



Zentrum für Entwicklungsforschung
Center for Development Research
University of Bonn



Symposium Report

ZEF/UNESCO Symposium on “Options for improving land and water management in Dryland areas of Uzbekistan. A decade (2001-2011) of achievements of the ZEF/UNESCO landscape restructuring project in Urgench”. Urgench, July 15-16, 2011



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List of Acronyms

GEF SGP	Global Ecological Facility Small Grants Program
GHG	Green House Gas
GIS	Geographical Information System
GIZ	German International Cooperation
KRASS	Khorezm Rural Advisory Support Service
NUUz	National University of Uzbekistan
RS	Remote Sensing
SDC	Swiss Agency for Development and Cooperation
TIIM	Tashkent Institute of Irrigation and Melioration
UNDP	United Nations Development Programme
UrDU	Urgench State University
WB	World Bank
WCA	Water Consumers' Association, former water users' association (WUA)
ZUR	ZEF/UNESCO Rivojlanishlari, Science briefs from ZEF/UNESCO project

Summary of Presentations and Discussions

ZEF/UNESCO Khorezm Project, funded by BMBF since 2002, has conducted a two-day symposium to present a decade of project achievements to local and international partners, collaborators and interested stakeholders at decision-making, educational and implementation levels. The symposium was inaugurated by Paul Vlek (director ZEFc, Bonn University), Ruzumboy Eshchanov (rector of the State University of Urgench (UrDU)), Alexander Osipov (representative UNESCO office in Tashkent), and Kamuljon Djumaniyazov (representative Khorezm Hokimiyat). The participants of the symposium included local partners and interested stakeholders such as representatives from the Parliament (Oliy Majlis), Ministry of Agriculture and Water Resources, Uzbek Committee of Nature Protection, Uzbek Universities (Tashkent, Samarkand, Andijan, and Namangan), Uzbek Academy of Sciences, President Academy of Uzbekistan, various Uzbek Research Institutes, Farmers Association, Water Consumers Association, and various Uzbek NGOs. Also representatives from major international financial institutions and development agencies functioning in Uzbekistan participated including the World Bank (WB), German International Cooperation (GIZ), Swiss Agency for Development and Cooperation (SDC), United Nations Development Program (UNDP), National Commission UNESCO in Uzbekistan, International Water Management Institute and others (for details see Annex 2). The symposium addressed therefore about 70 participants (Annex 2).

The clear consensus of the Symposium participants was to find a mechanism and associated funds to continue the efforts of the ZEF/UNESCO project which has elaborated a number of promising options to improve sustainable land management in the Khorezm region while others require additional research efforts and fine tuning. In addition, support is needed to develop strategies to better insure that these new, more sustainable crop and land management technologies can reach farmers in Khorezm and other relevant areas in Uzbekistan.

The three main messages from the Symposium therefore were:

1. Research findings and results from a decade of project achievements will be out- and up-scaled by the NGO KRASS, established by ZEF alumni in Uzbekistan and other ZEF/UNESCO Khorezm project staff and researchers together with UrDU and UNESCO Tashkent. Despite its young age, KRASS has already been implementing several small-scale projects and has the potential to be the right successor of the project;
2. A representative from the Parliament and encouraged the project team and KRASS and promised support and to provide the required (legal) framework for disseminating project's results in the country and the region;
3. Success of the next phase of ZEF/UNESCO Khorezm project will depend on strong partnerships with different organizations to reach a wider audience and transfer innovations, and the willingness of KRASS to cooperate in the country and in the region.

Welcome Statements

Prof. Paul Vlek (ZEF)

Prof. Vlek expressed his pleasure to stand in front of such a broad audience. He gave a retrospective view on the landscape and on agricultural production in the Khorezm region of Uzbekistan from his own experience, - "Before looking forward one has to look back. For the first time I visited Uzbekistan and Khorezm in 2001 and I was surprised to see the soil covered with a white substance, which was salt. I saw so many problems in the agricultural sector and wondered if research could help in solving these problems. I came back after 10 years and see certain changes in land and water use. I see some options developed by the project for improving agricultural practices. And I would like to return in 10 more years to see how these options would be taken up and disseminated by the local partners and interested stakeholders. I would like to see the real changes in water and land management and in the landscape of Khorezm".

Alexandr Osipov (UNESCO Tashkent)

Mr. Osipov greeted all the guests on behalf of UNESCO office in Tashkent. He referred also to an important event which coincided with the symposium, which was the opening of the UNESCO Chair on Sustainable Development at UrDU and the inauguration of Prof. Vlek as chair holder. The main objective of this UNESCO chair is the promotion of an integrated system of research, training, information and documentation in the field of sustainable development. Equally essential is the facilitation between high-level, international recognized researchers and teaching staff of UrDU and other institutions in Uzbekistan, Central Asia and beyond. UNESCO office in Tashkent contributes to the three components of sustainable development (social, economic and environmental) by supporting and improving the educational system in Uzbekistan, facilitating the cooperation among UrDU, ZEF/UNESCO project, Tashkent Institute of Irrigation and Melioration (TIIM), Wageningen University, GEF SGP, State Committee of Uzbekistan for Nature Protection and the Ministry of Agriculture and Water Recourses, and also farmers and other practitioners.

Furthermore, Mr. Osipov stressed the agenda of the symposium which was in his view to present the basic results of the project in the area of land and water use restructuring in the Khorezm region, as well as to provide policy recommendations to the local community.

Finally, Mr. Osipov expressed his gratitude to Dr. John Lamers, who has always devoted all his time and professional skills to the project. The achievements of the project would not be realized without the tremendous work of Dr. John Lamers. Thanks also were expressed to Mr. Alisher Ikramov, Secretary of the National Commission for his excellent work done and his contribution to the establishment of the UNESCO Chair at UrDU. Special thanks went to Prof. Eshchanov and his colleagues at UrDU for their continuous support and work done.

Kamuljon Djumaniyazov (Khorezm Hokimiyat)

Mr. Djumaniyazov welcomed all the guests to the ancient region of Khorezm, which has always been the land of scientists and great thinkers such as Al-Khorezmy, Abu Raykhon Beruniy, Az-Zamakhshariy, Changmaniy and others. Khorezm historically has been the place where the first academy in the country, the Mamun Academy, was established about 1000 years ago. Today, he is proud to see many scientists both from Uzbekistan and from other countries (and in particular from Germany) working in Khorezm. In particular, he stressed the valuable

contributions from the ZEF/UNESCO project to the development of the region. Since most of the research has been conducted directly in the fields and with local farmers, he mentioned that the results will be of great help in restructuring the present land and water use in Khorezm. Findings and recommendations from the project have been discussed at various conferences, in many articles and also in ZURs, which have been published in English and Uzbek and which have been distributed to official Uzbek organizations as well as farmers and other practitioners. He also mentioned that the project contributed a lot in capacity building of young Uzbek scientists, since the project created broad possibilities for studying at Bachelor and Master level (inside Uzbekistan) and at PhD level (both inside of Uzbekistan and in Germany). At the end, he expressed his gratitude to Prof. Paul Vlek and to Dr. John Lamers and their team for their contributions and congratulated them with the great achievements. Finally, he wished success to the project as well as to all the participants.

Presentations and Discussions day 1

GIS and Remote Sensing Services for Land and Water Management

(Fabian Löw et al.)

