



International Workshop

Climate Change Adaptation Strategies for Agriculture and Food Security in Central Asia and the Caucasus



22-24 October 2012,
Tashkent, Uzbekistan

The report on International Workshop on “ Climate Change Adaptation Strategies for Agriculture and Food Security in Central Asia and the Caucasus ” held on 22-24 October, 2012 in Tashkent, Uzbekistan was prepared by the Executive Secretariat of Central Asia and the Caucasus Association of Agricultural Research Institutions (CACAARI).

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The Photo on cover page: Group photo of the participants of the Workshop, 22 October, 2012r.
Tashkent, Dedeman Hotel, Silk-road conference hall.

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ACRONYMS:

AIS	Agricultural Innovation System
ARD	Agricultural Research for Development
AR4D	Agricultural Research for Development
ASTI	Agricultural Science and Technology Indicators
AVRDC	The World Vegetable Centre
CAC	Central Asia and the Caucasus Association of Agricultural Research Institutions
CACAARI	Central Asia and the Caucasus Association of Agricultural Research Institutions
CGIAR	Consultative Group on International Agricultural Research
EC	European Commission
EFARD	European Forum on Agricultural Research for Development
EIARD	European Initiative for Agricultural Research for Development
FAO	Food and Agricultural Organization
FSTP	Food Security Thematic Programme of the European Commission
FTPP	FAO/Turkey Partnership Programme
CC	Climate Change
GCARD	Global Conference on Agricultural Research for Development
GFAR	Global Forum on Agricultural Research
GIZ	German Society for International Cooperation
GMO	Genetically Modified Object
ICARDA	International Centre for Agricultural Research in the Dry Areas
ICT	Information and Communication Technologies
IFPRI	International Food Policy Research Institute
IPCC	Intergovernmental Panel on Climate Change
IWMI	International Water Management Institute
M&E	Monitoring and Evaluation
MA	Ministry of Agriculture
NARS	National Agricultural Research Systems
PFU	Program Facilitation Unit
RAIS	Regional Agricultural Information System
RI	Research Institute

RUz	Republic of Uzbekistan
SIC ICWC	Scientific-Information Center ICWC. Scientific-Information Center of the Interstate Coordination Water Commission of the Central Asia
TICA	Turkish International Cooperation Agency
TSAU	Tashkent State Agrarian University
USAID	United States Agency for International Development
WB	World Bank
WMO	World Meteorological Organization
UN	United Nations

Background

Global climate change is one of the main issues discussed at various international and intergovernmental meetings and consultations. Since the mid-1990s, the issue went beyond the scientific papers and discussions and became the subject of discussions among policy makers. Key issues of climate change impact on the environment, economic development, wellbeing, health and safety of the population, often discussed in various scientific and political forums, and many of them have been set up as priority for coordinated actions. In 1990, the First Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) has been published, which presented the first systematic scientific views on climate forecasts, assessment of the impact of global warming and measures to adapt to the upcoming changes. The Fourth Assessment Report of the WMO/UNEP Intergovernmental Panel on Climate Change (IPCC) released in 2007, suggested several adaptation strategies to deal with projected climatic changes which include, changing crop varieties; enhancing more efficient water use; appropriate scheduling of cropping activities; adoption of more effective pest, disease and weed management practices and insurance; and making better use of seasonal climate forecasts to reduce production risks. A comprehensive and integrated approach to planning and implementing the climate change adaptation strategies across the wide range of agroecosystems in different countries in CAC could help both the planners and the local communities to deal effectively with the projected impacts and also contribute to mitigation of climate change.

The countries of Central Asia and Caucasus (CAC) have long had the challenge of providing sustainable livelihoods for their populations in the fragile ecosystems of semi-arid and arid areas facing the challenging issues of absolute water scarcity, drought, land degradation and desertification. In addition to these, the region also has to deal with other issues including a significant increase in population, poverty, a geo-politically fragile environment, weak investment in agricultural research for development and constraints in human resources and institutional capacities.

Along with the concern of the world community and to meet the challenges arising under the climate change in CAC consultations to discuss the impact of climate change on agriculture and food security, as well as strategies for their adaptation are implied to be urgent. In this regard, it was decided to hold an international workshop, which will discuss issues related to the impact of climate change on agriculture and food security in the CAC region related to the problems and their solutions, to develop further strategies for adaptation of agriculture and food security to climate change for each country; planning joint research and work.

The main objectives of the Workshop are:

- i) to provide a better understanding and assessment of climate change impacts on agriculture and the associated vulnerability in the CAC Region;
- ii) to discuss and develop informed decisions on practical adaptation strategies for the agricultural sector;

- iii) to discuss and suggest appropriate ways to promote adaptation planning and implementation and its integration into the sustainable development planning in different countries;
- iv) to develop a Regional Climate Change Adaptation Framework for continuous information exchange on climate change impacts and adaptation amongst the different countries.

The workshop discussed the ways of integrating research and practice for adaptation measures for agriculture and food security to climate change. Also, questions were raised on strengthening cooperation between academic, research institutions, international organizations, NGOs at the local, national and regional levels in the adaptation of crop, livestock and fish production systems in the CAC region.

The solutions based on practical adaptation strategies for agriculture were discussed and developed.

Workshop proceeding

With support of the World Meteorological Organization (WMO), Project-Facilitation Unit / International Center for Agricultural Research in Dry Areas (ICARDA), the Central Asia and the Caucasus Association of Agricultural Research Institutions (CACAARI) have organized the International Conference on Adaptation to Climate Change and Food Security in Central Asia and the Caucasus in Tashkent, Uzbekistan, on 22-24 October, 2012. (See Program in Annex1, and Workshop Minutes in Annex 2).

The Workshop was held for three days in Tashkent, Uzbekistan, the first two days of which were enlightened the overview the agricultural sectors in the light of climate change, institutional and technological aspects, the role of the donors organizations, as well as information support and food security issues.

The first day was devoted to the strengthening of cooperation and collective action is needed to adapt to climate change, as well as coverage of the experience in the implementation of programs on climate change by various international and regional institutions, international organizations concerned in the CAC regional research area.

In the first half of the second day involved a visit to the Hydrometeorological Service of the Republic of Uzbekistan, where the participants were introduced to the activities of Regional Telecommunications Service, Remote Sensing Service and Hydrometeorological provision service (HMPS). In the afternoon, the participants continued the workshop proceedings presenting and discussing climate change and the environment related issues.

The third day was started with breakout sessions to discuss regional agriculture and food security mitigation and adaptation framework for climate change in CAC

Participants were asked to split into four groups:

- Group I: Crops, Fishery and Aquaculture
- Group II: Livestock, Grasslands and Rangelands

- Group III: Land Use, Forestry and Water resources
Group IV: Institutions, Policy and Cooperation

All sessions were simultaneously translating from Russian into English and from English into Russian. Presentations were presented in Russian or English in MS PowerPoint and projected to the big screen for audience.

The workshop was attended by over 50 people, including agricultural specialists, representatives of the National Meteorological and Hydrological Services of Central Asia and the Caucasus, international organizations, agricultural research and educational institutions, NGOs, farmers' organizations, etc. (The list of participants is attached).

Workshop outputs

The main purpose of the Breakout Group sessions was to consider and review the climate change adaptation strategies for the user sectors assigned to the different Breakout Groups and make recommendations which would be incorporated into the Workshop Declaration.

Participants had to cover:

- What are the different climate change adaptation strategies for your user sector in different sectors of CAC?
- What are the appropriate ways to promote adaptation planning and implementation?
- How can the identified strategies be integrated into sustainable development planning in CAC?
- Recommendations for Declaration

As a result of fruitful work in groups, the participants prepared a presentation with the main recommendations and insights to adaptation strategies for agricultural sectors to climate change, which are listed below¹:

Crop sector

- Increase resilience of production systems to climate change
- Creating flexible policy and institutional environment for enabling decentralized decision making on crop choices and agronomic practices
- Changing cropping system and cropping pattern
- Crop diversification
- Conservation, characterization and utilization of national genetic resources to address constraints that could happen under CC
- Regional exchange of crop germplasm
- Development of drought, heat and salinity tolerant crop varieties, and more water productive crop varieties (varieties for supplemental irrigation)
- Development of regional strategy on cooperation in seed production and exchange

¹ In more detail the group work results presented in Annex 3.

