Towards a water secure world!

Global Water Partnership of Central Asia and Caucasus

NEWSLETTER WATER, CLIMATE AND DEVELOPMENT PROGRAMME CAUCASUS AND CENTRAL ASIA

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SIGNIFICANCE OF WACDEP PROJECT IN THE LIGHT OF OUTCOMES OF THE CONFERENCE OF PARTIES TO THE UN FRAMEWORK CONVENTION ON CLIMATE CHANGE

On December 12, 2015 the Conference of Parties to the UN Framework Convention on Climate Change adopted the Paris Agreement for the period up to 2020 which contains a variety of decisions regarding world's adaptation to climate change. The documents can be found on the website: http://www.iisd.ca/climate/unfccc/adp2-11/. "Paris" can rightly be called a victory over the "climate" sceptics in the broadest sense of the word. Even the so-called advocates of unproven anthropogenic interference with the climate system, spoke about the need for realistic approach and realistic goals.

Almost all participants of the Paris summit confirmed the link between climate issues and water problems. Globally, the differences between the ways "2°C" and "3°C" are big and, basically, they are associated with the water. In the first case 500 million of people will suffer from water problems in the middle of the century, and in the second - about 3 billion. Both, the lack of water and drought, as well as its excess - floods, storms and surges, rise of sea level, etc. are kept in mind. These problems can acquire catastrophic proportions for a large number of vulnerable countries, including countries in the Caucasus and Central Asia. In the light of the outcome of the Paris Summit one begins to better understand the significance for our region of the 30-month operation of the Global Water partnerships network within the WACDEP - Water, Climate and Development. This project "put wise" about two aspects:

1. The project helped to understand the roots of human impact on the climate system - at least in Central Asia.
2. The project helped to test in real conditions the specific adaptation measures to climate change.

Anthropogenic impact in the form of irrational water use, which led to the death of the Aral Sea – is one of the key reasons for the intense climate change in Central Asia. With a large water surface, the Aral Sea before 1960 served as climate-regulating pond and softened sharp fluctuations of weather in the Central Asian region.

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Photo by Berdiev A.

Air masses over the Aral Sea invading the region from the west warmed in winter and cooled in summer. Due to this mode, the moisture carried by air currents, fell as rain over the mountains of Tien Shan and Pamir in autumn-winter period, adding to the volume of glaciers and snow reserves. After the disappearance of the sea, the summer in Central Asia has become shorter and hotter (frequent seasonal droughts) and the autumn-winter period was extended and became colder. Against the backdrop of global climate change, the disappearance of the Aral Sea has led to the fact that since the 1980s rate of warming in the region exceeds the rate of global warming by more than 2 times. A good indicator of climate change can be double the number of days with temperatures above 40°C in the Aral Sea, and one and a half times in Central Asia.

This change in temperature changed the structure of the moisture transport over the territory of Central Asia. Into its main flow from west to east, the fluxes from the north have been penetrating, which carry moisture from the Arctic Ocean, as well as flows from the south, which carry the moisture of the Indian Ocean. This moisture mostly discharges in the warm season, which has led to a reduction in the volume of mountain glaciers of the Pamir and Tien Shan at the rate of 0.2% - 1% per year. The tendency of reduction of snow in mountain river basins in the region is observed, leading to a deterioration of conditions for agriculture in the Central Asia. It is safe to say that as a result of climate change the following have already been observed in the region:

· Extension of the dry hot period;
· Increased number of days with heavy precipitation and high rainfall variability;
· Reduction of snow in the mountains and the degradation of glaciation;
Increased frequency of extreme events, droughts and water shortages;
· Increased evaporation of plains and foothills.

On the territory of the Aral Sea basin precipitation decreased by several times. Its average value is 100-150 mm with considerable seasonal unevenness. There is a high evaporation (up to 1,700 mm/year) with decreasing air humidity of 10%. The air temperature has decreased in the winter and has risen in the summer by 2-3°C. During the summer temperatures are up to + 50 ° C. Long-term assessment of water resources in the region on the basis of climate scenarios, taking into account the climate warming, shows that by 2050 the volume of river flow in the Amu Darya river basin will be reduced by 10-15% and by 2-5% in the Syr Darya. The number of dry years and the number of drought years will increase with the loss of flow up to 25- 40%, which will cause both a sharp increase in the demand for water, and the increase in the deficit of water. SIC ICWC experts predict increase of irrigation rates in 2030 by 5%; by 2050 - by 7-10% and by 2080 - by 12-16%. There will be inevitable losses of crops that with the current demographic growth rate will represent a serious risk to food security and hinder sustainable development.

Thanks to the active work of the Global Water Partnership in the framework of WACDEP "Water, Climate and Development", we were able to test in real conditions the specific measures to adapt to climate changes. I am pleased to present to you the key findings of these studies.

Vadim Sokolov
GWP CACENA Regional Coordinator.

Georgia

Cherry orchard in Sakire Village

As a result of the climate change impact, many beautiful places of Georgia could gradually lose the charm; that for the proud and selfish Georgians is a very sensitive issue. It conveys a feeling of Vladimir Mayakovsky's poem *Vladikavkaz - Tbilisi:*

«I know:
It is stupidity —
Eden and paradise!
However
if they sung about it,
it must be
Georgia –
joyful region –
that poets kept in
mind».

Flooding in Tbilisi in 2015 showed the risk of natural disasters has not diminished, but has been increasing. See picture on the left.

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On November 8, 2015 the villagers Sakire - Tajrisi Borjomi district came to take part in the tree planting. Among them were women, students, representatives of the village authorities. The event was the final chord of the demonstration project "Measures to mitigate the effects of natural disasters in the village Sakire, Borjomi district." The project was implemented within the framework of GWP CACENA Water, Climate and Development Program in Central Asia and the Caucasus.

A park, which the villagers call "cherry orchard", is located on a project pilot area, where the drainage system was built. This location was chosen as a result of repeated consultations with residents and local authorities.

