

## A STUDY OF FACTORS AFFECTING ON THE AGRICULTURE PRODUCTIVITY OF DRY LAND BLOCKS OF SATARA DISTRICT

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**Abstract:** Agriculture and its allied activities plays important role in Indian Economy.. Agriculture sector provides food, fodder and industrial raw material. Agricultural activities are depends on water availability, soil pattern, land utilization and crop pattern. All over the world agriculture is divided into two parts viz. Irrigated agriculture and Dry-land agriculture. Growth in the agriculture production is depends on productivity of crop per hector. India stood far away as compare to the world most agriculture productivity countries. In agricultural development, Satara district is one of the important districts of Maharashtra State. According to the Rainfall, Soil and Climate of Satara district is divided into two zones Western (Rainy zone) and Eastern (Dry zone). Irrigated agriculture is depends on water availability in dam, rivers, lacks etc. but dry- land farming is depends upon rain water, storage of the moisture in the soil and types of the crops. The present paper highlights agricultural productivity and the factors such as rainfall, land use pattern in Khatav and Man Block of Satara district.

**Keywords :** Productivity, Land use pattern, Rainfall, Crop pattern

**Introduction:** Agriculture production is gamble of monsoon. Out of 143 million hector of cultivated land 85 million hector is rainfed. It is also noted rainfed land suffers from low rainfall. Actually overall dry- land farming productivity is practiced where annual potential water evaporation exceeds annual rainfall. Dry- land contributes 42 % of the total food grains production of the country. These areas produce 75 % pulses and more than 90 % of sorghum, millet and groundnut. Agricultural growth is the most important determinant of rural poverty and therefore agricultural productivity growth has a positive impact on reducing poverty. The population growth of last 40 years is 2.26 % per annum and food grains output growth rate is 0.67 % per annum. Hence dry land agriculture management becomes very much significant. Agriculture production is either low or extremely uncertain and unstable are the real problems of dry land farming. In dry- land farming crop production is depend upon the amount and distribution of rainfall, moisture storage capacity of soil and crop pattern.

Satara district is one of the important districts of the Maharashtra State as concern to agriculture development. Mainly two zones of Satara District have been identified according to the rainfall pattern, Land use pattern, Soil Characteristics, Climatic Conditions and Cropping Pattern. These zones are Western Zone (Rainy zone) and Eastern Zone (dry zone). In the present study focus has been given to study the changing trends of agriculture productivity, Rain fall and land use pattern of Khatav and Man Block of Satara district.

**Significance of the Study:** Agriculture sector is the backbone of the country's development. The dry land agriculture plays an important role in the progress of agriculture in the Indian economy. As many as 115 districts of the country of the dry- land farming spread over the two third of cultivated area of country and about 280 million people are living in this belt. It supports 40 per cent of country population and 65 % of livestock population. Thus dry- land and rainfed farming will continue to play a dominant role in Indian agriculture. Dry- land area besides being high temperature during summer, high evaporation rates, high humidity, high runoff, soil erosion and water deficient. The water is the most important factor of crop production, inadequacy and uncertainty of rainfall cause partial or complete failure of crops which deals to period of scarcities and famine. Maharashtra has about 84% area under rainfed conditions that means maximum number of farmers depends on dry- land farming.

The present research work intends to analyze the change in trends of agricultural productivity of dry- land region of Satara district. Agriculture production is influenced by Geographical, Climatological, Socio-Economic and Technological factors. Also there is need of farmer's attitude and direction of new thinking.

### **Objectives of the Study:**

The major objectives of the present study are:

1. To study the rain fall effect on dry-land farming
2. To reveal the changing trends in land use pattern of these blocks.
3. To study the trends in Agriculture Productivity and Rainfall in Khatav and Man Block of Satara district during two decades.

### **Database and Methodology:**

#### **Database:**

The present study is based on secondary data. The secondary data has been collected from District Statistical Office, Agriculture Technology Management Agency (ATMA) Satara District, Department of Agriculture Z.P. Satara, Statistical Abstract of Maharashtra, Socio Economic Review of Satara District etc.