The GIS (Geographical Information System) and Remote Sensing concept of the ZEF/UNESCO Khorezm project aims to provide data collection, processing and management services, prepare various products, and facilitate capacity building. According to this concept, these services and products can be offered at several administrative scales including field, WCA (Water Consumers' Association) or higher levels (Rayon, Tezim, Oblast).

The backbone for all services is a well-equipped GIS laboratory at the project's premises in Urgench. The laboratory is equipped with computers and servers using GIS software and is also responsible for field measurements devices (for soil and water salinity measurements, groundwater issues, crop growth assessments, GPS devices). Furthermore, a total of seven meteorological stations are currently running, which are maintained by the GIS laboratory in the Khorezm region.

The GIS Centre can now offer different products on the basis of the equipment and the knowledge generated: Digitization and structuring of printed maps and information, downloading and simple processing of satellite imagery and land-use classification at field and higher scales. Simple statistical evaluations such as the extraction of crop rotations from multi-year satellite images are part of these processes. Maps of actual evapotranspiration (water consumed on the fields for crop production) can be calculated and analyzed together with additional data in collaboration with external science partners. GIS and Remote Sensing could be helpful in analyzing quality of land (bonitet) and in predicting the yields. The products can be used for objective monitoring of land and water management and can support a communication process with local stakeholders.

All datasets collected in the project are stored and organized in a central database with the possibility of a structured web-based access. A WCA-based indicator packaged for assessing and monitoring WCA development, combining most of the datasets, is in preparation. Finally, capacity-building in the field level of GIS and Remote Sensing can be provided in collaboration with the DLR and the University of Wurzburg as well as the local University of Urgench as a possibility for distributing the products and disseminating knowledge in Uzbekistan.

Discussion

UNESCO National Commission: 1. International standards - what does it mean? 2. Landscape - to which extent GIS and RS consider historical sites in Uzbekistan? 3. Can you distinguish with RS water use during day and night time (to make recommendations for farmers on efficient water use)?

Speaker: 1. Produced data is in interchangeable format. 2. These have been recorded indeed in the past and maps are available but by itself these have not been considered by the project as most of these sites are presently on the territory of Karakalpakstan. 3. No, while this also is not really important. A comment that there is a GIS lab in Nukus

Prof Tursunov: 1. Recommendations on the use of soil resources?

Speaker: Soil resources can be mapped as soon as data becomes available. These are available to a certain extent but I made only a summary and not a complete review of all the data in the database.

IWMI: GIS tools (software, algorithms) developed by the project are available, but how? For free, for purchase, for training, or only for some groups?

Answer by J. Lamers: The tools have been developed by the project GIS lab with funds of tax payers (BMBF), so they are in principle for free. However, in order to use these one would need software, PC, trainers, etc. and these will cost money. Project staff can provide training.

Comment from Tashkent State Agrarian University: The figures for rice area as depicted by your images do not seem right, seem overestimated. Fields under irrigation might have been mistaken for rice fields.

Speaker: This is possible but also unlikely since the data has been cross-checked through ground trusting.



ZEF/UNESCO Khorezm Project Landscape Segment Database

UaDU DLR

Login
Username:
Password:

Welcome!

The Landscape Segment Database (LSD) includes all relevant information and data of specific parameters collected from the landscape segment in a systematic way. This LSD allows all users to view the meta-information and to up-and download data for registered users. The interdisciplinary parameters will be used to assess the impact of different land and water management technologies.

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Landscape segment field boundaries

Water Management at Field and Beyond in Khorezm

(Mehmood Ul Hassan et al.)

Project findings showed that for meeting water demand of crops in the field, more than three times water needs to be released from the source in Khorezm. Out of the released water, 45% is lost while conveyance to field and another 28% gets lost within the field due to several factors. High conveyance losses are due to the poor state of the canal infrastructure, which is over half a century old and is poorly maintained. A regulation infrastructure is unavailable for secondary and tertiary canals. The water measuring devices, especially at the tertiary canal level, are not present. In addition to excessive irrigation, the soils are annually leached using another 6,000-7,000 m³ ha⁻¹. Monitoring water inflow/outflow on a 1,000 ha area in the Khorezm region showed that the leaching amounts were excessive and one-third of the leaching application had no or adverse effect on washing salts from the soil. As a result of these excessive applications and poorly functioning drainage system, the groundwater tables during the past decades have risen by over one meter and the groundwater levels are now within the critical depth of 1.4 meter during the irrigation season.

The overuse of water can partly be attributed to the blanket irrigation and leaching norms, which therefore would benefit from a re-assessment and they need to be applied according to local characteristics. The project has now linked models for crops, water, soil, salinity, such as Cropwat, Feflow, and Hydrus, to re-work irrigation schedules. This is not easy, as a lot of data needs to be collected and analyzed to parameterize the models. This difficult task has already been established by the project and can be easily taken over and applied elsewhere.

The other issue is the unreliability of water supply within the system, which can be partly addressed through on-farm storage. The excessive leaching irrigation applied at the beginning of the season for example could be stored as a buffer against unreliable water supply.

The water saving technologies for the field level often are not financially attractive to Uzbek farmers largely because of the state procurement system. Precision land levelling reduces water use by 30% and saves labour of farmer for irrigation. Retention of crop residues and mulching might seem attractive options for farmers but it does not save much water.

Salinity management can be based on express methods using for instance the EM38 device. If 3 million USD can be invested in purchasing 100 EM38, the entire irrigated area of Uzbekistan could be mapped for salinity 9 times per year. The operational costs of USD 0.2 per ha could be contributed by farmers.

The farmer-water manager interface has to be improved due to weaknesses in water consumer associations (WCAs), which often are considered still under the responsibility of local authorities and not yet by their members. Many WCAs do not have functional offices, equipment, and recognition by farmers/members. But if WCAs are engaged through facilitated dialogue and social mobilization, they can be activated. Yet their financial sustainability might remain an open question due to area-based state order system. After farming becomes financially viable, then water charges based on salinity and water use could be introduced.

As far as higher level water management organizations (WMOs) are concerned, they are also in disarray, not able to manage water equitably and reliably. Management Information Systems, such as the project designed water allocation model has been tested and adapted at

the Kulavat Irrigation System in Khorezm, and can be used to plan water use and monitor and assess the irrigation system performance. The canal management organizations at the moment do not see a value in using such models due to their heavy dependence on paper work and lack of trained staff and incentives. The measurement needs to be ensured and infrastructure and institutions need to be built and upgraded simultaneously, for which institutional capacity-building related to both hardware and software aspects need to be taken care of.

Discussion

IWMI: 1. My colleagues from Colorado University use Remote Sensing for salinity mapping, it would be good for you if you have such possibility here. 2. Can you tell the amount of water withdrawn from the river for irrigation and the amount of water lost due to low irrigation efficiency? 3. High level of groundwater decreases the efficiency of leaching, what was the amount of leaching in your case?

Speaker: 1. Thank you we will try to contact them. 2. We have monitored water use at different levels; at field, at WUA level and for entire Khorezm. 3. Water efficiency refers to the assessment of technical process of irrigation from the resource and field. Technical efficiency factor is between 40-45% ha⁻¹. 3. Pure leaching was 70 – 100 mm

NUUz: How do you measure the quality of leaching?

Speaker: We do not measure the quality, we measure the efficiency of leaching – the reduction of initial soil salinity related to water input.

WB Project in Beruniy: Do you consider the amount of salt coming from Amudarya water, how much is it in gl⁻¹?

Speaker: Yes we obviously do. It is approximately 1-1.2 gl⁻¹ for the approximately 4.5 km³ of water withdrawn annually for the Khorezm region.

