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Changing Trends Of Agricultural Efficiency (Ei) of Pune District Maharashtra

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Abstract

Agriculture is continued to be the most important activity of human beings from ancient time to till today. Agriculture is the not only feed the population but also responsible for bending the economic set up and security of the nations especially country like India. India have fertile tracts of the rivers and covers around one sixth of the world population. Means agriculture have an important activity it controls directly and indirectly political, economic and social and cultural pursuits of India. Therefore, agricultural productivity and efficiency plays a very vital role to focus the growth of the Indian economy and responsible for the social set up of the society.

Agricultural efficiency is the performance of various crop production in a selected area, which focuses on effectiveness of agricultural production with respective to available unit of land resources. The Pune district has been selected to find out agricultural efficiency. Along with rapid population growth, increasing urbanization, increasing industrialization and overall development in various economic sectors are affecting the agricultural sector. This study is to find out the agricultural productivity and efficiency index and its tahsil wise variation of the pune district, changing trends in the year between 2001-02 and 2014-15. It is observed that most of the tahsils have improved their agricultural efficiency (Ei), due to government policies, implementation in the irrigation systems, technological advancement and improvement and rural infrastructural development in the various sector and over all increasing demand of food grains due to feed the increasing population. But some tahsils of pune district are suffering from decreasing agricultural efficiency (Ei) rates due to increasing the rate of urbanization or adverse effect of urbanization, construction of the houses, increase in the industrialization. Large scale land acquisition for non-agricultural purpose;(Industry, Road construction, New Airport, Settlement etc) productive crop-lands are converting into low to medium efficiency and high agricultural efficiency (Ei) tahsils with reducing trends of yield rate. Here, Bhatia (1967) method has applied for calculating agricultural efficiency index (Ei). The study concentrates mainly on the changing agricultural efficiency rate of the district. Therefore, it is essential to find agricultural efficiency of the area, which will help to know and compare the situation of agricultural condition with respective economic development.

Key Words: *Agricultural Efficiency, Crop, Yield, Ranking, Economic development.*

Introduction:

Agriculture is the main activity of Indians, practised all over the Indian states and it is known as backbone of our economy. Agriculture is responsible for the change in socio-economic status as well as the development of our society. Agriculture is a dynamic process; it is transformed towards diversification with the influence of different climatic condition, various technological input and socio-economical infrastructure. Agricultural development can be measured by different ways. Agricultural efficiency is one of the most important agronomic techniques to understand over all development of agriculture. In geography agricultural efficiency is related to the productivity of per unit area of land (Dutta, 2012). Agricultural efficiency is a function of various factors including the physical (e.g. climate and soil), socio-economic (e.g. size of holding and type of farming) and technical- organizational (e.g. crop rotation, irrigation and mechanization). The efficiency of agriculture obviously implies that maximum return is obtained from land under a prevailing physico-cultural environment with the application of human effort at the existing level of development. Land use efficiency represents the degree of optimum use and performance of cultivated as well as

cultivable land.

This paper is trying to measure the variation of agricultural efficiency in tahsil level and agricultural efficiency has been calculated in between 2001-02 and 2014-15 cropping year. The study area covers diversified cropping pattern and variety of crop like jowar, Bajara, wheat, potato, sugarcane, onion etc. In the field of geography, the concept of land use efficiency measurement is not a new. Many scholars have discussed and used this concept on large scale in the last two decades. It is a dynamic but complex phenomenon. A study of the spatial variations in agricultural efficiency appears useful for differentiating areas that may be performing rather poorly in comparison with other area in the field of agriculture.

