Impact of Water Percolation Tank on Changing Cropping Pattern: A Case Study of Rampur Village, Tal.-Jath Dist: Sangli, (Maharashtra).

[a]Patil R.B, [b]Patil A.B, [c]Shinde S.
[a]Dept. Geography, R.R.College, Jath Dist: Sangli, Maharashtra, India
[b]Dept. Geography, Arts and Commerce College, Ashta, Dist-Sangli, Maharashtra, India
[c]Dept. Geography, Chatrapati Shivaji College, Satara, Maharashtra, India

Abstract

This paper examines the agricultural development with the help of impact of water percolation tank on cropping pattern: A case study of Rampur village in Sangli district (Maharashtra) post cropping pattern and minor irrigation tank developments and its highlight the importance of scientific information for the commons by demonstrating how even a simple synthesis of irrigated cropping pattern in a village is a quite complex. Understanding this complexity holds the key to micro planning of land, water on crop management in a village. The main focus was on distribution on of irrigated cropping and sources of irrigation in Rampur village, which facilitated in a analyzing the trend of cropping pattern change various water conservation measures adopted in the low land area. This study is mainly based on the primary agricultural cropping data collected from farmers fields, Government land records data serves as secondary source while Grampanchayat, Panchayat Samiti Office ,recorded data was used as a background check for verifying pre 1991-92 agriculture data. The study was under taken under the broader umbrella of an on-going international research project called as 'Augmenting Groundwater Resources by Artificial Recharge' (AGRAR), focusing on the Rampur village.

KEYWORDS: Watershed development, Groundwater, Artificial recharge, Agriculture, Irrigated Cropping Pattern, Scarcity.

1. Introduction:-

India is agricultural country. Indian economy depends upon agriculture. But now a day rainfall decreases due to increasing Global Worming. Because of this there is bad effect on agriculture. Therefore, water percolation tank is one of the best alternatives to solve scarcity problem and thereby increasing creasing the possibilities of sustainable agriculture in study area.

Western Maharashtra has been regarded as one of the agriculturally developed areas of the state where the high proportion of population seeks its livelihood from agricultural activity. Despite the intra-regional variations in the physic-socio-economic conditions, the region has shown an upward trend in the production. Rainfall decreases from west (2000mm) to east (500mm). The eastern part of Sangli district is therefore considered as semiarid region. Since the area under investigation falls under rain shadow region water scarcity is an acute problem for agricultural development so as to minimize the scarcity of water. The state government has implemented various schemes to enrich water regime of the scarcity zone by which irrigation is strengthened for promoting agricultural development

Water percolation tank is one of the best alternatives to solve scarcity problem and thereby increasing the possibilities of sustainable agriculture and it has become boon to rain shadow areas of Maharashtra, during the last three decades the efforts have been made towards this direction. The concept of water tank is not new to the region but, utilizing the natural sites (river or stream courses) as reservoirs to impound water available from rainfall. The stored water has been utilized through the canals to the fields or somewhere the storage tanks are constructed so as to recharge the water table. Moreover, the increasing the water table further leads to the development of well irrigation and changes in cropping pattern of the region. Fig.l.1 explain how water percolating tanks can be regarded as a major source of water and how indirectly influences the cropping pattern and socio- economic status of the region. Therefore, it has far reaching impact on the immediate areas located in downstream. In fact, this has proved to be successful attempt and many areas have been benefited by perennial irrigation. Thus, agricultural landscape gets transformed due to water percolating tank in the famine-affected areas. However, regional variation takes place in water table, intensity of cropping pattern and their productivity pattern, especially within the command area. In view of the above, the present investigation aims to analyses the impact of water percolating tank on the ground water table and cropping pattern of Rampur village in Jath tahsil of Sangli District in eastern Maharashtra.

