



Irrigation System Management:

Better response to farmers' needs
is possible by improved water distribution
and clear state policy



Performance Audit Report



Over the last 3 years state has made significant effort to improve productivity in the agricultural sector that implied increase in funding, legislative amendments and implementation of various stimulating activities for the sector.

The output and outcome of the agricultural activities to a great extent depend on the efficient and effective functioning of the irrigation system. In terms of full utilization of capabilities of the existing irrigation network, it is very important that service delivery is organized efficiently and its institutional modernization is ensured for further development of the irrigation system.

In the present audit report the State Audit Office identified those deficiencies, elimination of which will result in the ultimate beneficiary of the state efforts –the farmer- to receive increased benefits from the government activities.

In addition, the objective of the audit is to improve the overall management of the irrigation sector by ensuring clear identification of basic principles that underlie the state irrigation policy and irrigation service provision. In this regard, approximating the best international practice will entail better economic and environmental sustainability of the irrigation sector.

31.12.2014

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Glossary

FAO – Food and Agriculture Organization of the United Nations

IFAD – The International Fund for Agricultural Development

OECD – The Organization for Economic Co-operation and Development

PIU – Project Implementation Unit

HPP – Hydroelectric power plant

Irrigation – System of measures for artificial watering of lands

Melioration – System of measures, which aims to improve unfavourable conditions of land to increase its productivity

Drainage – Dewatering of swamped lands using trenches, canals and underground pipes; system of such trenches, canals, pipes

Magistral Canal – Main Irrigation Canal

D - Distributor

Subjected Area – Projected area, which can be irrigated in case of appropriate functioning of irrigation system

Irrigable Area – Area, which can be irrigated under existing conditions

Water User's Association – Autonomous union of farmers created for managing irrigation and other resources

Hydrometry – Part of hydrology which studies water regime

Primary Water User – Owner of license, who has water source transferred for private use and who ensures its operation

Executive Summary

State Audit Office carried out performance audit on the measures for management of irrigation system. The audit covered period from January 1, 2012 to August 1, 2014. Since the end of 2012 the Georgian government defined agricultural sector as a priority and consequently started actively stimulating the sector through financial, legislative, investment and other measures. One of the main components of these measures is rehabilitation of irrigation sector and its management according to the best international practice. Rehabilitation of the irrigation infrastructure and arrangement of good institutional setup and management practices are very important economically for successful functioning of agricultural sector as a whole. Increased agricultural production, on its own, will contribute to substituting import with local production, increasing export of agricultural goods, developing other interrelated sectors and rising incomes of the farmers and rural families.

Together with the economic rationale, stimulating agriculture and in particular improvement of irrigation service has another, social aspect to it. This is because the rural population constitutes nearly half of the total population, out of which major part are farmers with small parcels of land and with lower than average incomes.

During the audited period the State has spent about 90 million GEL for the rehabilitation of irrigation sector and according to the planning documents existing at the time of the audit financing is set to continue until the full rehabilitation of the remaining irrigation network. It has to be noted that as a result of long period of degradation of the irrigation system, the system along with the physical rehabilitation requires modernization and improvement of its management.

Due to social and economic importance of the sector for country's development, materiality of the financing allocated by the State for improvement and functioning of the irrigation system and also taking into consideration performance indicators which point to the deficiencies in irrigation system management, the State Audit Office decided to conduct performance audit of the field.

The objective of the audit is to evaluate effectiveness of measures taken by the Ministry of Agriculture (as the party which defines state irrigation policy and is the managing partner of the LLC) and the 'United Amelioration Systems Company of Georgia' LLC. Within the audit issues of productivity of irrigation service provision, long-term economic stability (viability) of the irrigation system and organizational as well as environmental considerations were examined.

State Audit Office considers that implementation of the recommendations issued within the present audit report will result in better distribution of the existing water resources and therefore will increase accessibility to irrigation service for the farmers. Also, after defining policy goals more clearly and carrying out consequent management activities (tariff, organizational, etc.) economic and environmental viability of the system will be improved.

The State Audit Office is of the opinion that there is significant room for improvement both in terms of provision of service to more agricultural area by using available water resources more efficiently and in terms of forming more consistent state policy and appropriate measures. In particular, after studying selected 4 system management branches it was found that during the audited period the LLC has not elaborated and implemented procedures, which would ensure reliable and equitable provision of the irrigation service. Due to lack of the mentioned procedures and to poor control (or in some cases, even absence of control) of water regulation infrastructure irrigation service was provided inefficiently and unequally: the quantity of irrigation water consumed by the land parcels located near the head of irrigation canal highly exceeded their irrigation water requirement while parcels located along the middle and tail of the canal received insufficient and unreliable service.

Consistent state irrigation policy, which would clearly identify policy goals and their desired combination, was not defined during the audited period. Based on the social and economic importance of irrigation sector, both capital and operational expenses of the LLC were almost fully financed by the state. Despite two, often conflicting goals set for the LLC: maximizing profit and providing accessible and reliable service to water users, its managing partner – The Ministry of Agriculture has not specified what kind of balance between these objectives would be desirable. In particular, it is not defined what operational and financial outcomes (revenue, irrigated area etc.) are acceptable in parallel with increasing irrigable area (and consequently increased capital and current expenses). Specifying such an indicator would make it possible to set concrete goals and evaluate progress against them.

After abolishing the law of Georgia on “Land Melioration” there is no legislative act for the irrigation sector which would, based on the present situation, define the rights and responsibilities of entities involved in irrigation service provision.

The fixed tariff set for irrigation service is rigid,¹ as it is set as one-off payment (– 75 GEL per hectare) despite the number of service delivery and thus does not depend on the quantity of the water consumed. Such tariff structure does not correspond to the principles that underlie better irrigation tariff models. Moreover, the absolute value of the tariff is not based on concrete calculation and is not related with the actual costs of water provision.

In contrast with commonly accepted practices elsewhere, no fee is levied in Georgia from the owners of irrigable lands who choose not to use irrigation service in any given year.

Currently the practice of farmer organization with different possible schemes that is consistent with good international practice of irrigation sector management and which would ensure involvement of farmers in operation and maintenance activities with an objective to improve quality of the service and reduce operational and maintenance costs is at initial stages.

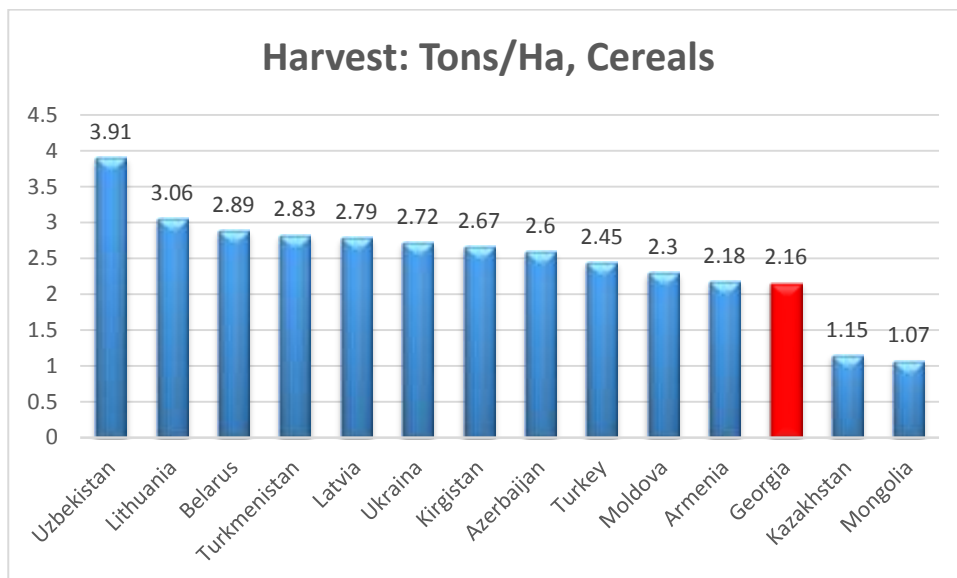
¹ Resolution of State Regulation Commission of Energy and Water Provision of Georgia #2, 2011

Important studies carried out on the regional and national levels about possible climate change effects suggest expected sharp decline of irrigation water availability due to the global warming effects on one hand and increase of demand for irrigation service on the other.

1. General Information and Audit Motivation

Agriculture is a traditional and significant sector of the Georgian economy. Currently, its share in GDP is approximately 9% and the share of rural population in total population is 47%.² Starting from early 90s, as a consequence of gradual deterioration of the sector, total cultivated area halved,³ total factor productivity declined and agricultural production shrunk dramatically. Today average productivity in the agricultural sector is 3 times lower than in Europe (EU) and ranks as one of the lowest among the ex-socialist states.⁴

Graph 1.1: Harvest tons/ha, Cereals



In 2012 the Georgian government defined the agricultural sector as a priority area and initiated number of reforms on a large scale: significant investments that are provided for the sector aim to enhance productivity, decrease poverty in rural population, improve food

² Geostat, 2014 Data

³ <http://data.worldbank.org/country/georgia>

⁴ FAO 2010 yearbook, 3 year average data is presented for countries other than Georgia, the data for Georgia is taken from 2013 Geostat Data

security, diminish dependence on imports by increasing national competitiveness of the sector⁵ etc.

The issue of attaining higher agricultural productivity became even more relevant after signing the agreement about 'Deep and Comprehensive Free Trade Area' (DCFTA) between EU and Georgia in 2014 and also after partially opening the Russian market for Georgian agricultural production.

It has to be noted that the Georgian agricultural sector mainly consists of small-sized farms (98% of them are below 5 hectares) which are less commercialized and often follow the practice of subsistence farming. Thus, the state agricultural policy has to cope with two main challenges: on one hand, it has to contribute to improvement of agricultural productivity which is usually achieved by agglomeration of small-sized farms and using more efficient technologies and know-how. Increasing productivity will naturally entail reduction of the number of people employed in the sector. On the other hand, the second objective of the policy is to serve social purposes, by supporting existing subsistence (small-sized) farmers whose livelihoods almost fully depend on land.

Proper functioning of the irrigation infrastructure together with other factors is very important for achieving the goals of the government in the agricultural sector.