- Improvement of seed production system
- Introduction of innovation technologies
- Adoption of resource conserving farming practices
- Conservational agriculture
- Organic agriculture
- Protected agriculture
- Better prediction of climatic events, extremes in particular, that might effect crop production
- Development national and regional database on potential impact of CC across different agroecologies and production systems
- Monitoring of crop pests and diseases
- Introducing of innovative technologies for serving agriculture
- Insurance for farmers against failure of crops
- Creating awareness among farmers and policy makers about CC
- Consulting service for farmers on choosing varieties and agrotechniques
- Capacity building
- Strengthening cooperatives in combining of small households and farmers
- Gender equality in ag.production

Fisheries and Aquaculture

- Growing Aquaculture production using land unsuitable for agriculture
- Introduction of innovation technologies (isolated artificial/plastic basins)
- Improved options and trade-offs for sustainable fishery and aquaculture management
- Enhancing the capacity in aquaculture and fishery production system
- Up-grading the land and water use management based on integrated livestock, crop and aquaculture production system

Livestock, Grasslands and Rangelands

- (Make) Grassland management action plans including optimal stocking grade, rotational grazing, pasture improvement activities (soil scarification, ditches, mulching) (for bigger herds)
- (Make) Community pasture management plan for smallholders
- Increase pasture productivity through introduction of good management practises; including extra seeding collected from wild local grass species; e.g. through halofytes, salinity resistant grasses.
- In order to reduce pressure on grazing lands, extend the areas of temporary grasslands, by planting luzerne, alfalfa. Use of some local wild grass species, resistant or resilient to unfavourable climate conditions
- Moving to summer pastures in summer; coming to lowlands in winter (winter pastures).
- Water resources management and water harvesting, (hauz); underground reservoirs if geography allows. Use additional sources of hot spring water for halofyte growing.
- Breeding schemes for drought- and saline resistant sheep, goats and cattle; use local species for crossing!
- Restoration of water supply system (watering points) for livestock
- Apart from Kyrgystan, there is no legislative base for grasslands (ownership, management, landuse) so we urge to develop rules and regulations.

- There is not any organisation (government or private or NGO) which is responsible for good pasture management, monitoring and control (and t that purpose reintroduce remote sensing in IWMI).
As soon as possible some organisation needs to take responsibility (a Ministry), or been given responsibility for good pasture management, monitoring and control, and act accordingly.

Forestry

- Forest management program to adapt to climate changes
 - government stimulation to farms in creation of forest isolation lines;
 - increase of forest area;
 - recovering degraded forest;
 - facilitation of access of population to plantings;
- Capacity building
 - access to new technologies and innovation;
 - information campaign;
 - integration of science, education and production;

Land use:

- State regulation on land use; (for both government and private sectors)
 - legal issues;
 - state program;
 - stimulation forms; (tax, insurance, credit)
 - integrated land and water use technology; (crop production, animal husbandry, soil fertility, efficient water use)
- Increase land use efficiency
 - implementation of soil conservation technologies;
 - salinization;
 - erosion; (wind, water)
 - soil pollution;
- Improve the soil quality (soil health)
 - organic farming;
 - improve melioration conditions;
 - crop rotation;
- Access to the innovation and new technologies on land use
 - extension services;
 - platform knowledge;
 - creation of network (science, farmers);
 - integration of science-education and production;
 - support to development of mobile (cell-phone, net) agrarian meteorology technologies;
- Application of know-how in production;
 - creation of techno-parks;

- creation of engineering companies;
- soil service;
- Regional inter-state cooperation in land and water use and integration

Water resources:

- Additional distributed water storages;
- Economical water saving technologies;
- Bio-drainage;
- Reuse of return flow;
- Change the crop pattern- towards less water intensive crops;
- Soil conservation technology;
- Estimation of crop water demand under climate change conditions;

Policy

- Build special task forces that identify key results of research, and disseminate effectively to farmers;
- Adaptation should be included in the restoration of water resources and land use management systems (example Georgia);
- Attention should be given to integrate gender issues into the policies, strategies, plans and programs implemented to combat climate change,
- Development of climate change indicators to promote monitoring and evaluation in local, regional and national level

Cooperation, integration of strategies into sustainable development planning

- At present, climate change adaptation and sustainable development strategies are separate. They need to be better integrated;
- Resource mobilization (including private sector);
- Capacity development (linking meteorological services with government institutions);
- Capacity strengthening at regional and national levels (ministerial branches working with local governments and weather services, who in turn work with local farmers)
- Strengthening of Institutional collaboration, innovation, exchange knowledge and technology transfer
- Community-based adaptation to climate change

Discussions in the breakout group gave a good result; all of the participants were active in discussing and resolving issues to mitigate the impact of climate change, not only in agriculture, but also on the environment in general.

CACAARI did not evaluate the Climate change Workshop. Informal feedback from many participants indicated that they highly appreciated the workshop, and particularly discussions in breakout groups because it was found more action-oriented and practical, as well as more interactive than the formal sessions in previous sessions.

**INTERNATIONAL WORKSHOP ON CLIMATE CHANGE ADAPTATION STRATEGIES
FOR AGRICULTURE AND FOOD SECURITY IN CENTRAL ASIA AND THE CAUCASUS**

22-24 October 2012, Tashkent, Uzbekistan
(Venue: Hotel Dedeman, Silk Road Hall)

PROGRAMME

Monday, 22 October 2012

08:30-09:00 Registration

SESSION 1: OPENING OF THE WORKSHOP

09:00-09:15 Welcome Opening Address
Prof. Victor Chub,
General Director of Uzhydromet

09:15-09:30 Welcome address
Dr. Zakir Khalikulov,
Deputy Head, Program Facilitation Unit
Consultative Group for International Agricultural Research
International Centre for Agricultural Research in the Dry Areas (ICARDA)

09:30-09:45 Welcome address
Dr. Alisher Tashmatov,
Executive Secretary of Central Asia and the Caucasus Association of
Agricultural Research Institutes (CACAARI)

09:45-10:30 Welcome and Keynote Address
Dr. Robert Stefanski,
Head agricultural Meteorology Division, Climate and Water Department,
World Meteorological Organization (WMO)

10:30-11:00 Group Photo and Coffee Break

SESSION 2: CLIMATE CHANGE ADAPTATION AND DEVELOPMENT COOPERATION

11:00-11:15 Climate change and food security
Dr. Tomasz Lonc,
Senior Policy Officer (Agriculture),
United Nations Food and Agricultural Organization (FAO)

- 11:15-11:30 EU activities on climate change in Central Asia
Mr. Norbert Jousten,
Head of Delegation,
Delegation of European Union in Uzbekistan
- 11:30-11:45 The Agricultural Research for Development (ARD), dimension of the
European Research Area: Actions for Climate Change
Mrs. Fatma Akkaya,
National coordinator,
Era-ARD
- 11:45-12:00 Monitoring Progress towards the Targets of CACAARI's Regional Strategy:
The Role of the ASTI Initiative
Dr. Stads Gert-Jan,
Coordinator for Agricultural Science and Technology Indicator (ASTI)
program,
International Food Policy Research Institute (IFPRI)
- 12:00-13:00 General discussions
- 13:00-14:00 Lunch
- SESSION 3: CLIMATE CHANGE IN CENTRAL ASIA AND CAUCASUS: OVERVIEW**
- 14:00-16:00 Climate Change in the CAC Region (country presentations each 15 min)
- 16:00-16:30 Coffee Break
- 16:30-17:00 Climate Change in Dry Lands of Central Asia: from Assessment Methods to
Adaptation Strategies
Dr. Mariya Glazirina,
ICARDA-Tashkent
- 17:00-17:30 Climate Change Impact on Irrigation Regime and Crop Production
Dr. Shukhrat Mukhamedjanov,
Head of IWRM-Fergana and WPI-PL projects in Fergana Valley
Dr. Gerorgi Solodkin,
Head Mathematic Modeling
SIC ICWC
- 17:30-18:00 General Discussions

Tuesday, 23 October 2012

Visit to UZHYDROMET

- 10:00-10:15 History of the Hydrometeorological Service of Uzbekistan
Museum of Uzgidromet
- 10:15-10:30 Regional Telecommunications Service (RTS)
Structure, technical equipment and tasks of the RTS
- 10:30-10:40 Discussion and Q & A
- 10:40-10:55 Service Remote Sensing (SRS)
SRS Tasks
- 10:55-11:05 Discussion and Q & A
- 11:05-11:20 Hydrometeorological provision service (HMPS)
HMPS Tasks, new ways to use the information
- 13:00-14:00 Lunch

