CONCLUSION OF THE 2006 TASAE

OVERVIEW

The 2006 TASAE was held from November 7-14 and had participants, country representatives, each of whom delivered their country reports. The representatives were Engr. Abdullah Aini (Afghanistan), Dr. Mark E. Grismer (USA), Dr A M M Motaher Ahmed (Bangladesh), Dr. Wei Zhang (China), Dr. Asis Mazumdar (India), Dr. Sixto A. Valencia (Philippines), Dr. Nuchanart Sriwongsitanon (Thailand) and Dr. Kingshuk Roy (Japan).

PRESENT SITUATION

Present situation on the utilization and conservation of water resources from the global points of view and the role of agricultural education today.

Afghanistan

<u>Executive Summary:</u> Afghanistan is landlocked country in central Asia having arid and semi-arid climate with precipitation from 75 mm per year in the plain to 1,170 mm in the highland area. Forests cover only 2 % of the country and de-forestations is going rapidly and if precautionary measure will not be taken, after 15 years the country will have a little forest. To measure natural resources of the country, the government established 31 stations for collection of meteorological information and 140 stations for water stage recording on different location of the country. Out of 140 water stage stations, 40 were selected for sediment transport measurement.

Water is a precious material for human being in different uses as domestic, industries and increasing of agriculture products. Water utilization in Afghanistan is mostly for agriculture and about 85 % of the country crops produced under irrigation systems. Irrigation system in Afghanistan is mostly in traditional method and distributes water on traditional ways as common in the country. 84.6 % of irrigation water is tapped from rivers. 7.9 % and 7 % of irrigation water tapes water from springs and Karezes respectively. A small amount (0.5 %) of water is tapped from Arhat (dug wells).

Due to 25 years conflict in Afghanistan all infrastructures including irrigation related structures are damaged or completely destroyed. After 1980 there is no any information about water resources in the country. From other side the country is suffered from continuous drought during the last six years. Ground water dropped down considerably and affected Karezes and dug wells to dry. It is worth mentioning that all related reports to water resources are due to 25 years of war.

After the new elected government in 2001, the government gave first priorities to security and communication system in the country and rebuilt 2,500 Km of pre-war paved highways. Less work on rehabilitation of natural resources has been done so far. As per reports prepared by FAO and the ministry of water and power under Afghan government, the total precipitation in the country is 180,000 million M^3 (150,000 million M^3 from snow and 30,000 million M^3 from rain). Meanwhile the total discharge of all rivers is 84,000 million M^3 (47 %) of the total precipitation in the country.

A total of 12 % of the country land is arable, where only 50 % of this area is irrigated per year due to shortage of water for irrigation and other 50 % will be irrigated next year. Out of total discharge produced in the country, only 55,000 million M^3 (65 %) is used within the country. The remaining is going out of the country. According to the ministry of water and power report, a total of 2,000 million M^3 is used for domestic water supply.

There are limited number of reservoirs to store water for irrigation and power generation. The government has to develop a long-term strategy to manage water resources and reduce drought effect on agriculture. The strategy should focus on increasing water capital and making better use of water. The strategy should include (i) water harvesting and watershed management, including more water reservoirs (small and large), (ii) effective control on ground water utilization, (iii) better information system on water availability, (iv) eliminating unsustainable land use practices, (v) improved intake structures and corresponding on-farm water management, (vi) Management transfer of state owned schemes, (vii) extending the irrigated command area. The geographical situation in the country is such, where water is available, there is no enough land for irrigation and where land is available there is no water to fulfill irrigation requirement.

Key words: Afghanistan, water resources management, water available and utilization, irrigation system, water conservation and water law._____