Trees are planted in order to strengthen the soil; and park covers only the territory belonging to the village. The total pilot area covers 1.5 hectares. Jemal Bibiluri - an activist of the village and project field supervisor provided cherry seedlings. He also managed the event. See the picture on the left.

At first, the villagers were skeptical about the proposed project. Moreover - there were opponents - for example, a villager, whose private courtyard was within the pilot area, refused to participate in the project. Although he and his family, who in the summer come to rest in the village suffered from the fact that their yard was flooded and turned into a swamp. After the villagers themselves convinced him of the benefits of the project, he agreed. Now he gratefully says his basement has drained from the water and the house does not threaten destruction. A mother of 10 children Tabagari Lela, who also lives directly next door, added that she and her family will take care of the planted trees.

The project expected outcomes included the ability to mobilize the community around a common problem; reduction of agricultural land degradation; food security of the rural population and a healthy environment; raising public awareness about the sustainable management of land and water resources; increased knowledge about existing specific threats posed by natural phenomena and others.As a result of 2-year project, the expectations were mainly met. The project overcame subjective and objective challenges, such as reduction or temporary suspension of funding that impede the planned seasonal work; business of village volunteers/activists with their own activities; weather; unforeseen changes in the project, etc. These difficulties were overcome as a result of social mobilization and the active support of WACDEP program management. For example, the additional works implemented in 2015. 3 branches were added into the already built drainage system (ditches were cut and wells constructed, pipes laid covered with gravel).

The program in Georgia cooperated with other international programs and projects - Institutionalisation of Climate Change Adaptation and Mitigation in Georgian Regions, Developing Climate Resilient Flood and Flash Flood Management Practices to Protect Vulnerable Communities of Georgia, Project Climate Forum East, Clean up, Environmental Protection of International River Basins Project, and others.

There were numerous informational meetings held with the population and local authorities. Educational seminars, trainings, and workshops were conducted in different regions of Georgia (Tbilisi, Zugdidi, Borjomi, Kutaisi, Poti, Batumi, Gori, Tskhaltubo, Lanchkhuti, Chokhatauri, Oni, Ambrolauri, Tsageri, Lentekhi, etc.). See the picture on the right.

An article in the "Borjomi" newspaper was published under the title "A good deed in the village". Article gives readers information about Global Water Partnership, the WACDEP GWP CACENA Program; it introduces the activists of the village - Lawrence Beridze, Guram Gogoladze, Andro Aalahadze, Giorgi and Gocha Gelashvili; family Shakulashvili, Nato Samsonadze, Daredzhanom Mikadze, Lela Tabagari and others. The project organizers were presented too.

The villagers, especially those who live directly next to the site, really benefited from the project. Gudzha Shakulashvili an activist, whom is head of a large family, said to reporters they have received support from the GWP and now the villagers are obliged to protect what has been done for them.

What will happen next? During the project, a friendly relationship between the leaders of the project, and the villagers have developed that is the foundation of all the benefits and achievements. Given this, plans and suggestions of the villagers may be realized in the future, such as the improvement of the “Cherry Orchard”, the rehabilitation of the irrigation canal, improved drinking water supply, Sakirula river bank protection activities or construction of similar drainage networks in other parts of the area, etc.

UZBEKISTAN Integrated Water Resources Management as a Practical Approach to Climate Change Adaptation in Central Asia and the Caucasus Project

Agricultural production, with its own specific problems in recent years has become more complicated due to the changing weather conditions in the context of the year and regular alternation of dry and wet years in the last decades. Strong changes in temperature and precipitation greatly deduce the planned agronomic and irrigation activities within the approved standard cropping and irrigation regimes. Currently, every farmer and employee of irrigation water supply service have been trying to resist these deviations using their knowledge and experience. None of the countries in the region have specific suggestions on how to take advance measures to adapt to sudden changes in weather conditions, especially during the year.

The program aims to demonstrate the experience of the projects Integrated Water Resources Management (IWRM-Fergana) and Water Productivity Improvement at the Plot Level (WPI-PL) through the maximum adaptation of technological operations to various deviations in weather conditions and their negative consequences, both agronomic and - closely related to them - irrigation activities. The main point of this approach is the choice of agricultural and irrigation activities consistent with the climatic conditions of the period; the quality and special preparation of the agricultural fields for possible weather anomalies and provision of technological tools to monitor and respond quickly to any kind of change in the situation. The main risks and measures to identify and eliminate them include:

- A sharp rise in temperature and the requirement for irrigation in an unstable water supply;
- Rainfall in the midst of vegetation and fields' need in special handling;
- Invasion of pests and disease emergence from a low temperature requires the development of preventive measures and measures to combat pests and diseases;
- The lack of irrigation water and prolonged irrigation interval require maximum mobilization and use of water retention measures and the application of effective technological irrigation scheme.

All of these risks can be controlled and prevented by the availability of certain information and provision of farmers with the necessary tools and technological approaches.

Methods of assessing and adapting agriculture to changing climatic conditions.

To adapt to climatic changes, it is important to carry out continuous monitoring of climatic parameters and indicators of growth and development of crops as well as changes in soil moisture. It is not possible and there is no need to forecast the climatic conditions for many decades to come. It is obvious that this kind of climate change in the region is the result of global climate change, the causes of which may be far beyond the borders of the region. However, the changes of climatic conditions should be studies on the region level both for the long-term period, and the distribution of rainfall and air temperature during the year. Such a study may allow not to control the climatic conditions, which of course is impossible, but to adapt agricultural and irrigation activities to unusual for the region climatic conditions.

It is necessary to collect monthly and, better, decadal data on precipitation and air temperature for the past 100 years (minimum 50 years). First of all we must establish:

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- Whether there are any deviations in the climatic conditions of what we have seen over the recent past in the region;

- Whether the existing climate changes are nonstandard deviations.

