual situation in the land and water sectors. The entire catalogue of Uzbek laws is available online, in Russian and Uzbek. Since my knowledge of Russian is fluent, studying legal documents in Russian was the obvious option.

4.1.2 Statistical data

The second resource of information were statistical data gathered from trustworthy institutions such as the World Bank (WB), the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), the International Monetary Fund (IMF), the State Statistical Committee of Uzbekistan (SSCU), the Ministry of Agriculture and Water Resources of Uzbekistan (MAWR) and the Tashkent State Agrarian University (TGAU). However, one of the basic obstacles is the deficiency of necessary statistical data. Uzbekistan is generally reluctant to provide more detailed statistical information, especially economic, and if it is available, usually only directly in the Uzbek State Statistical Committee in a printed version. Another difficulty is the difference between FAO or World Bank data and data provided by the SSCU. In some cases the differences are not marginal; in such situations both data are provided in the thesis. I relied mostly on the FAO and the World Bank databases but since they lack some more detailed or new

information, I used the SSCU official statistic almanac from 2014. Also the TGAU provided data hardly accessible anywhere else.

The main problem is therefore the lack of reliable official data; foreign researchers have pointed this out as well, e.g. Wegerich (2005) or Veldwisch (2008).

4.1.3 Literature

The main difficulty encountered is the lack of social scientific works in Uzbekistan. Scientific works dedicated to economic transformation, land and water management in Uzbekistan are available to a limited extent; however, experts from Germany, Israel, Italy, the UK or the US have made efforts to cover many of these issues. Among the most prolific authors should be mentioned the following experts: Max Spoor, William Sutton, Zvi Lerman, G. J. Veldwisch, Nodir Djanibekov, Kai Wegerich, Tommaso Trevisani, Darya Zavgorodnyaya, and others. Their research including field research serves as a valuable input in further developing of these issues. There is one detail that should not be omitted though: most of them have conducted their field research only in the Khorezm oblast so their point of view might be distorted. Some lack good knowledge of Uzbek and/or Russian which may be limiting for understanding – a proper knowledge of the language can enable the researcher to aim one's questions more precisely and interpret the answers correctly.

Another issue is the fact that most of Uzbekistan's scientific journals are published in Uzbek only; some articles are still published in Russian but they constitute a minority.

4.2 RESEARCH METHOD

Detailed, previously unavailable information was gathered particularly at respective institutions in Uzbekistan: the Tashkent State Agrarian University which is a part of the governmental structure and belongs to the MAWR organizational structure; SANIIRI (also a part the MAWR organizational structure), and the Institute of Market Reforms in Agriculture. The choice of these institutions and respective informants is described below.

The research method was restricted due to permission difficulties: the originally planned questionnaire as a research instrument had to be excluded because without proper socio-political connections such method is not possible in Uzbekistan. I travelled on my own without a patronage of an international organization, so survey research was not acceptable.

4.2.1 Interviews

Lacking a net of contacts in Uzbekistan, my options were limited. I had a reliable contact at the Tashkent State Agrarian University and also at the Czech Embassy in Tashkent. A *snowball method* was chosen to obtain the maximum information from available experts in the field. At the university I was gradually going through individual departments requesting interviews and gathering information from university journals. Outside the university I was moving between different institutions and using the findings at one place as guidance for understanding what is happening in another situation. With time the number of informants at higher positions grew. This was possible only thanks to the help of the university first vice-rector, Mr Saimnazarov, anticipating that with recommendations from him and previous informants, I will be able to get further and obtain necessary connections to other institutions and experts at higher positions. I was open to every one of them and it helped to gain their trust. Eventually I was able to approach directors of two major institutions, the SANIIRI and the Institute of Market Reforms in Agriculture.

RESPONDENTS

Purposive sampling was, due to permission problems, the only option available. I requested interviews with leading experts from various institutions involved in economics and agriculture in Tashkent. During my stay at the Tashkent State Agrarian University (March/April 2013), I was introduced to the experts from the Faculty of Economics, specifically from the Department of Farm Management and Department of Agricultural Economics. Many of them have actual farming experience and they took part in the reform process during the 1990s. Despite their busy schedule they never refused to answer all my questions. Information gathered from them is cited in the text of the thesis.

Interviews were held with the following experts:

- I. Tashkent State Agrarian University: Mr Kh. Saidakbarov (Head of Department of Agricultural Economics, associate professor), Ms R. Pulatova (Head of Department of Farm Management, professor), Mr T. Farmanov (Department of Agricultural Economics, professor), Ms I. Rustamova (Department of Agricultural Economics, associate professor), Mr S. Khalikov (Department of Agricultural Economics, associate professor). Some of the respondents (specifically Ms R. Pulatova, Ms I. Rustamova and Mr T. Farmanov) were kind enough to dedicate several hours to answer all my questions and look up data and documents I could use.

II. SANIIRI (Central Asian Scientific Irrigation Research Institute), Tashkent:
Mr Sh. Rakhimov (Head)

III. Institute of Market Reforms in Agriculture, Tashkent: Mr N. Khushmatov (Head)

IV. United Nations Development Programme Uzbekistan: Mr T. Farmanov

In general, all informants took a loyal attitude towards the state and its policies. On the other hand, they did not hesitate to explain certain semi-legal practices and to express their opinion regarding possible improvements. Since I had no possibility to carry out a field research and had to rely on my informants, it is necessary to point out their qualities and competences. The university experts carry out regular research among Uzbek farmers and they spend every autumn in cotton fields with their students. Their knowledge is based on solid field research. They typically travel to regions to distribute and collect questionnaires, and to do interviews face to face; they question statistically significant number of farmers to gain necessary information. University staff travel to regions to meet the farmers, observe their activities, they hold discussions with them. Their research is therefore grounded on proper field work.

They also take part in various international projects in cooperation with international organizations such as UNDP, ICARDA (International Centre for Agricultural Research in the Dry Areas), the ADB (Asian Development Bank) or CACAARI (Central Asia and the Caucasus Association of Agricultural Research Institutions), and many other regional and national organizations. TGAU is among leading research institutions in Uzbekistan, it holds regular conferences, seminars, and releases scientific journals in various fields. Information provided by the TGAU experts I therefore consider trustworthy and sincere.

I further requested interviews with the head of the SANIIRI, the Central Asian Scientific Research Institute for Irrigation, Mr Shavkat Rakhimov, and head of the Institute of Market Reforms in Agriculture, Mr Narkul Khushmatov. This choice was justified by two factors.

First, it was their knowledge and longtime experience. The SANIIRI and the Institute of Market Reforms in Agriculture are major institutions that belong to the structure of the Ministry of Agriculture and Water Resources. Especially the SANIIRI is a fundamental institution with a long tradition in science and research and has subdivisions in the whole country. Its main goals are to intensify the relationship between science and industry to improve water use and land reclamation and to promote wider manufacture application of water conservation and protection technologies. SANIIRI has close research and production relationships with scientific, design and construction institutions in Central Asia, Russia,

Europe and the USA. SANIIRI has provided engineering and consulting services on irrigation and drainage techniques in Yemen, Syria, India, Turkey and other countries. The Institute of Market Reforms in Agriculture was founded to perform research in issues closely related to agribusiness and it focuses especially on economic efficiency and development of farms. The directors of these two institutions are experts in the field. Their opinions and experience were of great value although they were likely influenced by the state official point of view.

And second, they were both recommended by the vice-rector of TGAU, Mr Saimnazarov, who kindly organized the meetings which would have otherwise been impossible since both men are extremely difficult to approach without any “special” connections.

The time spent gathering information and interviews with these specialists enabled me to gain an important insight into many problems and questionable issues I had encountered.

TYPE OF INTERVIEWING TECHNIQUE

I asked open questions and let everyone free in their replies. My respondents did not seem to answer my questions under any pressure and mostly tried their best to give honest answers. Sometimes I did not get direct answers, not due to bad understanding (there was no language barrier) but obviously due to the experts’ caution. Some even expressed it beforehand. I did not experience any kind of distrust though. When I was aware that the topic was sensitive, I introduced it with reference to what I had heard from other experts. Sometimes they were unexpectedly open when explaining semi-legal (or semi-illegal) practices, e.g. in fields. These interviews and discussions helped systematic ordering of ideas that were taking shape during my stay in Uzbekistan. Some of the informants of higher ranks (e.g., Mr Rakhimov) preferred to give me a “lecture” and then I had a chance to ask concrete questions.

INFORMAL DISCUSSIONS

Last but not least, very useful information was obtained from the staff of the Czech Embassy in Tashkent, primarily concerning the habits and customs of the Uzbeks and their attitude to water resources and their use. Such profound yet informal discussions were priceless when trying to understand the Uzbek reality and the way local people think. Another informal source of information were Ph.D. students of both university departments mentioned above; we exchanged our views on different issues and it helped us to sort out our thoughts and ideas.

4.3 THEORETICAL AND CONCEPTUAL FRAMEWORK

Theories and conceptual frameworks are tools to structure thinking about a problem; they provide a rationale, to justify decisions and explain findings. The following theories and concepts have been chosen to match the purpose of this thesis.

4.3.1 Land Tenure

In the fifth chapter, which concerns land issues, the problem I concentrated on most is the land tenure security, its concept and perception in Uzbek environment. Before getting into details of the concept, it is necessary to define land tenure.

Land tenure can generally be defined as “*the set of rules and relationship among people concerning the use, development, transfer and succession of rights to land. Land tenure rules define the rights held and duties owed concerning land by private and public actors, by individuals and by groups.*” (Prosterman et al., 2009). Land tenure arrangements may range from private to leasehold, community, group, shareholder, or other types of corporate rights. Land tenure systems include mechanisms to resolve disputes, defend rights, and administer or manage land resources.

Tenure institutions define how property rights to land and natural resources are allocated, used, and managed within society. Tenure systems define who can hold and use resources, for what period of time, and under what conditions (USAID, 2007).

LAND TENURE RIGHTS

Land tenure rights constitute one of the most basic and important institutions by which social and economic relations are conditioned. This is especially true in rural areas where land relations have profound implications for agricultural productivity, environmental sustainability, and the economic and social status of rural households (Prosterman and Hanstad, 1999).

Land tenure rights refer to a bundle of rights that reflect agreement among people about how this asset is held, used, and exchanged. This includes the right “*to occupy, enjoy and use; to restrict others from entry and use; to dispose, buy, or inherit; to develop or improve; to cultivate; to sublet; to realize financial benefits; and to access services in association with land*” (USAID, 2007).

SECURITY OF LAND RIGHTS

“Security of tenure is the perception by people that rights to land will be recognized by others and protected in the event of specific challenges” (USAID, 2007).

Land tenure security refers to the right of individuals or groups to effective protection by a central authority (the government) against any forcible evictions. Land tenure security is an element of property rights: the right to remain on land, and make use of and profit from it (Prosterman et al., 2009).

Secure land rights are of crucial importance because they substantially affect rural development and subsequently economic development as a whole. Land tenure security can be measured and defined in a variety of ways. A definition by Deininger (2003) contains several key concepts:

“Land tenure security exists when an individual or group is confident that they have rights to a piece of land on a long-term basis, protected from dispossession by outside sources, and with the ability to reap the benefits of labour and capital invested in the land, whether through direct use or upon transfer to another holder.”

The key characteristics are “confident”, “long-term”, “protected” and “ability to reap”. Land tenure security can be therefore assessed using three important measures: breadth, duration and assurance (Deininger, 2003).

Breadth refers to the quantity and quality of the land rights (rights to possess land, to grow or/and harvest crops, to pass rights to heirs, to sell land, to lease land to others, to use land rights as collateral or to build structures). An important aspect of *breadth* involves transferability of land rights. Market transfers typically include selling or sub-leasing of rights, non-market transfers include passing them to heirs. The marketability of land is an important moment: once it becomes marketable, it can be efficiently allocated from less productive to more productive users. Marketable land can be also used as collateral for credits.

Duration refers to the period for which land rights are valid. As one of the main effects of secure property rights to land is to increase incentives for investment, the duration needs at least to match the time frame during which returns from possible investments may accrue. Longer duration implies greater tenure security.

Assurance tells us the level of certainty of the breadth and duration of the land tenure rights. If the rights of a specific breadth and duration are difficult to exert or enforce, the assurance is low and such right is not a meaningful right.

LAND TENURE REFORMS

Reforms aimed at improving the rural population welfare should be designed to meet the following criteria: *broadening land access* to the whole rural population without exceptions, *improving land tenure security* to land rights already possessed, and improving the capacity of *public sector to protect the interests* of the rural population (Prosterman et al., 2009).

Secure property rights are a critical component of economic development and social stability. Inappropriate property rights policies and institutional structures that are not synchronized with economic, political, and environmental realities can undermine growth and productivity, erode natural resource bases, and even catalyse violent conflict (USAID, 2007).

4.3.2 Economies of Scale

Another problematic issue in Uzbekistan is the size of private farms, especially since they were artificially consolidated between 2008 and 2010. I focused on economies of scale as an official rationale for the farm consolidation.

Economies of scale is a term used to refer to the situation in which the cost of producing an additional unit of output (the marginal cost) decreases as the volume of output (i.e. the scale of production) increases (Ethier, 2009). More generally, economies of scale measure changes in output from proportionate changes in inputs (Hallam, 1991).

The extent to which economies of scale exist varies greatly according to industry. In some industries they might be insignificant, and thus such industries are characterized rather by numerous small firms competing with each other. Conversely, significant increasing returns to scale in the production of a particular output may lead to consolidation of firms in the associated industry (Hallam, 1991).

Large farms usually enjoy economies of scale in bulk purchasing of fuel, fertilizers, other chemicals, renting machinery etc. This greatly depends on the relations within the sector and level of state interventions into this net of services.

However, it is crucial to look into circumstances in the agricultural sector and also for any empirical evidence for the existence of economies of scale in farming.

Brooks et al. (1996) suggest that where capital is expensive relative to labour, the farmer will tend to substitute labour for capital and use labour intensive production techniques. Yet the cost of supervising a number of hired workers in agriculture, operating on a large area, tends to be high. Such additional expenses explain the common practice of family farms with family labour supplemented by a few hired workers in many market economies.

In capital-intensive production systems we would expect economies of scale to be relatively significant since there are many fixed expenses and many large assets used in farming activities. In countries where farming is labour-intensive and few capital inputs are used, however, the economy of scale losses could be minimal (Rozelle and Swinnen, 2006). In other words, as farms become more capital-intensive they tend to be larger because farms operate economically only when the high fixed costs of specialized machinery are spread over large output volumes. Technological progress encourages substitution of capital for labour and land, promoting greater specialization and larger farms. Conversely, when production is labour-intensive, fixed costs are lower, and there is little penalty for having small, diversified farms (Fernandez-Cornejo, 1992).

The most important potential source of scale economies in agricultural production arises from indivisible inputs. Farm machinery is such an input and its lowest cost of operation per unit occurs when applied on areas of certain minimum size. With the expansion of agricultural mechanization, many believed that the economies of scale associated with mechanization would be so large that the family farm would become obsolete because they would not be able to buy the machinery. However, farmers can rent it and thus offset the advantages of economies of large-scale associated with owning such machinery (Hanstad, 1998). Efficient rental markets strongly contribute to the farms productivity as shows evidence from Europe or the United States (Deininger, 1993).

Of course, management skills are another important factor in farm efficiency. The better manager, the larger is the optimal farm size. Technological progress influences the efficiency of managers so good technical skills are required to operate on a larger area. From another perspective, Raup (1969) discusses managerial costs in regard of the farm size. As farm size increases, management becomes a critical cost item. Management skills must be learned, and producing a capable manager is costly; that is yet another aspect that has to be taken into account.

Family farms that employ mainly family members save on “supervisor” costs, i.e. they do not have to check on their employees regularly, they do not have to spend money on looking for

the right candidates or on hiring them. Family members, who receive direct benefits from farming activities, are more motivated to work with more effort and enthusiasm, they share the risk and they are more flexible – they incur no extra costs for hiring, paying extra hours etc.

Several studies examining the relationship between farm size and productivity support the fact that the relationship is inverse, i.e. the agricultural output decreases as farm size increases (Deininger, 1993; Hanstad, 1998). For instance, a study by the World Bank focused on Polish private farms found that small farms were more efficient than large farms (over 20 ha), the most productive operated on an area of 10 – 15 ha (Van Zyl et al., 1996). Lerman et al. (2007) come to a similar conclusion in their work regarding the land reform in Ukraine, where it lacks a large contingent of mid-sized farms that market agriculture has shown are competitive in world markets. In Lerman's next work (Lerman, 2008) he analyses the situation in Moldova and concludes that, based on several surveys, that small farms are more productive and efficient than large farms; however, the prime role plays the organizational form where individual farms outperform corporate farms where the latter tend to be bigger. Hanstad (1998) analyses studies carried out in different countries and comes to a conclusion that the inverse relationship is valid unless the small-sized farms are handicapped by market imperfections (preferential access to credit or subsidies for larger farms). Lerman and Sedik (2009) also add to the growing body of evidence that highlights the performance advantages of family farms in transition countries. They come to a conclusion that some subsectors of the individual farm sector (specifically, the small household plots) are resoundingly more productive than the large corporate farms.

XXX

The second debate that I engage with is that of the water resources management. The following theories are discussed: the common-pool resources theory, the tragedy of the commons and game theory. They are linked to domestic problems of water management and the necessity of an effective solution, and to international disputes over water resources, primarily with Uzbekistan's neighbours, Tajikistan and Kyrgyzstan.

4.3.3 Common-Pool Resources Theory and the Tragedy of the Commons

The whole water management problem can be seen from a perspective of ***common-pool resources theory***. A river basin can be considered as a common-pool resource (examples of

the common-pool resources include irrigation systems, fishing grounds, pastures or forests). Common-pool resources are natural or man-made resources where exclusion is difficult, and yield is subtractable (Gardner et al., 1990). They share two attributes: the difficulty of excluding individuals from benefiting from a good (which is characteristic for public goods), and the subtractability of the benefits consumed by one individual from those available to others (which is characteristic for private goods) (Ostrom et al., 1994).

The temptation of a free-ride is obvious and is viewed as a major deterrent to successful economic development. In relation to irrigation, the main costs are the maintenance of the irrigation network. If one farmer decides to improve (fix) a part of the irrigation scheme, e.g. a leaking anti-seepage lining, the results in improved water supply are negligible in the perspective of the benefit of all farmers. If all farmers decide to undertake maintenance works and one farmer does not join them in their efforts, he or she will significantly benefit anyway. These free-riders seek to capture the benefits of other people's efforts or investments without contributing their fair share. Rational decision-makers will then choose to do nothing either way. The collective good will not automatically evolve (Freeman and Sampath, 1990). Maintaining an irrigation system is costly and requires the users to either provide their labour or pay fees. Unless the users are forced, they are reluctant to do so. Also they tend to cheat and take more water than they should or at times where they are not supposed to take any.

The common-pool resources theory is applicable to both domestic and interstate water allocation problems; it indicates that tail-end or downstream users are in a weaker position than the head-end or upstream users with a geographically advantageous location, who can misuse their position and directly affect them. Equal and efficient use of shared water resources are not automatically guaranteed and Wegerich (2002) claims that it can be enforced only by effective institutions which represent the interests of the downstream (or tail-end) users; only they can bring order and stability, and reduce transaction costs. This means that an external authority takes over the commons, and breaks the control of powerful individuals who tend to grab a disproportionate share of benefits.

The tragedy of the commons is a theory by Garrett Hardin (Hardin, 1968; Hardin 1998), according to which individuals, acting independently and rationally in their own interest, behave against the group's long-term interests by depleting the *commons*. *Commons* is a natural resource, such as water, shared by many individuals. At the root of the tragedy is the unrestrained self-interest of such individuals.

Hardin's theory, both the original and the revised one, is a useful tool in understanding the current problem of water wasting in Uzbekistan.

When introducing the common-pool resources, it has been remarked that one of the attributes is subtractability. Subtractability is the key to understanding the dynamics of how the “tragedy of the commons” can occur (Ostrom and Gardner, 1993). The irresponsible water use in Uzbekistan can be perceived as an example of a good (water) becoming a commons. Hardin in his 1968 article “Tragedy of the commons” introduced a concept of a *commons* and the tragedy of using it without temperance. His ideas have been included in several scientific works in various fields. Some of them are of interest up till today although Hardin himself revisited his work and adjusted some of his conclusions.

When insisting that water is not a commons, it is necessary to seek the definite social arrangements that will keep it from becoming a commons. Such arrangements that produce responsibility are arrangements that create coercion. Temperance can be created by coercion. For example taxing is a good coercive device. Taxes have to be compulsory to achieve the desired effect: therefore a compulsory tool to coerce temperance in water use to escape the “horror of the commons” is needed (Hardin, 1968).

Hardin, having revisited his original conclusions, states that the reality that underlies all the necessary curtailments is always the same – population growth. The more the population exceeds the carrying capacity of the environment, the more freedoms must be given up (Hardin, 1998).

Hardin's theory is completed with findings of Ostrom and Gardner (1993) who developed a concept of functioning self-governing irrigation systems as a solution of common-pool resources.

4.3.4 International Water Law

Since Hardin (1968) and Ostrom (1990) it has been established that the sustainable use of common-pool natural resources, such as water, requires cooperation among users. It is generally felt that the problem of water scarcity is not so much physical scarcity, but inefficient use and vested interests, in particular in case of the world's many international rivers (Houba, 2008).

The subchapter devoted to interstate conflicts over water resources consists of the elaboration of an interdisciplinary framework for the analysis of such disputes – the theoretical

framework is completed with an analysis of the role of international water law in resolving them, specifically the UN Convention on the Law of the Non-Navigational Uses of International Watercourses of 1997.

International water law, i.e. the Helsinki Rules of 1966 and the UN Convention of 1997, does not recognize claims by upstream countries of owing the water caught on its territory (absolute territorial sovereignty, ATS) or downstream nation's claims of "natural and historical rights" (unlimited territorial integrity, UTI). It introduces the principle of limited territorial sovereignty and thus aspires to stop the longstanding conflict between the two principles (Convention on the Law of the Non-navigational Uses of International Watercourses, 1997). International law states that the nations involved should mutually agree on sharing the river through negotiations.

The principle of ATS favours upstream states, allowing the unlimited use of the waters of a transboundary watercourse located within national borders regardless of any consequences that may occur downstream. It may freely decide how much water to use of the water flowing within its borders but cannot claim the continued and uninterrupted flow from upper basin countries. Alternatively, ATS also describes situations of "laissez-faire" regulation or anarchy among water users (Houba et al., 2014).

Conversely, the UTI principle states that the downstream country has a right to demand the natural flow of an international river into its territory that is undiminished in quantity and unchanged in quality by the upstream countries, i.e. not to be harmed by the upstream country (UN Watercourses Convention – User's Guide, 2012).

The UN Convention introduces principles of "equitable and reasonable utilization" and "no significant harm" which is a compromise between the two extreme principles ATS and UTI. The general principles contained in the UN Convention may be regarded as reflecting customary international law (McCaffrey, 2014).

BASIC PRINCIPLES OF THE INTERNATIONAL WATER LAW

The international water law of the non-navigational use related to the transboundary rivers concerns hydropower, irrigation, fishing, water supply, and protection of the ecosystems and environment of international watercourses.

There are two basic legal codifications in this field: The Helsinki Rules and The UN Convention on the Law of the Non-Navigational Uses of International Watercourses (The UN

Convention). The Helsinki Rules (1966) is the first effort at a comprehensive codification of the law in this field and together with The UN Convention it covers all the principal uses of international watercourses and certain procedures for the avoidance and settlement of disputes in relation to shared freshwater resources (Dinar et al., 2007).

The UN Convention reflects rules of customary international law relating to the use of international watercourses for purposes other than navigation, as mentioned above. It is the only treaty governing shared freshwater resources that is of universal applicability (McCaffrey, 2008). It incorporates three basic rules: equitable and reasonable utilization, prevention of significant harm and notification and consultation regarding planned measure.

The rule of *equitable and reasonable utilization* of shared freshwater resources requires that states use and protect international freshwater in a manner that is equitable and reasonable in relation to other states. The object of this rule is to achieve a fair balance among the uses of an international watercourse by the states sharing it (Dinar et al., 2007).

The second rule is an obligation *not to cause significant harm* to other states through activities related to an international watercourse. This rule requires taking all appropriate measures to prevent the causing of significant harm. In case it is nevertheless caused, the states have to try their best to eliminate or mitigate it. The solution must be equitable and reasonable for all parties involved.

The principle of *prior notification of planned measures* stipulates that if a project or other measures, which may have an adverse effect upon other states sharing an international watercourse, are planned, the state in which the measures are intended must provide timely notification to the other states. If the notified states believe that such project or measure does not correspond to the preceding rules (equitable and reasonable utilization, prevention of significant harm), then a process of consultations and/or negotiations follows. Such process is meant to lead to an equitable resolution.

The UN Convention entered in force on 17th August 2014. As of 19th May 2014, 35 out of the 35 countries needed for the Convention to enter into force have ratified, approved or acceded to it. In accordance with article 36: “*the present Convention shall enter into force on the ninetieth day following the date of deposit of the thirty-fifth instrument of ratification, acceptance, approval or accession with the Secretary-General of the United Nations*”, as stated by the UN legislative documents (United Nations Treaty Collection, 2014).

4.3.5 Game Theory

Unlike the international water law, game theory is a more specific tool, which makes the conflicting situation more transparent and offers an actual solution to water-related disputes. It is not an instrument per se. Coalition formation, the division of gains within coalitions and unilateral decisions prior to the negotiations traditionally belong to the realm of game theory, which is also recognized by global institutions involved in river basin management such as the World Bank (Houba, 2008).

While many countries do coordinate their water uses, international disputes do occur. Unfortunately, they cannot be resolved by international water law because in essence it only states that the countries involved should mutually agree on sharing the river through negotiations, and it is left in the middle how to resolve disputes over the allocation of water (Houba et al., 2014). Countries sharing water resources often proceed to negotiations regarding water allocation issues in order to settle their arguments. During such negotiations the use of appropriate tools, which will provide assistance to the opponent parties in terms of scenarios quantification and simulation processes, is an essential component towards conflict resolution.

Game theory is the formal study of decision-making where several players must make choices that potentially affect the interests of the other players. The mathematical techniques developed attempt to analyse any situation with conflicting interests where the decisions taken affect inevitably all the involved parties. It is the science of strategy as it provides a systematic pattern for planning strategies that provide a guide to the resolution of conflicting situations. It attempts to determine mathematically and logically the actions that players should take to secure the best outcomes for themselves in a wide array of games. The outcome for each participant depends on the choices (strategies) of all. In the so-called zero-sum games the interests of the players conflict totally; one player's gain is always another player's loss. Games with the potential of either mutual gain (positive sum) or mutual harm (negative sum) are more typical (Dixit and Nalebuff, 1991).

There are two main branches of game theory: cooperative and non-cooperative game theory. Non-cooperative game theory deals largely with how intelligent individuals interact with one another in an effort to achieve their own goals. In the cooperative game theory, used in the present thesis, the players (countries) are supposed to choose and implement their actions jointly.

The cooperative game theory provides the possibility of comparing and estimating the consequences of the players' behaviour toward its opponent. The incorporation of cooperative games is feasible through the addition of options that reflect the communication paths of the players and direct them towards cooperative strategies. Here the involved countries act as players with specific options and thus form strategies according to the corresponding payoffs and the counter player's strategies. It is evident that the choices of one country affect the other in the case of upstream-downstream relations. Each player (country) adopts a certain strategy provoking the reactions of the opponent party, while all the actions are characterized by a rational behaviour aimed at maximization of the payoffs (Eleftheriadou and Mylopoulos, 2008). Game theoretical results may help riparian countries to narrow down their differences, and thus to form a basis for negotiation. They also help riparian countries to understand the sources of their negotiation power (Wu, 2001). Thanks to the cooperative game theory we can suggest a simplified model for understanding and resolving conflicting situations over water resources in the region. The concept rests on the assumption that cooperation is beneficial to all players involved, and that the benefits can be fairly redistributed.

A solution concept is defined in game theory as the methodology of solving conflicting situations by estimating the equilibrium point of the conflict. The most popular solution concept of modern game theory is Nash bargaining solution, a concept by John Nash introduced in 1950 (Nash, 1950). According to its definition, a strategy vector $[S^*] = S_1^*, S_2^*, \dots, S_N^*$ (N = number of players) is Nash equilibrium when each strategy $[S_i^*]$ (the player i 's choice of an option) is the best response to the other players' strategies. At the point of Nash equilibrium all players profit the most (i.e., have high payoffs), taking into account all possible moves of the counter players (Eleftheriadou and Mylopoulos, 2008).

