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## **Project Conclusion Meeting on**

## **CRP Dryland Systems Activity**

# Improving Water-use Efficiency through Innovative Technologies in Irrigation and Farming

Meeting Proceedings

# December 16, 2016

# Tashkent, Uzbekistan

# Introduction

The Project Conclusion Meeting on CRP DS Activity: “Improving Water-use Efficiency through Innovative Technologies in Irrigation and Farming” was organized in the conference room of City Palace hotel, Tashkent, on December 16, 2016 and was attended by 36 participants. The participants comprised experts from the International Center for Agricultural Research in the Dry Areas (ICARDA HQ, Rabat, Morocco), the regional office ICARDA for Central Asia and the Caucasus (ICARDA-CAC, Tashkent, Uzbekistan), Uzbek Ministry of Agriculture and Water Management, agricultural research programs (Research Institute of Irrigation and Water Problems, TIIM, Uzbekistan Agricultural Economics Research Institute, Khorezm Branch of Cotton Breeding, Seed Production and Agro-technologies Research Institute, Urgench State University) and Scientific-Information Centre of the Interstate Commission for Water Coordination of Central Asia (SIC ICWC), and Non-Government Organization KRASS (Khorezm Rural Advisory Support) as well as representatives of regional water management Units (Water User Associations) from Fergana valley (Andijan and Fergana provinces, Uzbekistan) as well representative of Donor Organization (UNDP, CAREC) and Central Asia and the Caucasus Association of Agricultural Research Institutions (CACAARI). The list of the participants is attached in Annex I.

The purpose of the Conclusion workshop was i) to showcase the findings to the stakeholders and to find potential development partners and donors to carry this work forward, ii) to familiarize NARES researchers with ET based irrigation methodology, Heat Analyses methods and crop modeling activities, iii) and to link the CRP-DS WUE activity with the needs of the stakeholders, inform them of ICARDA methodologies, research outputs and outcomes in order to find possibilities for adaptation the technology in larger scale.

# Agenda

The agenda of the final workshop envisaged i) present the project findings (presentations and discussions of overall project research activities completed in Fergana Valley and Khorezm areas) and ii) Discussions with potential donor agencies the possibilities of continuation research in the form of Joint Projects, and iii) how to link biophysical research with Socio-economic/policy component, policy makers. The detailed program is attached in Annex II.

# January 26, 2015: Session 1 - Opening

**Dr. Ram Sharma,** The Head of Representative Office of International Center for Agricultural Research in the Dry Areas (ICARDA), welcomed all participants on behalf of the ICARDA, informed that he is aware of water saving technologies tested under the project, highlighted importance of out-scaling of research outcomes and expressed his warm wishes for successful work of the workshop.

Following welcome speech, the participants introduced themselves giving their names, position and organizations*.*

**Dr. Vinay Nangia**, Senior Agricultural Hydrologist, Project Manager, ICARDA HQ, presented objectives and expected outputs from workshop. In his presentation, Dr. Nangia informed that

Consultation meeting of the project titled: “Improving Water-use Efficiency Through Innovative Technologies in Irrigation and Farming” under framework CRP Dryland Systems Activity (CRP 1.1) was organized in the conference room of Ramada hotel, Tashkent, on January 26, 2015. The same people who participated at the Workshop and in designing of experiment and research plan were invited in this Workshop. He gave background why the project was designed, how we tried to involve WUA and national institutions from the start, attempts were made to teach WUA scientific staff every step of the way and ensure their buy-in.The main purpose of the workshop is share the outputs/findings under project, discuss lessons we learnt and problem solution and highlight the project findings to the donors to see opportunities for continuing WUE activities.

