GROUNDWATER DEVELOPMENT AND MANAGEMENT IN THE CRITICAL AREAS OF ANDHRA PRADESH, KARNATAKA AND TAMIL NADU STATES OF SOUTH INDIA

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INTRODUCTION

Liberal energisation of wells, subsidised power tariff for agriculture pumpsets and easy availability of institutional credit have contributed to a surge in groundwater development in Andra Pradesh, Karnataka and Tamil Nadu states of south India during the last three decades. The number of wells increased from 1,510,000 in the year 1960, to 2,860,000 in 1985 (Karnataka state registered a more impressive growth rate of 9.8% per annum). In the above period, the area irrigated by wells increased by more than two times.

Though rapid increase in groundwater irrigation was recorded in most parts of the country, the adverse effects of over development are more conspicuous in the three southern states because of the predominance of low rainfall hard rock areas which cannot sustain large scale development.

High initial cost, execution delays, inter-state disputes and environmental problems are a few limiting factors in expanding irrigation through major and medium projects. Poor management is eroding fast the vast potential of more than 100,000 irrigation tanks created through the ages. Given the above limitations, further increase in irrigation potential can be achieved only by maintaining the pace of groundwater development. The recommendation of the Working Group on Minor Irrigation for Formulation of the VIII Five Year Plan, proposing an investment of Rs 12 billion[1] for constructing 525,000 wells in the three states during 1990-95, confirms this view. However, development has to be on scientific lines. Otherwise, such ambitious targets will have devastating effects on the groundwater regime,

[1] In 1991, 20 rupees = $US 1.

1. PROBLEM AREAS

The critical groundwater ares in the southern states suffer from a number of problems related to estimation of potential and development and management of groundwater. Among them are the following:

Estimation of Potential The State Ground Water Departments (SGWDs) are responsible for estimating groundwater balance and classifying the blocks (group of villages) as 'white' (under-exploited), 'grey' (close to fully exploited) and 'dark' (fully exploited) areas.

Estimation of groundwater potential reveals that more than 90% of the blocks are under-exploited (white), whereas the ground realities are different. Over exploited conditions, reflected by alarming decline of water levels, are existing in many areas, including in a few white blocks.

Development of Critical Areas It is a paradox that demand for wells is more in dark and grey areas as compared to white areas because, the aquifer capabilities in a developed area are proven and the farmers are tuned to the advantages of well irrigation. Though institutional credit is not available for wells in the dark blocks, construction of new wells is going on unabated, resulting in alarming decline of water levels. Investments in such areas merely inflate the number of wells, with hardly commensurate increases in irrigated area.

Well Design in Critical Areas Design of wells in the hard rock areas, particularly in the critical areas, has undergone a vast change during the last decade. The traditional large diameter, shallow open wells were initially converted to dug-cum-bore wells, and later to bore wells (and then to still-deeper bore wells). Consequently, thousands of dug wells have gone dry and had to be abandoned along with their centrifugal pumpsets. However, the chase of groundwater through deeper and deeper bores cannot go on forever, because the productive fracture zone in the hard rocks is limited, which is already exceeded in the critical areas by bore wells.

Tradition-bound farmers insist of constructing large dug wells, at times 3 to 4 times larger than the optimum size, not realising that the recuperation capacity of wells is independent of the size[2]. Unproductive expenditure due to fall in water levels, reduces the useful life of a bore well to a mere 3 to 4 years. With thousands of bore wells constructed each year in the critical areas, the wasteful expenditure due to faulty well siting, over designing and reduced life is astronomical.

It is essential to arrest the declining trend of water levels. Improving recharge by desilting irrigation tanks and constructing new percolation tanks besides other soil conservation methods are a few important steps in this direction. In addition, drastic reduction in groundwater draft by shifting the crop pattern in favour of widely spaced crops which could be irrigated through drip system is necessary.

Inequitable Distribution In critical areas, due to lack of institutional credit, only those who could mobilise private resources could construct wells. Denying institutional credit in a dark block, however, justified, has deprived the poor farmers of the vital input of credit and forced them to continue with subsistence rainfed farming or purchase of water at exorbitant prices. Cultivating large ares of horticultural crops and irrigating them through community drip irrigation appears to be the solution for improving equity under well irrigation, particularly in the critical groundwater areas.

Electrification of Agriculture Pumpsets Farmers in the critical areas of Tamil Nadu construct bore wells because of deep water level conditions which do not favour dug wells. These farmers are forced to operate the bore wells with inefficient compressor pumps and incur heavy operational costs because of the enormous delays (up to 8 years) in receiving electric connections.

With the introduction of a flat tariff for agriculture pumpsets (in Tamil Nadu state, power consumption of electric pumpsets up to 5 HP is free), farmers are resorting to indiscriminate and almost incessant pumping, which has played havoc with the slender groundwater resources of the critical areas. As a result, even villages depending solely on groundwater for drinking are seriously affected.

[2] Many farmers construct these large diameter wells to provide a 'reservoir' for pumping, since in hardrocks, the low transmissivities means water will be drawn down while pumping. These wells may take a day or more to recharge.

