



**WATER RESOURCE MANAGEMENT FOR SUGARCANE CROP AND SUSTAINABLE**

DEVELOPMENT OF SUGARCANE CROPPING PATTERNS IN SANGAMNER TALUK OF AHMEDNAGAR DISTRICT

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**ABSTRACT**

Among the different component of natural environment, water is the most important component. Water is very important factor which is necessary for all living things. As well as water is a basic resource on the earth for all living organisms including mankind and for development and survival of plant community. This water 97 per cent has been locked in ocean as a saltwater, 2 per cent has been arrested by ice sheets and glaciers, 1 per cent fresh water present on the earth. This fresh water is various sources such as underground water and surface water. Amongst than underground water source such as springs, dug wells, tube wells are the prime sources which can supply water in dry season also. The surface water is found in rivers, streams, lakes, seas and ocean. The study area has abundant water through rainfall, surface water and underground water. The availability of water nourished the agriculture, industry and rural and urban settlements. In the context of utilization of water, it is observed that such precious resource is not utilized in proper manner. It reveals from the statistical information that the total geographical area of Sangamner taluk is 1705.06 Sq.km, out of this cultivated area is 1202.09 sq.km. Out of the cultivated area only 245.33 sq.km land is irrigated by different sources of irrigation. Besides this there are 72 villages having 439806 population live in taluk. The population requires daily water amount 4000 million liter but the problem of shortage occurs particularly in urban and some rural settlements. (especially in agricultural settlements). It is observed that in some settlements receive possible water in the crop area. It is suggested that proper water distribution plan is

**INTRODUCTION**

Water, the extraordinary natural phenomenon, has science and human dimensions, both in equal measure (Narasimhan, 2009). The water is a major and unique resource, which play significant role in economic development as well biological functions. So, the development process of any nation is stands on the availability of water. The resource water is available through major three sources viz. atmospheric water, surface water, ground water and newly added is soil water. As concern to study area has average rainfall is 416.6 mm per annum of which about 85 per cent in south-west monsoon and nearly 15 per cent in north-east monsoon seasons. Therefore, rainfall is the major source of surface water and ground water in the study area. As per estimation of rainfall and water received by the per sq km land of study area is 416 m<sup>3</sup> or 416 million liters. Surface water is the major source of water in study area. There are 168 percolation dams, 46 minor projects, 13 Kolhapur type weirs and Pravara river basins. Beside these there are 691 tube wells and 15234 wells. The both

surface water and ground water jointly irrigated to the area nearly 189.96 km<sup>2</sup>.

Differences in attitude towards the rural land, in the level of prosperity and in technology have produced changes in emphasis, which are only gradually coming to be appreciated, although in the long run their effects in both landscape and land use studies are likely to be far-reaching (Coppaock, 1968). The sets of the crops raised differ from place to place and there is wide gap in their percentage. In most of situations, the physical environment reduces the choice of the enterprise, either by prohibiting the growth of certain crops altogether or by reducing their level of output to an unprofitable degree (Morgan and Munton, 1971). The cropping pattern of any region shows the first hand information about the cropping intensity. With the help of cropping pattern the researcher attempts to know the water consuming crops and study the mismanagement in water supply to the particular crops.

**STUDY AREA**

Sangamner tahsil is one of the major tahsil of Ahmednagar district, which is located Western part of the district lies between 19°34'N 74°13'E 19.57°N 74.22°E. on the banks of the Pravara River. It has an average elevation of 549 metres (1,801 ft) from mean sea level. It is the second-largest city by population in Ahmednagar District, after Ahmednagar City. Sangamner is the biggest settlement on NH 50 (New NH-60) between Pune (143 km distance) and Nashik (68 km distance). The climatic condition of study area is monsoonal type. The study area is having three seasons i.e. rainy, winter and summer. The summer season has recorded maximum temperature which is an average 36.5°C and winter season shows average minimum temperature is 20°C. The rainfall is varying from west to east and its pattern is more towards west and less at east. The average annual rainfall is 416.6 mm. the major drainage system is river Pravara.

**OBJECTIVE**

The objective of the present research paper is to study the water resource utility for sugarcane crop and sustainable development in Sangamner tahsil of Ahmednagar district (Maharashtra).

**DATA COLLECTION**

The present research is based on primary and secondary data. The primary data is collected through questionnaire, schedule, interviews, field observations and researchers experience. The secondary data is collected from census handbook of Ahmednagar district, socio-economic review of Ahmednagar district, tahsil office, talati office, reports of the different agencies, various journals, reference books, internet (www).

