



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



Central and Eastern European Sustainable Agriculture

**Institutional Change in Central and Eastern
European Agriculture and Environment**

VOLUME 3

**Irrigation and Water Regulation Systems in Transition:
The Case of Bulgaria in Comparison
with Latvia, East Germany and Romania**



Food and Agriculture Organization of the United Nations
Humboldt University of Berlin

Institutional Change in Central
and Eastern European
Agriculture and Environment

Franz Gatzweiler and Konrad Hagedorn (eds.)

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The CEESA (Central and Eastern European Sustainable Agriculture) Project, QLK5–1999–01611, is funded under the EU 5th Framework Programme. Responsibility for the information and views in this publication lies entirely with the editors and authors.

For inquiries, please contact:

Franz Gatzweiler and Renate Judis
Humboldt University of Berlin
Institute of Agricultural Economics and Social Science
Chair of Resource Economics
Luisenstr. 56, D-10099 Berlin
Tel: +49.(0)30-2093 6305 Fax: +49.(0)30-2093 6497
<http://www.ceesa.de>
E-mail: franz.gatzweiler@agrار.hu-berlin.de
renate.judis@agrار.hu-berlin.de

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying or otherwise, without the prior permission of the copyright owner. Applications for such permission, with a statement of the purpose and extent of the reproduction, should be addressed to the Director, Information Division, Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, 00100 Rome, Italy

CEESA/FAO Series

Institutional Change in Central and Eastern European Agriculture and Environment

- 1** Maintaining High Nature Value Landscapes in an Enlarged Europe: A Comparative Analysis of the Czech Republic, Hungary and Slovenia
- 2** The Challenge of the Nitrate Directive to Acceding Countries: A Comparative Analysis of Poland, Lithuania and Slovakia
- 3** Irrigation and Water Regulation Systems in Transition: The Case of Bulgaria in Comparison with Latvia, East Germany and Romania
- 4** Institutional Change in Central and Eastern European Agriculture and Environment: Synopsis of the CEESA Project

Series editors: Franz Gatzweiler and Konrad Hagedorn

**IRRIGATION AND WATER
REGULATION SYSTEMS
IN TRANSITION:
THE CASE OF BULGARIA IN COMPARISON
WITH LATVIA, EAST GERMANY AND
ROMANIA**

By
Ivan Penov
Insa Theesfeld
Franz Gatzweiler

Photographs by: Franz Gatzweiler and Insa Theesfeld

PREFACE

The work for this study was conducted as part of the Project on Sustainable Agricultural Development in the Central and Eastern European Countries (CEESA) funded under the EU 5th Framework Programme. The Project analyzed the context and prospects for sustainable agricultural development in twelve Central and Eastern European Countries (CEECs): Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia and Ukraine. The research group was composed of researchers from universities and research institutes from these CEECs, as well as from the Humboldt University of Berlin, University of Helsinki, Wageningen University, University of Newcastle upon Tyne and the FAO Sub–Regional Office for Central and Eastern Europe, Budapest.

The CEESA Project explored how the requirements of environmental protection and nature conservation have been taken into account during both the transformation of the political and economic institutions of the CEEC agricultural sectors and the preparation for EU accession. Local case studies were conducted in each of the above–mentioned CEECs. The findings were collected and subjected to detailed scrutiny and discussion at the CEESA Policy Learning Workshops (PLWs), which were field–based workshops that took place in the Czech Republic, Bulgaria and Poland. This volume presents the results of the Bulgarian workshop; the Czech and Polish workshops are described in volumes 1 and 2, respectively.

The CEESA PLWs helped advance the creation of a pan–European research community through the exchange of knowledge and by strengthening research partnerships and networks. We are confident that the results of the three CEESA PLWs will contribute to the understanding and solving of problems that are at the interface of agriculture and the environment. We are certain that this report will find an interested readership in all related fields.

Prof. Dr. Konrad Hagedorn
Dr. Franz W. Gatzweiler

Humboldt University of Berlin

Dr. Stjepan Tanić

FAO SEUR

ACKNOWLEDGEMENTS

The authors would like to thank all the researchers who prepared the country reports for the comparative analysis, as well as the participants of the Policy Learning Workshop. We extend our thanks to everyone who has assisted with and contributed to this document.

Alexi Alexiev, Bulgaria

Kalin Andreev, Bulgaria

Georgi Atanasov, Bulgaria

Florin Badulescu, Romania

Hristo Bozov, Bulgaria

Peteris Busmanis, Latvia

Konrad Hagedorn, Germany

Iuliana Ionel, Romania

Eriks Kreslins, Latvia

Monika Kubratova, Bulgaria

Ivan Mitev, Bulgaria

Arne Musch, The Netherlands

Waltina Scheumann, Germany

Christian Schleyer, Germany

CONTENTS

	Preface	ix
1	Idea and Methodology of the Policy Learning Workshops	1
2	Description of the Bulgarian Irrigation Case.	3
2.1	Privatization Process in Bulgarian Agriculture	4
2.2	Formal Property Rights on Wand Irrigation Infrastructure.	5
2.3	Institutional Settings in Practice	7
2.4	Additional Factors in the Abandonment of the Irrigation System	12
3	Similarities and Differences with other Countries in Transition	15
3.1	Properties of Transactions: Technological Conditions	16
3.2	Characteristics of Actors: Behavioral and Environmental Concerns.	17
3.3	Property Rights on Nature Components	18
3.4	Governance Structures	19
3.5	Agricultural Product Markets	23
4	Overview of Problem Analysis	25
5	Options for Sustainable Irrigation Institutions	27
5.1	Actors' Characteristics	27
5.2	Policies Affecting Institutional Options.	29
5.3	Description of Selected Institutional Options	34
6	Discussion and Evaluation of Institutional Options	37
7	Evaluation of Institutional Options for Sustainable Irrigation Agriculture	41
	List of Participants	47
	References	49

1 IDEA AND METHODOLOGY OF THE POLICY LEARNING WORKSHOPS

The CEESA Project brought together researchers from Central, Eastern and Western Europe. Their specific aim was to explore how the requirements of sustainability have been incorporated in the restructuring of agriculture in the CEECs during transition and in preparation for EU accession. For many of the involved researchers it was their first opportunity to participate in such a pan-European research project. The researchers came from different research backgrounds and had worked in diverse theoretical, socio-economic and organizational contexts.

Although the Project offered a common framework for analysis, different conceptions of the participants led to different interpretations. It became obvious that a common understanding of the analytical framework required intensive discourse, which could not be achieved in a short period of time. Similarly, the project participants had to cope with empirical heterogeneity. Recommendations for the restructuring of various aspects of CEE agriculture (such as irrigation, landscape management or water protection) would remain meaningless for Eastern and Western European policy-makers if the context of transition were not sufficiently appreciated. Such a context includes historical, ecological, economic, political and social aspects.

These considerations called for an innovative approach to the exchange and communication of knowledge. As a result, the idea of carrying out the Policy Learning Workshops (PLWs) was brought into the CEESA Project.

The processes of transition, accession and enlargement should ultimately actualize the concept of “Unity in Diversity”. Creating a common basis will hardly be achieved if the systems and methods of the West are simply transplanted to and copied by the East. Especially in the field of environmentally sound agriculture the West cannot provide the ultimate, ready-made solutions which the East could simply implement.

What is needed for sustainability, therefore, is a twofold development. This development would draw on successful Western and Eastern examples and expertise and would fully account for specific characteristics and the diverse circumstances of Eastern European agriculture and rural areas. On the one hand, this development involves building some basic institutions that resemble those in Western Europe. On the other hand, it calls for innovative solutions that are well adapted to local circumstances and created with the participation of all affected actors. In this respect a pressing need remains for mutual learning among scientists and experts from Western and Eastern European countries.

As previously mentioned, these insights led to the idea of carrying out the PLWs as part of the CEESA research process. In a microcosm, the CEESA Project experienced

the transnational exchange and mutual learning that ideally characterizes the overall process of European integration. The PLWs were carried out after a one-year research period during which the case-study authors had prepared detailed background information on the topic under investigation. Each of the PLWs was preceded by a 4-day study tour, which brought together the various CEESA teams that had investigated similar topics. These tours allowed the teams (researching, for example, irrigation, landscape management or water protection) to conduct joint fieldwork 'on the spot' in relation to the host country's case study. The results of the study tour were subsequently presented to the PLW convened at the same location some time later.

Each PLW involved a detailed briefing of the case study in question, a field trip to observe the problem on the ground and to meet involved actors, and the preparation of comparative information about similar problems in other CEECs. The participants of the PLWs were asked to deliberate on specific solutions to the problem they examined as well as general lessons for national and EU policies.

2 DESCRIPTION OF THE BULGARIAN IRRIGATION CASE

During transition the amount of water used for irrigation in Bulgaria has sharply declined. In addition, the share of actually irrigated areas is small compared with the share of those that could be irrigated. Large sections of existing irrigation systems are abandoned, and the ones still in use are barely maintained. Crops such as wheat and barley have replaced more water-intensive crops, including vegetables, rice and maize. This situation impacts the development of agriculture and the allocation of the country's water resources. In addition, poorly functioning irrigation systems have a long-lasting impact on the environment. If the water supply from the irrigation systems is not reliable, the farmers will switch to pump irrigation; in the long run this will affect groundwater resources. Furthermore, the improper operation of canals can result in waterlogging and soil salinization.

The central argument of this report is that in the wake of decollectivization and restitution land fragmentation has contributed to the abandonment of irrigation systems. The irrigation systems in Bulgaria were originally designed to serve large water users. Now these systems are supposed to distribute water to a large number of small plots. This condition, however, has not been reflected by a change in the respective institutions.

This report focuses attention on the main institutional elements regarding water resources and irrigation. The institutional settings include the property-rights system and the existing governance structure. Property rights that are important for irrigation pertain to those over water and irrigation infrastructure and land. The following governance structure elements were investigated:

- water monitoring process,
- water pricing,
- management,
- conflict resolution mechanisms,
- sanctioning mechanisms.

In addition, the influences of other non-institutional factors were also discussed. These included:

- availability of water resources,
- decline in rural population,
- changes in crop structure and market conditions,
- costs of the alternatives for water supply.

Formal property rights were investigated by reviewing relevant laws. The institutional settings were investigated by conducting semi-structured interviews with involved actors. These interviews were carried out in the region around the town of

Plovdiv. Most of this region's agricultural land has irrigation systems (though many are unused) and much of the country's groundwater resources.