Afforestation as an innovative land use for reclamation of degraded croplands and improving rural livelihoods

(Asia Khamzina et al.)

The presentation provided an overview of published research conducted by the project on the potential of short-rotation plantation forestry to rehabilitate degraded, irrigated croplands. Bio-physical and socio-economic studies during 2002–2011 in Khorezm assessed the suitability of afforestation with multipurpose tree species as an alternative land-use option, by examining the ecosystems services and opportunities for income generation. The main findings were presented on the inventory, evaluation, and selection of suitable tree species and determination of the irrigation demand for establishing plantations on highly salinized, nutrient-poor soils with a shallow, saline groundwater table. Next discussed were the impacts of tree plantings on groundwater through transpiration and associated impacts on soil salinity, improvement of soil nutrient stocks through N₂-fixation and litter fall decomposition, and carbon sequestration into soil and tree biomass. Results of the cost-benefit analysis of afforestation considered multiple non-timber benefits such as wood for fuel, leaf fodder, fruits, and carbon units sequestered, as well as costs associated with plantation establishment and transaction costs under the Clean Development Mechanism. Profits from afforestation exceeded those from continued cotton and winter wheat cropping on degraded cropland, even

assuming adequate irrigation supply for the annual crops. Overall evidence on ecosystem rehabilitation and financial benefits suggested that converting degraded cropland to (long-term) tree use is an attractive option to increase the land value. Legal support and incentives would be needed in setting aside degraded croplands for tree farming. Improved market conditions for tree products and extension services to increase awareness on the benefits and practices of tree-based systems would facilitate the adoption of on-farm afforestation.

March 2003



August 2006



Discussion

Andijan State University: Thank you for the interesting presentation. I would be interested to include these results in the curricula of the soil science lectures in Andijan University. Can you provide detailed data, particularly on the initial soil characteristics, and how they were influenced by afforestation? What was the method used for determining N₂-fixation by trees?

Speaker: Detailed information can be found in the articles to which slides referred. I can provide those. The estimation of N₂-fixation was based on ¹⁵N natural abundance method.

GIZ mission in Nukus, Karakalpakstan: Thank you for the presentation. I would be interested to conduct a similar C sequestration assessment in Karakalpakstan in afforestation sites established on the desiccated bed of the Aral Sea. We would be open for collaboration on this matter.

Speaker: Thank you and we will come back to this offer as this coincides with our own planning.

NUUz: What methodology did you use to measure total soil carbon concentration? What is the total territory of Khorezm and how much land is irrigated? What was the soil type at the research sites? Have you measured the soil C stock in natural tugai forest? How do you determine electrical conductivity of the soil?

Speaker: Total carbon was measured by dry combustion of soil samples in an elemental analyzer. The territory of Khorezm is about 650,000 ha, of which about 270,000 are irrigated. According to the local classification, the soil at the research site was an irrigated alluvial

meadow. We assessed soil carbon stocks in natural tugai and desert sites but also in different land-use systems in Khorezm. The data has been published. The soil electrical conductivity was measured in the 1:1 soil-water paste and the results multiplied by 3.6 as recommended by SANIIRI for Khorezm soils.

NUUZ: Such method of determination of total soil carbon has not been used in Uzbekistan. Preparing saturation paste for electrical conductivity determination needs to be more carefully addressed.

Glavidromet: How were the carbon stocks in tree plantation determined? If you are offering the plantations on degraded land as a source of fuelwood would this not negate their carbon sequestration function? Why the fruit production has decreased over time?

Speaker: Biomass of stems, twigs and coarse roots was measured in-situ and this data combined with lab-measured C concentration in each biomass fraction to estimate total C stock on a tree basis. Next, these per tree data were multiplied by the plantation density to estimate the biomass carbon stock on per hectare basis. Carbon sequestration implies a temporary storage of carbon that will be in any case re-emitted. Burning fuelwood would mean releasing sequestered CO₂ thus indeed the overall balance is zero. But then it becomes positive overall when you assume that when by burning wood fossil fuels are saved. Here the data on C sequestration considered the scenario when the plantations were partially harvested for fuelwood while the bulk of the trees remained for capturing CO₂. The fruit production was declining due to the high density of tree plantations which is not favorable for fruit growing. If the latter is prioritized, more and targeted thinning must be applied to optimize fruit production.

UNESCO National Commission: Can you address the biodiversity conservation issue in re-vegetation degraded land by considering promoting natural vegetation and let the nature restore the natural species composition rather than artificially altering the landscape.

Speaker: The study region Khorezm is a place of ancient agriculture where the landscape has been altered by humans to the extent that presently it is hard to tell which plant is more “natural”. Promoting fallow vegetation of mostly halophytic plants does not seem to make the saline land more productive or species-rich and has only a low potential for increasing the value of land. Thus we select perennial plants, trees, which were assessed as most productive on saline cropland while capable of generating other ecosystem services. We have worked only with local species.

Improved management of cropping systems

(Nazar Ibragimov et al.)

Nitrogen (N) is the most yield limiting factor for agriculture in the Khorezm region but farmers follow at present blue print recommendations. Hence the current N management practices provoke high N emissions (greenhouse gases (GHG)) and losses through leaching. The losses and its magnitude from cotton fields, but also options which could help reducing GHG emissions and losses to farmers were presented. Results of experiments on improved N management conducted during the project Phase III were discussed.

Findings: Farmers presently apply N-fertilizers based on blanket recommendations without knowing if, and if yes, how much N in fact is needed. Therefore N management should be site-specific. Easy-to-use sensors based on non-destructive measurements that can give

information on the amount of N needed during the growing season of crops such as cotton, winter wheat, maize, rice have been widely accepted by farmers in for instance Europe, the USA and India. But before using these sensors in Uzbekistan they have to be calibrated and adapted for local use. With the help of such sensors, for example the SPAD-502 chlorophyll meter or the Green Seeker, scientists of the project could reduce N waste and increase N use efficiency by matching N application rates with crop demands. They can also estimate the spatially variable demand of N within one and the same field. Our researchers have successfully calibrated and tested in farmer's fields the SPAD meter and Green Seeker for irrigated cotton, winter wheat and short and long duration maize. With the help of this sensor, the efficiency of N- fertilizers applications can be increased, and the amount of N-fertilizers to be applied can be decreased. A 10% decrease in N-fertilizers application will save the farmer about 60 kg of ammonium nitrate per ha of cotton and 50 kg per ha of wheat, or USD 9-10 per ha in monetary value. But the sensor not only helps to match N demand by plants and application rates, but can also predict the crops yields accurately. To provide all farmers in Khorezm for instance with the SPAD meter a total investment of USD 2.6 million would be needed. But given the annual savings on N-fertilizers use in the Khorezm region, this investment would be paid off in less than two years.

For simulating water use and N response of winter wheat and cotton in conditions of the Khorezm region the crop growth model CropSyst was calibrated and validated. Since the agro-ecological conditions in Khorezm are similar to those in other parts of Uzbekistan and Central Asia, the results are transferable to other regions as well.



Discussion

NUUz: Could we use new bio fertilizer in your experiments? Because farmers also can buy this fertilizer.

Speaker: The presented results stem from our experimentation with mineral fertilizers and we will consider trying biofertilizers in our future activities.

Samarkand Agrarian University: Did you consider mechanical structure of the soil in your experiments when determining amount of mineral fertilizer?

