ABSTRACT
Ukraine is the East European country, which appeared as an independent state on the map of the Europe in 1991 after the collapse of the Soviet Union. It is an agrarian-industrial country with high agro-potential and favorable ecological conditions. Irrigation plays an important role in the provision of sustainable agriculture in the Southern region of the country. Large irrigation systems were built on an area of 2.6 min ha. The infrastructure was designed for irrigation on large fields of the state owned collective farms. The central planning concept dominated in irrigation management. Over many years experience of irrigation performance has shown its profitability. In the Southern regions up to 40% of gross plant-growing products was obtained on irrigated lands. In recent years existing irrigation management techniques became more and more incompatible with the rapid changes in social-economic situation in Ukraine. Complicated social-economic, technical, institutional, and ecological problems are aggravated. The main bottlenecks in irrigation management are linked with the following circumstances: land and farm privatization, unemployment, missing markets and institutions, lack of business undertakings, high energy costs, outdated irrigation infrastructure. The current situation creates definite conflicts between: i) existing large scale infrastructure and new private small scale land ownership, ii) traditional water management practice and reduction of state financial support on the O&M and iii) existing institutions and legislation in water management and new market relationship in agriculture. To overcome mentioned conflicts for provision of sustainable irrigation management under new social-economic conditions, the following methodology and modes are proposed. The methodology on Irrigation Management Transfer (IMT) includes the following: a) knowledge base creation (baseline surveys), b) dialogue set-up on the different levels, c) selection of the best modes on IMT and their implementation in pilot areas. Possible modes and necessary techniques are set up and analyzed for these purposes. The following approaches are used under the process of transformation: multidisciplinary investigations, integral water management, stakeholders' participation and full cost recovery. On the level of water-users different institutional forms, as well as me combination of public and private ownership, are set up and analyzed: creation of Water Boards, Water Users Associations, leased agricultural cooperatives, large stakeholders companies, individual farms. The complex of social-economic, institutional and legislation problems must be solved simultaneously in due course of IMT. It is necessary to provide the answers to the questions: where, how much and why irrigation will be feasible under new social-economic conditions? The costs and benefits of irrigation, as well as potential crop production under irrigation must be analyzed for this purpose. The potential crop production for the main crops under optimum conditions is calculated with the Crop Growth Monitoring System (CGMS). CGMS is standard crop growth simulation model used by the European Union to forecast crop production. Simulations indicate that improved crop and water management can double crop production. To analyze the economic consequences of possible IMT scenarios, a more detailed baseline survey is needed at farm and regional level. The baseline survey is also needed for estimation of the requirements and wishes of all water users and other stakeholders. With this key information a restructuring plan for sustainable and integrated water management in Ukraine will be drafted and proposed for discussion through the Dialogues and on the policy-making level.

RESUME
L'Ukraine est un pays de l'Est qui a apparu à la carte de l'Europe comme l'Etat indépendant en 1991 après le débacle de l'Union Soviétique. C'est un pays agro-industriel à haut potentiel agronomique, aux conditions écologiques favorables. L’irrigation joue un role important en assurant le stable développement de l’agriculture dans les régions sud du pays. De grands systèmes...

A l’aide du système de monitoring de la croissance des cultures (SMCC), sont calculées le rendement potentiel et la productivité des espèces principales de cultures. SMCC c’est le modèle normalisé de la croissance des cultures utilisé par CEE pour les prévisions du rendement. La simulation montre que la gestion améliorée des eaux et de la croissance des cultures peut amener à l’augmentation du rendement de 2 fois. Pour effectuer l’analyse des conséquences économiques des scénarios possibles de GTI, il faut réaliser une étude détaillée aux niveaux intra-économique et régional. Il est indispensable d’effectuer cet étude pour apprécier des exigences et des souhaits de tous les utilisateurs d’eau et autres actionnaires. En possédant l’information de base, il est possible de dresser un plan d’actions préliminaire de la restructuration pour la gestion des eaux stable et intégrée en Ukraine et le proposer pour la discussion en organisant des dialogues au niveau des organismes de gestion.