#### **Statistical Tools:**

The numerical data has been analyzed by applying Statistical tools, and also maps and graphs are used for finding the trend of productivity in Khatav and Man Block of Satara district. Following Statistical Tools have been used for data analysis and presentation.

- Descriptive Statistics tools are used to graphical presentation, measure average production of yield, variance and standard deviation used to measure variation of crops.
- Proportional Test for land use under cultivation during study period.
- Time Series analysis is used for prediction total agriculture production and productivity.

#### **Study Period:**

The study period is from the year 2001 to 2020 ( i.e. two decades). Total study period is divided in two separate decades such as;

Period-I : From year 2001 to 2010, and

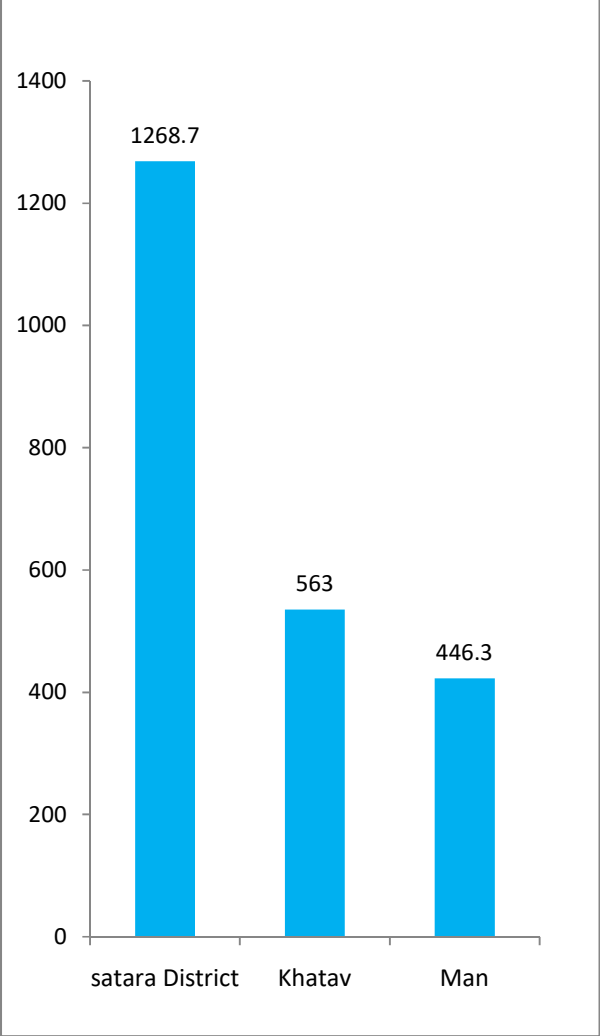
Period-II : From year 2011 to 2020.

**Data Analysis and Interpretation:**

For the present study data has been analyzed and interpreted in the following manner.

**Rainfall in Study Area****Table -1 : Changing trends in Average Rainfall of Khatav and Man Blocks of Satara District**

Year	Average Rainfall of Khatav ( in mm )	Average Rainfall of Khatav ( in mm )
2001	518	357
2002	398	353
2003	260	149
2004	951	354
2005	684	572
2006	602	558
2007	593	595
2008	419	455
2009	566	627
2010	814	761
2011	373	225
2012	273	269
2013	575	407
2014	552	383
2015	376	302
2016	499	396
2017	655	485
2018	443	228
2019	892	703
2020	824	744
<b>Average</b>	<b>563.4</b>	<b>446.3</b>
<b>SD</b>	<b>196.1</b>	<b>179.0</b>
<b>CV</b>	<b>34.8</b>	<b>40.1</b>