**METHODOLOGY**

The development in irrigation systems are directly observed on sugarcane and vegetable cultivation. But in the present study only sugarcane cultivation is considered. For this purpose 18 rural settlements (29%) have been randomly selected and out of these settlements 110 farmers are chosen on the basis of those who cultivate more than 80 per cent sugarcane crop with applying purposive sampling technique for further investigation to know water utilization for sugarcane crop. The collected data is processed by using simple mathematical treatment for identify an average values.

**DISCUSSION**

The western part of Maharashtra state is well known for sugarcane belt. The study area is part of this belt. Sugarcane cultivation is common and well flourished in study area. The recent statistics shows that out of NSA 7.13 per cent land is under sugarcane crop. The river Pravara and Mula are the major river systems. Due to such rivers lift irrigation through sugar industry, co-operative societies and individual farmer have been established. Beside this KTweirs, small and medium projects, wells and tub wells are the chief means of irrigations.

**Cropping pattern (2004-2015)**

The cropping pattern of any region shows the first hand information about the cropping intensity. With the help of cropping pattern the researcher attempts to know the water consuming crops and study the mismanagement in water supply to the particular crops.

**Table 1: Cropping Pattern and Rate of Change- 2004-05-2014-15 (in Percentage).**

| Sr. No. | Crops         | 2004-05 | 2014-15 | Rate of Change |
|---------|---------------|---------|---------|----------------|
| 1       | Cereals       | 58.54   | 48.20   | -10.34         |
| 2       | Pulses        | 06.72   | 07.19   | 0.47           |
| 3       | Sugarcane     | 08.08   | 10.02   | 1.94           |
| 4       | Oilseeds      | 02.40   | 02.88   | 0.48           |
| 5       | Other Crops   | 06.70   | 06.44   | -0.26          |
|         | Net Sown Area | 82.46   | 80.74   | -1.72          |

Source: 1) Govt. of Maharashtra, Socio-economic Review of Ahmednagar District, 2005 and 2015.

2) Compiled by Researcher, 2017.

The table 1 and fig. 1 shows the cropping pattern of Sangamner tahsil 2004-05 over 2014-15. The Net Sown Area (NSA) of study area was 82.46 per cent in 2004-05 and 80.74 per cent in 2014-15. It clearly reveals that nearly 1.72 per cent negative growth has been observed and it is not good indication for the study area. Whatever concern to the cropping pattern for the considered area, there is dominance of Sugarcane crops (rate of change in 10 years is 1.94%). On the second rank the other crop is Oil Seeds. It also shows the positive growth by 0.48 per cent. The farmers of study area have, recently inclined

towards the Pulses. The crop sugarcane stands on the rank First, there were only 8.08 per cent land (2004-05) under this crop but in the next 10 years period it occupied 10.02 per cent land (2014-15) and reveals positive rate of change (1.94%). There is one sugar factories, jaggary centres and easy availability of water supply as well as developed road network, capital investment etc. which are major causes for increase in sugarcane area. The mind setup of the farmers is as sugarcane crop should be grown with minimum effort and get more benefits.

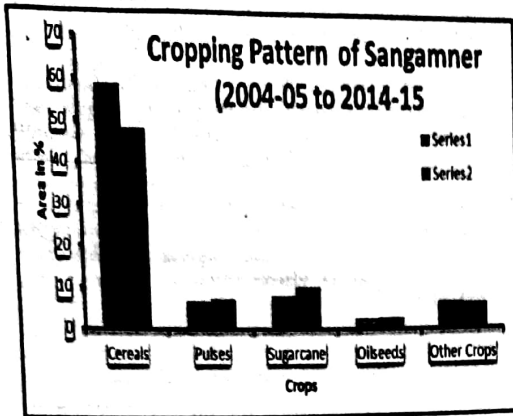


Fig 1: Cropping Pattern and Rate of Change- 2004-05-2014-15 (in Percentage).

The pulses and cereals are observed on fourth and fifth rank on the basis of area engaged. The pulses had 06.72 per cent land in 2004-05 and over 2014-15 it has 07.19 per cent land, which shows .047 per cent positive rate of change. The category of pulses has dominance of chana (chickpeas) followed that mung bean and chawali etc. The cropping pattern particularly cereals indicates the negative growth (10.34%). The cereal crops occupied 58.54 per cent land in 2004-05 but it was decreased upto 48.20 per cent (2014-15). The area of cereals is replaced by oilseeds, sugarcane and other crops. The replaced area is mostly irrigated. The irrigated area of Sangamner tahsil has observed over use of water. So, resource water needs proper management which will be benefited to maintain the soil quality, extend the irrigated area, water pollution, best possible drinking water and industrial water.

