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Assessment of Watershed Development Programme: A Micro Level Empirical Analysis

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Abstract

Although water in its totality is not a scarce resource, but when we consider its usable quantum, it becomes a scarce resource. With ever increasing pressure of population and its ever increasing demand, particularly for agriculture, industry and domestic purpose, water becomes scarce resource in real sense. In this situation 'watershed development and management' become a key factor for sustainable development, particularly in arid and semi arid regions. In view of this, various government and non-government organizations have launched different schemes under watershed development. The present is an attempt to assess one of these schemes. A case study of Kasaba Sangaon percolation tank of Kolhapur district has been chosen for the present investigation. The schedule, questionnaire, interview and observation techniques are employed to collect all the relevant information. The analysis reveals that due to the increased recharge in the ground water reservoir, water table of the wells has increased, resulting in increase in per day yield of wells. Also the duration of water in the wells has extended by two months. As a result the increased facilities of irrigation have changed the respective positions of crops. The consequential impact of all these is reflected in improving the socio-economic status of farmers in the command area.

Introduction

Watershed development refers to the conservation, regeneration and the judicious use of natural resources including land, water, plants and animals within a watershed. Whereas watershed is a basin or catchment area of a stream or river. It is the area from where the water to a river or stream comes from. The main goal of watershed approach is to keep the water where it falls, instead of letting it run unused at the same time carrying away fertile soil. It also offers an eco-friendly way that is both cheap and effective in arresting and indeed reversing the degradation of our natural resources. Fresh water is a major resource that sustains life on the earth. Any subsistence based economy functions on the basis of the availability and accessibility of usable water resources in the region. These twin conditions determine the resource use pattern and its consequential impact on the inhabitants. In fact water is a social treasure that must be protected at all levels by the Government and community as well.

In this situation watershed development and management becomes a key for sustainable development. Although, before 1992, the government of Maharashtra has implemented watershed development schemes such as contour bunding, nala bunding, trenching, social forestry, construction of percolation tanks, without proper co-ordination. It is only after 1992, all such

programmes were brought under the supervision and control of water conservation department, specially created for this purpose. Up till now, about 35,00,000 hectares has been brought under these schemes in Maharashtra. Among the various schemes launched by the state and central government for watershed development, the present study attempts to assess the quantitative and qualitative impact of percolation tank, one of the measures recommended by fact finding committee (Govt. of Maharashtra, 1973) to recharge the ground water in drought prone areas.

Key Words

Watershed development, water recharge, water yield, command area, social treasure, sustainable development.

Objectives

The present investigation aims:

1. To review the geographical and geological set up of the region under study.
2. To study the impact of percolation tank on groundwater recharge, facilities of irrigation, cropping pattern and yield of individual crops.
3. To assess the consequential impact on socio-economic status of farmers in the command area.

Study Area

Kasaba Sangoan's Percolation tank's command area has been selected for the present investigation. The village Kasaba Sangaon, under which the percolation tank falls (hence forth refered as PT) is located in Kagal tahsil, about 24 km. south of Kolhapur city. PT and its command area lies in a narrow valley, drained by a stream of a second order which belongs to Dudhaganga river (G.S. D.A. Govt. of Maharashtra, 1977), a tributary of river Krishna. The command area of 101.84 hectares is generally slopping towards the south. The construction of P.T. has been completed as a relief measure during the drough year of 1972.73

Data Base and Methodology

Importance of the study lies in the fact that entire information and data has been collected by organising frequent field trips, using a questionnaire schedule, interview and observation techniques have also been employed. To compare the situation before and after the construction of PT, years 1971-72 and 2000-01 have been considered. To know the intermediate situation the study carried out by researcher during 1984 has been given due weightage. The performance of wells and technical aspects of PT are collected from the technical report of Kasaba Sangaon PT, made available from the Asst. Geologist, G.S.D.A. Kolhapur (Task force, Govt. of Maharashtra, 1977), whereas the salient features of PT have been obtained from the Minor Irrigation Dept. Govt. of Maharashtra. A cadastral map of the village is available with the Inspector Land Records, Kolhapur. This was used to determine the area benefited, henceforth called the command area. Besides this, statistics regarding landuse, cropping pattern size of holdings, agro-inputs etc. for respective years have been procured from the village officials such as *Talati* and *Gram Sevak*. For the preparation of landuse map of the command area, plot to plot visits were undertaken.

