Proceeding of the Final Review and Planning Workshop of Indo-US AKI Projects on Water Management

Two days Final Review and Planning Workshop of Indo-US AKI Projects on Water Management was held at CSSRI, Karnal from 21-22 July 2009. Sixty five delegates including Principal Investigators from 3 Agricultural Research Institutes (CSSRI, Karnal; IARI, New Delhi; CSWCRTI, Dehradun) and 6 State Agricultural Universities (UAS, Bangalore; PAU, Ludhiana; GBPUAT, Pant Nagar; ANGRAU, Hyderabad; JNKVV, Jabalapur and TNAU, Coimbatore) from India, and five scientists and students from 3 US universities (Iowa State University, Purdue University and University of Illinois) participated in this workshop. The workshop was inaugurated and chaired by Dr. A.K. Singh, DDG (Natural Resource Management), ICAR, New Delhi.

Dr. Gurbachan Singh, Director, CSSRI and nodal officer of AKI projects on water management welcomed the Chief Guest Dr. A.K. Singh who is also the facilitator of AKI programme, presiding officer of the function Dr. R.K. Mittal ADG (EQR) ICAR, project collaborators and delegates from US and India and scientists and staff from CSSRI, Karnal. He also presented the brief background and overall progress of the project. Dr R.K Mittal informed that a total of 13 projects under AKI were sanctioned in the country in four major themes like Water Management, Bio technology, Post Harvest and Value Addition etc. Dr Mittal also appreciated the success of e-learning systems developed under this project at three Indian Agricultural Universities in which US professors delivered e-lectures to Indian students through video conferencing. Seven post graduate students from India who completed their course work in India but carried out their research work in US. Similarly, two US students visited CSSRI, Karnal for their research activities. Prof. R. S. Kanwar, US AKI Co-ordinator addressed the workshop and highlighted major issues of water, food and energy crisis confronting the society in view of impending climate change. He hoped that collaboration between Indian and US universities and research institutes will continue to jointly tackle serious global problems. In his inaugural address, The Chief Guest, Dr A.K. Singh expressed his satisfaction with the achievements and success stories emerged under AKI projects on water management. He believed waste water to be a major resource for irrigation in the country and stressed the need for developing interventions for its safe use in agriculture. He also highlighted the need for developing effective rainwater harvesting and groundwater recharge technologies for different agro-ecological regions of the country. Dr. K. Lal co-ordinated the inaugural session and Dr S.K. Kamra, Head, Division of Irrigation and Drainage Engineering proposed a vote of thanks.



A look at the experiments at CSSRI, Farm

Inaugural function

Technical Session-I
Chairman: Dr. A.K. Singh, DDG (Natural Resource Management), ICAR, New Delhi
Rapporteur: Dr. Pradip Dey, Principal Scientist, CSSRI, Karnal

The overview of AKI project was presented by Dr. K. Lal. He mentioned that the AKI Project on Water Management was conceived in a workshop held at NASC, Delhi on September 20–22, 2006 to develop technical programme, identify partners, planning research activities and identifying funding source. As a result of that four subprojects, viz., Water Harvesting for Ground Water Recharge and Biodrainage for Salinity Control; Sustainable Water Resources Management; Information and Communication Technologies for Efficient Water Management and On-farm Water Management for Rain-fed Agriculture on Benchmark Watersheds in Diverse Eco Regions of India were formulated. He discussed the objectives, expected out come, progress made during the period, conference/workshop organized in India and USA, future targets and centre-wise financial status in each of the four projects. He also informed that First Review and Planning Workshop of the Indo-US AKI project was held on 18th January 2008 at CSSRI, Karnal.
Dr. Lal enlisted in his presentation about the launching and other subsequent workshops organized at different centres in India and USA. He also mentioned about the establishment of three distance learning classrooms at PAU, Ludhiana, UAS, Bangalore and GBPUA&T, Pantnagar which were used to teach two courses viz., '*Landscape Hydrology and Water Quality'* and '*Water Economics, Marketing, Conflicts, and Policies'*. Other achievements include admission of 7 students in postgraduate sandwich degree program and research programme of two US students carried out at CSSRI, Karnal from May 24 – August 25, 2008.