It is important to determine the most important period to be analysed and evaluated. When considering the growth and development of plants it is important to establish the dynamics of climatic parameters for the vegetation period and the preceding period. It is necessary to establish a change pattern of climatic parameters in different years depending on the time of year, their frequency to establish a multi-year cycle, which is important for the prediction of climatic parameters in the current year. On the sum of the monthly figures in the context of the year the dynamics and pattern of distribution of rainfall and temperature can be set.

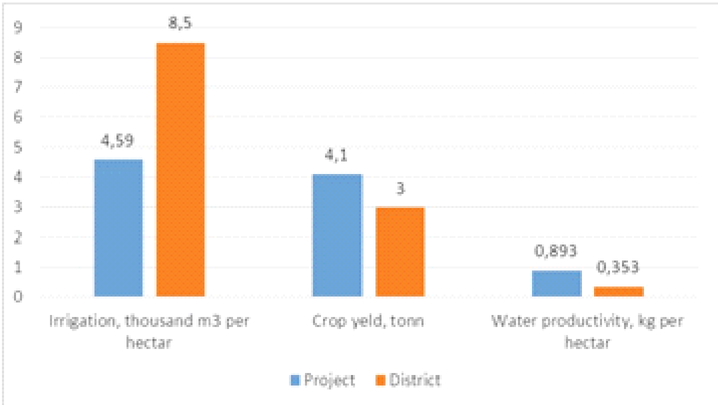
Using the long-term data of precipitation and temperature in winter and spring, you can set the frequency and pattern of rainfall availability on the territory.

Using the total precipitation for March-August for a certain period of time (10 or 20 years) you can determine the trend values of precipitation and air temperature in different years, and their sharp differences between them. Using this data, you can set the values of climatic parameters that are most typical for the region of interest to us. This assessment provides an opportunity to identify a combination of dry and wet years, almost during the whole observed period.

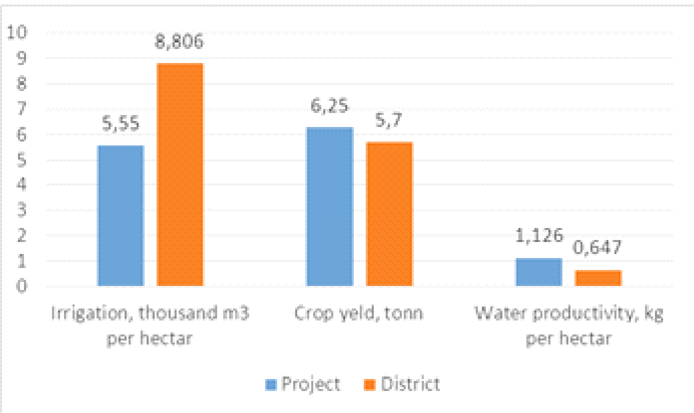
Based on the evaluation of climatic parameters, it is possible to develop approaches to provide an operational forecast for the upcoming growing season and for each subsequent month, especially: - on the precipitation and temperature regime, - to develop tools to effectively manage agronomic and irrigation activities in view of sharp intraseasonal fluctuations in precipitation, evaporation, air temperature and soil within the year.

Results.

2014-2015 experience of the GWP CACENA Project "IWRM as a practical approach to adaptation to climate change in Central Asia" showed that the influence of climatic conditions on the growth and development of crops, crop yields and profitability of agricultural production is obvious:



1. According to the analysis of long-term dynamics of the climatic conditions in the Fergana Valley, in forty years the mean most comfortable climatic conditions for agriculture occurred only 4 times, the rest of the years have fluctuations to either the drought or to abundant precipitation during cold temperatures.



2. Long-term climatic data revealed that there is a certain tendency to increased heat during the growing season. At the same time there is a tendency to reduced temperatures and increased precipitation in the spring.

3. The work with farmers showed they are unable to manage the processes of conducting agricultural operations focused on weather conditions.

4. Experience of the GWP CACENA Project in 2014 demonstrated the possibility of adaptation to the climatic conditions of each year and produce good yields without any damage caused by weather variations each year. (Top chart-data for cotton, on the left - wheat).

5. The experience of the project has also shown the importance of and the need for constant work with farmers, farmers' interest in the recommendations and best practices on adaptation of agriculture to different weather conditions.

ARMENIA

Completion of the pilot project in Parakar Village implemented within the regional Water, Climate and Development Program


Station ponds

The sewage treatment plant in Parakar village was built in two stages within two pilot projects (GEF SGP – UNDP, and Water, Climate and Development - GWP CACENA),

The goal of this pilot project was:

-To restore degraded agricultural lands of the community

-To demonstrate the effectiveness of decentralized sewage treatment plant as part of an integrated management of water and land resources,

- To provide food and sanitary security of the village population.

Population of Parakar is about 10,000 people and it is almost entirely provided with sanitation. In Soviet times, the village sewage was directed to a sewage treatment plant of the city of Yerevan through the double-stage pumping.

As a result of the energy and the economic crisis of the 1990s the pumps were stopped and waste water was released into the irrigation canals, mixing with the irrigation water. For many years, irrigation canals were filled with the silts formed due to the presence of sewage water. Therefore, the waste water was often overflowing canals, flooding surrounding area, spreading the stench and contributing to unsanitary state of the village.

Due to the contamination of irrigation water, land was not irrigated and much of the agricultural land degraded, losing its qualitative indicators, (pictured right).

To solve this problem CWP Armenia jointly with the company «JINJ» developed a pilot program within which wastewater treatment was provided with alternative technology, using traditional and natural methods of treatment. On the basis of financial capacity, the program was divided into two phases: the first phase was implemented from 2010 to 2012 in the framework of the Small Grants Program of the Global Environment Facility, with the assistance of UNDP and Parakar community funding.

During the first phase of the program, 900 meter long sewers delivering wastewater into the territory of the treatment plant and wastewater treatment plant were built in the community: screen chamber with the bars, pump station, biological pond with artificial aeration, building for air blowing equipment and sediment pond.