**Mr. Tulkun Yuldashev**, Soil and Water Specialist, ICARDA made a presentation on “Evapotranspiration-based irrigation scheduling methodology”. In his presentation. Mr. Yuldashev described theory of ET-based irrigation, existing widely adopted ET measurement methods (ET using changes in soil water, ET from mass balance over large areas, Lysimetric method, Bowen ratio Energy Balance, Eddy Covariance, Scintillometers, Sap flow methods, Remote sensing energy balance, Satellite-based ET using vegetation indices). He stopped on accuracy and reliability of each method, how to select suitable methods for estimating and projecting ET in accordance to availability of meteorological data and why ET-based irrigation method using changes in soil water had been selected for the studies. Mr. Yuldashev explained concept of reference ET, described equation to estimate reference ET using FAO 56 Penman-Monteith method and local equations and concluded FAO Penman-Monteith method is most reliable if weather data available. It requires representative measurements of air temperature, relative humidity, solar radiation and wind speed. He highlighted that in United States, ASCE-EWRI recommends using ASCE-Standardized Reference ET Equation (Allen et. al. 2005) which is simplified version of the Penman-Monteith equation (Jensen et. al. 1991). ASCE-Standardized Reference ET Equation has appropriate constant for two crop surfaces: short grass with approximate height of 12 cm, and a taller, rough crop similar alfalfa with approximate height of 50 cm (Walter et. al, 2000). ET-based irrigation scheduling was tested in Texas since 1991 via TXHPET Network – 17 Weather Stations and crop coefficients were estimating via ratio of ET actual to Reference ET. Currently farmers in US get daily ET ref and crop ET for major crops and irrigation is scheduled based on daily Fax/e-mail services. He explained how the ET based irrigation scheduling method was adopted to Uzbekistan conditions. Crop coefficients were estimated from KRASS field studies/FAO and reference ET using Translated ET calculator on base of solar radiation, wind speed, air temperature, relative humidity, atmospheric pressure data collected in hourly and daily bases from 3 weather stations (Fergana, Andijan and Urgench). Irrigation scheduling using ET based irrigation and traditional irrigation were tested for wheat at cotton at 3 hydromodul zones with 3 types of soil and groundwater level in Fergana valley. Irrigation scheduling was estimated in Tashkent on base of soil moisture balance equation using weather data, soil data and cop phonological data and irrigation day and rate were transferred to local Field scientists. Simple excel sheet was prepared by Dr. Prasanna Gowda, USDA Specialist, who trained ICARDA staff and provided it to SIC ICWC and KRASS where ET ref, Kc, initial soil moisture data and soil physical properties (FC and PWP) were fed into the model. Mr. Yuldashev described Field Measurements and their Frequency taken during project time. Finally he made conclusions that the standardized reference evapotranspiration equation is reliable tool and could be used for calculating reference evapotranspiration and, in turn, crop evapotranspiration (ETc), developing new crop coefficients, facilitating transfer of existing crop coefficients, ET Calculator is useful tool in estimation of ET a in different crop stages. Translated ET calculator could be used for educational purposes and translated into local language promotes to faster adoption of this technology.

**Dr. Shukhrat Mukhamedjanov,** National Project Manager, SIC ICWC, made presentation on "Improving water use efficiency through introduction of innovative technologies in irrigation and cultivation of cereals, potatoes, vegetables, fruits and forage crops". In his presentation, he showed allocation of 3 experimental sites in 2 Water User Associations (Qodirjon Agzamjon; Tomchikuli) in three hydromodule zones, HMZ (I, II, and IX) in Fergana valley of Uzbekistan. In next slide, he demonstrated area of each site, their location under ET based, and traditional irrigation treatments tested in wheat and cotton crops. Davlat Ganimat farm in Andijan province, WUA “Tomchikuli” was seleced for Hydromodul zone I, Kahramon Davlat Sahovati and Toshpulatov Ganijon Shukhrat farms in Quva district, Fergana province, WUA Qodirjon Agzamjon were selected for Hydromodul zone II and VIII, respectively. Dr. Mukhamedjanov showed overall view of weather station setting (solar battery and data transmitter) and how the soil physical properties data (Field Capacity, infiltration rate) was collected in field conditions. Weather parameters, soil moisture, water supply and crop phenology were collected as per prescribed field data collection plan. He described how they calculated wheat potential ET (ETc) via multiplication of Grass Reference ET (ETos) and Crop coefficient (Kc). Climate data from mini weather station was used to estimate Growing Degree Days and Grass Reference ET (ETos). Dr. Mukhamedjanov demonstrated table with calculating of irrigation rates based on climate data. Evaluation of irrigation rates applied for winter wheat at Hydromodul Zone I and Hydromodul Zone VIII revealed that ET based irrigation rates (192-281 mm) were 1.5-2.0 times lower that Traditional irrigation rates (411-413 mm). The ET based irrigation rates for cotton in HMZ I, II and VIII (358-477 mm) were also much lower than that under traditional irrigation (542-637 mm). Dr. Mukhamedjanov also demonstrated the soil moisture dynamics at depth of 15 cm at HMZI and HMZ VIII. The same trend in soil moisture dynamics at depth 45-150 cm was observed at HMZI and HMZ VIII. It shows that soil moisture dynamics has gently sloping in HMZ VIII with shallow GW with less spikes in comparison with that in HMZ I with deep GW. That means that there were fluxes across the lower boundary of the root zone area in the experimental Farm with shallow GW. Crop phonological data also revealed that cotton growth development rates did not significantly differ for HMZ VIII and there are some differences in HMZ I could be explained by observation errors.

**Dr. Abdukholik Mukhtorov**, Leading Scientist, Uzbekistan Agricultural Economics Research Institute, asked question how much area could be observed by one weather station.

**Dr. Shukhrat Mukhamedjanov** replied that one weather station could serve for one WUA with area of 2000-3000 ha.

**Dr. Abdukholik Mukhtorov** suggested to analyze cotton yields for at least 15 years and to take in consideration the differences in cotton yields (1-2 kg/ha) since it may have impact on economic profitability**.**

**Dr. Shukhrat Mukhamedjanov** replied that SIC ICWC conducted long-term research and they revealed that water productivity is main indicator of efficiency of technology.

**Dr. Alisher Tashmatov**, Executive Secretary, CACAARI, asked question related to collaboration with Uzbek Hydro meteorological Service.