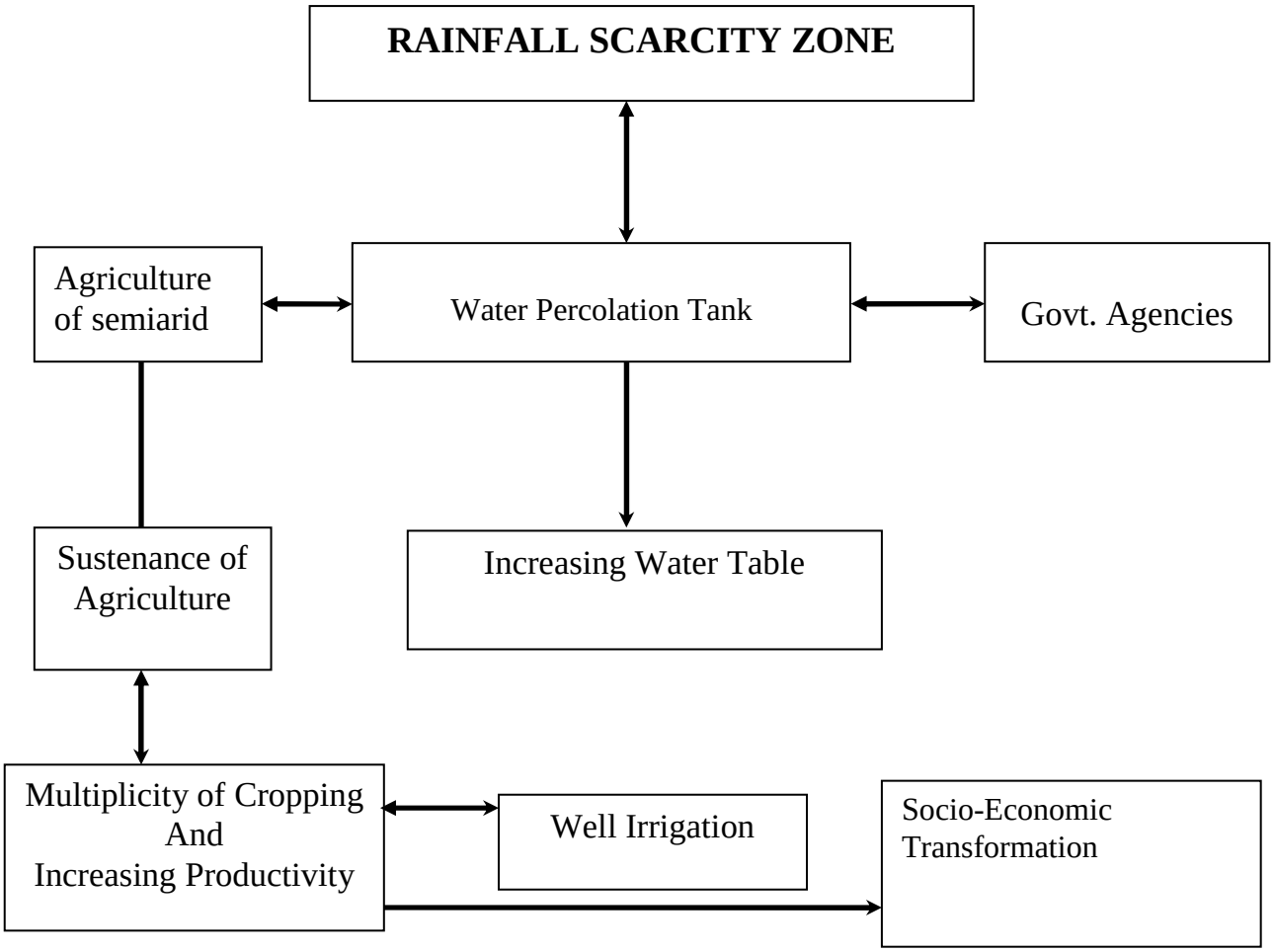

Fig No. 1

2. Objectives:-

The main objective of the present study is to study the impact of water percolation tank on cropping pattern. On the basis of this it is further aimed to suggest the meaningful suggestions for the development of agriculture in the study area. This is viewed in the light of following specific objectives:

1) To study the distribution of water percolation tanks in Sangli district.

2) To study the geographical background as the basis for agricultural development in the study area.

3) To study the spatial distribution of water percolation tanks in the study area.

4) To assess the impact of water percolation tank on the cropping pattern.

3. Statement of the Problem:-

The subject selected for research has various problems. The whole Jath tahsil is engrossed with severe famine conditions. The rain as it comes under rain shadow, falls here scantily. Too little rainfall is the crucial problem. There appears the dearth of essential planning for store & supply of water.