K. Sangaon Percolation Tank (Command Area)
Land use in Kharif Season

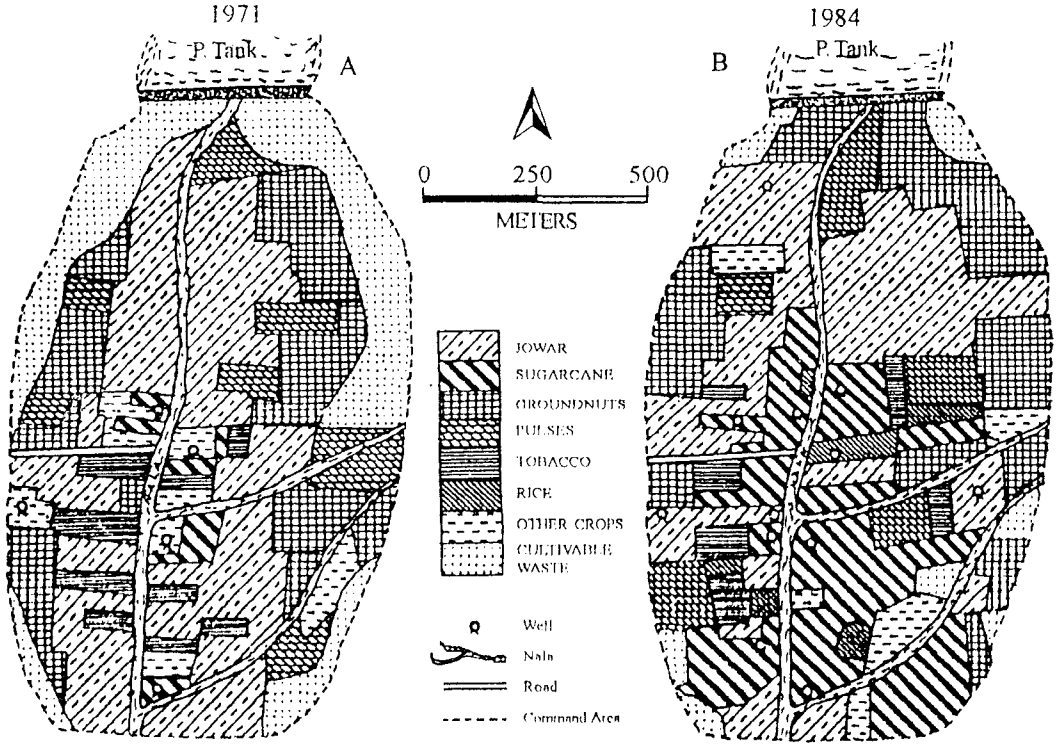

Fig. 1

To investigate the socio-economic changes, among 306 benefitted farmers, 12.5 per cent farmers were selected by stratified random sampling technique. The size of holdings has been considered to group the farmers into marginal, small and moderate. To assess the resource availability of farmers, the parameters such as size of land holdings, area irrigated, implements and agro-inputs used, type of houses and other assets are taken into consideration. Whereas to assess the socio-economic status, education, size of family, knowledge about modern agricultural practices, cosmopolitanism, average income etc. are considered.

The empirical data collected were processed and tabulated and mapped. The coropleth technique has been used for representing the cropping pattern.

Analysis and Results

Augmentation in ground water: Before the construction of the percolation tank, there were five dugwells. The depth of these dugwells varied from 6 metres to 25 meters below the ground level and the diameter varied from 5 to 7 metres. The water level in these wells in winter season was 2 to 2.5 metres, however most of these wells go dry in summer. As a result, these wells were

Table 1 **Kasaba Sangaon Percolation Tank Command Area: Changes in Cropping Pattern (1971-72 and 2000-01)**

Crops Change	1971-72 (%)	2000-01 (%)	Volume of Change	Area in Hect.%	Area in Hect.%
Rice	--	--	1.87	1.70	+ 1.70
Wheat	1.43	1.44	5.35	5.12	+ 3.68
Jowar	49.01	49.32	8.93	8.55	- 40.77
Other cereals	--	--	0.25	0.33	+ 0.33
Total cereals	50.44	50.76	16.40	15.70	- 35.06
Gram	--	--	3.50	3.35	+ 3.55
Other pulses	4.90	4.94	1.28	1.23	- 3.71
Total pulses	4.90	4.94	4.78	4.58	- 0.36
Total food grains	55.34	55.70	21.18	20.28	- 35.42
Sugarcane	3.27	2.30	36.61	35.06	+ 32.76
Vegetables & fruits	2.41	2.42	0.89	0.86	- 1.56
Total food crops	61.02	61.42	56.68	56.20	- 5.22
Ground nut	26.56	29.79	16.67	15.97	- 13.82
Soyabean	--	--	26.75	25.63	+ 25.63
Total oil seeds	29.56	29.79	43.45	41.61	+ 11.82
Tobacco	--	--	2.28	2.19	+ 2.19
Other non-food crops	8.77	8.79	--	--	- 8.79
Total non-food crops	38.33	38.58	45.73	43.80	+ 5.22
Gross cropped area	99.35	100.00	104.41	100.00	+ 60.58

Source: Village records

providing water for 10.5 hectares of land during the Kharif season only (G.S.D.A. 1977).