SESSION 4: CLIMATE CHANGE AND ENVIRONMENT

- 14:00-14:30 ICARDA's Crop Improvement Initiatives in Central Asia and the Caucasus in
the context of Climate Change
Dr. Ram Sharma,
ICARDA-CAC
- 14:30-14.45 Sustainable Pasture Management and Adaptation to Climate Change in
Central Asia
Dr. Ute Fischer-Zujkov,
Project Manager,
German International Cooperation (GIZ)
- 14:45-15:15 Conserving Green and Blue Water in the CAC Region
Managing Water Resources under Scarcity and Climate Change in Agriculture
in the Dry Areas
Dr. Akmal Karimov,
International Water Management Institute in Central Asia (IWMI-CA)
- 15:15-15:45 Intensification and Diversification of Production Systems for Climate Change
Adaptation and Mitigation
Dr. Ravza Mavlyanova
The World Vegetable Center (AVRDC-CAC)

- 15:45-16:15 Coffee Break
- 16:15-16:45 Organic farming as one of the solutions of improving the ecology problems, food security and soil fertility
Dr. Saparbek Alymkulov,
Executive Director,
Bio Service Public Foundation
- 16:45-17:15 Need for Synergy of Climate Change adaptation strategies for Agriculture and Food Security in the CAC Region with Regional strategy for transforming and strengthening of Agricultural Research and innovation systems for development in Central Asia and Southern Caucasus region
Dr. Alisher Tashmatov,
Executive Secretary, CACAARI
- 17:15-17:45 General discussions

Wednesday, 24 October, 2012

SESSION 5: BREAKOUT SESSIONS TO DISCUSS REGIONAL AGRICULTURE AND FOOD SECURITY MITIGATION AND ADAPTATION FRAMEWORK FOR CLIMATE CHANGE IN CAC

- 09:00-9:15 Discussion in Breakout Groups and Terms of Reference
Dr. Robert Stefanski,
WMO
- 9:15-11:00 Meetings of Breakout Groups
Group I: Crops, Fishery and Aquaculture
Group II: Livestock, Grasslands and Rangelands
Group III: Land Use, Forestry and Water resources
Group IV: Institutions, Policy and Cooperation
- 11:00-11:30 Coffee break
- 11:30-13:00 Meetings of Breakout Groups (Contd.)
- 13:00-14:00 Lunch

SESSION 6: PLENARY TO CONSIDER BREAKOUT GROUP REPORTS

Presentation of reports of Breakout Groups and Discussion

14:00-14:30 Group I: Crops, Fishery and Aquaculture
14:30-15:00 Group II: Livestock, Grasslands and Rangelands
15:00-15:30 Group III: Land Use, Forestry and Water Resources
15:30-16:00 Group IV: Institutions, Policy and Cooperation
16:00-16:30 Coffee Break

SESSION 7: WORKSHOP CLOSING

16:30-17:00 Workshop Declaration
Dr. Robert Stefanski,
WMO
17:00-17:30 Vote of Thanks from Conveners
WMO, Uzhydromet, CACAARI
17:30 Workshop Closing



**World Meteorological Organization (WMO)
Central Asia and the Caucasus Association of Agricultural Research Institutions (CACAARI)
International Centre for Agricultural Research in the Dry Areas (ICARDA)**

MINUTES

of

**International Workshop on “Climate Change Adaptation Strategies for Agriculture and
Food Security in Central Asia and the Caucasus”**

Dedeman Hotel
Silk Road Conference Hall

**22-24 October, 2012,
Tashkent, Uzbekistan**

Day 1 - Monday, 22 October 2012

SESSION 1: OPENING OF THE WORKSHOP

Chairman: Dr. Zakir Khalikulov, Deputy Head, Program Facilitation Unit, Consultative Group for International Agricultural Research, International Centre for Agricultural Research in the Dry Areas (ICARDA)

The International Workshop has been started with Welcome opening addresses.

Professor Victor Chub, General Director of Uzhydromet, welcomed the participants and stressed the importance of research and collaboration on the impact of climate change on agriculture and food security in the CAC and the need for appropriate measures for adaptation strategies.

Dr. Zakir Khalikulov, Deputy Head of ICARDA-CAC, welcomed all the participants of the international workshop, highlighted the importance of research and collaboration in the development of adaptation strategies for agriculture and food security to climate change. He wished all the participants of the meeting success and fruitful work. In his speech, he expressed the view that the international workshop will be an important event for the agricultural sector in Central Asia and the Caucasus.

Dr. Alisher Tashmatov, Executive Secretary of Central Asia and the Caucasus Association of Agricultural Research Institutes (CACAARI), thanked the co-organizers, participants and guests of the International Workshop on behalf CACAARI and also emphasized the importance of the Regional Strategy for Agricultural Research, as well as the need for this workshop, as one of the objectives of the CAC Work-plan coherent with GCARD-1 Roadmap Montpellier. He wished all success to the workshop.

The Chairman gave the floor for Welcome and Keynote address to **Dr. Robert Stefanski, Agricultural Meteorology Division, Climate and Water Department, World Meteorological Organization (WMO)**.

Dr. Robert Stefanski welcomed all participants, thanked the co-organizers: Hydrometeorology, ICARDA and CACAARI for organizing the workshop and stressed the importance of the workshop for the CAC. In his presentation he delivered the information and covered the issues on:

- Overview of WMO;
- Food and Water Security;
- Role of Weather and Climate Information to Agriculture;
- Global Framework on Climate Services (GFCS);
- Role and objectives the International Workshop, which are:
 - to provide a better understanding and assessment of climate change impacts on agriculture and the associated vulnerability in the CAC Region;
 - to discuss and develop informed decisions on practical adaptation strategies for the agricultural sector;

- to discuss and suggest appropriate ways to promote adaptation planning and implementation and its integration into the sustainable development planning in different countries;
- to develop a Regional Climate Change Adaptation Framework for continuous information exchange on climate change impacts and adaptation amongst the different countries.

The Chairman thanked **Dr. Robert Stefanski**, and suggested to participants to introduce themselves. Nearly 50 participants introduced themselves.

The Chairman thanked all the speakers and announced a break for a coffee, and then asked everyone to gather for a group photo.

After the coffee-break and group photo participants started to **Session 2: Climate Change Adaptation and Development Cooperation**.

The Chairman for the Session 2 was **Dr. Robert Stefanski**. He gave the floor for **Dr. Tomasz Lonc, Senior Policy Officer (Agriculture), United Nations Food and Agricultural Organization (FAO)**.

On behalf of FAO, **Dr. Tomasz Lonc**, welcomed all participants and thanked the organizers for the invitation to participate in the workshop. In his presentation, Dr. Tomasz Lonc noted that FAO's mission is to achieve food security, regular public access to food of the highest quality, ensuring a healthy lifestyle. To achieve these objectives, the main condition is the development of sustainable agriculture, including forestry and fisheries and food systems with social equity. In this regard, increasing food security can be achieved as a result of reforms in agriculture, mainly through the transition from planned economy to market economy institutions, allowing farmers to use agricultural land and to facilitate access to funds for future activities, improve marketing, and increase infrastructure investment with continued implementation of research and innovation in agriculture. Dr. Tomasz Lonc emphasized on the main strategic objectives of FAO, which include increasing production in agriculture, forestry, fisheries, as well as economic, social and environmental sustainability. In Central Asia, sustainable food production and environmental issues, including climate change, mitigating the effects of drought, land degradation and desertification are essential measures. Due to the importance of climate change, changes in the amplitudes of temperature, rainfall and river flow are expected. Increase in extreme weather events have a strong impact on the level of production in the world, the level of natural resources and people's livelihoods. Along with the effects of climate change, action is needed to make the transition to sustainable food consumption and production systems, which are able to respond to the growing demand, and at the same time ensuring the conservation of ecosystems on which they are based. Adapting to climate change, management of water resources, sustainable land management, conservation of genetic fund and reduce greenhouse gas emissions are remaining the key to the required increase in production.

Then Chairman gave the floor to **Mr. Norbert Jousten, Head of Delegation of European Union in Uzbekistan** to present EU activities on climate change in Central Asia.

