Regional Training Course: Central Asia and Caucasus

Crop diversification and adaptation under climate change: New salt-tolerant crops and modeling option for management optimization

Date: November 7-11, 2016
Venue: Almaty, Kazakhstan

Background

Water and land management is considered as the most critical resource for sustainable agricultural development worldwide. Under water scarcity and climate change considerable effort has been devoted to introduce policies to increase water efficiency based on the assertion that more can be achieved with less water through better crop management. In the Aral Sea Basin countries better management usually refers to improvement of water allocation and/or irrigation water efficiency through appropriate crop-based system introduction and management.

Many studies documented implications of the climate change to agriculture and pose a reasonable threat to poverty and sustainable development, especially in the arid and semiarid zones similar to the Aral Sea Basin countries. Definition and the implementation of adaptation measures of the key vulnerable production sectors and regions, design, evaluation of the agriculture will define the overall future vulnerability of rural communities. Environmental impacts and crops and yield modeling are essential information for managing food production and agricultural water usage in the Central Asian region given the challenges of food, nutrition and water security.

The most serious effects are at the margins (vulnerable regions and groups). Individuals and groups particularly vulnerable to environmental change are those with high sensitivity to changes, low coping and adaptive capacities, low resilience and recovery potential. Adaptation is necessary, but adaptation has limits (technology and biotechnology, politics and culture and others).

Scope and Aims

The regional training workshop in Almaty, Kazakhstan, will bring together the excellence of research in modeling crops, water, rangelands, livestock and agricultural market in order to illustrate how climate will affect regional farming systems and food production in marginal environments of Aral Sea Basin countries to decision makers. To achieve this goal, a range of activities, including methodological comparisons of models and use of their outputs, linking of complementary models from different research fields, involvement of stakeholders, training of young scientists, and establishing a community of practice across a broad range of water-crops–land surface scientific disciplines is considered.
Main objectives and activities

Satellite imagery and crop models can help fill some of these data gaps. To this end a technical workshop developed by ICBA and supported by IDB will provide introductory capacity building to develop skills in young engineers to produce crop maps from satellite images, collect field data to verify these maps, and to begin to use crop modeling for estimating yields of different agro-landscape affected by salinity and water scarcity.

Following the workshop ICBA will continue to work with the NARS to support further field data collection and processing in the Central Asian countries. The course structure includes hands-on training through oral presentations, practical exercise and open discussions.

The program will cover technical training using ENVI software for analyzing satellite images, and DsSAT, CropSyst crop modeling exercises. It will also include hands-on training using GPS and camera-GPS for field data collection and downloading the data into a GIS for use in the mapping and modeling work.

Crop production is consequently extremely sensitive to large year-to-year weather fluctuations. Future agricultural responses to climate change are based on scenarios. It is crucial to understand that there is large uncertainty in the climate scenarios used for the analyses. Therefore we propose including Atmospheric modeling, land surface modeling, crop and pastures modeling and assessment to make a link cycle that will show importance of each field to others. Through regional atmospheric modeling, meteorological impacts of climate change, water resources assessment, what type of data and how it can be used for calculation and usage will be presented. Land surface modeling (LSM) can further widen provided information for soil moisture, surface water availability, evaporation and water energy balance. Through this seminar where and how this model can be applied and what are possible outcomes will be shown.

Crop models. These models assess possible crop change and water requirements, crop production, and impacts of different anthropogenic and natural hazards. The model can be linked to the land surface model and further assess outputs of the land surface model or atmospheric model to the crop yields and others.

Application of the SWAT model to simulate water–salt transport under deficit irrigation with saline water will be introduced to the CA young professionals and skilful farmers. The numerical model proves to be a useful tool for studying water–salt transport under different scenarios and for evaluating irrigation practices for a long period.

Rangelands resilience and livestock models including value chain and cost benefits would be linked to the previous models to assess impacts of climate change, water and soil salinity stress on rainfed agriculture production and determine its future trends.