During the post construction period, twenty new wells and four tubewells are constructed, having an average depth of 300 meters, each tube well is providing water to about 2.5 hectares of cropped area. In case of dug wells, the water level has increased by 1.5 to 4.5 meters and duration of the water in these wells has extended by two months i.e. upto the month of March. The yield of the dug wells has increased significantly. At present about 41.36 hectares of land has benefitted from irrigation by wells and tube wells. All these facts reval that there is significant augmentation in ground water in the reservoirs during the post construction period. However, the decrease in water in the wells located at a distance of 100 mtrs. is noted indicating over exploitation in the command area. Hence, digging of new wells in the command area may not be economical (Pawar and Shinde, 1979 and Pawar, 1984). In this situation to increase the productivity of available water, as recommended by irrigation commission (Govt. of India, 1972), for Kolhapur region, adoption of drip and sprinkle irrigation seems to be the solution.

Changes in cropping pattern: At present out of the total cropped area, 56.20 per cent is occupied by food crops of which 35.06 per-

K. Sangaon Percolation Tank (Command Area)
Land use in Kharif Season-2000

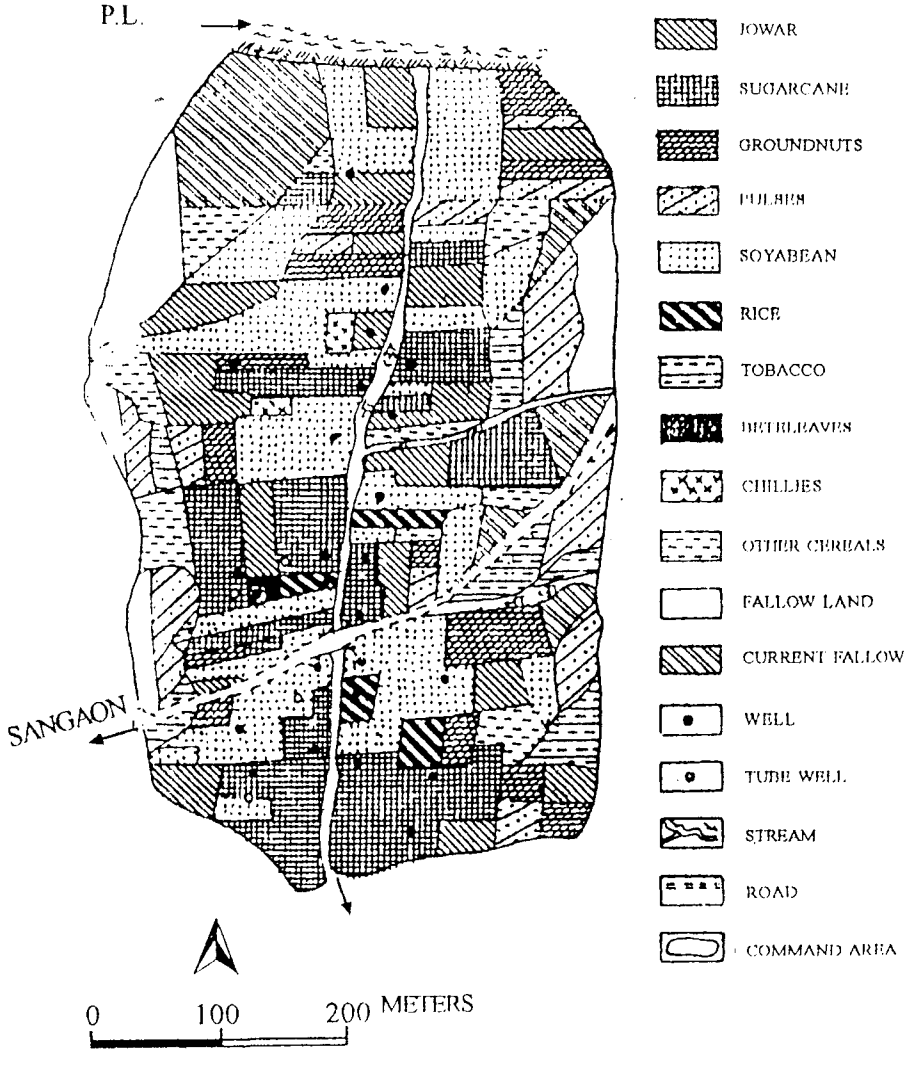

Fig. 2

cent is shared by sugarcane (table No.1 and Fig. No. 2). Among the non-food crops, soyabean accounted for 25.63 per cent, followed by groundnuts (15.97%). Among the cereals, Jowar (8.55%), wheat (5.12%) and rice (1.70%) are important. During 1984, about 74.28 per cent of the gross cropped area was occupied by food crops of which 40 per cent was shared by food grains and 30 per cent by sugarcane. Among non-food crops, groundnuts (15.08%) were dominant (Fig. 1B). In the command area sugarcane

Table 2 **Distribution of sampled farmers according to size of holdings**
(Figures in bracket indicate number of farmers)

Size of Holdings Years	Marginal <1 Hect.	Small to 2 Hect.	Moderate > 2.01 Hect.	Total
1971-72	50.00 (19)	39.48 (15)	10.52 (4)	100 (38)
2000-01	44.73 (07)	34.21 (13)	21.05 (8)	100 (38)

Table 3 **Area irrigated (in Hect.)**

Size of Holdings Years	> 0.5	0.6 to 1.0	1.1 to 2.00	Total
1971-72	76.33 (20)	19.78 (6)	7.79 (3)	100 (38)
2000-01	63.17 (24)	21.05 (8)	15.78 (6)	100 (38)

Table 4 **Area under cash crops (in. Hect.)**

Size of Holdings Years	Nil	< 0.5	0.6 to 1.0	> 1	Total
1971-72	44.73 (17)	34.21 (13)	10.52 (4)	10.54 (4)	100.00 (38)
2000-01	28.00 (11)	52.63 (20)	14.15 (5)	5.22 (2)	100.00 (38)

Table 5 **Agricultural Implements**

Types Year	Traditional	Traditional & Modern	Total
1971-72	100.00 (38)	--	100.00 (38)
2000-01	65.78 (25)	32.12 (13)	100.00 (38)