The second phase of the program lasted from 2013 to 2015 with the financial support of the Global Water Partnership (GWP). During this time, the sediment pond and bars of the screen chamber were rehabilitated; cleaning system for the bottom of the sediment pond from the sludge, biological pond with natural aeration and apparatus for removing sludge formed at the bottom of the pond, sludge beds and bathroom for employees were built. The territory of the sewage treatment plant was equipped and trees were planted on it.


The hyacinths

The water hyacinth was placed into the biological pond with natural aeration, which reduces bacteria (Kohli index) for about 4 times. Chemical analysis of effluent showed high treatment rate. The following results were achieved through the implementation of the pilot project:

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- The community has its own decentralized sewage treatment plant;
- Due to the effluent there is now additional amount of water available (11.7 l/s) suitable for irrigation which does not depend on weather conditions and climate change;
- 60% of degraded agricultural land has already been rehabilitated and put into production;
- Processed sludge is used in gardens as a cheap and high quality organic fertilizer;
- Food safety and sanitary condition of the inhabitants of the community as a whole is provided.

In the operation of the sewage treatment plant a number of problems were identified, such as low level of knowledge on the use of sewage among the community.

The regional GWP CACENA Water, Climate and Development program organized classes for students of elementary, middle and high schools. An information brochure entitled "The toilet - not a dump" was also developed and distributed; classes "The impact of climate change on the vulnerability of water resources" were conducted; educational cartoon for kids "Water cycle" was demonstrated. Volunteer from Uruguay presented a paper "The process of wastewater treatment in Montevideo," etc. The Global Handwashing Day and World Toilet Day were celebrated together with the children. Upon completion of training sessions students of primary classes were presented with hand towels (pictured right).

On November 27, 2015 to summarize project outcomes the scientific and ecological NGO Country Water Partnership in cooperation with engineering and consulting company «JINJ» within the Water, Climate and Development Program organized a regional seminar on "Alternative approaches to wastewater treatment". The seminar was held in Parakar community.

The aim of the seminar was:

- To inform representatives of various agencies, international organizations operating in Armenia, the decision-makers in Armavir marz (region), as well as the general public about the current state of sanitation, current problems and possible solutions;

- Strengthening conscious of the professionals, water managers and decision makers, of the notion of the wastewater as a valuable water resource.

Seminar participants

The seminar was attended by the representatives of the Ministries of Nature Protection, Health, Agriculture, the Ministry of Territorial Administration and Emergency Situations and Urban Planning; members of environmental and health state inspectorates, as well as authorized representatives of urban and rural communities of Armavir region, and representatives of water companies (37 participants in total).

During the seminar, representatives of the state inspectorates, CJSC "Nor Akunq", company «JINJ» and CWP, and volunteer from Uruguay reported on the current problems of the water sector and the results of pilot project carried out in the village Parakar, held a thematic debate, discussed the possibility of implementation of the similar project in other communities. After the seminar, participants visited wastewater treatment plant.

Scientific and environmental NGO "Country Water Partnership" expresses its deep gratitude to the head of the community Parakar Mr. Samvel Vardanyan, the head of the Company "Landscaping" in Parakar Mr. Artak Mkrtumyan, the staff of the rural municipality, school principals of the community Mrs. Karine Makaryan and Mr. Varazdat Hakobyan, as well as everyone who helped and made the implementation of a pilot project and its successful completion possible.

The Kyrgyz Republic is an agrarian country with more than half of the population engaged in agriculture; due to the prevailing climatic conditions it is located in the zone of risky agriculture; so agriculture is the most dependent on possible climate changes.

In Kyrgyzstan, there is an acute shortage of organic and mineral fertilizers on irrigated land, the use of which primarily depends on the solution of problems related to the purchase, transportation, use and storage.

Soil degradation, exacerbated by climate change, is causing great economic damage to Kyrgyzstan. Varying degrees of land degradation reduces crop yields by 20-60%.

The priority for climate change adaptation in relation to water is the implementation of good water management practices.

The implementation of the demonstration project "Water, Climate and Development" in the Kyrgyz Republic was aimed at:

- Wide dissemination of information obtained during the implementation of a demonstration project on agronomic, irrigation and drainage technologies of beans cultivation in soil of the Talas Valley upper zone;
- Assistance to farmers to adapt and become more resilient to the climate change effects;
- Steady increase in the productivity of beans and knowledge of the bean production technology in soil conditions of Talas Province and raise of rural incomes;
- Dissemination of the project experience and recommendations to the bean growers within the agricultural zone of the Talas valley, as well as in other areas of the Kyrgyz Republic.

Mass cultivation of beans in the Talas Province of Kyrgyzstan started in the last decade. In Talas Province beans is now a monoculture, since over 50% of agricultural land area sown with beans of different varieties and types. Soils of Talas Province are being depleted due to the fact that the leguminous plants take all the nutrients from the soil. Therefore, to maintain the level and volume of the crop without degrading the soil, it is necessary to engage in crop rotation. As a result of various studies, a scientific rationale was developed that explains what crops should be planted before and after beans.

The demonstration project implementation process coincided with the extreme weather conditions in Talas. During the implementation there were drought and lack of source water during the irrigation season; early frosts and heavy rains during the harvest were observed. Lack of soil moisture adversely affected the growth and formation of bean yields. Deficit of moisture resulted in slowed germination, reduced seed germination, damage to the beans because of the soil cracking, reduced growth of shoots and roots, blossom and bean drop, etc. Such extreme weather conditions tend to either thicken or strengthen as a result of climate change.


There will be bean field here!

According to the experts of the Ministry of Agriculture and Land Reclamation of the Kyrgyz Republic, in the Talas valley there is a danger of total contamination of soil, and it may become impossible to produce beans, i.e. large-scale introduction of this crop in large areas is fraught with development of specific diseases.