USA

Abstract

As elsewhere in the world, anticipated population growth in the next 50 years, climate change and reduced surface water availability, water "productivity", or water use efficiency (WUE) must continue to improve in the American Southwest. Beyond the intrinsic value to life, water takes on additional value as food and fiber, fisheries and ecosystem benefits that are linked such that emphasis of one over the other benefit often results in losses neglected in the past. For example, development of upstream water storage exchanges downstream fisheries and ecosystems benefits for crop production, while reservoir evaporation losses further reduce possible downstream resource values. Unlike WUE improvements in the municipal sector, possible through metering and technological changes in flow devices and washing appliances; improved WUE in crop production is hampered by unidentified achievable water use targets. In terms of water use, the dominant crops in the Southwest are alfalfa and sudangrass hay and cotton lint production. The water use characteristics, average planted areas and yields, and water values are examined for these crops in Arizona, California and Idaho to determine possible target WUEs and assess possible on-farm water savings in the region based on actual production information from 1988-2000. Field-based WUEs of 1.7, kg/ha-mm for alfalfa and sudangrass hay and pima cotton, and 2.1 kg/ha-mm for upland cotton lint production appear to be practical target values from which to determine appropriate water use. Based on FAO #56 estimated and yield-based water use for these three crops, possible water savings of up to 50% exist with the greatest water savings potential in desert regions where current water values as hay or lint crops are low relative to other regions. Such high water savings in the desert region are unlikely and targets of 20-30%

corroborated by research trials, are more likely. The greatest water values and least possible water savings occur in the southern San Joaquin Valley, CA where the combination of relatively high ET and some rainfall occur. This research is a starting point for assessing water use/savings at the field scale for hay and cotton productions and should be extended to other crops. Additional work may also be required considering water savings at the district scale associated with the water distribution systems.

Keywords: alfalfa hay, cotton, water use, water conservation, and water value

Bangladesh

In agro-environmental practice water resources play key role over the other variables. Bangladesh is located at the lower riparian country of the three major internationally famous rivers and the management and development of water resources of the country is completely dependent on the availability of water from these transboundary rivers and rainfall distribution round the year. It has been recognized that Bangladesh experiences water shortage in the dry season and water abundance in the wet season, which disrupt significantly the agro-environmental practices and socio-economic activities of the country.

These are two major conflicts in water resources management of the country. These two major conflicts can be overcome by conserving required amount of water in the wet season by building more barrages across the rivers as well as by dredging or by developing the rivers and spilling additional amount. The water conservation practice in Bangladesh still needs attention, as the country is geographically dislocated. Moreover, cooperation among the co-basin countries is necessary for

sharing of Transboundary river flows. Efficient water and flood management and assured shares of the dry season flows of the Transboundary Rivers have become imperative for the survival of Bangladesh. Interception of flood waters by upstream storage is crucial need for augmentation of dry season flow, power generation, comprehensive development and harnessing of water resources of Bangladesh.

Keywords: water demand, water supply, water conservation, water utilization, agro-environmental

China

ABSTRACT

The problems of water resources and water supply related nearly every country of the world. China is one of 13 countries, which face the most serious condition in water resources shortages. The water resources must be saved, conserved and well managed, and then the water supply will be sustainable. When constructed the hydro- engineering, the eco-systems interaction must be concerned. The cooperation, experiences and fund are the basic aspects for the water resources management.

Key Words: water resources   water supply   hydro-engineering   management

India

Summary:

India is facing the increasing water stress due to population growth, increase in

water demand, vulnerability from climate change and deterioration in water quality from domestic as well as industrial and agricultural pollution load. India occupies about 2.45% of the world area and has a share of 5% of global fresh water resource and with this share of vital natural resources about 16.87% of the world population is to be catered. Currently the population of India is little over 1 billion and it is expected that it will reach a figure of about 1.5 billion by the year 2050. The water availability per capita per year at present is 1730.6 CM (m^3) and has almost reached to the water stressed (<1700 CM) condition.

Despite the tremendous economic development and growth of industries and service sector, the livelihood of about 68% of Indian population depends on agriculture directly or indirectly. More than 70% of its population lives in rural areas although there is an increasing trend of urbanization in the last two decades. The irrigation water accounts for about 90% of the total water resources utilization. India stands at a cross roads in institutional options for natural resources management at local and village levels. The emphasis on future options like watershed development through participatory approaches coupled with sustainability issues is now widely recognized as a potential approach for vitalizing the rural economy.

Climate variability in India in terms of rainfall and temperature, has noticeable spatial and temporal variations. Even after achieving full irrigation potential from surface and sub-surface water resources, a major portion of cultivated area shall remain rain fed. Furthermore, the conditions may deteriorate in terms of severity of droughts and intensity of flash floods under the climate change scenario. In this article different measures followed for soil moisture conservation through rainwater harvesting on watershed basis in problematic Laterite, coastal saline and hill zones of West Bengal a state of India are discussed.