Several researchers have done work on the agricultural efficiency (Ei) in the international, national & regional level. Like, Kendall (1939) has calculated agricultural efficiency on the basis of output per unit of different crops and adopted ranking co-efficient. Stamp (1960) has explained international comparison of the agricultural efficiency of twenty countries on the basis of Kendall method. Shafi (1960) attempted to use previous method to measure agricultural efficiency in Uttar Pradesh. Bhatia (1967), highlights on measurement of agricultural efficiency of 47 district in Uttar Pradesh & identify the spatial variation, changes and trends of agricultural efficiency (Ei) in UP. Christensen (1975) has described concepts and measurement of agricultural productivity. B.E. Bravo, et al (1993), emphasized on to quantify the level of efficiency for a sample of peasant farmers in Eastern Paraguay. Others scholars likes Hemchandra (1993), Darku (2015), have highlighted on agricultural zoning, country wise comparative analysis in agricultural efficiency (Ei) and total factors of productivity. Chatterjee and Maitrya (1964), measured agricultural productivity on rice and wheat in W.B. Micro level studies were done by Siddiqui (1999), Chaskar (1987), Aktar (2015), Dutta (2012) who's emphasized on agricultural efficiency in different spatial scale. Many scholars from geography, economic and allied disciplines have developed techniques for measurement of agricultural efficiency (Ei) among them Ganguli (1938), Kendall (1939), Shafi (1960), Khusro (1964), Horing (1964) Sharma (1965), The need for such differentiation is of particular interest in developing countries where available land for expansion of cultivation is scarce and the only way to meet the increasing pressure of population seems to be the improvement of agricultural efficiency Bhatia (1967). and Jasbir singh (1979) have done remarkable contribution.

Objectives: The present studies have been conducted to achieve following objectives

1. To examine tahsil wise variation in agricultural efficiency of pune district.
2. Comparative analysis in agricultural efficiency in between 2001-02 and 2014-2015 of pune district.

Data base and Methodology: The present work is based on secondary data. The data has been collected from following sources and supporting field visit have been done for verification. Pune District Statistical Hand Book- 2001-02 and & 2014-2015. Census of India pune district 2011. Data has been collected from office of the Deputy Director of Agriculture (Administration), Pune district.

Study Area:

Pune district is an agriculturally pre-dominant district which is located in western Maharashtra. Agriculture sector provides the major source of income to the population of Pune district and major crops in this district are paddy, jowar, bajra, gram, sugarcane, groundnut and fodder.Pune district lies between 17.5° to 19.2° N latitudes and 73.2° to 75.1° E longitudes with a total geographical area of 17410.91 square kilometres. It is bounded by Ahmednagar district on the north, Solapur district on the east, Satara district on the south and Raighar and Thane districts on the west. In 2011 census, Pune district had population of 9429408 of which male and female ware 4924105 and 4505303 respectively.The district consists of 14 revenue tahsils: Junnar, Ambegaon, Khed, Mawal, Mulshi,

Velhe, Bhor, Haveli, Pune City, DaundShirur, Purandar, Baramati and Indapur. In Pune district total cropped area is 884299hectares, out of which an area of 55458hectares is under irrigation (2016)

Methodology

Methods of calculation of agricultural efficiency (Ei): Agricultural efficiency (Ei) can be measured by four ways (Bhatia, 1967) a. Output per unit area. b. Output and input ratio. c. Output per unit of labour applied. d. Output in terms of grain equivalents per head of population. In this study Bhatia's method has adopted to measure agricultural efficiency (Ei) following these steps:-

I. Iya = Yc Yr * 100Where, IYa is the yield index of crop a,
Yc is the acre- yield of crop a in the component unit.
Yr is the average acre- yield of crop a in the entire area.

ii. $Ei = \frac{IYa.Ca+IYb.Cb+IYc.Cc+...+YnCn}{Ca+Cb+Cc+...+Cn \text{ where,}}$

Ei is the agricultural efficiency index.
IYa, IYb, IYc, IYn are yield indexes of various crops.
Ca, Cb, Cc, Cn represent the proportion of crop land to different crop.

(Table no.1 & 2) On the basis of agricultural efficiency Pune District tahsils can be classified into five zones as below: a. Very low agricultural efficiency (Ei) zone (Below 60): - In this category efficiency value is less than 60, no tahsil is observed in 2001-02, but in 2014-2015 three tahsils are included. These tahsils are velhe, Bhor and Pune city b. Low agricultural efficiency zone (60 to 100) The study reveals that Maval, mulshi, Pune city in 2001-02 and in 2014-2015 only Mulshi tashil have been observed.c. Medium efficiency zone (100 to 150):- In this Ambegaon. Khed, Haveli, Velhe, Bhor tahils are observed in 2001-02 and 2014-2015 the tahsils like are seen Ambegaon, Maval, Haveli, Purandar in the 2014-15. High level agricultural efficiency (Ei) zone (150 to 200):- The high efficiency are observed in only two tahsils in Junnar and purandhar in 2001-02. In 2014-15 Junnar, Khed, Daund, Baramati, Indapur e. Very high agricultural efficiency zone (200 and above):- It is observed shirur, daund, Indapur, Baramati in 2001-02 and in 2014-15 only one tahsil is observed shirur in very high agricultural efficiency zone.