KEY WORDS: large-scale irrigation systems in Ukraine, current issues, state policy, experiences study, situation assessment, dialogue set-up, irrigation management transfer scenarios (grands systems d’irrigation, problèmes courants, politique d’Etat, étude de l’expérience, appréciation de la situation, organisation de la dialogue, transformation de la gestion de l’irrigation).
INTRODUCTION

Ukraine is an agrarian-industrial country which has a high potential for agriculture: high fertility soils, favourable climatic conditions for big number of crops and sufficient ecological state of the land on the major of the territory. More than 30% of GDP of the country is received from agrarian sector. The biggest natural limitation for agriculture and other sectors development is an insufficient natural moistening and surface water sources in South region of Ukraine. Irrigation and water sources development are needed to provide sustainable agriculture and water supply for drinking and industry purposes in this area. That is why large-scale irrigation and drainage systems were constructed on area 2.6 mln ha during period 1960-1980 to provide food security and water supply. The technical construction and technological possibilities of these systems were oriented on services of the large-scale collective farms. The state was the owner of the systems and effected financing of operation and maintenance on hierarchical level, managing by top-clear organisation structure. By technical view these systems are characterised by the following characteristics: large distance from water source, long distance network, many stages of water lifting, high energy consumption, large fields, sprinklers on 95% of area and supplementary irregularly on space and time irrigation.

Many years experience has shown a high profitability of irrigation performance. Up to 40% of gross plant growing products was obtained on irrigated lands in the South regions.

Nowadays, after the development of land privatisation, a new type of private land’s owner has appeared. Traditional organisation model for irrigation management is not sufficient anymore and, in many cases, it is a cause for a significant decrease of agricultural production, mainly due to the rise of serious social-economical, technical, technological and ecological problems.

Transformation from large state economies into private farms, land enterprises and farmer unions is hampered by the lack of the necessary legislative base, out-of-date methods in management, lack of financial and technical resources. Badly co-ordinated agricultural and water management reforms have created economical and ecological problems especially in the Southern part of the country. Complicated social-economical, institutional and ecological problems are aggravated and stipulate the significant decreasing of the actual irrigated areas and the productivity level of irrigated lands. The rural community in the South Ukraine is suffering from this economic regression. Unemployment and poverty threatens social security, which in turn has negative impacts on the large tourist potential of the area. It is believed that some unique nature area (Sivash, for instance) are also negative influenced by the negligence of the present irrigation and farming systems. Under new economic conditions, with many smaller private farms, it seems impracticable to operate and maintain irrigation systems efficiently and to care about ecological problems.

Reduction of the governmental support for O&M of irrigation systems and further development of privatisation in agrarian sector stipulate the necessary to provide simultaneously transformation in water and land management. Therefore, clear strategies for sustainable irrigation management has to be set. The priorities in irrigation management improvement are the institutional reorganisation, restructuring and than rehabilitation and modernisation of technical constructions and technological process of water management. The main challenges in the nearest two to five years are elaboration and implementation of new institutional models for managing the large-scale irrigation systems, their preservation and adopting to new social-economic condition for sustainable agriculture development as well as development of proper legislation for these purpose.

To develop transformation policy and strategy it is necessary to identify in more details the current problems and conflicts.
PROBLEMS AND CONFLICTS IDENTIFICATION

The current problems in irrigation in Ukraine have a cross-sectary character and depend on social-economical and institutional issues that are observed now in agriculture. Therefore, complex actions on development irrigation management and agriculture transfer process under transition in Ukraine are needed to overcome water, agricultural and environmental bottlenecks for sustainable development within the large area of the South region of the country.

Integrated complicated approach was implemented by join working team of Dutch-Ukrainian project WATERMUK to start transformation process in irrigation management. We have started from research and assessment in detail the current situation in water management and agriculture and now move to the vision of desired and possible future to define clear action plan for sustainable development within pilot area – one of the districts of Crimea-Dzhankoy.

Project was adopted and supported by the Dutch Ministry of Agriculture within the program Water for Food. Institute of Hydraulic Engineering and Land Reclamation of Ukrainian Academy of Agrarian Science represents Ukrainian research organization. The Dutch leading partner is Alterra + ILRI and Institute of Economy LEI is the second Dutch partner.

The first steps of the project included more technical aspects of investigations. Monitoring of irrigation performance was carried out through remote sensing, crop modeling and field observations. The main objective was to identify priority area for investment in irrigation infrastructure.

Comparison of two satellite images which was made in 1992 and 2001 showed significant reduction of actual irrigated area in the South region of Ukraine.

Simulation of crops yield dynamic by WOFOST model and data of dynamic of actual crops yield on irrigated and rained lands confirmed the low level of existing crop productivity and big potential possibilities for increasing agriculture outputs in agro-climatic conditions in Crimea.

In new economic conditions it is necessary to answer once more if irrigation still profitable? Preliminary costs-benefits analyzes which was performed on the results of on-farm baseline service demonstrated that irrigation is profitable under existing prices and costs and level of crops productivity.

The question is why farms are not profitable in this case? What are the reasons of their low outputs?
Base line survey on farm and district levels helps to identify the following key problems on this issue.