“Previously it was thought that “the beans for our agriculture is a godsend”. It was thought that as a nitrogen-fixing crop bean maintains fertility and improves soil structure, and its cultivation will create additional jobs, and increase fund flows in the budget of the republic. But one of the main laws of agriculture - crop rotation - was forgotten and the result is now evident. If 4-5 years ago 2-3 tons of beans per hectare were harvested in Talas in 2013-2014 –

Phenological observations

now it is only 1.5-2 tons. Commodity grain reduces in size, and the colour deteriorates. If before the main grain of the "white" bean was over 9 mm and had a pure white colour, it is currently in the range of 6-8 mm, and has an unpleasant yellowish tint, which dramatically reduces its commercial and consumer quality."

At present, Talas beans are more competitive, but in 2-3 years, if basic crop rotation is not practiced, bean seed propagation is not organized at the state level and modern plant protection methods are not applied, Kyrgyz beans will lose a profitable and promising market, on which it currently still has its place. This will entail substantial negative consequences for both farmers in Talas Province and Kyrgyzstan's economy as a whole.

Thus, it can be noted that the adaptation of the bean production technology, and crop production in Talas Province of the Kyrgyz Republic to possible climate changes involves increased use of resource-saving and environmental technologies.

Based on the experience of the demonstration project on adaptation of the bean irrigation technologies in Talas Province of the Kyrgyz Republic to climate change the following conclusions were made:

- New high-yielding and drought-resistant varieties of beans adapted to our local conditions are required;
- It is necessary to use soil conservation technologies and minimize anthropogenic impact on the soil;
- Rational use of irrigation water is required. Given the scarcity of irrigation water on sloping, uneven and foothill lands and high permeable soils (rocky, sandy, gravelly, etc.), the drip irrigation technology is recommended for the bean cultivation. Drip irrigation will help to: increase yield by 20-30%; save water by 3-5 times; accelerate ripening; eliminate soil erosion; ease application of fertilizers with irrigation water; reduce the manual labour for irrigation.

*S*eminar participants

- It is necessary to implement optimal crop rotation on the basis of the approved science-based recommendations on the soil conditions;
- It is necessary to encourage widespread use of organic fertilizers, mulching, use of compost, etc.;
- It is necessary to use modern technologies of cultivation of agricultural crops (organic farming, reclamation, etc.);
- It is necessary to apply modern measures to combat soil erosion and salinization;
- It is necessary to shift sowing for better use of water, based on early studies of soil moisture conditions and air temperature;
- It is necessary to organize consultations and trainings for Kyrgyz farmers – bean growers.
- It is required to adopt institutional and regulatory measures at the national level, such asintroduction the early warning systems and other forecasting systems: weather, climate change, market demand for the agricultural products, systems and mechanisms for procurement of agricultural products (including beans).

TURKMENISTAN

Development of innovative water saving technology for furrow cotton irrigation

Approximately 95 - 96% of the water resources of Turkmenistan is generated outside the country. The growing influence of global warming on the formation of water in the upper reaches of rivers, as well as regulation of the river flow in the neighbouring countries for hydro power and irrigation in hot and dry climate of the region greatly influence the fresh water supply for economy and drinking water supply of the country.

The crop cultivation, particularly cotton, the acreage of which is about 33% of all arable land in the country, is carried out only by the regular irrigation using mainly furrow irrigation. The traditional furrow irrigation of cotton on existing technology requires irrigation norms that, significantly, 1.2-1.5 times or more exceeds the crop requirement in irrigation water.

Given that approximately 92% of our country's water resources are used for crop irrigation, the issue of water conservation at the same time is one of the most pressing problems of the present and future of our country.

Due to the fact, the aim of this work is to improve the efficiency of irrigation water in the furrow cultivation of cotton through the introduction of advanced technology using portable irrigation hoses and pipes (left) and, consequently, to establish the research-based cotton irrigation regimes in the implementation of this technology

Results:

1. The hydro-physical properties and soil texture from demonstration and control sites were studies. It was found that soils are identical. The top 0-40 cm layer is represented by medium and heavy soils, the underlying 40 -100 cm horizon consists of interbedded loam and sandy loam varieties. Under conditions of high water permeability of the underlying layer the irrigation using portable pipelines according to calculated irrigation norms will provide uniform moisturizing of specific horizons and will be the basis for the optimal water regime in the root zone.

2. As a result of analysis and generalization of data an improved technology of furrow irrigation is suggested with the replacement of temporary sprayers with portable flexible and rigid pipelines. A hydraulic calculation of irrigation pipes installed was done; pressure losses along the length were identified, that ensure uniform supply of water to all water outlets in irrigation furrow.

3. Irrigation regime on the demonstration site is designed and implemented based on the deficit of soil moisture maintaining lower preirrigation soil moisture threshold at 70-80-65% PIM. Accordingly, at the watering with mobile rigid and flexible pipelines during the cotton vegetation period 6 general vegetation watering were conducted with irrigation norm of 3,920 m3/ha, which completely ensures optimal water regime of the field.

4. A phenological and biometric monitoring of the cotton growth and development was implemented. It was identified that at the irrigation with mobile pipelines, the timing of ripening was on average 15 days earlier than under furrow irrigation; while the actual cotton yield was 6.3 c/ha more than in the control (42.8 and 36.5 c/ha). With this in mind, the total water consumption was 7,921 and 9,269 m3/ha, respectively, and the coefficient of water consumption - 185.1 and 253.9 m3/c.

5.The analysis of the dynamics of salinization was done and salt balance of the specific soil horizon during vegetation period was calculated. In accordance with the approved classification on initial salinization, the root layer of soil is characterized as non-saline - solids

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content is 0.1088 – 0.1434%, Cl ion - 0.0102 - 0.0138%. By the end of the growing season there was a reduction in the total salt content of up to 0.097 - 0.104%. In general, at the beginning of the growing season the actual salt capacity averaged 17.56 and 22.8 t/ha; and at the end of the growing season - 15.5 and 16.54 t/ha, or 2.06 and 6.26 t/ha less. Taking into account the receipt of salts with irrigation water - 2.96 and 3.90 t/ha, the salt content calculated at the end of the growing season was 2.52 and 26.70 t/ha. The comparison of actual and estimated figures revealed that 5.02 and 10.16 t/ha of salts washed from the specific horizon to the underlying horizon.