Consequently, it is natural that development of the irrigation and drainage system network and enhancement of its effectiveness are defined as important goals in the national strategy – 'Georgia-2020' elaborated in 2013 by the Georgian government.

Studies carried out by the USA Development Foundation and FAO indicate that irrigation increases farmer net revenues by 600-700 GEL per ha of land on average and by 1000 GEL for some regions and specific crops.

At this stage, the rehabilitation of the irrigation systems consists mainly of restoring/reconstructing the old irrigation infrastructure built in previous periods, which is currently significantly deteriorated. In case of full recovery of the old system it has capacity to serve nearly 275000 ha of arable land.

In the framework of agricultural investing, since 2012 the government has spent 90 million GEL,⁶ for rehabilitation of the irrigation infrastructure and also for the measures serving institutional modernization of the irrigation sector. It is planned to invest additional 570 million GEL from the state budget to complete the rehabilitation by 2021.

Taking into the consideration the fact that project of such size has never been implemented in the irrigation sector in the history of independent Georgia, quite a lot depends on implementation of the rehabilitation and modernization process in an economical, efficient and effective way.

⁵ Strategy of MOA for 2014-2020 and the strategy of social-economic development of the Georgian government – 'Georgia – 2020'

⁶ Data of Treasury Service of Georgia for 2012, 2013 and 8 month of 2014

Around the world, contemporary irrigation systems have capacity of providing reliable and flexible irrigation service and are economically sustainable. This means organizing irrigation service as an economic activity. On its part, organizing irrigation services as an economic activity ensures efficient distribution of irrigation water to the water consumers and rational use of the water by them.

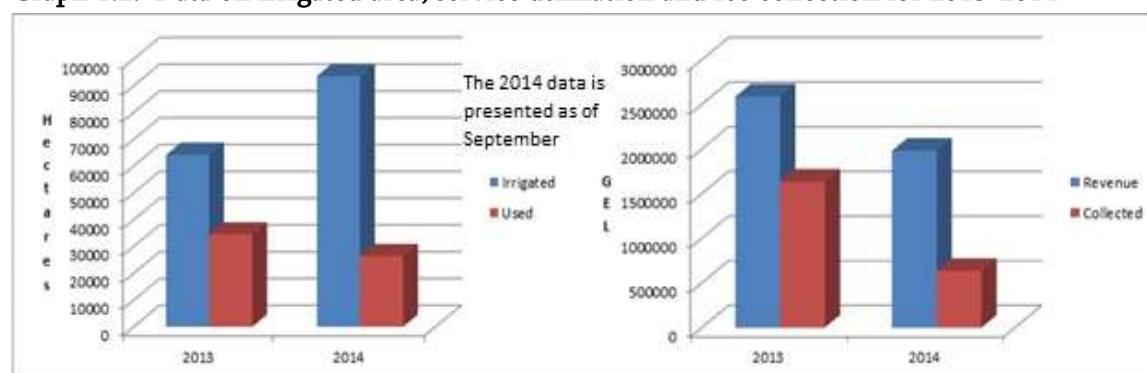
The state policy in the irrigation sector is defined by the Ministry of Agriculture of Georgia. Provision of the irrigation service and carrying out the rehabilitation projects are the competence of 'United Amelioration Systems Company of Georgia' – a state owned LLC.

Rehabilitation of the irrigation infrastructure and institutional modernization of the sector is a long process related to significant financial expenses. It is the duty of the Ministry of Agriculture of Georgia and the LLC to ensure that the process is conducted in accordance with best international practice in order to achieve effective provision of the service in line with the state policy, without taking unnecessary financial and administrative burden by the state.

The condition of using the budgeted funds for the rehabilitation of irrigation infrastructure points to the problems with the planning and implementation of the rehabilitation by the LLC. The adjusted budget for 9 month for the subprogram – 'modernization of melioration systems' (370103) was 51.1 million GEL from which only 17 million GEL was spent at the end of the 9 month period.⁷

The state Audit Office examined main operational and financial data of the irrigation sector for the last 2 years (2013-2014). The graph below shows the basic information about the irrigated area, service provided, revenue generated and fees collected in the given period.

Graph 1.2: Data on irrigated area, service utilization and fee collection for 2013-2014



As it is presented by the graph, at this stage rate of usage of the irrigation service and the fee collection rate are quite low. Moreover, the service usage by farmers is not growing at the

⁷ The State Audit Office Report on the Government Report 'On the Execution Process of the State Budget for 2013', 2013

commensurate rate to the increase of the irrigable area. The balanced growth of the two parameters is, in essence, the main goal of the state irrigation policy.

The present situation (low utilization of irrigation service) may be influenced by number of factors other than irrigation sector management activities (for instance, high rate of uncultivated land, problems in other agricultural sectors, etc.) It has to be noted also, that not enough time has passed from the inception of the reform to assess its long-term consequences. However, based on the analysis of the state irrigation policy measures and the operational and financial data, the State Audit Office has reason to believe that there is significant potential for improvement of the irrigation sector management.

Taking into account the importance of the rehabilitation project for the state and also its financial materiality, the State Audit Office decided to conduct performance audit of this field. Based on the audit findings, the State Audit Office issued corresponding recommendations aimed to contribute to the improvement of effectiveness of the irrigation service and also to mitigate existing risks.

The importance of clear policy, consistent policy implementation measures and economic sustainability for irrigation sector is further highlighted by the fact that for rehabilitation and institutional rearrangement the state spent 115⁸ million GEL in 2004-12 years, however, due to the organizational and technical problems, the system was deteriorated to nearly 15% of its initial capacity by 2012.

Audit objective and Audit Questions

The purpose of the audit is to evaluate to what extent is the principles of good governance used by the state in the process of irrigation sector management.

For this purpose, the audit team formed 2 audit questions:

- ✓ To what extent is the irrigation service provision by the LLC - 'United Amelioration Systems Company of Georgia' efficient?
- ✓ To what extent is foresight used by the state in order to achieve long-term sustainability of the system?

Audit Criteria

There is a significant body of literature issued by the governments of separate countries as well as by international organizations consisting from manuals and guiding principles, policy documents, benchmarks and best practices.

For the purposes of this audit several main sources were used: 'Technical Exploitation - Water Use In Irrigation Systems'⁹ –While discussing the issues of organizing water service

⁸ State Budget Data for 2004-2011 years

⁹ A. Miminoshvili, 1998

provision, 'Principles of Irrigation Management Transfer' issued by FAO in the part about creating water user organizations,¹⁰ other studies, benchmarks and documents describing best practices which cover a wide range of topics in the irrigation sector.

Together with analysis of foreign literature the audit team used national legislation, in particular: the strategy of the Ministry of Agriculture of Georgia, statute of the Department of Melioration in the Ministry of Agriculture of Georgia, charter of the 'United Melioration Systems Company of Georgia' LLC and other corresponding documentation.

All these criteria will be explained in more detail in the corresponding parts of the report.

Audit Methodology and Scope

The audit covers the period from January 1, 2012 to August 1, 2014. The audited entities are the Ministry of Agriculture of Georgia and the 'United Amelioration Systems Company of Georgia' LLC.

Study of other entities which are indirectly involved in the implementation of state irrigation policy in the irrigation sector like municipal self-governments, the Ministry of Natural Resources and Environment Protection of Georgia and farmer associations was carried only in the context of coordination with the LLC and the Ministry of Agriculture.

In the process of the audit the focus was made on the issues of operational and strategic management of the irrigation sector by the state. Under the operational and strategic management issues are meant improvement of the efficiency of the irrigation service in the existing system on one hand and formulating medium-term vision and improving financial sustainability of the LLC in order to ensure economic sustainability on the other.

In the audit process the audit team mainly conducted analysis of documents, physical/visual observation on the site (field visits), interviews and meetings with focus-groups. In order to carry out the mentioned procedures the audit team made 6 visits to 3 regional irrigation systems (Mtkvari-Jandara, Qvemo Alazani, Khrami-Debeda), also interviewed the director and specialist of the Water Management Institute of Georgia.

During visits to the regions, the Audit team was accompanied by the hydrometer of the Qvemo Samgori irrigation system who measured water parameters in irrigation canals.

¹⁰ FAO; Transfer of irrigation and Management Services, Guidelines;irrigation and drainage paper N58;1999

2. Background of the audit

From the 90-ies the management of the irrigation system of Georgia was carried out by the Department of Melioration System Management, which was charged with the responsibility to maintain and operate the main canals and first degree distributaries. The Department was abolished in 2006. On the basis of the abolished department 4 irrigation LLCs¹¹ have been established, which have been merged in 2012 into the LLC “Georgian United Amelioration Systems Company” (further LLC) with the founding capital of 393 million GEL. The LLC is owned 100% by the state, represented by the Ministry of Economics and Sustainable Development of Georgia. The share is transferred to the Ministry of Agriculture with management rights.

Along with the changes of the organizational structure on the central level, some reforms have taken place on the local level as well. During 2002-2010, 253 melioration associations have been established by the form of Legal Entities under the Public Law (43 out of this within the World Bank program on irrigation and drainage). The objective of the creation of the LEPLS was to increase the involvement of the local farmers into the water management process. Accordingly, transfer of the administrative function of the internal irrigation network to the farmers has taken place. Due to the organizational and technical problems, as well as to the inconsistent state policy the established associations did not meet the expectations and they eventually had been abolished in 2011¹²

The infrastructure of the LLC consists of 128 irrigation systems, 22 reservoirs, 31 dams and other hydraulic infrastructure. The total length of the main canals in the irrigation systems is 3100 km, first degree distributaries 3600 km, and second and lower degree distributaries (internal network canals) 25000 km.

Under the acting legislation, state irrigation policy is determined by the Melioration Department of the Ministry of Agriculture. Tasks of the Melioration Department include:

- a) Preparation of the state melioration policy for the development of the melioration field and control of policy implementation
- b) Participation in the state policy definition on the rational use of land, land conservation, productivity improvement and state supervision during the implementation of the state policy measures. Management of the unified GIS system related to the statewide land use and land quality
- c) Timely review of the complaints from the citizens and preparation of the decision projects in a timely manner

¹¹ Mtkvari-M, Sioni-M, Alazani-M and Kolkheti-M

¹² Law of Georgia about abolishing the Law about Melioration of Lands, 2010

The Melioration Department has two service units: Melioration and Land Use Service units. The Melioration Service Unit is competent to participate in the discharging responsibilities as a partner/majority shareholder/owner of the LLC in the decision making process regarding the LLC management, participation in the definition of the priority measures to be carried out in the country in terms of melioration and definition of the priority melioration systems and separate objects to be financed by the state budget or from other funds attracted from the international organizations and donors on the basis of the information received by the LLC.