**(Source: Socio Economic Survey of Satara).**

**Figure -1: Average Rainfall**

From the above Table -1, it is seen that average annual rainfall of Khatav and Man Blocks is 563.4 and 446.3 mm respectively. However average rainfall of Satara district is 1268.7 mm. It is more than double of average rainfall of study area. In agriculture sector rainfall has prime important factor. Rainfall also determines the cropping pattern. Trend of agricultural commodities goes down whenever there is reduction in rainfall. From the last two decades the average rainfall of these two drought prone blocks is 504.85 mm. from the above table, it is seen that highest average rainfall is 814 mm in year 2010 and in the year 2003 average rain fall is minimum i.e. 260 mm. From the above table it is seen that in study area agriculture production is depend on only rainfall.

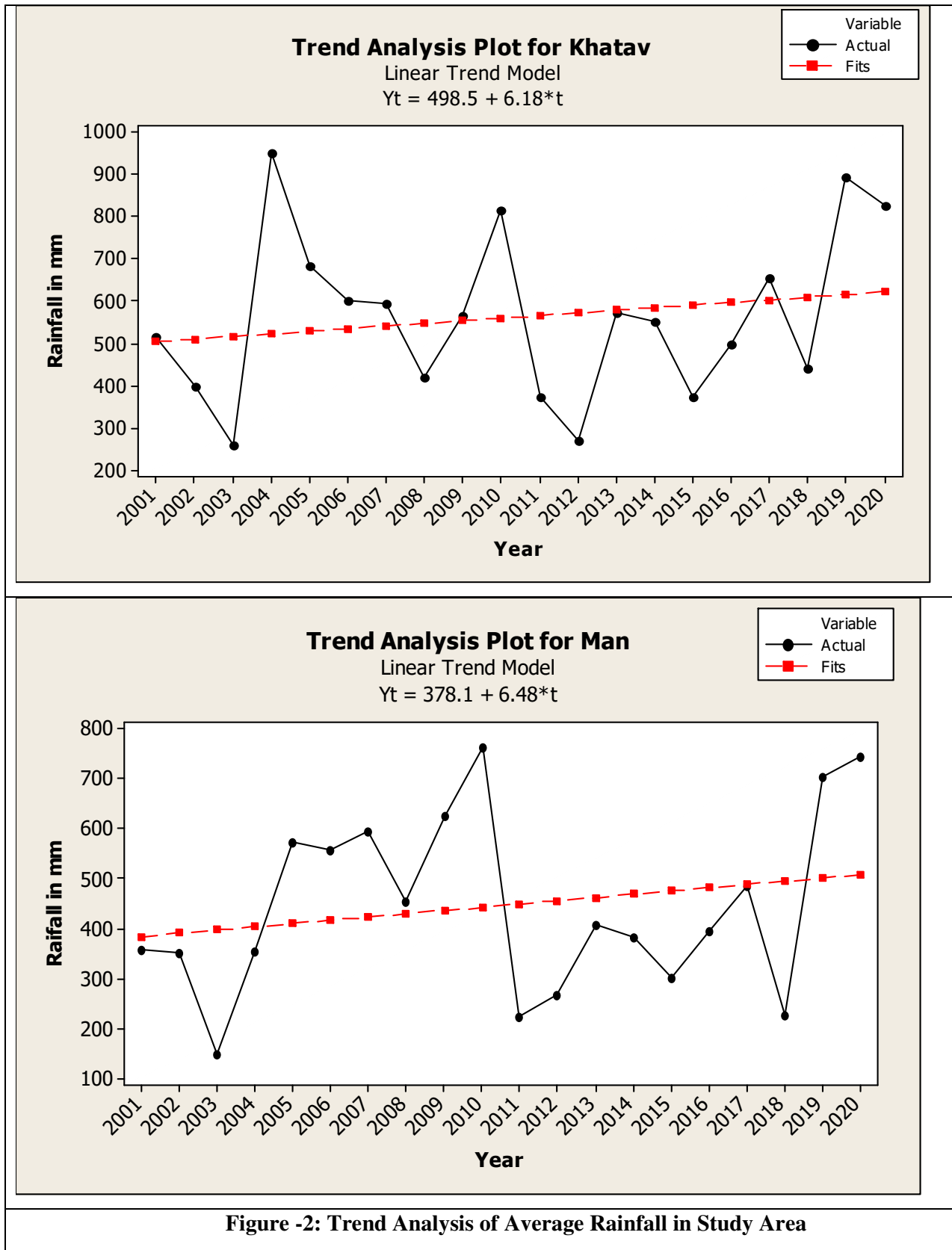


Figure -2: Trend Analysis of Average Rainfall in Study Area

Trend Equations for rainfall forecasting of Khatav and Man Blocks are-