Speaker: We determined and considered the mechanical structure of soil and other soil properties during the experiment. The main soil structure for Khorezm conditions is in 60 – 70% light loamy soil.

Samarkand Agrarian University: How many pieces of equipment we may use on 1 hectare according to your calculations? How many you will need to buy for Khorezm region and which organizations can use it?

Speaker: Among the devices tested, the Leaf color chart is the cheapest, costing 1 USD per piece of equipment but is not as precise as the other two tools examined. The SPAD can be used by one WUA or one farmer. A new updated GreenSeeker will be available next year, which is easy to maintain and use by one person. It would cost about 200 USD.

Comment by Ken Sayre (Cimmyt): It has been an interesting presentation, we have been working with you for a long time and SPAD meter and GreenSeeker have been carefully tested here as well as in other countries. In India, Pakistan and other countries farmers are already using these N management tools and they have had good experience. These tools help to save the money and increase income of the farmers.

Alternative cropping system in Khorezm agriculture: Problems, research and results

(Oybek Egamberdiev et al.)

The agricultural sector makes a significant contribution to the economy of Uzbekistan. The main crops are cotton (*Gossypium hirsutum* L.) and winter wheat (*Triticum aestivum* L.) which occupy annually 70-80% of the irrigated croplands. Present crop production methods are based on intensive tillage operations, which lead to increased fuel consumption, labor requirements, and other production costs, and at the same time result in enhancing of land degradation processes such as salinization, water logging, loss of soil organic matter and soil biota. There is a need in the Khorezm region of Uzbekistan for a wider introduction of alternative crop management systems for sustainable crop production and improving land productivity.

Since 2002, the ZEF/UNESCO project in Uzbekistan has developed a laser-guided land leveling equipment and studied conservation agriculture (CA) practices as alternative crop management systems. Laser-guided land leveling is a process of smoothing the land surface (± 2 cm) from its average elevation using laser equipped drag buckets. The main principles of CA are minimum/zero soil disturbances by tillage, retention of adequate levels or crop residues on the soil surface and appropriate crop rotations. These alternative management system practices are becoming increasingly attractive worldwide as a farming strategy to provide a more sustainable, economically viable and, environmentally efficient use of resources in agricultural systems. Research findings from the ZEF/UNESCO project showed that such alternative systems are suitable for Khorezm and that they have certain potentials.

Benefits of laser-guided land leveling for the farmers in Khorezm include:

- Saving of 20-25% of irrigation water;
- Salinity reduction via irrigated water application;
- Uniform water application and moisture distribution;
- Better crop emergence and availability of crop nutrients;

- Increase in water use efficiency up to 25-30%;
- Leveling of land once in 3-5 years and thus reduction in production costs.
- Additional crop yield 0.5-0.7 t/ha, and thus higher return to farmers.

Benefits of conservation agriculture for the farmers in Khorezm include:

- Increase in soil organic matter due to crop residue retention and minimization of soil tillage;
- Declining of soil salinity increase;
- Stable crop yields;
- Substantial reduction in machinery costs;
- Improved agro-ecological sustainability;
- Higher farm income.

Furthermore, research findings demonstrated that there were no significant adverse effects from alternative cropping management systems as compared to traditional agriculture practices. But a special sequence of methods (field visits, workshops and extension) is needed to engage farmers and stakeholders to smooth the transfer from conventional practices to alternative management cropping systems.



Discussion

Andijan Agricultural Institute: 1. In your winter wheat experiments you have different treatments with tillage, no tillage, and permanent bed and with mulch. In your treatment with no tillage there were no yield increase. Why? 2. What is the difference of your technology? Your treatments resulted in low humus content. Why?

Speaker: Our technology is based on leaving crop residues every year as mulch cover in order to improve soil properties such as humus.

Andijan Agricultural Institute: For thousand of years agricultural production has been based on soil tillage activities and now you are saying that no tillage is better than conventional agricultural practices?

Speaker: Yes, our trials showed that no tillage improves soil properties and increases yields in the run of several years. Few people in Uzbekistan have tried this technology, but we need to show that this technology works under the conditions of Uzbekistan.

UNESCO National Commission: Presentation was good, I want to know how many farmers have implemented such agricultural practices and in particular laser-guided land leveling? Why did they implement it?

Speaker: Laser-guided land leveling has been implemented by many farmers in Khorezm and farmers were satisfied. However, no-till practice has not been implemented by independent farmers, only at our experimental fields.

Comment from TIIM: This is a good question, we are implementing no tillage technology also in Syr Darya and other district of Tashkent region. However, further dissemination of this technology is hampered by the lack of the necessary machinery, such as seeders, laser levelers. This is one of the reasons why new agricultural technologies are not spreading fast in our country.

Comment from Ken Sayre (Cimmyt): Oybek and Alim Pulatov from TIIM have mentioned very relevant issues concerning these agricultural technologies. However, we should be optimistic and patient to see how these technologies will spread over Uzbekistan. In Mexico for example experimentation with conservation agriculture has started 50 years ago and many farmers were skeptical. However, now we see 2.5 mln. ha in Mexico under conservation agriculture. So, please do not say the technology does not work here, too fast. Let the farmers test it in their fields and you will see in some years how the technology is spreading in Uzbekistan. But of course you will need to develop the required preconditions, machinery, equipment and skills of the farmers.

Discussion Day 1

UNESCO National Commission (Alisher Ikramov): All the findings and recommendations from the project have to be presented in the form of hand-out materials, have to be broadcasted and delivered to a broader audience.

Mehmood Ul Hassan: The technical part is a smaller part of the existing problems in the country. Technology can be adapted, prices can be reasonably adjusted. But the bigger problems are the blueprint recommendations for the farmers, prescriptions to plow the land for example. We have to create space for the farmers to experiment, find solutions, and implement innovations. Professors are good for science, but not very good for working with farmers.

Ken Sayre: There are 23 mln ha of land under conservation agriculture in Brazil nowadays. 30-35 years ago farmers started to change their agricultural practices themselves to adjust to local conditions. The farmers found solutions themselves, without science. We can call them self organized researchers. In the beginning of this process many people in Brazil were against, but now we see a large area under this technology.

UNESCO National Commission (Alisher Ikramov): Everyday we face problems, both technology or market driven. Presentations show various aspects of these problems, but still research should be the basis of all innovations for sustainable development. I hope that good relations will be established between UNESCO and UrDU. In the curriculum of UNESCO Chair at UrDU you have to include more studies on biodiversity and educate students from all the faculties.

TIIM (Pulatov): During the Soviet Union kolkhozes were properly ruled, managed, then in 2004-2006 we had shirkats, then private farmers have been established throughout the

country. Our farmers have various backgrounds and experiences. And the state became concerned with the sustainability of agricultural production in the country. We need to update, train farmers, teachers, professors. Some recommendations from the project might seem shocking, but 10 years of research and experimentation showed that chosen innovations work. A couple of years ago local stakeholders in Uzbekistan did not want to see examples from other countries, since they thought they might not work in local conditions. But now, ZEF/UNESCO project can show the results from Uzbekistan, can show that new, alternative technologies can work here. Next step should come from the state. It has to pay attention to our recommendations.

Ken Sayre: Farmers themselves have to be involved in experimentation and testing of innovations, they have to adapt these to their needs and possibilities. Farmers have to be involved, especially with complicated innovations.