**Dr. Shukhrat Mukhamedjanov** replied that they have good relations with Uzbek Hydromet Service. Now this service investigates the impact of Climate Change on agriculture productivity. According to his observation, they do not provide data to users; the data may only reach the higher authorities.

**Dr. Alisher Tashmatov** recommended to write successful story with highlight of achievement obtained under these ET based advanced technology and to demonstrate it to the local Khokimiyats, to potential donors to disseminate the technology.

**Dr. Shinan Kassam**, Social Scientist - Learning and Innovation at ICARDA, ICARDA-Jordan, asked question if reduction of water use would affect the cotton quality.

**Dr. Shukhrat Mukhamedjanov,** told that they haven’t considered the cotton quality.

**Dr. Shinan Kassam** mentioned about recent CACILM Project in Bishkek where the NARES tested effect of plastic covered technologies and tested different crop varieties.

**Dr. Shukhrat Mukhamedjanov,** he agreed with Dr. Shinan Kassam, he supports idea of integrated research of irrigation treatments with varietal trials, and ICARDA could provide best varieties for further testing of irrigation requirements. He mentioned that SIC ICWC studied irrigation regimes of different mungbean varieties under CRP DS Project activities and they found that responses of mungbean advanced varieties to irrigation regimes were different.

**Dr. Vinay Nangia** mentioned that we are not applying deficit irrigation; we are not under stress conditions. We apply less irrigation amount in comparison with farmers. Therefore, quality of crop changes are not significant.

**Dr. Ram Sharma** asked WUA people about financial mechanism and possibilities to cover meteorological costs by WUA.

**Mr. Kurban Sharipov**, Agronomist, WUA Qodirjon Agzamjon, Fergana province, told that yield increases under ET based irrigation was around 0.4 t/ha and 1 irrigation was applied less.

Since there is no Agronomist in WUA, it is difficult to out scale this advanced irrigation technology among farmers. The handbook we produce needs further explanation since not all farmers understand the scientific language. The cost of weather station (1000-1500 USD) is not affordable cost and farmers does not subscribe heavy money to WUA.

**Dr. Abdukholik Mukhtorov** asked question whether project staff monitored farming practices, irrigation amounts in money expression.

**Dr. Shukhrat Mukhamedjanov,** replied that they made on-farm economic assessment**.**

**Mr. Oyture Anarbekov**, Senior Research Officer, IWMI-Tashkent, asked question related to maintenance costs of weather station, to whom they apply when weather station is damaged.

He told that IWMI organized supervisory service to facilitate knowledge exchange amongst farmers.

**Dr. Ram Sharma** suggested to take into account all cost, including operation and maintenance cost of weather station when promoting the Weather-based irrigation scheduling**.**

**Mr. Shuhrat Ergashev**, Deputy Head of Naryn-Karadarya Basin Management of Irrigation System, asked question related to weather station status after finishing of project activities, would the weather data be available in WUA at local level, what access would be given to WUA staff.

**Dr. Shukrat Mukhamedjanov** replied that this is sore subject. He told that due to pending of payment for second year (300 USD), weather station provider switched off two weather stations in Fergana and Andijan in February 2016. He told that as soon as weather station starts functioning SIC ICWC would donate these weather stations to the Regional Basin Management of Irrigation System. SIC ICWC will promote consultancy services related to collection of weather data.

**Dr. Shinan Kassam,** asked question whether farmers have any incentive to save irrigation water if water is free.

**Dr. Shukrat Mukhamedjanov** replied that he is right that since water is free there is no reason to save water. However, in the future, he think the Uzbekistan will transfer from no cost to fee-paying water consumption and cost of water would require necessity to transfer to water saving technologies.

**Dr. Vinay Nangia** complemented that project staff has not considered tail part of irrigation water where shortage of water and efficiency of water would be much apparent**.**

**Dr. Yulduz Djumaniyazova,** Senior Researcher, KRASS, Urgench made presentation on

"Main outputs of CRP-DS WUE research activities in Aral Sea Basin". In her presentation, she

described location and natural climatic conditions of Khorezm province on the Aral Sea basin. She showed Map with Distance (km) from the water intake points to the irrigated areas in the Khorezm region, spatial groundwater salinity in the Khorezm province.

She provided experimental field site characteristics of Xushnudbek farmer, Ostona WCA, Yangyarik district, Khorezm with description of farming practices for wheat/cotton (sowing, irrigation, fertilsation etc.) and soil characteristics, groundwater level, where the experiment was conducted. She demonstrated how the soil moisture data was taken by Soil moisture PF meter established at different soil depth (15, 45, 75, 120 cm). Dr. Djumaniyazova showed the Soil profiles moisture changes and GW fluctuation after irrigation application as soil saturation in Winter Wheat and cotton field 2015. She also demonstrated NDVI measurements (wheat (5 March-28 May 2015), cotton (28 May- 30 July 2015), Amounts, and number of irrigation application on winter wheat and cotton fields in 2015 under WUA and ET based irrigation treatments. Results showed significant saving of water, no loss of yield and significant increase in on-farm water productivity

**Dr. Abdukholik Mukhtorov** asked question related to economical assessment of irrigation treatments.

**Dr. Yulduz Djumaniyazova,** replied that under water saving ET based irrigation yields increase was 100-150 kg/ha.

**Dr. Vinay Nangia** complemented that saved water could be used for other purposes and WUA will decide where these saved water could be used.