**Case study: water utilization for sugarcane**

**Land Holding**

The selected farmers are analyzed on the basis of land holding. The table 1.2 reveals the land holding pattern of farmers in the study area.

Table 2: Land Holding Pattern of Farmers in Sangamner Tahsil.

| Land Holding (in Acres) | No. of Farmers | Percentage |
|-------------------------|----------------|------------|
| Below 5                 | 45             | 30.41      |
| 06-10                   | 34             | 22.97      |
| 11-20                   | 35             | 23.65      |
| 21-30                   | 19             | 12.83      |
| 31-40                   | 10             | 06.76      |
| Above 41                | 05             | 03.38      |
| Total                   | 148            | 100        |

Source: Compiled by Researcher, 2017.

The land holding level of farmers is varying from few guntas to acres. The farmers more than 30.41per cent which have land below 05 acre. The land owners in

range between 6 to 10 acres are 22.97 per cent and it is remarkable features of the study area. The 23.65 per cent farmers are having 11 to 20 acres as well as 12.83 per cent farmers are having 21 to 30 acres land and above 41 acres land holders shows only 3.38 per cent farmers. The traditionally fathers property (land) is divided among the children's is a main cause of low land holding in study area. One thing is prominently observed that all the farmers are interested to grown the sugarcane crop because in minimum exertion it is more beneficial as well as it supports the livestock for dairy production.

Land Holding Pattern of Farmers in Sangamner Tahsil

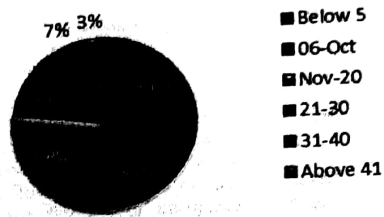


Fig 2: Land Holding Pattern of Farmers in Sangamner Tahsil.

**Source of irrigation**

The Sangamner tahsil is one of the leading tahsil of Ahmednagar district in number of ways and its major occupation is agriculture. More than one half areas are irrigated by different sources of irrigation. Out of these the river irrigation is dominant, followed by well and tub wells. The water table has deepened nearly 4.5 m to 7 m. As per field investigation it is observed that from the last decade water table is deflected due to variation in rainfall, longer span of dry days, continuous discharge of water from wells and tube wells, higher use of water for traditional and industrial purpose and blindly cropping pattern.

Table 3: Irrigation Sources in Sangamner Tahsil.

| Irrigation Sources |              | No. of Farmers | Percentage |
|--------------------|--------------|----------------|------------|
| Lift Irrigation    | Individual   | 21             | 14.19      |
|                    | Co-Operative | 52             | 35.14      |
| Well               |              | 46             | 31.08      |
| Tube Well          |              | 29             | 19.59      |
| Total              |              | 148            | 100        |

Source: Compiled by Researcher, 2014.

The table 3 reveals that the development in co-operative sector reflects from the co-operative lift irrigation schemes. In these 51 villages, there are more than five co-operative lift irrigation schemes on the rivers (Pravara

and Mula). The lift irrigation schemes are divided into two categories on the basis of its ownership first is individual scheme and second is co-operative schemes. The category of cooperative scheme stands on rank first. Whether these schemes are ruled by sugar industry or some farmers come together and construct the lift irrigation scheme. Therefore, 35.14 per cent farmers are providing water to their land by co-operative lift irrigation schemes and it shows in higher number in the study area. The second rank is hold by wells as means of irrigation. It is occupied nearly 31.08 per cent mass of farmers. Due to rainfall and surrounding irrigated area maintain the water table of the wells and also same happen with the tube wells. But the proportions of farmers are also used the tube well as means of irrigation. It is recorded only 19.59 per cent.

