

# Crop Combinations and Irrigation Systems in Sangli District

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**Abstract:** Multiplicity of crop combination has been one of the main features of Indian agriculture. It is attributed to rain fed agriculture and prevailing socio-economic situations of farming community. Depending upon the spread of crops in the area many crop combinations have been identified in Sangli district. The major issues emerging in the irrigated crop combination along with some important constraints are given in the text of this paper. Surface and natural irrigation systems cover 72 % agricultural land, whereas 22 % agricultural land is irrigated by drip and 6 % land is irrigated by sprinkler system in Sangli district. The information regarding crop combination in horticultural crops like vegetables is not compiled and readily available. However, constraints in the production and cultivation of these crops are given in brief.

**Key words:** crop combinations, irrigation systems.

## I. INTRODUCTION:

Crop combinations of a region are decided by a number of soil, irrigation and climatic parameters which determine overall agro-ecological setting for nourishment and appropriateness of a crop or set of crops for cultivation. While opting for particular Crop combinations at farmer's level, potential productivity and monetary benefits act as guiding principles. These decisions with respect to choice of crops and crop combinations are further narrowed down under the influence of several other forces related to infrastructure facilities, socio-economic factors and technological developments, all operating at micro-level. Infrastructure facilities include irrigation, storage, transport, marketing, post harvest handling and processing. Socio-economic factors includes financial resource, land ownership, size and type of land holding, labour availability and needs of food, fodder, fuel, fibre, etc. Technological factors include improved varieties, cultural requirements, mechanization, plant protection, etc.

## II. STUDY AREA

Sangli is famous for its name Turmeric city in the Maharashtra state of India. The climate ranges from heavy rainfall in the Chandoli (Shirala) region with annual rainfall over 4000 mm, to the dry areas in Atpadi and Jath tahsils where the average annual rainfall is about 300 mm. Sangli district is situated in the basins of Krishna and Warna rivers. The valley of river Krishna is one of the greenest areas of the country. Warna, Panchganga and another small river flow in the river Krishna. The land in the Krishna valley region is best suitable for agricultural crops. Sangli district shows a contrast in cropping pattern and use of irrigation systems in its different parts depending upon climate and source of irrigation. Agriculture is the main source of income in the district. Sugarcane, sorghum, groundnut, soybean, paddy, turmeric, grapes and pomegranate are the major crops cultivated in Sangli district.

## III. METHODOLOGY

The present study has been descriptive; the data for this study were obtained from secondary sources. The secondary has been collected from various references which already existed in published form; part of the paper is based on literature review the method comprising of collecting all the available papers relating to the them and selecting relevant papers/books for the review purpose. Selection of the paper is done on the basis of their relevance and contribution to the body of knowledge. The author has made an attempt to do primary reading of the selected papers which will constitute the core of this review study.

## IV. DISCUSSION AND RESULT

### Important crop combinations of the Sangli district:

#### Rice-Groundnut:

Groundnut is basically a *Kharif* crop grown under rainfed conditions; however, summer groundnut is emerging as an important high value crop under assured irrigation sources. The productivity of summer groundnut is almost double of the yield obtained in *Kharif* season. It has become possible to grow groundnut on well drained low lying fertile lands after harvest of preceding rice crop under assured irrigation. This crop combination is possible in the tahsils of Walwa and Shirala of Sangli district.

#### Rice-Wheat:

Rice-Wheat system is the most widely adopted cropping system in the state. Despite enormous growth of this system, some reports of stagnation in the productivity of these crops shows possible decline in future which raised doubts on its sustainability. Important issues emerging as a threat to the sustainability of rice-wheat system are decreasing response and over mining of nutrients from soil, disturbed soil aggregates due to puddling in rice, declining ground water table, build up of diseases/pests/*Phalaris minor*, shortage of labour and lack of appropriate varietal combinations.

#### Rice-Pulses:

Rice-Pulses cropping system is one of the dominant rotations in the productivity of rice and the pulse crops. The base crop in the system is rice which has higher productivity. It is possible and also imperative for rice growing regions to cultivate gram and Indian bean on residual moisture of rice. But if suitable varieties of paddy and pulses are available with assured irrigation sources, it is possible to grow pulses like gram, green gram and Indian bean after paddy by adopting proper management practices. This cropping system has its suitability for all rice growing areas of Sangli district.