1. Lack of clear property rights. Land privatization not yet completely settled, farms asset privatization not settled. The undefined, transition state of ownership of both land and farm machinery including irrigation equipment, restricts the required investments of the farming community, obstructs the provision of credit by banks and slow down the development of a market economy.

2. Missing markets for agricultural products. It was believed that price and markets for farm liberalization would lead to a strong market economy. Little attention was given to the build-up of markets and their corresponding institutions. This resulted in monopolistic or missing markets for farm inputs and outputs. Connected to the problem is the lack of credits and extension service.

3. Lack of entrepreneurship. After decades of being part of the large jig-saw puzzle, it is difficult for people to take risk and seize opportunities.

In addition to these general bottlenecks in the development of sustainable agriculture, two specific problems related to the Ukraine irrigation practice can be mentioned:

- high energy costs. Currently one-third of the actual power costs for water delivery is paid by the farmers. Even this amount of money caused large problems in the farming community. One can imagine that with further privatization of irrigation management prices will increase also.

- outdated irrigation infrastructure. Due to the break-down of the irrigation equipment a lot of farmers changed to rained agriculture, which resulted in under-utilization of the large-scale irrigation systems. No information about the actual water demands is available.
interference with environment. Drainage systems in many cases are out-of-date that following
soil salinization and ground water table rising. Insufficient water management stipulates
increasing of water losses from the canals and uncontrolled water withdraws to the sea and
lowlands as well as to Sivash lake.

Start point for all mentioned problems is collapse of the Soviet Union. To solve this problems and
attract investments for rural development and infrastructure modernization at first its need to
overcome existing conflicts which draw from traditional institutions, management practice,
infrastructure scales, people mind and behavior. The difficulties of the transformation process relate
with the following:

- lack of clear government policy, strategy and detail action plan on transformation and
  agreement between State authorities which responsible on reforms in water and agriculture
  sectors;
- shortage of knowledge and weakness of existing legislation;
- limiting participation of stakeholders on all levels and their awareness and motivation on new
  possibilities.

Currently the following conflicts may be identify: i) existing large scale infrastructure and new
private small scale land ownership, ii) traditional water management practice and reduction of state
financial support on the O&M and iii) existing institutions and legislation in water management
and new market relationship in agriculture, iii) agriculture development and security of
ecosystems.

GETTING CONFLICTS IN IMT

To overcome mentioned conflicts for provision of sustainable irrigation management under new
social-economic conditions, proper methodology and modes on new institutional structure have
been developed. Integrated approach was implemented within WATERMUK project, which uses
twinning collaboration between Dutch and Ukrainian specialists from scientific institutes and
NGO, national, regional and local authorities, district water management departments, extension
services, farmers and agribusiness companies. Each pair of partners has its own tasks:
cooperation and research, water services improvement, land zoning and integrated water
management implementation, business plans preparation, organization of market chain and
development of legislation and policy.

One of the largest districts of Crimea is Djankoy district was selected as a pilot area. This district is
typical for Crimean conditions. Multifunctional water use for agriculture, industry and
environmental are typical for this district. All types of current problems take place on the irrigation
systems in Ukraine. 28 large farms and several small individual farms need irrigation
performance. Unemployment and aging population are the main features for social environment.

Expected targeted project results for Djankoj district lay in commitment into agricultural sector and
development of rural development plan. First one includes:

- confidence in the future for all stakeholders;
- ability to make business plans for farmers;
- cooperation between farmers in market approach.

For rural development plan the following tasks will be carried out:

- zoning plan to protect Sivash area, which will be accepted by all stakeholders;
- investment plan for irrigation infrastructure (inter- and on-farm);
- business plan for Djankoy irrigation district to improve water services by way of
  implementation of integrated water management approach.

To prepare rural development plan a clear action plan has been developed. General scheme of these
actions looks like a complex of researches and proper measurements on National, district and farm
levels. These actions will include:

- developments of legislation on property rights and new institutions;
- implementation of integrated water management technology and agricultural extension;
- creation market oriented relationships on the basis of cooperation and stakeholders agreements as well as provision small investments into agriculture production;
- knowledge dissemination within stakeholders to create common cognition in further transformation.

Implementation of proper measurements in agricultural, water management sectors as well as in area of environmental control should be performed to follow these general actions scheme, to receive complex rural development plan. In agriculture this means: implementation of farm business plans, attract several small and then large public and private investments, develop new markets of resources and products.

To adapt infrastructure to the future requirements and attract investments for it’s modernization, develop new kind of institutions (irrigation district which be managed by means of water users participation, water users associations) it is necessary. New institutions will implement an integrated water management approach as well as develop for these purposes sustainable cost recovery mechanisms. The area of main actions that are necessary to overcome mentioned conflicts.