Paul Vlek: I want to remind you the title of the project which is “Economic and Ecological restructuring”, not just ecological. Farmers need incentives from the state. Transformation of the agricultural sector in Uzbekistan has been very complex: size of farms, knowledge of farmers. People had to learn new skills, capacities to undertake a complex of activities in the fields. Our research agenda has been dynamic, and tried to follow adaptations to state policies. The project did not want to change the system, but to update people, youngsters, farmers so that they can adapt and use new technologies. Farmers often have to work in uncertain circumstances. We have only 10 years of experience in Uzbekistan and possibly have to finetune the proposed innovations. For this we will collaborate with the state and will try to define which way and how to implement these innovations in the country. We have to try to bring the system to its equilibrium, but since the system is complex, we might need more time for this.

TIIM (Pulatov): The state is also learning in the process.

WB project in Beruniy: Project research and outputs are great, the question now is how to best disseminate these to the farmers and other stakeholders? You have to think about this, you have to collaborate with other projects on this. Our project in Beruniy also had good results, but after the project stopped its activities, farmers did not apply these results. What happened is that the farmers which were involved in our project did not share, disseminate their knowledge and new skills to other farmers. So, you need to advertize your results, have to show these to more farmers, other end users. You have to distribute your knowledge through TV, radio, leaflets, magazines, etc. You have to invite more farmers to your workshops and seminars.

Anna Hornidge: This project has explicitly chosen the current strategy. Just advertisements will not help, farmers have to participate in developing innovations and make sense of innovations themselves. Flexibility of decision making is lower now than in Soviet times, and farmers follow state norms. Space for decision making at low level (farmers) has to be developed for the farmers.

UzGIP (Khasankhanova): What kind of distribution material is available already from the project? Every country has its own specifics. Conservation agriculture has been a revolution in the sphere of agricultural production in the world. However, its dissemination needs much effort, time from the state, farmers, and other stakeholders. There are no real extension services in the country yet, there is lack of required machinery, other tools. So there is a need to develop extension services, train organizations in new methods in agriculture.

John Lamers: In the last session tomorrow we will talk about dissemination strategies we have identified for the project. We will focus on education and dissemination not so much on research. Skepticism is still there, and we need to be up-to-date with the developments in the country. We will work with various stakeholders and recipients.



Presentations and Discussions day 2

Plastic lining of canal beds

(Prof. Hujayoz Jabbarov et al. UrDU)

The presentation described one of the projects, undertaken by UrDU in 2008-2010 with a grant from GEF SGP. This project aimed at lining of one of the irrigation channels in Khorezm with plastic of a special thickness and length with the main objective to decrease infiltration and to increase irrigation efficiency of the canal. "Navruz-yap" canal in Yangibazar district of Khorezm was chosen for implementation of the project. Findings and estimations showed that infiltration of water decreased considerably, much energy (electricity) was saved due to improved gravity flow of water and due to a reduced use of pumps for pumping water into the canal. Furthermore, findings showed that soil in the fields was improved due to timely and sufficient delivery of water for irrigation; farmers received higher yields and thus higher

economic benefits. Finally, the coefficient of the canal efficiency increased from 0.23 to 0.98. Overall, it was estimated that investments in such a project can be covered/paid off within 2 years purely from energy saving.

Discussion

Andijan Agricultural Institute: 1. How many years can the plastic lining of the canal serve? Can it stay undamaged after the canal cleaning? 2. Which methods of measurement were used during the experiment?

Speaker: 1. According to our estimates and predictions plastic lining of the canal can last for up to 50 years. In the beginning of this plastic lining project there were many disputable issues about cases of damaging plastic lining during cleaning of the canal by excavators. The thickness of the soil cover above plastic layer is about one meter, and today we are using hydraulic elevators for cleaning the canal which do not dig very deep in the soil. So, we can assure that cleaning of canals by excavator will not cause damage to plastic lining. 2. In common we fulfilled hydrometric measurements using traditional methods.

NUUZ: Plastic which was used in plastic lining of the canal is a normal one or is it a special plastic, produced especially for this project?

Speaker: This is a special plastic which was produced upon our request by local producers in Jizzakh region. The initial material is available locally, but we ordered special length and thickness of plastic. So, basically this special plastic is available to all.

Economy, Institutions, Policies, Infrastructure and Markets of Agricultural Sector

(Nodir Djanibekov et al.)

From the onset the economic studies of the project comprised three core research clusters: land use; water use; and trade and macroeconomics. The economic research activities were conducted within several core studies. The objective of the presentation was to show the main research findings of the economic team of the project. The first section of the presentation focused on increasing occurrence of water scarcity and water supply variability. Water inflow to the Khorezm province is influenced and upper-bounded by water discharge at Tuyamuyun reservoir. Although water inflow usually meets the regional water demand, the likelihood of receiving the average long-term water supply has been decreasing resulting in significant price hikes for most of agricultural products (rice for example) as well as in losses for producers and consumers. At the same time, the vulnerability to water scarcity stems also from the population growth in Central Asia, which is assumed to lead to the increased total water demand for satisfying the regional food consumption. In this respect, the high rate of animal products in food diets will contribute to the growing pressure on water resources. While considering income growth via industrialization and urbanization, water demand for food consumption will be even higher raising the share of imported products and making the regional population more vulnerable to world price fluctuations.

Several options for strengthening the resilience of agricultural production and incomes to growing water stress were presented. The options include improved farm flexibility in decision making, ecologically and economically optimal cropping patterns, promotion of economically attractive water-saving technologies, designing new institutions for sustainable

land and water use, and development of cotton processing sector. The results demonstrate that although the improved farm flexibility in decision making, e.g. via modification of the cotton production policy, could lead to improved farm incomes and utilization of risk coping strategies, the dominance of rice in farm profits may result in undesirable effects. In this situation, the promotion of water-saving technologies will allow preventing the undesirable effects. From the point of improving irrigation and drainage canals, the functionality of local water consumer associations can be enhanced via extending services towards ones that create additional social benefits such as through the maintenance of local health centers and schools, provision of micro-credits and trainings to their members. The resilience to water scarcity can be further strengthened via development of cotton processing sector. The export revenues could be maintained at lower water costs if local cotton is further processed into ready textile products. However, the effects of the presented options can vary from location to location with different population density, water supply, land quality, availability of infrastructure and markets. Therefore, the local characteristics should be taken into account when developing the options for action.

Discussion

Prof. Ergashev: water required to produce has to be in litres, 1 kg of wheat requires 900 litres, rice 5,000 litres etc. Why the virtual water for cotton is not presented?

Speaker and other researchers from the project: We did not include the cotton products as the study was focused on virtual water requirements for food consumptions in Uzbekistan. Calculations show 6,800 litres of water used to produce 1 kg of raw cotton. The difference may be explained by the fact that the project estimated water for raw cotton production in the Khorezm province, whereas other scientists were referring to cotton fibre.

Ken Sayre (Cimmyt): Why wheat has very low virtual water content in one of your slides?

Inna Rudenko: Nodir in his calculations has used the virtual water for Uzbekistan presented in other studies FAO. In the project we have calculated virtual water content for various products including wheat, cotton, vegetables, etc for the Khorezm region. According to our estimates, virtual water content in wheat produced in the Khorezm region is about 2,300 liters per kg of wheat, which lies in the range of the world average of 1,000 – 3,000 liter of water per kg of wheat.

Speaker: In our study, we used the average values presented by Mekonnen and Hoekstra (2010) for Uzbekistan. The values for Khorezm may be different from the values they reported.

TSAU: The farm water use model considered drought years, but even if you consider high-water years then rice will be grown more at upstream areas, therefore downstream areas will always have to save water, need to look at ideology.