Very Low Agricultural Efficiency(less than 60)

Out of 14 tahsils, there is no tahsil observed in 2001-02 in 2014-15 the tahsils i.e. Velhe, Bhor, Pune city had very low efficiency These thasils are located in the westerm side of the study area. This area is recognized for hilly and mountain tract and poor irrigation system, less fertile soil and more cultivable waste area. The pune city is included in the 2014-2015 in the category of very low agricultural efficiency, this areais highly urbanized area.

Low Agricultural Efficiency(60 to 100)

Low agricultural efficiency observed in the tahsil like Maval, Mulshi and Pune city in 2001-02. The maval and mulshi tahsil shows low level of agricultural efficiency due to hilly area of the sahyadri, low fertile tract and lack of water storage though received high amount of rainfall and lack of irrigation system. The pune city is highly urbanized area and there is no sign of agriculture in the city area. In the year 2014-15 only one tahsil is observed in the low level of agricultural efficiency category.

Medium Agricultural Efficiency (100 to 150)

The number of tahsils having medium agricultural efficiency is high comparatively than the other category of land use efficiency In the year 2001-02, five tahsils namely Ambegaon, Khed,

Haveli, Velhe, Bhor tahsils are shows medium agricultural efficiency. The number of tahsils with medium efficiency decreased from five tahsils to four tahsils in 2014-2015. Only Ambegaon tahsil retained its position in this group again. Other tahsils are Maval, Haveli and Purandhar.

High Agricultural Efficiency (150 to 200)

The study reveals that pattern of high agricultural efficiency has changed from eastern part to the western part of the district. In 2001-02, there was two tahsils namely Junnar and Purandhar are found in high efficiency category. Junnar tahsil remain same in the high efficiency category. The tahsils like Khed, Daund, Baramati, Indapur are included in the year 2014-2015. All these tahsils Daund, Baramati, Indapur, with high efficiency are located to eastern parts of the district. The high agricultural efficiency of these tahsils due to the growth the dams in the sahyadri ranges in the upper part of the Bhima river and its tributaries providing of irrigation facilities and technological development in the agricultural sector.

Very high Agricultural Efficiency (200 and above)

The study shows that four tahsils are in the category of high agricultural efficiency shirur, Daund, Indapur and Baramati in 2001-02. In the year 2014-15 only one tahsil is observed in this category shirur. Means from 2001-02 to 2014-15 shirur maintain its high agricultural effieciency. This is due to the upper dams are providing the water through the canals. The very high agricultural efficiency was found only in the shirur because of improvement in cultivation methods, cash crops and improvement in irrigation facilities and adaption of the new technology in the agriculture.

Discussion: From this analysis it can be said that overall agricultural efficiency in some of the tahsils of pune district have increased while in some of the tahsils it is decreased. Although, in very high agricultural efficiency (Ei) category number of tahsils have decreased in 2014-15 in respect of 2004-05 but the tahsils showing High agricultural efficiency (Ei) has increased remarkably, i.e., from 2 tahsils to 5 tahsils and agricultural efficiency (Ei) of very low category has improved i. e, from 0 tahsils to 3 tahsils in 2014-15.Tahsils with improved agricultural efficiency (Ei) are as follows: 14 Tahsils have been improved their agricultural efficiency (Ei) value namely, Junnar, Shirur.