Now WATERMUK team is faced with question: what are the ways for implementation of all these actions?

Our opinion is that public-private partnership would be the most fruitful within the period of implementation. Twining approach will be used on preparation phase as well as in the period of implementation. Close collaboration of Implementing Agency in Ukraine and Supporting Agency in the Netherlands in creation is necessary to create precondition for further implementation of rural development plan. It could be supported by the funds which will be received from markets developments, banks, international donors organization as well as from governments side.

Implementation of rural development plan will be done by two collaborated Authorities-Reclamation Authority in Ukraine and Dutch Land Development Service with support of funds from Development Bank and Dutch Ministry of Agriculture.

The tasks of irrigation management transfer and integrated water management implementation for development of water services will be performed by Irrigation District in Ukraine and Dutch Water Board. This work can be supported by Bank and Dutch Ministry of Public Works.

At present it is not clear in detail what kind of farm systems and irrigation management institutional as well as additional legislation development will be implemented. But we have a strong platform for international collaboration, involving into the project activities of all stakeholders on national, district and local levels. The common worldwide methodology and recognized by international community approaches are disseminated in Ukraine. The process of transformation in water management and irrigated agriculture has started within the frameworks of WATERMUK project.

Elaboration of join vision on methodology and models of transformation through national Dialogue will feed further development of common recognized action plan for implementation and therefore will provide its sustainability. The main objectives of Dialogue establishment and proceedings are the following:

- creation of a new common cognition among stakeholders which is still based on long-term sustainable development in water management, agricultural production and environmental protection;
- organisation of the social training process;
- establishment of the permanent dialogue process and its involving in existing initiatives and institutions;
- creation of tools to choose the best development scenarios and measures for their implementation taking into account international experience, existing knowledge base to avoid mistakes and incorrect ways of implementation;
- international support on knowledge exchange, establishment of common initiatives, searching financial resources for the dialogue organisation on the national level;
- involving stake-holders in solving the problems of irrigation management transfer.
WATERMUK experience on pilot area in Ukraine will provide new knowledge, tools and solutions which will be useful for international community worldwide. We believe that Ukraine has to reach sustainable agriculture and improve well-being of population and to overcome difficulties on the way to the market economy and democracy development for social-economic and environmental sustainability in the country.

POSSIBLE SCENARIOS OF IMT

In Ukraine institutional issues as to the irrigation management transfer are in a stage of searching of new forms concerning privatization of infrastructure. One of the options on-farm irrigation networks should be transfer to local associations of water- and lands-users.

- World practice possesses the methodology to determine the most efficient scenarios of development, this means in our case, the determination of alternative variants for models of irrigation and drainage management transfer. There are many models as to the transformation and they should be taken into consideration and be adapted to the conditions of Ukraine.

Experience of highly developed and developing countries with market economy connected to the irrigation management transfer provides different models for the solution of this challenge. However, the world tendency consists in increasing of role of water users participation in irrigation management and attraction of private initiative in the form of investments in irrigated agriculture.

The role of the state is reduced to funding of large canals’ operation and construction maintenance on an inter-systemic level. The middle and low levels are partly or completely operated by landowners on the account of production. Special organizational structures are developing on the level of district managerial systems, which connect activities of state agencies, farms and service offices. The service offices render the complex of consulting services, training, and various information provisions and render technical assistance in maintenance of on-farm network and installations. Farmers’ interests are represented by voluntary associations, which are functioned on free-will basis – The Unions of Water-users. These Unions organize applications for services of state agencies and consultative services for the solving of general tasks.

At present the irrigation management transfer in Ukraine is performed within the framework of the existing legislative base. In the Land Code and Land Reclamation Law the requirement as to the collective performance of irrigation systems is determined to preserve technological integrity of water management under development of the process of land’s privatization. Based on the Land and Administrative Codes, the preservation of irrigation infrastructure on on-farm level is the obligatory responsibility of new landowners. In the case of system’s damage or out-of date state the proper measures are thus provided.

Nowadays, there are two kinds of property with respect to irrigation systems - state property on the level of main and distributive canals, non-governmental property on the on-farm irrigation network.