Khatav:  $Y = 498.5 + 6.18 * t$

Man:  $Y = 378.1 + 6.48 * t$

From the trend line graph it is seen that there is much more variation in annual rainfall during study period as compare to trend line. The points which are plotted on a graph are spread away from the fitted trend line, in both graphical presentation of rainfall data of Khatav and Man Blocks.

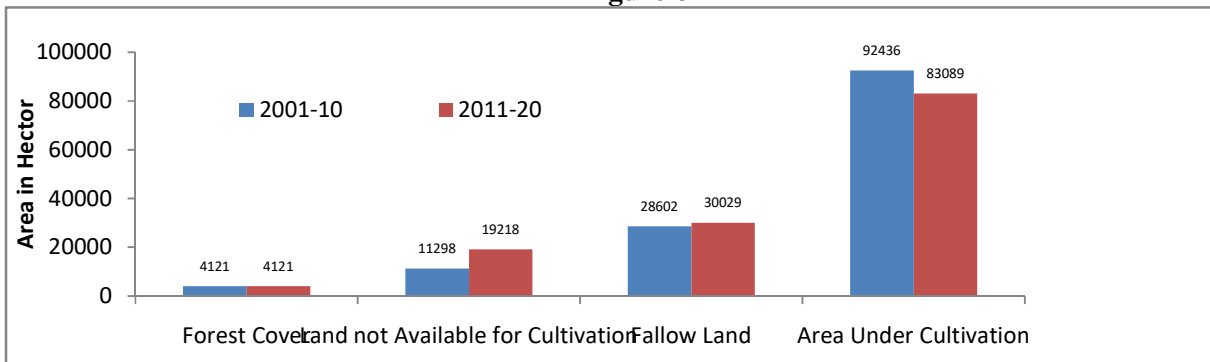
**Land Utilization:**

**Table -2: Utilization of Land in Khatav Block**

(Source: Secondary Data Compiled)

Period	Forest Cover (in Hector)	Land not Available for Cultivation (in Hector)	Fallow Land (in Hector)	Area Under Cultivation (in Hector)
2001-10	4121	11298	28602	92436
2011-20	4121	19218	30029	83089

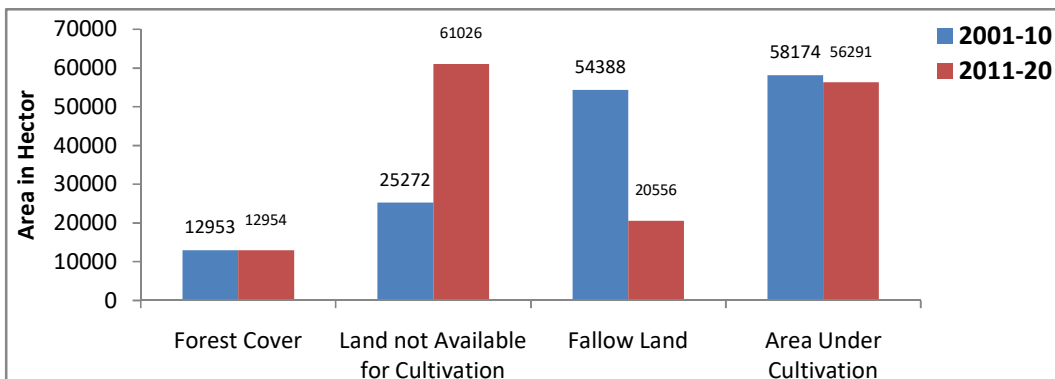
**Figure-3**



**Table -3: Utilization of Land in Man Block**

Period	Forest Cover (in Hector)	Land not Available for Cultivation (in Hector)	Fallow Land (in Hector)	Area Under Cultivation (in Hector)
2001-10	12953	25272	54388	58174
2011-20	12954	61026	20556	56291