Mr. Norbert Jousten welcomed all participants and thanked the organizers for the invitation to participate in the workshop. He noted that within the EU Strategy for Central Asia,

environment and water has been identified as a priority area for cooperation. Over the last years, this priority area has been expanded to explicitly include climate change and an ad hoc working group now deals with "environmental governance and climate change". After a first meeting in 2010, the second meeting of the EU-CA working group on environmental governance and climate change was held in Almaty/Kazakhstan on 13-14 September. The EU indicated that information sharing, not only between the CA countries and the EU, but also with EU institutions and agencies and Member States is essential to prepare policies and to interact with the general public on how to incorporate critical environmental parameters into all aspects of economic and social policy and legislation drafting. CA countries showed their strong commitment to work on environment and climate change related issues and the presentations gave a detailed overview of work done and achievements in the last two years trying to implement the recommendations of the first working group meeting.

The five CA countries are signatories of the Kyoto Protocol under the United Nations Framework Convention on Climate Change (UNFCCC), and as such they have a number of obligations to fulfil. They all asked explicitly for support in planning and drafting climate change policies to be better equipped for greenhouse-gas emission reductions and to be better prepared to deal with climate change impacts. The European Union and the Central Asian countries recognised the need to contribute to reducing systemic risks resulting from climate change before they trigger crises and they strongly encouraged taking all necessary measures. To slow down global warming and to adapt to climate change, civil society should play an increased role in promoting and supporting, among others, awareness raising, alternative transportation modes, emergency responses and waste management and other related programs.

After the presentation of Mr. Norbert Jousten, Chairman thanked him and gave the floor to **Mrs. Fatma Akkaya, National coordinator, Era-ARD.**

On behalf of Era-ARD partners **Mrs. Fatma Akkaya** welcomed all participants and thanked the organizers for the invitation to participate in the workshop. During her presentation, Mrs. Fatma Akkaya noted that The ERA-ARD II is supported by the 7th FP of the European Commission under the ERA-Net Scheme. ERA-ARD-II has two strategic objectives, which are: (i) Improving the EU contribution to global International Agricultural Research (IAR) by strengthening joint programming in the field of ARD; and (ii) Increasing the impact of EU contributions in achieving the Millennium Development Goal's (MDG's) and to sustainable growth in the developing countries. She also said, that as a country in the Mediterranean region, Turkey is highly vulnerable to climate change and already facing an observed warming trend in temperatures. Within the scope of combating climate change, Turkey's main objective is to contribute to the global efforts in line with the sustainable development policies by taking Turkey's special circumstances into account. Especially on the issue of combating drought, the Drought Test Centre was established as the Turkey's first Drought Test Centre. The center focuses on the impacts of aridity and on developing drought resistant species. Mrs. Fatma Akkaya concluded that due to the global extent of climate change, it is clear that all countries face the same problems but different level of resources. Developed countries can take necessary actions to prevent adverse effect of climate change but for developing countries more have to be done. ARD researches on the combination of agriculture and climate change issues are necessary with the more close cooperation from NtoS from WtoE. There is also a great necessity for interactive networks of researchers,

policymakers, and NGOs from around the world to discuss the possibility of conducting future research projects on CC and agriculture

After the presentation Dr. Robert Stefanski thanked Mrs. Fatma Akkaya and gave the floor to **Dr. Stads Gert-Jan, Coordinator for Agricultural Science and Technology Indicator (ASTI) program, International Food Policy Research Institute (IFPRI).**

Dr. Stads Gert-Jan welcomed all participants and thanked the organizers for the invitation to participate in the workshop. He noted that his presentation is not strictly aimed at discussing climate change, but is closely linked to research and development in agriculture and enlightened monitoring progress towards the goals of the CACAARI in accordance with the Regional Strategy and ASTI initiative role in it. Mr. Gert-Jan noted that to date, the problems in CAC include climate change, degradation of land and water resources, instability in food prices, population growth, so the agricultural research for development AR4D are one of the main factors productivity growth, food security and poverty reduction. Mr. Gert-Jan also said that based on GCARD Roadmap Regional Strategy CAC provides various changes, such as increased investment in AR4D that will reach 1% of agricultural GDP in 2025, as well as a better understanding of the relationship between investments in AR4D and labor productivity growth, strengthening human and institutional capacities for AR4D. Preparing a new generation of agricultural scientists in CAC is essential, since there is a huge shortage of specialists with master's and doctoral degrees, as seen in the example of Kyrgyzstan.

After the presentation **Dr. Robert Stefanski** thanked Mr. Stads Gert-Jan, and suggested to participants to start open discussion and ask question to speakers.

Dr. Alisher Tashmatov, Executive Secretary CACAARI, thanked all speakers noted the importance of cooperation of CACAARI with IFPRI, FAO, EPA-ARD and implementation of the IFPRI-ASTI, and requested all speakers and representatives of international organizations to brief the possibilities of further cooperation on the Regional Strategy implementation, as well as strategies for adapting to climate change.

Dr. Tomasz Lonc said that all presentations are timely and relevant, which were quite informative and provided information on the projects and programs, as well as areas for further collaboration. He emphasized three main points that are important to the work of FAO: First, the research work at the Institute, in cooperation with the farmers; and secondly the development of FAO's cooperation with the private sector, given the attention to training and retraining of farmers, in collaboration with the private sector; and thirdly growing FAO's interest in recent years in the development of small farms. Also, Dr. Tomasz Lonc expressed hope that the Workshop will be an opportunity to hear how climate change may affect the restructuring of large and small farms. FAO is interested in projects on gender issues. FAO Subregional office in Turkey has a close cooperation with the UN and the EU.

Mrs. Fatma Akkaya noted that the EPA-ARD is interested in the cooperation with all CAC countries CAC.

Dr. Oleg Shatberashvili asked **Dr. Gert-Jan Stads**: How is going the process of collection of data on agriculture in Georgia?

Dr. Gert-Jan Stads answered said that data is collected by partner in Georgia, which are responsible for collecting information in agricultural institutions, government organizations and universities.

The Chairman invited participants to comment on the presentation.

Dr. Jelleke de Nooy van Tol, Network Vital Agriculture and Food, Agro-ecosystems and food production, Netherlands, noted that throughout there is a necessity to increase the number of researchers and young professionals who work closely with farmers, as well as experts in the field of agriculture adaptation to climate change. She asked all participants, especially the representatives of universities and ministries: Are people interested in education in the field of adapted agriculture to climate change and scientific research in the field of climate change? What opportunities are available to work in these areas?

The Chairman proposed to participants willing to answer this question.

Dr. Alim Pulatov Head, EkoGIS center of Tashkent Institute of Irrigation and Melioration, noted that, recently in all CAC converts to the education system, such tendency is observed in agricultural research and education system. In the countries of the region, the transformation in agricultural education and research system at the focus of reforms.

Dr. Shuhrat Mukhamedzhanov, Head of Scientific Information Center, Scientific Information Center of Interstate Coordination Water Commission (SIC ICWC), said that we cannot say that we have the merging of educational and research institutions throughout the region. We have a large archive of scientific research, but, unfortunately, they are not implemented and not implementing. The data should be communicated to the development of production system.

Dr. Gert-Jan Stads noted the problem is a shortage of specialists, not only in the CAC region, but also in countries such as Vietnam, and may be due to the low wages and lack of jobs in the agricultural sector.

Prof. Laziza Gafurova, National University of Uzbekistan, Head of Agroecology Center, Head of the Department of Soil Science, thanked the organizers and noted the importance of the workshop. She noted that agriculture in the CAC region is very vulnerable by climate change. We need to develop methods and technologies to adapt agriculture to climate change, as well as transfer innovation into agricultural production system. Informatization of agriculture is needed, as it will increase the level of trained of farmers. Gender issues, women farmers are also very important. All of these actions are necessary in the complex to improve the stability and development of agriculture and improve the food security.

Dr. Reddy Junna Mohan, Head of IWMI Regional Office, commented on the state of development of agricultural extension systems in Central Asian countries, such as Tajikistan, Kyrgyzstan and Uzbekistan. He expressed gratitude and interest in the development of research and technology in agriculture and irrigation, training in these areas, the report presented by Dr. Gert-Jan Stads.

Dr. Alim Pulatov commented that in the countries of Central Asia agricultural extension system is not missing, and probably inefficient. There are many organizations in the Ministry of Agriculture, dealing with innovation. For example, in Uzbekistan, in the winter, all farmers participate in seminars and workshops, which involve all agricultural universities. The farmers' associations organized as well, which also focuses on trainings and skills' improvement of farmers. There are private consulting organizations, which are also involved in the consultation process for the farmers in the country.