Government Sponsored Schemes - Subsidy Government of India and the State Governments have sponsored several schemes for groundwater exploitation and its efficient use. Under these schemes, selection of areas for implementation and the subsidy rates have to be determined more scientifically. For example, under the schemes for installing drip system, the subsidy rate does not vary between Thanjavur district which has abundant groundwater and Kolar and Coimbatore districts, known for scarce groundwater.

After demarcating the critical groundwater areas, schemes for conservation of water could be implemented in such areas more aggressively, if necessary by providing much higher doses of subsidy. The present policy of spreading the subsidy uniformly for all areas will not achieve the desired results.

3. WATER USER ASSOCIATIONS

The drop in water levels in the critical areas is bound to be more rapid in future due to lower aquifer transmissibility as a result of reduced saturated thickness. Serious attempts, therefore, have to be made to arrest the declining trends. Groundwater legislation, though effective, could not be considered seriously in view of the difficulties involved in implementation. The ultimate solution probably lies in the collective management of water resources by farmers themselves. Water User Associations at village/micro watershed level have to be organised to decide the future development of groundwater and also improved management of the available meagre resources.

4. ISSUES FOR FUTURE STUDIES

Estimation of Potential Study a couple of blocks/watersheds in detail to compare the potential for wells as estimated form the groundwater assessment carried out by the State Ground Water Directorates and on the basis of field conditions. Such comparison will give a clue to a realistic estimate of the feasible number of wells which will form the basis for more purposeful planning.

Design of Wells Study the well design adopted by the farmers and examine their suitability to the hydrogeological conditions.

Decline of Groundwater Levels Is the declining trend of water levels in critical areas due to erratic and inadequate rainfall or over development? Study the effect of large scale groundwater extraction through bore wells on the existing open wells and shallow bore wells.

Bore Well Failures Study the high rate of failure (reported to be about 60% in critical areas) of the bore wells are the construction stage. What is the life of bore wells in critical areas due to declining water levels and how does it affect the viability of the investments on wells and pumpsets?

Technical Advice to Farmers Study the existing institutional arrangements for tendering advice to farmers on site selection and well (and pump) design - suggest improvements.

Energy Tariff Study the impact of subsidised, flat energy tariff on the extraction of groundwater, particularly in bore well areas. Also the advantages of metered tariff over flat tariff. Which class of farmers is actually benefitted by flat tariff and at whose cost?

Inequitable Distribution How do poor farmers cope with the need of drilling deeper and deeper bores due to declining water levels? Is groundwater in critical areas the monopoly of the more affluent who could drill deeper?

Development of Critical Areas What is the impact of denying institutional credit for wells in critical areas? Which section of farmers is affected most by this policy? How far this policy has helped to retard the growth of wells and arrest the decline of water levels? What is the relevance to groundwater legislation to Indian rural conditions.

Protection of Critical Areas - Water User Associations What is the awareness of farmers and administrators in critical areas to the impending danger of declining water levels? Are the farmers in a mood to organise themselves and face the challenge? What could be the role of NGOs in this direction? What is the scope in the critical areas for shift in the cropping pattern in favour of widely spaced horticulture crops which could be irrigated through drip system? How far can marginal farmers could be benefitted by community drip irrigtion system, installed on a common well?

A PROPOSED ACTION PROGRAMME TO MAINTAIN GROUNDWATER LEVELS AND ACHIEVE SUSTAINABLE AGRICULTURE IN TAMIL NADU

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Groundwater is extracted through 1.6 m wells to irrigate about 1.2 MHa in Tamil Nadu, which is almost 40% of the total irrigated area. The depth of open wells vary from 10-15 m in some pockets and near the river bank to 50-70 m in districts like Coimbatore. Bores inside the open well have gone to a depth of another 50-70 m in various places. Groundwater bores have gone up to 100-150 m. The groundwater table has depleted from 10 m to 50 m in the last 40-50 years. The area of irrigation by each well has reduced from 1.5 ha to less than 1 ha in the last 20-30 years.

The assessment of groundwater potential is estimated by many agencies/scientists and the figures given are anybody's guess. It varies from 1.4 MHm to 2.56 MHm.

The last data given by the Directorate of Ground Water has indicated that the total groundwater draft is about 50% and there is scope for constructing another 1.2 MHm wells in Tamil Nadu. However, if you visit the various districts and analyse the groundwater potential, it is observed that most of the wells in all the districts have reduced water supply and thousands of wells have been abandoned. This alarming situation is not only found in Coimbatore, which is traditionally known for its groundwater shortage, but also in Madurai and Chidambaranar and Ramanad Districts.

The Government records say that the extraction of groundwater in Pasumpon District is 1% to 24% in various blocks and about 80,000 more wells could be constructed in the District. But the picture in the field is completely different. Though the district obtained good rains during January 1990, the situation is alarming. In many *taluks*, the water table has dropped to 20-30 m from ground surface and large numbers of irrigation wells have deep bore wells inside to a depth of 60-70 m, and side bore for a distance of 50-70 m.