Although in recent years, both Government and Non-Government Organizations have stepped up their efforts in water conservation by rainwater harvesting on watershed basis through participatory approach, the Government of India's Commitment to Participatory Irrigation Management (PIM) with the help of Water Users Associations (WUAs) needs to be strengthened through adoption of its framework from state level down to village level. It is important to highlight the key factors in structural framework as well as in the operation domain of PIM involving WUA in the Indian perspective.

Keywords: Watershed, PIM, WUA, Rainwater Harvesting, Rain fed Agriculture

Philippines

SUMMARY

This paper highlights the importance of water, water resources in the Philippines, the oil spill in Guimaras Island, the super typhoon "Milenyo"(Millenium), and the significant role of environmental engineering education in water resources conservation and wastewater management.

Keywords: Education, Environmental Engineering, and Water Resources Conservation

Thailand

Abstract

Water and other natural resources of Bung Boraphet Wetland in Thailand have been under increasing pressure from over-exploitation. Sustainable management and 'wise-use' of the Wetland's resources require achieving a balance between economic exploitation and conservation. Scientifically based decision support tools are vital to gain better insights into the complex interactions between the large wetland system, its contributing catchments and floodplain, and then pave the way for planning effective long-term management. This paper presents a summary of several decision support tools that we developed for Bung Boraphet. The tools are: (a) Water budget predictive model, (b) Land-use analysis using satellite imagery, and (c) Database linked Geographic Information System.

From a review of literature and field studies, we identified the factors, which are having the most serious impacts on long-term sustainability of Bung Boraphet. We also conducted field studies to collect primary data on hydrological parameters on the lake between December 2002 and May 2006. These, and available secondary data, were then used to develop a model for the daily water budget of the Wetland. Model calculations and observed water levels are highly correlated for this period, proving the veracity of the model. Evaporation loss of water is a critical factor during the dry seasons (~ 41% loss), as is extraction for irrigated rice grown in encroached areas around the lake (~55% loss). The modeling tool allows the analysis of different water use scenarios. For instance, the model forecasts that even if the weir height is raised by 0.5 m to the level of +24.5 m (MSL), as has been suggested by some stakeholders, irrigation water abstraction has to be reduced by 35 % of the current consumption, to maintain the recommended minimum water level (+23 m, MSL) for sustainable fishery.

Insights into land use change in the surrounding catchments and lake were gained by a series of Land sat 5-satellite imagery. A comparison of imagery shows that between 1993 and 2003, the irrigated area surrounding the lake doubled. At the same time, the submerged and emergent vegetation in the lake declined by 50%. The database linked GIS, which was developed, includes meteorological data and primary and/or secondary data on hydrology, water quality, and biodiversity of the lake and its catchments, and covers the main rivers and their tributaries. Information from applying the decision support tools has stimulated discussions with key stakeholders, identifying the ‘wetland values’, which need protection, and the economic, environmental, and social goals that need to be met by a future Plan of Management. As discussed in this paper, we have made a significant difference to the nature of the discourse in progress regarding managing Bung Boraphet by demonstrating the value of basing wetland management decisions on scientific grounds. The POM, which is being developed, is expected to receive multiple stakeholder support, so that Bung Boraphet’s resources can be sustained for the use by present and future generations.

Keywords

Wetland, Bung Boraphet, Decision Support Tools, Water Budget, Satellite imagery

Japan

Abstract

Although Japan is well known as an industrialized country rather than an agricultural one, agriculture is treated as a very important sector for its cultural and environmental perspectives. Only 15% of Japan's land is suitable for cultivation, but the agricultural economy is highly subsidized and protected. With per unit area crop yields among the highest in the world, agriculture sector still dominates the major part of water use (65%) in Japan followed by domestic and industrial uses (20% and 15% respectively). Like many other monsoon Asian countries, rice is the staple food in Japan, and paddy fields and terraces are often referred to as the country's cultural and environmental indicators. This paper outlines the condition of water resources and their relations to some major agro-environmental issues in Japan.

Keywords: water use, water pollution, surface runoff, agro-environment, agro-ecosystem.