Ram C. Sharma, ICARDA, Senior Scientist/ Breeder, commented that in different countries the level of extension system efficiency differs. In Uzbekistan, agricultural advisory system is well developed, but lack of information provision is observed.

Dr. Tomasz Lonc recommended that issues and problems related to climate change should be included the process and agenda of the consultation/extension system.

Dr. Botir Dosov, CACAARI consultant, commented on the **Dr. Gert-Jan Stads's** answer to Dr. Oleg Shatberashvili's question, and explained the process of data collection and processing for the CAC countries.

After lunch the **Session 3: Climate Change In Central Asia And Caucasus**, was chaired by **Dr. Oleg Shatberashvili**.

Dr. Oleg Shatberashvili gave the floor for speakers of regional reporters of national hydrometeorological services. The first report was presented by the representative of Hydrometeorological Service of Georgia, **Dr. Marina Kordzakhia**.

Dr. Marina Kordzakhia presented a description of the geographical and climatic features of Georgia and presented data on the state of the climate over the last period.

The Chairman asked participants if they had questions or comment on the presentation.

Dr. Alexander Merkuskin, national communications coordinator of Uzbekistan on Climate, Uzhydromet noted that Georgia is a mountainous country, and therefore the flow of mountain rivers increases due to melting glaciers, and asked if there related research is conducted?

Dr. Marina Kordzakhia responded that she is aware of this issue, and that research is being conducted in this area.

The second question **Dr. Alexander Merkuskin** what is the ratio of melting ice and increased water in rivers and groundwater?

Dr. Marina Kordzakhia replied that she was not an expert in this area, but it is difficult to say that the level of ground water in Georgia fairly high. The main source of these waters are melting glaciers.

The Chairman, Dr. Oleg Shatberashvili, gave the floor for **Dr. Erkanat Iskakov, Kazahydromet, Head of the Agrometeorological monitoring Department**.

Dr. Erkanat Iskakov presented data on the state of the climate of Kazakhstan and the impact of climate change on livestock.

The Chairman asked participants if they had questions or comment on the presentation.

Dr. Oleg Shatberashvili noted that the report had forecast of climate change and changes accordingly animal keeping and productivity. How can it would be explained, what is the basis of the methodology of this prediction, how can it be characterized.

Dr. Erkanat Iskakov said that the methodology is based on the experience of many years of research of this process within the framework of the UNDP. This was the basis for forecasting. At this stage the scientists are seeking to further develop methodologies for the livestock.

Dr. Oleg Shatberashvili stressed not a forecast of climate change, but the forecast results in animal and possible alternatives, such as other breeds of sheep, or other plants in pastures.

Dr. Erkanat Iskakov responded that livestock requires significant contributions and developments, so the interest in the development of future prediction is large enough, and the different alternatives are welcomed.

Dr. Salohiddinov Abdulhakim (Tashkent Institute of Irrigation and melioration, Head of Water resource and environment engineering Department), Dr. Oleg Shatberashvili and Dr. Erkanat Iskakov discussed scenarios of climate change and changes in the content of Livestock, Scenario 1 and Scenario 2.

Dr. Alisher Tashmatov thanked the Reporter and asked him about the status of cooperation of Kazgidromet with agricultural organizations, what is the relationship with JSC Kazagroinnovation, as well as whether there is cooperation between the Kazgidromet and 14 CGIAR centers in Kazakhstan?

Dr. Erkanat Iskakov said that JSC Kazagroinnovation provides advisory services to producers of agricultural products, and the Kazgidromet closely cooperates with them, leading seasonal climate forecast, weather monitoring. Kazgidromet participates in a program #021 on climate and satellite monitoring, together with the Ministry of Agriculture, which, in turn, cooperate with agricultural producers.

Then Dr. Oleg Shatberashvili gave the floor to **Mr. Zafar Makhmudov, Tajikhydromet, Center of climate change and ozone, Specialist for climate change.**

Mr. Zafar Makhmudov presented the information on climate change in the region and in Tajikistan, the consequences of climate change in Tajikistan, and adaptive measures.

Dr. Alexander Merkushkin thanked for his presentation and asked two questions. The first question is about the principle of forecast: will river flows increased or decreased by 2100? And the second question posed, what method and tools for measuring the melting of glaciers?

Mr. Zafar Mahmudov said that forecasts of increase in river flows are based on simulation methods with the assistance of international consultants. For more information on all six components of the model and all relevant reports on their implementation can be found at <http://www.ppcr.tj> – the Pilot Program for Climate Resilience. The projections were made on the example of the river Pyanzh. Reporter did not answer the second question, because he didn't have the necessary information.

Dr. Natalya Shulgina, coordinator of CACILM: Capacity building project, Uzhydromet, noted that the issue of water resources and estimate changes in water resources in the future, depending on the climate change is very important. With the increase in temperature, there is a degradation of the ice mountains, and in connection with the increase in river flow is not possible, because the glaciers are the main source of fresh water in the rivers. Therefore, the statement on the report of a possible increase of water flow in the river Pyanzh is controversial.

Mr. Zafar Mahmudov thanked **Dr. Natalia Shulgina** for comment and suggested the possibility of cooperation.

Dr. Alexander Merkushkin noted the need to work together in research and forecasting in the region between the national Hydrometeorological Services.

Then Chairman gave the floor to **Dr. Gulchehra Hasanhanova, Design and Research Institute UzGIP, Head of department.**

Dr. Gulchehra Hasanhanova reported on the geographical, climatic features of Uzbekistan, as well as on the state of agricultural conditions and degradation, desertification of land and the problems of the Aral Sea.

Dr. Shuhrat Mukhamedjanov asked questions on how climate change is influencing on agriculture in high-water years.

Dr. Gulchehra Hasanhanova said that the consideration of climate change on agriculture was only in dry years, as there was an urgent need to study the impact of climate change on agriculture in extreme drought years.

The Chairman thanked all the speakers and announced a **coffee-break**.

After lunch the **Session 3: Climate Change In Central Asia And Caucasus**, was chaired by **Dr. Gayane Sarkisyan, Director of Vegetable and melon crops, Armenia.**

Then Chairman, Dr. Gayane Sarkisyan, gave the floor to **Dr. Mariya Glazirina, ICARDA-CAC Specialist on Modeling methods.**

Dr. Mariya Glazirina, in her presentation described the implementation and results of the project on adaptation to climate change in Central Asia and China in cooperation ICARDA, IFPRI and about 15 scientific-research institutes (SRI) related to agriculture in the region. In the process of implementation of the program the following issues were set up for consideration: Will climate change lead to shift of climate/agroecological zones in Central Asia? Will climate change affect agricultural production in the region? Is there any difference

on volatility change according to the farming systems? Which policies could be important to increase the resilience of agricultural producers?

As results of the project implementation following conclusion and recommendations had been developed: Methods for downscaling and regionalization of GCM outputs should be improved; Crop modeling of irrigated crop production in Central Asia should be combined with hydrological/climatic estimates of snowfall and snowmelt in the mountains and the impact of climate change; The number of crops considered in the investigation should be increased to assess CC impact on crop production systems; The point level biophysical results should be up-scaling to the province/national level to make use for assessment of CC impact on livelihoods; Impact of climate change on crop affection by diseases, pests and weeds should be assessed.

The Chairman thanked reporter and asked whether participants had questions or comment on the presentation.

Dr. Salohiddinov Abdulhakim asked how each measure of adaptation, proposed in the report would change the situation, compensate or mitigate the expected impacts of climate change?

Dr. Mariya Glazirina responded that the study of this issue was planned during the project, as part of the research program. For example: the study of the effects of increased temperature during the flowering period to change the date of sowing is now in Karshi. Different agricultural and climatic scenarios were simulated; it was planned that the results for each of the scenarios would be obtained in two years later.

Dr. Laziza Gafurova supported the importance of the project, and also proposed to include in future research to study the effect of selection varieties of agricultural crops, salinization and soil degradation, the presence of groundwater, the depth and extent of the mineralization, the period of pollination, depending on the climate change, and vulnerability of pasture, and what are the consequences of influence of climate change on animal husbandry.

Dr. Tomasz Lonc expressed gratitude for the interesting report and asked whether the report on the results of the project was submitted to the relevant Ministry.