Henceforth the variation in the matter of global warming should be thought of and to make proper and planned use of water, it is necessary for unnatural rainfall, to store water in tanks from interim flood situations. It is awfully essential with scientific view point to accumulate watershed for a long time use in an appropriate proportion.

4. Methodology:-

The following methods will be used for collecting the data and work will be carried out as follows.

1) The proposed study will be based on primary and secondary sources of data. The primary data as the source will be generated through intensive field work with help of schedule Questionnaire and through the method of observation, interview and discussion.

2) The secondary sources of data will be collected from District statistical abstracts census reports, Tahsil Records, Irrigation Departmental Records, unpublished records.

3) The data will be collected from different offices i.e. Department of forest, Revenue, Irrigation, Social welfare offices at the district and taluka headquarters.

4) For the micro level analysis village will be selected as a unit and taluka will be chosen as an aerial unit for regional analysis. The sample study will be conducted in some selected villages by conducting intensive fieldwork to bring out grass-root level realities. The stratified sampling techniques will be used. To support these some of the case studies will also the undertaken. The present study covers the period of 20 years from 1991 to 2011.

5. Geographical Background:-

Geographical background of any area must be evaluated on the basis of study of physical characteristics viz. physical setting, climate drainage etc. Geographical

investigation of the physical environment or resources is an important tool for planning and there optimum utilization.

A. Location and Physiography:-

Rampur village is situated nearly 4 km West of Jath City in Sangli district. At 17° 18'25"to 17°23'7" North latitude and 74°40'29"East to74°55'3"East longitude. In 2011 the village had a population of 2011, spreading over an area of 2200 hectares.

B. Physical Setting:-

The village area can be divided in to three physical divisions.

i. Hill and Hillock region

The village surrounded by three small hills located in north, south and east of village. It covers about the 71% of village area.

ii. Low- land region

It covers 21 % area which is moderately steep.

iii. Plain region

It includes a narrow flood plain of Rampur nala and covers a small part (8 %) of the village area.

C. Climate:

The average annual rainfall in the district as a whole is 600mm. In general rainfall decreases from west to east from 2000 to 500mm. from central parts eastwards, the region has severe drought conditions. The climate of the district is characterized by general dryness through the year except during the south-west monsoon season. Maximum and minimum temperature is 42° c and 27° c respectively. In general, the climate becomes hotter as one proceeds from west to east. The cold season is from December to about the middle of February. The hot season which follows lasts till the end of May, which is the hottest month. June to September is the south-west monsoon season and October and November contributes the post monsoon season. In the post-monsoon, cold and summer season, the air is dry, particularly in the afternoon, while during the south-west monsoon season the air is semi-humid. In south-west monsoon seasons, winds are from the direction between south-west to north-east. In the post monsoon season they are predominantly from the north-east or east.

D. Soils:-

The village possesses the following three soil types

i. Medium soils :

It occupies 27 % of the village area and located in west, south and eastern parts of village

ii. Deep black soils:

This soil covers 8% of total village area and located in Southern part of village.

iii. Coarse shallow soils

An extensive tract (65%) has been occupied by this soil which is not fertile and mostly devoted to grasslands but now being used for pomegranate and grape wine cultivation.

6. Impact of Water Percolation Tank:-

Water percolation Tank refers to an artificial tank mainly developed to store the water for irrigation and to enrich water table in downstream areas. The device of tapping rainwater has been emerged during the last four decades in famine - affected areas. Though it is a new phenomenon, it has become common feature in these areas of the state. In fact this technological advancement in irrigation has provided a suitable tool for the development of agriculture. Water percolation tanks are artificially developed tanks for impounding the water for various uses.

Although the concept of water percolation tank is the recent advancement in the field of irrigation, it has man folding effects on agricultural landscape. They require heavy capital layout, which can be afforded only by government agencies. The earthen bunds are constructed across the streams so as to impound the rainfall water throughout the year. The stored water has been used for agriculture and domestic purpose as well. Many times, the stored water is lifted by electric motors with heavy capacity for irrigating the fields. The rate of recharge has been accelerated in the downstream areas which have been utilized for irrigation purposes through dug wells and tube wells. This leads for bringing about the changes in agricultural landscape. The old cropping pattern is replaced by irrigated crops. The farmer adopts the cropping pattern which is suitable to existing environmental conditions and which may give high remuneration to them. The cash crops are usually preferred by the farmers by which income level is increased. This leads for socio - economic transformation too.