6. To improve the uniformity of moisture along the length of the field furrows, reduce seepage losses and discharge of water at the end of the field the issues of water supply in irrigation furrows of the calculated length of the portable parts of pipelines were explored. Water is supplied to the field simultaneously in the beginning, middle, and on the ¾ of the length of the furrow. The duration of irrigation compared with the water supply to the head portion is reduced by 2-3 times, deep seepage losses do not exceed 10 - 15%.

7. In developing the improved irrigation technology the base dependency is a relationship between yield and the irrigation norm. The resulting connection can be used for quantitative assessment of crop losses associated with the uneven distribution of irrigation water along the length of the furrow at different values of irrigation norm. The dependency graphs were developed of the distribution of the water absorbed along the length of the furrow, depending on various conditions of water availability in the cotton fields.

8. A calculation model was developed of irrigation jet change along the length of the furrow at different flow rates of water fed into the furrow; it allows selecting the optimal scheme of the portable irrigation pipes location under different criteria of moisture content and soil moisture uniformity.

9. It is recommended to introduce into practice the method of calculating the optimum technical norms for portable furrow irrigation system - watering area from one portion and the required flow rate of water for irrigation, characterized by a length of portable irrigation pipe, the number of outlets on the distribution pipe and flow rate of the water outlets. The sequence organization of cotton irrigation on irrigated plot was developed and recommended for the introduction. The most effective is the organization of irrigation with simultaneous operation of the entire portable pipelines system on one position.

AZERBAIJAN

Development of rational water use measures with the consideration of climate change

Azerbaijan – is a land of ancient irrigated agriculture. From 4.5 million ha of land suitable for agriculture 3.2 million of hectares are suitable for irrigation. Currently, irrigated land is about 1,426 million hectares. They are located mainly in plain-arid zone, which is characterized by hot, dry climate and scanty precipitation (200 to 300 mm per year) and the complexity of soil and climatic conditions. On 610 hectares of irrigated land reclamation activities were carried out, and complex collector-drainage network was built. In the dry climate and different soil conditions in the republic about 90% of the gross domestic product is made on the irrigated lands.

Water resources of Azerbaijan consist of surface (30-32 cubic km) and underground (5.2 cubic km) waters. Distinctive features of these waters are:

a) Scarcity;

b) Uneven distribution of the internal river flows;

c) Formation of about 70% of surface water resources in the territories of neighbouring countries;

d) Heavily polluted river water on entry to the territory of the country.

About 75% of the Azerbaijani population uses surface water from the Kura and Araz rivers for drinking and household needs.

The aim of this project is to analyse the impact of climate change on water resources and to develop adaptation measures that allow to mitigate or prevent the negative effects of climate change on water

Continued on page 12

resources, prove application of water saving techniques and irrigation methods, depending on the specific soil and climatic conditions and optimize relations water-soil-crop on irrigated land in order to maintain soil fertility considering the negative effects of climate change, as well as to demonstrate water-saving technologies of crop irrigation.

Conclusions and recommendations

- The role and the need to adapt to the already observed and expected climate change has been increasing, which leads to the need to apply the principles of integrated water resources management, which provides for the use of all kinds of water available. One of such water sources is mineralized collector-drainage water.

- Analysis and synthesis of theoretical and experimental research in the country and abroad have shown that so far there is no consensus on the use of saline water for crop irrigation, as criteria for assessing the quality of irrigation water greatly depend on the natural and economic factors. However, the current criteria make it possible to consider the preliminary assessment of the irrigation water quality. In specific terms, the issue of using saline water must be addressed, depending on soil and climatic, hydrogeological, irrigation and land reclamation and economic conditions of the array.

- The experiments and the results of research show that at the shortage of fresh irrigation water during the growing season the use for crop irrigation of mineralized collector-drainage water with a concentration of 2-3 g/l based on soil-reclamation conditions is feasible and worthwhile.

- In circumstances where the upper strata of soil and the upper layers of groundwater are desalinated to the required salinity limit, the irrigation with collector-drainage water against deep horizontal drainage does not lead to a noticeable salinization of soil and groundwater. A slight seasonal accumulation of salts in the root zone is fully liquidated in fall and winter (preventive leaching) or spring (arata), irrigation with fresh water at the rate of 2-3 thousand m3.

- Studies on plots with cotton show that the difference in yields is negligible. The highest yield (27.3 c/ha) was observed in the first option - irrigation with ditch water at the required rate, and the lowest (24.4 c/ha) - in the third option – irrigation with mineralized collector-drainage water.

- Studies on the alfalfa plots show that the difference in the yield on the options is negligible. The highest yield (110.9 c/ha) was observed for the first irrigation option - irrigation with ditch water at the required rate, and the lowest (97.4 c/ha) - for the third option - irrigation with saline collector-drainage water.

The report presents the results of one year studies. These one-year data allows us to come to certain results, but if these experiments continue at least for one more year, complete recommendations could be prepared on the basis of those results

KAZAKHSTAN

Drought risk management: IWRM solutions on water demand management in irrigated agriculture within WACDEP CACENA Water, Climate and Development Program

Project location: Republic of Kazakhstan, Kyzylorda oblast, Syrdarya district, village Shagan, rice fields of PLC "Shagan Jers" and experimental field of Kazakh Research Institute of Rice named after Zhahaev.

The **goal** of the study: the creation of an exponential irrigation system adapted to climate chang e, ensuring the efficient use of water and land resources.