2006 TASAE –Summary/Comments
Water Sustainability & Agro-Environmental Education

Introduction

Following the interesting and insightful presentations by representatives of the eight countries represented at the Seminar, there was considerable discussion about the common problems or issues faced in each country as well as possible solutions or directions that may improve effective utilization and sustainability of their water resources. Often the water resources problems vary by degree from country to country depending in part on their geographical location and climatic conditions, or simply the relative economic resources available and government stability. In nearly all countries meeting the needs of increasing populations or economic growth combined with the effects of climate change on available water resources and quality (e.g. salinity problems for coastal areas) was a critical issue requiring greater government attention, effective monitoring and resources.

Some Common Problems/ Issues

Problems and concerns associated with available water resources appear to be presently declining in some areas, but will only increase towards 2050 as populations grow. Management of water resources and quality becomes increasingly critical in all areas; technically, socially, economically and politically. Additional education and training at all levels of stakeholders is needed.

Water availability and quality variation spatially and temporally needs additional investigation, attention and quantification, that is, greater monitoring especially in the face of climate change. Water quality concerns should focus these efforts.

Government regulation and oversight is needed to facilitate and ensure equitable distribution of water resources to meet all needs (agricultural, municipal, industrial and environmental). This may require transfer of some management and control to local groups, or greater "empowerment" of water resources users to better ensure adequate water availability and water quality.

Flood management strategies may need to evolve to include release of both water and sediment to maintain or restore downstream riparian/wetlands and possible enhancement of downstream agricultural development. Such strategies must be studied and considered carefully so as to not degrade downstream soil and water quality or create additional health risks to poorer areas as a result of delivery of contaminated water and sediments.

Adaptive management, combined with science-driven effective monitoring of water resources and quality, is now required. Water management and policies ought not to be driven simply by historical precedent, local politics or economic pressures alone, rather they should evolve as knowledge levels increase and monitoring information can be incorporated so as to better direct management and policy.

<u>Classes of Water Resources Utilization Considerations</u>

Country representatives developed five broad classes of water resources utilization considerations, below which several sub-themes of concern can be listed. While perhaps not all-inclusive, these “classes” provide some context for discussion of obstacles and possible solution trajectories that might be developed to meet local conditions particular to each country. The broad classes might be labeled as below and include:

1. **Environmental Concerns –**
    a. Water distribution, spatially & temporally
    b. Water quality including salinity and potability
    c. Environmental degradation and loss of quality human and wildlife habitat
    d. Non-point pollution, erosion and sediment transport from agricultural sectors
    e. Ecosystem and biodiversity problems

2. **Water Policy and Planning –**
    a. Water resources infrastructure
    b. Water quality management
    c. Trans-border water basin oversight and control
    d. Watershed management and water user associations
    e. Irrigation project efficiency and control
    f. Problems of groundwater overdraft and sustainability
    g. Disconnects between politically derived policy and science
3. **Water Resources Management –**
    a. Water resources infrastructure concerns
    b. Water distribution and availability across country
    c. Watershed management and water user associations
    d. Irrigation project efficiency and control
    e. Problems of groundwater overdraft and sustainability
    f. Better water use efficiency (WUE) in municipal and agricultural sectors
4. **Social, Cultural & Political Implications –**
    a. Water policy implementation equitability
    b. Watershed management and water user associations

    c. Problems with entrenched bureaucracies
    d. Encouraging stakeholder participation in watershed management
    e. Respect for and incorporation of local traditions & customs
5. **Research, Education & Training –**
    a. Improving public awareness of watershed & water quality concerns to all stakeholders
    b. Greater incorporation of science into local, regional and national water policies and subsequent management

<u>Common Solutions/ Recommendations as Organized by Class</u>

<u>Environmental Issues (Env)</u>

1. Stakeholders should always take active participation in the solution on equal footing recognizing their different perspectives and local empowerment.
2. Improving public awareness and knowledge is needed.
3. Water quality standards (ISO, WHO) must be adapted to and strictly enforced in each country.
4. Manage and reduce rates of habitat and biodiversity loss and decrease deforestation.
5. Effects of climate change should be considered.

<u>Water Planning & Policy (WPP)</u>

1. Stakeholders should always take active participation in the solution on equal footing recognizing their different perspectives and local empowerment.
2. Policy and planning needs to be informed by good science. Adaptive management of applied policies must be monitored and refined.
3. Watershed planning is required at the micro- level regardless of institutional boundaries.
4. Effects of climate change should be considered.

