PERFORMANCE REPORT (upto March, 2007)
OF
WORKING GROUP (WG-PQW)
ON
USE OF POOR QUALITY WATER FOR IRRIGATION

1. BACK GROUND

Progressive increase in salinization of agriculturally productive soils and waterlogging are the two main constraints of our Agriculture. Conversely, population is increasing at an alarming rate of more than 2% per annum. Due to limited water resources agricultural extension is almost impossible therefore intensive cultivation has become almost unavoidable to meet the growing food and fiber requirements. Available surface supplies in the country are insufficient to meet the crop water requirements and reclamation of salt affected soils. To supplement the existing inadequate supplies of good quality water, farming has the constraint to resort to the use of brackish water which has the repercussion of affecting physico-chemical properties of soil and crops yield. Unfortunately about 50% of the groundwater reserves are of hazardous quality and need careful use otherwise their sole use will render the land unproductive. In order to develop appropriate technologies for reuse of brackish water, some studies are in progress.

2. RESEARCH STUDIES

During 2006-2007, three studies remained in progress and are briefly described as under:

Study 1: Sustainable Re-use and Disposal of Drainage Effluent

Background

Gross reliance of Pakistan's GDP rests on agriculture and agriculture based goods, but unfortunately the problems of waterlogging, salinity/sodicity and inadequate supplies of good quality water are not only threatening the potential sustainability of agricultural production but day by day further aggravating with growing intensity. The national strategy involves large-scale drainage projects to control the problem of waterlogging and salinity; and augment the inadequate water supplies. The effluent of most of the drainage schemes, implemented so far, is being used to supplement the irrigation water after mixing and also being disposed of into rivers/streams. It is important to reduce the drainage effluent by promoting local use after adopting the appropriate technology. There is an imperative need to study the possibilities of using brackish drainage water for crop production, reclamation of salt-affected lands, and improvisation of the abandoned lands and reduction of disposal pressure of the drainage water.

Objectives

The broad objective of the study is to supplement the prevailing shortage of irrigation supplies with poor quality drainage water for crop production and rehabilitation of salt affected desolated soils. The specific objectives include:

- Safe and efficient use of drainage water for growing salt tolerant crop cultivars and tree species.
- Monitoring long-term effects of drainage water on soil characteristics and environment.
- Environmentally safe use of drainage effluent.
- Access to reduction in drainage requirements.

Practical Utility

- Development of technology for the use of degraded water and soil resources.
- More area under production.
- Reduction in drainage requirement.
- Socio-economic uplift of the farmers.

Status of the study

This study was initiated during summer 2005 on crops and trees. Soil data for infiltration rate, EC_e, SAR and other soil characteristics is being collected at the specified time. Tree survival and subsequent performance are also being monitored. Crop germination, establishment and yield under saline soil and irrigation with poor quality water is also being observed. The study has a duration of three years and will be concluded in June 2008.

Study 2: Role of Effective Micro-organisms (EM) in Soil Reclamation and Crop Production.

Background:

In Pakistan, the salt-affected soils are generally deficient in organic matter and plant nutrients. The deficiency of these can be overcome by adding organic matter and chemical fertilizers or by increasing the availability of nutrients through microorganisms. Although the Effective Micro-organism (EM) Technology is getting popularity among farmers, but the farmers still have some concerns about the efficacy and potential of this material over other sources. This

study has been planned to evaluate the role of EM in soil reclamation, impact on release and availability of plant nutrients and better crop production.

Objectives

Evaluate the impact of EM-material on physical and chemical properties of soil.
Evaluate efficiency in reducing the salinity hazard of poor quality water for increasing crop production.
Evaluate economics of different soil and water amendments.

Practical Utility

- Increased crop production.
- Low dose of fertilizer application and less production cost.
- Better environment.

Status of the study

This study was initiated during summer 2005. Soil data for infiltration rate, EC_e, SAR and other soil characteristics is being collected at the specified time. Crop germination, establishment and yield under saline soil and irrigation with poor quality water are being observed. The study will be completed in June 2008.

Study 3: Use of Saline Land for Community Livelihood (Trees, Grasses, Crops, Fish-ponds, Lives-tock and Honey Bees etc)

Background:

Forced irrigation system under arid and semi-arid climatic conditions in Pakistan has given rise to the problem of waterlogging and salinity over approximately 6.3 million hectares of land, including approximately two million hectares of highly productive agricultural land. Over the last three decades the primary agricultural regions have undergone severe losses in agricultural productivity due to progressive increase in soil salinity. Soil salinity not only affects the usual agricultural enterprise but also affects the environment, land use, water consumption, poverty and social status of local people. Since these areas are generally unfit for most of the crops included in the copping pattern of the area, special attention is required for the potential alternatives that ensure the food security, poverty reduction and improvement of environment and livelihood.