Project 1: Water Harvesting for Ground Water Recharge and Biodrainage for Salinity Control

The Indian partners include UAS, Bangalore, PAU, Ludhiana, GBPUA&T, Pant Nagar, CSSRI, Karnal while the US Partners were Iowa State University, Illinois State University, Purdue University, Cornell University, Ohio State University, Texas A &M University. The first workshop of the project was held at UAS, Bangalore during 13-14 March 2007 to plan the programme and research activity and subsequent workshop at IOWA State University from 22-23 February 2008 to review the progress and incorporate changes for further improvements.

Centre: GBPUA &T, Pant Nagar
Dr. K.K. Singh presented the salient achievements which include development of smart class room, installation of biofilter jointly by US and Indian students to remove the contaminants for improving the quality of water and monitoring of biomaterial for filtration properties through laboratory trials. He, however, mentioned that the biofilter could not be evaluated under field scale since there was hardly any rain during the year after installation.

In the discussion, Dr. Gurbachan Singh suggested that testing could have been evaluated by runoff generated through artificial rain/irrigation. Dr. K.K. Singh pointed out that since the installation is already there in place, he will take observation in future without any additional financial support.

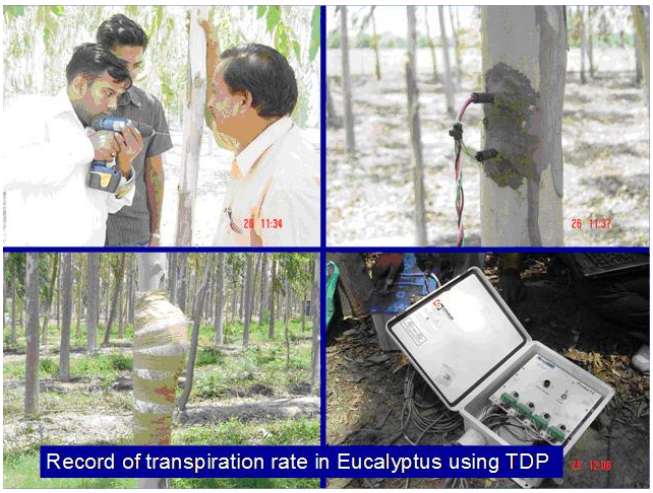
Centre: PAU, Ludhiana

Dr. M.P. Kausahal presented the salient achievements which include establishment of distant learning class room, development of course curriculum for M. Tech. Soil & Water Engineering, M. Tech. Hydrology and Water Resources Engineering and M.Sc. Soil Science. He informed that initially five students enrolled in master's sandwich degree program during July 2007 and ultimately three students were left who visited three US Universities, Iowa State University, University of Illinois and Purdue University for conducting part of the Master's research for one semester. A two credit course on Landscape Hydrology and Water Quality was taught by Dr. Ramesh Kanwar, Professor ISU, Dr. Prasanta Kalita, University of Illinois and Dr. Rabi Mohtar, Professor Perdue University using distance learning classroom from December 24-28, 2007 which was attended by six students. The course contents of Water Resource Economics course existing in PAU were revised by Dr. Arne Hallam Prof. & Chair, Iowa State University and Dr. Nagraj, Professor from UAS Bangalore by incorporating the international water laws and policies. Water harvesting and groundwater recharge studies were also conducted at Chohal Dam, Hoshiarpur, Punjab.

During discussion, Dr. Mittal pointed out that revision of course curricula is required since it was done in 2007 for the first time. Dr. M.P. Kaushal and his group may provide necessary input and experiences with newly developed and introduced courses to Dr. Mittal.