The game theoretical approach has been used several times in the past, first in 1969 by Peter Rogers in the case of India and Pakistan regarding the lower Ganges and the Brahmaputra rivers water management. He used linear programming and game theory to consider a rational plan to control floods on the Pakistani territory and suggested other possible complementary benefits of such control such as power production, irrigation, navigation, and salinity control (Rogers, 1969). There are many later studies using the game theory such as case studies of river basins – the Nile Basin (Wu, 2001), Mekong River Basin (Houba et al., 2012) or Syrdarya Basin (Ambec et al., 2013).

Ansink and Ruijs (2008) considered the effects of climate change and the choice of a sharing rule on stability of a water allocation agreement. Several studies have addressed the issue of

flow variability for two common sharing rules for water allocation, proportional allocation and fixed flow allocation (Ambec et al., 2013).

Dinar (in Houba, 2008) stated there is a computational burden in water issues which arises because the physical economic problem has to be transformed into the so-called “utility-space”, represented by the characteristic function form, before any of the game theoretic concepts can be applied. Then it requires a translation back into the original physical formulation. Also the computation of game theoretic concepts in utility space is computationally difficult. However, theoretical work by Houba (2007) provides a promising way to effectively deal with the critique in Dinar et al. (1992).

There are a few applications of game theory in which negotiation procedures are explicitly modelled and calculated. A solid example is a case study of the Bishkek water sharing agreement by Ambec et al. (2013), where they analysed the design of water sharing agreements under variable water flows.

This thesis implements game theoretical concept in the case of Uzbek-Tajik conflict over shared water resources, specifically a conflict over building a huge dam on the Tajik territory that may affect Uzbekistan’s irrigation needs.

CHAPTER 5

LAND RESOURCES

This chapter attempts to shed light on land-related issues by reviewing the development of rural land rights in Uzbekistan and the status of farmers' land tenure rights under current laws and policies.

This chapter is divided into several sections. After a brief presentation of the basic facts, definition of legal framework in Uzbekistan and a short analysis of the Land Code and other land-related laws will be introduced, including laws concerning individual agricultural entities. Characteristic of land tenure and land tenure security are included. Next an insight into a different country which had taken a similar reform path will be provided: the model of China is examined and useful parallels between the reform processes in the two countries are identified.

5.1 DEFINITION OF LAND IN UZBEKISTAN

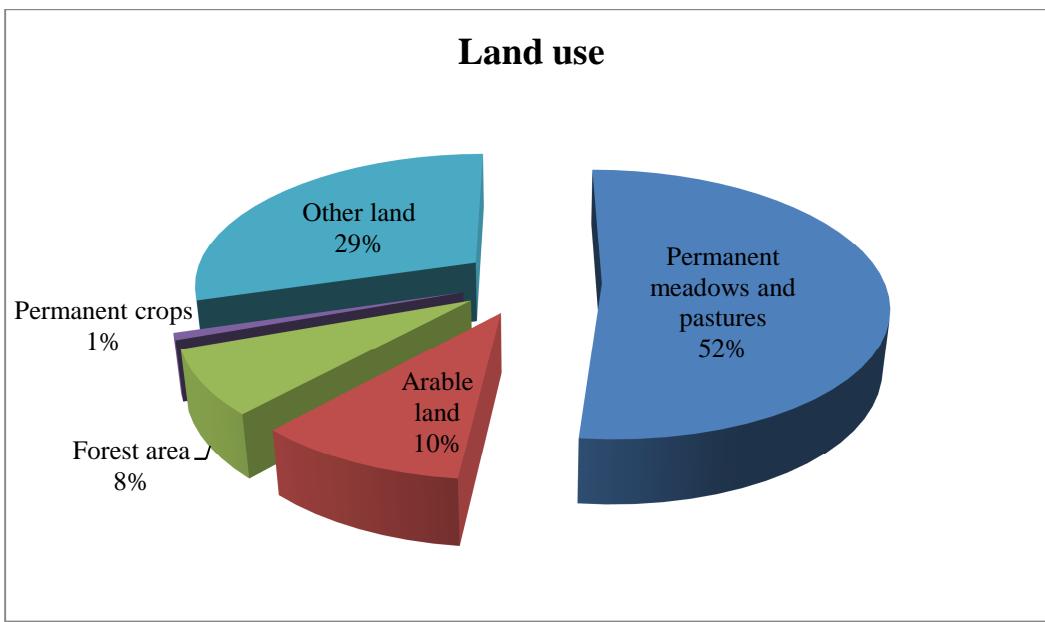
Land is a critical asset for economic growth, social development, and poverty reduction. It is the primary means for generating a livelihood for most of the Uzbek rural population. It is a main medium for investing, accumulating wealth and transferring it to the next generations. Land is the key determinant of economic activities in the rural sector and therefore the definition of land rights plays a crucial role in the development of rural society. The terms on which land is held, used and transferred have important consequences for economic growth, the distribution of wealth, and alleviation of poverty.

Tab. 4 Country area

Key area statistics (square km)	
Country area	447,400
Land Area	425,400
Agricultural Area	266,600
Forest area	32,716

Source: FAO Country profile, 2014

Fig. 7 Land use in Uzbekistan



Source: FAO Country profile, 2014

5.1.1 Legal Framework

Land in Uzbekistan is state-owned. Therefore it is not possible to purchase agricultural land at all, unlike in, for example, neighbouring Kazakhstan or Kyrgyzstan.

The concept of state ownership of land is, to some degree, acknowledged by countries all over the world. In its extreme form, the state may own all or nearly all the land and allocate rights of access and use, development and transfer. In different cases, only areas of strategic importance or as a reserve right in case of future needs are reserved for state ownership (Prosterman and Hanstad, 1999).

The concept of state land ownership is often a reaction to the presumptive and actual negative consequences of unrestricted private ownership. However, there are limitations, e. g. the administrative system cannot always respond efficiently to changes in demand for land.

After 1991, the exclusive state ownership of land was first incorporated in the 1992 Constitution and subsequently in the Land Code, adopted in 1998. The legal foundation for all land tenure in Uzbekistan is contained in three key documents: the Constitution (Article 55), the Land Code (Head 4), and the Civil Code (Head 8, Head 13 and Head 17).

The Land code stipulates that land is a state-owned national treasure, it is subject to rational use and it is protected by the state as a base of life, activities and welfare of the population (Land Code of the Republic of Uzbekistan, Head 4, article 16, 1998).

Property rights of legal entities and individuals to land are established when such entities privatize *small* objects of trade and services along with the land plot on which such objects are located (Land Code of the Republic of Uzbekistan, Head 4, article 18. 1998). In 2006, the President adopted a Decree “On Privatization of Land Plots Occupied by Citizens” and “Legal Entities’ Buildings and Structures”, purporting to permit privatization of land plots underneath buildings and other structures owned by resident individuals and legal entities. Legal entities and individuals may therefore own apartments and houses, including the underlying land plot (Baker & McKenzie, 2014). This provision demonstrates that it is actually possible to obtain property rights to land under certain circumstances. However, such property rights to land expire when such objects of trade or services, residential houses or other buildings are sold or bought back by the state or confiscated in cases stated by the law (Land Code of the Republic of Uzbekistan, Head 4, article 36. 1998). For example, if a hairdresser’s is to be demolished, and land is to be occupied by a production shop, the land plot shall cease to be owned by the hairdresser; instead, it will be transferred into another land category in the cadastre documents (MAWR, 2009). Vacant land plots cannot be privatized.

In practice, ownership of a land plot beneath a *medium* sized or *large* enterprise is not permitted without the authority of a Cabinet of Ministers Resolution or a Presidential Decree (USAID, 2005).

Rather than full ownership of land, the enterprise or individual owner of an enterprise is typically granted permanent or temporary land use or lease rights. A permanent or temporary land use or lease right includes the right to possess and use the land, but not the right to dispose of it (Baker & McKenzie, 2012).

Lifelong inheritable land tenure is possible in the following cases and it includes Uzbek citizens only:

- dehkan farms
- individual homestead construction and household operation
- collective orchards and vineyards (Land Code of the Republic of Uzbekistan, Head 4, article 19, 1998)

Land plots can be provided to legal and physical entities for a continuous, long-term or temporary tenure and use. Continuous land use envisages, first of all, agricultural production and forestry (Land Code of the Republic of Uzbekistan, Head 4, article 20, 1998).

Lease of a land plot is a temporary, paid land tenure and use on conditions set in the lease contract. Land plots are given on lease to citizens and legal entities by hokims (mayors) of districts and cities; however, if any foreign element is involved, the contracting authority is the government of Uzbekistan (Land Code of the Republic of Uzbekistan, Head 4, article 24. 1998). Users pay for the use of the land in the form of land tax.

It is not permitted to sublease the leased land plot as a whole or even part of it (Land Code of the Republic of Uzbekistan, Head 4, article 24, 1998). This is quite a controversial provision since the common practice is to let the land after the harvest to be cultivated by a dehkan family for a prearranged payment either in cash or crop. This provision further says that leased land plots cannot be sold and purchased, cannot serve as collateral, and cannot be donated or exchanged. A specific form of subleasing, “intrafarm leasing”, is permitted only to worker families within a shirkat (Lerman, 2008).

Under such circumstances, land markets cannot fully function. The users (agricultural entities) cannot flexibly adjust the size of their leased land when they need it. They cannot easily acquire more land, if they want to expand their production, from a less efficient farmer or a farmer that does not need the whole area he or she disposes of. Absence of land markets where individual agricultural entities would trade their lands is a serious barrier to improving the efficiency of agriculture and economy as a whole.

Land is the only productive asset that cannot be owned privately. The official rationale against privatization of land included several concerns:

- 1) Food security. To secure enough food for such large population with limited land resources, agricultural production has to be well organized and no land speculations and accumulation of large tracts in the hands of absentee owners should take place.
- 2) Social stability. As mentioned before, stable agricultural sector secures stability in rural society.
- 3) Cultivation in Uzbekistan is totally dependent on irrigation, which is delivered by a state-run irrigation system. (Saidakbarov, 2013).

The key question, whether the state ownership system in Uzbekistan impedes further development and under what conditions, will be discussed in detail later on and presented as an answer to one of the hypotheses.

5.2 AGRICULTURAL ENTITIES

The Soviet agricultural system was characterized by the dominance of large collective and state farms – kolkhozes and sovkhozes. The first step of land reform took place in the early 1990s when these large farms were converted to agricultural cooperative farms of 5000 hectares or less. Small household plots (dehkan plots) were enlarged.

This early stage of reform also became the germ of farm restructuring since the large-scale farms were now allowed to lease land to families of workers and groups of families (Land Law, 1990; Lerman, 2008).

First examples of a new farm structure, the peasant farm, began to emerge in 1991. Members of the kolkhozes and sovkhozes were given the option of leave with their share of land and assets to launch into independent private farming outside the existing collectivist framework. This new form of family farm received legal recognition in the Law of Peasant Farms adopted in July 1992. The size of these farms increased from less than 10 ha in the early 1990s to about 20 ha of arable land in the early 2000s (Lerman, 2008).

In the second half of the 1990s, land reform to transfer land from collective to individual use was implemented since the large cooperative farms had not proven their efficiency. Most of these cooperatives were therefore transformed to smaller, private farms. This process was completed in 2006.

5.2.1 Shirkats (Agricultural Cooperatives)

After gaining independence, unlike Kazakhstan and Kyrgyzstan, there has not been a disbanding of collective and state farms (kolkhozes and sovkhozes respectively) in Uzbekistan. These farms were instead transformed into agricultural cooperatives which had (and the few remaining still have) a form of a joint-stock company (Law on Agricultural Cooperative (Shirkat), Head 1, article 1, 1998). They were given land for permanent possession and, in fact, they inherited the rights, obligations (including production quotas and rural employment) of former collective farms. The former workers of the Soviet collective farms hold shares of the cooperative. In most cases, the cooperative was basically a

continuation of the kolkhoz, including the same leadership. Most of them were dedicated to cotton and grain production.

The workers were paid very small wages and the incentives to work harder were therefore little. They remained working in the cooperative also thanks to certain benefits such as the possibility to get some extra land on a short time lease to grow vegetables and other crops, access to inputs, fuels and services and the possibility to let their livestock graze on the cooperative lands (WFP, 2008).

In 1998 the shirkat, a new organizational form, was introduced. The large cooperatives were supposed to transform to shirkats with elements of market system. However, the only thing that actually changed was their name. Shirkats did not prove to be more efficient and their production was unsatisfactory. The state therefore decided to support fragmentation of shirkats in private farms. Only a few shirkats function these days, especially in research and karakul sheep breeding; they are also important in egg production (SSCU, 2014).

Tab. 5 Structure of production of main agricultural products in shirkats (in % of all categories of agricultural entities)

	2010	2011	2012	2013
Grain	1.2	1.1	1.2	1.3
Cotton	0.6	0.5	0.6	0.6
Potatoes	0.7	0.8	0.8	0.8
Vegetables	0.7	0.8	0.7	0.8
Meat	2.3	2.7	2.6	2.7
Milk	0.6	0.6	0.6	0.7
Eggs	32.6	34.6	33.4	33.9
Wool	10.7	8.9	7.2	6.4
Karakul skin	27.7	32.8	29.1	19.7
Silk cocoon	2.1	2.0	2.8	4.7

Source: SSCU, 2014

5.2.2 Private Farms

Private farms are independent entities engaged in agricultural production and they represent the main entities of such activity in Uzbekistan (Law on Farms, Head 1, article 3, 1998). They are managed by individual families or groups of families. The head of the farm has to meet the requirements of relevant qualification and farming experience (Law on Farms, Head 1, article 4, 1998). Private farms operate on land received under a long-term lease, usually for 30 – 50 years. Private farms produce a wide variety of agricultural products. Cotton and wheat on state order, vegetables, fruit, fodder crops and others are grown. The percentage of livestock production is relatively low.

Private farms specialized in livestock can be established if they possess a minimum of 30 heads of cattle. They acquire a minimum of 0.3 – 0.45 ha of irrigated land (depending on viloyat) and a minimum of 2 ha on rainfed lands. Farms specialized in crop farming obtain a minimum of 30 ha if they grow cotton or wheat, and a minimum of 5 ha if they are engaged in horticulture, viniculture and other sorts of crops (Law on Farms, Head 2, article 5, 1998).

Once the farmers obtain land, they are obliged to ensure satisfactory crop yields (measured as an average of three consecutive years), i.e. not lower than the land register evaluations. This obligation is included in the lease contract (Law on Farms, Head 2, article 5, 1998) (Pulatova, 2013). They are also obliged to preserve the soil qualities (Pulatova, 2013).

More intensive formation of new private farms began in February 1994, supported by a number of presidential decrees on private property and entrepreneurship. Land has been distributed (actually leased) to peasant farmers, based on a minimum area per head of cattle owned. Reforms in rural areas were very slow then. In 1999 it was estimated there were nearly 23,000 peasant farms with an average land holding of 19 hectares (Spoor, 2004). Since 1998, there has been a move towards liquidation of non-profitable shirkats which explains the consequent growth of private farms. The biggest “boom” became after 2003 when nearly all the shirkats fragmented into private farms (Djanibekov, 2012). In the end, circa 5 – 10 % of households became private farmers, while the remaining 90 – 95 % was left with their household plots (Veldwisch, 2011).

Private farmers cooperate with dehkans, as will be described below.

Tab. 6 Structure of production of main agricultural products in private farms (in % of all categories of agricultural entities)

	2010	2011	2012	2013
Grain	81.5	80.4	80.7	80.6
Cotton	99.4	99.5	99.4	99.4
Potatoes	19.9	21.4	23.7	24.1
Vegetables	34.9	35.4	35.2	35.6
Meat	2.6	2.6	2.7	2.7
Milk	3.3	3.4	3.5	3.6
Eggs	9.4	10.9	12.0	11.4
Wool	6.5	6.8	6.8	6.9
Karakul skin	4.7	4.2	4.1	4.8
Silk cocoon	97.9	98.0	97.2	95.3

Source: SSCU, 2014

5.2.3 Dehkan Farms

These rural household producers operate on small household plots received on lifetime inheritable tenure rights. They can function as both physical and legal entities (Law on Dehkans, Head 1, article 1, 1998). They use family labour and cultivate a plot (“tomorka”) adjacent to the family home. It is usually smaller than 0.1 ha. About 10 % of households have additional dehkan plots, often outside, but close to their communities. These additional dehkan plots (0.15-0.2 ha) are used for cultivation and/or for house construction. The criteria for plot size include, first of all, availability of land, but also the opinion of the local hokimiyat (Wehrheim, 2008).

Dehkan farms are the smallest of the three entities but the most numerous and very important. They satisfy basic needs of the large rural population – food, income (their surpluses are sold in the city and dehkan markets) and employment. Dehkan farms tend to specialize in vegetables, fruit and they are crucial for livestock production, they produce vast majority of meat, milk, eggs and other animal related products.

Typically, dehkans’ household farming activities are subsidiary and they depend on wages paid by an outside employer – unlike the workers at private farms whose primary activity is

farming. This difference is understandable also thanks to the obvious inequality of farm land. Dehkans often work for private farmers – for cash or on the basis of a sharecropping agreement (dehkans receive a percentage of the yield) (Veldwisch and Spoor, 2008).

In spite of their very low share in cultivated lands (11 %), in 2007 they accounted for almost 60 % of agricultural output (40 % of crop and almost 90 % of livestock output) (WFP, 2008). Although dehkans operate mainly on the basis of manual labour, there have been rapid and strong productivity gains leading to increased household incomes. Dehkan farms thus proved much more profitable than shirkats and it led to converting shirkats into private farms.

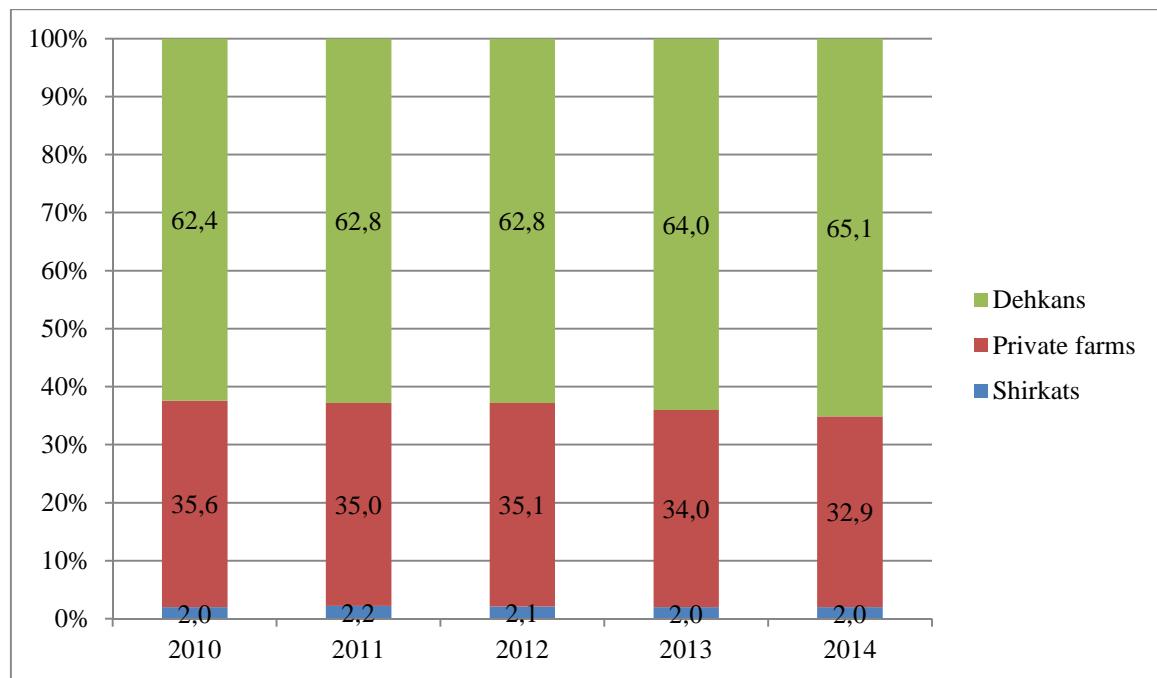
Tab. 7 Structure of production of main agricultural products in dehkan farms (in % of all categories of agricultural entities)

	2010	2011	2012	2013
Grain	17.3	18.5	18.1	18.1
Potatoes	79.4	77.8	75.5	75.1
Vegetables	64.4	63.8	64.1	63.6
Meat	95.1	94.7	94.7	94.6
Milk	96.1	96.0	95.9	95.7
Eggs	58.0	54.5	54.6	54.7
Wool	82.8	84.3	86.1	86.7
Karakul skin	67.6	63.0	66.8	75.5

Source: SSCU, 2014

The following figure demonstrates the share of each type of farming entity on the gross agricultural product. It is apparent that in the past four years, the share of each category of entities has remained quite stable with a slowly increasing share of dehkans.

Fig. 8 Gross agricultural product by category



Source: SSCU, 2015

5.2.4 Forms of Agricultural Production

According to the above described agricultural entities, it is possible to distinguish three forms of production: the household (or subsistent) form of production, the state ordered form of production (cotton and wheat), and the commercial form of production (Veldwisch and Spoor, 2008). The household production is crucial for subsistence of small scale dehkans and also for livestock production. The state ordered form is supported and subsidized by the state and is evidently favoured. The commercial form of production is any production by private farms except for their cotton and wheat production. These three forms of production will be further described in the sixth chapter in relation to their access to water resources – a key resource for agricultural production.

5.3 CHANGES IN THE LAND TENURE STRUCTURE

Land tenure in Uzbekistan is a complex issue, particularly in the light of the continuous reforms. Despite regional differences, the general pace of the reform process has been slow (Veldwisch, 2007). After gaining independence in 1991, Uzbek agriculture was still dominated by large-scale collective farms (kolkhozes) and state farms (sovkhозes), which

represented the core of Soviet agricultural production¹. The situation changed only in the late 1990s when individualization of agricultural production intensified.

The Uzbek government intended to reduce the number of state enterprises, which was expressed in the Law of Denationalization and Privatization from November 1991 (Law of Denationalization and Privatization, 1991). The state farms were transformed into corporate farms and other shareholder forms (production cooperatives, joint-stock companies).

However, such transformation did not give the expected results – which were higher profits and efficiency (Khalikov, 2013; Saidakbarov 2013). The strategy anticipated that the traditional socialist approach of economies of scale would achieve desired results: transforming an inefficient, unprofitable large state enterprise into an efficient and profitable large corporate enterprise (Lerman, 2008). In 1998, a new organizational form, the shirkat, was introduced. It was the last attempt of such transformation. Subsequently all collective farms and other agricultural enterprises were required to reorganize as shirkats by 2001 (Khalikov 2013). These large agricultural cooperative enterprises were supposed to apply elements of market system. In fact, shirkats have changed only the name of the property form, but their foundations remained the same. Relations between the heads of shirkats and local administrative leaders did not change (Djanibekov, 2012). Shirkats' outcome was rather disappointing and in 2003, the focus was shifted to private (family) farms as a new promising form of farming (Khalikov 2013). As a result of this round of reforms, the total number of active private farms in 2006 was 189,200 against 87,500 in 2003², and in 2006 they accounted for 86.3 % of raw cotton production and 73 % of grain crops (IMF, 2008). Legal framework for these enterprises was created in 1998 and stipulated in the “Law on Farms”. These farms were much smaller and commercially oriented. The number of shirkats was rapidly decreasing and by 2006, there were only a few left. A small number of shirkats still exist; they are narrowly specialized, e.g., in research and development (these are owned by the state) (Khusmatov, 2013), or karakul breeding (Khalikov, 2013). The new private farms received, along with their conditional freedom, a burden from their predecessors. It was the plan of production (state quotas on cotton and wheat) and also, in some cases they had to take over their debts. The production plan is a serious issue and the consequences of not fulfilling it are more severe for a private farmer. If the head of a private farm does not meet the production

¹ The main differences between a sovkhoz and a kolkhoz reside in the larger size of the sovkhoz and the source of financing. Sovkhozes were financed directly from the state budget (and the state would take their eventual profit), while kolkhozes were self-financed (Djanibekov, 2012).

² The numbers provided by TGAU (2014) differ: 121,917 and 67,120 farms respectively.

quotas, he can lose his lease contract to land (Pulatova, 2013). The head of a shirkat could at maximum lose his post. Also, after disbanding most of the shirkats many people lost their jobs – private farms tend to hire the minimum necessary workers, only as many as they can afford. Shirkats obviously suffered from overemployment (Swinnen and Rozelle, 2006).

From the above described processes it follows that there were three major rounds of farm restructuring. First, there was the expansion of household plots and restructuring of kolkhozes and sovkhozes into corporate enterprises (joint stock companies, partnerships, etc.); land shares were distributed within these farms to workers and to local rural population. The new corporate farms continued to operate on state owned land. The second round, after 1998, focused on transforming these enterprises into agricultural cooperatives (the so-called shirkats) with the anticipation of higher productivity and profits. At the same time, private farms were introduced as a new organizational unit in the Land Code and Law on Farms. This is when the individualization of agriculture came – in 1998 (Lerman, 2012). The third round started in 2003, where the core of agricultural production shifted from inefficient shirkats to more productive private farms. Another important change came in 2008, when private farms merged into bigger units. This process of consolidation, called the “optimization of farms”, was not a natural one; it was ordered by the state. There were three rounds of optimization, in 2008, 2009 and 2010. The official rationale for this process was to increase the productivity of farms thanks to economies of scale. This issue will be further investigated in the thesis.

5.3.1 Individualization of Farming

The most distinct feature of the land reform in the post-Soviet countries has been the overall shift from collective to individual land tenure in agriculture. The basis of such shift lies in two interrelated aspects of agricultural policy reform: *land reform*, which concerns issues of land use rights and land ownership; and *farm reform*, which deals with issues of restructuring of farms into individual land holdings (Lerman, 2012). Because land ownership remained state, the farm restructuring process has involved the allocation of land to producers through leasing contracts (Djanibekov, 2012). The farm reform through individualization of farming, which intensified only in 1998, contributed to the productivity of agriculture due to higher motivation of family farms. Individualization of farming has been among the main factors that helped the agricultural recovery in the post-Soviet region.

Nowadays, the tenure structure of private farms remains leasehold. Land is leased for a minimum of 10 years, usually for a period of not less than 30 years and not more than 50

years. Farmers generally do not have a right of free choice to produce what they wish and consider best, and have to fulfil state ordered quotas of cotton and/or wheat production that they have to sell for prices set by the state. Also, private farms are at mercy of local authorities (*hokimiyat*) – lease contracts can be cancelled for various transgressions, usually if the leaseholder fails to comply with the contract terms such as the cropping plan (Wehrheim, 2008).

5.4 SPECIFICS OF LAND TENURE IN UZBEKISTAN

5.4.1 Customary Law

Customary law influences the application and implementation of legal rules regarding land, also the settlement of local disputes and the extent of rural population observance of the written law (Giovarelli, 2002). In Uzbekistan, a customary institution that influences the behaviour of locals is the *mahalla*, a form of a “neighbourhood committee”. Mahallas are customary for Uzbek villages and they are supported by the state. They deal with all neighbourhood activities and still have a profound impact on life in rural areas. This fact originates in the pre-Soviet times when religious factors played an important role in Central Asia where numerous land tenure variations followed Islamic law and local tradition (Törhönen, 2002).

5.4.2 Factors Weakening Land Tenure Security

There are two particularities of state interventions in the Uzbek agricultural sector; the first one is a permanent phenomenon and the other took place in the not so remote past.

- A. First, it is a continuing process of state orders where state dictates what private farmers should grow on their fields and then buys up their production for state-directed prices.
- B. Second, it was the “optimization” process which took place in three rounds between 2008 and 2010.

A. STATE ORDERS

State orders determine the organization of production and mutual relationship between private farms and processing enterprises. Farmers are obliged to meet quotas set by the state on cotton and wheat; cotton is an important cash crop, export revenues of which are significant, and wheat is crucial for the country’s food security (Rustamova, 2013). If the farmers fail to

comply, they can be deprived of their lease contract and therefore lose rights to land (Wehrheim, 2008).