According to the Ministry, due to the lack of funding for the maintenance and repairs for a long period of time, as well as to vandalism the irrigation system is degraded and cannot function properly.

In parallel with the recent effort of the government to rehabilitate the system on its own, the Ministry of Agriculture applied to the World Bank and IFAD for assistance in introduction of the best irrigation practices to the country. Both organizations provided around 70 million US dollars in total that is to be expended on improvements in the institutional and legal base, rehabilitation of the irrigation and drainage systems and for the measures aimed at development of the land market.

According to the terms of agreement, the project implementation unit (PIU) should be created within the Ministry which will manage the project day-to-day activities. The Ministry will be responsible for overall coordination and implementation of the project¹³.

By the LLC budget mid-term forecast data for 2014-2017, the state budget should allocate 151 million GEL which will be used for the drainage and irrigation system rehabilitation and preparation for the irrigation systems to switch to the modern management practices.

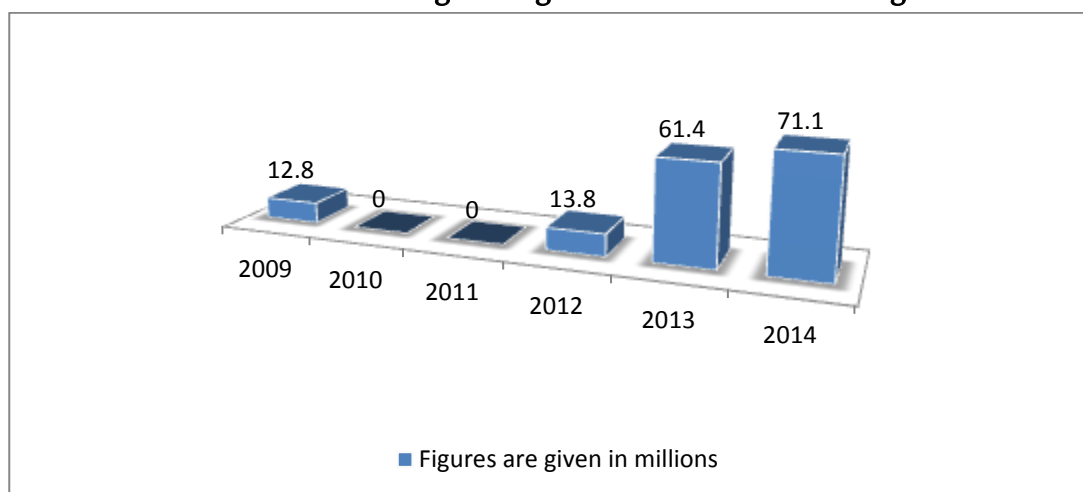
The LLC “United Amelioration System Company” provides irrigation service to the natural and legal persons. As was mentioned, the Ministry by carrying out the managing partner function makes decisions on the issues of strategic importance, and monitors the achieved results. According to the charter of the LLC, main objective is to receive/maximize profit by carrying out commercial activities allowed by the legislation and charter.

The capital and current expenditures of the LLC in the audited period mainly has been carried on the basis of the government decrees:¹⁴ from the budget allocations for the Ministry of Agriculture under the sub program the funds were eventually transferred to the LLC according to the government decrees for funding their main activities, mostly as the investments in the equity of the LLC.

By the equity investments the rehabilitation works and plant and machinery purchases were financed, and by subsidies and other income—current expenses for the functioning of the LLC.

¹³ Project of Development of Irrigation and land Market in Georgia (GGILMD)

¹⁴ Resolution of Georgian Government #672, 2012 and #122, 2013

Chart 2.1: Data on financing of irrigation sector from the budget

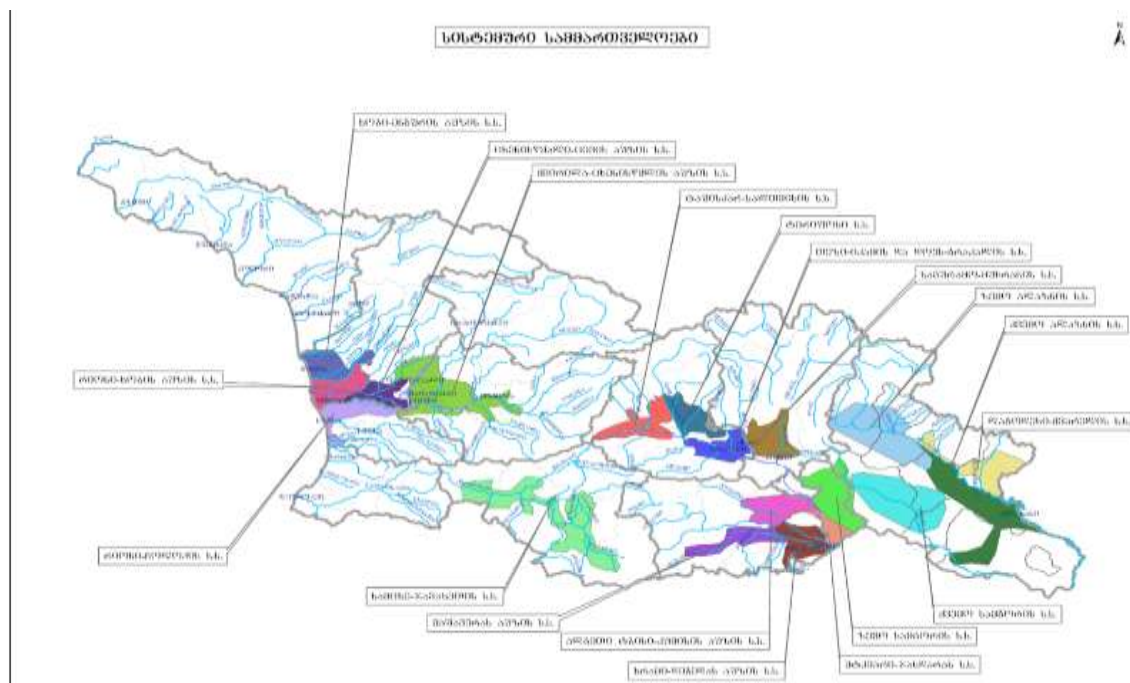
As a result of the increased funding, equipment of the LLC with necessary plant and machinery started, some structural reorganization has taken place as the geographic management principle was changed by the irrigation system management principle, and planning for the institutional capacity building of the LLC has been initiated.

Chart 2.1: LLC finance plan for 2013 and 2014

Income type	2013	2014
Income from company activities	3 500 000	5 422 938
Interest and other non-operational income	2 100 000	800 000
Investments in company equity	48 599 800	57 100 000
subsidy	11 100 000	14 000 000
From the fund for regional projects	500 000	0.00
Residual	104 000	0.00
Total	65 903 808	77 322 938

According to the existing organizational structure, the LLC has headquarters in Tbilisi from where the whole system is managed. Also, the LLC has 21 local irrigation systems management offices (System Units) throughout Georgia which themselves contain 128 irrigation systems. The local Irrigation System Units are mainly located in the eastern part of Georgia (14 irrigation System Unit branches in total).

Map 2.1: Irrigation System Units



The provision of the irrigation service by the LLC takes place as follows: in the beginning of the irrigation period potential water consumers in the local municipalities are offered to sign irrigation contracts by the irrigation System Unit officers. The standard form of the contract includes information about the desired period of irrigation, size of the farm, crops cultivated on it and other relevant data to be filled in by the water consumer. Based on the contracts signed, the water consumers demand water depending on their water needs and receive it in case of water availability. Paying the irrigation charge is obligatory until the beginning of the next irrigation season. In case of failure by the farmer to pay the charge, the LLC has the right not to deliver water until the debt is recovered. The service charge is determined by the State Regulation Commission of Energy and Water Supply. It is a fixed amount - 75 GEL¹⁵ per hectare per year irrespective of the number of the irrigation during the year.

¹⁵ Resolution of State Regulation Commission of Energy and Water Provision of Georgia #2, 2011

3. Provision of the Irrigation Service

3.1 Deficiencies in the organization of service provision

The provision of the irrigation service is dependent on number of factors, such as availability of water during the irrigation season, type of the irrigation system, physical condition of the system and system management model, among others. The modern irrigation service development however, is characterized by modelling itself as a farmer-oriented service.

In spite of the fact that around the world there are number of different irrigation system types and their management models, they can be generalized by main physical and management characteristics.

By types irrigation can be divided into gravitation (flow irrigation) and pressurized systems.¹⁶ In Georgia mainly flow irrigation is widespread, although in some regions the pressurized systems (pump stations) are preserved from the previous times. Within the irrigation system rehabilitation, construction and installment of new pump stations is planned in some regions subject to necessity. The flow irrigation constitutes 90% of the total irrigable area.

The irrigation service organization can be divided in two types - demand based irrigation service provision and supply based service provision. In the first instance the decisive factor is the need of the water user and consequently water user need dictates time and terms of service provision. One example of this can be a situation where a water user gives a pre-agreed short notice to the water service provider and receives the service in the specified timeframe.

Starting point in supply based service provision is availability of water in different periods. Taking into the consideration the availability of water, the water distribution principles and water distribution schedule is composed. Preferred mode of service provision is demand based supply, which enables farmers to request and receive water according to the specific crop need and prevalent climatic and weather conditions for that moment. However, due to the shortage of water in some periods, also in the conditions of the low technology irrigation systems, practice of composing different kinds of water distribution schedules is widespread (rotation, pre-arranged supply, centralized planning etc.)

Accordingly, systems which are not equipped with the infrastructure of high technical capabilities, necessary for the efficient and reliable distribution of water with low level of losses to ensure and enable the flexible management systems, also those systems which do not possess the guaranteed water source, generally use supply based system.