Centre: CSSRI, Karnal

Dr. K. Lal presented the salient achievements made at CSSRI, Karnal. He briefed about the experiments established on biodrainage capacity of Eucalyptus produced from clone and water use in potential industrial crops for the efficient use of wastewater in agriculture. He presented the tree performance, water use and fluctuation in water table due to application of wastewater at irrigation depths: cumulative pan evaporation (ID:CPE) ratio of 1.0, 2.0, 2.5 and 3.0. No definite trend of water table fluctuation was recorded from treatments. Average maximum daily transpiration rate of 113 l/day was recorded in low density 8 year old Eucalyptus plantations (163 stems/ha) during May irrigated at 1.0 ID:CPE. It was followed by 98 and 42 l/day in recommended density (517 stems/ha) and high density (1993 stems/ha), respectively. In another biodrainage study at Puthi, Hisar (Haryana), the average draw down of 85 cm was recorded due to plantation during the period April 2005 to April 2008 (5 years and 4 months old). He informed the house that ID: CPE>1.2 reduced marigold biomass. Amongst the different crops, *Salvia aegyptica* (Tukham Malanga), which produced higher biomass per unit area with the application of water at ID: CPE of 1.5 and required comparative less water to produce one unit of dry matter seemed to be suitable candidate for waste water use. Research work of Graduate student Stephen Anderson from University of Illinois and training programme of McDaniel Rachel undergraduate student from Iowa State University was also conducted at CSSRI, Karnal from June to August 2008.



During discussion, Dr. A.K. Singh suggested to ascertain at what level the toxic metal is excluded by different plant parts i.e., whether it is at root or shoot or leaf level in oil yielding plants.

Centre: UAS, Bangalore

Dr. N. Nagraj could not attend the meeting as he was in Japan. The progress from UAS, Bangalore could not be presented.

Presentations by Students

Steve Anderson, UIUC, USA: During attachment at CSSRI, he worked on extent of heavy metal pollution in soils caused by wastewater use at Panipat. He also conducted column studies to study the efficacy of low cost amendments like saw dust, charcoal, press mud, rice husk and gypsum for the removal of toxic metals from the wastewater. The analysis has already been done. However, it is being verified from another set of analysis presently.

Harsimran Kaur, PAU, Ludhiana: Title of the thesis was "Impact of climate change on crop yields in the maize-wheat cropping system in Punjab, India". It was observed that crop yields are likely to increase in future due to "CO_2 effect" but the increase in temperature due to global warming could decrease the crop yields. If negative effects of temperature rise outweigh the positive effects of CO_2, then increased frequency of irrigation may help in improving the crop yields.

Sanku Datta, PAU, Ludhiana: Title of the research work was "Analysis of agricultural N budget for row crop production in a subsurface drained watershed in Midwestern US". It was observed that major inputs of N for corn and soybean were fertilizer application and mineralization, respectively. Yearly corn and soybean N balances were ranged from 44 to 213 kg/ha and + 14 to – 96 kg/ha, respectively. Results indicate that soybean utilized most of the soil mineralized N whereas corn added extra nitrogen in soil. Need to reevaluate fertilizer application rates without affecting crop yields. Cropping management has significant effects on nitrate-N concentration in ground water.

Brief reports by US delegates

Dr. Kalita in his remarks emphasized that building of collaboration is very important and it needs to continue beyond the project period. He also pointed out that stimulating thinking process is very important in teaching.

Dr. Kanwar in his remarks told that the project has given wonderful opportunity to bring US scientists to India. He also mentioned that in 2050 we need to increase food production by 100% hence International collaboration is very important. He also urged scientific community to think big. He also commended current initiative of ICAR to introduce International Student fellowships for mutual exchange of Indian and US students.

Project 2: Sustainable Water Resources Management

The launching Indo-US workshop was held on March 5–9, 2007 at ICRISAT, Patancheru, Andhra Pradesh to discuss various issues regarding water resources management through collaboration between the US (University of Florida, North Carolina Agricultural and Technical State University) and India (IARI, New Delhi, ANGRAU, Hyderabad and PAU, Ludhiana). Subsequently, another workshop was held at University of Florida, USA during July 16 – 20, 2007.

Centre: IARI, New Delhi

Dr. (Mrs.) Ravinder Kaur presented the salient achievements made at IARI, New Delhi. She estimated background levels of heavy metal concentrations in soils, water, plants and food at the project site at Ujjina village in Mewat district of Haryana. The main reason of contamination pointed was the irrigation from Gurgoan canal or polluted water. To overcome the contamination, a structure (20x80 m^2) is being constructed at Ujina, Mewat (Haryana) and the efficiency of indigenous vegetation to remove the heavy metals will be tested. The main purpose of the study is to provide a local (de-contaminated) irrigation water resource, motivate/acquaint farmers with best (low cost) irrigation water management strategies and improve quality of natural resources and the crop productivity/ aquaculture in such degraded areas. She also established meso-cosum at IARI, sewage plot side to assess quality of wetland filter material for determining optimal hydraulic retention times and screening appropriate wetland vegetation.