The production is being bought up by the state for low, state dictated prices. The dual price system is typical for Uzbek agricultural system: production depending on its character (kind of crop) is sold either for state-prescribed low prices (case of cotton and wheat) or for market prices (commercial crops such as rice, vegetables, fruits etc. or wheat surplus) (Veldwisch and Spoor, 2008).

Rights associated with land have to correspond with the state endeavour to keep this system going.

SCHEME OF THE ORGANIZATION OF PRODUCTION ON STATE ORDER

The State represented by two enterprises, “Uzhlopkoprom” and “Uzdonmahsulot”, concludes contracts with farmers on production of cotton and wheat for the state needs. The contract states the volume of production and sowing area. Veldwisch and Spoor (2008) describe the process of defining the sowing area in detail: *“The exact area depends on soil characteristics and crop rotation schedules. In reality, the areas are negotiable. Farmers must obtain permission for their cropping plan from the branch office of the Department of agriculture. The yearly cropping plan is based on the farmer’s long-term business plan and may contain only crops mentioned in the business plan. The cropping plan contains not only the state-ordered crops, but all crops the farmer 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 farmers. In practice, the district hokimiyat (governor’s office) plays an important role next to the branch office of the Ministry of Agriculture.”*

The authors state that farmers less or more actively make their business plans but some of them simply get orders what to grow and their opinion is not considered.

In compliance with the contract another contract with a bank is concluded on providing credit, a contract with an insurance company on insurance to obtain such credit, and contracts with contractors on supplies of material and technical resources and services for production activity. These resources and services constitute of fertilizers, seeds, fuel and tractors rental at preferential prices. Subsidized fertilizers are allocated according to soil quality. Farmers are also entitled to buy fuel at subsidized prices. For agricultural machinery the farmers are largely dependent on the state-owned “Motor Tractor Parks” which prioritize production of

state-ordered crops (Pulatova, 2013). Some of the Motor Tractor Parks are run by farmers themselves (Khushmatov, 2013).

Not all the inputs actually reach the farmers: especially fertilizers and fuel are sometimes retained by the supplier and sold elsewhere to create an extra income (Veldwisch and Spoor, 2008).

During the cultivation period of the state-ordered crops, the cropping area is monitored by the state. There are regular controls to make sure that the field is sown under the appropriate crop, that fertilizers are applied in time and specifically used on the designated field and not elsewhere, and that the whole process is going correctly according to directions (Trevisani, 2007).

The existing mechanism allows the farmers to obtain credit (at very low interest rates) only if they conclude the basic contract with the above mentioned enterprises. They act as the customers according to the state order. Wheat producers are better off; the farmers are allowed to market, process or use as fodder 50 % of their wheat production (Khushmatov, 2013). However, in the case of cotton, even the surplus goes to the same enterprise. There is no right to choose another enterprise and sell the surplus separately (TGAU, 2013).

B. FARM OPTIMIZATION

The so-called “farm optimization” is a process of farms consolidation that took place between 2008 and 2010 on an involuntary basis. Some of the smaller farms merged with other and the total number of farms in Uzbekistan therefore decreased.

The first three stages of farm restructuring involved dismantling of large-scale farms, sovkhozes and kolkhozes, and subsequently shirkats into smaller, private farms. Farms have been successfully established since 1998 and, overall, they have been more efficient than the existing shirkats. However, in 2008 the state initiated a reverse land reform. Farm sizes were subject to adjusting in order to suit better the existent infrastructure (which had not changed much). A major challenge was the irrigation system because the network was aimed at large-scale farms. This new reforming procedure consisted in consolidating the smaller private farms into larger private farm units: particularly cotton and wheat farmers with land size under 30 ha were requested to give up their land (Djanibekov, 2012). This process was called the “optimization of farms”.

Moreover, some of the farms have been facing difficulties, especially financial. They had taken credits and many of them were not able to comply with the credit terms and conditions. These farms were struggling and the state took measures to eliminate them (Pulatova, 2013).

The selection of farmers receiving the enlarged farms was not always clear. Officially the best ones were chosen according to their results in the past, but more factors played role in this process, such as political connections and their position in the local community (Trevisani, 2009).

The process triggered by the Decree “On Optimization of Cropping Areas and Enhancing Food Crop Production” and “Instruction On Constitution of a Special Committee in Charge of Developing Proposals for Optimization of Farm Plots” issued by the President of the Republic of Uzbekistan in October 2008. The key objective of the decree was to consolidate a large number of existing small (less than 10 ha) leasehold farms into sustainable (around 50 ha) agricultural enterprises and to improve the efficiency of irrigation (MAWR, 2009). In particular, cotton and wheat farmers with holdings of less than 30 ha were requested to give their farmlands back to the state. Subsequently, the returned lands were leased back to larger private farms. At the same time, the minimum size for cotton and wheat farms increased from 10 to 30 ha and the minimum size for other types of farms (horticultural, gardening) from 1 to 5 ha (Djanibekov, 2012). The average size of cotton and wheat growing farms after the consolidation is 105 ha (Khushmatov, 2013).

This reform’s aim was to strengthen the farm households by drawing small farmlands under one holder. Local observers came to agree that land reforms what looked more as an attempt of “collectivization”, would cause discontent among Uzbek farmers. Obviously, a potential of dwarf size farms cannot go far beyond providing subsistence for farmers. As farmers remain uncontrollable, they also hamper the promotion of long-term plans of the government, negatively influencing a mass production of agricultural products («Fergana» News Agency, 2008).

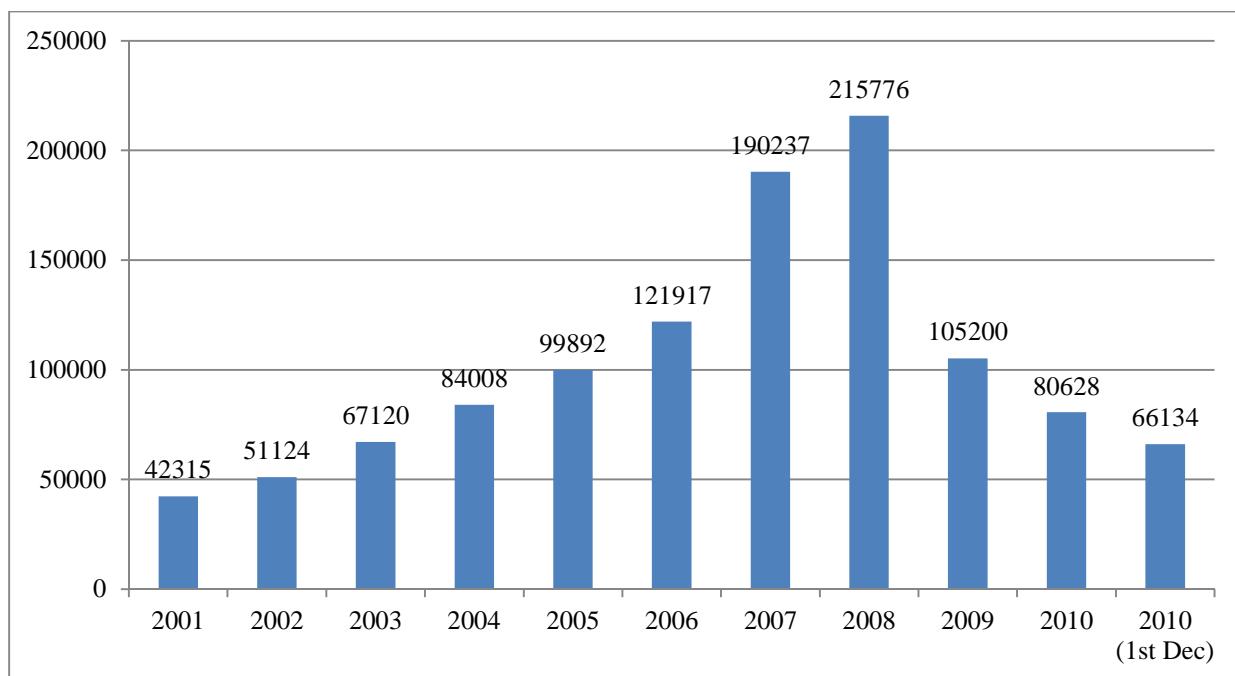
Officially, president Karimov stated:

“Our experience gained over the past period calls for resolution of a number of important issues, namely issues related to ensuring farm sustainability and, most importantly, increasing their efficiency with the view of further development of private farms. Experience of a majority of currently functioning farms evidences that small size of lands allotted to them at the initial stage of private farms formation limited the farms production profitability. The

practice is showing that farms with limited capacity and opportunities are not capable of turning into a reliable basis for provision of themselves with necessary machinery, working capital having creditworthiness, and, most importantly, cost recovery and increasing the profitability.”(Karimov, 2009)

Optimization of the size of a land plot owned by a farm is construed in the regulations as change of the land size (reduction or expansion) for more rational use of land and water resources and ensuring financial stability of the farm. In practice, it means termination of lease contracts and merging the farm plots with other, more successful farms. Three major optimization “rounds” took place in 2008, 2009 and 2010 (Pulatova, 2013). It resulted in a substantial decrease in the number of farms as demonstrated in the figure below.

Fig. 9 Number of private farms in Uzbekistan 2001 – 2010



Source: TGAU, 2014

The above mentioned regulations establish the order of land optimization on a voluntary basis, the order of land optimization and liquidation of the farming entity on the ground of a violation of contract and inefficient activity of the farm. The regulation also prescribes the mechanism of debt amortization of the defunct farms. Voluntary liquidation shall be performed according to the Resolution of the President of Uzbekistan number PP-630 dated 27th of April 2007 “On Development of the Procedure of Voluntary Liquidation and Cessation of Activity of Entrepreneurial Entities” (Azizov & Partners, 2013).

However, during optimization, legal problems occurred and many farmers complained about the process. The president therefore issued a decree “On measures on Compliance with Law and Order during Re-organization and Optimization of Farm Plots” in April 2011. It is stated that without any exceptions, all questions regarding the farm plots must be arbitrated only (Uznews.net, 2011).

5.5 CHINA’S LAND REFORMS: A MODEL TO FOLLOW?

To further analyse the consequences of state ownership of land under conditions of gradual transition to market economy, it is worth looking into a situation of a country with a similar model of land tenure where land reforms had taken place more than a decade earlier. Uzbek scientists seek inspiration abroad and Chinese reforms are of their big interest.

The aim is to identify the main features and results of China’s land reforms. In the seventh chapter, it will be discussed whether there are lessons to be learnt from China’s achievements.

China has adopted at the time epoch-making measures to change land tenure and thus improved the livelihood of its small-scale farmers. The rural sector is a key component of its economy, which cannot be labelled as a full-blooded market economy – which is also the case of Uzbekistan.

Although China’s “atomistic” production structure that results from its traditional land tenure system differs from the current production structure in Uzbekistan, this comparison will justify itself thanks to similar processes and similar initial conditions in both countries.

In China, agriculture is an important sector with its share in total employment at 38.1 % and its contribution to GDP at 10.3 % in 2009 (OECD, 2011). This indicates low agricultural labour productivity which contributes to low rural incomes per capita. However, China’s agricultural sector is a foundation to the country’s impressive growth. The Chinese reform and modernization policy has experienced a long and painful journey in search for an appropriate model. It has been developed taking into account national specifics and geopolitical situation of the country. The transformations intended to entail a transition from a centralized system of economic management to a “socialist market economy” (Guliamov, 1998).

China in the 1970s was poor and isolated. Rural workers slogged on collective land in cooperatives, directed by local officials. Since adopting market-based reforms more than 30 years ago, China’s ability to meet its food and agricultural needs has exceeded the

expectations of most observers. Re-establishing small-scale household agricultural production was the initial phase of establishing markets and releasing government control over the economy. Today, rural workers grow a variety of crops on individually managed plots, raise livestock and engage in affiliated production. Their welfare improved although their incomes remain vulnerable (Zhao, 2011). Agricultural reforms played a key role in China's economic resurgence. While China has come a long way in its transition to market economy, it still retains many of the institutional vestiges of the planned economy, such as collective land ownership, ambiguous water rights, and weak legal and financial systems (Lohmar et al., 2009). These institutional vestiges are similar to those in Uzbekistan.

The enormous increase in production suggests that China was far below its production potential before it adopted the reforms. Allowing farmers to produce according to market incentives and relaxing production quotas and restraints on inter-regional trade enabled China's farmers to use resources more efficiently and to raise productivity. At the end of the last decade, nearly all farm commodities and inputs were traded at market prices (Lohmar et al., 2009).

Before analysing some of the aspects of the Chinese reforms that are worth investigating and could be considered applying in other transition economies, it is important to briefly describe the basic conceptual factors of changes in China that are of key importance.

5.5.1 Concept of Chinese Reforms

Not in lieu of the existing government and collective forms of property, but along with them were formed new non-government and private forms of property, which gradually became part of the arising market. The government became the guarantor of their security, their fair rights and opportunities. Such measures created favourable social conditions for reform implementation, and gained trust and support from the population and foreign investors (Guliamov, 1998).

A proper theoretic study on Chinese conditions for reform implementation was provided as well as possibilities of using foreign experiences in building market economy. The main step was the abandoning of ideological dogmas, one-sided views and evaluations of political theory and practice. It was admitted that market relations are the most suitable way of accomplishing the set goals, and that socialism and market are not mutually exclusive but quite compatible (Guliamov, 1998).

The Chinese conceptual approach to reform implementation is close to the Uzbek principles

formulated by president I. Karimov concerning the Uzbek model of transition to market economy:

- economy has priority over politics;
- state is the main reformer;
- supremacy of law;
- strong social security on the way to market economy;
- gradual approach to market oriented reforms (Karimov, 2008).

Similar approaches to reform realization create favourable conditions to use the experience in concrete directions.

Uzbekistan, like China, has developed and carried out its own model of agrarian transformation. The basic principles of such transformation lie in gradualism, complexity and consistency. Market mechanism is not a goal but a means that can help to secure successful functioning of the economy as a whole, including the agricultural sector.

There are parallels in certain aspects of agricultural characteristics of Uzbekistan and China. It is the specifics of agricultural production, based on irrigated farming; it is the fact that a big share of population live in rural areas and is engaged in agricultural production and depend on farming for a livelihood. In both countries the share is significant and prospering rural sector is essential for stable social and political situation.

The ownership of land is one of those aspects too. In Uzbekistan, state is the sole owner. In China, most of cultivated land remains collectively owned which means that the land is owned by a collective (of peasants); none is truly privatized (Jacoby et al., 2002). The consequences of such ownership are similar, if not the same in both countries.

The main factor is the similar character of production relations in the not so remote past – the centrally planned system that has been the subject of reform in both countries. Both countries also share similar objectives, especially achieving a decent level of development and increasing the living standard of the population through the effective use of market relations.

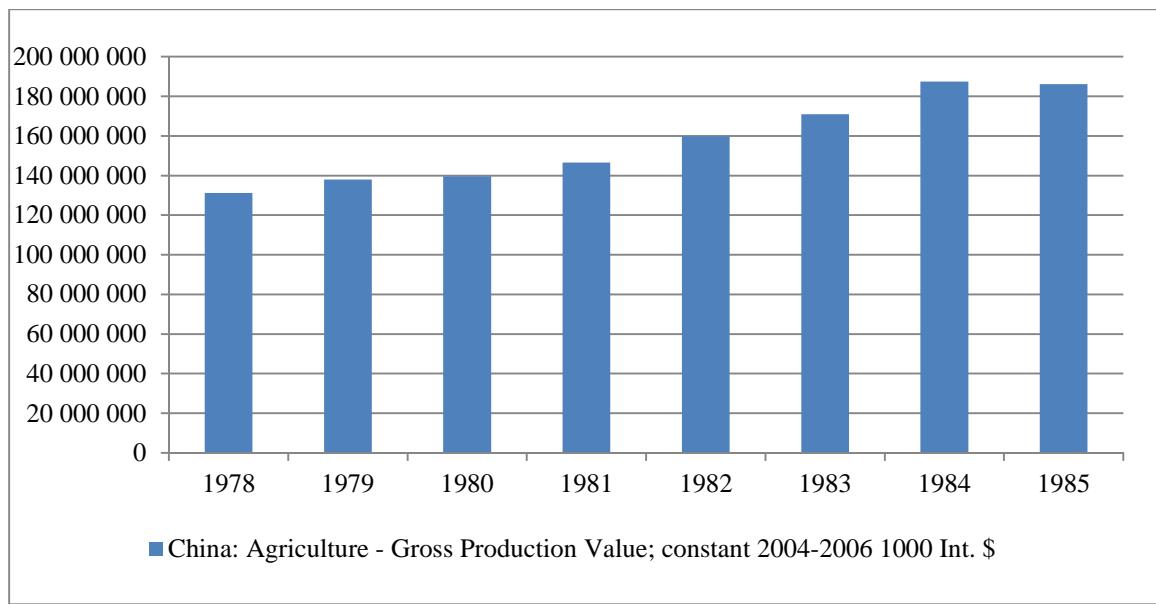
5.5.2 Individual Phases of Chinese Land Reforms

At the establishment of the People's Republic in 1949, China was still an agricultural economy. By the late 1950s, China's leaders intended to catapult underdeveloped China among industrialized countries of the 20th century. An important part of the plan was to introduce – following the Soviet model – collective farms, and organize millions of peasants

into “people communes”. Chinese land tenure system has therefore evolved from private ownership (promoted by Chinese communists up till mid 1950s) to collectivization during Mao (mid 1950s to late 1970s). Except for limited crop production on small plots near households, all agricultural decisions were made by local leaders according to production plans set by higher rank leaders. Agricultural prices were set low (Lohmar et al., 2009).

When reform-minded leaders came to power in 1978, China began abandoning the collective agriculture due to its poor results. Such efforts led to decollectivization of farming practice (while land remained public) and introduction of the so called “household responsibility system” policy (HSR). At the end of the 1970s, land rights in the form of land lease were introduced for a period of one to three years as a subject to local decisions. A compulsory plan was in force. Instead of rent, the household farms were obliged to deliver a fixed amount of production of “strategic crops” (primarily grain but also cotton and oilseeds in some areas) (Lohmar et al., 2009) which was sold to state at low prices, administered by the state. Farmers could keep the surpluses produced above the fixed quotas to consume or sell. They could raise livestock and produce other crops and sell their production on re-established markets. Grain and other kinds of agricultural production started to rise because farmers worked and used the resources more efficiently than previous centrally planned collective farms. Between 1978 and 1985 farm output and productivity grew by 5 – 10 % (Lin, 1992). However, it was not possible to transfer land rights. The following table illustrates the development of gross production value in agriculture in the first years of reforms.

Fig. 10 Value of gross agricultural production, China 1978 – 1985



Source: FAOSTAT, 2014

From this very brief characteristic of the early Chinese “decollectivization times”, many similarities with the Uzbek model can be revealed. Lease contracts on land, state orders and state purchases, and no land rights transfers possible. From extensive literature on Chinese land reforms it is evident that these measures were not always adhered to by local officials, which is typical for Uzbekistan as well. Because the tenure insecurity issues persisted, the duration of farmers’ land rights was prolonged to 15 years in 1984 and land rights transfers were eventually allowed. However, even after this reform, the 15 year contracts were subject to a so called “readjustment” which basically means that local officials could “readjust” the duration of the contract and such practice was not legal (Prosterman et al., 2009). Readjustment practices presented serious threats to farmer’s tenure security. Through the 1990s, taking back farmers’ contracted land through compulsory administrative land readjustment posed even more serious threats to the Chinese peasants.

In 1993, further land reforms took place. The lease contracts were concluded for 30 instead of 15 years and “no readjustments” were supposed to be promoted within the contracted period. However, no guidelines on how to implement this policy were set. Between 1983 and 1998 virtually all rural households had access to some arable land and such distribution of land took place in an egalitarian fashion, usually based on one equal land share per household member. The land system rules and practices were, however, not uniform throughout the country, and several imperfections existed: uncertain duration of the use term, the lack of written land use

contract and the practice of frequent land readjustment (Prosterman et al., 2009). Local leaders periodically reallocated collectively held land among farm households in the same village (Jacoby et al., 2002).

In 2002 the Rural Land Contracting Law (RLCL) was adopted as the first modern Chinese law to deal exclusively with the issue of rural land tenure. RLCL sets forth a series of legal rules addressing a broad range of tenure issues:

“Respecting the contractor's right to make its own decision on production and operation, and refraining from interfering with the normal production and operation conducted by the contractor according to law.” (Law of the People's Republic of China on Land Contract in Rural Areas, 2002) As opposed to the Uzbek practice, Chinese peasants have free decision on growing crops of their choice.

Another interesting aspect is the possibility to transfer land rights stated in the RLCL: *“The right to land contractual management obtained through household contract may, according to law, be circulated by subcontracting, leasing, exchanging, transferring or other means.”* (Law of the People's Republic of China on Land Contract in Rural Areas, 2002)

In 2007 the Property Rights Law was adopted. It is the first law to explicitly offer protection for private property rights (Zhao 2011). It grants the farmers even broader rights, stipulating that farmer's land rights are defined as usufructuary property rights (Property Law of the People's Republic of China, 2007), and thus enjoy a much stronger protection under the law than obligatory (contract) rights. The law permits the farmers to continue using the contracted land after their term expires: *“Where the contracted term (...) expires, the contractor of the right to land contractual management may continue the contract according to relevant provisions of the State.”* (Property Law of the People's Republic of China, 2007) This basically means permission for repeated renewals of the contracted term. Moreover, the law stipulates that full compensation should be paid when government expropriates farmers' property rights, i. e. confiscates their farmland. Such compensation should ensure long-term livelihood for the affected farmers (Zhu and Prosterman, 2009).

5.5.3 Benefits of Land Tenure Security in China

To name benefits of tenure security for Chinese farmers, it is necessary to mention the following:

The first improvements took place in the very beginning of Chinese land reforms – after a shift from collective tenure to individualized tenure. Farmers made short-term improvement of their farming practices such as better timing, proper weeding or more careful application of fertilizers (Prosterman, 2009). The decollectivization did not however mean a more secure land rights at the time. While the HRS, instituted in the early 1980's, gave farmers clear rights to the residual income from farm activities, reformers kept local officials firmly in control of the allocation and general management of land resources (Jacoby et al., 2002).

After the changes in the 1990, the land rights extended to 30 years and farmers were entitled to possess confirmatory documents for their land rights. However, contracts and certificates were not issued to all of them. Such an improvement signalized a stronger land security and where farmers actually received such documents, their investments in land substantially increased. The central government has substantially contributed to implementation of the laws and policies it has promulgated (Prosterman, 2009). This example shows that pro-farmer laws and policies can be successfully implemented even though it might be against the interests of local officials (collective cadres).

However, there were also some negative findings: first, it is the above mentioned lack of documentation, second, it is cases of “readjustment” (although it is an illegal practice) and third, inappropriate compensation on case of taking farmers’ land for non-agricultural purposes, and general complaints about compensation which is rarely favourable for the farmer.

Although the right to land obtained through household contract may, according to law, be circulated by “subcontracting, leasing, exchanging, transferring or other means” it cannot serve as collateral. It prevents the farmers from obtaining credits necessary for further improvement of their farming practices or for additional land. The legislative concerns are loss of farmer’s land to foreclosure (Prosterman et al., 2009).

The example of China shows that strengthening of land tenure rights is the key to successful development of agricultural sector. China gradually abolished state interventions in the agricultural sector such as state orders on crops, enabled transfers of land and therefore improved the productivity of its farmers.

5.6 SUMMARY OF THE CHAPTER “LAND RESOURCES”

Land is not only the cornerstone of economic activities and key to economic development; it also serves as the base for institutional development and it is the foundation for cultural and social identities. It plays a remarkable role in development of markets – credit, labour, real estate, rental and – last but not least, agricultural production markets.

Land in Uzbekistan is state-owned; the exclusive state ownership of land was first incorporated in the 1992 Constitution. The official rationale was to ensure food security and social stability; another concern was the state-run irrigation system, operation of which would be hampered in the event of land privatization.

Three major rounds of farm restructuring took place: the expansion of household plots and restructuring of kolkhozes and sovkhozes into corporate enterprises; second round focused on transforming these enterprises into agricultural cooperatives (shirkats) with the anticipation of higher productivity and profits; and the third round started in 2003, where the core of agricultural production shifted from inefficient shirkats to more productive private farms. Another important change came between 2008 and 2010 when private farms were consolidated.

Farming entities in Uzbekistan possess different rights to land: from long-life inheritable rights of the dehkans to rights limited by 30 to 50 years and defined by lease contracts of the private farmers. The latter are monitored by the state and subject to state interventions; in the first place they have to carry the burden of state orders on cotton and wheat and sell these crops for state-dictated prices. Dehkans account for the vast majority of livestock production and they can, unlike private farmers, sell all their production at market prices.

Since the rural population in Uzbekistan is very large, land issues play a crucial role in ensuring their livelihoods.

CHAPTER 6

WATER RESOURCES

Water is crucial for Uzbek agricultural sector. It would not function without its large irrigation network delivering water to make this dry, semi-arid country suitable for agricultural production. Water availability is one of the most burning problems of the Uzbek agriculture; poor water management has already led to tragic consequences such as the disaster of the Aral Sea. This chapter will be dedicated to water related issues that are very challenging for Uzbekistan. First part will focus on domestic problems. The second part is devoted to the long lasting conflict over water resources with neighbouring countries in the Aral Sea Basin; the historical background and roots of the disputes will be analysed.

Two hypotheses are set and they are linked to both domestic and interstate problems:

1. The main factor causing inefficient water use is the technical imperfections of the irrigation system.
2. The existing interstate conflicts over transboundary water resources in the Aral Sea Basin pose a serious threat and require seeking new methods of solving them.

6.1 DOMESTIC PROBLEMS OF WATER MANAGEMENT

To examine the situation, a deep insight into legal framework, water resources of the country and water use is necessary. Subsequently an analysis of the current organizational structure of water management in Uzbekistan, the irrigation scheme, and the condition and efficiency of the irrigation infrastructure has been done. Water losses and water wasting are two closely interrelated issues that need to be promptly solved to avoid not only lowering yields but also further environmental degradation.

6.1.1 Legal Framework

The key legal document that regulates water issues in Uzbekistan is the “Law on Water and Water Use”. Supplementary legislation incorporates further rights and obligations.

The law stipulates that water is a state-owned national treasure of the republic and is subject to rational use and it is protected by the state (Law on Water and Water Use, Head 1, article 3, 1993).

Rights to use water from transboundary water resources (from the rivers Amudarya, Syrdarya, Zeravshan, and other) are specified by international agreements of the Republic (Law on Water and Water Use, Head 1, article 4, 1993).

Authorities responsible for water management are the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan (surface waters), the State Committee for Geology and Mineral Resources of the Republic of Uzbekistan (ground waters) and the State Inspection for Supervising Geological Studies of Subsoil, Safety of Operations in Industry, Mining and Housing and Utilities Sectors under the Government of the Republic of Uzbekistan (thermal and mineral waters) (Law on Water and Water Use, Head 3, article 8, 1993).

The Water Consumers Associations (WCAs) and other non-governmental non-commercial organizations assist the state to take measures aimed at rational use and protection of water resources and water objects. State authorities can take into account suggestions of the WCAs, other non-governmental non-commercial organizations and citizens when carrying out such measures (Law on Water and Water Use, Head 3, article 10, 1993).

6.1.2 Water Resources of Uzbekistan

Water resources of the country consist of surface and ground water, and return water (waste water and drainage water). There are two major river basins in this region: the Syrdarya basin in the north and the Amudarya basin in the south. The Zeravshan River, a former tributary of the Amudarya, is located between these two major rivers. Most of the former tributaries no longer flow into the Amudarya and Syrdarya: the rivers Ab, Tedjen, Zeravshan, Kashkadarya in the former; the rivers Chu, Talas, Assa and Bugun in the latter, to name the most important tributaries (CA Water Info, 2013).

SURFACE WATERS

The Amudarya basin covers 81.5 % of the country, and Syrdarya basin 13.5 % (Dukhovny and Sokolov, 2003). There are many irrigation constructions along the Syrdarya and Amudarya. These irrigation schemes significantly reduce the volume of run-off in both rivers and thus the inflow into the Aral Sea. The water quality has become a problem: the river water mixes with drainage waters polluted by fertilizers and salts and their concentration is high due to the small volume of run-off. Besides the drainage waters there are also other sources of pollution, especially urban and industrial. In the last few years, however, the river water quality has stabilized thanks to reduction of untreated sewage (CA Water Info, 2013).