Under the current conditions, managing water by supply based service provision system is more realistic in the majority of irrigation systems in Georgia.

Despite the chosen water supply method (demand based vs supply based), efficient management of the irrigation system is necessary in order to provide service of acceptable

¹⁶ Sprinkler, drip irrigation, etc.

quality to the water users. Especially under the current conditions, where the physical infrastructure necessary for irrigation service provision is in unfavorable conditions and there are many objective hindrances to the quality service provision (for instance, fragmentation of land, lack of reliable and complete information regarding the farms, weak weather forecasting, awareness problems among population etc.)

In the international practice criteria of reliability, timeliness and equity are used for assessment of the quality of the irrigation service provision¹⁷.

- ✓ Reliability-comparison of the planned service to the actually provided water
- ✓ Timeliness-provision of service compared to timeframe set
- ✓ Equity-to what extent all farms in the irrigation system have equal opportunity in terms of water availability

According to the accepted practice, for optimization of the provided service the irrigation service provider should start with the assessment of availability of water during different periods, ascertaining the technical data regarding the irrigation canals (their condition, flow capacity, coefficient of efficiency etc.) and ensure their proper functioning. This will enable the irrigation service provider to obtain physical control of water, its distribution and measurement at the predetermined points (discharge or intake points). The collection of the information on the expected demand side is also necessary, including the information on the total irrigable area, number of farmers, harvested crop average water consumption and similar. Information on the other types of water users is also necessary, including fisheries, industrial use, power plants etc.

After collecting all required information, in the beginning of the year, taking into the account total available water for the season and total harvested area under each crop type, the consultations with farmers should start with the aim to come up with the workable irrigation schedule. With the involvement and participation of the farmers the irrigation schedule should be approved which will be perceived as just and equitable by all farmers within the irrigation district/system, in order to diminish the risk of water related conflicts between farmers and ensure low incidents of interference with the irrigation infrastructure. After approval of the irrigation schedule, this has to be communicated with all the stakeholders (the schedule must be posted in the public areas and so forth.)

These procedures give the process more transparency. On one hand, they enable the irrigation service provider to distribute water in a reasonable way during the irrigation season and on the other hand reduce the risk and uncertainty of unreliable service for the farmers.

According to the better practice, along with the approved schedule, the water service provider also prepares back-up plans for the extreme case scenario (deviation for the

¹⁷ Bos et al 1994, 2005, Horst 1998

projected -when there is excess water or scarcity of water) which should come into the play if such situations arise.

For the audit purposes, the audit team examined those irrigation systems and related canals, where basic pre-requisites of physical control and management of water are in place: they have the dam (head building), which enables the irrigation service provider to regulate the water flow and levels in the main canal, there are functioning manual gates on the main canal and first degree distributing canals.

In the System Units of the LLC (Khrami-Debeda, Qvemo Alazani, Mtkvari-Jandara) the definition of the prospective water demand and consequent water schedule preparation is not carried out. Irrigation water is provided to the farmers in a disorganized way, upon the request by the farmer and is based on the personal communication between the farmers and System Unit representatives. In case there is enough water to meet the demand at hand, the negotiation takes place and service is provided in reasonable time.

Despite the fact that the employees of the System Units (management and canal supervisors) try to rationally distribute the water and take into the consideration conflicting interests of the multiple water users, such management is not effective and cannot avoid productivity losses due to draught which could have been foreseen in the conditions of better irrigation planning, involvement of the farmers in the planning process and improvement of physical control of water.

During the audited period, the main priority for the System Units has been provision of water despite the proper registration of the service and consequent billing of the beneficiary. Owing to the weak physical control of water (sometimes due to the objective reasons-control gates are missing etc.) number of water users receive water, but they are not the LLC contractors neither pay any money for it. Accordingly, the number of beneficiaries from the irrigation activities is higher than contractor numbers registered with the LLC (however, their exact number is unknown).

Due to the shortcomings of the standard contract terms between the LLC and the water users (which will be explained in the relevant chapter) and weak organizational control of water under the circumstances when no information is collected for preparation of the workable irrigation schedule, water users in most cases do not indicate number of times they expect to receive irrigation service and their respective periods. Thus, the System Unit is unaware how much of the irrigation water supply is required for a given irrigable area during the irrigation season. On the other hand, the water users /farmers have not established their water requirements for irrigation water.

Balancing irrigation water demand and supply sides is made difficult by weather factor as well, in the situations when the farmers refrain from using irrigation services in hope of rainfall and in instances when the expectations does not hold true, urgent and sizeable demand for water is created which is impossible for the water service provider to meet in a timely manner.

The equitable and reliable distribution of water is made difficult by the fact that the control of the intake of irrigation water from the main canals by the first degree distribution canals is weak and the regulating floodgates are almost always open (except Mtkvari-Jandara, where the gates are locked by the service personnel and regulated by the System Unit staff). As a result, the farms situated in the vicinity of the canal head are irrigated on a permanent basis, while further down only small part of water is directed which, after infiltration and expected system losses is not enough to meet the farmer's requirements.

Mentioned problems in water distribution carry a systemic nature and are not characteristic exclusively to only those irrigation systems or canals which were examined during the audit.

3.2 Inefficiency of the Service and Its Economic Effect

Khrami-Debeda Systemic Unit (Khrami main canal)

Analysis of the information received by the LLC shows little difference between the two halves of this irrigation canal in terms of irrigated area: out of the areas served by the first degree distributary canals. D1-D7 irrigates 60% of the irrigable area subject to these distributaries, while D8-D13 serves 55% of total irrigable area subject to these distributaries. However, this modest difference between the irrigated areas does not highlight the underlying condition: canals in the head of the canal receive significantly more water than those situated in the middle and end of the canal, even though due to the deficiencies in the standard contract terms all areas are considered irrigated.

Map N 2 Khrami Main canal



During the audit group field visit on July 23, 2014 water measurements were carried out on Khrami canal in 5 points (see above map). In the beginning of the Khrami canal - 8 m³/sec, by the village Tsurtavi 2.3 m³/sec of water is diverted to the Tsereteli canal. By the village Kizlajlo out of water volume 5.7 m³/sec (8-2.3), after consumption remains 2.3 m³/sec.

So farther along by 1/3 length of the canal, out of flow 1.66m³/sec in the vicinity of Marneuli, some water is diverted to 9 April canal and after this, only 0.58m³/sec is remaining for the rest of the canal. However, extra flow was being diverted from river Algeti to this canal bringing the total capacity up to 2m³/sec. **(It is important to note that river Algeti feeds other irrigated areas down the Khrami-Debeda System Unit and may not be available to be exclusively used for Khrami canal replenishment purposes)**

If we break the Khrami canal into 3 near equal parts (D1-D5, D6-D9, D10-D13), according to the calculations based on the obtained data by the water flow measurements we can conclude that first third consumes 4m³/sec water whereas the remaining 2/3 consumes 2m³/sec. In other words, first third consumes 3times as much water than second and third thirds separately.¹⁸ (If 2m³/sec water is distributed equally between them)

In the below table basic data related to Khrami canal and its subjected area is presented

Table 3.2.1: information on irrigable and actually irrigated areas subject to Khrami canal

#	Distributary canal	Subjected Area (ha)	Irrigable area (ha)	Area Irrigated in 2013 (ha)	Number of farms
1	D-1	588	237	166	1336
2	D-2	350	169	98	1052
3	D-3	248	172	101	630
4	D-4	283	167	96	256
5	D-5	362	202	131	47
6	D-6	279	162	91	43
7	D-7	245	152	81	644
8	D-8	234	142	71	1
9	D-9	256	137	66	1
10	D-10	275	143	72	3
11	D-11	223	151	80	48
12	D-12	285	182	111	15
13	D-13	435	224	141	110
Total		4063	2240	1305	4186

During the visual verification of the Khrami canal by the audit team after 2/3 of the canals the water flow was insignificant and could irrigate farming plots only adjacent to the main irrigation canal.

¹⁸ D1-D5 947ha – 4.2 liter/sec/ha, D6-D9 593 ha – 1.7 liter/sec/ha, D10-D13 700 ha – 1.4 liter/sec/ha

By analyzing the maximum possible consumption of water per hectare of land per irrigation (1500 cubic meters of water),¹⁹ assuming the 50% efficiency of the canals (typical for the earth canals), water consumed by the first third of the canal would have been sufficient to irrigate 3456 ha of land (versus actually irrigated 592) per month or 1700 ha twice per month.

By the similar assumptions, on the remaining 2/3 of the canal by 2m³/sec would have been possible to irrigate 1728 per month and accordingly, 864 ha twice (versus actually irrigated 713 ha).

However, under the inefficient management of irrigation water, according to the visual verification of the canal as well as to the information received by meeting with the farmers who have the plots in the second and last thirds of the Khrami canal, they have acute shortage of irrigation water whereas farmers in the first third said that they do not experience such problems.

High level of losses is partially due to the unsatisfactory condition of the tertiary canals (second and below degree distributaries, which mean basically internal canals going to the harvested area), together with the inefficient management of water. However, it should be emphasized that conditions of the tertiary canals are almost the same on any given point of the Khrami canal. Consequently, inequality of the consumption of the water between the farms located at the head and tail of the canal is mainly caused by the distribution of water in the main canal and not by the different conditions of the tertiary canals along the main canal.

The audit team has calculated the economic effect for the farmers under the circumstances if the irrigation water distribution becomes more equitable and therefore, more efficient. Under the equitable distribution is implied a situation, where excessively consumed water from the first third of the canal is diverted to the second and last thirds.

From the total actual monthly consumption of water by the first third, if we deduct the maximum amount of water required to irrigate the total irrigable area twice per month (947 ha, with the same assumption of 50% efficiency and 1500 cubic meter consumption for one ha per irrigation), 2.4 million m³ extra water can be diverted to the second and last thirds, which would have been sufficient to irrigate at least additional 800 ha of land.

During the meetings with the focus groups, the audit team collected information regarding the cultivated crops by the farmers in the different areas along the irrigation canal. As it turns out, the farmers in the first third of the irrigation canal (village Kizlajlo) cultivate mainly alfalfa and other relatively high yielding crops (onions, maize etc.) whereas farmers in the second and last thirds had mostly hay. Farmers in the second and last thirds stated that they were willing to change crop type if the irrigation service was made more reliable.