(Source: Secondary Data Compiled)



**Figure-4**

From the Table -2, it is seen that forest cover area remained the same in both (i.e. study periods) of Khatav Block. It is also seen that in Khatav Block ‘Land Not Available for Cultivation’ and ‘Fallow Land’ are increased in study period –II as compared to study period-I, and area under cultivation is decreased in study period-II.

From the Table - 3, it is seen that forest cover area remained the same in both ( i.e. study periods) of Man Block and ‘Land Not Available for Cultivation’ is increased in study period –II but ‘Fallow Land’ is decreased in study period –II as compared to study period-I, and area under cultivation is decreased in study period-II.

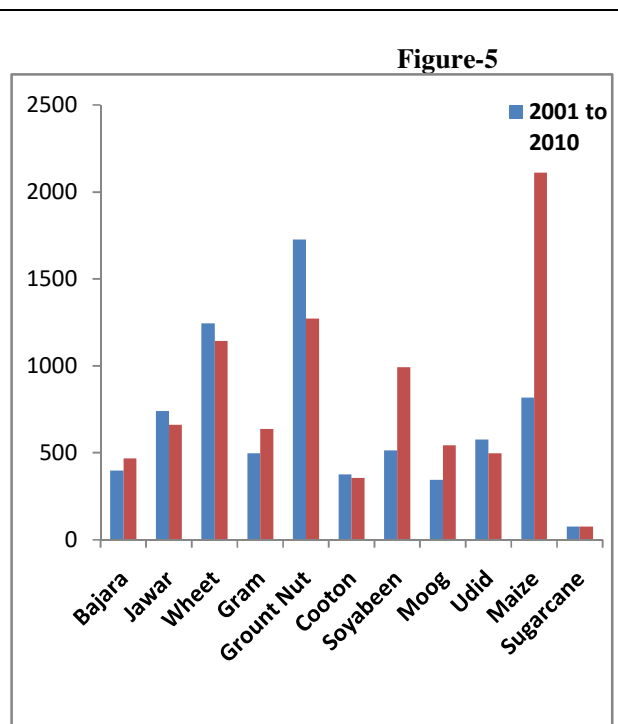
**Statistical Test for equality of proportions for land used pattern in time Period-I and Period-II:**

The duration of study is divided into two phases i.e. 2001 to 2010 and 2011 to 2020. Here, the researchers have tested for equality of proportions for land used pattern in study period-I and II. Land under the different heads in time Period-I are changed in time Period-II. The geographical area is remained the same. Here there is need to test whether the land utilization is proportionally significant or not. For that purpose Proportional Z test taken by the researchers. On the basis of ‘Proportional Z test’ it is observed by the researchers, there is no significant difference between land used patterns in both the stated time period.

**Trends in Agriculture Productivity:**

The present study focuses on computing crop productivity of drought prone Block of Satara district. Jowar, Bajra, Soyabean, Pulses, Sugarcane, Cotton, Groundnut, Maize etc. main crops in the study area.