Where natural drainage is minimal (flat lands), a network of drains and collectors was constructed. The saline and polluted excess water then often flows to reservoirs where it evaporates.

After the disintegration of the Soviet Union a strict limitation of water allocation between the countries has been implemented and environmental aspects have become more important. These measures have led to certain improvement of water quality (CA Water Info, 2013).

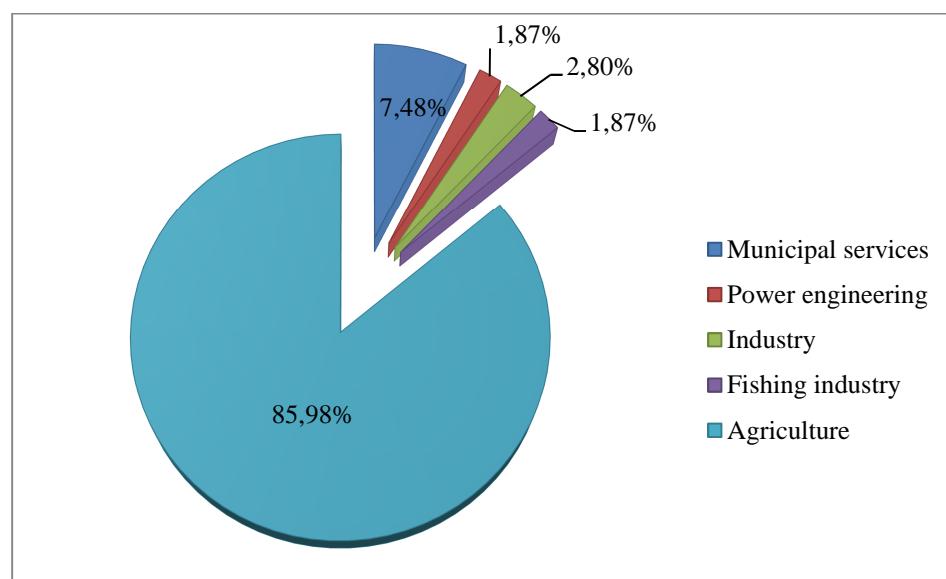
GROUNDWATER

There are two kinds of groundwater resources of a different origin: natural groundwater and groundwater that was formed thanks to infiltration on irrigated areas. Exploitation of groundwater resources has to be carried out carefully without significantly diminishing surface runoff. Quality of groundwater varies by salt content (CA Water Info, 2013).

WASTE AND DRAINAGE WATERS

An important part of water resources is created by return waters. Return waters are also a significant source of pollution due to high mineralization. 95 % of these waters come from drainage waters and 5 % is untreated municipal and industrial waste water (Dukhovny and Sokolov, 2003). The large percentage of drainage water indicates that irrigation actually consumes only about 45 – 50 % of total withdrawals. The poor quality creates limitations for the re-use of drainage water, especially for irrigation. About 30 % end up in natural depressions from which the water evaporates (CA Water Info, 2013).

Fig. 11 Water use in Uzbekistan (%)



Source: Internal document of The Department of Farm Management, TGAU, 2011

From the figure above it is apparent that agriculture is the obvious leader in water use; it is due to the colossal irrigation network, development of which is described in the next section.

6.1.3 Specifics of Water Resources Management

HISTORICAL BACKGROUND

Since the ancient times till the Soviet rule, the Central Asian region had been using its scarce water resources to the benefit of the whole society. The development of irrigation was narrowly related to the development of civilization in the region. Sustainable irrigation practices, water saving and pollution prevention were common measures taken to preserve water resources for next generations. The rules related to water use were strict and ancient states such as Sogdiana, Baktria, Bukhara, Khorezm or Merv did not suffer from water allocation problems. Tsarist Russia after its gradual invasion in the 19th century did not interfere and the system of water management was preserved. However, the traditional appreciation of the once inexhaustible water resources in Central Asia has diminished since the colonization and sovietization of the region. Since 1960 the region has witnessed a dramatic increase in the demand for water resources and the traditions of water allocation and conservation have weakened. Strict and rigid water management system was established to deliver and allocate water where it was needed. Access to water was ensured through construction, maintenance and costly operation of water delivery network, especially of irrigation and drainage systems, financed from the centre. Large-scale development started in the late 1950s, when the Soviet Union decided that the Uzbek SSR should specialize in the production of cotton. There was a shift from small- to large-scale irrigation, mainly in the arid and semi-arid regions (FAO, 2013). The self-sufficiency of individual water users was largely ignored (which became evident in the 1990s) as well as environmental sustainability. Whereas at the beginning of the 20th century only about 5 % of total river flow was used for irrigation, the expansion of the irrigated area led to an almost total abstraction of the average annual runoff by the end of the 1980s (Spillmann and Bächler, 1994).

As a result of a series of draught years in the 1980s, the relations between the Central Asian Soviet republics became tense. To settle and eliminate the conflicts, and to manage quantitatively strict water supply, the former Ministry of Water Resources of the USSR established two basin management organizations (BVO³) named “Amudarya” (with headquarters in Urgench) and “Syrdarya” (with headquarters in Tashkent). This scheme had,

³ BVO is the abbreviation for *Bassejnovoe Vodohozyajstvennoe Obyedinenie* (Russian)

however, certain disadvantages: there was no agreement on use of groundwater with transboundary character and there was no agreement on return waters utilization and water quality management (Dukhovny and Sokolov, 2003).

After the disintegration of the Soviet Union an agreement on establishment of a new body, the Interstate Coordination Water Committee (ICWC), was signed (Rakhimov, 2005). ICWC was to ensure a mechanism for regional collaboration in the area of shared (interstate) water resources management.

ICWC is a collective body which is responsible for a range of tasks: water allocation among countries, monitoring, preparing preliminary assessments of proposals on institutional, ecological, technical and financial approaches, based on mutually agreed decisions. The executive bodies of the ICWC are the Amudarya and Syrdarya BVOs, the Scientific-Information Centre (former part of the Central Asian Scientific Research Institute for Irrigation – SANIIRI) and the ICWC Secretariat (Dukhovny and Sokolov, 2003).

Shortly after the ICWC was founded, two new organizations were established: the Interstate Council for the Aral Sea (ICAS) and the International Fund for Saving the Aral Sea (IFAS). Later the two bodies merged into one – IFAS. Despite this activity, the Aral Sea situation did not improve, especially on the Uzbek side of the Aral Sea. Kazakhstan took measures to save the North Aral Sea which proved to be successful (Pribylovsky, 2014).

PRESENT SITUATION AND ORGANIZATIONAL STRUCTURE

Water scarcity in Uzbekistan is one of the most painful issues in the whole economy. While water is essential for the existence of agricultural sector of the country (93 % of freshwater withdrawals go to agriculture) (Sutton et al., 2013), it is also crucial for environmental stability. The disaster of the Aral Sea has caused a wide range of problems – economic, environmental and social, which are very hard to solve.

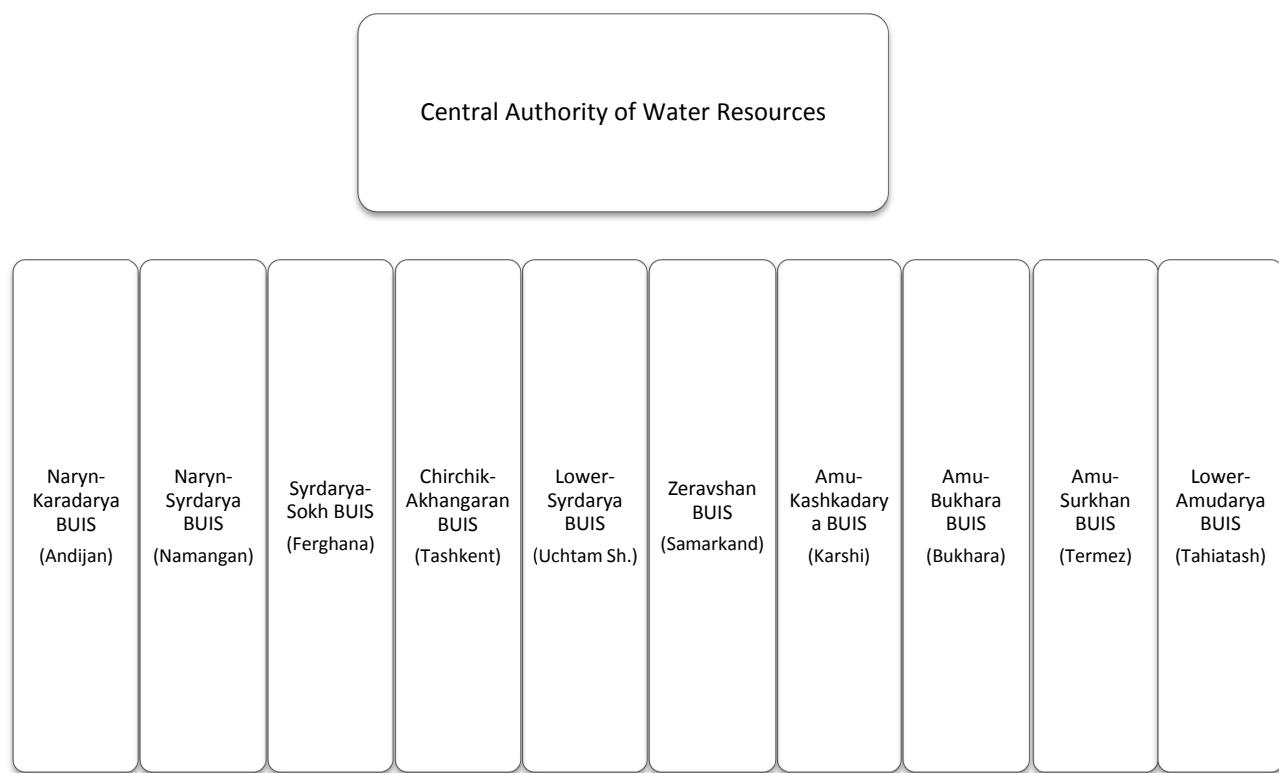
Irrigation infrastructure in Uzbekistan is state-owned. On the national level, the responsible body to carry out the regulatory policy in management of water resources is the Basin Authority of Irrigation Systems (BUIS⁴). It was created in 2003 by the decree no. 320 (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 320 “On Improvement of Water Management”, 2003) to restructure the existing water resources management system from an administrative-territorial based management to a basin based water resources management system. There are ten BUIS in Uzbekistan and their mission is to

⁴ BUIS is the abbreviation for *Bassejnovoe Upravlenie Irrigacionnykh Sistem* (Russian)

control the development and use of river and other water resources. They are directly responsible to the Water Resources Department of the MAWR. They are composed of the Authorities of the Main Canals and Irrigation System Authorities (FAO, 2013).

This organizational structure is represented by a national authority that allocates water to the different regional levels (“oblats”), which distribute water to the districts (“rayons”), and then the rayon water authority distributes water to the individual Water Consumers Associations. Although within the given resource distribution system each level tries to bargain for the maximum allocation, the decision for allocation is made in a top-down approach (Wegerich, 2002).

Fig. 12 Organizational structure of water resources management



Source: National legislation database of the Republic of Uzbekistan, 2014

The water sector was not taken into account in the first stage of reforms. This was corrected in the second stage that started in 2003 due to continuing land reforms which had led to extensive leasing of irrigated land to individual private farmers (Wehrheim, 2008). This delay of reforms in water sector was because the water management institutions had been organized according to the collective farming requirements and as long as the collective farming system

was kept alive, the changes in agriculture did not cause major problems for water management (Yalcin and Mollinga, 2007).

After private farms replaced the inefficient shirkats, land became fragmented into smaller plots; therefore thousands of new water users emerged which had not been envisaged. The water department was responsible for delivering water to the shirkat boundaries; after dismantling of the shirkats, an institutional gap appeared at the boundary between the former shirkat and the new individual farmer. The newly emerged farmers were supposed to manage water among themselves. Apparently, they were not able to do so; conflicts over water distribution started (Yalcin and Mollinga, 2007). Furthermore, new problems appeared such as technical maintenance of on-farm irrigation and drainage systems. This situation needed an adequate reaction which was the establishment of the pioneer Water Users Associations in 1999 which filled a gap in water management. The first WUAs were not grounded on a solid legal framework. From 2003 to 2006 the process accelerated and the whole country was covered by the newly established WUAs. Most WUAs were established with administrative boundaries, i.e. largely with same boundaries as the former shirkats.

WATER CONSUMERS ASSOCIATIONS

In 2009 the Law on Water and Water Use was revised and the WUAs were renamed into the Water Consumers Associations (WCA) (Law of the Republic of Uzbekistan N 3RU-240, 2009). The reason for the change in name was the specification of actual water availability: water use does not affect the actual amount of water (fisheries, hydropower); water consumption refers to reducing the amount of water (irrigation) (FAO, 2013).

By the end of 2010, 1640 WCAs have been established, which served nearly 65,000 farmers, covering 3.9 million ha (Hamidov and Thiel, 2011).

WCA is a non-governmental, non-commercial organization, founded by legal entities of water users and consumers. WCAs are given the responsibility to operate and maintain the irrigation and drainage infrastructure of the former collective farms and to distribute irrigation water to the end-users. WCAs' objective is to coordinate activities of their members in water-related questions and represent and defend their common interests (Law on Water and Water Use, Head 1, article 2¹, 2009).

WCA founders can be farmers and dehkans with a status of legal entity and other water users and consumers (legal entities only) (Law on Water and Water Use, Head 6, article 18, 1993).

WCA members are farmers, dehkans, institutions of civil self-governance (mahalla) and other water users and consumers. They decide all issues connected with water and its distribution within the on-farm irrigation. Dehkans (physical entities), however, do not have any decision-making rights. They are granted a *limit* (volume) of water they can use and if they face any problems or inadequate water supply, they can contact local mahalla committee in search of help (Rakhimov, 2013).

There are two types of WCA, administrative-territorial and hydrographic. The first type was organized on the basis of the liquidated shirkats and constitutes a majority. The latter is the association of farmers that takes into consideration the location of the irrigated area and the canals (aryks) – water consumers get water from the same canal (Zavgorodnyaya, 2006).

The state presented these new institutions as a tool to eliminate water use inefficiencies and conflicts among water users; they were established to improve participation of farmers in decision making. Officially, they are non-governmental associations but in practice they have remained under control of the government and play an important role in the control over agricultural production (Zavgorodnyaya, 2006; Veldwisch, 2008; Oberkircher and Hornidge, 2011). WCAs are state-initiated and state-controlled institutions. Government interventions in decision making are a common thing – both the local government (hokimiyat) and the Water Resources Department of the MAWR exert control over water distribution and agricultural production (Pulatova, 2013). From the field research conducted by international researchers it is obvious that WCAs are accountable, first of all, to the state, and only second comes the farmer (Zavgorodnyaya, 2006; Veldwisch, 2008; Veldwisch and Mollinga, 2013). The WCA chairman should be elected by its members but he is rather appointed by the hokim (Wegerich, 2000; Veldwisch, 2008; Oberkircher and Hornidge, 2011). From the following paragraphs it will become apparent that as long as the state orders on agricultural production remain (fixed sowing area and production quotas), the WCAs will not have the freedom to decide on water management issues.

Although several legal documents such as the Law on Water and Water Use, Law on Farms, Law on Dehan Farms and Law on Shirkats contain legal basis for WCAs, there is no concrete law concerning WCA itself so water user and consumer rights and obligations (especially maintenance obligations) are not specifically set. A draft law was prepared in 2006 but has not been approved yet (Veldwisch and Mollinga, 2013). Such legal uncertainty causes lack of new investments and private initiatives (relevant legal documents, 1998; Gunchinmaa

and Yakubov, 2010). Even recent works devoted to their functioning claim that WCAs are not yet well-established (Sutton et al., 2013).

6.1.4 Irrigation Scheme and its Efficiency

Uzbekistan's water scarcity problems go hand in hand with irrigation inefficiency and irrational use of water, which has already caused severe environmental problems. The strategy of development of irrigated agriculture under conditions of the possible deficit of water resources in the region due to the predicted climate change is one of the burning problems today, especially since the irrigated lands in Uzbekistan ensure more than 90 % of crop production (FAO, 2013). Insufficient water security is caused by the limited water resources and by the current practice of water management which does not fight against large withdrawals of water to support the current ameliorative regime, against losses due to infiltration and evaporation from the irrigation network, and particularly losses during the irrigation itself. From the total amount of water withdrawn from irrigation resources, up to 50 % vanishes in the irrigation canals and 30 to 50 % (sometimes even more) gets wasted during watering (Morozov, 2004). There are not enough hydrofacilities, especially those that measure water use within the intra-farm network.

IRRIGATION NETWORK

The water infrastructure in Uzbekistan is an extensive and complicated scheme of irrigation and drainage systems that are in operation on around 4.2 million hectares of irrigated lands. The irrigation network is impressive: 180 thousand km of canals, 140 thousand km of drainage network, around 160 thousand hydro-technical structures (over 800 large ones), 1,588 pumping stations of a yearly capacity of 8.2 thousand mil. kW, 55 reservoirs with a total 19.8 thousand mil. m³ volume and over 4100 wells (Ministry of Foreign Affairs of the Republic of Uzbekistan, 2012).

However, since 1990, on-farm irrigation networks have deteriorated due to poor financial situation of both shirkats and privatized farms which have no possibilities either to renovate on-farm networks or maintain them in a satisfactory condition. Investments in maintaining the whole irrigation infrastructure appears to have decreased in recent years (Sutton et al., 2013). The majority of irrigation, drainage and collector systems in Uzbekistan have been in exploitation for decades, so they are obsolete and worn out. All the facilities need regular investments and need to be fixed and some of them reconstructed. Overall and on-farm water efficiency is difficult to measure: Veldwisch (2008) conducted a detailed research in Khorezm

and described the process of measuring water consumption. It is being done frequently, however, not always according to quite strict rules. He evaluates the general efficiency as satisfactory, however, he names quite a few cases when, for example, water was charged to a WCA, although that volume of water was actually seepage from a large canal flowing through the area of the WCA.

Another factor negatively influenced the state of the irrigation-drainage network, and has resulted in higher irrigation water consumption rates than would otherwise have been the case. It is the large increase in the area sown under winter wheat which has essentially changed the irrigation practices and crop rotation (FAO, 2013). Earlier, under cotton monoculture, during the non-vegetation period between October and March, there were no crops in the fields, and the irrigation-drainage network was cleaned and prepared for the next season. But nowadays, winter wheat is grown from October to the next vegetation season in June. While the evapotranspiration of wheat during this period is low, it still requires five to six irrigations. Therefore, the irrigation-drainage network is operating almost 12 months a year, leaving little time for cleaning or minor repairs (Abdullaev et al., 2009).

Measuring the water applied on irrigated lands should be done but it can be quite problematic. In some areas meters (*sketchiki*) are installed. They are concrete structures without any sophisticated mechanism; it is a simple gauge that measures volume of water that is supplied to the field. Any electronic devices would break within a short period of time because irrigation water from surface resources is usually muddy (Khushmatov, 2013). Meters are not installed everywhere and it is often the experienced staff who can estimate the amount of delivered water (Veldwisch, 2008). After dry years (2000-2001) the plan was to install them everywhere possible to control the actual volumes of supplied water to run the water management under worsened conditions responsibly. The plan was abandoned as soon as the threat of water shortages passed (Khushmatov, 2013).

DRAINAGE SYSTEM

Good condition of the drainage system is very important especially in the case of flat topography where natural drainage is minimal. Groundwater levels can be easily kept high and shallow ground water kills crops when it reaches the root zone (waterlogging). 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 the correct depth to both contribute to growth and to avoid dangerous levels of salinization of upper layer of soil (Veldwisch, 2008). The drainage system keeps the

groundwater level at an optimum height in case the irrigation practices are reasonable. Its role is especially important when the irrigation doses are excessive without regard to the soil properties, and when the absence of rains does not permit any soil leaching – in this case the excessive irrigation water is logged in the ground and makes the groundwater level to rise up to the soil surface – by this the groundwater transports salts to the soil surface where the water evaporates and the salts remain making the soil salinity increase until values of salinity become unacceptable to most crops (Kitamura et al., 2006). This is the case of Uzbekistan where the soils have mostly higher contents of salts and by origin are desert soils, and where the in-farm water application rates are very high. Proper drainage system is therefore very important. The problem of keeping groundwater levels at an optimum height can be simply explained with an example:

The optimum of groundwater levels is specific with regard to different crops grown on fields. For instance, rice fields are filled with standing water (irrigation practice called flooding), causing the groundwater levels to rise which is good for the rice crop. This can also influence groundwater levels on surrounding fields. However, the cotton crop is damaged by groundwater in its root zone, so growing rice next to cotton can be dangerous for cotton plants. A proper drench between the fields is therefore very important.

WATER DISTRIBUTION AND ACCESS TO WATER

Water distribution is planned from the centre where the *limits* (volumes of irrigation water) for each agricultural entity are determined, approved and allocated. Water is then delivered to individual users according to an agreed schedule. *Limits* are determined for the leaching period (October-March) and vegetation period (Veldwisch, 2008). WCAs elaborate their irrigation plans by the end of August; the basis for water allocation and scheduling of water supply reflect the cropping patterns that correspond to the state quotas on cotton and wheat, determined in Tashkent. Then these plans are sent to the Department of Water Resources of MAWR. The water allocated to Uzbekistan by the ICWC is divided by individual BUIS in form of water *limits* among arterial canals and irrigation authorities, which further determine *limits* to provinces (oblast), and districts (rayon) (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 320 “On Improvement of Water Management”, 2003). Irrigation systems determine *limits* to WCAs and WCAs divide water among farmers and dehkans. The process of approval takes place in rounds during September to determine the final *limits* for each agricultural entity (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan

“Provision on the Procedure of Water Use and Water Consumption on the territory of Republic of Uzbekistan”, 2013).

Veldwisch (2008), however, remarks that the real volume of supplied water differs from the approved *limits* and water is delivered according to the daily instructions from above rather than to the provided schedule, depending on actual weather conditions (the schedule is based on climatic averages).

Access to water by farmers and dehkans is affected by several factors. A natural factor is the location of the field, i.e. if the field is in the head-end area or in the tail-end area of the WCA. Fields at the head-end are generally better off since they get water first, before the fields at the tail-end. This is connected to the proximity of the canal; the closer to the irrigation canal the field, the better. Elevation of the field is another important characteristic. It is not easy to say whether (or not) it is better to grow crops on a high or low field. This is narrowly connected to soil salinity as has been described before. High land is usually less saline and more fertile. However, it is more difficult to irrigate it (when there is not enough water, the pumping costs are higher). Low lands are easier to irrigate but they are generally less fertile, prone to salinization, groundwater levels are shallow.

Another factor that affects access to water is the form of production – it is obvious that state production is preferred over commercial production; however, farmer's socio-political position seems to stand above all.⁵ WCA gets a *limit* and further distribution is up to the WCA; distribution of water is personalized. Rules apply differently for different people and different production processes.

In general, dehkans have priority when accessing water – they form most of the rural households, state recognizes them as the core of the rural society (Veldwisch, 2008). Farmers producing state ordered crops are second in the “preferential access” hierarchy since water distribution is subordinated to achieving production targets, and only then comes the commercial production. Rice producers are dependent on private relations and informal networks. However, in times when water is scarce, dehkans quickly lose their preferential status and socio-political connections seem to be of greatest importance (Oberkircher and Hornidge, 2011).

Access to water is crucial and WCAs are not always able or willing to help the farmers in getting enough water for their crops (usually it is the lack of funds of the WCA). Farmers who

⁵ A remark made by several authors who conducted research in the Khorezm oblast.

carry the burden of state orders and at the same time they want to maximize their profit sometimes invest in irrigation technology themselves – buy a diesel pump etc. (Khushmatov, 2013). When the government fails to help, the farmers give up and try to fix things themselves (Veldwisch, 2008).

PAYMENTS FOR WATER SUPPLY

While irrigation water delivery at the system level is still free (or covered by an overall land tax, to be more precise), WCAs that distribute water at the farm level must charge for their services in order to generate financial resources to cover operational costs. The irrigation service fees are paid directly to the WCA. They are not tied to use of a specific volume of water, the fees for water are calculated as 1 % of the farmer's revenues (Pulatova, 2013).

The WCAs face problems collecting the fees from farmers – for some water is a gift from God and should not be sold (such approach originates in the Islamic law as described later), some perceive it as a free good. Also the fees amount is an object of discussion because some people use gravity and some pumped water (Wegerich 2000; Zavgorodnyaya, 2006). People hesitate to pay fees also in the case when the WCA staff do a bad job at distributing water and maintaining the infrastructure; as a result, the WCA faces difficulties in paying the staff. Poorly paid staff is reluctant to provide adequate services and thus a vicious circle begins (Zavgorodnyaya, 2006).

Water consumers are granted a so-called *limit*, as mentioned earlier. It is a volume of water that has been approved beforehand according to the cropping plan and to estimated water abundance in the next year.

IRRIGATION EFFICIENCY AND WATER LOSSES

Irrigation efficiency is low due to several factors, including significant on-farm and conveyance losses, and saline soils that often make re-use of water unfeasible. Soils in Uzbekistan are high in salts, and irrigation leaches and deposits salts into groundwater or further along the catchment. On-farm losses result from surface runoff (vast majority of irrigation uses flood techniques such as furrow or border irrigation), seepage and evaporation from unlined earthen canals, operational waste, and deep percolation. About 20 % of water is used for leaching itself: to reduce salinity levels in soils sufficiently to support crops. These factors contribute to farm-level efficiency in Uzbekistan of between 50 and 55 % (Sutton et al., 2013). Seepage problems are typical for main canals as well.

The problems of seepages are common; large volumes of water seep away due to poor anti-seepage lining (or its absence; only 33 % of main irrigation canals are lined), aging pumping infrastructure from the Soviet times, and unattractiveness of water-saving technologies because of low fees for water (Sutton et al., 2013).

One of the basic problems in the current irrigation method (mainly surface watering) is the significant water losses on the irrigated fields because of excess watering. A huge part of this happens because of lack of control during irrigation works where water unnecessarily flows into the drainage system. Another reason is poor levelling of the fields where one part is higher and the other one lower: crop on the higher part grows well and crop on the lower part stands in water (Veldwisch, 2008). Also some crop varieties are quite water demanding. New ones, that would be resistant under conditions of water shortages, are being developed (Khushmatov, 2013).

A big problem of Uzbek soils is their texture – high permeability, leading to enormous losses of irrigation water when using inappropriate watering techniques, so a considerate choice of watering is very important in order not to use excessive volumes of water. Sandy soils with higher permeability require more water than loamy soils to achieve the same effect. Loamy soils, on the other hand, tend to log water and aggravate soil salinization (Oberkircher and Hornidge, 2011). The higher the permeability, the more efficient watering technologies need to be used.

Tab. 8 Permeability of soils in individual administrative districts of Uzbekistan

Administrative district	Very strong		Strong		Medium		Slight		Total thousand ha
	thousand ha	%	thousand ha	%	thousand ha	%	thousand ha	%	
Karakalpakstan	47.6	9.5	146	29.1	146.2	29.1	162.1	32.3	501.9
Andijan	17.5	6.2	52.6	18.8	63.1	22.4	147.9	52.6	281.1
Bukhara	36.2	13.2	2.1	0.8	87.5	32	147.8	54	273.7
Jizzak	11.3	3.8	20.5	7	246.6	84	15.3	5.2	293.7
Kashkadarya	40.1	8	44.8	8.9	258.2	51.3	160.3	31.8	503.4
Navoi	6.5	5.2	34.7	27.6	54.3	43.2	30.2	24	125.7
Namangan	5	1.8	81.7	29.4	132.2	47.6	59	21.2	277.9
Samarkand	-	-	-	-	188.9	50.3	186.5	49.7	375.4
Syrdarya	3.1	1	22.2	7.5	203.3	68	70.3	23.5	298.9
Surkhandarya	25.4	7.7	52.7	16	143.9	43.6	107.8	32.7	329.8
Tashkent	-	-	93.6	24	252.1	64.8	43.5	11.2	389.2
Ferghana	69	19.3	121.8	34	63.6	17.7	104	29	358.4
Khorezm	46.8	18.3	71.1	27.8	21.3	8.3	116.3	45.6	255.5
Total	308.5	7.3	743.8	17.4	1861.2	43.6	1351	31.7	4264.6

Source: SANIRI, 2004

COMMON VIOLATIONS AND DAMAGES

Some of the mentioned problems of water losses and water wasting are created by improper manipulation with water. The following violations and damages are observed:

- increased withdrawals of water in the head-end of the irrigation system due to lack of technical facilities, incorrect irrigation techniques and, as a consequence, drainage of large volumes of water above the norm;
- consequent increased losses of water from drains and collectors due to large flow of irrigation water from the fields;
- the necessity of water supply of the tail-end plots of the irrigation system with the help of pumps, caused by the increased withdrawals of water in the head-end parts of the system;
- deterioration of the irrigation water due to the reuse of saline drainage water; basically salts are taken away from one field and put to another;
- needless construction of drainage canals for draining technically unjustified volumes of water (caused by the imperfect irrigation techniques) in such environment, where it would be enough to create drainage tracts along the natural thalweg (Morozov, 2004).