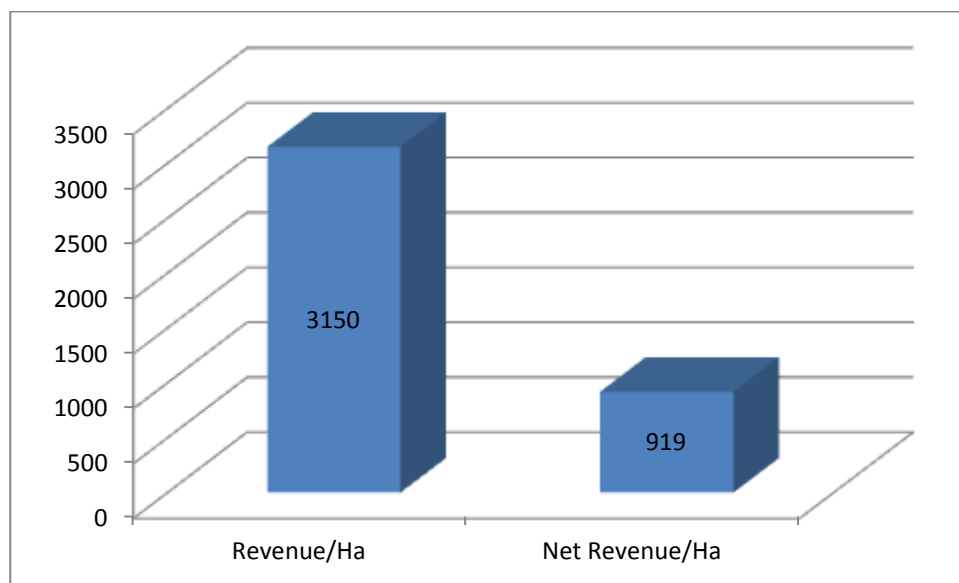
¹⁹ Which is the maximum amount for irrigating 1 Ha

More equitable distribution of water will enable the farmers in the second and third thirds to irrigate their crops at least once per month during the irrigation season and respectively, plan better the agricultural activities for the cultivation of the preferred crop type. The audit team calculated the economic effect of the irrigation service improvement in the case when the farmers substitute the hay with alfalfa, as it is prevalent in the irrigated areas of the canal²⁰.

On the irrigated area in 2013 the better management of water would made it possible to increase profit for farmers per hectare by 900 GEL on average, including all the investment cost and taking into the consideration the time value for money.

Thus only on the Khrami canal, on the areas that are subject to irrigation from the second and last thirds by conservative calculations it would have been possible to get a total extra profit of about 641 thousand Gel.

Chart 3.2.1: – Benefit to farmers by cultivating alfalfa due to the improved delivery of water²¹, GEL/Ha



The presented data indicates that under reasonable planning, modest capital expenses (repairing and replacement of damaged regulating gates) and better physical control of water from the LLC side, it will be possible to significantly increase the farmer's income. Conservative basic calculations show that excessively used water on current irrigated areas will be sufficient to fully irrigate the present irrigable area on the Khrami canal and to increase productivity of agricultural produce. However, under the conditions of the

²⁰ The method of Discounted Cash Flow valuation is used

²¹ Calculations are given in the annex

rehabilitation of the total irrigation network the introduction of water saving technologies will become more pressing.

It has to be pointed out also, that during the peak period in the summer, when there is acute water shortage and stress between second and last thirds, System Unit management agrees the water delivery ad hoc plan with those village trustees, which have conflicting interests, trying to somehow adjust to the situation and set some clarity as to who has rights to irrigate and when. According to this water delivery schedule, water delivery alternates after the G7 between the second and last thirds of the canal, along the main canal and Vakhushti canal. However, no restriction is put on users who are situated up to the G7.

Qyemo Alazani

According to the project data, this System Unit irrigation network encompasses about 22 thousand ha, out of which 5 thousand ha was irrigable by the time of the audit. In 2014, out of the irrigable area the irrigation service was provided to about 2.8 thousand ha, including ponds for fishery (847 ha). The length of the canal is 90 km.

Similar to Khrami canal, there are problems related to physical control of the water within the territory of the given system administration unit. At this stage the Unit cannot ensure regulation of water abstraction from the main canal and administration of the water regulating gates, as a result of which the water is delivered to the land parcels located in the vicinity of the canal source despite the fact they had paid for the service or not. There are regulating gates installed on the main canal and the first degree distributors; however, their bulk requires repair and accordingly, water loss is significant.

During the field visits made by the audit team on August 8, 2014, the water level was measured in the main canal at two points – at Qyemo Alazani head dam and Gurjaani section of the canal. At the head dam, water flow volume was 12 m³/sec. At Gurjaani, at the distance of 1/5 of the entire length of the canal, the volume was 8,23 m³/sec.

Under the conditions of absence of the water supply schedule and weak physical control of the regulation gates, shortage of water is observed from the middle point of the canal until its end point.

Water consumption regulation is hindered by the circumstance that the information regarding the order of the distribution canals, subordinated area to each canal and the conditions of the local/internal network, which significantly determine the size of the total irrigable areas, are not up to date and validated.

18 individuals were interviewed in the scope of the audit. They were grouped according to the location of their land parcels on the canal (again, the canal was conditionally split into 3 parts).

Table 3.2.2: interview results generalized

Canal section	Number of interviewees	Condition of service	Problems	Recommendations
0–30 km Villages: Akura, Vachnadziani, Vazisubani, Velistsikhe, Gurjaani and Chumlaki.	6	Receive water, informal queue	Internal network malfunction	Release gates should be repaired, internal network should be repaired
30–60km Villages: Vakiri, Jugaani, Bodbiskhevi and Kvemo Machkhaani.	6	Water deficit in summer season	Internal network and competition with the fishery industry	Improvement of relations with the fishery industry, repair of the infrastructure
60–90km Villages: Khornabuji, Samtsatskaro.	6	Was irrigated twice at most	Lack of water	

First part: as a result of the interviews with the farmers it has become evident that there is no problem of water shortage at the indicated district and during the irrigation season most of the farmers take water according to particular need of irrigation for crops. There is no formal queue since the water is sufficient for all. However there are occasions when water is misappropriated, which becomes the subject of the conflict. The farmers of this district mentioned that although there is no deficit of water in the canal, in some cases they still cannot deliver water to their parcels because the second and the third degree canals are malfunctioning.

The farmers noted that water losses are significant which is caused by malfunctioning of the regulating gates and damaged parts of the canal. In addition, leaking water damages the road infrastructure and incurs additional losses.

Second part: At this district, water deficit problem has been identified. Farmers noted that for the past two months (June-July) and especially after the second part of August, water flow was decreasing which caused irrigation problems. Agricultural crops were not supplied with the necessary volume of water in most cases. However, in terms of the water deficit, the farmers managed to regulate the order and minimize water misappropriation facts.

Part of the farmers named water consumption by the fishery as one of the reasons of the water deficit. According to them, there are many fisheries on this section of the canal which frequently utilize water voluntarily and create problems to the farmers. In addition, problems similar to the ones identified at the first section of the canal were revealed -

uncontrollable water losses caused by the malfunctioning of the irrigation infrastructure and damage of the road infrastructure by the irrigation water.

Third part. Significant reduction of the water availability levels is observed at this section. Most of the interviewed farmers managed to irrigate land maximum twice, which in most cases was not sufficient for the crops cultivated on those lands. In addition, interests of different types of water consumers - famers and fishery owners in this system have to be taken into account. Fishery owners need uninterrupted water supply in summer season to enrich ponds with oxygen and to ensure its cooling. Water exiting from the ponds in some cases does not flow back into the canal and accordingly, cannot be used for the irrigation purposes.

According to the existing methodology of LLC, the volume for water supplied to the ponds is calculated according to its surface area, which is not the accurate measurement of the actual water needed for the pond.

Thus, without preliminarily determined water supply schedule, reliable physical control and metering of water, there is a risk of conflict between the water consumers and in case of insufficient water, there is a risk of the significant financial loss for the fishery owners and the farmers.

The State Audit Office is of the opinion that the country-wide practice of the service supply has significant improvement potential, which owing to the better quality service to the farmers will enable them to cultivate crops with higher added value and therefore increase their income.

Without improved planning of the irrigation service and without drawing up the rational schedule of water consumption, taking into consideration the cultivated crops during the year and the required water supply volumes on the basis of the water demand, fair, timely and reliable distribution of the irrigation water cannot be secured. Such shortcoming will not allow the part of the population, who follow economic activities, especially in the middle and last parts of the canal to fully receive the benefits of the irrigation network rehabilitation process.

In the process of drawing up water consumption schedule, without technical expertise, basic level of the hydraulic measurements and proper functioning of the key elements of the irrigation network (release gates, water spillway etc.), also without engagement of the local farmers in the process of preparing the schedule, acceptable level of physical management of water and service supply cannot be ensured. Such situation, on the other hand, will increase the inefficiency of the system and will create the risk of emergency situations, conflict between the farmers and interference of farmers in the irrigation network operation.

In order to ensure the introduction and application of rational principles of water consumption, without developing the relevant legislative act, guiding the activities of the System Units, which would regulate the preparation of the annual irrigation service delivery plans by the System Units, determine rights and obligations of the farmers as well

as System Units and manage other service provision related matters, implementation of the uniform practice in the System Units and carrying out of the activities according to the preliminarily agreed better irrigation management principles cannot be ensured by the LLC.

Recommendations:

- LLC shall issue the guidelines for the irrigation System Units, which they will rely on for the purpose of annual planning and water distribution scheduling as well as for regulating relations with the water consumers. Such guidelines will incorporate main principles/goals of the irrigation service, including the principles of timeliness, reliability and equity.
- Irrigation System Units' capacity building shall be ensured to allow preparation of the optimal schedules of water distribution with participation of the population and to secure adherence to the basic hydraulic measurement principles and accepted management practice while distributing water.
- Irrigation systems and LLC shall ensure minimal necessary investments which will enable the irrigation System Units to exercise the elementary physical control of water (repair of gates and protection) and its measurement, which will lead to increase in revenues of farmers, who have their land parcels in the middle and terminal parts of the canal, as a result of the better distribution of irrigation water

4. State Irrigation Policy

Legislative Base for Irrigation and Goals of the State Policy have not been Determined

According to the international practice, the state policy on irrigation is composed of the water management law and the respective normative acts which regulate water consumption at the level of companies, melioration associations, municipalities, farmers and other stakeholders.