A comprehensive strategy for soil improvement and further salinization of soil is necessary. Growing of salt tolerant crops, trees, grasses and saltbush is the best mean of long-term salinity management. Salt tolerant crop cultivars have some promise for farmer income without opting for any tangible shift-over in the

production technology. Tree-plantation keeps the water balance both above ground and below ground by preventing saline groundwater moving to the soil surface by capillary pressure through the soil pores and evaporation.

Highly saline-sodic soils need heavy investment on reclamation interventions and leaching with good quality fresh water. Good quality canal water has assumed its maximum shortage while groundwater quality is generally poor and unfit for reclamation. To do with the situation, these soils can also be resorted for some non-conventional uses e.g. fish farming, apiculture, raising of livestock etc.

Objectives

The development objective of the study is to promote traditional and non-traditional agriculture for the best use of abandoned saline lands for improving community livelihood. The specific objectives are:

- Management of saline soils for traditional agriculture i.e. crops, trees and grasses.
- Management of saline soils for some non-traditional agriculture i.e. fish farming, apiculture and livestock production.
- Ensure livelihood and income to the farmers of salt affected areas.
- Economic evaluation and potential of different alternatives for handling the salt-affected soils.

Practical Utility

- Use of degraded soil and water resources for traditional agriculture such as crops, grasses and forage production.
- Use of degraded soil and water resources for non-traditional agriculture such as fish farming, livestock and bee farming.
- Restoration of abandoned land for agriculture and more production.
- Reduction in drainage requirement.
- Socio-economic uplift of the farmers.

Status of the study

The study was initiated during summer season of the year 2005 and will last up to June 2008. Sub-component wise status is given as under:

a. Salt tolerant crops, trees, grasses and salt bushes (Traditional uses of saline land)

Different irrigation and management practices are under trial on fodder and rice during summer and wheat during winter season. Salt tolerant fruit trees were planted in post monsoon period of 2005 with re-stockings in April 2006. Salt tolerant grasses and fodders were sown during Kharif 2006. Almost two years

data have been collected and study sub-component will be completed in June 2008.

b. Fish farming, livestock production and honey bee farming (Non-traditional uses of saline land)

Fish farming under farmer's control and IWASRI management is in progress for the last one year. Data collection under both the managements is in progress for subsequent comparative evaluation. Livestock survey of the adjacent farmer is also in progress. Apiculture is in progress since September, 2005.

All the scheduled activities like soil monitoring for EC_e, SAR, infiltration rate; yield estimation of crops and forage; yield assessment for fish and honey; and other related observation are being recorded as and when required.

3. PAPERS and REPORTS PREPARED BY IWASRI

Following papers and reports were prepared during the period under report:-

3.1 Papers

Bhutta, M. N., M. Iqbal and A. H. Shah 2006. Role of Salinity Management for Combating Desertification in Pakistan. Environment Day held in Pearl Continental, Lahore.

Shah, A. H., M. R. Chaudhry and M. N. Bhutta 2006. Bio-Saline Approach for Rehabilitation of Salt-Affected and Waterlogged Land in Pakistan. 11th Congress of Soil Science held in Islamabad during March, 2006.

Chaudhry, M. R., A. H. Shah, K. M. Subhani and M. N. Bhutta 2006. Role of Sulphurous Acid Generator for Amending High RSC Water and Reclaming Salt-Affected Soils. 11th Congress of Soil Science held in Islamabad during March, 2006.

3.2 Publications

Subhani, K. M., A. H. Shah and M. Iqbal. Use of Sulphurous Acid Generator for Treatment of Brackish Groundwater and Reclamation of Salt-affected Soils.

Sidhu, M., M. Iqbal and K. M. Subhani. Testing of RISTECH Material for Soil Reclamation and Management of Brackish Drainage Water.

Sidhu, M., M. Iqbal and K. M. Subhani. Evaluation of Agro-Magnetic Technology for Management of Brackish Water.

4. WATER QUALITY MONITORING

SCARP Monitoring Organization of WAPDA is monitoring surface and ground water quality through out Pakistan on five year interval basis. IWASRI has been and is involved in digitization of water quality data and preparation of maps.

FUTURE RESEARCHABLE AREAS

- Impact evaluation of brackish water on profile salinity and ground water quality.
- Participatory use of brackish water under saline agriculture.
- Sustainable water management practices for irrigated agriculture in fresh and saline groundwater areas.
- Impact of brackish water use on food and wood quality under different soil and climatic conditions.
- Fertilizer requirement in saline agriculture.
- Management interventions for higher water use efficiency.
- Secondary salinization due to irrigation with brackish water under different management conditions.
- Preparation of Master Plan for the re-use of brackish water.
- Dissemination of technology developed for the use of poor quality water for agriculture to the end users, especially the farmers.