PERCEPTION OF WATER WASTING

Water losses caused by unlined canals and especially over-irrigation is something that would not be considered simply water losses but also water wasting since few measures to avoid such losses have been taken. The Uzbek point of view is slightly different; from their perspective, water wasting is an intentional deed such as irrigation water running from fields straight to the drain (Oberkircher and Hornidge, 2011). For such violations of rules farmers can be punished; usually in the form of fines.

Another example of water wasting is excessive water use for growing rice. Rice farmer prefer to keep their rice paddies flooded continuously – rice is intolerant to drying and highly tolerant to excess water. Extra water keeps weeds under control but could be used more efficiently to irrigate more fields to yield more rice.

Box 1 Water wasting

It seems that most people in Uzbekistan perceive water as a free, endless good. A prime example was observed in a university dormitory in Tashkent. The common practice of shutting down electricity during the day had unpleasant consequences particularly for those few people who were lucky to own a refrigerator. The head of the dormitory, to keep her barrel of milk fresh, put the barrel in a sink and let cold water flow over it for the whole day. Such approach to water wasting was a shocking revelation for me, but for locals, it was not anything worrying or surprising. (April 2013)

WATER SAVING

Oberkircher and Hornidge (2011) mention an interesting fact: their research in Khorezm oblast showed that people do not understand the term “water saving” which is used by the Uzbek scientists and in state documents. They do not understand why they should save water, for whom. As long as there is water in the canal, it is all right. Only if water is scarce, they try to use it more efficiently, practising water-saving measures (Oberkircher, 2011).

ENVIRONMENTAL CONSCIOUSNESS

Social and cultural specifics of the depletion of water resources should be examined under the aspect of the attitude towards water in Islamic societies and the effect of sovietization on traditional attitudes. The Islamic religion and Islamic customary law show great appreciation of water. The importance of water to traditional Islamic societies is underscored by the Arabic word for Islamic law, Sharia, which literally means the “way to water” (Murthy, 2010). Water is a gift from God; it can neither belong to anyone nor be sold. According to the traditional water law, users of irrigation water had to take part in the construction and maintenance of irrigation networks. The administration of water was locally institutionalized: village communities distributed water, controlled water use and enforced the water laws. After colonization and later sovietization and collectivization the responsibility for water distribution was delegated to the highest possible level, to Moscow. Delegating the responsibility to the Russian colonizers has led to a lack of concern for the environment, especially for water. The attitude to water changed since it became socialist property (Spillmann and Bächler, 1994). Water, like land, was the property of the state, and therefore it was provided as a free good. As a result, efficiency was impaired, because farms were not required even to keep a record of the amount of irrigation water used (Hollis, 1978).

Box 2 The Aral Sea tragedy

When interviewing one of the professors from the Tashkent university, one of the questions was linked to the desiccation of the Aral Sea and possibilities of its restoration – such as the efforts progressing on the Kazakh side of the disappearing sea. To find out that there are no plans to do so in Uzbekistan were a huge disappointment. Instead, mining facilities are being installed on the dry bottom of the once glorious sea. (April 2013)

6.1.5 Concluding Remarks

The water sector in Uzbekistan has gone through reforms that followed the individualization of farming. Land became fragmented into smaller plots and thousands of new water users emerged. The institutional gap needed an adequate reaction which was the establishment of the Water Users Associations in 1999. Most WUAs were established with administrative boundaries (former shirkats boundaries), the minority constituted hydrographic WUAs. The WUAs were later renamed to Water Consumers Associations since water use (fisheries, hydropower) does not affect the actual amount of water while water consumption, such as irrigation, reduces the volume of water. WCAs are given the responsibility to operate and maintain the irrigation and drainage infrastructure of the former collective farms and to distribute irrigation water to the end-users. Officially, they are non-governmental associations but in practice they have remained under control of the government and play an important role in the control over agricultural production. WCAs are accountable in the first place to the state. While irrigation water delivery at the system level is free, WCAs that distribute water at the farm level must charge for their services in order to generate financial resources to cover operational costs.

Water distribution is planned from the centre where the *limits*, i.e. volumes of irrigation water for each agricultural entity are determined, approved and allocated. Eventual access to water by each private farmer or dehkan is affected by several factors. A natural factor is the location of the field (the head-end area or the tail-end area of the WCA), the proximity of the canal and the elevation of the field. Another factor is the form of production – state production is preferred over commercial production; however, farmer's socio-political position seems to stand above all. In general, dehkans have priority when accessing water but in times of water scarcity, socio-political connections seem to be of greatest importance

Irrigation efficiency is low due to several factors, including significant on-farm and conveyance losses, and salinity of soils. Common problems include seepages, current irrigation methods, excess watering, poor levelling of the fields and high permeability of soils. Another problem is the perception of water in the current Uzbek society. The traditional attitude originating in the Islamic law shows great appreciation of water; however, decades of Russian and Soviet rule have changed the perception of water which is considered a free good.

6.2 REGIONAL CONFLICTS OVER WATER RESOURCES

The decreasing availability of water in Central Asia is complicated by the fact that water resources are shared among the countries. Transboundary waters have become objects of disagreements and disputes. This subchapter is dedicated to a burning problem of “water wars” in the Central Asian region. The ongoing disputes will be analysed and mutually satisfying solutions for the involved countries will be suggested.

As mentioned earlier, a river basin can be considered a common-pool resource; such resources share two attributes: excluding individuals from benefiting from a good is difficult, and the yield is subtractable – the resource units one person (subject) appropriates from a common-pool resource are not available to others (Ostrom and Gardner, 1993). This is the case of the transboundary water resources in the Aral Sea Basin, where upstream countries are in a stronger position thanks to their more advantageous location.

Water has always been a scarce resource and a source of conflicts in the Central Asian region. The Central Asian republics, once a raw materials and agricultural base of the Soviet Union, used to be managed from the centre. Moscow was in charge of water and energy resources and provided funds for building, operating and maintaining a wide range of infrastructure. However, inequitable water resources re-allocation in order to increase irrigated areas in the Soviet republics and a series of extremely dry years in the decade of 1980s have resulted in political tensions among the Central Asian republics. Subsequently, in 1987 the Scientific and Technical Council of the USSR Ministry of Water resources determined water allocation quotas for the five Soviet republics sharing the Aral Sea Basin. In terms of water utilization, while Uzbekistan and Turkmenistan were apparently favoured by the Soviet water management system, Tajikistan and Kyrgyzstan became water suppliers and runoff regulators. The above mentioned quotas were reconfirmed in the 1992 Almaty Agreement although they did not reflect the situation at that time. Disagreements over water resources have become a

source of permanent conflicts since the mid-eighties, especially between Kyrgyzstan and Tajikistan on one side, and Uzbekistan, Turkmenistan and Kazakhstan on the other.

There are two competing groups of countries in Central Asia; the region almost coincides with the territory of the Aral Sea Basin which is specified in the next section.

1) The first group of upstream countries is represented by water suppliers: Kyrgyzstan and Tajikistan. The countries' mountainous terrain is suitable for building hydroenergetic power plants.

2) The second group of downstream countries is represented by water users: Uzbekistan, Turkmenistan and part of Kazakhstan. They are dependent on irrigation water, i.e. on the upstream countries.

Conflicts between the two groups originate from their different intentions regarding water use. The former group, in view of its energetic needs, supplies water to the latter especially in winter (when the upstream countries release water from dams to generate electricity). However, the second group of countries do not need the water for irrigation in winter; they need it mainly in spring and summer. The first group, vice versa, wishes to accumulate water during the warm period to release it again during the cold months. Such collisions of interest end up in permanent tensions between the countries which sometimes turn into heated disputes.

Before focusing on one of the conflicts, general characteristics of the Aral Sea Basin will be provided to demonstrate interconnection of the Central Asian countries due to shared water resources.

6.2.1 Aral Sea Basin

The whole territory of Uzbekistan belongs to the Aral Sea basin. The basin includes also other Central Asian countries. The whole territory of Tajikistan, a large part of Turkmenistan, three provinces of Kyrgyzstan (Osh, Jalal-Abad, Naryn), southern part of Kazakhstan (two provinces – Kyzyl-Orda and Southern Kazakhstan) and northern parts of Afghanistan and Iran belong to the ASB. It covers more or less the entire territory of Central Asia as shown in the next figure. The area of the basin is phenomenal – only the territory of the five countries occupies 1,549 mil. km² (CA Water Info, 2013).

Fig. 13 The Aral Sea Basin



Source: Dukhovny and Sokolov, 2003

From the table below it is obvious that Uzbekistan is the absolute leader in irrigated areas which explains its large withdrawals of water. Uzbekistan's agricultural sector is therefore more vulnerable in terms of water insufficiency than any of its neighbours.

Tab. 9 Land resources in the Aral Sea Basin

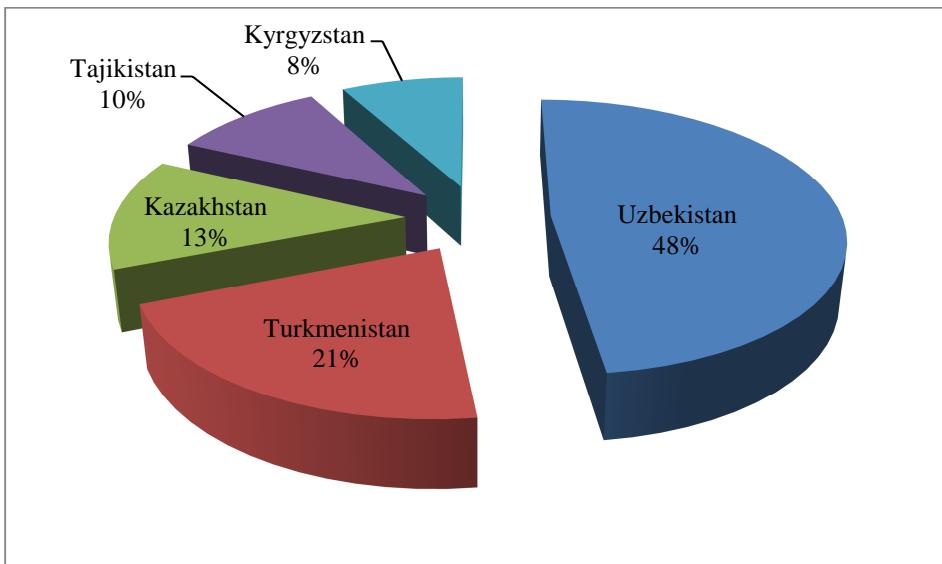
Country	Area	Cultivable area	Cultivated area	Irrigated area
	ha	ha	ha	ha
Kazakhstan*	34,440,000	23,872,400	1,658,800	786,200
Kyrgyzstan*	12,490,000	1,257,400	595,000	422,000
Tajikistan	14,310,000	1,571,000	769,900	719,000
Turkmenistan	48,810,000	7,013,000	1,805,300	1,735,000
Uzbekistan	44,884,000	25,447,700	5,207,800	4,233,400
Aral Sea Basin	154,934,000	59,161,500	10,036,800	7,895,600

* only provinces in the Aral Sea basin are included

Source: CA Water Info, 2013

The following figure demonstrates the share of water used in agriculture; Uzbekistan is again the leader among the five Central Asian republics.

Fig. 14 Use of water resources in agriculture in the Aral Sea Basin countries



Source: Internal document of TGAU: Agriculture of the Republic of Uzbekistan: Current situation and development prospects, 2009

The territory of the Aral Sea basin can be divided into two basic zones: the Turan plain in the central and western part, and the mountain zone in the east and south east. The western parts of the Aral Sea basin are covered by deserts – the Karakum in the south and the Kyzylkum in the north. The Tian-Shan and Pamir ranges are situated in the eastern and south eastern parts, with highest peaks reaching over 7000 m. The remaining part of the basin is composed of various types of alluvial and inter-mountain valleys, dry and semi-dry steppe.

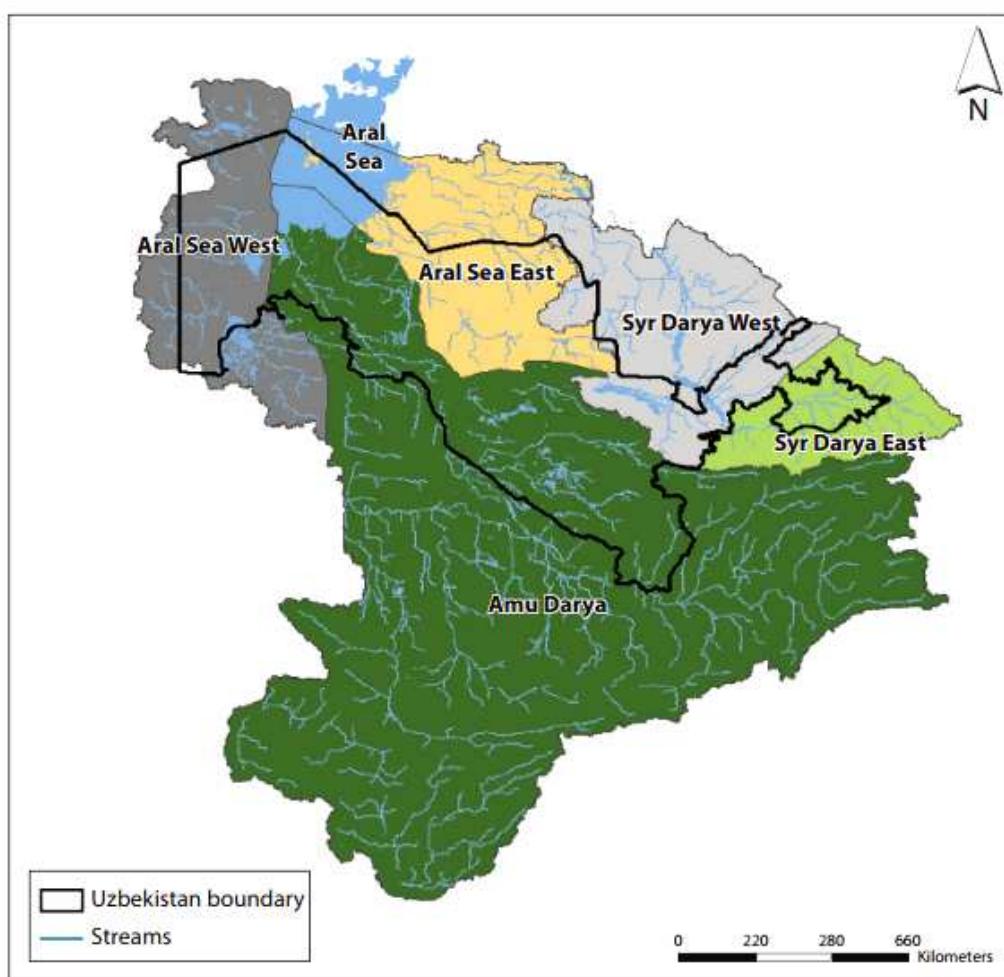
Kyrgyzstan and Tajikistan belong to mountainous countries, they have plenty of water resources but they lack cultivable land. On the other hand, in Kazakhstan, Turkmenistan and Uzbekistan there are important oases which are densely populated: the Ferghana valley, Tashkent, Khorezm, Dashkhovuz, Mary, Zeravshan or Chimkent. They have been centres of settlement since the ancient times thanks to their favourable conditions such as good quality soils and abundance of water. Most of the territory of Kazakhstan, Turkmenistan and Uzbekistan is covered by desert and only little is mountainous. Such conditions are favourable for development of irrigation. During the Soviet times, water resources were re-allocated in order to increase irrigated areas in respective Soviet republics. However, besides dreadful environmental problems, this policy became a source of potential conflicts. Tense relations

between Uzbekistan on one side, and Tajikistan and Kyrgyzstan on the opposite side, are a result of such policies.

6.2.2 Water Resources of the Aral Sea Basin

As mentioned earlier, there are two major river basins in the region: the Syrdarya basin in the north and the Amudarya basin in the south. These water resources (surface and ground) are shared among the countries of the basin.

Fig. 15 River basins in Uzbekistan



Source: Sutton et al., 2013

THE AMUDARYA

The Amudarya basin covers 81.5 % of the country (FAO, 2013). The Amudarya is the biggest river in Central Asia. Its length from the Pyanj headwaters to the Aral Sea is 2,540 km with a catchment area of 309 thousand km². It is called Amudarya after the Pyanj and Vakhsh confluence (Rakhimov, 2005). The entire main Amudarya can be divided into three reaches: the upper reach borders Afghanistan and Tajikistan, where most of the water flow is generated; the middle reach first borders Uzbekistan and Afghanistan and then enters Turkmenistan; and the lower reach, in Uzbekistan, before the river discharges into the Aral Sea (FAO, 2013).

There are four important tributaries that flow into the Amudarya within the middle reach: The Kafirnigan, Surkhandarya and Sherabad rivers are its right tributaries, and the Kunduz river is its left tributary. Further downstream towards the Aral Sea it has no more tributaries. It is fed largely by water from melted snow, thus maximum discharges are observed in summer and their availability is very favourable for irrigation purposes. When the river water reaches Nukus, it loses most of its water due to evaporation (the river flows through the desert), infiltration and withdrawal for irrigation. The flow reaching the Aral Sea is therefore limited to less than 10 % of this figure in the driest years (FAO, 2013).

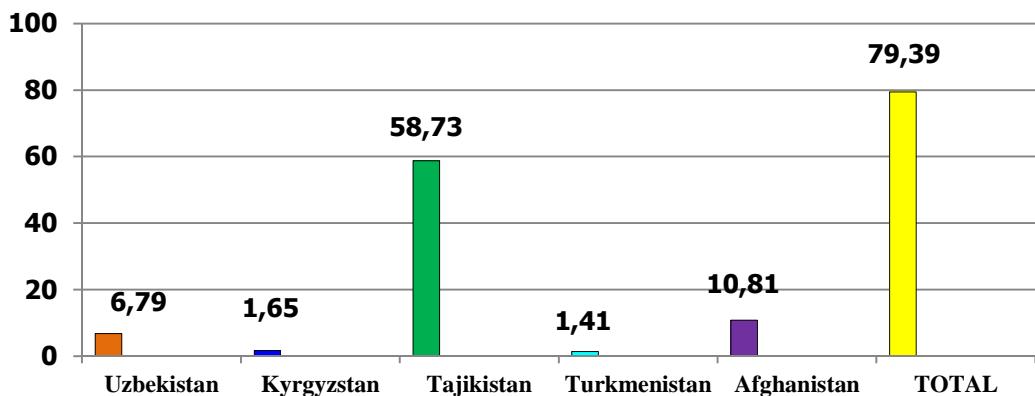
The main flow of the Amudarya originates on the territory of Tajikistan (74 %). The river then flows along the border between Afghanistan and Uzbekistan, across Turkmenistan and then it returns to Uzbekistan where it discharges into the Aral Sea. About 13.9 % of the Amudarya water is formed on Afghan territory and in Iran. About 8.5 % of the Amudarya flow is formed in Uzbekistan (CA Water Info, 2013⁶).

The three largest canals in the Amudarya basin are the Karakum, the Karshi and Amu-Bukhara canals. In addition to these three largest canals there is a network of hundreds of smaller canals distributing water from the Amudarya to cultivated fields (Central Asia Energy Water Development Program, 2009).

The Amudarya carries the heaviest load of sediment of all Central Asian rivers and the level of sedimentation is among the highest in the world.

⁶ figures given in the FAO Water Report (2013) slightly vary

Fig. 16 Amudarya total average flow (km^3)



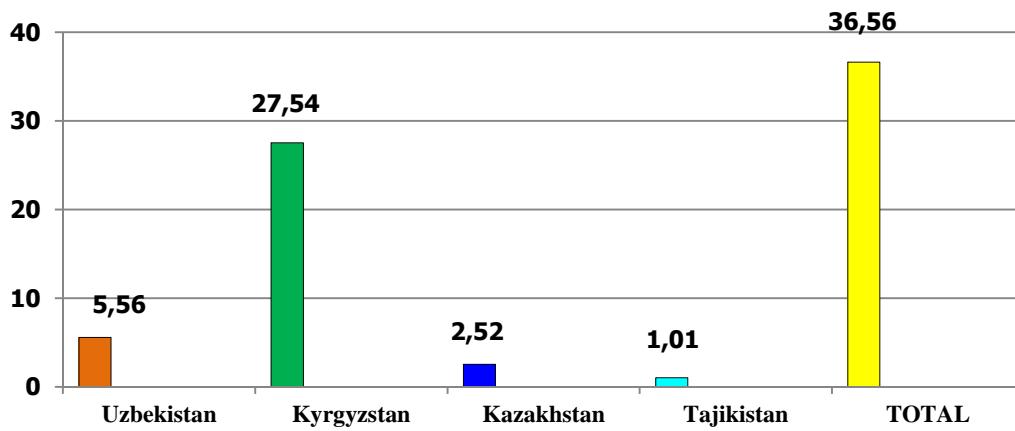
Source: CA Water Info, 2013; the figures given in the FAO Water Report (2013) slightly vary.

THE SYRDARYA

The Syrdarya basin covers 13.5 % of Uzbekistan (FAO Water Report, 2013). The Syrdarya is the second largest river in Central Asia by its volume and the longest one. Its length from the Naryn headwaters in the Central Tian-Shan mountains to the Aral Sea is 3,019 km with a catchment area of 219 thousand km^2 (Rakhimov, 2005). The river is called Syrdarya after the Naryn and Karadarya confluence. The entire main Syrdarya can be divided into three reaches: the upper is in Kyrgyzstan, where most of the water flow is generated; the middle in Uzbekistan and Tajikistan; and the lower reach in Kazakhstan, before it discharges into the Aral Sea. The main tributaries within Uzbekistan are the Chirchik and Akhangaran rivers, which flow from Kyrgyzstan (FAO Water Report, 2013). The river has glacial and snow feeding with a prevalence of the latter. Its largest discharge is in June. About 75.2 % of the Syrdarya run-off originates in Kyrgyzstan. The Syrdarya then flows across Uzbekistan and Tajikistan and discharges into the Aral Sea in Kazakhstan. About 15.2 % of the flow of the Syrdarya is formed in Uzbekistan, about 6.9 % in Kazakhstan, and about 2.7 % in Tajikistan (CA Water Info, 2013).

In the Syrdarya basin, the major irrigation complexes include the Golodnaya Steppe system in Uzbekistan (including the Dustlik canal), the Ferghana Valley system (including the Great Ferghana canal) in Uzbekistan and Tajikistan, the Kyzylkum the Kyzylorda canals, both in Kazakhstan. The Golodnaya Steppe is one of Uzbekistan's major cotton producing regions (Central Asia Energy Water Development, 2009).

Fig. 17 Syrdarya total average flow (km^3)



Source: CA Water Info, 2013; the figures given in the FAO Water Report (2013) slightly vary.

The total average annual flow of all Aral Sea Basin rivers is estimated circa 116 km^3 . This amount comprises the flow of the Amudarya at $79.4 \text{ km}^3/\text{year}$ and the Syrdarya at $36.6 \text{ km}^3/\text{year}$. Depending on wet or dry years, the annual flow ranges from 109.9 to 58.6 km^3 for the Amudarya and from 51.1 to 23.6 km^3 for the Syrdarya, respectively (TGAU, 2011).

Tab. 10 Surface water resources in the Aral Sea basin (mean annual run-off, km^3/year)

Country	River Basin		Total Aral Sea Basin	
	Syrdarya	Amudarya	km^3	%
Kazakhstan	2.516	—	2.516	2.2
Kyrgyzstan	27.542	1.654	29.196	25.2
Tajikistan	1.005	58.732	59.737	51.5
Turkmenistan	—	1.405	1.405	1.2
Uzbekistan	5.562	6.791	12.353	10.6
Afghanistan and Iran	—	10.814	10.814	9.3
Total Aral Sea basin	36.625	79.396	116.021	100

Source: CA Water Info, 2013; internal documents of TGAU, 2013

The two transboundary rivers, the Syrdarya and the Amudarya, satisfy 82 % of the total water demand for irrigation in Uzbekistan, the rest being satisfied by the Kashkadarya, Zeravshan and Surkhandarya (without transboundary character) (Rakhmatullaev et al., 2013).

GROUNDWATER

The international management of groundwater resources in the Aral Sea basin lacks of proper legal legislation. Estimated regional groundwater reserves are about 31.7 km^3 . 14.7 km^3 are located in the Amudarya basin and 16.4 km^3 in the Syrdarya basin. Reserves confirmed for extraction are estimated at 13.1 km^3 per year (CA Water Info, 2013).

6.2.3 Concrete Case of Regional Transboundary Water Conflict

This part of the thesis is devoted to a concrete example of an interstate conflict over water which has led to frozen Uzbek-Tajik relations. To get the whole picture, a brief insight into the Soviet irrigation and power-generating systems is provided.

SOVIET HERITAGE

During the Soviet era, the irrigation and power-generating systems were operated primarily for irrigation purposes with power generation having a secondary role (Dukhovny and Sokolov, 2003). Hydropower plants of the upstream republics (Tajikistan, Kyrgyzstan) operated in a so-called *irrigation regime*. In summer they released water from their dams to generate electricity and help irrigate downstream republics, especially Uzbekistan's thirsty crops, cotton and rice. In winter, when there were shortages of energy, the upstream countries were compensated with fossil fuels (Uzbekistan delivered gas).

In 1991 the Central Asian countries inherited unequal water-use quotas and a highly interdependent system of reservoirs, dams, pumps and canals. Uzbekistan continues to be reliant on its agricultural sector and on cotton as the leading export commodity. During the Soviet era, Uzbekistan became dependent on irrigation particularly due to increased acreage of cotton crop which demands enormous water resources. While Uzbekistan appears to have a strong influence on the region's water allocation, agricultural developments and water infrastructure projects in neighbouring upstream states could weaken its position of the most populated power in Central Asia (Wegerich, 2009). It is obviously the most vulnerable country among the five post-Soviet Central Asian republics in terms of water resources availability and irrigated agriculture. It has the largest area of irrigated land (4.28 mil. ha), the largest rural population (about 17 million) and the highest population density with a maximum exceeding 600 inhabitants per square km in Andijan oblast (World Bank, 2010). It has, however, little control over its water resources. The country's agricultural sector would not function without river water, 80 % of which originates in upstream countries – particularly

Kyrgyzstan and Tajikistan. The problem resides in the fact that both countries plan to manage their rich water resources in favour of their own interests and to use their huge hydropower potential to avoid dependency on foreign energetic resources.

CASE “ROGUN”

In this section, the focus will be on one of the disputes over water resources in order to illustrate the situation in more detail: the current conflict between Uzbekistan and Tajikistan over the completion of a huge dam, Rogun, on the Vakhsh River in Tajikistan. Such structure may significantly change the water regime of the Amudarya. Ways of resolving current disputes between the two countries will be proposed, and experience, useful findings and guidelines for future use in neighbouring countries will be gathered.

Based on the current conflict between Uzbekistan and Tajikistan, two methods can be suggested to contribute to resolving such situations.

First, the international water law and relevant agreements between interested countries can give general directions for settling disagreements over the use of transboundary watercourses.

Second, the game theory can provide a useful concept applicable in this particular situation with respect to its specifics. The presented model is a simplified overview of the reality but offers a satisfactory explanation of the issue.