**Dr. Ram Sharma,** suggested to do statistical estimation to check whether NDVI measurements correlates with yield/Biomass data and if they are significantly different**.**

**Dr. Shukrat Mukhamedjanov** suggested doing gross-margin analyses to see whether economics confirm benefit from ET based irrigation**.**

**Dr. Vinay Nangia** commented that if water is subsidized then it is not fairly to do economic analyses. There is need to do real analyses of water (energy), salary to make water reach to water customers. We saved water and if one farmer in tail part of irrigation system would benefit from ET based irrigation all farmers should adopt this technology.

**Dr. Shinan Kassam,** told that the separated socio-economic study to be done and asked if women benefited from the project.

**Dr. Yulduz Djumaniyazova,** replied that extra saved water could be used for aquifer, fishery, for other products.

**Dr. Jusipbek Kazbekov,** Water Programs Specialist, CAREC Program-Tashkent office**,** told incentive motivation in dissemination of the technology- water saving. The more water saved the much money. Khokimiyat (Governance) can provide water to other users in case of 35% of water saving.

**Dr. Abdukholik Mukhtorov** told thatit is high success if 35 %water saved. It could be justified by saving irrigation specialists salary. Farmers would need this saved water for other irrigated fields etc.

**Mr. Samandar Gapparov**, Senior Scientist, Research Institute of Irrigation and Water Problems, TIIM, asked question related to soil salinity level at the end of crop season and furrow length.

**Dr. Yulduz Djumaniyazova,** replied that soil salinity has not changed significantly at the end of crop season and length of furrows was same.

**Dr. Vinay Nangia,** made presentation on “Overview of main outputs of activity”. In his presentation, he presented overview of main outputs such as Consultation Meeting, Equipment purchase, Trainings, Data collection and analysis, Farmer field days, Publications.

He reminded the CRP DS Consultation meeting held in Jan 2015 where NARES participated at field design and work plan development, trainings provided on crop modeling, on field data collection, on sampling for soil properties’ determination, Scientific Equipment (TDR, Weather sation) purchase, installation, calibration and training. He mentioned that handbooks has been prepared, Russian version of reference ET calculator developed, Data Collection and Analysis was completed, publications, testimonies from local governmental sources were obtained.

**Dr. Abdukholik Mukhtorov** asked question related to capacity building of students under the project.

**Dr. Vinay Nangia,** replied that fortunately project staff in Khoresm is also the teachers at Urgench State Universities and they teach the students on advanced irrigation methods applied at the project.

**Dr. Shinan Kassam** told that the he fully agree with introducing these technologies in Educational Programs.

**Mr. Shuhrat Ergashev,** confirmed the issue of necessity to introduce ET based irrigation technology presented by Tulkun Yuldashev in educational program of Higher Educational Institutions/Colleges so students could be familiar with International experience related to irrigation scheduling and ET estimation.

**Mr. Azamat Mukhamedjanov,** Field Coordinator (Water and Climate Program) made presentation on “Bushland Reference ET calculator (Russian interface)”. In his presentation, Mr. Mukhamedjanov demonstrated ASCE-Standardized Reference ET Equation and described climatic parameters needed to calculate ET reference. After, he showed Russian interface of ET calculator and mentioned about Developers of ET calculator in USDA (Dr. Prasanna Gowda et. al.) Bushland Texas and highlighted that ET calculator could estimate ET reference in daily and hourly base for grass and alfalfa. He demonstrated window in ET calculator where climate data to be entered, how to download hourly or daily weather data and how to proceed with ET reference measurement. Additionally, he demonstrated possibilities to make statistics and showed graphs of selected variables.

**Mr. Shuhrat Ergashev**, asked question how Kc was estimated for cotton, wheat, and show live demo how to calculate ET reference and irrigation scheduling.

**Mr. Azamat Mukhamedjanov,** told that they used Kc developed by FAO and modified it using field data from previous projects for local conditions. He promised to hand over this ET calculator in Uzbek Language to Mr. Maraim Mirzaliev, Chief Hydrometer.

Mr. Azamat presented a live demo with demonstrations of weather data entering into input files, uploading them to the ET calculator and estimation of ET reference, as well as how these ET reference data would be used in calculations of ET and irrigation scheduling of winter wheat crop using simple Excel sheet.