2.1 Privatization Process in Bulgarian Agriculture

During socialism, large production units (cooperatives and agro-industrial complexes) organized agricultural production in Bulgaria. Private farming was allowed only on small plots, but even then individual farmers were dependent on the cooperatives.

Land reform was initiated at the beginning of 1991 by starting to liquidate the cooperatives and reallocate the agricultural land to individual owners. Land in Bulgaria was never nationalized, and therefore from a legal point of view this land reform was actually an act of restitution as it changed formal property rights into effective property rights again. The ownership of land parcels was restored to previous owners (or their heirs). The real or comparable boundaries that existed before collectivization (during the 1950s) were used.

Nevertheless, there have been problems even after land reform. Land ownership in Bulgaria prior to collectivization was highly fragmented, and the restitution process deepened this problem even further (Table 1). Those that had owned land before 1950 (before collectivization) are too old to farm and some have already passed away. In addition, many of them have several heirs living in towns who have little or no experience in agriculture and no intention of returning to the villages. Soon after the cooperatives were abolished, new producer cooperatives were established in almost every village. The opportunities for establishing private farms were constrained by a lack of tradition, land fragmentation and a lack of resources. Moreover, frequent changes in legislation and the decline of the food processing industry created great uncertainty and further hindered the development of stable production units.

In addition to these problems, the land restitution process was slow and contradictory. When the formal procedures for land reform ended in 2000, Bulgarian farm structure was dominated by three groups: small subsistence farms (operated by people near retirement), cooperatives (most in a poor financial state) and large commercial farms. The number of medium-sized family farms remained small.

Although irrigation is very important for Bulgarian agriculture, until the end of the Second World War only a small share of the land was irrigated. During the 1960s the state initiated an extensive programme to increase the share of irrigated land. Since cooperatives were the dominant organizational form, irrigation systems were designed to supply water to these large production units. The main sources for water supply were the lakes of large dams located in the mountains and rivers. Groundwater was used as a complementary source.

Table 1: Private Farms in Bulgaria According to Size

Arable Land (ha)	Number of Private Farms	%	Total Area (ha)	%	Average Size (ha)
Up to 0.2	915 217	51.5	83 101.7	3.2	0.09
0.2 – 0.5	363 564	20.4	118 412.8	4.5	0.33
0.5 – 1	256 442	14.4	180 535.2	6.9	0.70
1 – 2	156 473	8.8	214 634.0	8.2	1.37
2 – 5	68 474	3.9	205 148.1	7.8	2.99
5 – 10	13 446	0.8	90 299.3	3.5	6.72
Above 10	3 506	0.2	1 728 427.0	65.9	492.99
Total	1 777 122	100.0	2 620 558.1	100.0	1.48

Source: The Agrarian Report (1999)

The process of reorganizing irrigation started at the beginning of 1999 after parliament approved the Water Law (State Gazette, 1999). In 2001, two additional acts were issued, the Water User Association Law (State Gazette, 2001a) and the Executive Hydromelioration Agency Structural Rules (State Gazette, 2002b). These three documents form the backbone of irrigation reform. They specify the legal property rights to water and irrigation infrastructure and also define the main organizational rules.

Irrigation reform started when the land restitution process was approaching its end. The investments in irrigation systems are specific to the site and capital required. Therefore, it is reasonable to expect that this may also have caused problems. In Germany (Schleyer, 2002) and Latvia (Busmanis et al., 2002), irrigation reform was implemented more quickly than in Bulgaria. However, the phenomenon of abandoned irrigation and drainage systems was observed in all these countries. Therefore, other institutional reasons have also influenced the process.

2.2 Formal Property Rights on Water Irrigation Infrastructure

The Water Law, passed in 1999, granted state, municipal and private ownership to water resources. Water resources in Bulgaria are generally state-owned with some exceptions. Spring water and natural lakes on community-owned land are considered municipal property. Private ownership is allowed only for water located on private land (wells, springs within property borders and artificial or natural lakes that are not fed by water sources from state or communal property). Landowners can use water from wells up to certain limit free of charge. Above the limit they must apply for permission and pay a tax. In addition, all wells must be registered in the local

municipality. The law also specifies the sanctions for times when water resources are used without the required permission, when water use and monitoring rules are violated, when irrigation infrastructure is damaged and when water resources are polluted.

Three ministries and a number of government offices manage the water infrastructure. At the national level, the Ministry of Environment and Water conducts water management. Basin Offices are supposed to coordinate water usage activities at the regional level. There are four water regions and they are specified in the Water Law (shown in Figure 1). The Ministry of Agriculture and Forestry is responsible for the irrigation systems (the main canals and some of the large dam lakes). The state firm Irrigation Systems, Ltd. conducts the management of these systems. The Ministry of Regional Development and Public Works is responsible for household water supply. The Energy Committee is responsible for the electric power stations and the large water dams. The government intends to transfer management of the internal canal system and some small dams to water user associations.

Figure 1: The Water Regions in Bulgaria



In summary, land restitution in Bulgaria has led to land fragmentation. Cooperatives, which coordinated not only agricultural activity but also the village's social life, were abolished before alternative forms emerged. Formal legislation regarding irrigation is already in place, but most of it has not been put into practice.

2.3 Institutional Settings in Practice

In order to investigate the problem of irrigation system abandonment at the local level, interviews were conducted in the Plovdiv region. This region is located in the Western part of the Trakia plain along the Maritza river. The main crops grown in the area are fruits, vegetables and rice. The region is rich in water resources. Maritza is the biggest Bulgarian river. About 40 percent of all the country's groundwater resources are located here. Irrigation systems are built on 80 percent of the agricultural land; however, during the last several years most of them have not been under operation. There are four large and 263 small water dams.

The firm Irrigation Systems, Ltd. has two branches in the area. The first one, Irrigation Systems, Ltd., Plovdiv–North, organizes the water supply north of the Maritza River where most rice production is located. The second branch, Irrigation Systems, Ltd., Plovdiv–South, serves the area south of the river. Small agricultural producers dominate this region. Interviews were conducted with both branch managers of the irrigation company.

The Union of Rice Producers is an organization of farmers and processors involved in the rice industry. Rice producers are among the biggest and best-organized water users in the Plovdiv region. An interview was conducted with the secretary of this union. The development of water user associations (WUAs) in the region was supported by the Ministry of Agriculture and Forestry and the World Bank. Currently, they operate under the Cooperative and Trade laws. Interviews were conducted with four representatives of WUAs. The final sample is comprised of 49 interviews. These interviews included 3 producer cooperatives, 3 large rice producers, 2 water dam tenants and 4 water user associations, while the rest are individual producers.

Drawing on Ostrom (1992), the following elements of governance structures were investigated: existing monitoring system, pricing mechanisms, management and coordination and conflict-resolution and sanction mechanisms. Water is supplied through a hierarchy by the firm Irrigation Systems, Ltd., which enjoys a state monopoly in irrigation. Currently cooperation is weakly developed at the village level. The market, in terms of trading water rights or quotas, is non-existent.

Monitoring. Before transition, the quantity of water used was measured at the main canal exits. The cooperatives were responsible for water usage on their territory and paid according to watermeter readings. During the transition, water has still been measured at the official main canal exits. However, in many places the canals are deliberately destroyed by water users, and the water flows onto their plots.

Water theft is viewed differently by the managers of the two branches of Irrigation Systems, Ltd. According to the manager of Irrigation Systems, Ltd., Plovdiv–North, stealing water is not a serious problem for the firm. Water is inexpensive and only small producers can steal water without being noticed. According to the manager interviewed, the main problems are the large water losses within the systems due to a

lack of maintenance and the stealing of irrigation equipment. These two factors pose serious threats to the water supply in his region. Water guards control the main canals; however, according to farmers and the managers of Irrigation Systems, Ltd. this protection is considered inadequate for the area they serve. According to the manager of Irrigation Systems, Ltd., Plovdiv–South, water theft is a problem that does affect water supply in his region. Though small producers are the main culprits, he says that “..They are small but many, and the monitoring is expensive... Small producers not only steal water from the firm, but they also disturb the water supply to large producers.” He also considers protecting irrigation equipment an urgent task.

The managers have different opinions because of the structure of production and the type of farms in both regions. Rice production is prominent in the northern area, and the farmers cultivate larger plots. In the southern region, most of the water users are small. Internal canal systems are rarely guarded and water is not monitored. Agricultural producers rarely participate in the monitoring process; they report thieves only if water is scarce.

Water pricing mechanism. The local branches of Irrigation Systems, Ltd. calculate average prices per cubic metre of water. The water price is determined by two factors: operation costs and area expected to be irrigated. These prices are then presented for approval to the central office of the firm in Sofia. After correction, the prices are given to the local branches. The water price is below the delivery costs, and the firm receives subsidies from the state. Because the irrigation firm is state-owned, subsidies from the state to this firm can be problematic. For large agricultural producers and water dam tenants, the water price is measured in cubic metres. For small producers, it is measured in hectares because of monitoring difficulties. Two factors determine the water price per hectare: water price per cubic metre and the watering norm of crops. The water price is doubled if an agricultural producer uses more than a certain amount above the norm. Water user associations have certain privileges, one of which are lower water prices. Generally, only a few of the interviewed complained about the water price level in 2001. It was considered high, but reasonable.

Management and coordination. Irrigation Systems, Ltd. is obliged to supply water to agricultural producers who sign a contract and pay water fees. This system causes difficulties when only small areas need to be irrigated. In this type of case per-unit water delivery costs are high, and the price is predetermined; therefore the firm incurs losses if only one producer requires water. To ease this problem, the manager of Irrigation Systems, Ltd., Plovdiv–South is trying to collect more requests before releasing water in the canals. This strategy, however, is not always possible because agricultural producers in the area grow different crops that require irrigation at different times and also have different resistance towards drought. Because of this difficulty the irrigation company avoids signing contracts with small producers.

Water–use timetables are prepared in many of the villages; however, they are often violated. After water is released into the internal canals, farmers have to protect the water that they paid for from non–eligible water users. As a result of the land restitution process some farmers own parcels of land far away from the canals whereas others are nearby. This situation has also aggravated the conflicts deriving from water access.

Conflict resolution. There are at least two types of conflicts surrounding the distribution of water. The first type – between the irrigation company and water users – concerns regularity of water supply, water tax collection, water theft and damage of irrigation equipment. The second type – among water users – concerns water distribution.