In his concluding remarks, Chairman Dr. A.K. Singh narrated that wastewater generation will be much more in the days to come and we need focussed low cost technology for these wastewaters. He shared that he is very happy with the progress as wastewater use in agriculture has been focused in the programme. He emphasized that the points raised by Dr. Kanwar about the need of maintaining the collaboration emerged out of the project is very important. Dr. Mittal thanked all the participants and emphasized the need of about teaching methodologies and orientation modules for fresh teachers. He felt satisfied with the overall progress made under this project.

22nd July 2009

Technical Session-II
Chairman: Dr. Gurbachan Singh, Director, CSSRI, Karnal
Rapporteur: Dr. Pradip Dey, Principal Scientist, CSSRI, Karnal

Centre: ANGRAU, Hyderabad
Dr. M. Devender Reddy presented the salient achievements made at ANGRAU, Hyderabad. A base line survey was conducted to assess practices for improved water management in Kothakunta Watershed, Wargal, Medak district of Andhra Pradesh. Social & gender issues in farm management for improving groundwater security were also studied. He recorded that women are more concerned about social livelihood issues like education and adequate health care for their children, bus routes to town for easier access to markets, and clean and abundant water for domestic use. A total 39 soil profiles were morphologically characterized and prepared a soil map of 500 ha. Majority of soils were found to be red sandy loam or loamy sands and their bulk density ranged from 1.31 to 1.81g/cc. The soils were slightly acidic to moderately alkaline in reaction and non saline. DEM development from local survey data for use in SWAT model also completed. He also monitored the level of ground water and surface water bodies. Studies related to quantification of water, energy, and nutrient balances, yield and economic return for traditional cropping systems currently were initiated in Wargal watershed.

Centre: PAU, Ludhiana
Dr. S.K. Jalota discussed the progress made under the project at PAU, Ludhiana. Two students from the University for their Doctoral Research Programme visited Department of Agricultural and Biological Engineering and Department of Soil and Water Sciences in University of Florida, USA. To customize DSSAT model, experiments on effect of transplanting date, irrigation schedules on yield and water balance of medium and short duration varieties, interactive effects of drainage period and nitrogen levels on crop productivity, water and nitrogen balance and methods of sowing and irrigation schedules on yield and water use in rice were conducted in Birmi village of Ludhiana and Jodhpur of Bathinda districts. The relevant data for customising the DSSAT model with respect to meteorological soil and plant parameters were collected. He observed that longer duration variety PR118 gave highest mean grain yield than medium duration PR 111 and short duration PR 115 and also found lower evapo-transpiration and higher water use efficiency with later transplanting (June 25 and July 10) than earlier transplanting (May). Nitrogen application increased the grain yield in all varieties up to 300 kg N/ha, however the

response declined at higher levels for medium to short duration varieties like PR 111 and PR 115.

Project 3: Information and Communication Technologies for Efficient Water Management

An opening workshop of the project was organized at ICRISAT, Patancheru, Andhra Pradesh from March 5-9, 2007, which was attended by all the co-partners of the project (ICRISAT, Hyderabad; ANGRAU, Hyderabad; TNAU, Coimbetore; CSWCRTI, Regional Centre Chandigarh; PAU, Ludhiana and University of Florida) in order to develop jointly the project themes and specific e-learning needs. A visit to University of Florida was made to attend training cum workshop and participation in the development of Reusable Learning Object (RLO) as a part of Joint Indo-US Project from February 2 to 24, 2008 in the Soil and Water Science Department, University of Florida. Another workshop was arranged at ICRISAT, Hyderabad from 5 – 9 March 2007. Total 39 reusable learning objects on Water Management were proposed and 17 were developed at the workshop held at University of Florida by both the Indian and US partners.