**Sorghum-Wheat:**

Sorghum-Wheat is one of the most prevalent cropping systems in the Sangli district of Maharashtra. The productivity of sorghum faces wide fluctuations due to some problems like a parasitic weed striga, major insects top shoot borer and shoot fly affecting plant population and reducing yield levels considerably. Fluctuating market prices, usually discourage the sorghum growers, however, sorghum cultivation is indispensable as it is the most important source of food and fodder in the Maharashtra.

**Sugarcane-Wheat:**

Sugarcane is grown in about 55700 hectares area which account for 10 % of the total area under cultivation in Sangli district. In the sugarcane belt, sugarcane-ratoon-wheat is the most important crop sequence. This system is gaining importance in sugarcane growing districts of the Maharashtra like Ahmednagar, Kolhapur and Sangli. Late planting of both the crops, imbalance and inadequate use of nutrients, poor nitrogen use efficiency in sugarcane and low productivity of ratoon crop are the major problems in sugarcane-wheat system.

**Soybean-Wheat:**

Soybean-wheat cropping system has been emerged as an important cropping system only after 1980 with introduction of soybean as a *Kharif* crop in wheat growing areas of the country particularly under irrigated ecosystem. Relatively recent introduction of soybean as a crop, limited genetic diversity, short growing period available in Indian latitudes, hindered availability of inputs at farm level, rain fed nature of crop and water scarcity at critical stage of plant growth, insect pests and diseases, quality improvement problems, inadequate mechanization and partial adoption of technology by farmers have been identified as the constraints limiting the soybean production and productivity. This cropping system is also feasible when there is water availability for irrigation in the winter.

**Legume based cropping systems:**

Pulses and oilseed crops are popular for their suitability in different cropping systems. Recent advances in the development of large number of varieties of pulse and oilseed crops, varying largely for maturity duration have made it possible to include them in irrigated crop sequences. Lack of technological breakthrough with respect to yield barriers in legumes, susceptibility of the pulses to water logging, high susceptibility to disease and pests, low harvest index, flower drop, indeterminate growth habit and very poor response to fertilizers and water are the major problems in legume-based cropping systems.

**Horticultural crops:**

The productivity of fruit and vegetable crops grown in the country is low as compared to developed countries. The information with regard to cropping pattern in horticultural crops particularly vegetables and tuber crops are not compiled and readily available. Low productivity is the main feature of vegetable production India. Preponderance of hybrid varieties and protected cultivation are mainly responsible for high productivity in the developed countries. Maharashtra is placed in the central tropical zone of vegetable growing in which productivity levels are low due to lack of planning in production, non-availability of seeds of improved varieties, high cost inputs, inadequate plant protection, weak marketing and post harvest losses. Vegetable crops can be incorporated in various cropping systems after eliminating major constraints in their production.

**Irrigation systems:**

In Sangli district irrigation systems used for different crops includes natural irrigation by rain, surface irrigation, sprinkler irrigation and drip irrigation.

**A. Natural irrigation:**

Major crops like sorghum, bajara, soybean, groundnut and chickpea are grown on natural irrigation by rainfall. No additional sources of irrigation from well, river or canal are used. By using natural irrigation only one crop is grown in a year. There is no proper arrangement in the field for irrigation. Rain water harvesting is also not done.

**B. Irrigation:**

Irrigation means artificial application of water to the soil using various systems to assist growth of field crops, horticulture crops and maintenance of landscapes. Various types of systems of irrigation have been designed to distribute the water within the field which is obtained from the source.

**1. Surface irrigation:**

This is the most common method of irrigating agricultural land. In this method water moves over and across the soil by gravitational flow in order to wet and infiltrate into the soil. Surface irrigation by flooding the whole land is most conventional method by making small canals alongside the field and distributing water through various channels into the field. Water is obtained by pumping or lifting from the sources like well, river, canal or ground water. In Sangli district, surface irrigation by flooding is given to the crops like wheat, sugarcane, paddy, turmeric, etc. Check basins are used for most of the perennial fruit orchards.