In case a conflict arises, Irrigation Systems, Ltd.'s water guards or local mayors are expected to solve it. Water guards, however, usually avoid getting involved in conflicts because they are often local people integrated into the rural society, and also because they are supposed to serve a large area. In some villages, an interviewee stated, violators do not respect the water guards and their orders. Some of the interviewees believed that only outsiders could impose effective control over water usage. In addition, they thought that the water guards' salaries should be connected with the water taxes they collect. In other villages interviewees think that the water guards' orders are obeyed and they are doing a good job.

The manager of Irrigation Systems, Ltd., Plovdiv–South avoids hiring water guards from the local population. He also complains that the law has not equipped the water guards with sufficient rights, and that this is a part of the problem. The water guards of the firm receive a fixed salary. They are dismissed from the job if water tax collection is considered too low in the area they are supposed to control.

Local mayors are provided with the necessary resources for pursuing state and some regional policies. Although solving conflicts concerning irrigation is not among their obligations, very frequently they are asked to solve conflicts because the members of the communities respect them. In such a situation, they sometimes act as mediators. However, as they also represent the state authority their role as a neutral mediator can have its problems. The social mechanisms for conflict resolution are underdeveloped. For that reason violence is a frequently applied mechanism for conflict resolution, and those farmers who are closer to the canal or have more relatives or friends in the field usually win a dispute.

Sanctioning mechanisms. Most of the interviewees did not know of anybody who had been charged for violating the rules. However, several years ago in the village of Tcalapitca, some water users were taken to court by Irrigation Systems, Ltd. for not paying for water. Unfortunately, access to information about the court decisions is restricted.

According to the manager of Irrigation Systems, Ltd., Plovdiv–South, the process of bringing violators to court is long, expensive and inefficient. First, the water guards must detect the violation, and then witnesses must certify it. Violence frequently overrides the law. Water guards can be seen armed and violators are held accountable on the spot.

Irrigation Systems, Ltd. refuses to provide water to agricultural producers who have not paid all their water fees in previous years. There are several conditions, however, that may limit the success of this strategy. First, it is difficult to exclude a violator from irrigation, especially when his plot has a favorable position in relation to the canal system. In this case, the threat of the water supplier would not be credible. Second, the threat is credible if the whole branch of the system is isolated and the other agricultural producers would not be able to irrigate. By using collective punishment the water supplier would either lose revenues and clients, or the violator would be forced to pay because of social sanctioning. However, this strategy could be successful only for small irrigation systems or in a case involving large water users.

Water resources and infrastructure for water distribution. None of the small farmers interviewed who were using water from wells or directly from a river were paying for it. Furthermore, the private wells had not been registered, as the law requires.



Irrigation Systems, Ltd. is legally responsible for the main canals. These canals are usable, but the losses in the systems are high. Additional investments are needed to reduce water losses. The resources for the investment are difficult to accumulate because revenues from the irrigation systems are insufficient. Revenue levels are low partially because of the difficulties posed by existing monitoring, conflict–resolution and sanctioning mechanisms. Furthermore there is a lack of resources because Irrigation Systems, Ltd. is a state company. The company owners (the state) have rent–seeking incentives because the deficits are covered by the state (see Section 3.2).

Currently many internal canals are the responsibility of local municipalities. However, they are supposed to transfer the rights to manage the systems, and later their full property rights, to the water user associations. Active water user associations, however, are still rare. In most of the villages where the interviews were conducted, local municipalities did not maintain the internal canal systems. Revenue levels from local businesses were low or insignificant. Financial resources from the state are not provided for the purpose of canal maintenance. Moreover, in many places the canals were destroyed, and where they were operating, the water users and (in some cases) municipalities maintained them.



The small water dams, as part of the internal irrigation systems, are also the responsibility of local municipalities. Individuals who operate fisheries in these dams rent them from local municipalities. The tenants hardly maintain the dams, because their 1– to 5–year contracts do not give them any incentive to make long–term investments. These contracts will be terminated if a water user association is created.

Land property rights. Most of the interviewees named land fragmentation one of the main reasons for irrigation problems. Large parts of the internal canal systems, which pass through privately owned plots have been destroyed. Land fragmentation also constrains the implementation of the Water User Association Law. This law requires fifty–one percent of the landowners and land users to participate in order to establish an association.

2.4 Additional Factors in the Abandonment of the Irrigation System

Several other factors also deserve attention when investigating the problem of irrigation–system abandonment. Among these factors are expectations of water shortages in the region, changes to crop structures that require less water, unfavorable market conditions and alternative water–supply sources.

Water shortage. The agricultural producers in the region did not report any water shortages. According to the manager of both branches of Irrigation Systems, Ltd., the water level in the dams has declined because of insufficient snow and rainfall. Because water demand for agriculture has also declined, the producers have not yet felt a shortage. Therefore, water shortage has not been a factor causing the abandonment of the irrigation systems in the region. With increasing agricultural production, however, it will play an important role.

Cost of pumping groundwater. The costs of drilling wells and then pumping water are considered to be higher than normal water prices according to most of the interviewees. A small water pump costs about 1 000 Leva, and the cost for drilling a well varies from 20 to 100 Leva per metre. Moreover, the water from the wells has a much lower temperature compared to canal water and may cause stress on the plants.

Only small–scale farmers used pump irrigation as a main water–supply source. Several reasons were expressed by the interviewees for using water from wells. First, when the canal system does not operate, wells are the only source of water. Second, it is more convenient for the farmers to have water whenever they need it. Third, wells provide insurance for eventual problems with the water supply from the canals.

Changes in crop structure and market conditions. The area of the Plovdiv region in which perennial crops are grown has decreased significantly from 44 000 hectares in 1988 to 35 000 hectares in 1997 (National Statistical Institute, 1999). How-

ever, the main reason for this decrease was not related to irrigation but to the privatization process. The area growing wheat has been increasing. The area covered by corn and rice, which require frequent irrigation, has decreased. Market conditions have contributed to this change as livestock numbers have decreased, leading to a decreased demand for corn feed. The instability of the water supply, however, has played even a greater role in the change in crop structure. One of the interviewed rice producers seriously considered switching to cereals because of the irregularity of the water supply.

The trends in vegetable growing are not as clear as those for cereal cropping. Tomatoes and green peppers are the main vegetable crops in the region. The area planted with tomatoes has decreased, but that cropped with green peppers has increased. The market conditions have played a decisive role in this situation. Peppers account for about 30 percent of fresh vegetable export, while tomatoes have a share of only 3 percent (Ministry of Agriculture and Forestry, 2000). Consumption is comparatively stable, consisting of about 30 kg of tomatoes and 10 kg of peppers per capita.

Most of the interviewees complained about lower prices, the instability of the agricultural product markets (especially vegetables) and the import of agricultural products. The manager of the water user association in Katunica said, "... Agricultural producers in the area make their production decisions blindly. They do not have any information in advance about what the agricultural product prices would be so that they could plan their crop structure..." The export of agricultural products has also declined, and the market has shrunk.

Because irrigation systems do not operate in some villages, people have started to grow more cereals, but less vegetables and corn (Kadievo, Chamukovi, Kochovo). These changes, along with the problems of irrigation, have contributed to declining irrigation–water use (Padarsko, Ruvevo Konare, Malo Konare). Most of the small agricultural producers do not have access to microcredit. This constrains their opportunities to develop agricultural production. The banks are unwilling to provide loans for agriculture because of the high risk involved. The lack of credit mainly affects small agricultural producers.

During the interviews, evidence was found repeatedly that a large portion of the land was abandoned. Therefore, the changes in crop structure (although a response to declining water resources from irrigation) have also contributed to declining irrigation–water use. The area that maintains crops sensitive to irrigation has decreased, and the area that does not require irrigation has increased.

3 SIMILARITIES AND DIFFERENCES WITH OTHER COUNTRIES IN TRANSITION

The following chapter is a comparison of the water–resource management in the transition agriculture of Romania, Latvia, East Germany and Bulgaria. This comparison has been made because similar problems have occurred in resource management regimes in post–socialist CEECs (Bromley, 1992: 2). It is very useful to broaden the investigation to include the situation in other transition countries. In this way a key objective of the Policy Learning Workshop – mutual learning – can be fulfilled.

In Bulgaria, Romania, Latvia and East Germany efficient management of water resources is a key factor for agricultural production. Irrigation cases in Bulgaria and Romania, a drainage case in Latvia and a hydromelioration case with drainage and irrigation facilities in East Germany are presented. Background material for this chapter was provided by the country reports elaborated as outcomes of the Bulgarian 'Study Tour' in March 2002 by Peteris Busmanis and Aija Zobena (Latvia), Christian Schleyer (Germany) and Iuliana Ionel (Romania).

The comparison follows the analytical framework identifying the following key determinants in the analysis of agro–environmental institutions:

- properties of transactions related to nature,
- characteristics of actors,
- property rights to natural components,
- overnance structures for environmental coordination.

The institutional arrangements that arise are the result of two main driving forces. These forces are the features and implications of the transactions related to nature and the characteristics of the actors involved. The resulting changes in institutional arrangements affect the design and distribution of property rights on nature components. Likewise, such changes in property rights are accompanied by corresponding changes in governance structures (Hagedorn et al., 2002: 4–6).

Key features of this framework were selected for comparison in order to exemplify similarities and differences of the institutions of water–resource management. Many similarities were found especially in the governance structures of water management in Bulgaria and Romania. The comparison was restricted to certain main criteria, which were elaborated during the Bulgarian Study Tour:

- properties of transactions: technological conditions;
- characteristics of actors: environmental concerns;
- property rights to natural components: property rights on land, formal property rights on drainage and irrigation infrastructure;

- governance structures: state monopoly of water supply, effectiveness of water user associations, operation and maintenance.

In addition we compared the state of the agricultural product markets.

3.1 Properties of Transactions: Technological Conditions

In the following paragraphs general issues applying to technological conditions in the case–study areas are summarized.

The information about water management in Romania applies to the national level. On average the climatic and soil conditions make irrigation a precondition for successful agricultural production.

In Latvia two municipalities were analysed, one in the central part and the other in the western part of the country. Both regions represent average soil fertility with abandoned land having shares of 16 percent and 19 percent. Latvian soils suffer from excess water. The average precipitation in Latvia is 700 mm, but evapotranspiration is only 450 mm. Therefore, drainage is an important precondition for agricultural use of the land. Drained land makes up 60 percent of the total agricultural land in Latvia.