Centre: ICRISAT, Hyderabad

Dr. V. Balaji from the centre could not participate in the meeting due to his prior engagements therefore, the progress from ICRISAT could not be presented in this workshop.

Centre: ANGRAU, Hyderabad

Dr. M.D. Reddy briefed the house about the progress for the year 2008-09made at ANGRAU, Hyderabad. He told the house that following e-learning material/RLO were developed at ANGRAU, Hyderabad.

- Remediation–Reclamation of salt affected and water logged areas in irrigated agriculture
- Irrigated agriculture –Efficient Water Management in rice
- Soil and Water use/conservation management –Participatory water
- Human dimension of watershed management –Participatory watershed management
- Water resources – Micro irrigation for vegetable and commercial crops

Dr. Gurbachan Singh, enquired about the specific RLOs developed and material available so that it can be used for teaching aid, extension activities for the farmers and can be submitted to Dr. R.K. Mittal (ADG), ICAR. Dr. Reddy promised to send the material available in form of compact discs and hard copies also for 4 RLOs developed to CSSRI, Karnal for further action.

Centre: TNAU, Coimbetore

Dr. N. Venkatesa Palanichamy presented the achievements made at TNAU, Coimbetore in brief. The main objective was to test the feasibility of ‘e-agriculture’ model of extension/technology transfer to the farmers in selected command areas of Tamil Nadu. During July 2007 the scheme was implemented in Palar sub basin by selecting five villages spread over five water users association covering 25 farmers. One field coordinator was appointed to offer technology transfer services between the experts and the farmers. Both soil and water sampling were done for all the 25 farms to analyze the soil and water status and providing the recommendations. Similar

model of e-agriculture was adopted at Aliyar sub basin also from May 2008. The same model of e-agriculture was also replicated at Varahanadhi sub-basin in Villupuram district of Tamil Nadu during July 2008. However it was felt to upscale the benefits of the scheme to more farmers and hence now the paid model of e-agriculture is being developed.

Dr. Gurbachan Singh requested Dr. Planichamy to submit the write up along with CD for record and submission to iCAR**.**

Centre: PAU, Ludhiana

Dr. Prabhjyot Kaur Sidhu, Agro-meteorologist briefed the house that a list of RLOs related to "Water Management" were identified and finalized in consultation with the team members from PAU, Ludhiana and other partners. She also told that following two RLOs have been submitted on "EcoLearnIT website" for peer review:

1. Best Management Practices for Soil and Water Use for Rice-Wheat Cropping System of Punjab by Prabhjyot K. Sidhu & Romesh Khera
2. Soil Moisture Measurements by Romesh Khera & Prabhjyot K. Sidhu

She demonstrated these RLOs using multimedia and also submitted the copies of that in form of CD. It was also informed that third RLO on 'Measurement of irrigation water, importance, methods and measurement devices' by A K Jain and Samira Daroub has also been posted on "EcoLearnIT website".

Centre: CSWCRTI, Research Centre, Chandigarh

Dr. Swarn Lata Arya presented the progress made at CSWCRTI, Research Centre, Chandigarh. It was told that a village named Sambhalwa, District Ambala, in Shiwalik foothill region of Haryana was selected to establish Village Knowledge Centre to impart training and provide the information related with agriculture, animal husbandry, and optimum water allocation to enhance productivity of crops. A Content Management System has been developed in Hindi (local language) to address the need for demand driven and value-added information for the use of local farming community, which is time specific and location specific. Consequently, a web site has been prepared and registered under the name. **http://www.gsgk.org.in**. The web site is under progress and is being updated. Following was list of RLOs developed at CSWCRTI, Chandigarh.

- Participatory Watershed Management
- Water Users Association
- Soil and Water Conservation
- Gender Dimensions in Natural resource Management.
- A Successful Case Study of Water Users Association in Shiwalik Foothill Village-Haryana, India.

The information on crops, animal husbandry, soil and water management, cottage industries, success stories, marketing, about the project and problems and solutions were developed in Hindi and presented in the house.

Dr. Gurbachan Singh pointed out that an excellent progress has been made under this project and these e-communication technologies should be shared with the farmers for solving location specific problems.