The State Committee of Water Economy centrally manages the main and distributive canals. Non-governmental irrigation systems that until 1999 were in the collective farms property or agricultural state property are transferred to the private individual property or to public local communities and to the new agroproduction enterprises (LTD, stakeholders companies, agrofirms and etc.). Special Guidelines were developed by the specialists of State Committee of Water Economy and Institute of Hydraulic Engineering and Land Reclamation to preserve technological integrity of water management within irrigation systems. These Guidelines include requirements as to land sharing and property transfer on irrigation infrastructure taking into account the saving integrated technological processes. Technologically integrated units are considered as a part of the irrigation system that can provide delivery, distribution and drainage of water to any land partial with necessary intensity to achieve an optimal water regime in the soil. The area of the technological, integral unit is determined taking into account peculiarities of engineering constructions, irrigation network conveniences, productivity of pumping stations and sprinklers, growing crop rotations and
hydro-geological conditions as well. The area of crop rotation covering 200 ha is determined as the minimal area of the technological, integral unit within large-scale irrigation systems.

Proposed scenarios of IMT took into account the mentioned requirements as to the area of technologically integral units and existing forms of private land property organization. There is a common primary situation for each scenario, which includes four groups of owners and users within large-scale irrigation systems. Each group acts separately and has different goals: the first two-(Canal management Departments, District management department) to sell water at more expensive costs, the other two-(agroproduction enterprises and individual farmers) to buy it cheaper.

The main task is to join their interests to achieve food and environment security. Therefore different kinds of stakeholders companies organization are observed. By the first scenario the main canal management is still in direct State property, while all other groups joined into Stakeholders Company with mixed private and state capital. The negative issue of such scheme represents danger in losing water management integrity on the system and poor state regulation in irrigated agriculture.

Joining into State Stakeholders Water Company of Main canal Management Agencies and District Irrigation Management Departments, which maintain and operate distributive network being within the zone of this canal, would be a more appropriate decision. By this scenario water-users are joining into a separate company which collaborates with State Stakeholders Water Company on the basis of market relations.

In this case the differences in goals of water-providers and clients are preserved, therefore at poor financial supplies and the lack of sufficient circulating assets, there would be no possibilities for market services connected with water supply and drainage.

Other probable scenarios can join the State and Public property to manage water distribution on secondary and on-farm level. For compact middle sized irrigation systems with area up to 5000ha this scenario would be more efficient.

For more huge irrigation systems such as Kakhovska and North-Crimean, each of them covering area more than 300 thou ha, it seems more attractive to join all managerial and user groups into separate State Stakeholders- Water and Agricultural Company with common capital involving land capital (Kovalenko P., Zhovtonog O. etc., 2001).

Such mechanism shall link the interests of the all shareholders. To get profits and towards the fast repayment of investments, both agricultural producers and investors would be interested in the reduction of expenditures per unit of crop yield and other agricultural production obtained from the irrigated area. To this end investors would be forced to supply their production to the agricultural producers by the nominal value as it is known that concession in price would have to be transformed in a considerable profit by realization of vitally important resources – foodstuffs.

The key problem is how to make such companies profitable. It can be settled on the account of significant increase in amount and quality of irrigated cultures crop yield with simultaneous reduction in specific expenditures of water, power and another resources. The profit could be attained at the cost of production of highly remunerative agricultural production under conditions of irrigation which is in demand on domestic and foreign markets, for example: seeds, fruits and vegetables, hard wheat varieties, forage and technical crops.

Water and energy necessary for water distribution between water-users and irrigation is the main restricting factor of high yields under conditions of dry climate in eleven administrative regions of Ukraine. In this case the technologies of water distribution and watering differ significantly though they are closely interrelated.

At present management by main canals is involved in systemic water distribution, irrigation systems management is involved in inter-farm water distribution, and watering is conducted by the land-users, that means, the single successively interrelated technological chain is artificially broken.

Each managerial irrigation subject has a different purposeful function: the first two are aimed at recoupment of means allocated by the state for definite volume of water by canals, the last mentioned (the third) – to obtain a maximum of yield without additional expenses for watering.
Power companies, industrial enterprises and reprocessing of agricultural production are not involved into this process. It is supposed to entrust existent management by main canals with function of the parent enterprise in NIC composition. They would be accounted for the rational systemic and inter-farm water distribution, efficient use of irrigated lands, water, power and material – technical resources at first supplied by the state. Existing management by irrigation systems plays the role of public dealers on water supply for agricultural producers as well as for the enterprises conducting on a contractual basis construction and repair works, maybe, and the watering, consulting services connected with rational use of irrigated lands. Such company will be able to tackle with difficult problems connected to the main irrigation goal – obtaining high and qualitative agricultural crop yields. On the level of water-users can represent different institutional form as well as combination of public and private ownership. At present there are the following kinds of water-users organizations, to whom the rights for use or ownership by on-farm irrigation network could be transferred:
- creation of water-users associations;
- leased agricultural cooperatives;
- individual farms.

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