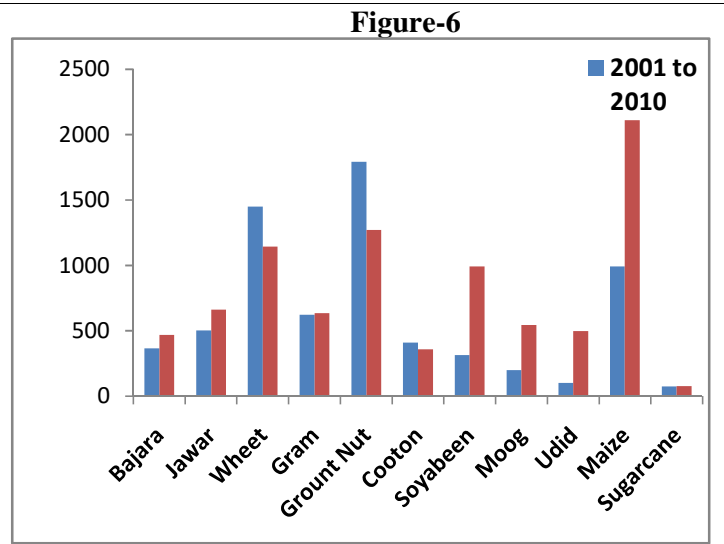
Sr. No.	Crop	Productivity in Kgs (per hector)	
		2001 to 2010	2011 to 2020
1	Bajara	397.7	467
2	Jawar	740.6	662
3	Wheet	1243.9	1143
4	Gram	496.9	637
5	Ground Nut	1725.2	1271
6	Cotton	375.4	356
7	Soyabeen	515	992
8	Moog	345	544
8	Udid	576.2	497
9	Maize	817	2110
10	Sugarcane	77	77



**Table – 4: Trends of Major Crops in Khatav Block (Source: Agriculture Technology Management Agency (ATMA), Satara District)**

From the Table -4, it is seen that trends of average agriculture productivity of major crops like Bajara ,Gram, Soyabeen, Moog, Maize have been increased in study period-II. However, the productivity of crops like Jawar, Wheet, Summer Ground nut, Cotton, *Udid* have been decreased during study period-II as compared to study period-I in Khatav Block.

Sr. No.	Crop	Productivity in Kgs (Per Hector)	
		2001 to 2010	2011 to 2020
1	Bajara	367.3	467
2	Jawar	501.5	662
3	Wheet	1448.2	1143
4	Gram	622.4	637
5	Ground Nut	1793.4	1271
6	Cotton	410	356
7	Soyabeen	314.2	992
8	Moog	200	544
8	Udid	102.4	497
9	Maize	993	2110
10	Sugarcane ( in tonnes)	72.8	77



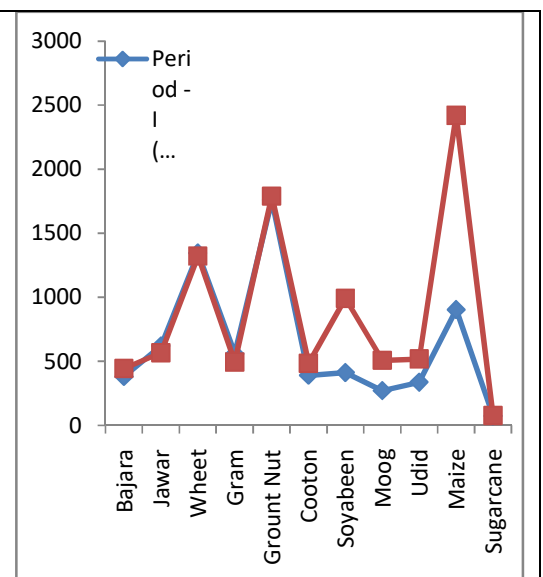
**Table -5: Trends of Major crops of Man Block**  
(Source: Agriculture Technology Management Agency (ATMA), Satara District)

From the Table-5, it is seen that major crops like Bajara ,Jawar, Gram, Summer Groundnut, Soyabeen, Moog,Udid, Maize, Sugarcane have been increased in study period-II. However, the productivity of crops like Summer Ground nut, Cotton have been decreased during study period-II as compared to study period-I in Man Block.