Dr. Maria Glazirina answered that not yet, but at the last workshop where the results were reported was participated by representatives of government organizations.

Dr. Alim Pulatov, Dr. Alexander Merkushkin and Dr. Maria Glazirina discussed the development of the two models covered in the report.

Dr. Ram C Sharma, Dr. Robert Stefanski and Dr Maria Glazirina discussed the experimental results for two models of the program, depending on the change in climate.

After discussion of the report, the Chairman gave the floor to the next speaker - **Head of Scientific Information Center, Scientific Information Center of Interstate Coordination Water Commission (SIC ICWC)**.

Dr. Shuhrat Mukhamedjanov and **Dr. Dr. Gerogi Solodkin, Head Mathematic Modeling, SIC ICWC**, reported on the impact of climate change on irrigation regime and productivity of crops. This work was the result of two projects in the last ten years of water management in the Fergana Valley, and improving water productivity at the field level. Main objectives of the project was to help farmers in the most productive use of water and land resources, especially in the conditions in which the Central Asian countries were occurred, after independence; and provide recommendations for more productive use of resources to increase productivity, as well as for more coherent operation of interstate resources, and in particular in context of water resources.

The Chairman thanked reporter and asked whether participants had questions or comment on the presentation.

Dr. Alim Pulatov, Dr. Shuhrat Mukhamedjanov and **Dr. Georgi Solodkin** discussed about variation of crop yields of in different years depending on the temperature and humidity indicators, precipitation.

Dr. Gulchekhra Khasankhanova, Dr. Shuhrat Mukhamedjanov and **Dr. Georgi Solodkin** discussed the system to optimize the use of water in the field and getting the results to be used in the advisory system.

After discussions the Chairman gave the floor to **Dr. Alisher Tashmatov**.

Dr. Alisher Tashmatov thanked all the speakers and announced the changes in the program and plans for the second day.

The second day of the workshop

During the first half-day participants visited and acquaint participants with the activities of the Hydrometeorological Service of Uzbekistan.

In the first half of the second day involved a visit to the Hydrometeorological Service of the Republic of Uzbekistan, where the participants were introduced to the activities of Regional Telecommunications Service, Remote Sensing Service and Hydrometeorological provision service (HMPS). In the afternoon, the participants continued the workshop proceedings presenting and discussing climate change and the environment related issues.

The second part of the day began with Session 4: Climate change and the environment and was chaired by **Dr. Erkanat Iskakov, Kazakhstan**.

The Chairman gave the floor to **Dr. Ram Sharma**.

Dr. Ram Sharma, ICARDA-CAC, presented the information on the activities of ICARDA to improve crops in Central Asia and the South Caucasus in the context of climate change. The report highlighted the following issues:

- Progress in the establishment of winter wheat varieties resistant to yellow rust;
- Making progress in the definition of winter wheat varieties that are resistant to salinity;

- The use of new devices in the definition of heat-resistant varieties of wheat;
- Chickpea varieties for winter sowing;
- Capacity building.

The Chairman thanked reporter and asked whether participants had questions or comment on the presentation.

Dr. Laziza Gafurova was interested in research on saline soils, and particularly at chickpea in Syrdarya region, and whether chickpea varieties resistant to salinity were developed.

Dr. Ram Sharma said that in this area research was conducted and in particular scientists from Tashkent State Agrarian University (TSAU).

Then the Chairman gave the floor to **Dr. Ute Fischer-Zujkov, German International Cooperation (GIZ), Manager of the Pasture management project.**

Dr. Ute Fischer-Zujkov noted that the GIZ is the organization for the implementation of innovation and research results into practice. The speaker provided information about the projects implementing in CA countries on sustainable pasture management to adapt to climate change.

The Chairman thanked reporter and asked whether participants had questions or comment on the presentation.

Professor Asanbek Ajibekov, Director of Kyrgyz Research Institute of livestock and graze lands and **Dr. Ute Fischer-Zujkov** discussed the issue of livestock in Kyrgyzstan, its transfer to the private sector, reducing the quantity of livestock and its impact on the pasture.

Dr. Salohiddinov Abdulhakim and **Dr. Ute Fischer-Zujkov** discussed the issues of watering and supply pastures with sufficient water throughout the Asian region, the different techniques, as well as the development of technologies that contribute to an increase in the level of forage, depending on the impact of climate change and challenges for the sustainable management of pastures.

Then, Chairman gave the floor to **Dr. Akmal Karimov, IWMI.**

Dr. Akmal Karimov presented the information on the problems of preservation of green and blue water in the CAC region, as well as water resources management at the deficit and climate change in agriculture. The report highlighted the main issues of methodology for adaptation of water resources, the problems of cropping patterns, Groundwater development and managed aquifer recharge.

The Chairman thanked all the speakers and announced a **coffee-break.**

After coffee-break the session was chaired by **Dr. Alexander Merkuskin.** Chairman gave the floor to the report of **Dr. Ravza Mavlyanova, Regional coordinator of AVRDC.**

Dr. Ravza Mavlyanova presented the information on Intensification and Diversification of Production Systems for Climate Change Adaptation and Mitigation, which covered the issues related to: Food security, adaptation to climate change, rational use of natural resources, sustainable agriculture system, employment, householders' encouragement, livelihood.

Chairman, Dr Alexander Merkuskin thanked for his presentation and noted the significance of the data, because the data on vegetable production in the context of climate change are very small, and the importance they have in the strategies of adaptation of agriculture, and therefore of great interest.

Dr. Saparbek Alimkulov asked about information on new varieties, whether they have being produced based on Genetically-Modified Objects (GMO)? He also noted that Kyrgyzstan is not among the AVRDC member-countries.

Dr. Ravza Mavlyanova replied that during the selection for all vegetable crops GMOs were not used. She also noted that AVRDC works with all eight countries of the CAC region, and Kyrgyzstan is also included in this list.

Dr. Natalia Shulgina noted that the AVRDC was working with farmers, and asked how easy it is to work with farmers.

Dr. Ravza Mavlyanova said that the work is carried out with farmers for years, demonstration fields with improved varieties are organized, all the necessary information and booklets are providing. At the initial stage the seeds are distributed free of charge for a trial planting. Subsequently, farmers have an opportunity to multiply crops for further commercial purposes. Trainings and information support to farmers are provided.

Dr. Shuhrat Mukhamedjanov asked about the restoration of local varieties of tomato and other vegetable crops.

Dr. Ravza Mavlyanova explained that local varieties of vegetables are a unique material, but after a time they are losing popularity due to the needs of the population, often local varieties are less resistant to transportation. But with the support of many organizations and also ICARDA, the works to preserve the local gene pool and breeding new varieties of crops are conducted.

Dr. Laziza Gafurova, as a longtime partner of ICARDA and AVRDC, noted that much work to develop new varieties, as well as with the improvement of soil fertility, which is necessary in adapting crops to climate change have being done. The importance of vegetable crops for the CAC region is very high, because the solution of the food problem is one of the priorities in the developing countries. The AVRDC is training young specialists and experts as well.

The Chairman thanked **Dr. Laziza Gafurova** for exhaustive comments on the presentation.

Then Chairman gave the floor for **Dr. Saparbek Alimkulov, Director of Bio Service Public Foundation.**

Dr. Saparbek Alimkulov presented to attention of participants the presentation on organic farming as one of the solutions to environmental problems, food security and soil fertility.

Organic farming - is a holistic production management system which promotes health of soils, ecosystems and people. Organic agriculture combines tradition, innovation and science to improve the environment and promote fair relationships and a decent standard of living for all of the above. Not least, improving the ecological environment by following these conditions, such as the use of food waste for composting, a complete rejection of chemicals, fertilizers, economical attitude to water, the use of crop rotation to prevent land degradation, non-GMO products, lower costs due to economy on pesticides and mineral fertilizers. Instead, the use of organic fertilizers, beneficial insects, tinctures and decoctions of herbs are advocated.

The Chairman thanked the speakers and gave the floor for representatives of the Hydrometeorological Services of Armenia, Azerbaijan and Kyrgyzstan.

Mrs. Zarmandukht Petrosyan, Armenian Hydrometeorological Service, Head of Department, in her report highlighted the issues of agrometeorological forecasting and systems to reduce the vulnerability of climate change in Armenia. The speaker provided information about the climatic peculiarities of Armenia and their impact on agriculture.