In the present study the focus of attention is on Rampur tank, a Minor Irrigation Project and its impact on changing cropping Pattern.

7. Spatial Distribution of Water Percolation Tank In Sangli District:-

Sangli district is one of the agriculturally developed districts in Western Maharashtra which has the advantage of Krishna River and presence of fertile black soil. Though, there are various advantages, the rainfall distribution is uneven over Sangli District, to tackle the problem of scarcity of rainfall, various irrigation projects have been developed in Sangli District there are 96 different irrigation projects undertaken. Of these presently there are 2 major, 5 medium and minor projects.

The two major projects are located along the Warna and Krishna River in Shirala and Tasgaon tahsils respectively. In the district, there are 89 minor projects being developed. Their concentration and presence goes on increasing as one moves from west to east because the rainfall decreases from west to east. Therefore, maximum minor projects are observed in Jat, Tasgaon, Atpadi, Kavthe-Mahankal and Khanapur Tahsils. There are five medium irrigation projects being developed in the semi- arid track.

They are confined mainly to Jat, Kavathe-Mhalmkal, Tasgoan Tahsils. In the present study, Rampur Minor Irrigation Project is located in western parts of Jat Tahsil. Rampur Minor Irrigation Project was completed in 1984 spreading over an area of 6 hectares with the total 29.45 hectares of command area. The tank has direct influence is observed in Rampur Village and surrounding areas. Such influence has been studied by us in the present work.

8. Spatial Distribution of Wells:-

Rampur Village is located in the rain shadow region of Sangli District (Jat Tahsil). So wells play an important role in agricultural activities of farmers of Rampur

Village. The distribution of wells in Rampur Village is uneven and number of wells and tube wells has tremendously increased after the construction of water percolating tank since 1984. At present there are nearly 98 wells and 467 tube wells which are distributed unevenly 5 wells are available per 100 hectares and 22 tube wells are available per 100 hectares. Near the reservoir and nala wells are sparsely distributed because the farms receive the irrigation water through the Pipe line, whereas the wells are densely observed in south-western part of the village, mainly due to lack of the other irrigation facilities. In 1991-92, the village had total 67 wells and 277 tube wells with a density of 2.1 wells per 100 hectare and 12.6 tube wells per 100 hectare. Thus, formerly the distribution of wells was very sparse.

If one notices the map of two periods that is 2011-12 and 1991-92's showing the distribution of wells and tube wells, there is a tremendous change in the pattern of wells, tube wells and their numbers. During the last two decades, 48 new wells and 277 new tube wells have come up, especially in the north, east and west parts of the village. This increase in the number of wells can be attributed with the change in the water table mainly due to the water percolation tank.

9. Spatio-Temporal Variation in Water Table:-

Wells and their water table had played an important role in the agricultural activity of the farmers. The distribution of wells was influenced by the construction of water percolation tank. Similarly, their water level is also indirectly influenced by water percolation tank. In the present study, with help of intensive field work an attempt is made to locate the present number of wells and with figure of water table on a map and similar map showing distribution of wells and their water table was prepared by using the data and the information collected from the farmers.

The map not only shows the distribution of wells but also their water table. Based on, water table figures the Isoclines have been drawn which joins equal water table places The Isoclines maps of water table for the two different decades, help us to see not only the spatial variations in the water table but also the temporal variations in them.

10. Present Spatial Cropping Pattern:-

Cropping pattern of 2011-12, this is unevenly distributed all over the region. More than 48.6% area is under the category of Bajara -Jawar. These are generally medium lands. These are agriculturally medium lands but can be developed with heavy cost. Among the crops Jawar is dominant crop covering 30.2 % area followed by pulses, with 1.7 % area in 2011-12.