**2. Drip irrigation:**

The most water efficient method of irrigation is drip irrigation system, since evaporation and runoff losses are minimized. When fertilizers are given through drip irrigation along with water, it is known as fertigation. The benefit from the drip irrigation is that the usage of fertilizer is optimum as they are not washed away by the flow of irrigation. Usually lower water pressures are needed for this system as compared to other systems, except low energy central pivot and surface irrigation systems. Drip irrigation system is designed for uniform and precise delivery of water throughout the field or to the individual plants in landscape containing various plant species. The government is providing subsidies to support large scale use of drip irrigation systems for horticultural and agricultural crops. This system is mostly used for horticultural crops like grapes and pomegranate and for field crops like sugarcane and turmeric in Sangli district. There are two types of drip irrigation systems viz., time-based system and volume-based system. In time-based system, operation sequence will be set by the user as desired on the basis of time. The basic objective is to prepare a schedule based on crop water requirements. In volume-based system, every section receives the preset volume of water.

**3. Sprinkler system:**

In this system, water is piped to one or more central locations within the field and distributed by overhead high-pressure guns or sprinklers. A system utilizing overhead mounted sprinklers, sprays or guns on permanently installed risers is often referred as Solid-set irrigation system. Higher pressure rotating sprinklers are called rotors and are driven by a ball drive, gear drive or impact mechanism. On the basis of arrangement of spraying irrigation water, the sprinkler systems are classified into two major types viz., Rotating head or revolving sprinkler system and perforated pipe system.

**1) Rotating heador revolving sprinkler system:**

Small size nozzles are placed on riser pipes fixed at uniform intervals along the length of the lateral pipe and the lateral pipes are usually laid on the ground surface. They may also be mounted on posts above the crop height and rotated through 90° to irrigate a rectangular strip.

**2) Perforated pipe system:**

This method consists of drilled nozzles or holes along their length through which water is sprayed under pressure and usually designed for relatively low pressure (1 kg/cm<sup>2</sup>).

Based on the portability, sprinkler systems are classified into the following types:

- (i) **Portable system:** This system has portable main lines, laterals and pumping plant.
- (ii) **Semi portable system:** It is similar to a portable system except that the location of water source and pumping plant is fixed.
- (iii) **Semi permanent system:** This system has portable lateral lines, permanent main lines and sub mains and a stationery water source and pumping plant.
- (iv) **Solid set system:** A solid set system has enough laterals to eliminate their movement.
- (v) **Permanent system:** A fully permanent system consists of permanently laid mains, sub mains and laterals and a stationery water source and pumping plant.

Sprinkler irrigation system is used for the crops like wheat, ground nut and chickpea in Sangli district.

**V. CONCLUSION**

Net cultivated area in Sangli district is 557100 ha, while area sown more than once is 91900 ha. Thus, gross cropped area is 649000 ha. Net cropped area is 85.84 % as compared to the total cultivable area. Major field crops includes sorghum, paddy, groundnut, bajara, wheat, chickpea, soybean and sugarcane, whereas major horticultural crops are grapes, pomegranate and ber.

Out of net cultivable area, 45.95 % area is under sorghum, 17.16 % under bajara, 14.83 % under soybean, 10.00 % under sugarcane, 7.20 % under groundnut and 5.49 % under wheat. Sorghum (Kharif) is sown in Walwa, Miraj, Tasgaon, Palus and Kadegaon tahsils, while sorghum (Rabbi) is cultivated in Miraj (East), Khanapur, Atpadi, Jath and Kavthe Mahankal tahsils. Bajara is grown in Atpadi, Jath and Kavthe Mahankal tahsils. Paddy is cultivated in Shirala, Walwa and Palus tahsils. Sugarcane is taken in all the tahsils where there is an assured source of water. Soybean is sown in Shirala, Walwa, Palus and Miraj tahsils. These tahsils along with Khanapur also have groundnut crop. Wheat is cultivated in all the tahsils as per availability of water and chickpea is mostly sown on residual moisture of paddy crop. Grapes are cultivated in Tasgaon, Khanapur and Kavthe Mahankal tahsils on about 10200 ha land. Grapes of Tasgaon tahsil are famous in India and the Middle East. Pomegranates and ber are grown in Jath and Atpadi tahsils. Vegetables like tomato and onion are also grown on about 3600 ha and turmeric on 9000 ha of land.

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