The merits of each mentioned above Model Approach vary according to the level of impact being studied, and they may frequently be mutually supportive. For example, simple agro-climatic indices often provide the necessary information on how crops respond to varying rainfall and temperature in wide geographical areas; crop-specific models are used to test alternative management that can in turn be used as a component for an economic model that analyses regional vulnerability or national adaptation strategies to be applied later in Central Asian region.
Agenda

Monday 7 November

Inaugural session

08:30-0900  Registration
09:00-09:30  Opening and welcome remarks, Course Director, Dr Shoab Ismail, ICBA
            Welcome speech by IDB Representative
            Welcome address by Representative of Ministry of Agriculture, Republic of Kazakhstan
            Briefing about the course
            Introduction of participants
09:30-10:00  Group photo and Coffee break

Importance of Crop diversification and adaptation under climate change

10:00-12:00  Session 1: Crop diversification and genetic improvement research - ICBA experience, (Dr Kristina Toderich, ICBA-CAC)
12:00-13:00  Session 2: Crop modeling for estimating cereals and forages yields and yield analyses, (Dr Makram Belhaj Fray, ICBA)
13:00-14:00  Lunch and Prayer break
14:00-16:00  Session 3: New salt-tolerant crops in Central Asia and Caucasus, (Dr Kristina Toderich and Dr Hasan Boboev, ICBA-CAC)

Tuesday 8 November

Climate change modeling and adaptation

08:30-10:00  Session 4: Monitoring agricultural and water resources for planning, (Dr Rachael McDonnell, ICBA and Dr Kristina Toderich, ICBA-CAC)
            Country presentations and discussion based on the following questions:
            - What data sources do you use for planning water and agriculture?
            - What additional data sets would you like to use in your work?
10:00-10:30  Coffee break
10:30-13:00  Session 5: Regional drought monitoring and early warning system for optimizing agricultural production, (Dr Rachael McDonnell, ICBA)
            Discussion of the following questions:
            - What are the indicators that drought is occurring in your country? Reduced stream flow? Crop stress?
            - What systems do you have in place to overcome the impacts of drought?
13:00-14:00  Lunch and Prayer break
14:00-16:00  Session 6: Climate change downscaling and impact, (Dr Temur Khujanazarov and Dr Mariya Glazirina, Uzbekistan)
### Wednesday 9 November

**Field Trip**
- 08:30-10:00 Visit seed production specialized private farm “Turgen”, Almaty region
- 10:00-10:30 Coffee break
- 10:30-13:00 Exhibition and achievements of farmers (Turgen and Svetlana Farms, Almaty region)
- 13:00-14:00 Lunch and Prayer break
- 14:00-15:00 Prospects for seed production of salt and drought tolerant crops under rainfed conditions
- 15:00-16:30 Departure to Almaty

### Thursday 10 November

**Application of crop modeling under climate change**
- 08:30-10:00 *Session 7:* Application of crop modeling for simulating growth and development, *(Dr Makram Belhaj Fraj, ICBA)*
- 10:00-10:30 Coffee break
- 10:30-13:00 *Session 8:* Applications for optimizing crop production, *(Dr Mariya Glazirina and Dr Temur Khujanazarov, Uzbekistan)*
- 13:00-14:00 Lunch and Prayer break
- 14:00-16:00 *Session 9:* Scaling up diversified and integrated production systems, *(Dr Kristina Toderich, ICBA-CAC)*

### Friday 11 November

**Proposal development**
- 08:30-10:00 *Session 10:* Further optimizing production systems under climate change, *(Dr Mariya Glazirina, Uzbekistan)*
- 10:00-10:30 Coffee break
- 10:30-13:00 *Session 11:* Group discussion for projects design ideas and project proposals development, *(Dr Makram Belhaj Fraj, ICBA and Dr Kristina Toderich, ICBA-CAC)*
- 13:00-14:00 Lunch and Prayer break
- 14:00-15:30 Training wrap up and course evaluation
- 15:30-16:00 Closing ceremony and distribution of certificates