The “Schraden” is a low moor region in East Germany with a long history of hydromelioration activities. In the 1960s and 1970s the main objective was to intensify agricultural production. Large drainage systems equipped with weirs were built to optimize groundwater level. The drastically lowered water level and longstanding intensive farming of this meliorated low moor have led to an increased, and mostly irreversible, degradation of soil. The visible consequences are drought periods in the summer and waterlogged plots in the spring.

Properties of transactions related to nature depend on the physical properties and material transformations of natural resources and infrastructure characteristics (including available technologies). Agro–environmental transactions in the observed case studies include, for example:

- increasing salt concentrations on groundwater–irrigated land in Bulgaria;
- agrochemical run–off from flood irrigation in Romania;
- acidification of soils as a result of land abandonment and deteriorating drainage infrastructure in Latvia.

Typical for the transactions under review are the inability to exclude free riders and the high degree of uncertainty about the effects of certain actions. The technological conditions represent one characteristic in water–resource transactions. In contrast to Bulgaria, the irrigation system in Romania is based to a larger extent on pumping water. For this reason irrigation is much more costly. Similar to Bulgaria, the infra-

structure is old and obsolete, partially destroyed or missing. In both countries the infrastructure needs large investments to be improved. Also the drainage infrastructure in Latvia and the machinery of the polder stations need to be renovated.

3.2 Characteristics of Actors: Behavioral and Environmental Concerns

Actors involved in transactions have different capacities and interests to claim rights on natural resources. During the transformation process asymmetric power relations have emerged among different actors. Certain individuals use their power to maintain their opportunistic strategies and, consequently, they do not agree to any further rule change. For example, water appropriation rules in place are deliberately misused by a few powerful actors to make profit (Theesfeld, 2002b:14). Local power abuse is a behavioural attribute typical of actors in the transformation process. There are strong incentives for government officials to use their power to serve their own interests. Numerous key positions, including mayoral and other municipality posts, offer opportunities to gain advantage.

Corruption is a common power strategy occurring quite frequently concerning irrigation systems because irrigation institutions create many such opportunities. One form of corruption in the irrigation sector is withholding the delivery of water from those entitled to it in order to receive illegal payments on the side (of money, commodities or special favours). Bribes can be paid to ensure water in the canal is delivered on time. Many opportunities for corruption are offered in the manner the water price is calculated and collected, as sources of information on water prices and water availability are very limited for the water users. Actors differ in their values, interests and resources to exert influence. Also, groups of individuals (like communities) use networks to shape institutions according to their objectives (Hagedorn et al., 2002: 5).

In the Schraden case, interests supporting nature conservation appear and call for land use that is better adapted to the habitat. Some stakeholder groups create conflicts over priorities with agricultural producers.

Most local actor groups feel that drained–landscape changes and land abandonment do not have a positive impact on biodiversity, though environmental concerns are rarely expressed by local actors. So far, in Bulgaria no environmentally concerned stakeholder group has called for proper irrigation management to reduce the risk of either soil salinization or decreasing groundwater levels. Similarly, in Latvia the environmental impact from badly maintained drainage systems is less severe and hardly any local actor group regards drainage maintenance important for environmental protection. Especially in Romania and Bulgaria, economic pressures on small– and medium–sized farms (plus the lack of alternative income sources) force farmers to pursue short–term profits instead of investing in environmentally

friendly practices. This behaviour is supported by a lack of support and incentives for environmentally friendly farming, as well as the lack of human capital (education, expertise) and constrained access to information.

3.3 Property Rights on Nature Components

Property rights on natural components determine the distribution of cost and benefit streams originating from the use of a natural resource. This approach is often misunderstood as an approach explaining the definition and distribution of disposition rights focusing on physical entities, i.e. material goods. However, property rights refer to bundles of rights and duties, as different entities may enjoy different rights and obligations for different components of a resource (Hagedorn et al., 2002: 13; for further discussion see Sikor, 2002: 11).

Property rights on land. Land fragmentation is judged to be one of the main reasons for the problems in the irrigation sector. The fragmentation is a consequence of the restitution of land to historical owners and the dominance of smallholdings in the pre-collectivized land ownership structure. In East Germany, Romania and Latvia the extensive systems of channels, ditches and water regulation facilities were designed to serve large production units (cooperatives and state farms). Now, after the land restitution processes, the infrastructure does not meet the needs of the large number of small landowners.

The transformation process reveals a heterogeneous agricultural production with requirements that vary by farm size and location (top-end or tail-end plots), cropping structure, production know-how and economic performance (Theesfeld, 2001). Almost all new owners in the Schraden case decided to lease their land to the new, restructured and reorganized agricultural firms. As a result, about 10 000 ha of agricultural land is currently farmed by 13 farming enterprises. In contrast, in Romania the new private landowners largely decided to stay out of cooperative production. Therefore, the individual private household or family farm became the predominant type of farming. There are 3.9 million farms with an average size of 2.3 hectares estimated in Romania compared to the previous 5 000 cooperative farms. This fragmentation applies to Latvia as well. In addition, Latvia's comparatively settled formal land property rights do not create any advantages for solving problems related to drainage, drainage restoration and maintenance.

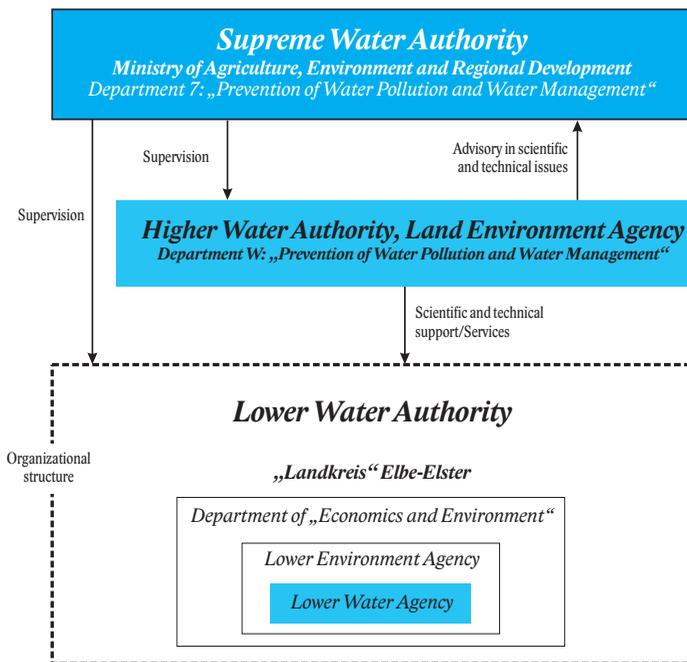
Formal property rights on drainage and irrigation systems. Bulgaria, Romania and East Germany are similar in that the irrigation sectors started to be reorganized in the late 1990s (in East Germany in 1994), after the land restitution process had been in progress for years. This led to legal uncertainties concerning the ownership of the large internal canal system. Compared to the other three cases, Latvia had less legislative uncertainty regarding responsibilities over the drainage infrastructure, as land privatization started in 1991 together with the reforms of the drainage systems.

In Bulgaria and Romania, the state firms are responsible for distributing water to agricultural land. However, their responsibility is limited to the main canals. The distribution within the internal canal system is the responsibility of the municipalities, the former cooperative farms or the small private farmers. In addition, currently there is no clearly designated authority in Romania for the distribution of water beyond the main canal system. The state firm has neither the necessary means nor interest to take measures to protect against the high water losses caused by often deliberately broken internal canals and water theft. Water distribution within the internal canals is rarely monitored. These outcomes in both countries are caused by the fact that the state firm is financed by socially acceptable water charges paid by the farmers, as well as by substantial state subsidies. The price of water is controlled by the state and the charged fee does not correlate to the costs of irrigation–water management. The water price in most cases is not calculated based on the actual amount of water reaching the plot.

In the East German Schraden Region, no substantial implementation took place of new rules and structures for the water management and planning system at the administrative levels until 1992. At that time the Water Management Directorate (WMD) ‘Oder Havel’ was dissolved. In Brandenburg, only those tasks for which the Water Management Directorates and the ‘Kreise’ had been responsible were safeguarded by the ‘Land Environment Agency’. This agency operated like a successor in interest to the WMD. In 1994, the Brandenburg Water Act established a new administrative structure, which basically follows the example of the old ‘Länder’, putting emphasis on self–government on the communal level. Figure 5 gives a brief overview of the different administrative layers of Water Authorities and Water Agencies in Brandenburg in relation to the ‘Landkreis Elbe–Elster’ after 1994 (Schleyer, 2002).

Water User Associations. In Bulgaria and Romania the World Bank supported projects to establish Water User Associations (WUA). Direct management and administration of the infrastructure by landowners and users represent forms of self–governance. The objective is that these associations receive the usage rights of the canal systems. They represent collective action solutions to ensure sustainable resource use. Bulgaria enforced the Water User Association Act in 2001, and Romania enforced the Government Ordinance in 2000. Both legal acts build the legislative framework for the WUAs, among other issues, and regulate the establishment and registration procedures and the ownership transfer of the irrigation infrastructure from the state firm to the associations. Many WUAs were founded on paper, but in practice only a small number of these WUAs in Bulgaria and Romania are actively functioning at the local level (Theesfeld, 2002a: 174). In Latvia cooperation between farmers and landowners is insufficient for the maintenance of public drainage systems.

Figure 5: Water Authorities and Water Agencies Operating in the Schraden



Source: Schleyer (2002: 11)

In East Germany, the new Water Act of 1994 formally attributed the duties to maintain and clean the large network of small ditches to semi-state water associations. This was done to ensure the necessary water run-off and hence to avoid damage by floods or high groundwater tables. This current administrative structure puts more emphasis on self-governing and self-organization. The associations were founded all over the country and their structure followed the West German model (Schleyer, 2002). Unlike in Bulgaria and Romania, membership is compulsory for municipalities and for those landowners not subject to rates. Effectively, the tenant pays the membership fee, which only corresponds to the size of the land, as an implicit part of the rent. These revenues, however, are not supplemented by state subsidies and cover only a part of the maintenance costs of the weirs. Since most of these weirs are now legally owned by the respective landowner, the water association must get permission from them before beginning any activity. Due to their limited statutory rights in conjunction with their small financial resources, the present water associa-

tions do not appear to be an adequate substitute for the pre–1989 melioration cooperatives.

Operation and maintenance. Due to the small size of the plots and the interconnectedness of the canal system, maintaining small parts of the system would only make sense if all farmers along a canal would cooperate and share the responsibilities. Certain transactions, such as avoiding the cleaning of canals or simply irrigating a plot, always impose positive or negative external effects for neighbouring farmers, such as flooding fields or nutrient run–off. Moreover, free–riding occurs quite frequently in irrigation systems. According to Ostrom (1992: 32–33), free–riding is defined as investing time in private activities while others are investing in joint activities (such as canal maintenance) that increase the supply of water over time to all users.

