How Irrigation and Drainage Play an Important Role in Climate Change Adaptation?

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Question 58

“How Irrigation and Drainage play an important role in Climate Change Adaptation?”

- Climate change is an added stress on the increasingly complex and interlinked issues of rural development, food security under demographic changes, overstretched environmental and natural resources.

- It is believed that improving irrigation and drainage systems and rural development as well as increasing food production will play a key role in achieving the rural water and food security, especially in the developing countries.

- Considering the impending climate change, intervention to mitigate the impacts of climate change and consequent extreme climate events, such as floods and drought, have to be factored in all decision making processes in the irrigation and drainage activities.

(ICID, 2014)
Question 58.1
PE: Dr. Takao Masumoto (Japan)

- Q58.1: Understanding Impacts of Climate Change on Land and Water Use
  - Sub topics
    - future emission scenarios, downscaling methods, soil-crop-climate model, impact of rising sea levels on coastal agricultural system, methodologies for modeling climate change impacts on land use, land use changes in agricultural landscapes, impacts of bio-energy crop on rural land use, changes in crop production and irrigation patterns, factors in land use change, innovative and adaptive technology for irrigation and drainage, new and renewable energy for irrigation and drainage systems, and smart water grids

Question 58.2
PE: VPH Felix Brits Reinders (south Africa)

- Q58.2: Revisiting Design and Operation Criteria for Irrigation and Drainage Facilities
  - Subtopics
    - new design criteria under non-stationary hydrologic time series due to changing climate, new project evaluation techniques, case for large storages to cope with increasing climate variability, changes in irrigation water demand for crops, operation of reservoir and diversion weirs using agro-climate information, sustainable groundwater usage, development and protection of sea dike, safety of coastal areas under rising sea levels
Q.58.3: Managing Frequent Floods and Droughts;
- Subtopics
  - integrated flood management, flood risk assessment, flood forecasting, floods and drought risk and vulnerability assessment, drought index and its evaluation, drought early warning, drought mitigation through irrigation.

General overview on Question 58
Structure of the Question
General overview of the papers on Question 58

- In the 22nd ICID Conference, under the Question 58, finally 48 papers and 27 posters are accepted after peer-review process and going to be presented.

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<th>Sub question</th>
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<td>Q.58.1: Understanding Impacts of Climate Change on Land and Water Use</td>
<td>Paper 25</td>
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<td>Q58.2: Revisiting Design and Operation Criteria for Irrigation and Drainage Facilities</td>
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Outcomes of Q. 58.1

- Basic tools to assess the climate change impacts on land and water use are hydrologic model and crop model. The hydrologic model is a key for the assessment to combine other element models. Selection of the model is one of the main subjects of the research, including for calculation of ET.

- Further development and modification of unique hydrologic models should be promoted, with modelling of anthropogenic water use activities, coupling of surface water and groundwater flow and so forth. For better assessment, continuous observation is essential.

- For the process of impact assessment, selection of its condition is important, including the scenarios, terms of the analysis, GCM and downscaling method and so on.

- Uncertainty of model simulation and projection is to be taken care of in every process of the assessment and development of adaptation.

- Latest appealing topics: step-wise integrated, treatment of water temperature in irrigation areas, integrated climate smart agriculture, and climate trust fund.
Outcomes of Q. 58.2

- It is important that the natural, social, technical and economic conditions are taken into account as primary factors in the feasibility analysis of irrigation improvement projects, which is as an important adaptation strategy for food and water security under climate change.
- For new developments in extremely data scarce areas, a basin-wide irrigation planning approach is recommended with a procedure of impact assessment of climate change on agricultural water use.
- To mitigate climate change on agricultural water use, installation of water measurement equipment in irrigation projects, modernization of current irrigation systems, encouragement of people as well as relevant stakeholders (irrigation cooperatives, NGOs, etc.), leading to sustainable irrigation water use.

Outcomes of Q. 58.3

- There should be more efforts to addressing flood and drought risks in agriculture at the policy level with adequate integration into agricultural development policies, plans and programmes. A community-centred, bottom-up approach and model-based analysis are good ways forward that address the risks of current and advanced adaptation and resilience for the future.
- Institutions can play a key role in introducing new flood and drought provision technologies to farms. Changes in resource endowments resulting from climate change can become a trigger for institutional innovation.
- Institutions can reinforce flood and drought adaptation by introducing location-specific technologies in anticipation of future needs, linking local, national and international institutions to transfer technologies.
- The relevant priorities for managing flood and drought risks and advancing adaptation can be initiation of community-based adaptation actions.
Wrap-up remarks on Question  58

Role of irrigation and drainage management

- Improving irrigation and drainage systems and rural development as well as increasing food production play a key role in achieving the rural water and food security, especially in the developing countries.
- With the impending climate change, intervention to mitigate the impacts of climate change and consequent extreme climate events have to be factored in all decision making processes in the irrigation and drainage activities.

Uncertainty in climate change assessment

- While impacts of climate changes in atmospheric and hydrological system on food production are being projected, the impacts on crops are still under initial assessment.
- Its outputs are expected to be more dependable with the development of better analysis methods and a greater availability of reliable climate data and future scenarios.
Wrap-up remarks on Question 58

Role of sub-process evaluation in climate change impacts

- At this stage, it is very hard to do integrated impact assessment, which covers the whole agricultural and hydrological process including soil-water profile, crop growth, river flow, groundwater dynamics, water requirement, drainage discharge, water quality, cropping pattern and farming system, etc.
- Therefore, each sub-process is to be evaluated and accumulation of its outcomes and cases is to be promoted.

Adaptive adaptation to be introduced

- Since the phenomena or factors associated with climate change and its apparent impacts are difficult to be projected and evaluated at the present phase, one of the more effective and feasible measures for adapting to the impacts is to take actions incrementally, as in an adaptive/trial-and-error manner, utilizing the best available current knowledge and past experiences, and collecting additional information.
Agriculture is the art of managing uncertainty.

Irrigation and drainage is the art of managing unstableness and unpredictability.

Thank you for your attention.