III. PROTECTING FOOD AND LIVELIHOODS SECURITY THROUGH CONJUNCTIVE WATER MANAGEMENT: THE CHALLENGE OF GROUNDWATER GOVERNANCE IN PAKISTAN PUNJAB

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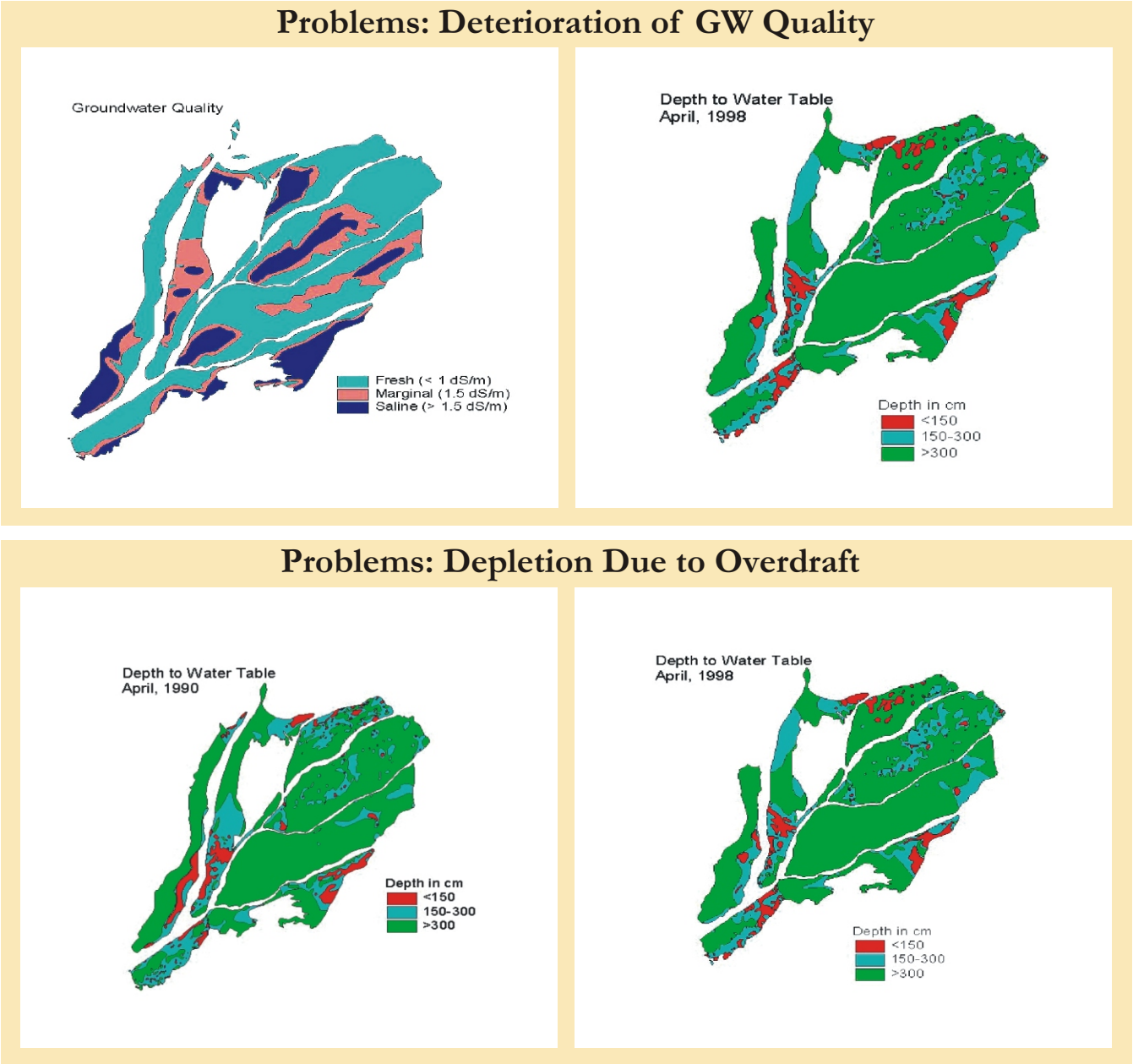
Increasing demand and deteriorating water quality has put enormous pressure on the agriculture sector to use its available water resources more efficiently and to improve the productivity of water. These pressures are a result of the increasing demand for food and ever declining opportunities for the extension of irrigation to other areas due to scarcity of land and water resources and high costs of development. Increasing the productivity of water and the sustainability of existing water resources is central to fight poverty, to reduce competition for water and to ensure that there is enough water for nature.