A new water act was enforced in 1994 in East Germany and at the end of the 1990s in Bulgaria. In both cases, the new law did not fully solve the problem of unclear rights and duties for the maintenance and operation of the melioration system. The long–term legal insecurities, the fragmented land ownership structure and a large number of short–term leasehold contracts certainly reduced the incentives for most farmers to maintain or to invest in facilities. More than ten years of transformation worsened the situation, resulting in the deterioration of the major parts of the water management facilities that are now operating in an uncoordinated or even unauthorized manner.

Figure 6: Overgrown Internal Canal



The same applies to Romania, where the overall performance of the irrigation sector has substantially declined. Due to reduced maintenance the schemes have steadily degraded. In the Latvian drainage case the network problem also matters, as the land–ownership borders were set according to the former land borders and did not take into account the borders of hydrological watershed and drainage systems. This has created an interdependence among neighbouring farmers in the maintenance of drainage systems.

3.5 Agricultural Product Markets

In Bulgaria, Romania and Latvia the agricultural product markets are a major concern, particularly regarding the lack of market infrastructure. At the start of the marketing chain there are insufficient or uncompetitive transport and storage capacities. Other insufficiencies are the poorly organized commodity markets and badly developed price information systems. All this leads to high levels of planning insecurity when crop decisions have to be taken, i.e. during planting season. Therefore, many farmers, and especially the larger agricultural producers (tenants and cooperative farms), stay away from intensively irrigated crops, as these require more labour and capital. This is one reason that has led to the decline in irrigated agricultural area and the deterioration of the irrigation system.

The causal connections concerning declining markets and insufficient market infrastructure on irrigated land (and vice versa) are still being debated among scientists (Penov, 2002: 15). These causalities also apply for the drainage infrastructure in Latvia. Underdeveloped agricultural product markets lead to land abandonment, which in turn leads to the deterioration of drainage infrastructure. In East Germany the uncertainties that farmers faced because of a lack of information about the agricultural product markets were solved more quickly than in other Eastern European countries. Market information systems were transferred from West Germany to East Germany, and the breakdown of former market relations with the Soviet Union was mitigated by EU payments in the framework of the Common Agricultural Policy (CAP).

In summary, various similarities were identified among the water resource management practices in Romania, Latvia, East Germany and Bulgaria. The reforms of property rights on land (especially the resulting large degree of land fragmentation) have created problems for the irrigation and drainage infrastructure, which was formerly built to serve large production units. Property rights to the infrastructure, particularly the distribution of duties and responsibilities, are unclear and lead to maintenance and operation problems. Several water user associations were formally established in an attempt to create more self–organization at the local level. However, a discrepancy between the formal legislation and the effectiveness on the ground can be identified in all the compared cases. Likewise, the conditions of the agricultural product markets affect the situation in the irrigation and drainage sector.

Compared to Bulgaria, differing features were found regarding the technological conditions and the characteristics of the actors involved. In Romania the technological condition of the irrigation infrastructure relies to a larger extent on pumping facilities. At present, only in East Germany have actors with environmental concerns emerged. Several additional aspects influence the institutional change in water resource management, such as the power asymmetries of local actors, opportunistic behaviour and the implication of EU accession. These require further discussion.

4 OVERVIEW OF PROBLEM ANALYSIS

During the day devoted to discussion the participants of the Policy Learning Workshop carried out a problem analysis by dividing the wide range of problems into four categories. Each category refers to problematic circumstances concerning the building of institutions for sustainable irrigation management. See Table 2 for this problem analysis.

Table 2: Problem Analysis

Problem Categories	Features
Framing Conditions	<ul style="list-style-type: none"> • Deficits of the overall legal system. • Instability of formal rules. • Instability of the state enforcement mechanism.
Impact of Transitions	<ul style="list-style-type: none"> • Dual farm structure: large commercial farms and small subsistence farms. • Land abandonment. • Land fragmentation. • Deteriorated irrigation facilities, large amounts of water loss, declining water demand. • Unclear agricultural policies. • Destruction of the existing coordination mechanisms before alternative options emerge. • Original design of technological infrastructure adapted to the needs of large cooperatives. • Former territorial units too large for effective cooperation, decision-making or monitoring under the new conditions. • Lack of agricultural advisory service.
Resource Characteristics	<ul style="list-style-type: none"> • Low degree of excludability. • High degree of rivalry. • Irrigation infrastructure characteristics. • Specificity of assets (site and capital). • Interdependence between water suppliers and users. • High fixed costs.
Actor Characteristics	<ul style="list-style-type: none"> • Small farmers – subsistence farming (short planning horizon). • Large farmers – profit maximization (strong bargaining position). • Producer cooperatives – many under unfavourable financial conditions. • Irrigation company – local state-controlled monopoly. • Local municipalities and mayors – reputation, local interest representation and organizational capacity. • Negative association matching collective action with socialism. • Negative association matching the current way of doing business with individualism. • Rural poverty – inability of poor farmers to pay for water. • Mistrust among actors.

<p>Property Rights</p>	<ul style="list-style-type: none"> • Water resources – laws limited in effectiveness at local level. • Main canal systems – rights partially exercised. • Internal canal systems – rights not exercised. • Land – rights partially exercised.
<p>Governance Structure</p>	<ul style="list-style-type: none"> • State-owned irrigation company – Initial steps made to change water supply rules, but policy limited to the creation of WUAs. (System lacking organized farmer participation and their right to participate in decision-making). • Monitoring systems – Somewhat developed for the main canals, but absent from the internal canals; water users unwilling to participate in the monitoring process; theft of water and irrigation equipment. • Water prices – Water prices fixed regardless of plot position and size; small producers charged per hectare, large farms per cubic metre; no clear relation between water price and canal maintenance. • Contracts with irrigation company and water use timetables – <ul style="list-style-type: none"> – Contracts not binding; violations of water-use timetables; insufficient communication between the irrigation company and water users. • Conflicts between many actors – Conflicts between farmers and irrigation company over water supply regularity; clashes among small farmers clash and with large farmers over water distribution. • Nearly non-existent conflict resolution and social mechanisms – <ul style="list-style-type: none"> – Water guards and the local mayors expected to solve problems. • Weakly developed and informal sanctioning mechanisms – Formal sanction mechanisms seem to work only in the case of large water users, not small users.
<p>Additional Factors</p>	<ul style="list-style-type: none"> • Instability of agricultural product prices. • Lack of financial services for agricultural producers (e. g. Microcredit schemes). • No significant water shortage. • Pumping costs higher than canal-water prices.

5 OPTIONS FOR SUSTAINABLE IRRIGATION INSTITUTIONS

In the previous sections the factors that have driven the abandonment of irrigation systems in Bulgaria were investigated. It was found that, among other factors, existing institutional settings have contributed to this process. Also at the root of these problems are:

- the monitoring system,
- conflict resolution and sanctioning mechanisms,
- cooperation among agricultural producers,
- formal sanctioning mechanisms,
- land fragmentation,
- the liquidation of former cooperatives.

In addition to the institutional issues, the instability of agricultural product prices and low farm income levels has also contributed to the abandonment of the irrigation systems.

The main objective of the institutional changes is to adapt the irrigation system's operation and infrastructure to the economic, ecological and social conditions of the area. Another main objective is to stimulate improvement in water usage, water allocation efficiency and equity by giving adequate incentives. In the following subsection, we aim at developing institutional options for the sustainable management of irrigation systems in the Plovdiv region. These options are based on the research carried out by the authors and the exchange of knowledge and expertise among the participants of the Policy Learning Workshop.

5.1 Actors' Characteristics

Four types of actors are involved in irrigation in Bulgaria: small producers, large producers, the irrigation company and local municipalities.

Small agricultural producers have knowledge of the local irrigation systems but insufficient organizational skills. In addition, many of them are either in or close to retirement. They are typically risk averse and invest limited resources in agricultural activities; thus their benefits and losses from irrigation are not significant. For many of them, however, agriculture is an important income-generating activity. The small farmers cooperate in order to organize the irrigation process. However, the cooperation occurs on a small scale and is locally isolated. In addition, because they cultivate small plots, the revenues the water suppliers receive from individual producers are negligible. In their opinion, the irrigation company does not care about their interests. Therefore, the actors within the small agricultural producer group have the following main characteristics:

- a short planning horizon,
- insufficient trust towards water suppliers and other water users,
- lack of organizational capabilities,
- limited resources,
- a weak bargaining position.

Large producers have better organizational skills. Many of them also have knowledge about the local irrigation systems. They invest considerable resources in agricultural activities and therefore their eventual losses and benefits from irrigation are substantial. Because they cultivate large plots, the revenue that the irrigation company receives from an individual farmer is considerable. Some of them do not live in the villages, but rent land. Therefore, the main characteristics of the large farmers (compared to small producers) are: better financial resources and organizational capacity, as well as a stronger bargaining position.

The irrigation company has organized the water supply in the areas for many years. The specialists working in the firm have organizational skills and because of their established business and political contacts they are well-informed about new laws, prices and policies. The knowledge of the firm's specialists concerning irrigation infrastructure is indispensable. Often, the only way water can reach the fields is through canals controlled by the company. The company tries to provide reliable water supply to the large farmers, but believes that the small farmers would steal

Figure 7: The Practice of Gravity Irrigation



water, if the company did not monitor them. Therefore, the main characteristics of this actor (the irrigation company) are:

- technical skills,
- access to information,
- established networks,
- organizational capacity,
- strong bargaining position,
- lack of trust towards small farmers.

Local municipalities have knowledge about the local irrigation systems and they have appropriate organizational skills. They are not directly affected by the irrigation problems but are directly involved in water distribution issues. For instance, they manage small water dams and receive revenue from tenants involved in fishery at the dams. By doing so the tenants of the water dam cause downstream problems with water availability, especially in the summer period when conflicts arise over water use for fishery and for irrigation. In some villages, the mayors play an important role in assembling and coordinating activities with respect to irrigation. Therefore, the main characteristics of this actor (local municipalities) are:

- organizational capacity,
- reputation,
- access to information,
- leadership ability for local action (depending on his/her personality).

5.2 Policies Affecting Institutional Options

The choice of institutional options is closely related to the existing farming systems and the type of farms that predominate in the region. The current land and agricultural income policy influence these two determinants. The options are also directly influenced by the state irrigation policy.