**Dr. Yulduz Jumaniyazova**, made presentation on ”Crop modeling for crop coefficient (Kc) estimation. In her presentation, Dr. Jumaniyazova presented how she used historic and project trial datasets to setup crop models to fine tune literature-cited crop coefficients. She listed the soil, weather, management and crop parameters used from a researcher-managed, on-farm trial conducted at the Amir Temur Farmer’s Association in the Urgench district of the Khorezm region (Djumaniyazova et al., 2010). Kupava variety has input data to DSSAT model and calibration and validation techniques applied to check accuracy of simulated and observed yield data. The parameterization of the existing DDSAT cotton module was based on a complete data set from 2009 and 2012 seasons. Field experiments for collecting the necessary data were conducted at the research site of the ZEF/UNESCO project in Urgench district of Khorezm region (Devkota, 2011; Egamberdiev, 2012). Khorezm 127 variety. For validation from Hushnudbek Farmer’s Association in the Yangyarik district of the Khorezm. Crop coefficients (Kc) were calculated by dividing actual evapotranspiration for non-stress conditions by ET0 (for grass). She showed how the crop coefficients modeled match the trend in the literature. She concluded that crop coefficient obtained via DSSAT model can be used for winter wheat/cotton varieties in the region and could be shared under similar conditions.

**On behalf of GIS group, Dr. Yulduz Jumaniyazova**, made presentation on “Strategy of outscaling of technique using GIS and remote sensing tools”. In this presentation, she demonstrated Similarity maps with similar soil texture and GW at the same locations at Khushnudbek farm, Astana WCA, Yangiarik district where study was conducted and methods of irrigation scheduling and how using this point data, area in whole Khorezm region could be identified where this technology could be up scaled. She also demonstrated Water availability Maps of crop fields based on combined horizontal and vertical distances of water intake point’s classification map, Maps of agricultural crop types and Land suitability assessment map based on suitability criteria. She also informed about Capacity development program – farmer days organized to demonstrate this outscaling the technology.

**Feedback from WUA representative**

**Mr. Kurban Sharipov,** WUA agronomist, WUA Qodirjon Agzamjon, Fergana province, told that the experiment was easy to understand, he felt the project scientific team involved them throughout the project, their voice was heard, they saw significant saving of water without loss of yields. He told that they can adopt the ET calculator and irrigation threshold as per crop requirements (50, 60, 70% FC). They think this can be of use to next generation since they are getting old and next generation needs to save water and grow more food to feed the growing population. He endorses the methodology and hopes government will continue to support and outscale the methodology.

**Dr. Vinay Nangia**, made presentation on “Heat Units-based Potential Yield Analysis”. In his presentation, he informed that Dr. Prasanna Gowda did analysis of potential cotton yields for Uzbekistan and he will present his results, which can now be used for linking with the crop yield target data of Uzbek government, and with crop insurance service the government provides to help policy makers plan better. He presented calculation of Total Heat Unit on base of minimum and maximum air temperature and base temperature and Cotton Yields for 21 stations in Uzbekistan. According to these results, difference between potential and actual yields was smallest (19%) for Samarkand and highest (107%) for Nukus. He told that criteria for suitability is HU since Crop growth and development of cotton are directly related to accumulated heat units when other environmental factors are not limiting.

**Dr. Shinan Kassam**, Social Scientist - Learning and Innovation at ICARDA-Jordan, made presentation on: “Improving Water-use Efficiency through Innovative Technologies in Irrigation and Farming”. In his presentation, Dr. Kassam presented division of technology to hardware, software and orgware, risk factors and stated that heat indexes have the potential to mitigate the impact from threats and reduce vulnerability in agricultural production. After he demonstrated case study from CACILM Program 2015: Agrobank, and stressed importance of collateral required for working capital: Contract to provide cotton/wheat for the state and an agricultural insurance certificate. He demonstrated crop insurance schemes in Uzbekistan. He told that Current system of insurance hinges on a state plan and a regulated system of monitoring: any one farmer is not incentivized to take on more risk because someone else bears the cost of risk, (‘moral hazard’ is limited). He mentioned historical records of farm production are available in order to aid actuarial calculations of loss (good for state written insurance schemes). He highlighted value of Heat Unit Index methodology as it allows better targeting of areas for production in order to meet national production plans. It permits the potential for diversification in crop mix choice (moving towards food and income security);, allows for better targeting of areas for production in order to meet national production plans, potential to reduce premiums charged, reduces exposure on payment for loss, reduces vulnerability for farmers and if used as an index for assessing loss, through security in compensation for loss . He concluded that Heat indexes is tool for informing actuarially sound insurance premium calculations, reduces vulnerability and mitigates threats and need for an independent and trusted interlocutor.

**Dr. Abdukholik Mukhtorov** told that he fully supports idea of better allocation of crops in order to meet national production plans and continue these socio-economic studies.

**Dr. Shukrat Mukhamedjanov** complemented that this idea of changes in sowing area of crops and providing loans to farmers (agricultural insurance certificate) is good because farmers should have choice in selection of type of planting crops on base their financial interest. He told that Uzbekistan does not have private sector engagement in insurance provision and we have state insurance plans.

**Mr. Maraim Mirzaliev** told that state provides insurance in case of nature disaster even if farmers would not subscribed to insurance Companies.

**Dr. Shukrat Mukhamedjanov** underlined that WUA were created not only for water distribution purposes but also to help farmers to get knowledge of their rights, to facilitate getting the state insurance in case of natural or other damages.