Tasks: - Study of water balance elements (water supply, discharge, precipitation, evaporation, filtration, drainage, etc.) and their relations with the determining factors;

- Monitoring of groundwater regime;
- Study of hydro-physical and chemical characteristics of soils;
- Study of hydro and salt regime of soils;
- Observation of the dynamics of mineralization and chemical composition of surface water and groundwater;
- Phenological observations;
- Seminars for information dissemination; development of recommendations.

Partners: to achieve the objectives of the project the Water Partnership of Kazakhstan involved the following organizations in the project implementation:

- Extension Centre "Kyzylorda"- the main activity is dissemination of advanced knowledge and technology in agriculture.
- Kazakh Research Institute of Rice named after Zhahaev, which has the scientific potential and is a leading research institute in Kazakhstan in the field of rice.

Activities: - Improvement of water management infrastructure in order to increase the efficiency of the use of land and water;

- Development of tools and methods to respond to the growing risks associated with the water security;
- Strengthening support for the IWRM approach stakeholders through regional and national dialogues;
- Raising awareness and understanding of climate change adaptation issues.

The following measures were implemented in order to demonstrate how to get a good harvest and profit:

- Effective technological irrigation schemes, taking into account the characteristics of the field;
- Use of irrigation water according to the crop requirements and taking into account soil conditions;
- Use of the recommended application norms of mineral and organic fertilizers according to the schedule;
- Effective use of measures against diseases and pests;
- Timely implementation of agronomic activities;
- Repair and reconstruction of irrigation and field systems;
- Levelling of irrigated fields;
- Accounting of irrigation water and water discharge;
- Equipment with new water measuring devices;
- Monitoring of groundwater and evaporation on irrigated areas;
- Measurement of temperature and humidity.

Water measuring devices

Results: - On each hectare of rice the water supply was 22,498 m3; whereas in 2013 31,280 m3 per hectare was delivered That is 8,782 m3 less; or water saving is 28.1%

- Yields of rice on demonstration plot: area - 14.59 hectares, total weight - 775.7 centners, yield - 53.1 c/ha, with the traditional technology - 45.0 c/ha
- Cost-effectiveness of water-saving technology: return on traditional technology- 5%; project- 15.5%.

Materials presented by Djailoobaev A., Pulatov Ya., Nurmukhamedova G., Khaydarova V., Sokolov V., Dzamukashvili G., Hovsepyan A., Musabaeva K., Mukhamedzhanov Sh., Kipshakbaev N., Gadzhimetov G. Newsletter editor: Kamalov Yu. kamalovGWP.@gmail.com

The demonstration project is aimed at promoting scientific and technological achievements, best practices, introduction of modern technologies and capacity building, awareness and knowledge of water and land users of the Republic in terms of climate change.

The following conclusions can be made based on analysis of published works on Water, Climate and Development, the assessments and actual study of the problem:

- Global warming will have large impact on the water resources of the region. It is expected that the depletion of water resources will be the reason for the decline of agricultural production in Central Asia by 15-50%. Currently, the natural resources of river flow in the Aral Sea basin is completely exhausted and the water management system in the region is dealing with the growing scarcity of water. The total use of water resources in the Syrdarya River Basin is 130-150%; and in the Amu Darya Basin it is 100-110%.

- The growth of average annual temperatures leads to a more intensive melting of glaciers, which affects the annual flow of the rivers with glacier-snow type of supply. During the XX century the area of glaciers in Tajikistan has decreased by 20-30%, and by 50-70% in Afghanistan. In the near future, the area of glaciers in Tajikistan may decrease by another 15-20%, while the water reserves in the glaciers will be reduced by 80-100 km3. In Tajikistan, the annual flow of the rivers in 2050 may decline by 3.9%.


Cotton drip irrigation

- It is predicted that more than 2°C increase in temperature would lead to negative consequences for the environment and ecosystems, economy and public health. The reserves of groundwater may reduce due to a decrease of their feeding by surface water and precipitation, leading to disruption of drinking water supply in some areas. With global warming and the impact of mudslides, landslides and floods the risk of spreading water-borne infections will increase. The volume of alluvial deposits washed into rivers and reservoirs will increase as well, which, respectively, will increase water turbidity and create major problems for safe drinking water supply.

- Up to 60% of river flow in the Aral Sea Basin is formed on the territory of Tajikistan. For 30 years, the greatest reduction in average annual runoff is observed in rivers Kyzylsu, Zeravshan, Vakhsh and Panj (up to 7%). To a lesser extent there is a reduction in the river flow of Kafirnigan (3%). In the Eastern Pamirs the river flow remained virtually unchanged, and in some areas of the Western Pamirs it increased slightly (0.5-1%).

- Aquatic ecosystems undergo changes associated with the flow regimes, temperature and water level. Increased runoff variability, particularly the frequency and duration of great floods and droughts could reduce water quality, biological productivity and habitat in rivers, especially small ones.

- Most vulnerable to climate change is irrigated agriculture, which consumes up to 90% of water resources, and provides employment to 70% of the population.

- Vulnerability of agriculture is also due to the increasing abnormal weather events

- Research to assess the vulnerability of crops to climate change showed that their productivity is primarily determined by regular irrigation, the sum of effective temperatures, rainfall, soil properties and the level of agricultural cultivation.

- With the expected increase in the average temperature the biological crop water needs will increase by 3-10%. Evaporation from water surface will rise by 5-10%, and evapotranspiration of plants will increase by 10-20%. This will increase the irrigation rate by 22-38%.

- The Republic of Tajikistan among Central Asian countries has the lowest rate of water availability (1,680 m3/year/person.) and specific irrigated land (0.09 ha/pers.). In this regard, in order to ensure food security, Tajikistan needs to increase the irrigated area in the near future and bring it to one million hectares.

- The current situation requires the development of new modes of reclamation, increase of the efficiency of irrigation systems and the introduction of advanced irrigation methods, promoting water conservation, crop optimization and transition from water-loving to more drought-resistant crops to ensure food security. Implementation of the principles of integrated water resources management (IWRM) would greatly contribute to this.