Project 4: On-farm water management for Rainfed Agriculture on Benchmark watersheds in diverse eco regions of India

A two-day workshop was organized during February 2007 at NASC complex, Pusa, New Delhi to discuss the details of work plan. The collaborators from Ohio State University, USA; PAU, Ludhiana and JNKVV, Jabalpur along with the representatives from ICAR New Delhi participated in it. A detailed discussion about the problems of the Kandi area and Jabalpur, M.P. were discussed and programme formulated.

Centre: JNKVV, Jabalpur

Dr. A.K. Bajpai presented the progress of the centre. Under this project a detailed benchmark survey involving characterization of physio-chemical properties of soil, socio-economic status, present agricultural practices, constraints (bio-physical and socio- economic) was carried in micro-watershed in Sihora, Jabalpur, Madhya Pradesh. Interaction with farmers was made which helped in formation of water user groups and identification of constraints. Procurement and installation of runoff and soil loss measuring devices has also been partially completed. Execution of on-farm water management experiments with treatments like systems of rice intensification (SRI) in rice and border irrigation in *rabi* crops in terms of agronomic productivity, economic profitability and social acceptability of RMP's for watershed management were executed. The targets related to runoff and soil loss data and testing and validation of models have not completed fully and are under progress.

Centre: PAU, Ludhiana

Dr. K.L. Khera presented the information on topography, run off, climate, major problems of the watershed and socio-economic constraints, availability of water and soil health problems of the Kandi Watershed, Punjab. Different aspects like soil erodibility factor k as effected by land use, particle size distribution, water retention characteristics, soil aggregation, soil fertility status, land holding, input use pattern and soil and water management practices followed in the watershed were also discussed. Results on field studies related to develop the agro-horticulture model and establishment of the vegetative barrier to control soil erosion under rain-fed conditions of lower Kandi were also presented.

The PI requested for the extension of the project with out financial liability.

Financial Status:

Assistant Finance and Account officer, CSSRI, Karnal presented the consolidated financial report of the project and pointed that the audit utilization certificate and statement of expenditure from 4 centres (Dr. Nagraj, UAS, Bangalore; Dr. K.K. Singh, GBPUA&T, Pant Nagar; Dr. P.K. Sidhu, PAU, Ludhiana and Dr. Planisamy, TNAU, Coimbetore) have not still submitted to the nodal officer. However, the relevant information was submitted by all the centres except UAS, Bangalore and GBPUA&T, Pant Nagar. Dr. K. K. Singh assured to supply the requisite information as the earliest possible.

Chairman's Remarks:

The chairman was happy about the progress made under the Indo-US AKI project. He informed that the final report of the two already concluded projects may be submitted by August 15, 2009. He also stressed that report should incorporate the information on the aspects like human resource development, student exchange, extension aids, research activities, constraint faced and suggestion for future collaboration and it should not exceed 10 pages. One page executive summary with good coloured photograph, budget statement for all the years should also be included in the report. He was of the view that this type of collaboration should continue in future also and success stories coming out of the project should be documented.

Success stories of this US-India partnership – an open discussion: It was felt by the house that programme was very successful. It was also agreed by DDG Dr. A.K. Singh and ADG Dr. R.K. Mittal on the opening day itself. The success stories have already been discussed in form of achievements under the respective project presentations.

US-India AKI on Water Management: What Next

Dr. R.S. Kanwar informed that the US Government may spend some money in the agricultural research under competitive grant. USAID may be available for the Northern States like U.P., Bihar etc. which have progressed comparatively less. Dr. P. Kalita, Professor of Soil and Water Engineering from University of Illinois informed the house about the programme 'Basic Research to Enable Agricultural Development (BREAD) jointly supported by NSF and Bill & Melinda Gates Foundations. The funding could be to the tune of 20 millions US dollars. He exhorted the scientist to make the collaborative research programme on the basic research aspects like enhance yield or the nutritional contents of crops important to small scale farmers, enhance resource use efficiency, to fight against the emerging threats due to global climate change etc. In his closing remarks the chairman pointed out that consortium need to be continued even after the project period in one or other form.

At the end of the workshop, a vote of thanks was presented by Dr. K. Lal.