BACKGROUND OF THE CASE

As mentioned above, the upstream countries intend to use their huge hydropower potential to avoid dependency on foreign energetic resources. In the case of Tajikistan, this desire should be fulfilled by the Rogun hydroelectric power plant which should double Tajikistan’s power-generating capacity. The plans for this power plant were drawn up back in the Soviet times. The Tajik president considers the project and hydroelectric power in general a cure for the country’s numerous economic problems. Tajikistan is the poorest of all post-Soviet countries. The country survived a civil war in the 90s and it still faces its consequences. Tajikistan deals with poverty, lack of natural resources (or difficulties extracting them), unemployment which causes enormous labour emigration and other issues such as drug trafficking. Another problem which, however, cannot be solved by revenues from hydroelectric power, is widespread corruption. It scares off foreign investors and this way significantly limits economic development.

The dam generates concerns that it would limit water available for irrigation purposes in downstream Uzbekistan since Tajikistan could focus only on electricity production to gain higher economic returns. Uzbekistan is expecting a reduced water flow in the growing period – in a time when water resources are already deficient. Tajikistan was therefore forced to approach the World Bank and request a study of the Rogun dam feasibility. In September 2014 the World Bank assessment studies confirmed that the building of the dam is feasible (World Bank, 2014).

INTERNATIONAL WATER LAW AND TRANSBOUNDARY WATER RESOURCES

To resolve the current disputes over shared water resources, the newly independent states have entered into various bilateral, multilateral, regional and international agreements and treaties. They have also expressed their commitment to the principles of international law since they had become new players in the global community.

At the regional level, the key document is the “Almaty Agreement” (1992).⁷ It recognizes water resources as common and shared, and states that “parties have equal rights for their use and responsibility for ensuring their rational use and protection”. It confirmed the water allocation quotas set back in 1986 although it did not and does not reflect current political, economic and social situation. The Agreement envisaged establishing of the Interstate Coordination Water Management Commission (ICWC). The ICWC is responsible for strict observance of release regimes and water use *limits* and takes measures to ensure rational and economic use of water resources. However, the ICWC’s efficacy in dealing with such challenges has proven to be rather low.

The role of international law in this field has been partially successful. Relevant principles that can help to resolve the existing disputes do exist. International law consists, for the most part, of treaties and customary international law which comprises the unwritten rules of international law formed over time on the basis of state conduct. Opposed to domestic law, it is a decentralized system which affects everything from how is the law made to how it is enforced (Dinar et al., 2007). The UN Convention introduces principles that are a compromise between the principle of absolute territorial sovereignty and unlimited territorial integrity. The UN Convention reflects customary international law.

⁷ Agreement Between the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan, and the Republic of Uzbekistan on Cooperation in the Field of Joint Management of the Use and Conservation of Water Resources of Interstate Sources.

The international water law (as specified in the 1997 UN Convention) stipulates three most fundamental rules of customary international law regarding the non-navigational use of international watercourses, and they apply to both surface and groundwater: the rule of *equitable and reasonable utilization*, an obligation *not to cause significant harm* to other states through activities related to an international watercourse, and *prior notification of planned measures*.

It is apparent that international water law does not attempt to provide countries with specific guidelines for dispute resolution; it rather focuses on codifying customary law in the most general terms. Its goal is not to replace individual agreements and treaties negotiated between individual countries. This may be considered a weakness of the Convention, but anything more specific would be hardly acceptable for the international community.

Uzbekistan is among the 35 parties of the 1997 UN Convention (accessed 2007), Tajikistan has not joined. It may explain Tajikistan's reluctance to fulfil the three basic principles of the Convention, and in particular, *equitable and reasonable utilization* and *not to cause significant harm*. However, Tajikistan agreed and requested the World Bank to provide feasibility studies on Rogun. This step can be rated to be in accordance with the three principal rules of international water law which strengthen the international law principles in the Central Asian region.

GAME THEORETICAL APPROACH

Another instrument to grasp the problem and make the conflicting situation more transparent is the game theory. Game theoretical approach has been used in several works regarding allocation of water resources among upstream and downstream countries in a way each country benefits from such allocation. Conclusions supported by mathematical reasoning state that improvement is possible via optimal allocation of water that maximizes total welfare (sum of all benefits). This is, in general, beneficial for countries with high marginal benefits but at the expense of countries with low marginal benefits – the latter will object. This can be solved by transfers in order to reach an agreement on optimal water allocation (Van den Brink et al., 2014). The transfers could be financial or in kind, e.g., delivery of gas or coal.

In the present case, Tajikistan's decisions may generate externalities affecting Uzbekistan's water availability and thus its agricultural performance. These externalities are negative if Tajikistan stores water in the dry season and positive if it increases the river flow to the downstream countries, leading to less water scarcity for economic activities in the summer,

especially irrigation of fields. Joint management of the Amudarya basin has to address all such externalities.

Instead of elaborating intricate mathematical calculations, the focus will be on a demonstrative graphic representation.

The problem of water allocation between Uzbekistan and Tajikistan can be understood as an (S, d) *Nash bargaining problem* within the cooperative game theory framework. To apply this theory to the above mentioned problem is more than inviting. A brief theoretical introduction is needed before applying the principles to our specific situation.

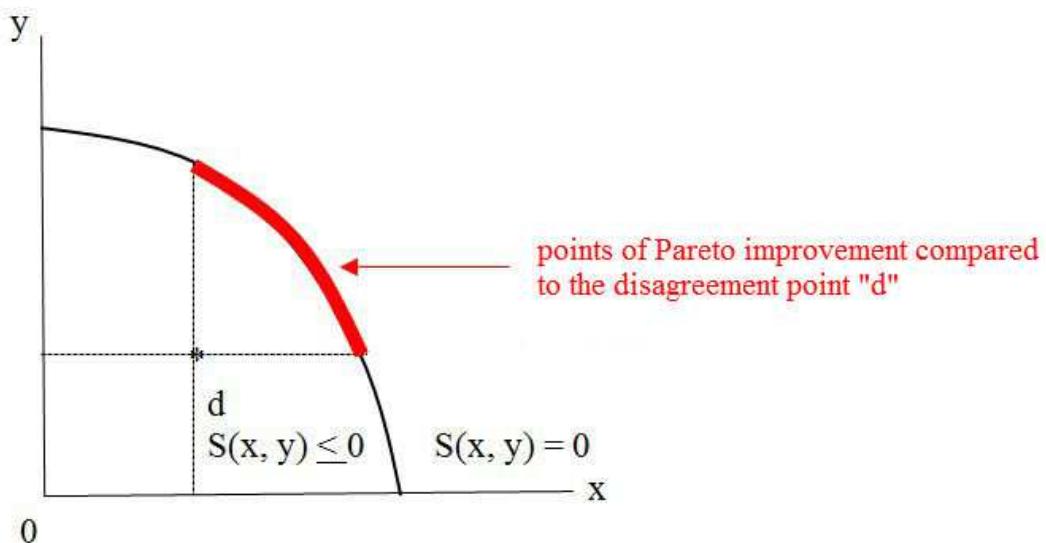
The approach is based on the formal definition of Nash bargaining solution for n players as a set **B** of ordered pairs (S, d) , where S is a compact convex subset to R^n and point d belongs to S . The elements of **B** of are called instances (examples) of the problem **B**, elements of S are called variants or vectors of utility, point d is called the *disagreement point*, or status quo. Every case (S, d) from **B** is called *d-comprehensive* (includes d).

The theory suggests several concepts for the one-point solution. The term “solution” is understood as function f from **B** to R^n that assigns the value $f(S, d)$, belonging to S , to each example (S, d) from **B**.

The best known concept of the cooperative bargaining problem is Nash’s solution (Nash 1950), the other being the Kalai-Smorodinsky’s solution (Kalai and Smorodinsky, 1975). The egalitarian approach suggested by Kalai (1977) can be also understood as a solution. All mentioned solutions can be expressed by axioms. Kalai-Smorodinsky solution is the maximum point on S in the segment connecting point d and the so called *utopian point*, coordinates of which are defined as $U_i(S, d) = \max\{x_i : x \geq \in S \text{ and } x \geq d\}$.

The Nash bargaining problem can be illustrated as follows:

Fig. 18 Nash bargaining solution



Source: Melnikovová et al., 2014

The d point is the disagreement point that represents the parties' payoffs in case they do not achieve an agreement. All the red points represent Pareto improvement compared to the original d point. Which of the red points to choose and how to allocate the utility between the parties?

As mentioned above, several answers can be found. From the mathematical point of view, it depends what axioms are selected. It shows that even only slightly different axiomatic systems which incorporate axioms almost obviously applicable in „our world“, give us different results.

In the Rogun case a few other circumstances have to be taken into consideration to suggest a reasonable concept:

Each of the parties (Tajikistan and Uzbekistan) has different possibilities to enforce a solution acceptable for them. Tajikistan has more possibilities to make decisions about water regime, Uzbekistan, on the other hand, is a bigger, economically stronger country and can demonstrate its disagreement quite effectively.

When evaluating the water allocation effect it is necessary to take into consideration various aspects that are not easy to convert to a common denominator. Water is used to generate power and to irrigate fields. Vice versa, in case of floods its utility is negative. A related fact

is that benefit from water use changes according to season and climate conditions (such as precipitation quantity and precipitation distribution) during the current year.

From the above stated, it is obvious that this is not just one task. It is a series of tasks that emerge in different times of the year and in different climatic situations. The first step should be to put together a specific catalogue of situations, especially climatic, which can be subsequently resolved using the cooperative game theory apparatus.

Based on the level of willingness to reach an agreement, it is possible to choose the following bargaining concept: to maximize the total of payoffs and subsequently compensate the country, payoff of which will be lower (Melnikovová et al., 2014).

It is essential to mention that the goal of the game theoretical model is not to give precise mathematical calculations; it is used to show possibilities of mutually beneficial cooperation which eventually brings involved parties to negotiations.

6.2.4 Concluding Remarks

The subchapter deals with conflicts over shared water resources in the Aral Sea Basin. The major part consists of an analysis of the tense relations between Uzbekistan and Tajikistan which are a result of their conflicting interests in using transboundary water resources, in particular water resources of the Amudarya basin. Uzbekistan's main concern are its cotton fields, dependent on irrigation water – most of which comes from Tajikistan. From the Uzbek point of view, the Rogun dam will be likely to retain the water and affect the yields; Tajikistan would this way gain significant leverage against its neighbour. Uzbekistan is therefore strongly opposed although Tajikistan has suggested that the dam's reservoir be filled over a prolonged period of time in order to mitigate any effects on downstream agricultural production in Uzbekistan.

Two guidelines that can contribute to resolving this long term dispute have been proposed in this subchapter. The international water law is a more general yet respected set of norms and rules. The game theory concept is more specific and can be successfully applied to enhance chances to establish cooperation between the two countries. It should be emphasized that the current situation can be beneficial for both countries. The game theoretical concept demonstrates a possibility to find a reasonable compromise. Complex evaluation of the situation is necessary to elaborate a suitable model that would be mutually satisfying.

6.3 SUMMARY OF THE CHAPTER “WATER RESOURCES”

Water is the bone of contention among both domestic and international users. The competitive environment demands strict rules, and temperance in water use is one of the main conditions for preserving sustainable water resources for future generations. The water sector needs much effort to stabilize the – still quite fresh – relations between individual water users and consumers; domestic and international.

The domestic water sector underwent significant changes only in the last decade when the former collective farms were disbanded and many smaller water users emerged – mainly private farms. The former system of water delivery could not function anymore. Water Users Associations were established with much anticipation. They were supposed to become independent institutions, serving their members – mainly private farmers and dehkans. However, this plan fell short due to government interventions. In the previous chapter it has been emphasized that the state still advances its interests in agricultural sector and private farmers are obliged to fulfil quotas on crop production, cotton and wheat. These farmers have preferential access to water resources. Such policy prevents the water sector from independent decision making.

On international level, the situation is a little more transparent due to a smaller number of players. There are five rivals on the scene, in the Aral Sea Basin: the five post-Soviet Central Asian republics. Relations are tense between the downstream countries (Uzbekistan, Turkmenistan and Kazakhstan) and the upstream countries (Kyrgyzstan and Tajikistan). The downstream countries need water for irrigation; the upstream countries need water for generating energy. While generating electricity in winter makes more sense (so water flows out of the dams), it does not make much sense to use it for irrigation; it only causes flooding since there are not sufficient reservoirs to store it. Such vicious circle is difficult to solve and the current situation in the region is a proof. In search of a mutually satisfactory solution two instruments have been proposed. Legal aspects of such behaviour are one option that can be investigated. The international water law is presented by The UN Convention on the Law of the Non-Navigational Uses of International Watercourses (1997) which is the most recent development in this area. It gives useful guidelines but – as it comes with international law in general – it is not recognized by all concerned countries. There is another option which can bring counter parties to negotiate about their disputes. It is game theory. Nash bargaining solution is a useful tool that can be used in different situations and provides an accessible

solution. Without going deep into intricate mathematical calculations, the principle can be expressed with diagrams.

Water sector in Uzbekistan is a very complex set of issues that need an urgent solution. Domestic issues are as important as international ones, if not more. People realize that the tragedy of the Aral Sea did not emerge by itself but was a consequence of irresponsible water management. This should be the first step to national awareness of the necessity of water saving and its rational use.

Water supplies, the so-called *limits* for individual users are planned in MAWR for every year, according to business plans where each crop grown is indicated. Moreover, there is enough space for informal, socio-political connections, which are important for farmers to get extra water for “commercial” crops, such as rice. This makes the whole system less transparent and unfair to those who do not dispose of such connections and are not treated the same way. That is why it is hardly possible to talk about temperance here; it is necessary to reflect upon Garrett Hardin’s “tragedy of the commons” and think of possible ways of forcing reasonable use of scarce resources that are basically almost free.

CHAPTER 7

RESULTS AND DISCUSSION

7.1 RESULTS

This subchapter presents the results of the analysis which has been done in chapters “Land Resources” and “Water Resources” in two respective sections. The results are illustrated by tables and figures where appropriate.

7.1.1 Land Issues

According to specific objectives set in the present thesis, this section is divided into two parts. The first one is to identify the rationale of the current model of state ownership of land, and the second one is dedicated to the farm restructuring process and its consequences.

ARGUMENTS FOR THE CURRENT MODEL OF STATE OWNERSHIP OF LAND

Uzbekistan has promoted the state ownership of land with supporting arguments of food security thanks to change in cropping patterns and limiting speculations with land, and social stability. Other reasons, disclosed in the previous chapters, follow.

I. Food security

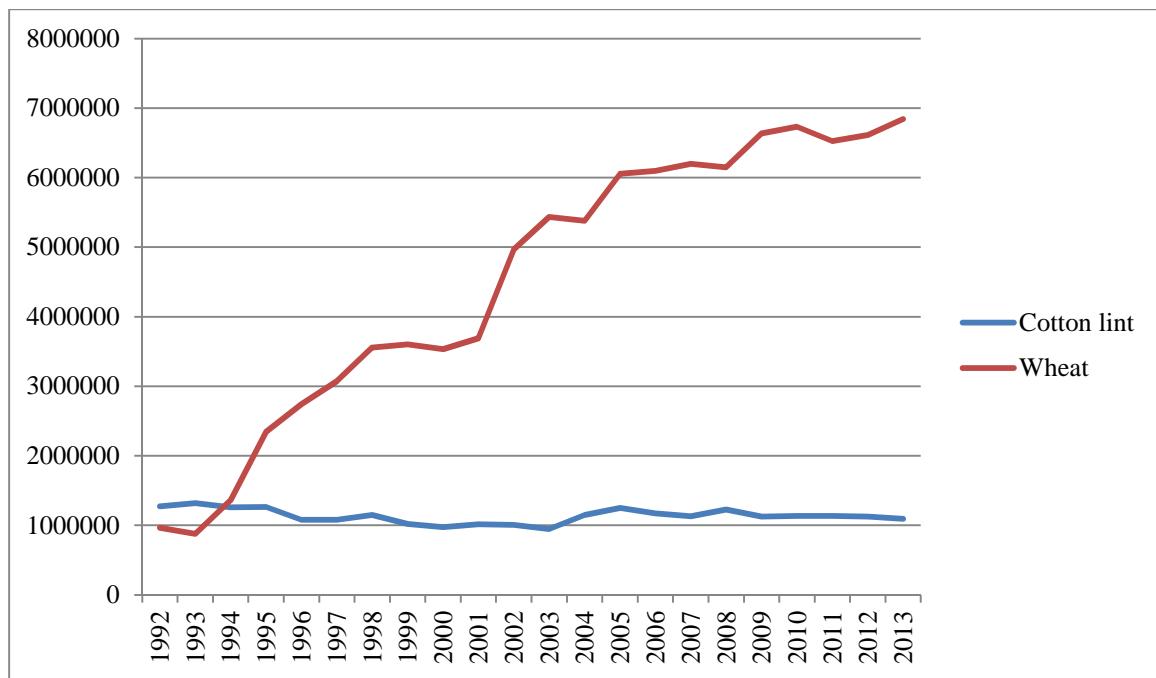
A. Change in cropping patterns

The table below illustrates that the shift in cropping patterns have resulted in significant improvement in food security of the country. Vast areas sown under cotton were dedicated to wheat instead. The change in the last couple of years indicates that Uzbekistan is not as focused on food self-sustainability (Tab. 11).

The goal of food security was ensured thanks to the *state order system* where farmers are obliged to sow a fixed area of their leased lands under wheat and cotton and supply the production to the state for state-dictated prices.

The following figure shows how the production of cotton lint and wheat developed after 1991. It is obvious that the change of cropping patterns had a significant impact on production of wheat.

Fig. 19 Production of cotton lint and wheat 1992 – 2013



Source: FAOSTAT, 2014

The next table demonstrates how the change in cropping patterns helped to lower dependency on imports of cereals.

Tab. 11 Cereal import dependency (in %)

Year	%
1992	70.3
1993	59.7
1994	63.3
1995	50.9
1996	42.9
1997	29.7
1998	23.0
1999	15.0
2000	15.1
2001	15.7

Year	%
2002	12.8
2003	8.2
2004	5.5
2005	6.1
2006	8.2
2007	11.5
2008	13.9
2009	16.0
2010	17.2
2011	19.5

Source: FAOSTAT, 2014

B. Restrictions on land speculations

To avoid land speculations, the state has limited the land rights. The next table brings a list of land rights divided into two groups.

Tab. 12 Limitation of land rights of private farmers

Limitation of land rights of private farmers in Uzbekistan	
<i>what is allowed</i>	<i>what is restricted</i>
rights to obtain a lease contract	transferability of land rights
	limited period of lease
rights to grow and harvest crops	free choice of cultivated crops
rights to use land rights as collateral	banks are not interested in such collateral

II. Social stability

Uzbekistan has managed to maintain social stability in the country since the break-up of the Soviet Union. Decreasing poverty rate, ensuring food security and stable livelihoods of the growing population especially in rural areas was one of the main challenges. The conditions are favourable enough for private farmers and dehkans to create a stable environment. Land rights are clearly defined in legal documents which should reduce conflicting situations. However, it is difficult to measure social stability and evaluate the level of national well-being because of lack of complete statistical data.

III. Other reasons

Besides the declared arguments such as food security and social stability, there are other reasons for state ownership of land, as has been revealed in the thesis. First, it is the state-run irrigation system. Privatization of land would bring complications regarding maintaining, restructuring and modernization of the current irrigation network.

Second, it is the control over production. Since farmers can be deprived of their lease contract in case they do not comply with the state orders, it gives the state certain leverage against them and the agricultural sector remains to a significant extent under state control. State ownership of land therefore enables the state to introduce interventions which are the main obstacle in independent decision making of private farmers and maximization of their profit.

RESULTS OF THE FARM REFORM PROCESS

The following tables illustrate the gradual individualization of farming in Uzbekistan that took place after the dissolution of the USSR. Characteristics of the current types of farms, and the subsequent change in distribution of land are included as well.

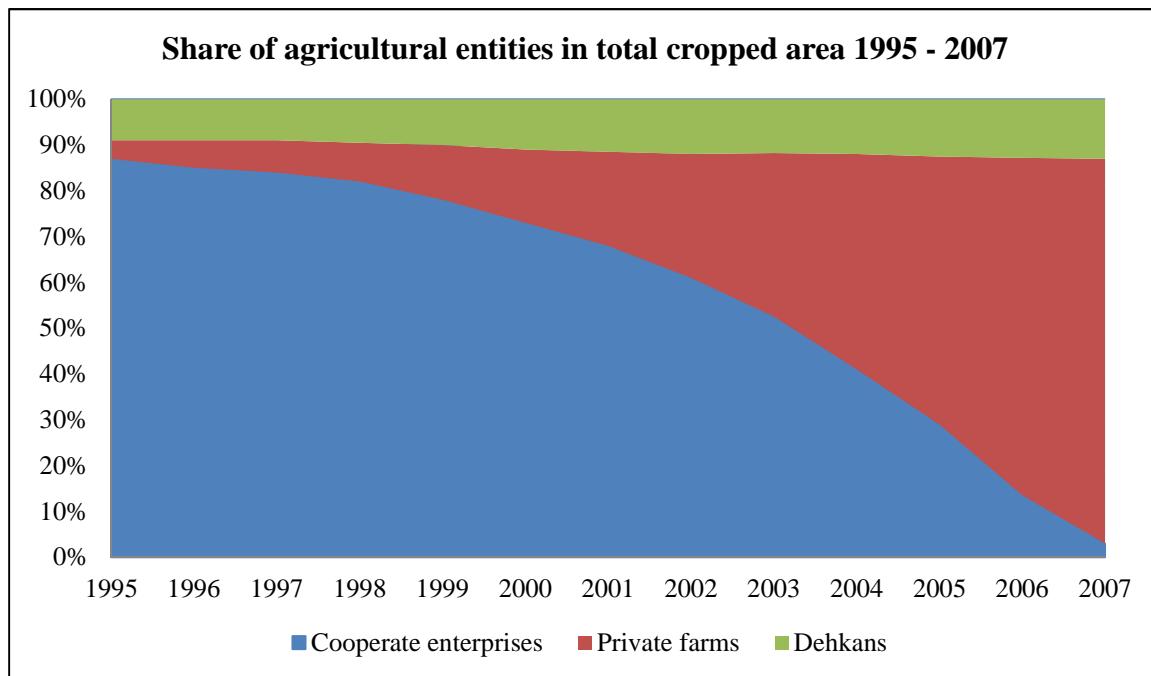
Tab. 13 Characteristics of the individual stages of farm restructuring in Uzbekistan

Individual phases of farm restructuring process			
	<i>Main goal of farm restructuring</i>	<i>Type of producers (ordered by dominance)</i>	<i>State order system</i>
First phase of reforms (1992 – 1997)	sovkhозes and kolkhozes restructured into corporate enterprises	large corporate enterprises, dehkans (households)	cotton, wheat, rice and other crop production
Second phase of reforms (1998 – 2002)	corporate enterprises transformed into shirkats; some fragmented into private farms	shirkats, private farms, dehkans	cotton, wheat
Third phase of reforms (2003 – 2007)	final break-up and transformation of nearly all shirkats into private farms (“vertical restructuring”)	private farms, dehkans, remaining shirkats	cotton, wheat
Fourth phase of reforms (2008 – now)	optimization of farms (i.e. farm consolidation), private farms merged into larger units	private farms, dehkans, remaining shirkats	cotton, wheat

It took a decade to carry through proper individualization of farming; development of private sector in agriculture began gradually from the small household farms and accelerated only in the next decade.

The following table illustrates how the farm restructuring process influenced the share of individual agricultural entities in cropped area. Data after 2007 are not available; however, the shares are not likely to radically change.

Fig. 20 Share of agricultural entities in total cropped area 1995 - 2007



Source: Yusupov et al., 2010

The following table summarizes fundamental information about the current types of agricultural entities such as type of production, land tenure rights or labour force.

Tab. 14 Characteristics of the main types of agricultural entities

	Private farms	Dehkans	Shirkats
Definition	Legal entity engaged in medium- to large-scale agricultural production	Physical or legal entity engaged in various agricultural activities on small household and adjacent plots	Legal entity specialized in livestock production or other specific activities
Type of production	Cotton and wheat; commercial production of rice and other crops	Livestock production; vegetables, fruits	Karakul breeding, egg production, research and development
Labour force	Family members, hired workers	Family members	Members of the shirkat, hired workers
Management	Person with an adequate qualification and experience	Family members	Members of the shirkat
Land tenure rights	Long-time lease contracts (30 – 50 years)	Lifelong inheritable rights to state-owned land	Long-time lease contracts (30 – 50 years)

Since land tenure rights were given a priority in this thesis, the table below characterizes this category in the case of private farmers and dehkans. Shirkats are not included as they represent a specific category (some of them are owned by the state) and they represent a marginal production capacity.

Tab. 15 Land tenure rights of private farmers and dehkans

	Private farmers	Dehkans
Limitation of rights to land resources	yes – leasehold limited by: 1) duration and 2) economic performance of the farm	yes – limited area
Duration of rights	30 – 50 years	lifelong
Rights enforcement	depends on socio-economic connections	depends on socio-economic connections and the mahalla
Unequal rights distribution	yes – proved during the farm consolidation process	disputable; hokims in charge of distributing land rights to dehkans

Both private farms and dehkans are specialized in different agricultural activities. Dehkans do not bear the burden of state orders. According to this criterion, it is possible to divide the forms of agricultural production as shown in the table below.

Tab. 16 Forms of production and rights to sell

	State ordered production	Commercial production	Subsistent-household production
Producers	Private farms	Private farms	Dehkans
Main crops	Cotton, wheat	Rice, vegetables, fodder	Adjacent plot: fruit, vegetables Distant plot: wheat, rice
Rights to market the production	Cotton: no (bought by the state for fixed prices) Wheat: 50 %	Yes	Yes

7.1.2 Water Issues

Water issues are very complex. This section is therefore divided into two parts: domestic problems concentrated on irrigation issues, and interstate problems focused on disputes over transboundary water resources.

The second objective is to define the actual water management problems, especially water distribution and irrigation efficiency.

DOMESTIC PROBLEMS

Domestic water issues are closely connected with problems inherited from the past. Among the most painful issues are the maintenance and rehabilitation of the large irrigation network, water losses during irrigation and subsequent environmental problems.

I. Water distribution problems

Water distribution network is state-owned but the individualization of farming has brought new problems. In the beginning of the new millennium management of irrigation systems at the farm level was transferred from governmental agencies to local water users and Water Consumers Associations were established. The subsequent problems are listed in the table below.

Tab. 17 Problems arising from the individualization of farming

Problems arising from the individualization of farming	
CHANGES AFTER 2000	CONSEQUENT PROBLEMS
Large number of newly emerged water consumers	Covering costs of adequately operating and maintaining the irrigation and drainage systems at the farm level
Establishing new formal institutions – Water Consumers Associations	Controlled by the state
	Their operation undermined by informal institutions (socio-political connections)
Introduction of irrigation service fees to WCAs	Some farmers refuse to pay the fees
Decision-making of water allocation based on cropping plans of individual farmers	Water allocation plans are made in a top-down approach which is rigid

II. Irrigation efficiency

The main factors that are behind enormous water losses are the irrigation inefficiency and irrational use of water. The following table summarizes the factors causing water losses in Uzbek agriculture and the original reasons.

Tab. 18 Factors causing water losses

Water losses		
TYPE OF LOSSES	FACTORS CAUSING LOSSES	ORIGINAL REASON
ON-FARM LOSSES	Surface runoff	Using flood techniques such as furrow or border irrigation Poor planning of fields
	Seepage and evaporation	Unlined earthen canals
	Operational waste	Excessive watering; reckless attitude to water
	Deep percolation	Sandy soils
	Water used for leaching the salinized soil	High salinity levels in soils
CONVEYANCE LOSSES	Poor technical condition of the irrigation network	Long-term neglect of maintenance, modernization and rehabilitating works
		Increase of the area sown under winter wheat
WATER WASTING	Reckless attitude to water	Islamic law
		Sovietization of the economy

INTERSTATE PROBLEMS

The interstate problems can be defined as tensions between Uzbekistan and its neighbouring countries over shared water resources. Uzbekistan as a downstream country may face water shortages due to the conflicting interests of the upstream countries, Kyrgyzstan and Tajikistan. In the present thesis two methods of resolving such disputes were suggested.