#### Sugarcane: Watering Period

Sugarcane being a long duration crop producing huge amounts of biomass is classed among those plants having a high water requirement and yet it is drought tolerant. It is mostly grown as an irrigated crop. The plant crop season being 12-18 months in India ([www.sugarcanecrops.com](http://www.sugarcanecrops.com)). The crop sugarcane is required continuous water as per its need. In rainy season it has no need of artificial water supply. If the span of rainy days are extended then it is needed to provide water. The summer season has more water requirement then the winter season to this crop. Secondly the nature of soils is an important factor which affect on the water requirement for sugarcane crop. Generally it is observed that, the farmers supply water to their sugarcane crop more than requirement. Watering period is significant aspect in water management for agriculture purpose. The watering period is varying from farmer to farmer. The sugarcane producing majority farmers have mindset, if we supply frequently and plentiful water to sugarcane crop then and then the average production will be increased and it is real fact. So, they are supplying frequently and too much water to such crop. With proper awareness among the farmers we can conserve the water and conserved water should be used for replacing unirrigated land into irrigated land. This will be support the socio-economic development of Sangamner tahsil. The present analysis is based on the average values based on the interviews and questionnaire filled by the farmers as well field observations. Particularly an average values are considered for submersible and monoblock pumps capacity, average discharge of water per minute per liter and watering period per acre for sugarcane crop and winter and summer season are think about as a water requirement period. The standard watering period (for clay soils is above 20 days and for-stony soils is above 11 days) is assumed which is longer and the average production of sugarcane is higher because the average sugarcane production is 150 tones per hectors which is commonly taken by the number of farmers. It is observed that watering purpose, the sugarcane crop is habitual. If farmer supply water regularly to sugarcane crop after 7 days to above 20 days then such crop needed water with

same interval otherwise that crop shows water requirement indications (dryer).

The water requirement for this crop depends upon the nature of soils. The soils of the selected settlements differ from place to place. The soils is medium to deep brown or black (clay soils) along the river side's but the interior from the river as per altitude the stony soils are appeared. The water holding capacity of brown or black soils is higher than the stony soils. For the purpose of present analysis two categories soils are kept in mind. These are brown or black soils (clay soils) and stony soils. As per the category of soils the watering period is classified into each four sub-groups on the basis of watering interval days. The clay soils have below 14 days, 14 to 17 days, 17 to 20 days and above 20 days and stony soils have below 6 days, 7 to 8 days, 9 to 10 days and above 11 days.

#### Farm Watering Method by Farmers

1. Traditional watering methods i.e. pat or dare system.
2. Up to few centimeters water level above the ground is general parameter of watering.
3. Overflow of farms is commonly observed.
4. On the farmers or co-operative irrigation system each farmer has particular day for watering. Therefore, such farmer supply water to his farm without knowing the requirement of water to this crop because of only sequential number or round of watering.
5. The Pathakari is authorized person particularly on co-operative schemes. He plans the distribution of water among the beneficiaries. The farmers are maintaining good relation with implementing wrong way and make available frequently water to their farms.
6. The farmers, who have well or tube well irrigation and these well or tube wells have abundant water. Due to this happen only availability of water they are provide water to their crops.
7. Not a single farmer knows the actual requirement of water to sugarcane crop.

#### Water Management and Suggestions

Farm cultivation is the major business of the people living in the study region. In Solapur district 68 per cent (2011 census) of the people are engaged in agricultural activity. In Solapur district rainfall is received from south west and retreating monsoons. District is situated in the southern part of Maharashtra and it comes under the rain shadow region of the state. Hence, the rain received in the study region is irregular and scanty. Drought will be the permanent natural hazard in this region. There should be need applying new techniques of water harvesting and knowledge of bio-technology. Any kind of planning for development of agriculture sector would be incomplete and insufficient in the absence of efficient water for the development of agricultural products. On the basis of earlier observations and after studying the availability of water resources and drought prone area, following

suggestions should be incorporated in making strategies for rational and substantial development of water in the study region.

1. Applying new methods of irrigation is very useful for the better development of agriculture in study area i.e. drip irrigation, sprinkler, perforated pipe etc.
2. At the meso-level we could better integrate ground water development comprising exploration assessment and sustainable exploitation from remote sensing by hydrological and geophysical studies.
3. The most important thing is to increase the area under of forest. In recent out of total geographical area forest occupies 2.14 per cent area in the study region.
4. We could also consider at alternatives to traditional cropping practices, where feasible artificial recharge augmentation can be achieved by recharging wells and bores with good quality water from streams. With percolation tanks in semi-arid hard rock areas and with rainwater harvesting in urban areas.
5. The proper planning of water resource management is needed in the study region. Therefore number of methods should be apply for water conservation like well and tube well recharge, nala building, construction of dams and tank, kholapuri bandhara etc.
6. Finally at the micro level each one of us should be a socially aware and responsible citizen, exercise water economy and promote and support water management practices.

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