Among the irrigation crops fruits (10.9%), Oil seeds (0.7%) & vegetables (3.4%) are important. The significant increase in Fruits (3.4%) area is major characteristic of the cropping pattern. The north, east and southern parts have the dominance of medium lands. Jawar is mainly confined to north, east and southern parts of the study area.

11. Spatial Cropping Pattern During
Pre-Construction of Water Percolation Tank:-

Before the construction of percolation tank in 1984-85, the information regarding cropping pattern and irrigation facilities was collected through interview technique at farm level and the table was prepared.

The remarkable feature of this period was that irrigated tracts were mainly confined to Rampur streams where irrigation from tube wells was dominant. However, most of these wells and tube wells were drying up during summer season

limiting the development of cash crop farming. The rest, of area was depending on seasonal but erratic rainfall. Up to 10 % land was waste lands covered mainly by seasonal dwarf grasses, useful only for seasonal grazing.

During this period (1984-85) there was dominance of food crops and cereal crops, such as Jawar (32.86 %), Bajara-jawar (51.39 %) etc. which occupied nearly 91.4 % of the village. They were grown mainly near the streams. The rest of village had very small area under other crops such as Turmeric, Wheat, Oil seeds, Vegetables, Pulse & Fruit (Table 1). The cropping pattern was dominated by food crops as there was limited scope for irrigation.

12. Temporal Change In Cropping Pattern:-

Table 1 reveals the picture of spatial cropping pattern during 1984-85 and 2011-12. The temporal change can be evident during 21 year period. There has been gradual change in cropping pattern after the construction of water percolation tank. The water percolation tank has enriched the water table resulting into increasing the number of wells. Consequently, the irrigated area was devoted to cash crops like Fruits, Vegetables, Sugarcane and Jawar.

Area under Different Crops (in hectares and percentage)
In l991-92 and 2011-12 and Difference in percentage

Sr. No.	CROPS	YEAR 1991-92		YEAR 2011-12		
		AREA IN HECTARES	AREA IN %	AREA IN HECTARES	AREA IN %	% CHANGE IN AREA
1	Jawar	111	10.97	111	10.97	00
2	Bajara& Jawar	489.82	48.37	309.82	30.59	-17.78
3	Wheat	20	1.98	60	5.93	3.95
4	Oil seeds	0.8	0.08	90	8.89	8.81
5	Pulse	180.1	17.78	180.10	17.78	00
6	Vegetables	9	0.88	59.8	5.90	5.02
7	Fruits	201.86	19.94	201.86	19.94	00

Table No.1
Source: - Compiled by The researchers 2011-12

The increase in irrigated crops has replaced many traditional crops. The area under Wheat increased from 1.98% in 1991-92 to 5.93 % in 2011-12 similarly; there is also absolute increase 5.02 % under vegetables, a cash but irrigated crop. There is

also positive increase in the area under oil seeds from 0.08 % to 8.89 % during this period. An interesting fact is that the area under Bajara and Jawar has declined from 38.37 % to 30.59% which was subsequently brought under Wheat and oil seeds cultivation. In the region most important thing is the crops like vegetables, oil seeds shows positive change 14.01% increases .The proportion of rest of the crops shows, negative change in the region.

Conclusions

1) In the Rampur village, after the construction of water percolation lank, there were considerable changes in irrigation facilities and cropping pattern.

2) In the Rampur village due to water percolation tank, there was increase in the number of wells and there were 106 new wells were constructed. As result, there was increase in well density by 4.9 per 100 hectare.

3) Water percolation tank has directly influenced the agricultural land use pattern In the area, there is change in the area under crops i.e. a few new crops such as fruits, vegetable have been introduced and area under few other crops. Such as pulses and others have decreased whereas the area under fruits, vegetable and wheat has increased. The availability of water is resulted from water percolating tanks.

4) In this study, it is observed that area, under pulse has decreased by 5.4 % which further has been occupied by some cash crops like fruits and vegetables wherever irrigation is extended in the western part of study area, these changes are observable.

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

The above study reveals the fact that there is positive and direct impact of water percolation tank on water table, resulting in the increase of the number of wells and tube wells. The increase in the number of wells further changed the spatial characteristics of cropping pattern. Thus water percolation lank is the single most important tool to bring about favorable changes in the agriculture of famine affected regions of the state.

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