Tab. 19 Methods of settling interstate conflicts over transboundary water resources

Methods of settling the interstate conflicts over water resources			
Instrument	Method	Outcome	Possible problems
International water law	Applying principles of international water law in negotiations and bilateral agreements	Improved conditions for negotiating	Provision are often too general
Game theory	Cooperative game theory: Nash bargaining solution	Demonstration of concrete benefits for both parties	Distrust of policy makers to theoretical models
		Improved conditions for negotiating	

7.2 DISCUSSION

This subchapter is dedicated to discussing the results and critically examining the findings. The Uzbek land and water sectors face many complicated and interrelated problems which need to be discussed in the light of previous research. The following text is structured according to the set hypotheses.

7.2.1 Land issues

STATE OWNERSHIP OF LAND

Land issues were analysed in the fifth chapter. Many experts perceive the state ownership of land as a major obstacle in successful economic development. However, the advantages of privatization of land are often overestimated. It could lead to the situation that existed before 1917; landlords and tenants may re-emerge. This could lead to poverty of many of the rural workers and the rural sector would lose its stability. Private ownership of land may lead to more economically efficient use of land but it often excludes the poor. People with better relations to the local administration would very likely have preferential conditions and would be able to buy land at lower prices or more easily. Under the state ownership of land, the rural population is protected (more or less) from exploitation.

The choice to privatize land or not was affected by historical and legal legacies of land ownership in the former socialist countries. Without a history of private land rights, in Uzbekistan, where no such tradition existed, the state did not take land rights from households that were farming individually, but the land was transferred from collective ownership to the state. As Swinnen and Rozelle (2006) point out, the absence of a tradition in private farming was reinforced by decades of collectivization.

State ownership of land has several justifications, as has been mentioned in the previous subchapter. It is food security, social stability and the state-run irrigation system. Privatization of land would bring complications in operating of the current irrigation network.

To summarize the findings in the present thesis, private ownership of land is non-essential for agricultural development. China represents a prime example. Chinese agricultural success showed that private ownership of land is not a prerequisite for a strong supply response to

reform (Lin, 1992; Prosterman, 2009; Zhao, 2011). In Russia, land was privatized but the outcome in the 1990s was similar (and disappointing) to the one in Uzbekistan.⁸

The following paragraphs will identify the main impediments to continuing agricultural development in Uzbekistan.

LAND TENURE SECURITY

The previous analysis shows that the major barrier in further development of the agricultural sector lies in the *insufficient land tenure security*, as mentioned and summarized in the previous subchapter, “Results”.

Land tenure rights in Uzbekistan lacks a few qualities that make land tenure rights meaningful. Land rights should be of sufficient *duration* to provide incentives for investment, they should *assure* the holder that rights will be recognized and enforced at low costs and provided with mechanisms allowing *adjustment* under changing conditions.

Agricultural enterprises in Uzbekistan possess different levels of land rights security: dehkans have an obviously better position thanks to their lifelong lease rights so they tend to invest more into their plots. The position of private farmers, on the other hand, is not as secure; land tenure security in their case lacks some key aspects. The period of lease contract, 30 to 50 years, is sufficient; however, the *assurance* to prevent outside interference is rather low. The farmer’s lease contract can be terminated in case of violations of the lease contract, low effectiveness of production or non-compliance of the state order on crops. Another burning problem is the *transferability of rights*. Land rights are inheritable only in the case of dehkans, but otherwise they are not transferable – neither market nor non-market transfers are permitted. Removing restraints on transfer of land would enable more efficient producers to obtain more land from those who are less efficient, without any administrative obstructions. Solving this problem would considerably facilitate farms’ economic activities and increase productivity of the agricultural sector as a whole. The state should take care of this issue since it plays a major role in contributing to the definition and enforcement of secure land rights, and property rights in general.

To summarize the effects of secure land rights on economic development, the following benefits can be identified:

⁸ Lerman (2001) claims that privatization of land in Russia did not result in transfer of direct control to individuals, and most land privatized by the state got in the hands of large-scale successors of former collective farms. As a consequence, the anticipated benefits of privatization could not be fully realized.

- Crop productivity rises through increased investment in land.
- Land can be transferred from less efficient to more efficient land users.
- Access to credit is facilitated thanks to the possibility of using land or land rights as collateral.
- Farmers invest more into reducing soil erosion, soil salinization and other environmental degradation to land; they try to keep it in good conditions for the following years.
- Favourable conditions for farmers also create a stable social environment and strengthen political stability.
- Migration from rural to urban areas is reduced thanks to increased attractiveness of agricultural activities.

In the fifth chapter, benefits of improving land tenure security in China have been analysed because it was the first centrally planned economy where the collective farms broke up; therefore the Chinese have a rich experience dealing with land tenure reform in a quasi-socialistic economy. The Chinese success demonstrated what was done to improve rural population's livelihood – especially what was done in the early stages of reforms where even a little land tenure security dramatically improved the lives of hundreds of millions of people. China has already released state orders on crops and increasing the level of security of land rights proved that such efforts can help to achieve a significant improvement to the life standard of the rural population. Zhao (2011) predicts that further development of land reforms might include an explicit perpetual use rights to the contracted land.

STATE INTERVENTIONS

The land rights security is further weakened by state interventions – a major issue is a system of state orders on two main crops, cotton and wheat. Another state intervention that significantly changed the private farmers' sector was the consolidation of farms (the so-called “optimization”). Both have been thoroughly analysed in the fifth chapter.

State orders on crop production

The state puts orders on cotton and wheat production and keeps controlling not only the quantities produced but also the sown area. This state order system applies to private farmers, not dehkans. If the farmers fail to comply, they can be deprived of their lease contract and lose rights to land. The discussion whether they should be abolished or kept and adjusted is

principal. Authors engaged in this area of research do not recommend any specific plans to change the state orders, in general they recommend abolishing them. The example of China demonstrated that elimination of the state quotas initiated further economic growth. If this happens in Uzbekistan, the farmers' situation can rapidly change and therefore such step has to be carefully considered. Many of the farmers are dependent on subsidized rental of agricultural machinery, on supplies of fertilizers and seeds, and on special credits for cotton production. Without this "initial capital" their farm might face enormous financial difficulties.

Another concern is the specialization of production. Would such release of the existing mechanisms lead to a rapid change in production specialization, which would have consequences for farmers' welfare, food security and irrigation requirements of the country?

From the author's point of view, the abandoning of the state order system should be gradual and careful to mitigate negative impacts on producers, and introducing a well-functioning micro-financing scheme would be necessary. The initial phase might involve a simple solution: to fix only the required quantity of production, not the area sown under cotton or wheat. That would enable the farmers to decide if they want to devote 90 % of sowing area to cotton and 10 % to different crops, or 70 % to cotton and 30 % to different crops. Crucial would be the output, not the sown area. This would serve as an incentive for the farmers to increase the yields per hectare and it would lead to increased productivity. Abandoning of the state order system should be gradual to not cause a rapid change in cropping patterns.

If the quota and price liberalization gets implemented, shifts from wheat to cotton production can be expected (a reverse of what happened in the early 1990s). The reason is competitive imports of wheat (e.g., from Kazakhstan) and also the competitiveness of cotton on international markets. It is also the physical conditions of Uzbekistan that give a comparative advantage in growing cotton. This would impact water management as well – cotton is more water intensive than wheat, completely dependent on irrigation water. This would probably lead to higher water consumption. Introducing volumetric pricing, as suggested later, may, however, mitigate such consequence.

From the Chinese model it is obvious that allowing farmers to produce according to market incentives and relaxing production quotas and restraints on inter-regional trade enables farmers to use resources more efficiently and to raise productivity.

Optimization of farms

The consolidation of farms which took place between 2008 and 2010 proved that farmers' land rights can be difficult to exert. In the name of more rational use of land and water resources and ensuring financial stability of the farm, the optimization consisted of consolidating smaller private farms into larger private farm units. Some of the small farms had been dealing with financial difficulties. Officially the most successful farmers received the enlarged farms. But this fact is arguable since socio-political connections have always played an important role in the economy – a fact emphasized by many authors (Trevisani 2007, Veldwisch and Spoor 2008, Djanibekov 2012).

The provision regulating optimization establishes the order of land optimization on a voluntary basis; however, some of the farms were forced to give up their land. The fact that farms were consolidated on an involuntary basis significantly lowered the level of land tenure security.

The official rationale for the farm consolidation was to increase productivity thanks to enlarging the size of farms:

"The practice is showing that farms with limited capacity and opportunities are not capable of turning into a reliable basis for provision of themselves with necessary machinery, working capital having creditworthiness, and, most importantly, cost recovery and increasing the profitability." (Karimov, 2009)

One of the main arguments claims that small farms face difficulties since they are not able to buy machinery. However, farmers can rent necessary machinery in rental parks (Motor Tractor Parks, both state owned and private) and thus offset the advantages of economies of large-scale associated with owning such machinery, which was emphasized by Hanstad (1998). Leasing programmes are also available (Khushmatov, 2013). Instead of taking land from farmers, the government should have tried to help the small and medium-size farmers to improve their economic activity and profitability in other ways, e.g. facilitating access to credits or giving them more freedom to grow crops of their choice that would be more profitable.

Increasing productivity thanks to economies of scale is a debatable issue as international experience indicates. It shows that there is little empirical evidence of the existence of economies of scale in farming (Brooks et al., 1996; Hanstad 1996; Hanstad 1998; Lerman 2008). Brooks et al. (1996) claim that the common view in most post-Soviet countries is that

large farms are more efficient and competitive than small or mid-sized farms and the main argument is the presumed existence of economies of scale. They state that this assertion has not been confronted with empirical evidence on farm size and efficiency from around the world.

Djanibekov (2012) argues that the land consolidations as implemented since 2008 will have limited effect. He claims that increasing the farm size alone will provide insufficient incentives for creating economically efficient farm enterprises. He supports this assertion by detailed evidence of the process of land reform in the Khorezm province in northwest Uzbekistan, which mirrors the nationwide farm restructuring processes.

Due to lack of statistical data, it is not possible to evaluate whether or not the optimization of farms in Uzbekistan achieved expected results.

xxx

From the above said follows that state ownership of land itself does not represent the main obstacle to economic development. It is the insufficient land tenure security and state interventions that are rather limiting.

7.2.2 Water issues

The water sector is at least as complicated and Uzbekistan has to solve an endless list of problems ranging from on-farm irrigation and water allocation within the Water Consumers Associations to interstate conflicts over transboundary water resources. Water is considered a state-owned national treasure and the sole owner of the massive irrigation system, which is absolutely necessary for the normal functioning of the agricultural sector, is also the state.

DOMESTIC PROBLEMS

The irrigation boom started in the late 1950s and brought irreversible consequences. With the anticipated climate change, the country is pressured to speed up improving the irrigation efficiency, implementing new technologies and reconsidering the current model of water management.

INSTITUTIONAL CHANGES

The government has taken measures to adapt the model of water management matching new conditions after a large number of private farms emerged (after the individualization of

farming). Water Users Associations, later renamed to Water Consumers Associations, were established, to manage water distribution to individual farming entities and operate the on-farm irrigation network.

The current system serves in the first place, however, not the individual farmers, but the state (Trevisani, 2007; Djanibekov, 2012). Fulfilling the state orders is number one challenge and only then comes the farmer – unless he or she has expedient socio-political connections. Then he or she can expect a different approach, and access to water is almost guaranteed. After the first WCAs were established, they were to play a key role in supplying water and maintaining irrigation system in lieu of the former large cooperatives. The WCA members should hold the decision-making power. The WCAs are supposed to collect irrigation service fees from the farmers and make sure water is used according to *limits* (water allocations) which are determined, approved and allocated by the central authority, the Department of Water Resources of MAWR in Tashkent. However, the system does not work properly. Collecting fees proved to be complicated, measuring taken water not accurate⁹, and priorities in water allocation depend more on personal relationships than the designated *limits*. The WCAs were presented as a solution to improving water use efficiency and as participation of the private famers in decision-making. However, they are actually state-controlled institutions: interventions are being made by both the hokimiyats and the Department of Water resources of the MAWR. WCAs are accountable to the state first, farmers come second, and thus the original idea of a self-governing institution has been betrayed. Another important factor is the previously mentioned level of land rights security in Uzbekistan; as Wegerich (2000) remarks, insufficient land tenure security makes it more difficult and less attractive for farmers to actively engage in management of the WCA.

EFFICIENCY OF THE IRRIGATION NETWORK

The state-owned irrigation network is an extensive and complicated scheme. Since 1990, on-farm irrigation networks have deteriorated due to the poor financial situation of both shirkats and privatized farms and the situation has not changed much since. The unsatisfactory state of the irrigation network causes enormous water losses. Another factor of the deteriorating state of the irrigation system is the increase of the area sown under winter wheat so there is not much space left for maintenance works during winter.

⁹ Veldwisch (2008) claims that the WCA staff tries to keep their records in order, however, the author's high-ranking source (who prefers to remain anonymous) spoke of many violations of the rules.

Technically, the most burning problems of water management are excessive irrigation, water logging, untimely water delivery, and salinization of soils.

Too much water is used for irrigation; the volume of water sometimes exceeds twice the actual needs. The main issue is the irrational use of water causing enormous water losses. Such behaviour originates back in the Soviet times where the principle “the more water the better” was common. Attention was not paid to individual crops with regard to their water requirements; currently the Uzbek research institutes, including the TGAU, focus on developing new, less demanding varieties (Khushmatov, 2013).

Introducing water saving technologies is an issue that has been promoted for a long time but practical results are still to come. Environmental education for the masses and good technical preparation for the future farming experts is the goal of the TGAU where various options of water saving are being analysed, as well as in SANIIRI (Rakhimov, 2013). More effort should be dedicated to explaining why farmers should save water and give them reasons to do so; environmental education to create awareness is a possible option. People are in general aware of the tragedy of the Aral Sea and with its consequences including health problems. Teaching about the causalities between water wasting and such environmental tragedies should be the first step to introducing the importance of pro-environmental behaviour. The TGAU promotes the expansion of water saving technologies. There seems to be much potential for their application, such as the popular drip irrigation system. It saves both water and fertilizers but it can be used only on limited area where clean water (usually groundwater) is available (Khushmatov, 2013). Farmers who have introduced drip irrigation are eligible for credits at concessional rates and they do not have to pay the land tax for five years (Pulatova, 2013). Other water-saving technologies have been introduced, but so far plans have been more ambitious than results. The efforts in introducing water saving technologies are still more on the theoretical and small-scale level; time for large-scale implementation has not come yet.

TEMPERANCE IN WATER USE

Another major question is the attitude to water: it is actually viewed as a public good with related free-rider problems. There is no volumetric pricing and water is basically perceived as a free good (as a consequence, water fees are often difficult to collect). Such perception is harmful for sustainable development of irrigation as a whole.

Introducing volumetric water pricing would definitely help the system to become fairer and save water thanks to economic incentives. Its introduction would be, however, huge and

costly (water measuring structures at each field, paid by farmers) as emphasized by Veldwisch (2008). Another question is the possibility of water being actually priced and sold, given the religious objections that might arise.

The tragedy of the commons by Hardin (1968; 1998) is a concept that is helpful in understanding the current problem of unsustainable depletion of water resources. His conclusions match the complicated situation in Uzbekistan, a country that faces population growth especially in rural areas, water scarcity and lack of effective instruments to actually avoid the upcoming “tragedy of the commons”. Much needed temperance in relation to water use needs to be enforced. Only strict rules ensuring proper manipulation with water and its allocation to individual users can avoid such a tragedy where members of the society take advantage of the common-pool resources at the expense of the others and eventually of the whole rural society.

Hardin (1968) in his work asks a key question: how can we legislate temperance? Prohibition is easy to legislate but temperance is a conception that cannot be as easily quantified. Temperance is a quality that most water consumers in Uzbekistan lack. If we ask an Uzbek farmer to introduce water saving technologies in the name of conscience, he will, according to Hardin, receive an unintended communication – if he behaves the way we ask, he will be secretly condemned for a simpleton who stands aside while the rest of the farmers exploit the commons (i.e., water resources).

To create temperance in water use, an effective coercive device is needed (Hardin, 1968). Such tool can be the previously mentioned fees for water – fees based on volumetric measuring and pricing. This way the farmers can be forced to become temperate in terms of water use. Despite the obvious difficulties in introducing the measuring facilities and payments, this is perhaps the only way to actually coerce temperance. Volumetric pricing would gradually change the understanding of water as a free good.

Hardin (1998), having revisited his original conclusions, states that the reality that underlies all the necessary curtailments is always the same – population growth. The more the population exceeds the carrying capacity of the environment, the more freedoms must be given up. This statement is valid for water and other natural resources in Uzbekistan and any other countries dealing with scarcities and growing population.

INTERNATIONAL WATER PROBLEMS

Water scarcity is becoming one of the major challenges worldwide. Because of population and economic growth, demand for water has greatly increased. Sustainable exploitation of common-pool natural resources, such as water, requires cooperation among users (farmers, industries, cities or countries). Water problems are complex not only within the borders of the country but also behind them. It is a crucial issue for all Central Asian countries and Uzbekistan might feel the most vulnerable thanks to its position of a downstream country and the importance of its agricultural sector, completely dependent on irrigation.

The conflicts are quite rough and relations between the upstream and downstream countries in the Aral Sea Basin are still tense. Uzbekistan's problems concern water resources that flow in from Kyrgyzstan and Tajikistan. To illustrate these conflicting situations, a concrete case has been chosen – it is the infamous controversy concerning the unfinished Rogun dam on the Vakhsh River on the Tajik territory. It has been worrying Uzbekistan for over a decade. The problem was investigated via two different, yet interrelated concepts: the international water law and the game theory.

The international water law is a more general tool to assess the rights and duties both sides of the conflict have. The current legislation brings together two contradictory principles, the principle of absolute territorial sovereignty, which prioritizes upstream countries, and the principle of unlimited territorial integrity, prioritizing downstream countries. The international water law presents a basic guideline stipulating basic principles, especially the principle of “equitable and reasonable utilization” and “no significant harm”.

Since the international water law states that countries should mutually agree on sharing the river through negotiations, the sharing problem can be approached from a bargaining perspective. Some experts do implement legal principles from international water law in the river sharing problem. They translate the legal principles of absolute territorial sovereignty and unlimited territorial integrity into their game theoretical models (e.g. Ambec and Sprumont, 2002; Houba et al., 2014).

The game theory offers a more specific approach that can help to bring counterparties to negotiate about a concrete problem. The literature on water resources management based on game theory approaches shows that sharing the total economic benefits from cooperation among the river basin countries, if it is attainable, gives rise to Pareto improvement. That is, either every country is better off or none is worse off. Even if some countries are not better

off, there is still a possibility of being compensated if the total gain is larger than without cooperation. This implies that one can hope to bring countries to negotiate on cooperation on how to mitigate conflicts over water (Dinar et al., 1992). Of course, the basic requirement of using such tool is the perception of the problem as a mutual issue by both countries, i.e. their governments.

In the present case, two countries, Uzbekistan and Tajikistan, do not cooperate in solving a problematic situation mentioned above. A simplified model, based on the formal definition of Nash bargaining solution, demonstrates that both countries can benefit from negotiating. It was concluded that this model presents a series of tasks that emerge in different times of the year and in different climatic situations, and an appropriate model can be designed. A specific catalogue of situations needs to be prepared so it can be subsequently resolved using the cooperative game theory apparatus. Such solution is clear and fair to both involved parties and can be further developed. It is, in the first place, aimed at improving a platform for negotiations between the countries.

Current disputes over water resources significantly damage relations between individual countries in the region. It is necessary to eliminate these negative feelings and start taking actual measures to settle these conflicting situations. This would contribute to economic growth of all involved countries.

xxx

This thesis is limited to the core of the Uzbek agricultural sector – its main production inputs, land and water. On basis of the research results it is recommended to conduct further research on Uzbek agricultural and rural sectors and extend it to cover the whole Uzbek economy. Uzbekistan is a very attractive country in the Central Asian region with good prospects for future growth.

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS

Uzbekistan is a unique country with rich natural resources, diverse landscape and ethnics, ancient history and culture. It is a regional power in Central Asia but like its neighbouring countries, Uzbekistan has to deal with inherited problems from the Soviet past. The once sustainable irrigated agriculture was radically changed during the Soviet rule and these changes proved to be a failure with regard to the natural conditions and climate of the country. Natural resources began to be used in an unsustainable way and the state power did not reconsider their decisions before it was too late. The Aral Sea disaster is the most striking consequence of such practices.

The focus is on the agricultural sector because of its absolute dependency on the two natural resources and its crucial importance for the large rural population, their employment and livelihood. Agriculture is a key sector of the economy. Rural population constitutes majority of the people and its share is steadily increasing thanks to higher population growth rates in rural areas. The sector is specific thanks to several factors. First, it is its high level of dependency on man-made infrastructure, particularly huge irrigation network. Second, it is its state of transition: the break-up of the system of collective farms differed in every post-Soviet country. Uzbekistan chose to be careful with the privatization of land and agricultural production and defined its own path of reforms. The agricultural sector is therefore not fully controlled by the state, but at the same time the road to full-blooded market economy will be long and winding. And third, the security of agricultural production is influenced by outside factors, such as conflicts with neighbouring countries over water resources.

8.1.1. Objectives

MAIN OBJECTIVE

The present thesis is dedicated to natural resources in Uzbekistan and the main objective is “*to analyse and assess specifics of their ownership with special focus on agriculture and its main input resources, land and water.*” This goal has been achieved by the research results which are contained in the thesis and summarized in the previous chapter. The related specific objectives which particularize the main objective are quoted below.

SPECIFIC OBJECTIVES

The *first specific objective* is “*to identify and analyse the rationale of the current model of state ownership of land.*” This objective has been reached in the thesis. Officially, state ownership of land has been chosen to preserve social stability in the country and ensure food security. These official goals have been fulfilled; however, complex evaluation of social stability is hampered by lack of data. The current model of ownership of land also facilitates operating of the state-owned and state-run irrigation network. On the other hand, state ownership of land is also a tool to control the agricultural sector. State interventions are typical for Uzbekistan. The current situation in the agricultural sector is characterised by gradual reforms that are supposed to liberalize the economic environment and introduce market principles. In fact, state control persists, and although agricultural production is mainly in private hands, many aspects are still under state regulation, such as crop production or water allocation.

The first objective is closely connected to the *second specific objective*, which has been achieved by the research results; it is “*to define the actual land and water management problems, especially analyse the farm restructuring process and its consequences, and water distribution and irrigation efficiency.*” The most significant feature of the farm restructuring process was the individualization of farming. Individualized agricultural production has brought benefits and risks to the newly emerged agricultural entities, especially private farmers, but state has kept control over the sector: be it the state orders on crops, determining prices of these crops, interfering in field management, allocating irrigation water, or limiting exports of agricultural products. The state can implement these interventions thanks to the state ownership of land and of the water delivery irrigation system. Cotton and wheat production plays a crucial role in the regulated system. They are grown on state orders and farmers are forced to sow a fixed area of these crops. Similar like in the case of land, water use for irrigation purposes is regulated as well. Since agricultural production without irrigation would not be possible in Uzbekistan, this is a very efficient instrument. There is a hierarchic system that manages water distribution and the Water Consumers Associations have no real decision-making power. State supervision over water distribution is used to control the agricultural production, especially with regard to wheat and cotton.

The irrigation efficiency is rather low. Introducing proper technical measures would result in water saving, decreased volume of drainage and waste waters, reduced costs on construction

of drainage canals, and lower costs on solving environmental issues. Accomplishing these goals would be a great achievement of the Uzbek water policies.

Enormous water losses are not only due to poor technical condition of the irrigation network but also due to the perception of water as a free good. Both Islamic law and sovietization of the Uzbek economy lie in the core of the current attitude to water. The perception of water needs to change from the perception of a free good to the perception of an economic good. This problem can be viewed as public versus private goods problem. Water is still perceived as an almost pure public good. Free-rides are possible – it depends on the farmers' socio-political connections. Introducing fees for water, based on volumes used, would certainly have a favourable impact on people's behaviour. Farmers would try to keep the irrigation network in better shape to minimize water losses and they would not use excessive amounts of water. The WCAs will get another chance to become a real self-governing institution.

The *third specific objective* aims “*to examine and suggest possibilities of resolving conflicts over shared water resources*”. This goal has been fulfilled by introducing game theoretical approach in a concrete case – a dispute between Uzbekistan and Tajikistan over finishing a huge dam on a river on the Tajik territory. Nash bargaining solution within the cooperative game theory framework is the most popular solution concept of modern game theory; it demonstrates that both countries can benefit from negotiations. The International water law generalizes basic principles that aim to introduce fairness to such conflicts. Both approaches are complementary – the game theoretical model is based on fundamental principles of the current international water law.

8.1.2 Hypotheses

FIRST HYPOTHESIS

The first hypothesis has been confirmed by research results of which are contained in the present thesis:

The state ownership of land in Uzbekistan does not represent the main impediment to further development of the agricultural sector.

State ownership can indeed be a great impediment to development of the agricultural sector. However, the state ownership itself is not the main hurdle if it does not restrict economic activities of the farmers. State ownership may lead to flourishing bureaucracy and corruption practices, but it facilitates equal access and distribution of land. The example of China

demonstrates that significant growth in agricultural sector is possible although land remains non-privatized. The research results show that the major obstacle impeding development in agricultural sector lies in misusing the state power, manifesting itself in the insufficient land tenure security, which is further undermined by state interventions. The major state interventions involve state orders on crops and water allocation limits; their gradual releasing and market principles introduction would be beneficial for farmers since they would gain more freedom in decision making and could maximize their profits.

SECOND HYPOTHESIS

The second hypothesis has been partly confirmed by research results:

The main factor causing inefficient water use is the technical imperfections of the irrigation system.

The factor that lies in the core of the problems of inefficient water use is not only the defective irrigation network. A wide range of factors, both technical and institutional, is the reason for inefficiencies. Although the technical condition of the irrigation represents an immense problem, the research results have shown that there are other important factors.

The current role of the Water Consumers Associations, that are controlled by the state and do not function as independent self-governing institutions, impedes efficiency in water use. Farmers have to comply with the designated water *limits*, and flexible adjustments are not possible, unless they dispose of socio-political connections. Another problem is excessive watering due to improper irrigation techniques and reckless attitude to water. The perception of water as a free good originates in the Islamic law and was reinforced during sovietization; water wasting is a consequence of such interpretation.

THIRD HYPOTHESIS

The third hypothesis has been confirmed by the research results:

The existing interstate conflicts over transboundary water resources in the Aral Sea Basin pose a serious threat and require seeking new methods of solving them.

The current conflicts over shared water resources between upstream and downstream countries in the Aral Sea Basin do indeed pose a danger; the case of Uzbekistan and Tajikistan shows that activities of one of the countries on a shared river (construction of a huge dam) can fundamentally affect activities (irrigated agricultural production) of another.

Both activities are crucial for economic development of the involved countries. Relations between Uzbekistan and Tajikistan are currently frozen due to reluctance of both sides to negotiate. Heated disputes over such clashes of interests require new methods that would mitigate them. The problem of water allocation between two countries has been translated to the Nash bargaining problem within the cooperative game theory framework. It offers a solution that is not primarily biased against any party; it is clear and fair. Its main asset is that it can bring the involved parties to negotiate about the conflict. The international water law can serve as an auxiliary tool; it does not attempt to provide countries with specific guidelines but its codification of customary law is helpful in understanding basic principles of transboundary water use.

8.2 RECOMMENDATIONS

8.2.1 Recommendations on Land Issues

Recommendations are defined based on the above conclusions. With regard to the findings, essentials required for effective land policy bear institutional character:

- recognition of broader property rights to land to increase land tenure security;
- implementation of transferability and marketability of land rights in order to increase productivity of land, and to enable to use land rights as collateral;
- gradual elimination of state orders on crops to provide more market incentives to famers to increase productivity of their land.

These are the basic land policy issues that will help to improve welfare of the rural population in Uzbekistan and to boost economic growth in agriculture.

8.2.2 Recommendations on Water Issues

DOMESTIC WATER ISSUES

The current problems of domestic water sector need solutions that bear both technical and institutional character. The current system is not adequate, functioning ad hoc and not taking into account future needs of the agricultural sector under conditions of water scarcity.