This type of information is mainly reflected in the sector strategy of the irrigation and the irrigation regulating act. The sector strategy should outline the significance of the irrigation for the country and its role in water resource management. The strategy should also regulate water distribution among irrigation and other possible utilization of irrigation water (urban, industrial, HPPs etc.) Irrigation regulating act should determine the structure of the irrigation system, the form of management (private or state management) and the rights and obligations of each participant of this system.

The act should identify key principles of functioning of the irrigation system, also set organizational and financial management issues country-wide; however, at the same time it should take into the consideration social-economic conditions of various regions and their priorities. For example, in the USA water consumers are required to fully cover the cost of consumed water (both maintenance and capital investment costs); however, the law makes exceptions for those regions where it is economically impossible to recover costs and with respective social or economic considerations these systems are subsidized.

In terms of operation and financing, the state policy should outline the irrigation system goals, also the requirements for its physical operation and financial sustainability. It is noteworthy that according to the worldwide practice, the state undertakes obligation to cover the capital investments costs of the irrigation system, since most of the time these are significant expenditures. System maintenance and operation costs (cleanup, periodical repair, salaries of the service personnel etc.) normally are funded by the water consumers. Thus, with exception of the several distinguished occasions (USA, Israel) where the system is financially fully independent from the state, almost everywhere the state subsidizes the irrigation system to some extent.

The law of Georgia on “Land Melioration” has been revoked in 2010, as it regulated relations between the associations and LLCs, which had not been efficiently exercised in practice and this sector was exposed to reorganization.

As of today, there is no particular law in place to deal with melioration/irrigation system operation which would determine its directions and general goals. Also, sector strategy of the irrigation has not been developed yet.

Despite the lack of uniform legislation on irrigation, the statement provided in the Agriculture Development Strategy, developed by the Ministry that “priority shall be given to

development of schemes with the potential of ensuring highest returns and cost recovery”²² for the purpose of rehabilitation of the irrigation systems and the measures set in 2013-2015 action plan, such as:

“Selection of the LLC management system as a result of the technical-economic analysis, determining the priority list of rehabilitation schemes on the basis of the economic estimations, considering the types of water charges for the purpose of optimization of the consumption, introduction of water-saving technologies etc.” is the clear indicator that the state intends to establish competitive, efficient and economically viable system on the basis of the market principles in this sphere.

In the Action Plan to the Strategy, key indicators of performance of the tasks determined by the Ministry are:

- ✓ Increase of irrigable land area
- ✓ Rehabilitation of the irrigation systems

As mentioned above, the state implements the policy in the irrigation sphere by means of exercising LLC’s partner’s authorities. Key objective of LLC is to maximize the profit and fund economically viable projects, while its major partner - the Ministry of Agriculture is focused on increasing the irrigable area. Growth of the irrigable area in the medium term perspective is not always economically profitable for LLC (since the rehabilitation of the network is related to high expenses, in some regions water consumers have low motivation to use the service and pay the cost etc.) Hence, the state has two, in most cases conflicting goals: the social aspect – ensuring availability of the irrigation service to the public, which implies expansion of the network and on the other hand, reasonable guidance of LLC’s economic activities, which implies effective organization of its activities (and maximizing profit). The contradiction emerges when irrigation expansion to the new areas does not ensure generation of significant income. In addition, significant increase in capital expenditure will cause increase of the current costs in future for LLC in a form of maintenance and operational expenses.

In the audit period, rehabilitation of the irrigation system was the priority task of the Government and under the circumstances of unprecedented increase of funding, rehabilitation of the irrigation network is performed with accelerated pace. However, if the existing imbalance of irrigation demand and supply is preserved, taking into account incomplete utilization of already irrigable areas and additional costs of operation and maintenance of the irrigation network which will be expanding in future, the state will have to compensate the costs of LLC.

Consequently, in order to determine the acceptable parameters for functioning of the irrigation system, both in terms of social and financial viewpoints, the Government and the

²² Strategy. Page. 28

Ministry will have to determine the acceptable balance between the social and economic goals of the state (for example: Increase in irrigable area in the year; Service use /Revenues from the service use). On the basis of such correlation, the state will have an opportunity to determine the amount of required subsidies in the sphere of irrigation, taking into account costs increased as a result of network rehabilitation and the estimated revenues of LLC.

This will facilitate determination of the goals of the irrigation system reform, will improve budgeting of this sphere by means of estimating anticipated costs and revenues for the upcoming periods, also, it will be possible to evaluate the economic activities of LLC in terms of pre-determined indicators.

Without sector strategy of the irrigation sphere and the irrigation regulating legislative act, which would explicitly determine the direction of the state policy, establish relations between water consumers, taking into consideration the best practice and Georgian reality, the Government, the Ministry, LLC and the other stakeholders will find it difficult to adopt and effectively enforce consistent decisions in the irrigation sphere.

Unless the Ministry identifies future operation and maintenance costs of the irrigation network, the effectiveness standards of LLC's future operations and considers other factors and determines the correlation between the social and financial goals of the irrigation, economic, effective and efficient achievement of the state policy goals in the irrigation sphere and realistic budgeting of its activities will not be secured. (1. It should exactly be aware of its goals and 2. How much is needed to achieve these goals).

Recommendations:

- The Ministry, with close cooperation with the 'United Amelioration Systems Company of Georgia' and other interested parties shall develop the sector strategy of irrigation and further, as needed, a legislative act which together will determine significance of the irrigation sector with respect to other sectors. These documents also will identify rights and obligations of the different stakeholders engaged in the irrigation.
- Based on social and economic objectives of the state in this sector, taking into the consideration the current trends in irrigation water consumption, consequences of the expanding irrigation network and forecast economic performance indicators of the LLC, the financial needs and acceptable performance levels of this sector should be determined in order to ensure rational spending of state resources and realistic assessment of LLC performance in the future.

5. Tariff Structure and Amount

5.1 Rigid Tariff Structure is not Conducive to Rational Use of Water

Rate of the tariff as well as its structure have impact on the behavior of irrigation water users. The tariff rate of irrigation service significantly affects water distribution between the alternative uses (irrigation, industrial water, HPPs etc.). This will become especially poignant taking into the consideration expected increase in industrial production, demand on electricity, population growth and other factors.

On the other hand, the irrigation service tariff significantly affects the cost of producing the national agricultural products and accordingly, the competitiveness of the agricultural sector. In some regions of Georgia, part of farmers still consider water as a common good and does not agree with the idea to pay for it. Nevertheless, in the process of formation of the modern irrigation system, assigning the status of significant economic resource to water is inevitable.

Irrigation service tariff depends on multiple factors. Its main determinants are the irrigation system maintenance and operational costs, organizational structure of water supply, availability of the alternative means of the irrigation etc. In terms of price formation, according to the international practice, “volumetric” tariff is the best option i.e. the product of volume obtained as a result of the exact metering of consumed water and the respective tariff. This type of payment is proportionate to the volume of consumed water and is considered as the most fair and relevant method. However, to ensure functioning of “volumetric” method, it is necessary to equip water consumers with water meters, which will measure water consumption by individual customers.

The second, widely used type is “binomial” tariff, which is composed of fixed and variable components. All water consumers pay the fixed component despite actual use of water for the given period, the second part of the tariff is related to the volume of consumed water (however, since it is not possible to measure the actual consumption of water in this case, the payment may be determined according to the land unit and cultivated crops (\$ per ha/crop). When such tariff is introduced, each subsequent irrigation, according to the principle of decreasing marginal benefit is priced lower compared to the previous; however, as a rule, the upper limit is set on consumption for the maximal volume of water consumed in the given period.

In the EU countries, as a result of revision of the Water Framework Directive, according to which the principle “the polluter pays” has been introduced, the law obliged farmers to pay the cost of water pollution caused by agricultural activities which was included in the water tariff.²³

As for the tariff rate, it directly depends on the irrigation network operation and maintenance costs and the participation of the state in funding of such expenses (if

²³ Water Framework Directive, EU; Directive 2000/60/EC

applicable). According to the acknowledged principles, for the economic viability of the system it is desirable the irrigation system to cover at least own operational and maintenance costs by the revenues collected from irrigation service consumers as a payment for the water consumption.

As mentioned in the introductory part of the report, the tariff, until the water tariff calculation methodology for irrigation is established, is set at 75 GEL in a year, irrespective number of irrigations. Also, the upper limit for water consumption for the particular area is not determined.

Accordingly, the existing tariff does not create economic incentive for the farmers to use water economically, since single payment allows them to receive any amount of water whenever they wish.

This type of the tariff, in terms of its structural composition, is ineffective in two ways: firstly, it does not create incentive for the water consumer to use rational amount of water for irrigation of a specific area, and secondly, it does not limit the number of irrigations, which creates the opportunity of unlimited consumption.

Moreover, those farmers whose lands fall under the irrigable zone but are unwilling to receive the service in the given year, are not obliged to pay at least the minimal cost of network maintenance for keeping the system running and serving its function in the following years as well.

Under more flexible structure of the tariff, it might have been possible to attract the interest of those potential water consumers, which require few/occasional irrigations, but refrain from payment of the full cost.

5.2 The Established Tariff does not Reflect Actual Needs of the Irrigation System

In order to establish the respective tariff, the service provider should be familiar with the real system operation and maintenance costs for particular irrigation system. On the basis of realistic calculation of these costs, the State, in the framework of the general policy referred in Chapter 4, taking into the account economic, demographic and social factors, should adopt the decision to subsidize the tariff in case of necessity. At the moment, there are several factors which hinder realistic determination of the tariff: for many years, the maintenance and capital investment measures on the canals have not been performed and accordingly, the canals have been degraded. Consequently, even those canals which still function often require extra repairs and unforeseen works, which ultimately increase the normal operation and maintenance costs. The actual specified costs of the entire system may become known only after the capital rehabilitation works are finished and the practical revision of the procedure prescribed by respective operation and maintenance manual is conducted.