The Bulgarian irrigation policy is outlined several documents: the “Strategy for development of irrigation in Bulgaria under the conditions of a market economy” (Petkov et al., 2000), the Water Law, the Water User Association Law and the Executive Hydromelioration Agency Structural Rules.

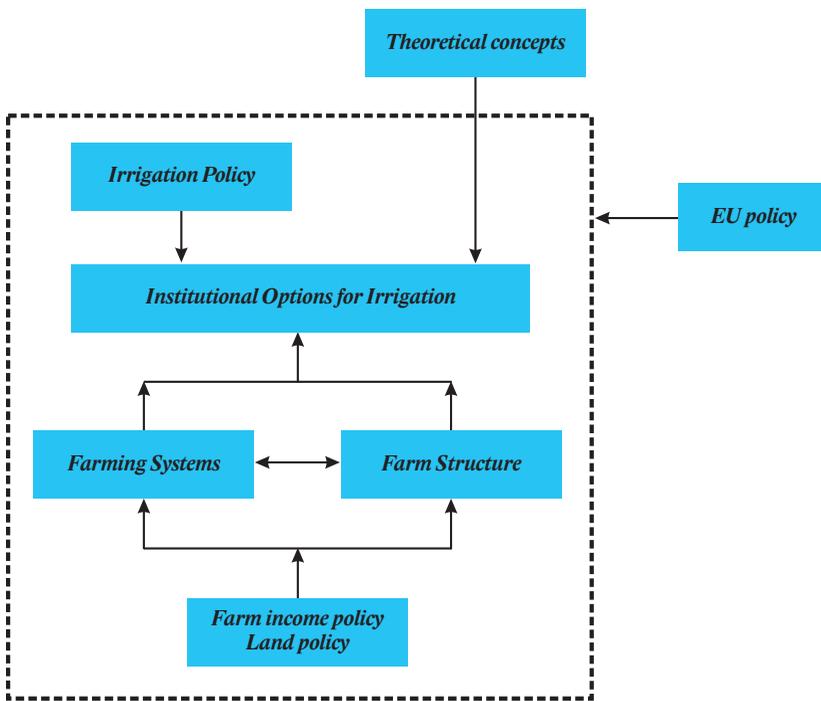
The main goals of the “Strategy for development of irrigation in Bulgaria under the conditions of a market economy” are the restructuring and adaptation of ownership, management and usage of hydromelioration infrastructure to market conditions and private land ownership. The restructuring is based on several principles. Some of them are:

- involvement of agricultural producers into irrigation system management through water user associations;
- privatization of the water infrastructure;

- decentralization and de-monopolization;
- sustainable water management.

The reform's intended duration is 20 years and consists of three stages. The main goal of the first stage (1999 – 2006) is to set the administrative, institutional and legal preconditions for development of irrigation. The main goal of the second stage (2007 – 2012) is to create conditions for improving irrigation-system efficiency and developing an information system for water management. The main target of the third stage (2013 – 2020) is to stabilize the results of the reform.

Figure 8: Factors Influencing Institutional Choice



The Bulgarian Water Law was designed in accordance with the strategy outlined above. It introduces water management at the river-basin level and promotes participation of non-governmental organizations. The law specifies the property rights for water usage from water resources and infrastructure and also outlines the mechanisms for coordination of the different actors involved. The water law anticipates the establishment of water user associations and specifies their main rights and duties.

The main elements of the Water User Association Act are: (1) transferring ownership of internal canal systems from the state to agricultural producers; and (2) changing the direction of the decision-making process from top-down to bottom-up. In other words, the intention is to have the decisions made by the actors who are most affected by them – namely, agricultural producers. An association of water users can be established by at least 51 percent of the landowners or users who own or cultivate more than 51 percent of the land on the territory. In addition, only one WUA can be created on territory that is served by a technologically isolated irrigation system. These provisions of the law, however, are difficult to achieve, considering: (1) the land fragmentation that predominates in almost all regions of Bulgaria and (2) many of the landowners do not live in the villages.

The legislation also anticipates the full coverage of the investment and operation cost regarding irrigation by WUAs. In this respect, two types of water charges are foreseen: fixed charge per hectare of irrigated land to recover investment and variable fees for covering operation and maintenance cost. However, the state is involved in investment and maintenance of the irrigation equipment. Fund “melioration” has been created in order to facilitate investing in irrigation with resources from the state budget. Presently, the resources from this fund are used mainly for maintenance and reconstruction of the existing irrigation systems and also for the completion of already initiated projects. The state also intends to support investments on the territory of the newly established WUA. According to the Act of financial support of WUAs (State Gazette, 2002) the state can pay for up to 80 percent of the investments in irrigation infrastructure.

In summary, the Bulgarian irrigation policy is oriented towards devolving irrigation system management and property rights to the water users. The policy offers one organizational form, i.e. water user association. The law's requirements concerning the number of landowners needed to initiate the WUA establishment process are difficult to meet. In addition, only a few people can read and understand the law or even know about the new law. Therefore, there is a considerable discrepancy between legal texts and practice. In light of this, short-term support in the form of agricultural advisory and extension services and long-term support through investments in the agricultural training and education system are needed.

The Bulgarian land policy. The Bulgarian land policy aims at consolidating and enlarging land parcels. At present there are four policy instruments used or intended in this respect. The Land Law imposes restrictions on plot size. The minimum plot sizes (in hectares) are 0.3 for arable land, 0.2 for meadows and 0.1 for orchards. This policy, while partially solving the problem of land fragmentation, also creates new problems. Plots below these sizes are categorized as having group ownership and no single inheritor can make decisions about the plot independently. This eventually will hinder the evolution of the land market.

The bill for the Land Consolidation Law was prepared in 2001. According to this bill, the state organizes land consolidation with the presumption of voluntary participation and equal treatment of landowners. The process of land consolidation could be initiated upon the request of:

- fifty percent of land owners in the area or landowners who possess two-thirds of the land to be consolidated;
- tenant farmers that cultivate more than two-thirds of the land with the written agreement of the landowners.

In order to accelerate the process of land consolidation a tax was also proposed (10 to 300 Leva per hectare) for arable land that is not being cultivated.

The Land Consolidation Law, if passed by parliament, would have a marginal impact on land fragmentation in Bulgaria. The requirement concerning the number of landowners or land users who can initiate the consolidation process is difficult to meet. Also, complete land consolidation is possible only in a limited number of areas. Even if consolidation were implemented in the very near future, Bulgarian agriculture would still face the same problem because of inheritance laws and traditions. In addition, the reform may be welcomed by people directly involved in agricultural production, but may be resisted by the landowners, who are in the majority now. Therefore, the political party that attempts to implement the Land Consolidation Law is likely to lose a considerable number of votes.

The “Agriculture” state fund provides a guarantee for agricultural producers who want to purchase land. The guarantee is worth up to 135 000 Leva for a period of 5 years. The banks are supposed to provide credit from their own resources and according to their rules. The “Agriculture” fund guarantees the credits, but requires the land and additional assets to be used as collateral amounting to 130 percent of the loan value. Considering the de-capitalization of agriculture and villages in Bulgaria, this requirement could be achieved only by a limited number of people. Therefore, this program will have only a marginal impact on the land market.

The Ministry of Agriculture and Forestry supports a website with information on the land market in Bulgaria. On this website agricultural producers who want to sell, buy, or rent land can publish announcements. It is also possible to obtain information about the land price in different regions. The reported land prices in some regions, however, are unreasonably high, which suggests that the land has not been purchased for agricultural production.

In summary, Bulgarian land policy aims at enlarging land parcels. The attempts have been made in two ways: (1) development of land market and (2) land consolidation through law. Although land restitution has already been completed, expectations that the land market will operate better in the near future are not very high. A law that can initiate an effective land consolidation process is not likely to be voted

on soon by parliament. Therefore, the land fragmentation problem is likely to persist at least in near future.

The Bulgarian farm–income policy. The Bulgarian farm–income policy officially supports medium–sized family farms. In this respect, several programs were initiated. The Law for Protection of Agricultural Production was passed by parliament in 1995. This law was supposed to regulate agricultural production and markets through the following policy instruments:

- production subsidies per hectare;
- credit subsidies for investments;
- export subsidies and subsidies for up–lands;
- protective prices for the main agricultural commodities.

The law established the “Agriculture” state fund as a special tool for policy implementation. Most of these measures have never been fully implemented due to a lack of financial resources and the priority given to support consumers.

The Law for Supporting Agricultural Producers was implemented in 1998, and the law of 1995 was abolished. This law intended to support individuals, as well as organizations of agricultural producers. It established the National Advisory Bureau for Agriculture and reformulated the goals and instruments of the “Agriculture” state fund. According to this law, the main agricultural policy instruments are: (1) production subsidies, (2) credits, (3) interest rate subsidies and (4) credit guarantees. The direct price–support programs were abandoned (Ministry of Agriculture and Forestry, 2000). Regardless of the legislation's good intentions, the credit market for agricultural producers is not yet well developed and most credit options are not accessible to small farmers.

In summary, the official policy concerning creation and support of economically viable medium–sized family farms has had limited success. Some of the limiting factors have been:

- the programmes were not sufficiently backed up with the necessary financial resources;
- the lower profitability of agricultural production.

Mainly large farmers can benefit from the available programmes. Therefore, the dual farm structure of Bulgarian agriculture is likely to persist for a long time.

The Bulgarian Water Law. The Bulgarian Water Law has been designed according to EU legislation and also with World Bank support. The same applies to the Water User Association Law. Therefore, there is a close match between the national and EU policies in this respect. Investment in irrigation systems is supported by the sixth measure of the SAPARD programme (Water Resource Management). The programme supports:

- reconstruction and modernization of the existing canal systems;

- drainage, river beds corrections, building and renovation of ditches and forestation for protection along rivers;
- completion of water dams and the attached hydromelioration systems.

Recipients under this programme can also be state organizations. The programme does not support on-farm investments in irrigation.

The fifth measure of the SAPARD programme stimulates the development of agricultural producer organizations. Although this measure is not especially designed to support organizations of water users, it stimulates joint actions and cooperation among agricultural producers.

