

Advance Report of the ICCAP Irrigation Sub-group in FY2005

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1. Activities and main research outcomes in the FY 2005

1.1 Monitoring of tertiary canals in the LSIP

- 1) We monitored two tertiary canals in the LSIP for the second year.
- 2) Reference water budget of two canals were obtained
- 3) Transport losses from the canal were estimated to be 35-45% of irrigation intake.
- 4) Large amount of management loss was observed in furrow irrigation. Irrigation tail water caused higher flow in drainage canals than in the winter time.
- 5) Dr. Önder quantified water use efficiency of each land use.

1.2 Development of GIS for the LSIP

- 1) Fully integrated information would be available by May 2006.
- 2) Detection of land use change through satellite image analysis is being carried out by Dr. Berberoğlu. He created cropping pattern classification in the LSIP for summer of 2003.
- 3) Ms. Donma has analyzed historical change in groundwater depth and salinity in the past 20 years using GIS. According to her analysis, there has been continuous decrease in groundwater salinity, though there has not been significant change in groundwater level. This was primarily due to good drainage networks that carried away high amount of irrigation water applied to the field.

1.3 Monitoring of Salinity prone area in the LSIP

- 1) Dr. Selim Kapur and Dr. Erhan Akça are carrying out monthly monitoring of soil salinity on 50 field plots along the east-west transect in the project IV area of the LSIP using the EM.

- 2) Along the same transect DSI staff observes shallow groundwater fluctuation and EC of twelve observation wells.

- 3) Dr. Kume carried out preliminary analysis of relation between cropping pattern and salinity using observation data from 1) and 2). He found high salinity in cotton field and bare field in the area. He also found out good correlation between NDVI and soil salinity for two land uses above. He showed the possibility of detecting saline area by combining cropping pattern classification and NDVI evaluation using satellite image analysis.

1.4 Development of Irrigation Management Performance Assessment Model

- 1) Dr. Hoshikawa almost completed the model and now it is being tested for sensitivity to scale problems.
- 2) Test application on monitored tertiary canals obtained fair representation of the system.
- 3) Preliminary simulation using pseudo warming data showed critical effect of decrease of winter precipitation on permanent tree crops. Summer crops were less affected because of irrigation. Increase in evaporation demand and decrease in precipitation by climate change would narrow adaptation capacity of the LSIP.

1.5 Analysis of Efficiency of WUA

- 1) Dr. Umetsu addressed the relative efficiency of WUA management by suggesting alternative composite efficiency index.
- 2) Data envelopment analysis was applied to compare efficiency levels with management-, engineering- and

welfare-focused models. The analysis revealed that some WUAs are suffering from unfavorable management practices and there is a scope for major reorganization.

- 3) Expected value-variance (E-V) model was applied to estimate farmers' preference for crops under the water constraint and variability of gross revenue. Farmers are more likely to choose high value added crops such as citrus, melon, vegetables and fruit.

1.6 Generation of Future scenario

- 1) Main framework of future scenario was discussed. We would assume, a) no change in land use, b) return maximizing strategy, c) environmentally sustainable strategy and d) Turkey becoming part of EU.
- 2) Dr. Özekici presented farmer's point of view at ICCAP workshop in March 2006. He pointed out that farmer's choice on crop in the LSIP is purely economical and have not been constrained by the other physical factors up to present.

2 Proposed activity of FY 2006

2.1 Monitoring of tertiary canals in the LSIP

- 1) Measurement was terminated in March 2006 and the result from second year observation is under analysis. Result will be used as reference water budget for the whole plain.
- 2) Water use in project 4 area with drainage water re-cycling should be observed for comparison with 1).

2.2 Monitoring of Salinity prone area in the LSIP

- 1) Support by TUBITAK will terminate towards June 2006. By June we would have a complete dataset of a year's measurements.
- 2) Irrigation history should be clarified for 50 measurement points.

2.3 Evaluation of change in land and water use in the past 20 years.

- 1) Landsat satellite image of 2005, 2003, 1993 and 1984 will be analyzed for

detecting cropping pattern changes.

- 2) Shallow groundwater data of the same period would be compared with 1) and main canal intakes of that time.
- 3) Historical change of salinity in the project 4 area will be analyzed using NDVI and other possible spectrum band.

