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GROUNDWATER AND AGRICULTURAL DEVELOPMENT IN NORTH-EASTERN HARYANA (1970-2003)

Doctoral Dissertation Abstract (2008)

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At present India has achieved self-sufficiency in food production. Haryana is one of the leading states in the development of agriculture of the country. The main factor behind this development is the role played by non-physical factor i.e. irrigation. The use of available water resources whether surface water or sub-surface water for irrigation can increase the agricultural production to meet the needs of increasing population.

The study area (Ambala, Punchkula and Yamunanagar districts) having developing agrarian economy lies in the north-eastern part of Haryana. Its east-west extent has enriched it in topographic variety i.e. hills, dissected rolling plain and alluvial plain. The sub-tropical continental monsoon climate of the study area makes the agricultural dependent on irrigation because, the rainfall is generally unreliable in space, amount and time.

The main objectives of the present study are; to highlight the various aspects of groundwater; to analyse the development of water resources; to study the dynamics of agricultural development and; to study the socio-economic structure of the farming community. These objectives have been achieved by collecting and analysing block level groundwater data pertaining to its depth-fluctuations, quality and potentialities for the future development of the study region and to determine the impact of over exploitation of groundwater. To find out agricultural development, the study region was divided into 56 enumeration units. These enumeration units have been selected through systematic sampling method. The study runs for a period from 1970-2003. Primary data at field level and secondary data at village level have also been collected from various agencies.

Major Observations

Due to over drafting for irrigation through tube wells, groundwater is depleting at a very faster rate. Maximum depth of groundwater was recorded (17.16 metre) in June 2003 in Barwala block, which is followed by Pinjore block. Barwala block is situated in piedmonts and Pinjore block is situated in hills, therefore steep hydraulic gradient is the main cause for this lower level of groundwater in these blocks. In the alluvial plain the depth of water table was 11.29 metre as recorded by Chhachrauli block in June 2003.

All the blocks of the study area have recorded negative fluctuations except Ambala block, which also uses canal water for irrigation along with tube well water. An assessment of

groundwater budget shows that the level of exploitation of groundwater has reached its maximum i.e. 96 per cent in Yamunanagar district and thus it is put under grey category. Ambala and Punchkula districts are under white category with 68 and 52 per cent level of exploitations of groundwater respectively. The quality of groundwater is within safe limit with low mineralization. The electrical conductivity ranges between 248 and 2000 micro-hmos/cm. The entire study region has good quality of fresh groundwater.

During the last thirty years there has been over exploitation of ground water resources. Since 1971, the number of tubewells has increased more than four times in the study area. The number of both shallow and deep tubewells increased from 12,060 in 1971-73 to 51,564 in 2000-03. The density of tube wells has increased from 0.1/km² in 1970-71 to 11.6/km² in 2000-01 in the study area. This enhanced the irrigated area by about eight folds from 1970-73 to 2000-03. The extent of irrigation has increased from 19.06 per cent to 84.14 per cent during the reference period.

Irrigation sources directly affect the cropping pattern, cropping intensity and crop combination. An increased irrigation facility has changed the cropping pattern of the study area. Most of the area is under double or multiple cropping systems. Intensity of cropping in study area has increased from 175.72 to 193.09 per cent during the study period. Analysis of the data suggests change in cropping pattern from coarse food grain to fine food grain and cash crops like sugarcane. In 1970-73 seven types of crop combinations were common but in 2000-03 only three types of crop combinations were generally practiced. This shows the tendency of specialisation in cropping pattern in the study area.

High positive co-efficient of correlation between area under major crops and depth to groundwater level was found in 2003. It has been found that when area under rice and sugarcane increases the depth of water level also increases. In post monsoon period the correlation found to be stronger (0.825) as compared to pre monsoon (0.711) period. It is assumed that in monsoon season there is more recharge of surface flow as compared to pre-monsoon season. But due to more discharge of groundwater through tubewells for rice and sugarcane cultivation (water demanding crops) groundwater is continuously depleting.

High positive co-efficient of correlation between number of tubewells and depth of groundwater was found in 2003 indicating that as the number of tubewells increases the level of groundwater decreases. This correlation is stronger in post monsoon season because more groundwater is withdrawn for Kharif crops (rice and sugar cane) cultivation.

Jagadhri, Radaur and Mustfabad blocks are over exploited and fall under grey category. These blocks are located in central part of the study area where rice, wheat and sugarcane are dominating crops and occupy more than 85 per cent of agricultural land. These blocks have fallen under grey category and do not have potentials for future development of water resources. Ambala, Naraingarh and Shahzadpur, Pinjore, and Barwala blocks are in safe limit and fall in white category.

Three sample villages have been selected for detailed investigation of economic status of the farmers. In all three sampled villages marginal-sized farms achieve less profit with low input cost. Large-size farms also attain less profit because they paid less attention to their farms. In sugarcane cultivation they achieve more profit than other crops. Small and medium-size farms achieve maximum profit in all crops except sugarcane. It may be due to intensive care of the cultivators. Their main motive is to get

maximum profit.

Fast depleting ground water in fresh zone of study area compelled analytical assessment of present use and future needs. Therefore, there is a need to put a check on overdraft and readjustment the cropping pattern. Crops demanding less water for irrigation should be given more acreage like, maize, gram, pulses etc. Soil and moisture conservation measures should be carried out by raising soil moisture content. Agro-forestry is one of the most effective and efficient measure for soil and water conservation in hilly and undulating areas. It is, therefore, imperative that the existing water supplies for irrigation and farming practices are designed in such a way that it may increase irrigation efficiency to achieve maximum farming output.