Speaker: This is exactly what the model shows. If we increase the flexibility of farmers' decision making, the rice production near the irrigation canals will increase and the cultivation of other crops will be moved to the fields located further from the canals.

WB drainage project in Beruniy: In your calculation of economic efficiency of laser levelling you refer to LL equipment capacity of 300 ha per year, isn't this too much? Because in practice it can be much lower.

Other researchers from the project: Capacity of LL depends of many factors, including the capacity of the tractor, the width of the bucket, soil characteristics and how it was prepared before laser levelling. In our case, the findings are based on the technical capacity of the equipment developed and windows of implementation within the year, knowing that about 1.5-2 ha per day is possible with this size of bucket and tractor, maximum 5 months per year which adds up to maximum 300 ha per year.

Natural Resources Governance and Innovation Development – Social Science Research in an Interdisciplinary Project

(Anna-Katharina Hornidge et al.)

In line with the project's mandate, the social science research components rest on the three pillars: (a) water management, (b) land use and planning, and (c) knowledge & innovation development processes, each of which is further substantiated by institutional and organizational studies as well as embedded into the ongoing socio-economic transformation and agrarian change processes reshaping the social organization of everyday life in Khorezm, Uzbekistan. The presentation offered an overview of the conducted research in altogether four research work packages and eight PhD-studies. The main research findings were summarized.

Water management. For increased efficiency and sustainability in water management, technical and infrastructural improvements have to go hand in hand with the institutional strengthening of the implementing organizations, clearly defined tasks and rules of implementation, and assured transparency and up- and downward accountability. For the adoption of water-saving technologies, the researchers identified increased environmental education in schools as necessary to lay the ground-works.

Land use and planning. For increased land productivity, secure, long-term land use rights and relaxed norms on agricultural land are favorable, providing the ground for long-term thinking, local innovativeness and risk taking on (peasant) farm level. Furthermore, the development of local agro-entrepreneurship requires reliable access to markets and credits.

Knowledge & Innovations. The development and further diffusion of innovations for addressing 'real-life' problems in Uzbekistan, seems most promising via a double path approach, combining participatory, transdisciplinary innovation development processes (bottom-up) with the feeding of innovations into the national system of policy-making (top-down) for potential outscaling.

Discussion

UNESCO National Commission: Coming back to your last slides, I expected something different. Topic is important. Important is the role of social science and social studies in transformation process. But your output from the project is not the number of PhD studies and students. For me the output of the project (according to your component) would be reducing poverty, for example, or community empowerment, women support, mindset changed. It is not the number of PhD students. Therefore, I strongly disagree that this is an output.

Vefa Mustafaev (UNESCO Paris): You might speak from the point of engineer, not social scientist!

Speaker: I disagree with your assessment. The findings presentes are valid research outputs. I could not present all the findings but underlined my arguments. Without these studies

conducted so far these could not be made. Of course, there is more on the spot including potential changes in the region. For instance, long term rights to land and land use – these are important to study. How people can develop innovations, invest in land, develop innovativeness, and so on. It is not the stuff we simply wrote up since all publications undergo a strong review process starting from the university level to the reviewers for the international publications.



UNESCO National Commission: Then, in reply to you my second comment is that social studies and results must be integrated, their ideas and summaries and interlinkages. It is a nexus between social science and policy making. Otherwise it is utopia – there is no law on land rights in Uzbekistan. All your recommendations stay hence as an Utopia! I expected something concrete with local stakeholders, interlink to policy makers. Nice recommendations, but they remain an utopia.

Vefa Mustafaev (UNESCO Paris): Present here is a member of Parliament. We can give the floor to her.

Speaker: I disagree. Secure water right and land rights as elsewhere in the world is not an Utopia. Of course, I could present theories and methods on inclusion of social issues, but presenting these does not make any sense. I can send you some of our publications.

Parliament (Dilorom Fayzieva): Of course, these are research outputs and not utopia. This is the vision based on research findings, which they recommend for further considerations. This was presented to the Agrarian Committee of the Parliament. But anyway, the results should reach the Parliament to its full extent. There are different mechanisms to reach this transfer–this is one thing. The parliament has a great volume of work and routine. Sometimes, it may stay without proper attention. Therefore, propaganda should be organized in the form of seminars, we should organize some joint events, seminars, parliament hearings for taking into consideration and planning further actions. What can the Parliament do in this regards? Certainly, it can use the project findings, not only from the social science component, but all the others, for further recommendations.

But not only the Agrarian committee, also all other committees, different deputies when they meet their people can discuss. Yet, the wider discussions should take place at the Parliament,

where a document can be generated which afterwards will reach the other organizations and institutions.

Prof. Ergashev: The first stage results are that we succeeded in officially submitting the 4 packages to Agrarian Committee and MAWR, which were signed by UNESCO. Moreover, last year there were 2 meetings in June, in the Legislative Chamber. The packages of documents we had submitted to the executive organs, which on the spot elaborate the plan for actions in accord with these recommendations. I think this will be possible. We should work further on with the project findings (social, economical, etc). I see it in this way. Surely, the parliamentarians have to be informed about the results of these studies. A number of scientific and education committees next year are interested in the 10years experiences from the Project and we should discuss this with John Lamers.

Speaker: We have to disseminate into the different levels. We are now starting here.

Parliament (Dilorom Fayzieva): As many of you may know, our President in May 2010 presented a new concept to deepen reforms....". This concept includes the widening of the social partnership and role of NGOs. Sooner or later we expect the law on social partnership which will create the basis for public control, as well for your actions (to Krass).

Up- and Out-Scaling Findings Phase IV and Consortium

(Akmal Akramkhanov et al.)

This presentation introduced further steps of the project. The consortium of UrDU-UNESCO-KRASS in collaboration with ZEF prepared a project proposal for a final Phase IV. Main activities in phase IV will be dissemination, institutional strengthening, and enabling research. Each component will consist of several work packages, but the focus will be on dissemination of project results to various stakeholders and addressing therefore institutions. Dissemination can be split into hardware and technology related to suit stakeholders engaged in production in agriculture, and soft products such as lectures, analytical reports, policy briefs targeted to decision makers, publication in journals to increase international awareness about results originating from Uzbekistan. The consortium partners UrDU and UNESCO are well known to the audience, KRASS is a young organization established by the graduates of the project who joined their expertise to form a local NGO. Despite being young the organization has already gained much experience in running full scale projects (supported by GEF SGP, UNDP), short term consultancies in the country (WB, UNDP) and abroad (Cornell University in the USA, Azerbaijan). This presentation conveyed the message that the success of the next phase will depend on the strong partnership with different organizations to reach wider audience to get the innovation across, and the openness of KRASS to cooperate in the country and in the region.

Discussion

Parliament (Dilorom Fayzieva): KRASS and the project need to enhance contacts with the governmental representatives, for instance with Hokimiyat and the Parliament. KRASS should take considerable efforts to contact the government representing bodies in Tashkent.

The Decree of President on enhancing the economic reforms was issued on November 12th, 2010. This Decree can be used as a concept for promoting the research results.

Speaker: Agreed

UNESO office Tashkent: The dissemination of the research results should be carried out via extension centers.