On the other hand, operation and maintenance costs will increase together with the network's physical expansion. Also, in terms of expansion of the irrigation network, in the future the irrigation service will be provided to less accessible agricultural lands which will

be linked to additional costs (for example: cost of electricity, maintenance measures of related pumps etc.).

It is hard to accurately determine the operation and maintenance costs according to actual spending either, because the actual spending reflects only the costs of urgent measures which were funded by LLC in a specific year within the limits of resources available.

According to the estimation of the LLC management, water supply and accordingly operation and maintenance costs per 1 ha vary in the range of 200-250 GEL for the gravity systems and significantly increase in case of using electric pumps. Similar figure – 166 GEL is obtained by dividing actual maintenance and operational expenses in 2013 by the total irrigable area.

The table below shows the comparison of operation and maintenance expenditures in 2013 with the service provided by the System Units administrations, as well as billed and recovered amounts.

Table 5.2.1: Comparison of System Units' operation and maintenance expenditures with the revenues, year 2013

	Irrigable (ha)	Serviced (ha)	Revenue earned GEL	Recovered amount GEL	expenditures (operation & maintenance) ²⁴	revenue/ expense	recovery/ expense
Mtkvari-Jandara	8042	6014	451068.0	390967.1	903896.4	49.9%	43.3%
Mashavera	4500	1720	129014.8	94698.5	304504	42.4%	31.1%
Zemo Samgori	5508	3045	228360.1	114651.1	546377	41.8%	21.0%
Qvemo Samgori	5000	2169	162652.5	189354.5	601395	27.0%	31.5%
Khrami-Debeda	7980	6836	512728.7	214099.8	782739	65.5%	27.4%
Algeti Tbisi Kumisi	1050	644	48301.5	16264.9	460154	10.5%	3.5%
Qvemo Alazani	5105	2899	217441.5	149992.5	808509	26.9%	18.6%
Zemo Alazani	4228	538	40323.0	9447.7	457716	8.8%	2.1%
Samtskhe-Javakheti	200	127	9521.7	5088.3	106893	8.9%	4.8%
Tashiskari-Saltvisi	7500	3829	287166.7	195013.8	697030	41.2%	28.0%
Tiriphoni	7300	4010	300774.3	145068.5	828003	36.3%	17.5%
Tezi-Okami and Does- Grakali	3085	832	62371.1	43121.1	373033	16.7%	11.6%
Saguramo-Mukhrani	4500	1306	97975.1	57803.3	331149	29.6%	17.5%
Lagodekhi-Kvareli	167	526	39450.0	9095.0	84659	46.6%	10.7%
Total units	64165	34495	2587149	1634665	7286057	35.5%	22.4%

To date, the State has funded irrigation service by compensating capital and operation and maintenance costs. As seen from the table, in 2013 LLC revenues from servicing comprised

²⁴ In order to get the full cost, expenses on electricity for functioning of pumping stations should be added. In 2013 the expenses reached 3 million GEL.

about 1.6 million GEL. It is obvious that in terms of existing operation and maintenance expenditures, under the current tariff and especially in terms of incomplete use of irrigation service, LLC will find it hard to cover the operation and maintenance costs without State subsidies. However, there are several System Units which have a real potential of achieving positive financial results.

The rate/amount of the current tariff does not represent the market price of irrigation service, as it takes into account the level of income of the rural subsistence farmers and the social significance of the irrigation service to them.

However, despite the absolute rate/amount of the tariff, there is a significant potential to introduce sound economic incentives within the structure of the existing tariff, which will facilitate establishment of the modern irrigation system. In particular, in case of preserving rigid and unlimited consumption tariff, the farmers will not be motivated to limit water consumption or to consider in their decisions the additional consumption cost of each unit of irrigation service.

Consequently, under the circumstances of uneconomical and inefficient utilization of resources, costs of which will be reimbursed/borne out by the State, saving of the significant amount of resources won't be safeguarded for further service quality improvement.

Also, in a situation of tariff system not linked to the water resource consumption, the farmers will not be motivated to commence introduction of water saving technologies.

As a result of growth of the irrigable area and respectively, the water consumption in the nearest future, the competition between the farmers for water will be increased and accordingly, without the rational tariff, it will be difficult to ration water consumption for each farmer.

Without the LLC realistically determining the operation and maintenance costs for specific System Units, real amount of the tariff and appropriate subsidizing (in case of such decision) amounts per given region cannot be determined, which in turn, will negatively affect the planning and implementation of the operation and maintenance activities, irrespective of the ownership type of the internal irrigation network.

Recommendation:

- Flexible tariff structure has to be introduced, which will be compatible with the type of tariffs recognized by the best practice and will facilitate rational use of water for establishing modern irrigation system.

6. Farmers' Organization and Environmental Issues

6.1 Organization of Farmers Requires Improvement

Unification of farmers with the purpose to improve the irrigation service implies their organization in a particular way and assumption of rights and obligations by those organizational units, which ensures maximal protection of the common interests of the entire union. Decent functioning of the irrigation system highly depends on farmers' unification. As a rule, it has a significant impact on the effectiveness, economic viability and other important aspects of the irrigation system.

In international practice farmers' unions exist in various forms such as water users associations, fellowships, cooperatives etc. Regardless of their organizational and legal forms, its basic principle is to grant certain level of autonomy to the farmers assigned to specific irrigation network area, which implies transfer of particular part of the irrigation network management responsibilities to them. Such unions receive the authority to settle disputes between the members, distribute water inside the group, establish and collect fees from the association members for covering operation and maintenance expenses and other necessary tasks. The world-wide practice of establishing the Farmers' Associations and granting certain autonomy to them is conditioned by two main reasons²⁵:

- ✓ Reduction of the fiscal burden of managing irrigation system to the state and thus improvement of the economic sustainability of the system
- ✓ Necessity to increase the effectiveness of the irrigation system

The first reason is explained by the fact that in general, planning, rehabilitation or maintenance of the irrigation systems is very expensive and in terms of the modern state governance, when the state assumes numerous public functions and responsibilities, it becomes a heavy burden on the State Budget. In this regard, sharing the fiscal burden with the private sector is desirable from the perspective of the state. Moreover, there is a political risk of linking the irrigation system entirely to the state: if the budgetary funds needed for the functioning of irrigation system are cut due to the political decisions, the system conditions may significantly worsen and the irrigation system established in the prior periods could be affected. (If regular operation and maintenance procedures are not performed, the canals are filled with earth sediments, get damaged and consequently become useless. Particularly this factor caused degradation of the irrigation network in Georgia).

The second reason for which the irrigation systems are transferred to the Farmers Unions is the overall ineffective functioning of the system, which implies unsatisfactory operational and financial performance (low quality of service, high operation and maintenance costs, low fee collection rates etc.).

²⁵ Transfer of irrigation and Management Services, Guidelines. FAO irrigation and drainage paper N58

Above mentioned two factors and the improvement potential of the system performance should be permanently evaluated by the state and accordingly, decided whether it is reasonable to transfer certain functions to the Farmers' Unions.

According to the criteria, in order to successfully transfer the management rights, there should be willingness and appropriate capacity on behalf of farmers to undertake the administration of the irrigation system or its part, to establish the management unit and effectively lead activities. To achieve this goal, farmers must have certain incentives; they should see clear benefits from the transfer, i.e. opportunities of the service improvement in case they administer the system, financial benefits/savings etc.

In case of transferring the irrigation service management, according to the widely accepted model, the state organization which provides the irrigation service (irrigation agency) significantly narrows down its own scope of activities and is limited to implementing the capital projects, administering river basin management issues and carrying out complex maintenance works. Local service providers are established as separate legal entities and receive water on the basis of the contract conditions from the central irrigation agency (LLC in case of Georgia). The local service providers in most cases are established as the Farmers' Associations, where farmers choose the board members who assume the association management rights. The board determines the costs necessary for the association, establishes fee/payment rates and ensures functioning of the system.

Farmers make due payments to support the association's objectives, participate in the system maintenance activities and decide problematic issues at the general meetings. Activities of the association should be transparent, auditable and the board members should receive some compensation. Also, it is important for the associations to have necessary equipment for conducting certain works by themselves or to have enough resources to hire qualified service provider.

The present report does not intend to review the types of farmers unions; rehabilitation of the irrigation system and its institutional reform has recently begun in Georgia. Hence, at this stage is it premature to make final assessments on the effectiveness of the LLC activities.

As it was already mentioned in the introductory part, the initial attempt to establish associations was not successful. According to the law, the internal network (2-nd and lower degree distributors) were transferred to associations. After abolishment of the Water User Associations, the Ministry of Economy was assigned to make inventory of the internal irrigation network and to transfer it to the primary water users. At the present time, a big share of the internal network is not accounted for and similar to the high line canals, is degraded. According to the Government's Resolution ²⁶ LLC was authorized to conduct rehabilitation of the internal network together with the higher degree(main canal and first

²⁶ The Government Resolution N122, 29 January 2013

degree) distributors. However, due to the size of the internal network, its rehabilitation requires significant efforts and is a time consuming process.

The quality of functioning of the internal network directly affects the efficiency of the irrigation system and consequently, the effectiveness of the service. Under the conditions of malfunctioning internal network, even in cases when enough amount of water is supplied from the higher degree distributors to the internal distributaries, high water losses, ground wash-off, flooding etc. are observed.

For the irrigation service provider-System Unit administrations it is difficult to physically deliver water to separate land parcels attached to the irrigation system, also to measure the volume of supplied water, etc.

Further, when the land is highly fragmented and the area of an average land parcel equals about 1 ha, rational distribution of water will depend on the readiness/condition of the internal network in the entire hydrological unit, or “block”; for supplying water to the land parcels which are located far from the canal/distributor, it is necessary that the internal network of the neighboring land parcels be ready to pass the needed volume of water. Also, from the water measurement viewpoint, under the current technical conditions it will be very hard for the LLC to accurately measure water consumed by every individual water consumer.

Hence, water measurement will be possible at the distribution point which serves one entire hydrological unit, or “block”. Distribution of particular volume of water between the land parcels existing within this block and regulation of queue should be performed on the basis of the principles preliminarily agreed with the farmers.