**Linear trend equations for forecasting the agriculture productivity :**

- Khatav Block During the study period 2011- 2020 is  $Y_t = 520.1 - 9.666 * t$
- Man Block During the study period 2011- 2020 is  $Y_t = 465 - 7.8060 * t$

Sr. No.	Crop	Productivity in Kgs (per Hector) Period -I ( 2001 to 2010)	Productivity in Kgs (per Hector) Period -II ( 2011 to 2020)
1	Bajara	382.5	444.5
2	Jawar	621.05	566.5
3	Wheet	1346.05	1323
4	Gram	559.65	495.5
5	Ground Nut	1759.3	1790.5
6	Cotton	392.7	484
7	Soyabeen	414.6	992
8	Moog	272.5	508.5
8	Udid	339.3	519
9	Maize	905	2421

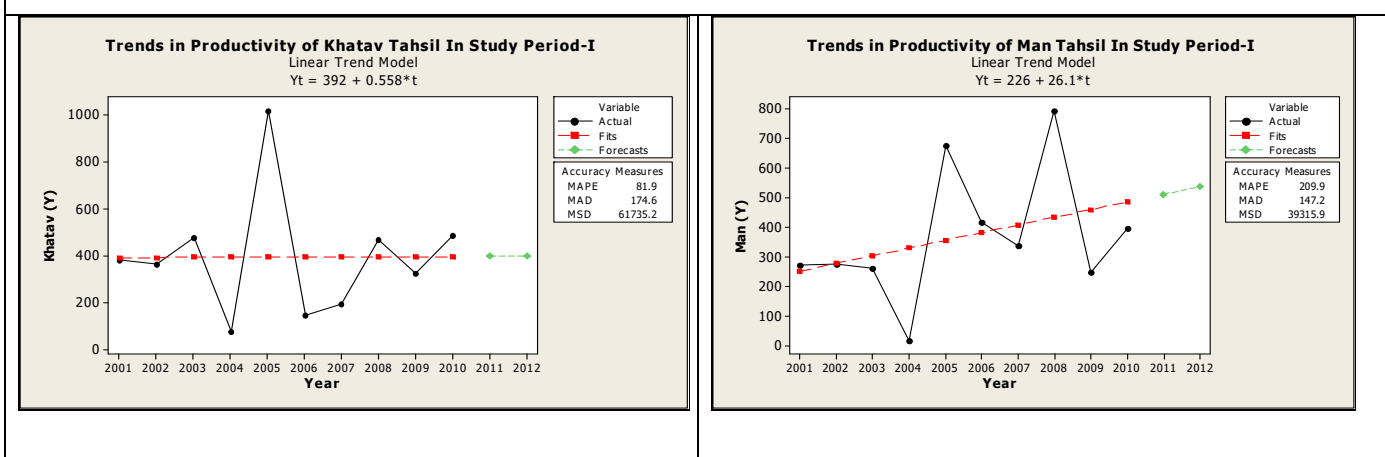


10	Sugarcane ( in tonnes)	74.9	78
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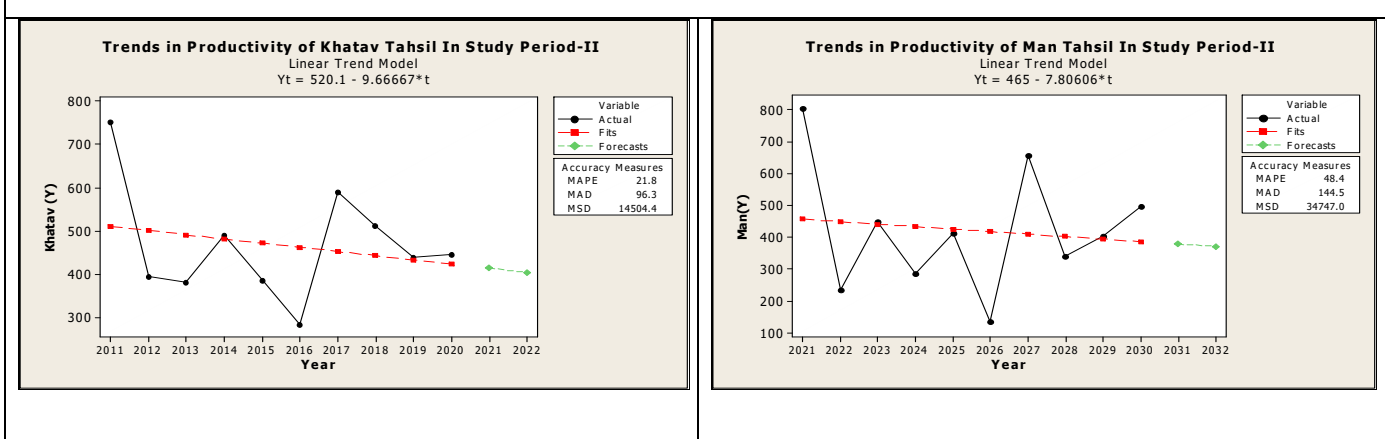
**Table-6 :Average Productivity of Major Crops**  
**(Source: Secondary Data Compiled)**

From the Table -6, it has seen that there is no change in agriculture productivity during the study Period-I and Period-II of the crops such as Bajara, Jawar, Wheet, Gram, Summer Groundnut, Cotton. However, the productivity of crops Soyabeen, Moog, Udid, Maize have been decreased during the study Paeriod-II as comapred to study Period-I, while productivity of sugarcane remained the same in study period-I and II.

**Measuring Trends of agriculture production of Khatav and Man Block during 2001 to 2010**



**Measuring Trends of agriculture production of Khatav and Man Block during 2011 to 2020**



**Findings:**

- Proportionally there is no significant difference of the land used pattern in the study area during Period-I and Period-II.
- Average rainfall of Satara district is 1268.7 mm and in drought prone Blocks showed near about 500 mm only. So, Block wise there is high variation in rainfall...
- In Land use pattern such as forest cover area remained the same in both study period of Khatav and Man Blocks. However, it is seen that fallow land in Khatav Block have been increased but in Man Block it has been decreased. Area under cultivation in both Blocks is decreased.
- There is no significant difference between land used patterns in both the time Periods.