- It is shown that effective technological irrigation schemes, especially the use of drip irrigation, based on hydro-physical and climatic characteristics of the selected field, the use of irrigation water in accordance with the biological requirements of crops and with consideration of soil-reclamation conditions, the use of recommended norms of mineral and organic fertilizers within the optimal timing and schedule, effective use of disease and pest control methods, and timely implementation of all agro-technical activities helped to raise crop yields by 1.5-3 times, save irrigation water by up to 60% and reduce unproductive water losses by up to 5%.

This was facilitated by:

- Reduction of water loss through seepage and evaporation;
- Lack of surface runoff and water erosion;
- Reduction of weeds, therefore - wastage of water from inter-rows;
- Optimal and sustainable moisturization of root zone during plant growth and development;
- Possibility to apply small doses of fertilizers with the water locally;
- Reduced number of inter-row cultivation;
- Ability to intensify crop planting (increased plant density);
- Absence of ground water raise and risk of secondary salinization;
- Ability to use on the hillsides;
- Reduced energy consumption for water pressure in the pipes as compared with overhead irrigation;
- Increased productivity and quality of crops.

Vineyards on the hillside

- Maximum yield of 5.6 t/ha of medium fiber cotton was obtained under drip irrigation with mulch film, which is 2.2 t/ha more than with the furrow irrigation with mulch film (3.4 t/ha). Specific irrigation water use per 1 ton of medium fiber cotton harvest varies from 500 with drip to 1,600 m3/t with furrow irrigation.
- During furrow irrigation of vegetable crops (tomatoes, cucumbers, bell peppers), the best irrigation regime providing maximum yield is to maintain the pre-irrigation moisture of the soil in the range of 70-80% of the maximum field moisture capacity of the soil. At the same irrigation norm on average is 6,200 m3/ha and the irrigation rate does not exceed 550-750 m3/ha. With drip irrigation the maintenance of moisture content in the soil provides average yields of 56 t/ha for tomatoes, 50 t/ha - cucumbers and 22.5 t/ha - pepper, which is 2 times higher than with furrow irrigation.
- Given the shortage of water and land resources and climate change, increasing returns of irrigated fields through intensification, i.e., year-round use of irrigated land and water conservation is important. Therefore, site was selected where, after harvesting of corn (1st harvest), winter-vegetating interim agricultural crops (wheat, canola, oats, rye, pea) were planted to obtain second crop. For intensive use of irrigated land the production technologies for potatoes, wheat and alfalfa in the inter-rows were demonstrated.

Second crop - sunflowers

Thus, we can say that the scale of the climate change challenges and mitigation is quite impressive and covers almost all aspects of human activities. Mitigation and recovery from these crises require mobilization of all stakeholders and more harmonious cooperation of the basin countries.

CONGRATULATIONS!

GWP CACENA Chair Nino Chkhobadze with the election as GWP Chair of the Chairs! This is recognition of her personal prestige and the GWP CACENA authority! Good luck to Nino and all

New books

Jedediah Purdy, *After Nature*, Professor of Duke University, North Carolina, USA. Journalist Ross Andersen prior to the climate summit spoke with Purdy. Here are the final words of Professor: Andersen - The most important talks on climate change in the last decade are this week in Paris. Do you believe that this conference can form a new concept of natural world - and even a new Anthropocene policy? - I would love to believe that. A lot of hope has been invested in these climate talks in the decades. And we should wish success to delegates. But so far, the pessimistic analyses (of futility) that I was reacting against when I started this book are still more true than false. International efforts are still epiphenomena of national politics that are themselves, on the whole, pretty selfish and short-sighted. The worst compromise would be a sugary layer of noble talk about global responsibility slathered on a world whose economies are still driving up greenhouse-gas emissions, toxicity, soil degradation, ocean acidification, species extinction, deforestation. It's nice that there is much, much more of a climate movement now than there was even five years ago, and it's nice that Canadians are back on the side of the angels. But the scary possibility is that we may know the right thing to do for decades, talk about it on the international stage, and keep living in a way that deepens the problem. A politics that can pivot how we live, freely and democratically, is a tall order, but it's the only way forward.

Full text:
http://inosmi.ru/social/20151208/234715209.html

ATTENTION! WATER AWARD

The Prince Sultan Bin Abdulaziz International Prize for Water (PSIPW) is a scientific prize with a focus on innovation in water. Five prizes are awarded every two years.

Surface water prize covers all aspects of the study and development of surface water resources.

Groundwater Prize is awarded for work related to all aspects of research and development of groundwater resources. Alternative Water Resources Prize covers desalination, wastewater treatment, and other non-traditional methods of producing high-quality water.Water Management & Protection Prize provides an award for innovation in the use, management and protection of water resources

Each of these four special prizes is US $133,000. The researchers, research teams and organizations can nominate themselves for these awards.

The fifth prize is a Creativity Prize, which is awarded for innovative, advanced scientific research, a breakthrough in any field related to water. It can be a research, an invention or a new patented technology. The amount of the prize is US $266,000. You cannot self-nominate for this prize. Candidates may nominate universities, research institutes, organizations and institutions. Candidates can be individuals and groups of researchers. Application Deadline Dec. 31, 2015. More information: http://www.psipw.org

Please note - The prize is awarded every 2 years. The next cycle will begin in February 2016. Watch for announcements!

The Global Water Partnership in Central Asia and Caucasus (GWP CACENA) *is one of 13 regional partners of the Global Water Partnership Organization (GWPO). GWPO was established in 1996 under the auspices of the United Nations in accordance with the decision of the 1992Global Summit to promote integrated water resources management (IWRM). GWP CACENA was established in 2002 in Almaty and brings together national water partnerships of all 8 countries of Central Asia and the Caucasus, as well as Mongolia. GWP CACENA Secretariat is located in Tashkent, Uzbekistan, #6 Osiyo Str., apartment 103.*

For more information about the GWP visit web-site www.gwp.org

Global Water Partnership
Central Asia and Caucasus