Under current conditions, a substantial part of the irrigable land areas in the System Units studied by the audit team cannot receive irrigation water because of the malfunctioning of the internal network. Since improvement of the internal network is not only the concern of particular farmers but rather requires relevant actions on behalf of the state and joint efforts of the farmers, the role of local governments is high in organizing farmers associations. By coordination from the System Units and with assistance of the local municipalities, the purpose of organizing the farmers should be to ensure the acceptable level of functioning of the internal irrigation network despite the management model the government may choose in the future for dealing with the farmers: the irrigation system will remain under state control or the Farmers’ Associations will be established.

6.2 Important Environmental Aspects

Currently, global climate change is a scientifically proven phenomenon and a factor to be taken notice of in the process of formation and implementation of the state policy. Analysis of the existing information on climate²⁷ demonstrates the average annual temperature growth trend in Georgia. It is anticipated that in future the climate change will accelerate. Climate

²⁷ Climate Change in the South Caucasus; Zoi Environment Network, 2011

change, besides the growth in the annual average temperature is reflected on such parameters of the climate as minimal and maximal temperatures, weather variability and precipitation.

According to the analysis, it is anticipated that the annual precipitation may decrease at the regional level, which affect the river flow and will reduce the available irrigation water resource. In addition, because of increased temperature, the water demand of plants will also increase, leading to rise of the amount of water needed to irrigate one hectare of land. Both above indicated factors may jointly incur irrigation water resource deficit. In 2011 as a result of substantial research conducted by three countries' experts (Georgia, Armenia and Azerbaijan)²⁸ the trend of decreasing annual flow of Alazani and Khrami-Debeda rivers has been identified. In particular, this study proved that at the section of Alazani (Shakriani observation station) from where Qvemo and Zemo Alazani irrigation systems are supplied, it is anticipated that the river flow will decrease for 38% (minimum 14% of irrigation water demand) in 2020-2050 period (27% in 2050-2070) compared with the baseline data (1961-1990); at Khrami-Debeda basin the river flow is projected to decrease by 9-11% for 2040.

Under these circumstances, emphasis should be put on one hand on the improved management and distribution of irrigation water and having a long term vision related to the irrigation system on the other.

In the future, transition to the water saving technologies and other adaptation measures will become more pertinent, such as building of the local water reservoirs to provide timely response to increased irrigation water demand in peak periods, provision of information on drought-resistant species to the farmers through the agro consultation centers, improvement of the weather forecasting system etc.

Farmers' organization has big practical significance for proper functioning of the irrigation system, considering highly fragmented land parcels and unsatisfactory conditions of the internal irrigation network.

Without ensuring the involvement of the farmers in the organization of the irrigation service supply, preconditions for the effective service provision will not be prepared, which in turn will prevent the LLC from distributing water accurately and efficiently, in line with the water metering standards among number of land parcels.

Without establishment of additional incentives for involvement of farmers in the operation and maintenance of the internal irrigation network, which in itself will strengthen the perception of the irrigation infrastructure as common good, LLC will find it hard to achieve the irrigation goals due to large scale of annual maintenance works of the internal network. Taking into consideration that the operation and maintenance costs per ha significantly exceed the existing tariff per one ha, LLC has two alternatives to balance the revenues and expenditures in a long term perspective – either to increase the tariff or as a result of

²⁸ Regional Climate Change impacts study for the South Caucasus region. Tbilisi, 2011 UNDP

cooperation with the local municipality, improve the public engagement in operation and maintenance of the internal irrigation network and therefore reduce the state expenditures for this component.

Recommendations:

- Unification of the farmers into hydrological units should be ensured, which will enable the LLC to distribute water between farmers within the given unit according to the predetermined fair principles and to realistically measure the volume of provided water
- LLC and the local municipality shall mobilize involvement of local population in the internal irrigation network maintenance activities, which will improve the internal network conditions, enhance farmers' participation in the institutional management process of the irrigation sector and is likely to reduce the system operation and maintenance costs.

Overall summary and recommendations

Ensuring efficient, fair and reliable provision of irrigation service needs substantial effort of all the interested parties. On the effective management of the irrigation sector (together with physical rehabilitation) largely depends the development of agricultural sector and consequently, wellbeing of the farmers employed in it.

Unless the LLC 'United Amelioration Systems company Of Georgia' starts collecting operational data (irrigated areas, cultivated crops, estimated number of the consumers, available irrigation water resources etc.) with the objective to improve service quality and also, without involvement of farmers in the preparation of irrigation schedules, efficient use of irrigation water resources and availability of the service cannot be ensured. Forming an efficient, fair and reliable irrigation schedule will become even more relevant in case of intensification of the agricultural activities and entailing increased irrigation water demand.

Without an Instruction to guide the planning of the irrigation service provision, prepared on the basis of the principles of accepted good international practice and which will assist the managers of System Units in preparation of the irrigation schedules, the system administrations will find it difficult to ensure uniform service of satisfactory quality within the whole LLC.

Moreover, for the implementation of the mentioned irrigation schedule existence of basic irrigation infrastructure (dam, manual water gates etc.) is necessary. No less important is that this infrastructure should be operated by authorized and qualified personnel. Strict and competent control of the dam, gates and other infrastructure will ensure rational distribution of irrigation water among many water users.

There is potential for significant improvement of irrigation service quality by implementing the mentioned measures, without material financial costs or large-scale physical rehabilitation. It will enable farmers (especially those located near the middle and tail end of a canal) to cultivate crops with higher added value and consequently increase their incomes.

Defining and specifying economic and social goals and acceptable balance between them in the irrigation sector by the Ministry of Agriculture will make it possible to adequately define objectives of the State in this sector. Without defining medium-term strategy of the sector and specific financial and operational targets it will be hard for the policy implementing parties to evaluate achieved progress and also to take appropriate measures in case of deviation from the desirable course.

Without having a sector strategy and a legislative act for irrigation, which will clearly define directions of government policy and establish forms of interactions among the water users, taking into consideration best international practice and Georgian reality, the Government, the Ministry, the LLC and other interested parties will find it difficult to take consistent decisions and to implement them effectively.

Setting the irrigation tariff according to good international practice, which takes into consideration the volume of consumed irrigation water, will guarantee producing those economic incentives for the water users which are necessary for ensuring efficient and economic use of water.

Moreover, existence of a tariff with a flexible structure will help to create demand on water saving technologies by farms. Without realistic determination of the costs per region needed to keep irrigation infrastructure in good working condition, it will be hard to calculate irrigation tariff and accordingly, part of it due to be paid by the state (in case of government subsidizing the tariff).

The System Units will find it difficult to distribute water to all the individual water consumers and to measure the provided water reliably without creating some kind of farmer organizations, especially when taking into consideration high level of fragmentation and unsatisfactory conditions of inner irrigation canals. This will make it difficult for the LLC to provide the service and calculate relevant fees to be paid by the water users.

Without creating additional incentives for the farmers to participate in maintenance of the irrigation canals, which will facilitate perception of the canals as common good, the LLC will find it difficult to achieve irrigation targets taking into consideration the scale of the need yearly maintenance works.

Recommendations:

- LLC shall issue the guidelines for the irrigation System Units, which they will rely on for the purpose of annual planning and water distribution scheduling as well as for regulating relations with the water consumers. Such guidelines will incorporate main principles/goals of the irrigation service, including the principles of timeliness, reliability and equity.
- Irrigation System Units' capacity building shall be ensured to allow preparation of the optimal schedules of water distribution with participation of the population and to secure adherence to the basic hydraulic measurement principles and accepted management practice while distributing water.
- Irrigation systems and LLC shall ensure minimal necessary investments which will enable the irrigation System Units to exercise the elementary physical control of water (repair of gates and protection) and its measurement. This will lead to increase in revenues of farmers, whose land parcels are situated in the middle and terminal parts of the canal, as a result of the better distribution of irrigation water
- The Ministry, with close cooperation with the 'United Amelioration Systems Company of Georgia' and other interested parties shall develop the sector strategy of irrigation and further, as needed, a legislative act which together will determine

significance of the irrigation sector with respect to other sectors. These documents also will identify rights and obligations of the different stakeholders engaged in the irrigation.

- Based on social and economic objectives of the state in this sector, taking into the consideration the current trends in irrigation water consumption, consequences of the expanding irrigation network and forecast economic performance indicators of the LLC, the financial needs and acceptable performance levels of this sector should be determined in order to ensure rational spending of state resources and realistic assessment of LLC performance in the future
- Flexible tariff structure has to be introduced, which will be compatible with the type of tariffs recognized by the best practice and will facilitate rational use of water for establishing modern irrigation system.
- Unification of the farmers into hydrological units should be ensured, which will enable the LLC to distribute water between farmers within the given unit according to the predetermined fair principles and to realistically measure the volume of provided water
- LLC and the local municipality shall mobilize involvement of local population in the internal irrigation network maintenance activities, which will improve the internal network conditions, enhance farmers' participation in the institutional management process of the irrigation sector and is likely to reduce the system operation and maintenance costs.

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Annex #1 Calculation of the net revenue of farmers in case of replacing hay with alfalfa

Period (Year)	I	II	III	IV	V	Unit	GEL	Source
Harvest of alfalfa	150	330	330	330	150	Press	-	Interview with farmers
Harvest of hay in existing conditions	100	100	100	100	100	Press	-	Interview with farmers
Net Harvest	50	230	230	230	50	Press	-	
Revenue	300	1,380	1,380	1,380	300	GEL	-	Interview with farmers, Mymarket.ge
Operational expenses	190	298	298	298	190	GEL	-	Interview with farmers, ras.ge
Operational Profit	110	1,082	1,082	1,082	110	GEL	-	-
	1.2	1.3	1.5	1.7	2.0	-	-	-
Discount Factor	0.9	0.8	0.7	0.6	0.5	-	-	-
Discounted Operational Profit	95.7	818.1	711.4	618.6	54.7	-	2,299	Operational Profit per Ha
							1,638,872	Operational Profit on irrigated area
							983,940	Capital Expences on irrigated area (ras.ge)
							654,932	Net discounted Revenue on Irrigated area
							918.6	Net discounted Revenue per Ha (see 3.2.1 chart)
							3,150	Discounted Revenue (see. 3.2.1 chart)