In summary, the Bulgarian state policies on land, farm income and irrigation policy are consistent. Land policy aims at the enlargement of cultivated plots. Farm-income policy aims at creating economically viable medium-sized family farms. Such farmers will eventually have longer planning horizons and a greater incentive to optimize inputs (including water) compared with subsistence and aged agricultural producers. In this situation the irrigation policy favours the establishment of WUAs. The problem is that the number of medium-sized family farms is still very small, and it is not likely to increase in near future. Large producers can organize water supply individually in an efficient way and eventually they will have no incentive to initiate the process of establishing WUAs. Therefore, the WUA currently is not likely to lead to the satisfactory solution of the irrigation problems in Bulgaria. Moreover, it is necessary to rebuild and strengthen social and human capital, which are necessary for collective action.

5.3 Description of Selected Institutional Options

The participants of the Policy Learning Workshop in Plovdiv, Bulgaria identified and discussed four institutional options for solving irrigation water problems:

Option 1: Farmers participate in the decision-making process of Irrigation Systems Ltd. Under this option farmers' representatives are included in the decision-making process for water allocation and investment by the irrigation company. This option is a response to the local monopoly problem. It requires changes in the governance structure, particularly the rules of water supply. Depending on the rights and duties granted to the representatives, it might require changes in property rights on the main canals.

Option 2: Local municipalities organize irrigation water supply. Under this option the local municipalities organize the irrigation water supply on their territory. This option is a reaction to the inadequate local coordination through the hierarchy and requires changes in the property rights on the secondary canals and increased rights and duties attributed to the local municipalities. Under this option, the agri-

cultural producers are indirectly involved in the decision-making process (through the political process).

Option 3: Non-governmental organizations (shareholding companies, small water user groups and water user associations) provide irrigation water. Under this option the Water User Associations were discussed. Associations of water users are frequently recommended as forms of self-governance organizations. Under this option farmers cooperate in order to operate a large, distinct part of the irrigation infrastructure. According to Ostrom (1992) this form provides an opportunity for sustainable water management. The conflict would be almost fully internalized and, provided that the rights and duties are clearly identified, the water users would develop mechanisms for conflict resolution.

Option 4: Joint management. This option suggests that the firm Irrigation Systems, Ltd. and potential Water User Associations collaborate in the management of irrigation water.

6 DISCUSSION AND EVALUATION OF INSTITUTIONAL OPTIONS

During the discussions it became obvious that the problems with irrigation agriculture are more complex than merely declining water use or destroyed irrigation infrastructure. The problems are multi-faceted, and the re-organization of the institutional and technological irrigation infrastructure itself is only one component of the complexity. These problems are embedded in larger-scale contexts.

Each of the problems discussed has a different weight based on the socio-cultural and economic environments of the villages in which they can be observed. In general, it seemed to be easier to establish networks of trust and collaboration in areas where people do not need to worry about basic survival strategies. It was commonly agreed that the crucial problems of irrigation-water management in the region were related to issues of integrated rural development. Problems related to the re-organization of water distribution were perceived to be less of a limiting factor compared with rural development problems such as rural poverty, lack of education and access to information, as well as other issues like a less reliable legal system, rent-seeking activities and corruption.

From the perspective of several stakeholders it was made clear that organizational problems of water management are only one task to be solved. From different stakeholders it was emphasized that clear rules, strict controls, laws and monitoring would essentially improve the entire confusion and dispute surrounding the water management problem. This idea seems to be closely related to the peoples' mental models, which show a strong affinity towards patterns of control and command. The government has tried to cope with increasing complexity by increasing control and order. Commissions and agencies have been established to supervise irrigation activities. However, these mechanisms clearly do not work any longer in the period of transition.

The behaviour of farmers, which partly is a result of such unfavourable starting positions, was often viewed by the irrigation company or the Ministry of Agriculture, as lacking motivation and interest to change things. It remains unclear which incentives are needed to motivate the farmers. Few ideas were presented about what could motivate farmers towards institutional change and what could be the entry point for such innovation. Solutions, which are of immediate interest for farmers, were not suggested. This suggests that being able to design institutional alternatives is more relevant than the institutional design itself. However, among the more powerful actors (e.g. the Irrigation Systems, Ltd. or local municipality) there seemed to be consensus that the poorest farmers needed pressure to fulfill their duties connected to the water supply (e.g. paying for water).

The small and poor agricultural producers were perceived by all actors as the problematic group, although for different reasons. Other actors (Ministry of Agriculture, Irrigation Systems, Ltd., municipalities) very often took a patronistic attitude towards the problems of poor farmers. The Ministry of Agriculture's attitude towards these farmers was one of good will and readiness to support. However, the farmers were required to inform the Ministry of Agriculture about knowledge gaps and other problems. The usual procedure suggested by the representatives of the Ministry of Agriculture was to ask the farmers to write a letter to the Ministry of Agriculture requesting support. In contrast, the mayor of one municipality acted as if he knew best what the farmers needed most. He explained that they wouldn't have to think about WUAs because they could not come up with the initial investments necessary to run a WUA. In addition, the farmers were described as being disinterested because they did not attend a meeting that the mayor scheduled in order to discuss WUA establishment with the farmers. Unfortunately the meeting was held during their work time.

Despite the willingness of the Ministry of Agriculture to help solve farmers' problems and inform them about the new WUA law, none of the actors (including the farmers) complained about lacking an agricultural advisory service. Access to information and training obviously was a problem, but it was not recognized as one because there has never been such a service. There have also been no mediating non-governmental organizations or branches of farmers' organizations that would be able to represent the farmers' interests. An intermediate level of communication has been completely absent.

The status quo regarding the opportunities and constraints for institutional innovation is an unfortunate situation. The driving forces towards institutional change have been hindered by several factors, such as interests to preserve the positions of various actors. Institutional change has occurred at the legislative level but has not reached the operational level because of the following:

- a lack in communication,
- limited access/provision of information,
- lack of experience with successful models of cooperation,
- a strong belief in law and order and other mental models,
- rural poverty,
- continuity of positions held by influential people with good business contacts and networks.

Irrigation System Ltd. and the Ministry of Agriculture have different visions of how the future could look. From the viewpoint of Irrigation Systems, Ltd., a good solution would be joint stock companies. All farmers would buy a share of the company and receive water based on contractual relations to the company. The Ministry of Agriculture in turn promotes WUAs. Both parties have good arguments for their proposals, however both would require the collaboration of the diverse agricultural

producers. Neither vision is based on experience with such organizational forms because they are new to the country.

The Ministry of Agriculture is especially aware of the fact that a law for WUA will not guarantee the successful establishment and operation of a WUA, and experience with bottom–up approaches is necessary. Participatory approaches are required in the selection of new institutions for sustainable water management. The state was viewed as having an important role during transition towards sustainability. State involvement is needed in order to set the preconditions for self–governance, especially for societies in which the state played an important role in the past.

Without social cohesion among farmers and lacking sufficient access to information, farmers are prevented from acting in their own interest. This was regarded as a big problem, especially in poor villages. Aging rural populations and the outmigration of younger generations add to these problems. Those who stay in agriculture are often elderly and lack a professional education.

7 EVALUATION OF INSTITUTIONAL OPTIONS FOR SUSTAINABLE IRRIGATION AGRICULTURE

The expert–participants of the Policy Learning Workshop suggested that it was probably too costly to irrigate marginal areas in the future, and that the size of the area under irrigation would never reach its pre–1990 level. Proposals were discussed for different organizational and institutional forms that would manage irrigation systems and water distribution. All the proposed options, including joint solutions, could probably address most problems if they were well designed, showed sufficient levels of participation and fairly distributed costs and benefits.

The options with most chance of success are those that address the most urgent social and rural–development problems. Presently, such options would not be feasible without state involvement. Of course, this requires a “strong state” not dominated by rent seekers, suggesting that an organizational form can only be successful if rural development problems would be addressed simultaneously. This would require substantial investments in agricultural advisory services, giving organizations additional tasks and responsibilities that are not primarily related to water management or investing in other flanking measures.

Table 3: Strengths and weaknesses of the identified management options

STRENGTHS	WEAKNESSES
Option 1: Irrigation Systems, Ltd. + Farmer participation	
<ul style="list-style-type: none"> • Few additional organizational structures required and low costs for such structures. • Rapid implementation possible. • Increased legitimacy for Irrigation Systems, Ltd. • More communication required between Irrigation Systems, Ltd. and farmers (possibly improving communication and conflict resolution). • Possible decrease in water prices and increase in transparency of price determination. • Easy identification of subsidy recipients possible. 	<ul style="list-style-type: none"> • Conflict of interests between Irrigation Systems, Ltd. and farmers. • Danger of monopolization. • Possible decrease in legitimacy if no change in practice. • Lack of acceptance by Irrigation Systems of farmers' equal participation in decision–making; lack of effective farmer participation rights leading to lengthy decision–making processes. • Farmers' lack of management skills and reliance on the staff of Irrigation Systems, Ltd. • Difficult farmer representation. • Unclear distribution of rights and duties. • Legitimizing the survival of an organization with soft budget constraints. • Weak consultative body having little power.

Option 2: Local municipalities	
<ul style="list-style-type: none"> • Accepted leaders (mayor). • Village representatives' knowledge of farmers' problems and concerns. • Easy collection of irrigation charges and distribution of subsidies. • Less conflict among farmers. • Building on social consolidation in the village. • Easy implementation. 	<ul style="list-style-type: none"> • Conflict between municipalities managing the same canal systems. • No direct participation by farmers in water management decisions. • Conflicting policy objectives (village vs. water management). • Lack of professionalism. • Dependence on local leaders' personalities. • No clear connection between large producers and any one municipality. • Clash of local problems and need for transboundary decision-making. • Danger of misuse of water charges. • Incentive problem (e.g. mayor wants to be re-elected). • Option too costly for municipality. • Lack of investment possibilities across municipality boundaries.
Option 3: Water User Associations (WUAs)	
<ul style="list-style-type: none"> • Possible model (WUAs) for the democratization of rural areas. • High degree of farmer participation. • Cost-based water prices. • Clear internal rules, including conflict resolution mechanisms. • Possibility to hire specialists. • Clear division between hydromeliorative property rights. • Possibility to establish a union and increase competition. • Great flexibility to meet local water demands. • Reduction of free-riding and increase of social control. • Improved water-charge collection. • Easier to negotiate with a legal body (than with individual small farmers). • More reliable water delivery. • Investments can be planned better. • Ensured maintenance of irrigation infrastructure. 	<ul style="list-style-type: none"> • Weak representation at higher political levels. • Lack of specialists (need to hire). • Little incentive for subsistence farmers to join; small farmers' problems not solved. • Conflicts and competing interests between WUA and Irrigation Systems, Ltd. • Difficulty to maintain the main canals. • Insecure start (social capital among farmers is low). • Insufficient information and support from government and Irrigation Systems, Ltd.