**Donors’ opinions on outscaling and continuation of WUE activities**

Invited donor representatives, Mr. Usmon Rakhimjanov, Task Manager at Business Forum project (III Phase), UNDP, Tashkent, introduced the research work in Uzbekistan and his view and possibilities to include these research in future UNDP Projects. Mr. Usmon Rakhimjanov explained that within the framework of the UNDP and the Chamber of Commerce and Industry ‘Business Forum of Uzbekistan (Phase III)' project, the project is planned to install four weather stations for horticultural sites in the Tashkent region. With the assistance of a partner organization providing horticulture consulting services, farmers will receive text messages to their mobile phones with meteorological data and suggested agro-technical measures (diseases managements), to be taken for crops such as apples, peaches, cherries and grapes. In addition, the project is planning to organize trainings for farmers on how to use weather stations. Mr. Usmon Rakhimjanov informed that donors reduced support by 20% and they have not applied weather station services in crop irrigation purposes, however, he ensured that would take into account possible collaboration with ICARDA and other stakeholders in the field of water resources management using weather station data. He suggested applying for small Global innovation grants to upscale the ET based technology.

**Closing remarks**

**Dr. Shukrat Mukhamedjanov and other Fergana province representatives** told that research conducted under CRP DS WUE activities went successfully and it got attentions from the State Higher Authorities. However, this CRP DS WUE project stopped suddenly. They told that at least 3-4 years needed to validate the results and go to upscaling of ET based technology via producing Handbooks and instructions to farmers.

**Dr. Vinay Nangia** told the project was designed mainly to bring new technology, teach how to use it and these local institutions should be proactive to upscale the project outputs.

**Dr. Shukrat Mukhamedjanov** thanked Dr. Vinay Nangia for bringing new technology to the region and weather stations; however, the water balance method is not new for the region. He told that System Approach should be developed so it could be fitted to the system. He told that second phase –upscaling stage is needed to upscale the technology in order to best respond to the needs of the farmers. He highlighted that discussions went in friendly atmosphere and this is good indicator of workshop success. There are many approaches and this approach is sound well with new system. He thanked Dr. Shinan Kassam for his innovative ideas in transferring research outputs to decision-making people. He suggest that network of small weather station are to be established in the region.

**Dr. Alisher Tashmatov,** thanked Dr. Vinay Nangia and Dr. Shinan Kassam for their presence in the region and ensured that CACAARI would help to connect the stakeholders and highlight the project outputs through new innovative electronic web based system.

**Dr. Nangia Vinay** thanked all people who was involved in organizing and conducting the workshop and assured that ICARDA is doing best to find resources in continuation of the project activities.