Table 6 **Annual income (in Rs.)**

Income Year	< 25,000 Low Income Group	25 to 50,000 Moderate Income	> 50,000 High Income Group	Total
1971-72	81.57 (31)	10.52 (4)	7.91 (3)	100 (38)
2000-01	50.00 (11)	34.22 (13)	14.78 (7)	100 (38)

Source: Compiled by researcher.

is the major cash crop whose area has increased by 32.76 per cent, during the last three decades. The per hectare yield of sugarcane has also increased from 60 to 95 tonnes. Increased irrigation facilities, assured water supply by tube wells, nearness to sugar factory and sugarcane crop, being a symbol of status are some of the reasons for the increase in area under this crop (Pawar, 1989). Soyabean is another important cash crop which has recently been introduced by the farmers.

During the period under review, there has been a remarkable change in the respective positions of crops. Among the major crops, the highest decline was in jowar (40.77%) followed by groundnuts (13.82%). Whereas crops which recorded increase are sugarcane (32.76%) and soyabean (25.63%). It is interesting to put on the record, that a crop like betel leaves, a perennial water demanding crop is cultivated on 0.5 hectare of land.

Socio-Economic Changes

Among the 306 beneficiaries, 38 farmers were selected by stratified random sampling methods. The results of the analyses are:

Size of holdings:

In an agro-based society, land holdings have immense importance. It is one of the major parameters to evaluate the socio-economic status of the farmers. At present about 45 per cent farmers are marginal land holders followed by small (34.21%) and moderate holders. As compared to the base year there is a slight change observed in the proprotion of large size holdings (table No. 2)

Area irrigated:

The cropping pattern; intensity of cropping and crop productivity depend upon the availability of assured irrigation facilities. The farmers with assured irrigation facilities adopt modern agricultural technology earlier than other farmers (Pawar and Kanawade 1990-91). About 63 per cent of the farmers have irrigated land below 0.5 hectare while 21 percent have between 0.6 to 1.0 hect. and about 16% have above 1 hect. of irrigated land. As compared to the base year, increase is observed in the moderate size of holdings. This is mainly due to an increase in the irrigated area from 10.5 hect. to 41.36 hectare on account of increase of ground water reservoirs in the PT command area.

Area under cash crops:

The farmers adopt cash crops only when assured water supply is available. As such sugarcane is the major cash crop, followed by soyabean and tobacco. Farmers having 0.5 hectares and above, irrigated land have switched over to cash cropping. Only 28 per cent farmers do not cultivate cash crops.