<u>Water Resources Management (WRM)</u>

1. Policy and planning needs to be informed by good science. Adaptive management of applied policies must be monitored and refined with increasing knowledge.
2. Integrated watershed management should be sustainable and acceptable.

3. Economical feasibility through satisfactory green accounting should be adopted and maintained.
4. Water pricing and WUE should be balanced.
5. WRM should be as widely integrative as possible including soils, rivers, crops, forests, fisheries, aquatic habitats, etc.
6. Effects of climate change should be considered.

Social, Cultural & Political (SCP)

1. Water policies and technology should be designed based on preservation of local cultural and traditional knowledge and characteristics (may require government subsidies and protection).
2. Link traditional cultural practices with water resources conservation.

Education & Training (E&T)

1. Stakeholders should always take active participation in the solution on equal footing recognizing their different perspectives and local empowerment.
2. Capacity building programs for all levels of stakeholders through available knowledge for sustainable water resources development and management.
3. Development and availability of a broad range of training materials across all educational levels should be considered.

Issue Class	Water Resources Problems	Country							
		Afghan.	Bang.	China	India	Japan	Phil	Thailand	USA
All	Technology Available?	H							
All	Lack of Funding?	H	H				H		
All	Avail. Data?	M	M						
WRM, Env	Water Distribution	H	H	H	M		L	L	M
WRM, WPP	Infrastructure/ Reservoirs	H	H					L	
SCP	Water Policy/ Implementation?	M	M	H	M	L	M	M	L

Env, WPP	Water Quality		M	M	M		L	L	L
E&T	Education/ training	H	M	H			L	M	
E&T	Public Awareness	M	H		H		L	M	L
WRM, WPP	GW Overdraft	H	L	H	M		M	L	M
WRM, WPP, SCP	Inst. WUA development issues	M			H			M	
WPP, SCP	Trans-border Basin Management	H	H		L				
SCP	Stakeholder Participation User Empowerment				M	L	H	M	
SCP	Beauracratical Structure		L		M			M	
Env, WRM, WPP	Climate change	H	M		H	M	H	H	H
Env, WRM	Seawater Intrusion		M		M	L	L	L	
Env	Soil Salinity		L		H				
Env	Environmental Degradation		L	M	M	M	L	M	
Env	De-forestation	H		H	L		M	M	
E&T, WPP	Policy-science disconnect					L	M	L	
WRM	Water Use Efficiency.		L	H	M	L	L	M	
WRM, WPP	Irrigation. Project Efficiency	H	H	M	M			M	
Env	Non-point pollution		L	H	M	H	L	M	
Env	Erosion, sediment transport	H	H	H	H	L	H	M	M
Env	Agro-industrial								
Env	Eco, bio-diversity		L		L	M	L	M	

Water Resources Solutions	**Country**							
	Afghan.	Bang.	China	India	Japan	Phil.	Thailand	USA
Technology Available?	Foreign Aid							
Lack of Funding?	Foreign Aid	H				H		
Avail. Data?	Rebuild	M						
Water Distribution	Train & Rebuild outlets	H	H	M		L	L	M

Infrastructure/ Reservoirs	Rebuild	H					L	
Water Policy/ Implementation?	Integrate old & new	M	H	M	L	M	M	L
Water Quality		M	M	M		L	L	L
Education/ training	Capacity bldg	M	H			L	M	
Public Awareness	M	H		H		L	M	L
GW Overdraft	H	L	H	M		M	L	M
Inst. WUA development issues	M			H			M	
Trans-border Basin Management	H	H		L				
Stakeholder Participation User Empowerment				M	L	H	M	
Beauracratical Structure		L		M			M	
Climate change	H	M		H	M	H	H	H
Seawater Intrusion		M		M	L	L	L	
Soil Salinity		L		H				
Environmental Degradation		L	M	M	M	L	M	
De-forestation	H		H	L		M	M	
Policy-science disconnect					L	M	L	
Water Use Efficiency.		L	H	M	L	L	M	
Irrigation.Project Efficiency	H	H	M	M			M	
Non-point pollution		L	H	M	H	L	M	
Erosion, sediment transport	H	H	H	H	L	H	M	M
Agro-industrial								
Eco, bio-diversity		L		L	M	L	M	

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