Mrs. Omurzakova Sharipa, Kyrgyzhydromet, Head of Agrometeorological department of the Agency of the hydrometeorology, Kyrgyzstan, presented the information on the geographical and climatic conditions of Kyrgyzstan, the impact of climate change on agriculture and the performance of the Department of Agrometeorology and collaboration with public and private organizations and agencies

Mrs. Kamala Huseynli, Azerbaijan Hydromet service, Chief engineer, in her report briefed the impact of climate change on agriculture in Azerbaijan. The speaker noted that due to the change of climate in Azerbaijan, an increase of annual precipitation in the winter, the flooding in the autumn-spring period, an increase in evaporation in the summer are observed, therefore in some lowlands and foothill areas the agricultural production significantly reduced. It has been observed that some of the crops that were traditional for the country, reduced their productivity, and may be completely lost, and they can be replaced with other crops which until now were considered as non-typical for Azerbaijan.

The Chairman thanked the speakers and gave the floor to **Dr. Alisher Tashmatov**.

Dr. Alisher Tashmatov in his report highlighted the issues of the need to combine adaptation of agriculture and food security to climate change in the CAC with the regional strategy transformation strengthening agricultural research and innovation systems for development.

The Chairman gave the opportunity for questions and comments.

Dr. Robert Stefanski thanked all the speakers of the second day of the workshop and explained the terms for the preparation and adoption of the Tashkent Declaration.

The Chairman announced the closing of the second day

The third day of the workshop

Session 5: Breakout sessions to discuss regional agriculture and food security mitigation and adaptation framework for climate change in CAC

The third day was started with breakout sessions to discuss regional agriculture and food security mitigation and adaptation framework for climate change in CAC.

The session started with an introductory speech by Dr. Robert Stefanski; he introduced the goals and objectives of the group discussions.

The main purpose of the Breakout Group sessions was to consider and review the climate change adaptation strategies for the user sectors assigned to the different Breakout Groups and make recommendations which would be incorporated into the Workshop Declaration.

Participants had to cover:

- What are the different climate change adaptation strategies for your user sector in different sectors of CAC?
- What are the appropriate ways to promote adaptation planning and implementation?
- How can the identified strategies be integrated into sustainable development planning in CAC?
- Recommendations for Declaration

Participants were asked to split into four groups:

- Group I: Crops, Fishery and Aquaculture
- Group II: Livestock, Grasslands and Rangelands
- Group III: Land Use, Forestry and Water resources
- Group IV: Institutions, Policy and Cooperation

Dr. Alisher Tashmatov, Dr. Botir Dosov, Dr. Ram Sharma and Dr. Robert Stefanski discussed the distribution of participants by group, and the ability to move specialists from one group to another for a more thoroughly discussion of each group theme.

All participants formed working groups, and the first half of the day of the seminar was devoted to work in groups.

All groups presented their outputs in the form of presentation².

Session 6: Plenary to consider breakout group reports

The Chairman, Dr. Robert Stefanski, gave the floor to present the results of work of Group 2: Livestock and pastures. The presentation was introduced by **Dr. Yakug Gulyev**.

Then Chairman gave the floor to the other representatives of the working groups for presentation of results and recommendations.

Mrs. Marina Kordzhahia, Group 4: Institutional aspects and development cooperation.

Dr. Maria Glazirina, Group 1: Agriculture, fisheries and aquaculture.

² Content of the presentation is presented in Annex 3.

Dr. Laziza Gafurova, Group 3: Land use, forestry and water management.

The results of the group discussions are given in Annex 3.

Сессия 7: Завершение семинара

После докладов и обсуждения результатов в рабочих группах, присутствующие перешли к обсуждению принятия Ташкентской Декларации. В результате обсуждения было принято решения о детальном рассмотрении и внесении предложения и последующем утверждении Декларации после внесения всех замечаний и предложений участниками семинара вне рамок семинара.

После обсуждения представители ВМО, АСНИОЦАК, УЗГИДРОМЕТ, ИКАРДА и других организаций поблагодарил всех участников и организаторов семинара, и объявили о закрытии семинара.

Session 7: Workshop closing

After the presentations and discussions of the results of the working groups present moved on to discuss the adoption of the Tashkent Declaration. Following discussions it was decided to review detailed proposals, and the subsequent adoption of the Declaration, after considering all the comments and suggestions of the participants of the workshop afterwards.

After discussion and consent on follow-ups, the representatives of WMO, CACAARI, Uzhydromet, ICARDA and other organizations thanked all the participants and organizers of the workshop, and announced the closure of the workshop.

**The outputs of the Breakout session of
the International Workshop on Climate change adaptation strategies for agriculture and
food security in Central Asia and the Caucasus,
Tashkent , October, 22-24, 2012**

Group 1 - Crops, Fisheries and Aquaculture

Strategies for ensuring food security and welfare of rural population under Climate Change (CC)

- Increase resilience of production systems to climate change
- Creating flexible policy and institutional environment for enabling decentralized decision making on crop choices and agronomic practices
- Changing cropping system and cropping pattern
- Crop diversification
- Conservation, characterization and utilization of national genetic resources to address constraints that could happen under CC
- Regional exchange of crop germplasm
- Development of drought, heat and salinity tolerant crop varieties, and more water productive crop varieties (varieties for supplemental irrigation)
- Development of regional strategy on cooperation in seed production and exchange
- Improvement of seed production system
- Introduction of innovation technologies
- Adoption of resource conserving farming practices
- Conservational agriculture
- Organic agriculture
- Protected agriculture
- Better prediction of climatic events, extremes in particular, that might effect crop production
- Development national and regional database on potential impact of CC across different agroecologies and production systems
- Monitoring of crop pests and diseases
- Introducing of innovative technologies for serving agriculture
- Insurance for farmers against failure of crops
- Creating awareness among farmers and policy makers about CC
- Consulting service for farmers on choosing varieties and agrotechniques
- Capacity building
- Strengthening cooperatives in combining of small households and farmers
- Gender equality in agricultural production

Strategies for Fisheries and Aquaculture

- Growing Aquaculture production using land unsuitable for agriculture
- Introduction of innovation technologies (isolated artificial/plastic basins)
- Improved options and trade-offs for sustainable fishery and aquaculture management

- Enhancing the capacity in aquaculture and fishery production system
- Up-grading the land and water use management based on integrated livestock, crop and aquaculture production system

Ways to promote

- Creating awareness through mass media, education, demonstrations, meetings, farmers schools, study tours, field visits
- Establishing of unit within the governmental structure aimed on adaptation to climate change in agriculture
- Improving of strategy for development of national research programs in the agricultural sector
- Strengthening of regional and international cooperation
- Creating of warning system to reduce impact of hazardous events
- Creating demonstration sites for adaptive research and monitoring impact of CC on crop productivity
- Creating of farmer schools and support for existing ones
- Development of regional networking

Integration into sustainable development planning in CAC

- Intergovernmental agreement on sustainable development (SD)
- National Government Agenda on SD
- Institutional support on national and regional level
- Work package for priorities scientific – research projects to be developed under funding of interested international organizations

Recommendations

- Creating awareness through mass media, education, demonstrations, meetings, farmers schools, study tours, field visits
- Establishing of unit within the governmental structure aimed on adaptation to climate change in agriculture

Group 2 - Livestock, Grasslands and Rangelands

Climate change adaptation strategies for Livestock, Grasslands and Rangelands

- (Make) Grassland management action plans including optimal stocking grade, rotational grazing, pasture improvement activities (soil scarification, ditches, mulching) (for bigger herds)
- (Make) Community pasture management plan for smallholders
- Increase pasture productivity through introduction of good management practises; including extra seeding collected from wild local grass species; e.g. through halofytes, salinity resistant grasses.
- In order to reduce pressure on grazing lands, extend the areas of temporary grasslands, by planting luzerne, alfalfa. Use of some local wild grass species, resistant or resilient to unfavourable climate conditions
- Moving to summer pastures in summer; coming to lowlands in winter (winter pastures).
- Water resources management and water harvesting, (hauz); underground reservoirs if geography allows. Use additional sources of hot spring water for halofyte growing.

- Breeding schemes for drought- and saline resistant sheep, goats and cattle; use local species for crossing!
- Restoration of water supply system (watering points) for livestock
- Apart from Kyrgystan, there is no legislative base for grasslands (ownership, management, landuse) so we urge to develop rules and regulations.
- There is not any organisation (government or private or NGO) which is responsible for good pasture management, monitoring and control (and t that purpose reintroduce remote sensing in IWMI).
As soon as possible some organisation needs to take responsibility (a Ministry), or been given responsibility for good pasture management, monitoring and control, and act accordingly.