2.4 Generation of Future scenario

- 1) Possible scenarios for different responsible bodies with respective topics should be generated, which are;
 - a. DSI (Development of upper basin, additional construction)
 - b. WUA (Land owner ship, efficiency of management, maintenance and renovation)
 - c. Farmers (Land use decisions, technological advance, groundwater use).
- 2) We will clarify, to which extent the scenario is based on assumptions. We try to scientifically quantify changes based on qualitative assumptions.

2.5 Efficient Management of WUAs in LSIP

- 1) Comparative analysis of operation efficiency will be carried out using statistics of 2004.
- 2) Basin wide impact model will be constructed.
- 3) Vulnerability assessment of the impact of climate change will be carried out.

2.6 Pseudo warming runs using GIS and IMPAM

- 1) We will incorporate irrigation and drainage canal network in the model and will enlarge simulated area to the whole plain.
- 2) We will analyze water budget structure of the whole plain using land use in 1984, 1993 and 2003 as input reference, and shallow groundwater fluctuation as output reference.
- 3) Pseudo warming runs with different scenarios for land-use and technological development will be tested for assessing vulnerability and adaptation capacity of the system.

3. Additionally Necessary data in 2006

3.1 Land use maps

- 1) Land use (cropping pattern) of the LSIP at WUA level in 1980s and 1990s
- 2) Wheat cultivated area (to be analyzed using remote sensing images)
- 3) Citrus cultivated area (to be analyzed using remote sensing images)
- 4) Subsurface drainage dimensions

3.2 Monitoring of Salinity prone area in the LSIP

- 1) A planning map of irrigation/drainage canals and ditches of forth stage area of LSIP.
- 2) Past measurement data of soil salinity and groundwater level and EC.
- 3) Time series soil salinity map in whole LSIP from 1960's to present.
- 4) Historical map of installation of irrigation/drainage canals and ditches from 1960's to present
- 5) Literatures of historical development for agricultural activities of LSIP
- 6) Irrigation amount at project IV area.
- 7) Crop yield in salinity-prone are

3.3 Evaluation of change in land and water use in the past 20 years.

- 1) Actual cropping pattern in 2005, 2003, 1993 and 1984 (Spatial information.)

3.4 Pseudo warming runs

- 1) Integrated data mentioned above

3.5 Efficiency of WUA

- 1) DSI. (2005) Briefing of WUA and Year 2004 Management Activity Report, DSI VI Region, Adana.
- 2) DSI. (2005) Transferred Irrigation Association Year 2004 Observation and Evaluation Report. DSI VI Region, Lower Seyhan Irrigation Project, Operation and Maintenance Department.
- 3) DSI. (2005) Year 2004 Yield Census Results for Areas Constructed, Operated and Reclaimed by DSI. DSI Operation & Maintenance Department, Ankara. (early as possible to the present data for Sayhan riverbasin irrigaiton projects, LSIP, and Konya region)

3.6 Future Scenario generation

- 1) Need dialogue between researchers and government officials.

4. Visiting period of Japanese side to Adana (Tentative)

- 1) Apr.2 - Apr. 10: Drs.Watanabe, Umetsu and Hoshikawa, Adana
Prof. Osman Tekinel's momeorial Symposium
- 2) Apr.2 - Apr. 15: Dr. Kume and Dr. Nagano, Adana
Prof. Osman Tekinel's momeorial Symposium and research discussion with collaborators.
- 3) Mid July: Dr. Nagano, Adana
Observation of Water distribution in drainage water-reuse area (Two weeks.)
- 4) August: Dr. Kume
Salinity monitoring
- 5) September: Dr. Umetsu
Efficiency of Water user's association (2 weeks)

5. Presentations at international conferences

- 1) 4-8 April, 2006: International Symposium on Water and Land Management for Sustainable Irrigated Agriculture Adana Turkey
<http://symp2006.cu.edu.tr/>
//Participants from Turkey and Japan.
- 2) 16-18 October, 2006: Asia Pacific Association of Hydrology and Water Resources conference at Bangkok.
<http://www.thirdaphw.org/>
// Drs. Hoshikawa and Nagano (in plan)
- 3) 7-8 November, 2006: RIHN International Symposium at RIHN, Kyoto.
http://www.chikyu.ac.jp/rihn/sym/index_e.html
// All members from Japan and invited representative from Turkey
- 4) 9-12 November, 2006: An Earth System Science Partnership Global Environmental Change Open Science Conference
<http://www.essp.org/essp/ESSP2006/>