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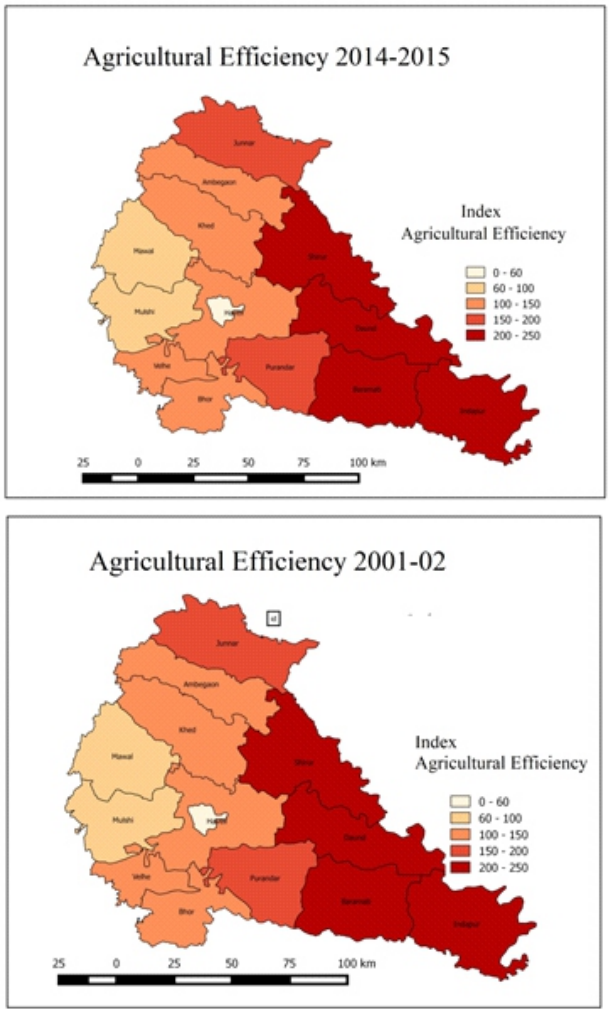

Figure 1. Agricultural efficiency of Pune district, 2001-02 and 2014-2015.

Table No.1Agriculture Efficiency (Ei) in 2001-02 of Pune District

Sr. No.	Name of Tahsil	Rice			Wheat			Jowar			Bajari			Maize			Onion			Potato			Sugarcane			Total Area	Ei
		Area	Yield	Iya	Area	Yield	Iyb	Area	Yield	Iyc	Area	Yield	Iyd	Area	Yield	Iye	Area	Yield	Iyf	Area	Yield	Iyg	Area	Yield	Iyh		
1	Junnar	47500	5120.5	180.95	40000	7236	100.57	23885	12109.695	85.35	30650	19340.15	267.58	445	8377.935	38.36	2440	4528.64	151.99	673	11642.2	147.33	76000	6688	178.70	74443	179.29
2	Ambegaon	51130	5530.14	195.42	22230	4036.3	56.10	22080	11216.64	79.06	14545	9177.895	126.98	850	1600.55	73.27	1320	2449.92	82.22	342	5916.26	74.87	17500	154	41.15	48247	103.40
3	Shirur	0	0	0.00	62330	11282.53	156.81	18290	9309.61	65.61	35500	2240 0.5	309.92	2070	3897.81	17 8.43	0	0	0.00	491	8493.81	107.49	30445	267.96	71.60	65626	210.58
4	Khed	64200	6920.76	244.56	44200	8009.04	111.32	27990	14274.9	100.61	16450	10379.95	143.61	1680	3163.44	14 4.81	1627	3019.712	101.35	2376	4110 2.4	52 0.16	60	5.28	1.41	61023	145.60
5	Mavl	16790	1809.96	63.96	3660	6635.58	92.23	21650	11063.15	77.97	30000	1893	26.19	25	47.0 75	2.15	251	465.856	15.64	24	415.176	5.25	6770	586.96	15.75	46070	69.30
6	Mulshi	134770	1452.06	51.31	19800	3591.72	49.92	17820	9123.84	64.31	4100	2587.1	3.58	50	94.15	4.31	15	27.84	0.93	12955	2240 2.2	28 3.50	5355	470.8	12.58	35575	64.98
7	Haveli	26000	2802.8	99.04	31550	5717.25	79.46	15070	7730.91	54.49	20622	1301 1.22	180.01	1100	2071.3	94.82	2405	4463.68	149.81	19	328.681	4.16	94000	827.2	221.03	54364	139.49
8	Pune city	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0.00
9	Daund	10	10.78	0.38	75000	13627.5	189.40	55140	28397.1	200.15	43000	2713.3	37.54	3672	6914.38	31 6.51	6445	1196 1.92	401.47	20	345.98	4.38	150000	1320	352.71	92087	235.19
10	Purandhar	10555	1137.29	40.19	25055	4554.09	63.30	33160	17110.56	120.60	26000	1640 6	226.98	285	536.655	24.57	2178	4042.368	135.67	22	380.578	4.82	8110	712.8	19.05	66015	157.84
11	Velhe	55000	5929	209.52	6400	1164.16	16.18	61000	3153.7	22.23	0	0	0.00	30	56.49	2.59	40	74.24	2.49	40	691.96	8.76	3600	316.88	8.46	12710	102.43
12	Bhor	82600	8904.28	314.66	29500	5369	74.62	16625	8611.75	60.70	6200	391.22	5.41	135	2542.05	11.64	327	606.912	20.37	84	1453.12	18.39	7100	624.8	16.69	29711	129.69
13	Baramati	0	0	0.00	109000	19848.9	275.87	57360	29769.84	209.82	31170	2000.27	27.67	2090	3935.47	18 0.15	3600	6681.6	224.25	426	7369.37	93.26	108000	950.4	253.95	88346	216.15
14	Indapur	0	0	0.00	53000	9656.6	134.21	70700	3676 4	259.12	51100	3218.1	44.52	3810	7174.23	32 8.41	1827	3390.912	113.81	583	1008 5.3	12 7.63	88000	774.4	20 6.92	96120	235.25