Speaker: Agreed

Discussion Day 2

Paul Vlek: The KRASS agenda presented focused on the technical aspects but we have also considered the institutional arena including legislation. Laws have to be updated and adjusted. Info from the project may lead to changes in policies, laws. Governments all over the world are in principle conservative. We have an opportunity to meet together: active partners, new faces for new partnership. In the project we have become a good family of good specialists. Now time has come to run for the final goal, which is to restructure land and water use based on many aspects: social, economic, ethical, environmental and others. So we have to think about integration and equity for sustainable development in the world and in Uzbekistan. I realize that it is difficult to think about development and about the future without satisfaction and meeting the present needs. I hope to see positive changes in several years in Uzbekistan.

Vefa Mustafaev: You have to prepare a good report of this Symposium.

Closure

Paul Vlek

“I will support the promotion of KRASS continuation in Phase IV to international agencies and hope that Phase IV will be successful on both the institutional and technical level. Sustainable development is not just a word, the underlying idea is much broader. Sustainable development is the equality of access to resources between generations. What we have now, our next generations should also have. We have to think beyond the coming 100-200 years and create the required conditions for sustainable development and life in future”.

John Lamers

Dr. J. Lamers expressed his gratitude to all the participants and to the organizers of the event.

Dilorom Fayzieva

“I am not an outside person for the project. I was involved in the project since very beginning. Within 10 years the project has done an enormous work whereby to tell about this work needs 10 more years. I want to say that the project was very much relevant, it has its own results and the most important that there is KRASS to continue. Most of the projects end up after being functional for several years, with no continuation in the after-project years. In my view this Symposium is a final one for the project, moreover you should prepare and publish the final report and organize presentations of your results on a centralized level in Tashkent. Thanks again to UrDU, John Lamers and Ruzumbay Eshchanov, rector of UrDU”.

Ruzumbay Eshchanov

Before, there was an old hotel “Urgench” in this place and now it is a very modern hotel which was also reconstructed by Germans. The same was with our university, initially we had few projects and partners but now we have about 15 local projects and 18 international ones. We have a big number of students graduated with the support of this project. Most of them have good jobs. We have done a

tremendous work. Thanks to BMBF for support ZEF/UNESCO project, thanks to Paul Vlek, Christopher Martius and to everyone who has supported us. Today we see 10 years' results in practice and hope that Phase IV will be a successful one. We need to develop science, agriculture and our region. Thanks again to everybody and I hope for future collaboration.

Abdi-Kadir Ergashev

I would like to add that where there is a problem, cooperation and partnership would always help. ZEF/UNESCO project has done a lot. I had a chance to prepare the reports and submit it to the Parliament. We've submitted 4 components of the work to the Parliament and it is already something. This is a good project. I had an experience to coordinate 20 UNDP projects, 17 UNESCO projects and this one is the most serious and the best. The project should not disappear as water in the sand, results should be passed to our future generation with the help of UNESCO Chair at UrDU and KRASS.

Nazar Ibragimov

I have worked in this project for 8 years. We have established a balanced team and now feel as we are one family where KRASS is a project successor. I think that we will continue working together with this team, and hope that we will be able to keep the level set by John Lamers. Our future plans are to develop KRASS and to establish good cooperation with many projects. Thanks to everyone, to all our partners who supported us up to now and who will support us in future.

Alim Pulatov

I am very pleased to participate at the closure part of the project. I have a lot of experience to work with international organizations. Who can tell me that there is a better project than this one in Central Asia? Just have a look at its website. In the 2nd Phase project had very few publications and now it has a lot. There are now about 220 publications at international peer-reviewed journals plus many chapters in various books, brochures. On average this is about 30 publications per year. Can you tell me which University or any other project in Uzbekistan is publishing that much? Nobody. I support Dr. Fayzieva from the Parliament in her suggestion to prepare a good report and to present all project findings at the national level and to the ministries. Furthermore, I would like to thank the leader of the project, Prof. Vlek, the best international strategist I have ever met. I am thankful to BMBF. I can say that the most effective projects are the German ones. 2-3 years for a project are not enough to get the results. I was amazed when BMBF gave funds for 10 years. When I asked how you managed to take such big funds, I was told – we do not want to lose our money. In 10 years one cannot build an educational system but one can build a school. We managed to build a school here by supporting bachelors in Urgench, Masters in Tashkent and PhDs in Germany. It was very effective and sustainable as Khorezmians finally return to Khorezm and continue work there. I would like to see more of such projects in the country. Establishment of KRASS was the right strategy, but it still very young and needs to develop further. Thanks to BMBF for such a big investment and we need to spend such kind of investments in the right way.

Inna Rudenko

On behalf of organizing committee I also would like to thank everyone for coming to our Symposium and I would like say once more that KRASS is open for cooperation and collaboration. You are welcome to share with us your ideas, suggestions, recommendations and plans for the future.

Recommendations from Symposium participants:

NUUz (prof. Tursunov):

1. Make soil data available from the project
2. In the next phase work more on ground water dynamics and balance
3. New materials, leaflets, educational programs, recommendation, etc. give to Uzbek Universities, so that these updated figures, innovations can be included in their curricula
4. Provide recommendations to the Parliament

Parliament (Dilorom Fayzieva):

You have to organize a separate workshop at national level in Tashkent for showing your results

TSAU, President Academy and other Universities:

Project and KRASS have to conduct lectures and training at the Uzbek Universities and show results, findings

National State Committee for Nature Protection

Wants to bring a group of journalists from local TV and radio and to broadcast with their help project activities, results and innovations



Annex 1. Symposium Program



Zentrum für Entwicklungsforschung
Center for Development Research
University of Bonn



Urgench State University
in collaboration with
Center for Development Research (ZEF)
Land and Water Restructuring Project in Khorezm
United Nations Educational, Scientific and Cultural Organization (UNESCO)
and
Ministry of Agriculture and Water Resources of RUz

SYMPOSIUM

on

Options for improving land and water management in Dryland areas of Uzbekistan.
A decade (2001-2011) of achievements of the ZEF/UNESCO landscape restructuring project in
Urgench.

Program

Venue: Urgench, July 15-16, 2011

Date	Topic and Time	Including sub-topics	Responsible
July 15th	Introduction/ Welcome words 13:00- 13:45	Introduction of participants, Greetings and welcome, Background of and introduction to the conference	Representative Khorezm Hokimiyat; Mr. Osipov (representative UNESCO); Prof. Paul Vlek; Prof. Eshchanov (rector UrDU)
	Break 13:45 -14:00		
	1. Tools for improving land and water monitoring for management 14:00- 14:45	GIS/RS-based tools and models for monitoring and improving irrigation water management	Fabian Loewe
	2. Integrated Water Resources Management 14:45–15:30	Improving water resources management at field/farm and WUA, Khorezm level	Mehmood Ul Hassan

	Coffee break 15:30-16:00		
	3. Innovations for Land Improvement 16:00 – 16:45	Afforestation of degraded land options for improving livelihood and environment	Asia Khamzina
	4. Improving Land Productivity 16:45-17:30	Improved management of cropping systems, crop diversification and alternative cropping systems	Nazar Ibragimov and Oybek Egamberdiev
	17:30-18:00	Discussion, questions	All participants
	18:00-21:00	Dinner/Banquet	Organizers
July, 16th	8:30-12:00	Field visits	Organizers
	Lunch 12:00-13:00		
	5. Innovations on land and water management 13:00-13:45	Plastic lining, afforestation, indigo cropping	Ruzumboy Eshchanov
	6. Economy, institutions, policies, infrastructure and markets of the agricultural sector 13:45-14:30	Agricultural policy, supply chains, cotton production, economic efficiency of water use, farm incomes, multi-level modeling	Nodir Djanibekov and Inna Rudenko
	7. Natural Resource Governance and Innovation Development – Social Science Research in an Interdisciplinary Project 14:30-15:15	Resource governance (land, water and knowledge), innovation development, agrarian transformation, social sciences	Anna Hornidge
	Coffee break 15:15-15:45		
	8. Up and outscaling findings discussion 15:45-16:30	KRASS and Phase IV	Akmal Akramkhanov
	9. Wrap Up & follow-up 16:30-17:00	Key messages and how to mainstream these in Uzbekistan’s agricultural policy agenda	Prof. Paul Vlek/ presenters

Note: some titles of the presentations have been adapted by the presenters and might not correspond to the titles in the program, which however, did not alter the contents.