Agricultural Impliments and machinery:

Mechanized agriculture is encouraged in commercial farming. Modern agriculture includes use of mechineries and bio-chemical inputs. In the command area of PT, use of such agro inputs were absent. At present about one third farmers are using modern implements. This proportion is increasing with increasing facilities of irrigation. As rightly observed by Gadgil (1948) "due to irrigation, farmers could make additional investment in cattle, farm implements and

more valuable crops like sugarcane" seems to be applicable to area under investigation.

Education:

Education is the prime factor for over all development of human beings. Higher education leads to a positive approach towards adoption of agricultural innovations (Pawar and Kanawade, 1990-91). During the base year about 29% farmers were illiterate, about 15% had completed their primary education and another 21% had entered secondary schools.

However during last 3 decades considerable change in educational level has been observed. None of them is illiterate, and over 20% have achieved degrees of higher secondary and higher education.

Cosmpolitanism:

Involvement of farmers in social activities is complementary for the development of agriculture and allied activities. Although all the farmers participate in social functions, fairs and festivals, very few (15%) play an active role in political and other community activities. However it is interesting to note that one of the farmers was awarded the 'ideal farmer' prize for crop productivity.

Annual Income

During the period under investigation there is considerable rise in annual income of farmers. In the base year, over 81 per cent farmers were in the low income group, about 10 per cent in the moderate income group, whereas only 8 per cent were in high income group. At present, about 50 per cent farmers belong to low income group, about 32 per cent to the moderate and about 15 per cent belong to the high income group. This can be attributed to the changing cropping pattern, particularly cultivation of cash crops such as sugarcane and soyabean, due to increase in assured irrigation. In this regard, Baviskar's (1998) statement, "commercialization of agriculture through growing sugarcane has contributed to the economic viability of small farmers and the co-operativization of sugar industry has strengthened the economic and political position of the cane growers" seems to be supported.

Conclusions

Due to watershed development programme, recharge of ground water has increased, resulting in rise in the water table leading to increase in yield and duration of well water and assured irrigation facilities.

The cropping pattern has changed drastically. Farmers have switched over from cereals to cash crops. The increase in per hect. yield has also been achieved.

The consequential impact of all these factors have been on increasing the socio-economic status of farmers, rise in educational level and attitudinal change in the farmers as well.

It is found that such schemes of watershed development would be a panacea for rural development, provided there is real co-operation and active participation of local people. In this respect Ralegan Shidi of Ahmednagar district, Gokul project of Ratnagiri district, Adagaon of Aurangabad district, Nayagaon Pani Panchayat of Pune district could be cited as models for watershed development.

References

Assistance Geologist, Ground Water Survey and Development Agency, Kolhapur (1977): A Short Note on Hydrological Condition of the Command Area Under the Percolation Tank at village Ksangaon Tahsil, Kagal of Kolhapur district.

Baviskar, B.S. (1998): Indian sugar: Power to the Peasants, Co-Operative *Sugar, N.F.C.S.F. New Delhi*, Vol. 29, 5 pp. 313-320.

Gadgil, D.R. (1948): *Economic Effects of Irrigation*, Gokhale Institute of Politics and Economics, Pune.

Govt. of India, Irrigation and Power Deptt. (1972): Report of the Irrigation Commission, Vol. II, III.

Govt. of Maharashtra (1973): The Report of the Fact Finding Committee for Survey of Scarecity Areas, M.S. Bombay.

Govt. of Maharashtra, Directorate of Economics and Statistics (1995-2001): Socio-Economic Review and District statistical abstract of Kolhapur district.

Pawar, C.T. (1984): An Appraisal of Ground Water Resources in Maharashtra; *Readings in Agriculture Resource Development* (Ed.), K.V. Reddy and R. Rao, Hyderabad Publisher, Hyderabad pp. 64-76.

Pawar, C.T. (1989): *Impact of Irrigation: A Regional Perspective*, Himalaya Publishing House, Bombay.

Pawar, C.T. and Kanavade, M.C. (1990-91): Trends of Diffusion of Agricultural Innovations in Kolhapur District: A Case Study of Spread of Tractors. *Journal of Shivaji University, Kolhapur (Science)*, Vol. 23, pp. 119-126.

Pawar, C.T. and Shinde, S.D. (1979): Well Irrigation in Upland Districts of South Maharashtra Region: A Spatio-Temporal Perspective, *Geographical Review of India*, Vol. 41, No. 4, pp. 314-320.

Pawar, C.T. and Shinde, S.D. (1986): Irrigation in Maharashtra: Spatio-Temporal Perspectives, *National Geographical Journal of India*, Vol. 32, 2, pp. 105-110.

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