Source: Socio Economic Survey of pune district 2001-02

Table No.2 Agriculture Efficiency (Ei) in 2014-15 of Pune District

Sr. No.	Name of Tahsil	Rice			Wheat			Jowar			Bajara			Maize			onion			potato			Sugarcane			Total Area	Ei
		Area	Yield	Iya	Area	Yield	Iyb	Area	Yield	Iyc	Area	Yield	Iyd	Area	Yield	Iye	Area	Yield	Iyf	Area	Yield	Iyg	Area	Yield	Iyh		
1	Junnar	6357	9198.579	#####	9949	14495.69	131.74	41429	22785.95	####	####	13647	285.32	2611	6911	####	5010	9519	148.65	2894	####	#####	17927	#####	189.58	1E+05	176.81
2	Ambegaon	4788	6928.236	#####	6352	9254.864	84.11	29450	16197.5	####	####	7914	165.46	1773	4693	####	4203	7985.7	124.71	4524	####	#####	6059	54531	64.08	73671	124.49
3	Shirur	1879	2718.913	43.56	12075	17593.28	159.90	98067	53936.85	####	####	10906	228.02	1988	5262	####	5075	9642.5	150.58	1092	####	#####	8354	75186	88.35	2E+05	227.77
4	Khed	4625	6692.375	#####	8567	12482.12	113.44	31965	17580.75	####	####	10951	228.95	2170	5744	####	2822	5361.8	83.73	5182	####	#####	864	7776	9.14	79057	158.44
5	Maval	10316	14927.252	#####	4588	6684.716	60.75	10110	5560.5	####	1028	492.4	10.29	664	1758	40.05	293	556.7	8.69	20	380	1.93	1133	10197	11.98	28152	109.02
6	Mulshi	7367	10660.049	#####	4570	6658.49	60.52	23155	12735.25	####	1240	594	12.42	1629	4312	98.25	69	131.1	2.05	0	0	0.00	11562	#####	122.27	49592	91.55
7	Haveli	3632	5255.504	84.20	7182	10464.17	95.10	25940	14267	####	####	6330	132.35	1882	4982	####	6697	12724	198.71	129	2451	12.48	21120	#####	223.35	79798	135.07
8	Pune city	4	5.788	0.09	15	21.855	0.20	15	8.25	0.04	1	0.479	0.01	6	15.9	0.36	0	0	0.00	0	0	0.00	0	0	0.00	41	0.15
9	Daund	1142	1652.474	26.47	9875	14387.88	130.76	74689	41078.95	####	3177	1522	31.82	1677	4439	####	4435	8426.5	131.59	0	0	0.00	15481	#####	163.72	1E+05	176.00
10	Purandhar	5015	7256.705	#####	12971	18898.75	171.76	38003	20901.65	####	####	8597	179.74	937	2480	56.51	4381	8323.9	129.99	0	0	0.00	562	5058	5.94	79817	131.26
11	Velhe	4704	6806.688	#####	1138	1658.066	15.07	3875	2131.25	####	988	473.3	9.89	773	2046	46.62	417	792.3	12.37	0	0	0.00	382	3438	4.04	12277	50.69
12	Bhor	5144	7443.368	#####	4103	5978.071	54.33	16812	9246.6	####	1546	740.5	15.48	1579	4180	95.23	736	1398.4	21.84	444	8436	42.94	1679	15111	17.76	32043	56.86
13	Baramati	2896	4190.512	67.13	12355	18001.24	163.60	68143	37478.65	####	6674	3197	66.84	2275	6022	####	7568	14379	224.55	30	570	2.90	27425	#####	290.03	1E+05	195.44
14	Indapur	2524	3652.228	58.51	11985	17462.15	158.70	68410	37625.5	####	3335	1597	33.40	3249	8600	####	5478	10408	162.54	161	3059	15.57	19835	#####	209.76	1E+05	175.79