**Project Conclusion Meeting on**

**Improving Water-use Efficiency through Innovative Technologies in Irrigation and Farming**

**Workshop**

***In collaboration with CGIAR Program Facilitation Unit for Central Asia and Caucuses***

16 December 2016

Tashkent, Uzbekistan

# Annex 1: List of Participants

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| --- | --- | --- | --- | --- | --- |
| **N** | **Name**  | **Position** | **Affiliation**  | **Address** | **Contacts** |
| 1 | Dr. Ram Sharma | Head, CGIAR Program Facilitation Unit for Central Asia and the Caucasus andRegional Coordinator ICARDA | International Center for Agricultural Research in the Dry Areas (ICARDA) | Osiyo 6/106, P.O. Box 4564Tashkent 100000, Uzbekistan | T:  +998 71 237-21-30/69/04E:  r.c.sharma@cgiar.org |
| 2 | Mr. Rustam Ibragimov | Deputy Head of Representative Office | International Center for Agricultural Research in the Dry Areas (ICARDA) | Osiyo 6/106, P.O. Box 4564Tashkent 100000, Uzbekistan | T:  +998 71 237-21-30/69/04T:  +998 90 989-40-34 (mobile)E: r.ibragimov@cgiar.org [www.icarda.cgiar.org/cac](https://legacy.cgiar.org/exchweb/bin/redir.asp?URL=https://legacy.cgiar.org/exchweb/bin/redir.asp?URL=http://www.icarda.cgiar.org/cac) |
| 3 | Mr. Zakir Ishpulatov | Head of Department of Water Balances and Water resources saving technologies | Ministry of Agriculture and Water Management | Navoi, 4, Shaihantahur district, Tashkent, Uzbekistan | T:  +998 71 241-33-11E: z.ishpulatov@qsxv.uz |
| 4 | Dr. Vinay Nangia | PhD, Agricultural Hydrologist,Project Manager | International Center for Agricultural Research In the Dry Areas (ICARDA) | Abdoun, Khalid Abu Dalbouh Str. Bldg. no. 15P.O. Box 950764, Amman 11195, Jordan | T: +962(6)5531196 Extn. 167 (desk); T:+962.79.545.6033 (cell)Facsimile: +962.6.552.5930Skype:nang0004 E: V.Nangia@cgiar.org |
| 5 | Dr. Shinan Kassam | PhD,Social Scientist - Learning and Innovation at ICARDA | International Center for Agricultural Research In the Dry Areas (ICARDA) | Abdoun, Khalid Abu Dalbouh Str. Bldg. no. 15P.O. Box 950764, Amman 11195, Jordan | E: S.Kassam@cgiar.org |
| 6 | Ms. Marthe Wens | GIS intern | International Center for Agricultural Research In the Dry Areas (ICARDA) | Abdoun, Khalid Abu Dalbouh Str. Bldg. no. 15P.O. Box 950764, Amman 11195, Jordan | T: +962 (6)5903120  Extn. 157 [http://drylandsystems.cgiar.org](http://drylandsystems.cgiar.org/) Skype : marthewens T: +962 790 201 485 (cell) E: marthe.wens@cgmel.org |
| 7 | Dr. Shuhrat Mukhamedjanov | National Project Manager,Head of Department | SIC ICWC | Address: 11, Karasu-4, Tashkent, 100 187, Republic of Uzbekistan | T.:265-09-57,+998909939813E: shukhrat\_m@icwc-aral.uzshuhrat.shakir@mail.ru |
| 8 | Mr. Samandar Gapparov | Senior Scientist | Research Institute of Irrigation and Water Problems, TIIM | Address: 11, Karasu-4, Tashkent, 100 187, Republic of Uzbekistan | T: (998 71) 2651655T: 998909976041F: (998 71) 2653241E: ikramovrk@mail.ruE: gapparovsm@mail.ru |
| 9 | Dr. Sergey Nerozin | Agronomist | SIC ICWC | Address: 11, Karasu-4, Tashkent, 100 187, Republic of Uzbekistan | T: +998 903152118 |
| 10 | Dr. Mariya Glazirina | Crop modelling and climate change specialist | Formerly with ICARDA | Tashkent, Uzbekistan | T:  +998 71 237-21-30/69/04T:  +998 90 900-2804 (mobile)E:  mariya.glazirina@gmail.com |
| 11 | Dr. Akmal Akramkhanov | Project coordinator Knowledge Management in CACILM II | ICARDA | Tashkent, Uzbekistan | T:  +998 71 237-21-30/69/04T:  +998 90 900-2804 (mobile)E:  A.Akramkhanov@cgiar.org |
| 12 | Dr. Abdukholik Mukhtorov | Leading Scientist  | Uzbekistan Agricultural Economics Research Institute | Tashkent, Uzbekistan | T:  +998 90 1758464(mobile)T:  +998 93 5272963 (mobile)E:  jahongir4@mail.ru |
| 13 | Mr. Kahramon Jumaboev | Senior Research Officer | IWMI | Tashkent, Uzbekistan | T:  (99894) 654 31 60 (mobile)E:  k.djumaboev@cgiar.org |
| 14 | Mr. Oyture Anarbekov | Senior Research Officer | IWMI | Tashkent, Uzbekistan | T (99890) 178 65 48 (mobile)E:  o.anarbekov@cgiar.org |
| 15 | Mr. Usmon Rakhimjanov | Task Manager at Business Forum project (III Phase) |  UNDP | Tashkent, Uzbekistan | Т: (99871) 1501261 E: usmon.rakhimjanov@undp.org |
| 16 | Dr. Jusipbek Kazbekov | Water Programs Specialist  | CAREC Tashkent office | Tashkent, Uzbekistan | T: +(998 71) 277-37-87E: jkazbekov@carececo.org  |
| 17 | Dr. Alisher Tashmatov | Executive Secretary | CACAARI | Tashkent, Uzbekistan | T: (99890) 326 06 05E:A.Tashmatov@cgiar.org |
| 18 | Dr. Botir Dosov | Technical Adviser  | CACAARI | Tashkent, Uzbekistan | T: (99898) 128 63 22E: B.Dosov@cgiar.org  |
| 19 | Mr. Tulkun Yuldashev | Soil and Water Specialist | ICARDA | Tashkent, Uzbekistan | T:  +998 71 237-21-30/69/04T:  +998 90 956-8825 (mobile)E:  t.yuldashev@cgiar.org |
| 20 | Mr. Azamat Mukhamedjanov  | Field Coordinator (Water and Climate Program) | SIC ICWC | Address: 11, Karasu-4, Tashkent, 100 187, Republic of Uzbekistan | T: +998 (371) 265-09-57T: +998 ( 93) 556-86-10 (mobile)E: azamatm.84@mail.ru |
| 21 | Mr. Rustam Sagdullaev | Specialist hydrotechnic | SIC ICWC | Address: 11, Karasu-4, Tashkent, 100 187, Republic of Uzbekistan | T: (998 93) 5886263E: r.sagdullaev@mail.ru  |
| 22 | Ms. Liliana Sin | Director  | NGO KRASS(Khorezm Rural Advisory Support Service) | 14 Khamid Olimjan street 220100 Urgench, Uzbekistan | T: +998 91 277 7852 F: +998 62 224-66-71 E: liliana.sin66@mail.ru [www.krass.uz](http://www.krass.uz) |
| 23 | Dr. Yulduz Jumaniyazova  | Senior Researcher | NGO KRASS | Urgench, Uzbekistan | T: +998 91 430 7623F: +998 62 224-66-72E: yulduzoy@yandex.com |
| 24 | Dr. Ravshanbek Karimov | Director | Cotton research institute of Khorezm   | Urgench, Uzbekistan | T: +99893 2860378 E: ravshanbek.karimov\_62@mail.ru |
| 25 | Dr. Sattarbergan Avezov | Land cadaster specialist | Urgench State University | Urgench, Uzbekistan | T: +99891 9176539 |
| 26 | Mr. Djamol Ahmedov  | Director | WUA Qodirjon Agzamjon | Fergana province, Kuva district, Uzbekistan | T: +998901735454 |
| 27 | Mr. Maraim Mirzaliev  | Chief Hydrometer | WUA Qodirjon Agzamjon | Fergana province, Kuva district, Uzbekistan | T: +998906326313 |
| 28 | Mr. Ismail Ganiev  | Agronomist-hydro technician | SIC ICWC | Fergana province, Kuva district, Uzbekistan | T: +998916663645 |
| 29 | Mr. Kurban Sharipov  | Agronomist | WUA Qodirjon Agzamjon | Fergana province, Kuva district, Uzbekistan | T: +998913255192 |
| 30 | Mr. Shukrat Ergashev  | Deputy Head of  | Naryn-Karadarya Basin Management of Irrigation System  | Andijan Province, Markhamat District, Uzbekistan | T: +998902587227 |
| 31 | Mr. Avaz Akhunov  | Water resources management specialist | WUA Tomchi Kul | Andijan Province, Markhamat District, Uzbekistan | T: +998902691086 |
| 32 | Mr. Abdurakhim Urinov | Hydrotechnic | WUA Tomchi Kuli | Andijan Province, Markhamat District, Uzbekistan | T: +998902179652 |
| 33 | Mr. Abdugani Yusupov | Director | WUA Tomchi Kuli | Andijan Province, Markhamat District, Uzbekistan | T: +998903860263 |
| 34 | Mr. Jurabek Saimatov | Deputy Head | Syrdarya Sokh Basin Management of Irrigation System | Fergana Province, Kuva District, Uzbekistan | T:+ 998916662427E: ss.havza@qsxv.uz,gulomiddin\_1987@inbox.uz |
| 35 | Ms. Farida Yusupova | PhD student, Researcher | Uzbekistan Agricultural Economics Research Institute | Tashkent, Uzbekistan | T.: + 998946115664E: rida-2005@mail.ru |
| 36 | Mr. Rasul Rakhimov | Researcher | Research Institute of Irrigation and Water Problems, TIIM | Tashkent, Uzbekistan | T: +998946895711E: rasulbek\_rr@mail.ru |