Annex 2. List of Symposium invitees and participants

№	Organization	Name	Invited	Participated
1	UZGIP	Khasankhanova Gulchekhira	+	+
2	National University of Uzbekistan	Latif Tursunov	+	+
3	Tashkent Institute of Irrigation and Melioration	Alim Pulatov	+	+
4	State Scientific Research Institute for Soil Science and Agrochemistry	Ramazan Kuziev	+	+
5	Cotton Research Institute	Khasanova Firyuza	+	+
6	Cotton Research Institute	Sindarov Obidjon	+	+
7	Tashkent State Agrarian University	Dusmuratov Radjapboy	+	+
8	Ministry of Agriculture and Water Resources	Ahmadjan Ortikov	+	+
9	Ministry of Agriculture and Water Resources	Jalol Masharipov	+	-
10	Institute of Water problems, Parliament	Dilorom Fayzieva	+	+
11	Parliament	Ilkhom Atadjanov	+	-
12	Parliament	Muhammadyusuf	+	-
13	Republican Scientific Production Center for Decorative Gardening and Forestry	Evgeniy Botman	+	+
14	Andijan Agricultural Institute	Mahmudjon Mamajonov	+	+
15	Andijan Agricultural Institute	Eshpulat Ochilov	+	+
16	Andijan Agricultural Institute	Tadjidin Uraimov	+	+
17	Namangan Economic and Engineering Institute	Azam Ahmedov	+	+
18	Nukus State University	Marat Tagaev	+	+
19	Nukus State University	Nizomaddin Mamutov	+	+
20	Samarkand Agrarian University	Tulkin Ortikov	+	+
21	Samarkand Agrarian University	Salohiddin Ahmedov	+	+
22	The Kashkadarya Scientific Research Institute of Selection and Seed Farming of Crops	Makhmayusuf Kurbannazarov	+	-
23	The Kashkadarya Scientific Research Institute of Selection and Seed Farming of Crops	Gulomjon Uzakov	+	-
24	Academy of sciences	Erkin Zakhidov	+	+
25	President Academy	Muattara Rakhimova	+	+
26	SDC (Swiss Cooperation Office in Uzbekistan)	Omina Islamova	+	+
27	SDC (Swiss Cooperation Office in Uzbekistan)	Ilkhom Ibragimov	+	+
28	SDC (Swiss Cooperation Office in Uzbekistan)	Khamid Khamdamov	+	+
29	SDC (Swiss Cooperation Office in Uzbekistan)	Mariya Sklyarova	+	+
30	OBSE and FA Farm development project	Mirzokhid Yuldoshev	+	+
31	OBSE and FA Farm development project	Jumanazar Bozorov	+	+

32	Republican Association of Farmers	Kamoladdin Mamadaliev	+	+
33	Republican Association of Farmers	Zokir Allamurotov	+	+
34	Republican Association of Farmers	Kumush Saidova	+	+
35	Sreda.uz	Nataliya Shulepina	+	+
36	State Committee for Nature Protection	Khoniya Asilbekova	+	+
37	UzGidroMet	Bakhriddin Nishanov	+	+
38	UzGidroMet	Marina Plotsen	+	+
39	UNESCO office Tashkent	Alexandr Osipov	+	+
40	UNESCO office Tashkent	Abdi-Kadir Ergashev	+	+
41	UNDP	Alexey Volkov	+	+
42	IWMI	Mohan Reddy (Dr. Junna)	+	+
43	IWMI	Indira Akramova	+	+
44	IWMI	Davran Eshmuratov	+	+
45	IWMI	Khilola Masharipova	+	+
46	WB	Matluba Mukhamedova	+	+
47	GIZ	Bakhitjan Khabibullaev	+	+
48	GIZ	Saidjabbor Khasanov	+	+
49	CIM	Hans - Juergen Fuelle	+	+
50	National Commission UNESCO	Alisher Ikramov	+	+
51	CACAARI (Central Asia and the Caucasus Association of Agricultural Research Institutions)	Alisher Tashmatov	+	+
52	National Institute of Deserts, Flora and Fauna, Ministry of Nature Protection of Turkmenistan	Mukhammet Nepesof	+	+
53	Philipps University of Marburg	Ilkham Aslanov	+	+
54	Regional Hokimiyat	Komiljan Jumaniyazov	+	-
55	Regional Hokimiyat	Alisher Tadjibaev	+	-
56	Cotton Research Institute Khorezm	Alisher Karimov	+	+
57	Agricultural Research Center Khorezm branch	Ilkhom Masharipov	+	-
58	Mamun Academy	Shavkat Kodirov	+	+
59	Regional Department of Agriculture and Water Resources (Agroprom)	Maksud Jabborov	+	+
60	Regional Department of Agriculture and Water Resources (Agroprom)	Khudaybergan Masharipov	+	+
61	BUIS Low Amudarya	Tokhir Boltaev	+	+
62	BVO of Amudarya	Iskandar Kalandarov	+	+
63	BVO of Amudarya	Marimbay Saparbayev	+	-
64	BVO of Amudarya	Gulnara Tlalova	+	-
65	OGME	Bakhtiyor Kabulov	+	+
66	OGME	Bakhodir Bekchanov	+	+
67	Regional Department of	Matrasul Madirimov	+	-
68	Urta-yop WCA (Ashirmat WCA)	Karim Ibragimov	+	-
69	Urta-yop WCA (Ashirmat WCA)	Tangribergan Khujaniyazov	+	+
70	Amir Temur WCA	Maksud Jumaniyazov	+	-
71	Amir Temur WCA	Makhmud Abdullaev	+	+
72	Shomokhulum WCA	Ravshan Kuryazov	+	

73	Amudaryo WCA	Tursunbay Bazarbayev	+	-
74	Amudaryo WCA	Tulibay Kutimov	+	-
75	NGO	Rashida Masharipova	+	-
76	NGO	Bakhtiyar Ruzmetov	+	+
77	NGO	Khikmat Allaberganov	+	+
78	WB project in Beruniy	Reimbay Kurambaev	+	+
79	WB project in Beruniy	Dinesh Kumar Shrestha	+	+
80	WB project in Beruniy	Dilbar Allaberganova	+	+
81	Regional Department of Farmer Association	Muhammadmurod Khudayberganov	+	+
82	Central Bank of Uzbekistan, Khorezm branch	Bobojonov Egambergan	+	-
83	Agrobank Khorezm branch	Ochilov Murod	+	-
84	NGO	Jasur Masharipov	+	+
85	Khorezm branch of Uzlandproject	Khudaynazar Madrimov	+	+
86	Regional branch of the Chamber of Trade and Commerce	Atajanov A.	+	+
87	"Makhalla" fund	Sobirov Z.	+	+
	Total		87	68

From 87 of invited stakeholders, 68 could participate at the Symposium (78% participation rate).