Recommendations for the domestic water sector, based on the research results, can be defined as follows:

➤ *Technical solutions:*

- technical improvement of irrigation network
- introducing new water saving technologies
- improvement of irrigation techniques to avoid excess irrigation
- replacing water demanding crops by less demanding varieties or different crops

➤ *Economic solutions:*

- introducing volumetric pricing

➤ *Institutional solutions:*

- releasing state control over Water Consumers Associations

➤ *Environmental solutions:*

- improvement of education on environmental problems

INTERNATIONAL WATER ISSUES

The following recommendations are based on the findings obtained when analysing a concrete case of transboundary water allocation conflict between Uzbekistan and Tajikistan:

- the Aral Sea Basin states should respect general rules of the international water law that provide them with basic guidelines;
- the Aral Sea Basin states should open up for negotiations, which can be initiated by methods suggested in the present thesis; the water allocation problems can be modelled within the game theory framework using Nash bargaining solution which can serve as a platform for such negotiations.

xxx

Uzbekistan has many prerequisites to become a strong, economically powerful country in the region. After the initial downfall of the gross domestic product in the early 1990s, the country began to successfully cope with its economic situation and after a few years the economy started showing impressive growth. The Uzbek economy remains stable and has a prospect of successful development in the future. However, if the country does not use its natural resources, land and water, in a sustainable manner, the promising growth may be in danger. To satisfy needs of the increasing population, effective land and water management are essential.

LIST OF REFERENCES

I. MONOGRAPHS

- Craumer P. 1995. Rural and Agricultural Development in Uzbekistan. London: Royal Institute of International Affairs. 48 p.
- Dinar A, Dinar S, McCaffrey S, Mc Kinney D. 2007. Bridges Over Water: Understanding Transboundary Water Conflict, Negotiation and Cooperation. New Jersey: World Scientific Series on Energy and Resource Economics. 468 p.
- Dixit AK, Nalebuff B. 1991. Thinking strategically: the competitive edge in business, politics, and everyday life. New York: W.W. Norton. 393 p.
- Dukhovny V, Sokolov V. 2003. Lessons on Cooperation Building to Manage Water Conflicts in the Aral Sea Basin. UNESCO - IHP. 50 p.
- Kandiyoti D. 2002. Agrarian reform, gender and land rights in Uzbekistan. Geneva: United Nations, Research Institute for Social Development. 89 p.
- Karimov I. 2008. Po puti modernizacii strany i ustojchivogo razvitiya ekonomiki. Tashkent: Uzbekiston. 279 p.
- Karimov I. 2009. The Global Financial-Economic Crisis: Ways and Measures to Overcome It in the Conditions of Uzbekistan. Tashkent: Uzbekiston. 45 p.
- Ostrom E, Gardner R, Walker J, Agrawal A. 1994. Rules, Games and Common-Pool Resources. Ann Arbor: University of Michigan Press. 369 p.
- Linke P, Naumkin V. 2009. The Years That Changed Central Asia. Moscow: The Center for Strategic & Political Studies. 380 p.
- Prosterman R, Mitchell R, Hanstad T. 2009. One Billion Rising: Law, Land and the Alleviation of Global Poverty. Amsterdam: Leiden University Press, 455 p.
- Spoor M. 2004. Agricultural restructuring and trends in rural inequalities in Central Asia, Geneva: United Nations Research Institute for Social Development. 45 p.
- Tursunova Z. 2014. Women's Lives and Livelihoods in Post-Soviet Uzbekistan: Ceremonies of Empowerment and Peacebuilding. Lexington Books. 248 p.
- Wegerich K. 2005. Institutional Change in Water Management at Local and Provincial Level in Uzbekistan. New York: Peter Lang. 263 p.

Wehrheim P, Schoeller-Schletter A, Martius C. 2008. Continuity and change: land and water use reforms in rural Uzbekistan: socio-economic and legal analyses for the region Khorezm. Halle/Saale: Leibnitz-Institut für Agrarentwicklung in Mittel- und Osteuropa (IAMO). 203 p.

Yusupov YB, Lerman Z, Chertovitskiy AS, Akbarov OM. 2010. Zhivotnovodstvo v Uzbekistane. Karshi: Nasaf. 160 p.

II. BOOK CHAPTERS

Ethier WJ. 2009. Economies of Scale. In The Princeton Encyclopedia of the World Economy. Princeton: Princeton University Press. pp. 332-337.

Freeman DM, Sampath RK. 1990. Designing local irrigation organizations for linking water demand with supply. In Social, economic and institutional issues in Third World irrigation management. Boulder: Westview Press. pp. 111-140.

Guliamov SS. 1998. China: The Results of Reforms. In Iriyama A., editor. Economic Reform in Uzbekistan: Characteristics and Responses. Tokyo: The Sasakawa Peace Foundation. pp. 151-162.

Isadjanov AA. 1998. The Reform of Foreign Economic Activity: Past Experience and Problems of Further Development. In Iriyama A., editor. Economic Reform in Uzbekistan: Characteristics and Responses. Tokyo: The Sasakawa Peace Foundation. pp. 46-63

Rakhimov ShKh. 2005. Regional experience in solving problems of water resources in Uzbekistan. In Vogtman, H., Dobretsov, N. Transboundary Water Resources: Strategies for Regional Security and Ecological Stability. The Netherlands: Springer. pp. 43-54.

Saidova GK. 1998. Special Feature of the Economic Reforms in Uzbekistan. In Iriyama A., editor. Economic Reform in Uzbekistan: Characteristics and Responses. Tokyo: The Sasakawa Peace Foundation. pp. 2-23.

III. ARTICLES IN SCIENTIFIC JOURNALS

Abdullaev I, De Fraiture C, Giordano M, Yakubov M, Rasulov A. 2009. Agricultural Water Use and Trade in Uzbekistan: Situation and Potential Impacts of Market Liberalization. Water Resources Development 25(1): 47-63.

Ambec S, Sprumont Y. 2002. Sharing a River. Journal of Economic Theory 107(2): 453-462.

- Dinar A, Ratner A, Yaron D. 1992. Evaluating Cooperative Game Theory in Water Resources. *Theory and Decision* 32(1): 1-20.
- Djanibekov N, Van Assche K, Bobojonov I, Lamers JPA. 2012. Farm Restructuring and Land Consolidation in Uzbekistan: New Farms with Old Barriers. *Europe-Asia Studies* 64(6): 1101-1126.
- Eleftheriadou E, Mylopoulos Y. 2008. Game Theoretical Approach to Conflict Resolution in Transboundary Water Resources Management. *Journal of Water Resources, Planning and Management* 134(5): 466-473.
- Fernandez-Cornejo J, Gempesaw II CM, Elterich JG, Stefanou SE. 1992. Dynamic Measures of Scope and Scale Economies: An Application to German Agriculture. *American Journal of Agricultural Economics* 74(2): 329-342.
- Gunchinmaa T, Yakubov M. 2010. Institutions and transition: does a better institutional environment make water users associations more effective in Central Asia? *Water Policy* 12(2): 165-185.
- Hallam A. 1991. Economies of Size and Scale in Agriculture: An Interpretive Review of Empirical Measurement. *Review of Agricultural Economics* 13(1): 155-172.
- Hardin G. 1968. The Tragedy of the Commons. *Science* 162(3859): 1243-1248.
- Hardin G. 1998. Extensions of “The Tragedy of the Commons”. *Science* 280(5364): 682-683.
- Hollis GE. 1978. The Falling Levels of the Caspian and Aral Seas. *The Geographical Journal* 144(1): 62-80.
- Houba H. 2007. Alternating Offers in Economic Environments. *Economics Letters* 96(3): 316-324.
- Houba H. 2008. Computing Alternating Offers and Water Prices in Bilateral River Basin Management. *International Game Theory Review* 10(3): 257-278.
- Houba H, Do KHP, Zhu X. 2012. Saving a River: A Joint Management Approach to the Mekong River Basin. *Environment and Development Economics* 18(1): 93-109.
- Houba H, van der Laan G, Zeng Y. 2014. Asymmetric Nash Solutions in the River Sharing Problem. *Strategic Behavior and the Environment* 4: 321-360.
- Jacoby H, Li G, Rozelle S. 2002. Hazards of Expropriation: Tenure Insecurity and Investment in Rural China. *American Economic Review* 92(5): 1420-1447.

Kalai E, Smorodinsky M. 1975. Other Solutions to Nash's Bargaining Problem. *Econometrica* 43(3): 513-518.

Kalai E. 1977. Proportional Solutions of Bargaining Situations: Interpersonal Utility Comparisons. *Econometrica* 45(7): 1623-1630.

Kitamura Y, Yano T, Honna T, Yamamoto S, Inosako K. 2006. Causes of Farmland Salinization and Remedial Measures in the Aral Sea Basin – Research on Water Management to Prevent Secondary Salinization in Rice-Based Cropping System in Arid Land. *Agricultural Water Management* 86: 1-14.

Lin YJ. 1992. Rural Reforms and Agricultural Growth in China. *The American Economic Review* 82(1): 34-51.

McCaffrey S. 2014. International Water Cooperation in the 21st Century: Recent Developments in the Law of International Watercourses. *Review of European Community & International Environmental Law* 23(1): 4-14.

Melníkovová L, Valenčík R, Havrlan B. 2014. Rogun – Hydropower Generating Controversy in Central Asia. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* 62(6): 1353-1361.

Murthy S. 2010. Iraq's Constitutional Mandate to Justly Distribute Water: The Implications of Federalism, Islam, International Law, and Human Rights. *The George Washington International Law Review* 42(4): 749-785.

Oberkirchner L, Hornidge A-K. 2011. "Water Is Life"—Farmer Rationales and Water Saving in Khorezm, Uzbekistan: A Lifeworld Analysis. *Rural Sociology* 76(3): 394-421.

Ostrom E, Gardner R. 1993. Coping with Asymmetries in the Commons: Self-Governing Irrigation Systems Can Work. *The Journal of Economic Perspectives* 7(4): 93-112.

Pomfret R. 2000. Agrarian Reform in Uzbekistan: Why Has the Chinese Model Failed to Deliver? *Economic Development and Cultural Change* 48(2): 269-284.

Raup PM. 1969. Economies and Diseconomies of Large-Scale Agriculture. *American Journal of Agricultural Economics* 51(5): 1274-1282.

Rogers P. 1969. A Game Theory Approach to the Problems of International River Basins. *Water Resources Research* 5(4): 749-760.

Spoor M. 1998. The Aral Sea Basin Crisis: Transition and Environment in Former Soviet Central Asia. *Development and Change* 29(3): 409-435.

Tashmatov A et al. 2000. Food policy reforms for sustainable agricultural development in Uzbekistan, the Kyrgyz Republic, and Tajikistan. *Food Policy* 25(6): 719-732

Trevisani T. 2007. After the Kolkhoz: rural elites in competition. *Central Asian Survey* 26(1): 85-104.

Van den Brink R, Estevez-Fernandez A, van der Laan G, Moes N. 2014. Independence of downstream and upstream benefits in river water allocation problems. *Social Choice and Welfare* 43(1): 173-194.

Veldwisch GJA, Mollinga PP. 2013. Lost in transition? The introduction of water users associations in Uzbekistan. *Water International* 38(6): 758-773.

Veldwisch GJA, Spoor M. 2008. Contesting Rural Resources: Emerging 'Forms' of Agrarian Production in Uzbekistan. *Journal of Peasant Studies* 35(3): 424-451.

Veldwisch GJA. 2007. Changing patterns of water distribution under the influence of land reforms and simultaneous WUA establishment: Two cases from Khorezm, Uzbekistan. *Irrigation and Drainage Systems* 21(3-4): 265-276.

Veldwisch GJA, Bock BB. 2011. Dehkans, Diversification and Dependencies: Rural Transformation in Post-Soviet Uzbekistan. *Journal of Agrarian Change* 11(4): 581-597.

Wegerich K. 2009. The New Great Game: Water Allocation in Post-Soviet Central Asia. *Georgetown Journal of International Affairs* 10(2): 117-123.

Wegerich K. 2002. Natural draught or human made water scarcity in Uzbekistan? *Central Asia and the Caucasus* 2(14).

Zhao Y. 2011. China's land tenure reform: Time for a new direction? *China Review* 11(2): 125-151.

Zhu K, Prosterman R. 2009. Securing Land Rights for Chinese Farmers: A Leap Forward for Stability and Growth. *Yale Economic Review* 5(2): 15-16,18-21.

IV. STUDIES

Adams G, Boyd S, Huffman M. 2013. The Economic Outlook for U.S. Cotton 2013. National Cotton Council of America.

Brooks K, Krylatykh E, Lerman Z, Petrikov A, Uzun V. 1996. Agricultural Reform in Russia: A View from the Farm Level. World Bank Discussion Papers 327. The World Bank, Washington, D.C.

Deininger KW. 1993. Cooperatives and the Breakup of Large Mechanized Farms. Theoretical Perspectives and Empirical Evidence. World Bank Discussion Papers 218. The World Bank, Washington, D.C.

Fazylova N. 2010. Tehnicheskij doklad po nacional'nomu zakonodatel'stu i politike v sfere Ustojchivogo upravleniya zemel'nymi resursami v Uzbekistane. Mnogostranovoj proekt po usilenu potenciala v ramkah Iniciativy stran Central'noj Azii po upravleniyu zemel'nymi resursami. UNDP.

Giovarelli R, Akmatova Ch. 2002. Local Institutions that Enforce Customary Law in the Kyrgyz Republic and their Impact on Women's Rights. Agriculture & Rural Development e-paper. World Bank: Washington, D.C.

Hamidov A, Thiel A. 2011. Institutional change in transition: Review of conditions for sustainable water consumers associations in semi-arid Uzbekistan. Agricultural University of Plovdiv.

Hanstad T. 1998. Are Smaller Farms Appropriate for Former Soviet Republics? RDI Reports on Foreign Aid and Development #97. Seattle WA: Rural Development Institute.

Khalikov S. 2013. Karakul sheep breeding in shirkats. Internal document created upon the author's request. Department of Agricultural Economics, TGAU.

Lerman Z, Sedik DJ. 2009. Sources of Agricultural Productivity Growth in Central Asia: The Case of Tajikistan and Uzbekistan. Discussion Paper No. 13.09. Hebrew University of Jerusalem. Department of Agricultural Economics and Management.

Lerman Z. 2008. Agricultural Development in Uzbekistan: The Effect of Ongoing Reforms. Discussion Paper No. 7.08. Hebrew University of Jerusalem. Department of Agricultural Economics and Management.

Lerman Z, Sedik DJ, Pugachov N, Goncharuk A. 2007. Rethinking agricultural reform in Ukraine. Studies on the Agricultural and Food Sector in Central and Eastern Europe no. 38. Institute of Agricultural Development in Central and Eastern Europe (IAMO).

Lerman Z. 2012. Land reform and farm performance in Europe and Central Asia: a 20 year perspective. Discussion Paper No. 2.12. Hebrew University of Jerusalem. Department of Agricultural Economics and Management.

Lerman Z. 2001. A Decade of Land Reform and Farm Restructuring: What Russia Can Learn from the World Experience. Discussion Paper No. 7.01.

Lohmar B, Gale F, Tuan F, Hansen J. 2009. China's Ongoing Agricultural Modernization: Challenges Remain After 30 Years of Reform. Economic Information Bulletin No. 51, U.S. Department of Agriculture, Economic Research Service.

McCaffrey S. 2008. Convention on the Law of the Non-Navigational Uses of International Watercourses. United Nations Audiovisual Library of International Law.

Prosterman R, Hanstad T. 1999. Legal Impediments to effective rural land relations in Eastern Europe and Central Asia: a comparative assessment. Washington, DC: World Bank.

Spillmann KR and Bächler G. 1994. The Water and Soil Crisis in Central Asia: a Source for Future Conflicts. Zurich/Berne: Center for Security Studies.

Sutton WR, Srivastava JP, Neumann JE, Droogers P, Boehlert BB. 2013. Reducing the Vulnerability of Uzbekistan's Agricultural Systems to Climate Change: Impact Assessment and Adaptation Options. World Bank Study. Washington, DC: World Bank.

Törhönen M-P. 2002. Land Tenure Transition: Case Uzbekistan. FIG XXII International Congress. Washington, D.C. USA, April 19-26.

Van Zyl J, Miller BR, Parker A. 1996. Agrarian Structure in Poland: The Myth of Large-Farm Superiority. World Bank Policy Research Working Paper 1596.

Yalcin R, Mollinga PP. 2007. Institutional transformation in Uzbekistan's agricultural and water resources administration: The creation of a new bureaucracy. ZEF Working Paper Series, No. 22. Center for Development Research (ZEF), University of Bonn.

V. THESES

Veldwisch GJA. 2008. Cotton, Rice and Water: The Transformation of Agrarian Relations, Irrigation Technology and Water Distribution in Khorezm, Uzbekistan. [Ph.D.] Bonn: University of Bonn, Faculty of Philosophy, 220 p.

Wu X. 2000. Game Theoretical Approaches to Water Conflicts in International River Basins – A Case Study of the Nile Basin. [Ph.D.] Chapel Hill: University of North Carolina, 154 p.

Zavgorodnyaya D. 2006. Water Users Associations in Uzbekistan: Theory and practice. [Ph.D.] Bonn: University of Bonn, Faculty of Agriculture, 201 p.

VI. STATISTICAL INFORMATION

FAO. 2014. FAOSTAT: Top production - Uzbekistan. Available at <http://faostat.fao.org/DesktopDefault.aspx?PageID=339&lang=en&country=235>: Accessed 2014-06-06.

FAO. 2014. FAOSTAT: Top ten agricultural commodities – production value. Available at <http://faostat.fao.org/site/613/default.aspx#ancor>: Accessed 2014-05-10.

FAO. 2014. FAOSTAT: Evolution of population and labour force in size. Available at <http://faostat.fao.org/site/550/DesktopDefault.aspx?PageID=550#ancor>: Accessed 2014-05-10

FAO. 2014. FAOSTAT: Evolution of rural population and share of labour force in agriculture. Available at

<http://faostat.fao.org/site/550/DesktopDefault.aspx?PageID=550#ancor>: Accessed 2014-05-10

FAO. 2014. FAOSTAT: Production of cotton lint and wheat in Uzbekistan 1992 – 2013. Available at <http://faostat3.fao.org/compare/E>: Accessed 2014-11-23

FAO. 2014. FAOSTAT: Cereal import dependency in Uzbekistan 1992 – 2011. Available at <http://faostat3.fao.org/compare/E>: Accessed 2014-11-23

State Statistical Committee of Uzbekistan. 2012. Cropping area. Available at <http://stat.uz/press/1/8156/>: Accessed 2013-05-06.

World Bank. 2014, 2015. World Development Indicators. Available at <http://databank.worldbank.org/data>: Accessed periodically, dates given in the current thesis are up to date.

World Bank. 2014. World Bank, Region and Country Specific Forecast and Data. Available at <http://www.worldbank.org/en/publication/global-economic-prospects/data?region=ECA>: Accessed 2014-12-05.

VII. EXPERT PAPERS AND DOCUMENTS

Baker & McKenzie – CIS, Limited. 2014. Doing Business in Uzbekistan. Almaty. Available at <http://www.bakermckenzie.com/bkdbiuzbekistan14/>: Accessed 2015-01-16.

Baker & McKenzie – CIS, Limited. 2012. Doing Business in Uzbekistan. Almaty. Available at <http://www.bakermckenzie.com/bkdbiuzbekistan14/>: Accessed 2013-04-25.

Centre of Hydrometeorological Service. 2008. Second National Communication of the Republic of Uzbekistan under the United Nations Framework Convention on Climate Change. Available at <http://unfccc.int/resource/docs/natc/uzbnc2e.pdf>: Accessed 2013-04-16.

Czech Trade. 2013. Summary territorial information: Uzbekistan. Available at <http://www.businessinfo.cz/cs/zahranicni-obchod-eu/teritorialni-informace-zeme/uzbekistan.html>: Accessed 2013-05-05.

FAO. 2012. Eastern Europe and Central Asia Agro-Industry Development Country Brief: Uzbekistan. Available at

http://www.fao.org/fileadmin/user_upload/Europe/documents/Publications/AI_briefs/AI_briefs2012/fao_uzbekistan.pdf: Accessed 2013-04-22.

FAO. 2013. Water Report Uzbekistan. Available at

http://www.fao.org/nr/water/aquastat/countries_regions/UZB/index.stm: Accessed 2014-04-27

FAO. 2014. Country Brief Uzbekistan. Available at

<http://www.fao.org/giews/countrybrief/country.jsp?code=UZB&lang=en>: Accessed 2014-04-27.

FAO. 2014. Country Profile Uzbekistan. Available at

<http://www.fao.org/countryprofiles/index/en/?iso3=UZB>: Accessed 2014-04-27.

IMF. 2008. International Monetary Fund: Welfare Improvement Strategy of Uzbekistan. Available at <http://www.imf.org/external/pubs/ft/scr/2008/cr0834.pdf>: Accessed 2013-07-23.

IMF. 2012. Country Report No. 13/278: Republic of Uzbekistan. Available at <http://www.imf.org/external/pubs/ft/scr/2013/cr13278.pdf>: Accessed 2013-07-23.

MAWR. 2009. Ferghana Valley Water Resources Management Project – Phase 1. Resettlement Policy Framework and Specific Resettlement Action Plan. Available at <http://goo.gl/7FFAuE>: Accessed 2013-07-04.

OECD. 2011. “China”. Agricultural Policy Monitoring and Evaluation: OECD Countries and Emerging Economies, OECD Publishing. Available at http://dx.doi.org/10.1787/agr_pol-2011-23-en: Accessed 2014-07-12.

UN Watercourses Convention. 2012. User's Guide Fact Sheet Series: Number 10. Theories of Resource Allocation. Available at

<http://www.unwatercoursesconvention.org/documents/UNWC-Fact-Sheet-10-Theories-of-Resource-Allocation.pdf>: Accessed 2014-04-05.

University of Washington. 2009. Central Asia Energy Water Development Program. Available at <http://test4.ocean.washington.edu/story/Irrigation>: Accessed 2013-05-19.

USAID. 2005. Uzbekistan Land Reform Assessment, final report. Prepared by Association for Rural Development, Inc. Washington. Available at http://pdf.usaid.gov/pdf_docs/PNADC874.pdf: Accessed 2014-07-22.

USAID. 2007. Land Tenure and Property Rights. Volume I. Framework. Available at http://usaidlandtenure.net/sites/default/files/USAID_Land_Tenure_Framework_Tool_0.pdf: Accessed 2014-07-22.

World Bank. 2010. Uzbekistan: Climate Change and Agriculture Country Note. Available at <http://siteresources.worldbank.org/ECAEXT/Resources/258598-1277305872360/7190152-1303416376314/uzbekistancountrynote.pdf>: Accessed 2013-05-05

World Bank. 2013. Uzbekistan overview. Available at

<http://www.worldbank.org/en/country/uzbekistan/overview>: Accessed 2014-02-14.

World Bank. 2014. Assessment Studies for Proposed Rogun Hydropower Project in Tajikistan. Available at <https://www.worldbank.org/en/region/eca/brief/rogun-assessment-studies>: Accessed 2015-03-06.

World Food Programme. 2008. Poverty and Food Security in Uzbekistan. Available at <http://documents.wfp.org/stellent/groups/public/documents/ena/wfp179011.pdf>: Accessed 2014-07-02.

VIII. LEGISLATION

Uzbekistan:

Constitution of the Republic of Uzbekistan. 1992; as last amended by the Law of the Republic of Uzbekistan no. 366 of April 16, 2014.

Civil Code of the Republic of Uzbekistan. 1996; as last amended by the Law of the Republic of Uzbekistan no. 355 of October 7, 2013.

Land Code. 1998; as last amended by the Law of the Republic Uzbekistan no. 365 of January 20, 2014.

Law on Farms. 1998; new redaction 2004; as last amended by the Law of the Republic Uzbekistan no. 355 of October 7, 2013.

Law on Dehkan Farms. 1998; as last amended by the Law of the Republic Uzbekistan no. 355 of October 7, 2013.

Law on Agricultural Cooperatives (Shirkats). 1998; as last amended by the Law of the Republic Uzbekistan no. 345 of December 29, 2012.

Law on Water and Water Use. 1993; as last amended by the Law of the Republic Uzbekistan no. 352 of April 30, 2013.

Law on Denationalization and Privatization. 1991; as last amended by the Law of the Republic Uzbekistan no. 365 of January 20, 2014.

Law No. 3RU-240 on “Introducing amendments to some legislative acts of the Republic of Uzbekistan in connection with the deepening of economic reforms in agriculture and water management”. December 25, 2009.

Government resolutions:

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 320 “On Improvement of Water Management”, Article 62 of the Attachment “On Basin Management of the Irrigation System”. July 21, 2003; following the Presidential decree No. UP-3226 from March 2003.

Resolution of the Cabinet of Ministers of the Republic of Uzbekistan “On Water Use and Water Consumption in the Republic of Uzbekistan”, Attachment no. 1 “Provision on the Procedure of Water Use and Water Consumption on the territory of Republic of Uzbekistan”, Head 4 “Limits on Water and Principles of their Determination”, 2013.

China:

Law of the People's Republic of China on Land Contract in Rural Areas. 2002. Available at http://www.npc.gov.cn/englishnpc/Law/2007-12/06/content_1382125.htm: Accessed 2014-07-29.

Property Law of the People's Republic of China. 2007. Available at <http://www.lawinfochina.com/display.aspx?lib=law&id=6642>: Accessed 2014-07-29.

Other:

Agreement Between the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan, and the Republic of Uzbekistan on Cooperation in the Field of Joint Management of the Use and Conservation of Water Resources of Interstate Sources. 1992. Available at <http://www.caee.utexas.edu/prof/mckinney/papers/aral/agreements/ICWC-Feb18-1992.pdf>: Accessed 2013-04-29.

United Nations Treaty Collection. 1997. Convention on the Law of the Non-navigational Uses of International Watercourses. Available at http://legal.un.org/ilc/texts/instruments/english/conventions/8_3_1997.pdf: Accessed: 2014-01-05.

IX. INTERVIEWS

Interviews taken in March/April 2013 in Tashkent.

1. TASHKENT STATE AGRARIAN UNIVERSITY:

Farmanov T. Department of Agricultural Economics

Khalikov S. Department of Agricultural Economics

Pulatova R. Head of Department of Farm Management

Rustamova I. Department of Agricultural Economics

Saidakbarov Kh. Head of Department of Agricultural Economics

2. SANIRI, Tashkent:

Rakhimov Sh. Head of the Institute

3. INSTITUTE OF MARKET REFORMS UNDER MINISTRY OF AGRICULTURE AND WATER RESOURCES, TASHKENT:

Khushmatov N. Head of the Institute

X. WEB PAGES

Azizov & Partners. 2013. Available at <http://www.azizovpartners.uz/index.php/ru/news>: Accessed 2014-04-23.

CA Water Info. 2013. Available at <http://www.cawater-info.net>: Accessed 2013-02-17

Ministry of Foreign Affairs of the Republic of Uzbekistan. 2012. Available at <http://mfa.uz/en/>: Accessed 2013-09-16.

Morozov AN. 2004. Funkcionalno-stoimostnoi podhod k sovershenstvovaniu gidromeliorativnyh sistem. Problemy ispol'zovaniya vodnyh, zemel'nyh i gidroenergeticheskikh resursov Central'no-Aziatskogo regiona. Available at: http://watersalt.narod.ru/o_fsa.htm: Accessed: 2014-07-23.

The Governmental Portal of the Republic of Uzbekistan. 2013. Local Authority. Available at http://gov.uz/en/regional_authorities/: Accessed 2013-04-23.

The Governmental Portal of the Republic of Uzbekistan. 2013. President. Available at <http://gov.uz/en/president/>: Accessed 2013-04-23.

The Governmental Portal of the Republic of Uzbekistan. 2013. State Authority. Available at <http://gov.uz/en/govauthorities/>: Accessed 2013-04-23.

XI. NEWSPAPER ARTICLES

«Ferghana» News Agency. 2008. Uzbekistan: Farmers are against land reforms. Available at <http://enews.fergananews.com/articles/2476>: Accessed 2013-02-23.

Uznews.net. 2011. Minsel'vodhoz Uzbekistana protiv "Parizhskoj kommuny". Available at <http://fermerville.ru/minselvodhoz-uzbekistana-protiv-parizhskoj-kommuny>: Accessed 2015-01-05 (the original resource, Uznews.net, does not exist anymore).

Pribylovsky P. 2014. Revival of the Aral Sea: Kazakh and World Efforts to Restore the Island Sea. The Astana Times. Available at <http://www.astanatimes.com/2014/11/revival-aral-sea-kazakh-world-efforts-restore-island-sea/>: Accessed 2015-01-16.