# Annex 2: Workshop Program

## AGENDA

## Project Conclusion Meeting on

# Improving Water-use Efficiency through Innovative Technologies in Irrigation and Farming

16 December 2016, City Palace hotel, Tashkent, Uzbekistan

|  |  |
| --- | --- |
| 08:30-09:00 | Arrival of participants and registration |
| 09:00-09:05 | ICARDA welcome statement  | Dr. Ram Sharma  |
| 09:05-09:20 | Self-introduction of participants |
| 09:20-09:30 | Objectives and expected outputs from workshop  | Dr. Vinay Nangia |
| 09:30-10:00 | Evapotranspiration-based irrigation scheduling methodology | Mr. Tulkun Yuldashev |
| 10:00-10:45 | Main outputs of research activities in Fergana valley  | Dr. Shukhrat Mukhamedjanov |
| 10:45-11:30 | Main outputs of research activities in Aral Sea Basin  | Dr. Yulduz Jumaniyazova |
| 11:30-12:00 | Coffee break and group photo |
| 12:00-12:30 | Overview of main outputs of activity | Dr. Vinay Nangia |
| 12:30-13:00 | Bushland Reference ET calculator (Russian interface) | Mr. Azamat Mukhamedjanov |
| 13:00-14:00 | Lunch break |
| 14:00-14:40 | Crop modeling for crop coefficient (Kc) estimation | Dr. Yulduz Jumaniyazova |
| 14:40-15:00 | Strategy of outscaling of technique using GIS and remote sensing tools | Dr. Yulduz Jumaniyazova |
| 15:00-15:20 | Feedback from WUA representative | Mr. Kurban Sharipov |
| 15:20-15:40 | Heat Unit analysis  | Dr. Vinay Nangia |
| 15:40-16:10 | Link of biophysical work to crop insurance and yield target data for Uzbekistan | Dr. Shinan Kassam |
| 16:10-16:30 | Donors opinions on outscaling and continuation of WUE activities  | Invited donor representatives |
| 16:30-17:00 | Coffee break |
| 17:00-18:00 | Round table discussion and feedback on how to best respond to the needs of the farmers, prepare research proposals to donors and disseminate results | All participants |
| 18:00 | Closing and farewell |