In semi-arid regions, scarcity of fresh water resources has forced farmers to extract groundwater to supplement their crop demands. Groundwater is now the largest source of irrigation (50-60%) in South and Southeast Asia and North China, and its use for cities is also rising rapidly. The extent of groundwater development in Pakistan can be gauged by the fact that in 1960 there were less than 1000 irrigation pumps. Today it has over 0.5 million and groundwater contributes upto 50% of the total water available at the farm gate. The exploitation of useable groundwater provided an opportunity for the farmers of these areas to supplement their irrigation requirements and to cope with the vagaries of the surface supplies. This has transformed a situation of low and uncertain crop yields to more secure and predictable regime of crop production.

Studies have shown that crop yields have increased almost by 150 to 200 percent due to the use of groundwater to supplement rotational canal water supplies. As a result, groundwater has become the heart of booming local economies, and the mainstay of agriculture, food security and rural livelihoods. But the current rates of groundwater use in most of these regions are unsustainable. Rapidly falling water tables and increasing salt contents in the pumped groundwater imply that more expensive and poor quality groundwater will have to be used for irrigation in future. This impairs the Pakistan's capacity to feed its growing population.

Water logging and salinity in the Indus basin still remains one of the key bottlenecks in managing land and water productivity to the optimal levels, despite of immense efforts. Secondary salinization associated with the shallow groundwater tables and use of poor quality groundwater for irrigation has further compounded the salinity problems. Therefore, salt-affected soils have become an important ecological entity in the Indus basin of Pakistan. It is estimated that nearly 6 million hectares are already afflicted with this menace, of which about half are located in irrigated areas. About 40% of this area

Figure 6



(2.7 million ha) lies in the Punjab province, which produces more than 90% of Pakistan's total food production. Another 1.0 million hectare is affected by water logging. The above facts indicate that the agricultural sector suffers deeply from both water logging and salinity. About 75 percent of the population and about half of the Gross National Product (GNP) are directly or indirectly related to the agricultural sector. This shows that the problems of water logging and salinity are not just agricultural problems, but that they do affect the country as a whole and ultimately the social fabric of Pakistani society. Water logging and salinity have very adverse social and economic effects on communities in Pakistan, causing poor living standards in affected areas and health problems for humans and animals. This situation has forced the local population in many parts to migrate to other areas.

The problems of the Indus basin are complex because good quality water resources are diminishing and the demand for food is increasing, which means that the productivity of water must go up. Reduced irrigation applications can increase the risk of soil salinization due to insufficient leaching. Drainage systems have the drawbacks of being expensive to install and operate and to produce highly saline effluent, which is a problem for downstream users. Therefore the challenge is to utilize canal water and groundwater (extracted from tubewells) optimally for crop production while keeping groundwater table fluctuations and salinity build up within the acceptable limits.

Over the past three decades, numerous efforts have been made to develop guidelines for the use of different quality waters for the irrigation and to reclaim salt-

affected soils through biotic, physical and chemical measures. In spite of huge investments, the success has been limited because these efforts remained confined to the farm and field level, and no serious attempt was made to translate the implications of these findings to a larger, system level. The research conducted to advise farmers on the use of different quality tubewell waters was based on field scale experiments and was not tested for their long-term consequences on crop production and environmental degradation. The results were therefore regarded as local and short-term solutions and could not get the attention of farming community.

Effective conjunctive water management requires effective technologies for controlling surface water applications, water logging, groundwater withdrawal, and artificial to recharge to aquifers. Technologies exist to provide almost any degree of control required but their costs and upkeep requirements differ widely. More importantly, combination of institutions and management tools needed to effectively integrate management of surface and groundwater is lacking, particularly in developing countries. Sustainability of irrigated agriculture through conjunctive water management also demands the existence of effective institutional arrangements and long-term on-farm financial and economic benefits for the farmers to ensure that conjunctive water management leads to increased farm incomes and alleviate poverty. Therefore there is every motivation to designate more capital and efforts to study technical, institutional and management aspects of conjunctive water management to ensure sustainability of irrigated agriculture.