Option 4: Joint management (Irrigation Systems, Ltd. + WUAs)	
<ul style="list-style-type: none"> • Maintenance of management skills within Irrigation Systems, Ltd. • Special legal basis for joint management. • Professionalization of social control. • Stronger representation and participation of farmers. • Positive influence on water price. • WUA also responsible for financial results. • Opportunity for regional level organization (across village boundaries). 	<ul style="list-style-type: none"> • No current official legal form for this kind of organization. • Possible difficulty in coordinating decision-making. • Presupposition of pre-existing and functioning organizations (WUA and Irrigation Systems, Ltd.).

During the workshop the previously identified options were drawn together and evaluated. The evaluation aimed at collecting and discussing the strengths and weaknesses of each option. Table 3 gives an overview of the options and their strengths and weaknesses.

Following the discussions it became clear that each option has its own strengths and weaknesses. Therefore, no single option – but rather a mixture of institutional options – is likely to mitigate the irrigation problem in Bulgaria. The concrete choice will depend on local conditions. We have summarized these findings in Table 4.

Table 4: Summary of the Options Discussed

	Options	Recommendation
1	Participation of farmers in irrigation-company management.	Only in places with existing organizations of agricultural producers.
2	Local municipalities' organization of irrigation.	In small villages with insufficient social capital.
3	Non-state organization of irrigation.	In places with sufficient social capital.
	Shareholding company.	Not acceptable from a political point of view, but may be a reasonable solution in places where large farming predominates.
	Small water user groups.	Cannot provide a long-term sustainable solution.
	Water user associations (WUA).	Provides a long-term sustainable solution but problems in short-term with establishment.
4	Joint management by irrigation company and WUA.	Ensures integrated management of irrigation.

Conclusions

The difficulties of establishing new irrigation institutions in Bulgaria during transition need to be viewed in the context of a variety of obstacles, many of which are specific to Bulgaria. Land restitution in Bulgaria has led to land fragmentation. Cooperatives, which coordinated not only agricultural activity but also social life in the village, were abolished before alternative forms emerged. Formal legislation for irrigation is already in place, but some of the structures have yet to be established. When the formal procedures for land reform ended in 2000, Bulgarian farm structure was dominated by three groups: small subsistence farms (operated by people near retirement), cooperatives (most in a poor financial state) and large commercial farms. The number of medium-sized family farms remained small.

The existing governance structure contributes to the abandonment of the irrigation system. The monitoring system is somewhat developed for main canals, but absent from internal canals. In addition, stealing irrigation equipment and water is a problem. The unwillingness of the water users to participate in the monitoring process further intensifies these problems. The problems affect mainly the internal canal system and to a lesser extent the main canal system operated by the irrigation company. Water prices are fixed regardless of plot position and size. Small producers are charged per hectare, which lessens their incentives to participate in the monitoring process. Moreover, charging per hectare results in more water usage compared with charging per cubic metre. Land fragmentation causes coordination problems when only small areas need to be irrigated. This increases the cost for the water supplier and lowers its incentives to provide services to small producers. Conflict-resolution mechanisms are poorly developed. Rent-seeking activities of actors involved in water management and distribution are overarching problems and hinder institutional change.

The formal sanction mechanisms seem to work only in the case of large water users, but not in the case of small users. Existing property rights have contributed to the decline in irrigation water usage. The legal ownership of water and the main canal systems is partially exercised. Irrigation Systems, Ltd. bears a portion of the costs and does not receive all the possible revenues from the system. The property rights on the internal canal systems are not exercised. The local municipalities neither bear the costs nor receive benefits from them; only in some occasions some management is done by the water users. Land fragmentation further deepens the problem because it prevents the application of modern production technologies and therefore makes agricultural production less competitive. Land fragmentation also increases monitoring and transaction costs, and hence the effectiveness of conflict resolution and sanctioning mechanisms decreases.

Besides institutional factors, changes in crop structure have contributed to the decline of irrigation water usage. The area that maintains crops sensitive to irrigation

has decreased. Unfavorable market conditions and agricultural reform have contributed to this process.

It is likely that no single option – but rather a mixture of options – will lead to an improvement in the current situation. Some of these options were discussed and evaluated. The option to organize irrigation through ‘local municipalities’ is appropriate for places (mainly small villages) with insufficient social capital and many small farmers (who have a short planning horizon). Its implementation demands a low cost for establishing the system but a comparatively high cost to operate it afterwards. This option shares some characteristics with the option in which the state takes over organizational responsibility. Both cases respond to the coordination problem caused by hierarchy.

The option proposing ‘non–state organization of water supply’ is appropriate for places with sufficient social capital. It best matches the features of transactions and has the strongest positive effect on resource usage. However, with this option the problem arises about who will initiate the process of institutional change and how. Small farmers with a short to medium planning horizon can initiate the process of establishing small water user groups. Small water user groups could be considered a transition step towards the establishment of water user associations. Only small–to medium–scale farmers with a long planning horizon can initiate the establishment of WUAs. The problem is that there are few farmers with such characteristics in Bulgaria.

Finally, the option proposing ‘participation of water users in irrigation–company management’ is appropriate for places with sufficient social capital and with well established organizations of agricultural producers.

LIST OF PARTICIPANTS

NAME	INSTITUTION	COUNTRY
Alexi Alexiev	Plovdiv University of Agriculture, Dept. of Agricult. Economics	Bulgaria
Kalin Andreev	Ministry of Agriculture, Sofia	Bulgaria
Georgi Atanasov	Ministry of Agriculture, Sofia	Bulgaria
Florin Badulescu	Ministry of Agriculture, Bucharest	Romania
Hristo Bozov	Irrigation Systems, Ltd., Plovdiv–South	Bulgaria
Peteris Busmanis	Agricultural University of Latvia, Jelgava	Latvia
Franz Gatzweiler	Humboldt University of Berlin, Chair of Resource Economics	Germany
Konrad Hagedorn	Humboldt University of Berlin, Chair of Resource Economics	Germany
Iuliana Ionel	Institute of Agricultural Economics, Bucharest	Romania
Eriks Kreslins	Ministry of Agriculture, Riga	Latvia
Monika Kubratova	Agricultural Economics Institute, Sofia	Bulgaria
Ivan Mitev	Irrigation Systems, Ltd., Plovdiv–North	Bulgaria
Arne Musch	Consultant	The Netherlands
Ivan Penov	Plovdiv University of Agriculture, Dept. of Agricult. Economics	Bulgaria
Waltina Scheumann	Technical University of Berlin	Germany
Christian Schleyer	Humboldt University of Berlin, Chair of Resource Economics	Germany
Insa Theesfeld	Humboldt University of Berlin, Chair of Resource Economics	Germany

REFERENCES

- BROMLEY, D. W.** 1992. The Commons, Common Property, and Environmental Policy. Vol. 2. *Environmental and Resource Economics*, pp. 1–17. Dordrecht, Netherlands, Kluwer Academic Publishers.
- BUSMANIS, P., ZOBENA, A., GRINFELDE, I. & DZALBE, I.** 2002. Privatization and Soil Drainage in Latvia. In F. Gatzweiler, R. Judis & K. Hagedorn, eds. *Sustainable Agriculture in Central and Eastern European Countries*. Aachen, Shaker.
- HAGEDORN, K., ARZT, K. & PETERS, U.** 2002. Institutional Arrangements for Environmental Co-operatives: a Conceptual Framework. In K. Hagedorn, ed. *Environmental Co-operation and Institutional Change: Theories and Policies for European Agriculture*, pp 3–25. Cheltenham, Edward Elgar.
- Ministry of Agriculture and Forestry of Bulgaria.** 2000. *Agrarian Report – 1999*. Sofia, Grafis.
- National Statistical Institute of Bulgaria (NSI).** 1999. *The Statistical Yearbook*. Sofia, NSI.
- OSTROM, E.** 1992. *Crafting Institutions for Self-governing Irrigation Systems*. San Francisco, California, ICS Press, Institute for Contemporary Studies.
- PENOV, I.** 2002. *Irrigation Water Usage During Transition: An Empirical Analysis in the Plovdiv Region, Bulgaria*. CEESA Discussion Paper No 7. Berlin, Humboldt University of Berlin, Chair of Resource Economics.
- PETKOV, P., IVANOV, S., ZIVKOV, Z., POPOV, B., GEORGIEV, D., POPOV, I. & KIOSEV, G.** 2000. *Strategy for Development of Irrigation in Bulgaria under the Conditions of Market Economy*. Water Affairs, N1/2, pp 29–35.
- SCHLEYER, C.** 2002. *Economic and Ecological Transformation Processes in Post-Socialist Water Management Regimes: The Role of Property Rights and Governance Structures – A Case Study in Brandenburg*. CEESA Discussion Paper No 9. Berlin, Humboldt University of Berlin, Chair of Resource Economics.
- SIKOR, T.** 2002. *The Commons in Transition*. CEESA Discussion Paper No. 10. Berlin, Humboldt University of Berlin, Chair of Resource Economics (available at www.ceesa.de).
- State Gazette.** 1999. No. 67, 27.07.1999. The Water Law.
- State Gazette.** 2001a. No. 34, 06.04.2001. The Water User Association Law.
- State Gazette.** 2001b. No. 53, 12.06.2001. The Executive Hydromelioration Agency's Structural Rules.
- State Gazette.** 2002. No. 11, 31.01.2002. Act No.2 for Financial Support of WUA.

THEESFELD, I. 2001. *Constraints for Collective Action in Bulgaria's Irrigation Sector*. CEESA Discussion Paper No. 5. Berlin, Humboldt University of Berlin, Chair of Resource Economics (available at www.ceesa.de).

THEESFELD, I. 2002a. Constraints on Collective Action in Bulgaria's Irrigation Sector – Empirical Results from the Village of Varbiza. In F. Gatzweiler, K. Hagedorn & R. Judis, eds. *Sustainable Agriculture in Central and Eastern European Countries: the Environmental Effects of Transition and Needs for Change*, pp. 169–174. Proceedings of the ACE Phare Seminar. Aachen, Shaker.

THEESFELD, I. 2002b. *Collective Action in Bulgaria's Irrigation Sector as restricted by Opportunistic Behavior – Empirical Results*. Paper presented at the Xth European Congress of Agricultural Economists (EAAE), Zaragoza, Spain: 28–31 August.