- Trends of average Productivity of major crops such as Bajara, Gram, Moog, Maize in Khatav Block have been increased. However, the productivity of crops like Jawar, Wheat, Summer Groundnut, Cotton, Udid have been decreased during study period II as compared to study period-I.
- In Man Block trends of average agriculture productivity of major crops like Bajara, Jawar, Gram, Summer Groundnut, Soyabean, Moog, Udid, Maize, and Sugarcane have been increased in study period-II. However, in Man Block the productivity of crops like Summer Groundnut, Cotton have been decreased during study period-II as compare to study period-I.

### Suggestions:

- There is a need to increase cultivation land area in order to improve agriculture production per hector in study area.
- On an average rainfall of these two Blocks is lower, therefore farmers have required to take crops which requires minimum water.
- In order to improve productivity of land it is necessary to make use of land by considering scientific view for production by applying cost control techniques.
- Follow land should be used for creation of Solar Power by using various Government Scheme for said purpose.
- The introduction of new technologies is radically changing land use. Better equipments, application of scientific techniques for improving moistures in soil, and new strains of crops and grasses should be considered by farmers for better utilization of land for improving productivity.
- There is an urgent need to create awareness among farmers about land productivity and land utilization by 'Government Agencies, Grampanchayats', and NGOs.

### Conclusion:

In the present paper the researchers pointed out need of improving productivity and land utilization especially dry zone area (Khatav and Man Blocks). It is observed that, the productivity of land is totally depending upon rain fall in that area but actually rain fall is less as compared to remaining blocks of Satara district. In these two blocks fallow land is more which can be cultivated by considering modern technology and equipments that will bring reliable productivity and it is also possible to utilize such land in better manner.

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