Ways to promote adaptation, planning and implementation for Livestock, Grasslands and Rangelands

- Capacity building, participative projects with farmers and awareness raising activities, to improve farmers knowledge how to maintain and improve vegetation cover.
- Reintroduce remote sensing in IWMI.
- Appropriate manure management to avoid Methan emission, water pollution and animal diseases. By using manure as organic fertilizer you avoid the above mentioned problems...
- (Automatic) collection of data about air temperature, relative humidity, evatransporation, sunshine, windspeed, precipitation and relate that timely to famers
- Encourage farmers to include forage crops in crop-rotation (and modelling towards that purpose)
- We urge to develop rules and regulations toward a legislative base for grasslands (ownership, management, landuse); Kyrgystan is setting the example
- Some organisation (the Ministry, an Agency?) could be made resonsible for pasture management, monitoring and control and also act and improve the situation according to its responsibilities
- Find and organise subsidies and financing mechanisms for all the above activities!!!

Integration of strategies in CAC plans

- Involvement of national policymakers to discuss integration of the above strategies and actions into their national plans.
- Encourage higher budget commitments for adressing climate change issues and to support 'Climate Smart' Agriculture.

4. Recommendations for Tashkent CAC declaration Oct 2012

- Split Recommendation 2 in two:
 - capacity bulding and
 - data collection
- (enlarge upon) Capacity building:
 - (1) Capacity building in the fields of participative projects, water resources managment, grazing managment, climate smart agriculture, breeding, enhancing the role of smallholders, involving smallholders, legislation for land use & pasture management/.

- (2) Enhance capacity building and empowerment to access other available financial resources and develop safety nets, so that poor people could be given access to development programmes and insurance.
- (Add a recommendation): involve ministries of agriculture to the extent that they understand the urgency of climate change adaptation strategies and support those in substantial ways. E.g. Propose annual meetings about climate change; find out what is in it for them.
- (Add a recommendation): invite Governments to consider allocations to mitigate effects of climate change on agriculture.

Group 3 - Land Use, Forestry, and Water Resources

Forestry

- Forest management program to adapt to climate changes
 - government stimulation to farms in creation of forest isolation lines;
 - increase of forest area;
 - recovering degraded forest;
 - facilitation of access of population to plantings;
- Capacity building
 - access to new technologies and innovation;
 - information campaign;
 - integration of science, education and production;

Land use:

- State regulation on land use; (for both government and private sectors)
 - legal issues;
 - state program;
 - stimulation forms; (tax, insurance, credit)
 - integrated land and water use technology; (crop production, animal husbandry, soil fertility, efficient water use)
- Increase land use efficiency
 - implementation of soil conservation technologies;
 - salinization;
 - erosion; (wind, water)
 - soil pollution;
- Improve the soil quality (soil health)
 - organic farming;
 - improve melioration conditions;
 - crop rotation;
- Access to the innovation and new technologies on land use
 - extension services;
 - platform knowledge;
 - creation of network (science, farmers);
 - integration of science-education and production;

- support to development of mobile (cell-phone, net) agrarian meteorology technologies;
- Application of know-how in production;
 - creation of techno-parks;
 - creation of engineering companies;
 - soil service;
 - Regional inter-state cooperation in land and water use and integration

Water resources:

- Additional distributed water storages;
- Economical water saving technologies;
- Bio-drainage;
- Reuse of return flow;
- Change the crop pattern- towards less water intensive crops;
- Soil conservation technology;
- Estimation of crop water demand under climate change conditions;

What are the appropriate ways to promote adaptation planning and implementation?

- Socio-economic analysis of adaptation measures;
- lobbying of adaptation plans;
- Information dissemination;
- carrying out regional projects, seminars, etc;

How can the identified strategies be integrated into sustainable development planning in CAC?

- through regional programs and regional institutional structure;

Recommendations for Declaration

- Add to: strengthen regional cooperation and exchange of successful experiences among countries through the creation of a network for climate change and food security in CAC countries... **by developing systems of monitoring, especially agro-meteorological, and creating a database on the basis of new data.**
- Add to: develop innovative financial mechanisms to scale up technical and financial support for the adaptation efforts of the CAC countries...
- **Socio-economic evaluation of adaptation measures.**
- Add to: Communicate and engage wider society in understanding the implications of climate change ..
- **and the necessity of applying the organic farming principles ..**
- **with communities becoming part of adaptation solutions themselves**
- The participants **agreed that the participation of each in the implementation of plan is compulsory and made a decision to lobby the plan in each country they are representing, and** urge development partners and the private sector to fund the implementation of programs that reflect the recommendations outlined above that

deal with the mitigation and adaptation to climate change while advancing food security in Asia and the Caucasus.

Group 4 - Institutions, Policy, Cooperation

Institutions

- Government
 - Ministries of Agriculture
 - Ministries of Environmental Protection
 - Relevant parliamentary commissions
 - Rural development agencies / Agricultural development agencies (which provide insurance to farmers)
 - Meteorological services
 - Research institutes / universities
 - Extension agencies
- Donor agencies
 - Bi-lateral donor agencies
 - Multi-lateral Development Banks
 - Other funding sources
- Ngo's
 - International
 - National
 - Civil society
- Private
 - Insurance companies
 - Farmer organizations

Policies

- Which countries have a climate change adaptation strategy?
- Turkey has one; Central Asia and South Caucasus Countries have country notes Climate Change and Agriculture, WB project;
- Include the climate change as an important component of rural livelihood improvement programs and strategies;
- Enhance of enable environment (legal frame, mechanisms)
- Follow up the international policy documents on climate change and agriculture

Policy Recommendations

- Build special task forces that identify key results of research, and disseminate effectively to farmers;
- Adaptation should be included in the restoration of water resources and land use management systems (example Georgia);
- Attention should be given to integrate gender issues into the policies, strategies, plans and programs implemented to combat climate change,
- Development of climate change indicators to promote monitoring and evaluation in local, regional and national level

Cooperation, integration of strategies into sustainable development planning

- At present, climate change adaptation and sustainable development strategies are separate. They need to be better integrated;

- Resource mobilization (including private sector);
- Capacity development (linking meteorological services with government institutions);
- Capacity strengthening at regional and national levels (ministerial branches working with local governments and weather services, who in turn work with local farmers)
- Strengthening of Institutional collaboration, innovation, exchange knowledge and technology transfer
- Community-based adaptation to climate change

Recommendations

- Inter-ministerial committee for climate change that coordinates the work of relevant ministries (major function: water resources and land use management, climate and social-economic data collection, analysis\report, review) in all countries;
- National climate change adaptation strategy for all countries. The best practice of Turkey. In other countries, work is underway. (Armenia, Azerbaijan, Georgia is preparing the country note about climate change and agriculture, supporting by the WB);
- Building specialized government institutions working in the field helping farmers in case of natural disasters;
- Greater involvement of the private sector, including insurance companies;
- Public/Private partnerships (example of insurance companies co-funded by government in Turkey);
- Cooperation in the region between meteorological services; cooperation should be extended to the agricultural field
- Extension of agricultural services need to make climate change a priority and introduce farmers to technologies to reduce impact of climate change, Sharing best practices and knowledge (what worked, what didn't?) → important role for CACAARI, CACILM; Developed knowledge needs to be freely accessed not only by different departments and ministries within the country, but also by colleagues from other countries of the region.
- Promote international cooperation - Climate change is not a local problem.
- Communication strategy to raise awareness of climate change important at all levels, as an advocacy tool for increased funding (involve media, international community, etc.)
- National strategies need to be translated into local and sector action plans and we need specialists to do so.
- Severe underinvestment in R&D will have negative implications on the long-term, Improve access to R&D funding (How to improve the access to finances?);
- Resource mobilization (CACAARI recommendation spend 1% of agriculture GDP for agriculture research)
- Additional research needed: socio-economic implications of climate change in CAC; climate change mitigation; insurance policies (Assessment of economic impacts/damages of climate change on agricultural system)
- Joint regional climate change programs (climate change has no borders);
- Environmental and social impact assessment, as part of M\E;
- In addition to crops and livestock, forestry and fisheries equally deserve attention

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