Source: Socio Economic Survey of pune district 2014-15

(Table No. 3)Degree of Efficiency (Ei) of pune district between 2001 and 2015

Degree of Efficency	Index value of Ei	No of Tahsils in 2001-02		No of Tahsils in 2014-2015	
		Sl name of the Tahsil	Total Tahsils	Sl name of the Tahsil	Total Tahsils
Vey low	60 and below		0	Velhe, Bhor, Pune city	3
Low	60 to 100	Maval. Mulshi, Pune city	3	Mulshi	1
Medium	100 to 150	Ambegaon, Khed, Haveli, Velhe, Bhor	5	Ambegaon, Maval, Haveli, Purandhar	4
High	150 to 200	Junnar Purandhar	2	Junnar, Khed, Daund, Baramati, Indapur	5
Very High	200 and above	Shirur, Daund, Indapur, Baramati	4	Shirur	1
Total			14	Total	14

Table No. 4 Comparative analysis of Agriculture Efficiency between 2001-02 and 2015-2015

Sr. No.	Name of Tahsil	Changing nature of Ei in between 2004-05 and 2014-2015	Amount of Ei Changed	Degree of Ei		Tentative causes of that change
				2004-05	2014-15	
1	Junnar	Lagging	-2.48	H	H	Adverse effect of availability of agricultural land, irrigation, land holding and technologies
2	Ambegaon	Improved	21.10	M	M	Improvement of agricultural infrastructure, irrigation and technologies
3	Shirur	Improved	17.19	V. H	V. H.	High productivity crop converting into low/medium crops and infrastructural deficiency
4	Khed	Improved	12.84	M	H	Improvement of agricultural infrastructure, irrigation and technologies
5	Maval	Improved	39.71	L	M	Improvement of agricultural infrastructure, irrigation and technologies
6	Mulshi	Improved	26.57	L	L	Adverse effect of urbanization, acquisition of land in non agricultural purpose.
7	Haveli	Lagging	-4.42	M	M	Adverse effect of urbanization, acquisition of land in non agricultural purpose. Increase in urbanization area.
8	Pune city	Lagging	0.15	L	V. L	Adverse effect of urbanization, acquistion of land in non agricultural purpose. Increase in urbanization area.
9	Daund	Lagging	-59.19	V. H	H	High productivity crop converting into low/medium crops and infrastructural deficiency
10	Purandhar	Lagging	-26.57	H	M	Improvement of agricultural infrastructure, irrigation and technologies
11	Velhe	Lagging	-51.74	M	V. L	High productivity crop converting into low/medium crops and infrastructural deficiency
12	Bhor	Lagging	-72.83	M	V. L	High productivity crop converting into low/medium crops and infrastructural deficiency
13	Baramati	Lagging	-20.72	V. H	H	High productivity crop converting into low/medium crops and infrastructural deficiency
14	Indapur	Lagging	-59.46	V. H	H	High productivity crop converting into low/medium crops and infrastructural deficiency

V.H= Very High, H=High, M=Medium, L=Low, V .L=Very Low

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