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Agricultural Efficiency and Productivity of Fringe of Raipur City, Chhattisgarh

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Abstract:
In present day sufficient agricultural production can fulfill the increasing demand of food and abolish rural poverty, which is the most common problem in the fringe of Raipur city. Agricultural productivity or efficiency is the ratio of agricultural inputs to agricultural outputs usually indicating market value of agricultural products where input such as labour and land yield. This study analyses, per hectare agricultural production and agricultural development status in terms of efficiency in the selected sample villages of fringe of Raipur City. This study finds out status of food availability in the fringe of Raipur City. This work finally evaluates some problems and prospects of agricultural production.

Keywords: *Agricultural efficiency, Agricultural productivity, Correlation*

1. Introduction

Agriculture is one of the most important economic activities in India (Ayankumar Pujari, 2005). It has a direct impact on socio-economic status as well as Gross Domestic Product (GDP) of rural population (Datt and Sundaram, 2009). Thus the development of agricultural sector can solve poverty and diminish food crisis. In Geography, agricultural efficiency is related with the productivity of per unit area of land (Shyamal Dutta, 2012), which is scientific techniques to measure per unit output of various crops in overall performance (Bhatia, 1967). There are so many factors responsible for improvement of agricultural efficiency in the fringe of Raipur City, but in some cases traditional cultivation process and agricultural equipments, misuse and under use of agricultural land, lack of irrigation facilities, use of insufficient fertilizer are most common problems in the selected villages of fringe of Raipur City. This study shows that the selected sample villages are not having sufficient agricultural production.

1.1. Study Area

The fringe of Raipur City comprises 130 villages, lying between21°4′30″N to 21°25′30″N latitude and 81°33′Eto81°51′E longitude. It has total area of 4299. 21 sq.km and population is about 249435(census, 2001). This area has classified by two divisions in the scenes of their land use pattern and human activity, the first one is urban fringe and later is rural fringe. In this fringe area, NH.6 (NH.53) and NH.43 (NH.30) extend from east to west and north to south respectively. The Kharun River, flowing North West of the city has become a natural as well as political barrier for the further expansion of the fringe of Raipur City.Village Tibreya is15 kms from the city along the Bilaspur road in the North. In the South the fringe extends upto Kurru and Pacheda village about 18 kms along NH.30. Towards the East the fringe extends upto Umaria and Rewa village at 19 kms from Raipur City along the NH6 and in the West the fringe extends upto Kharun River at 10kms distance from the City

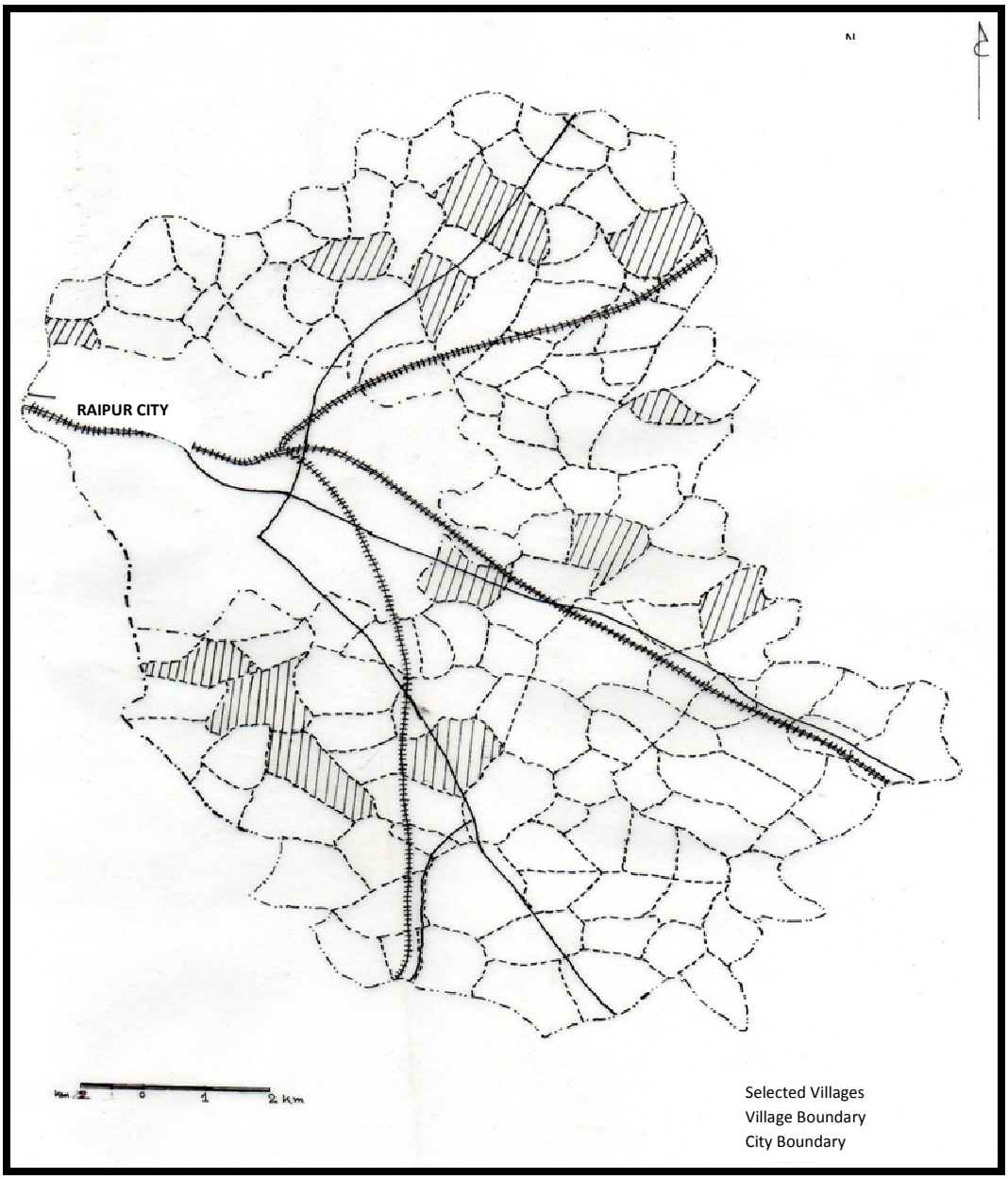

Figure 1: Location Map of Study Area

1.2. Objectives of the Study

The main objectives of this study are as follows:

i. To highlight agricultural efficiency in sample villages.
ii. To evaluate agricultural productivity in term s of different crops.
iii. To compare agricultural efficiency with irrigated area.
iv. To give suggestion for improvement of agricultural productivity.

2. Review of Literature

Whittelessy (1936), divided the world into thirteen agricultural regions on the basis of crops, animals, sale of agricultural products etc. Kendell (1939), calculated productivity coefficient by per unit yield rate. Stamp worked on agricultural efficiency of India. M.Shafi (1960), measured agricultural efficiency by eight food crops, in eight tahsils of Uttar Pradesh. Bhatia (1967), analyzed the spatial variation and changes in agricultural efficiency. Ahluwalia (1978) studied rural poverty and agricultural performance in India. Hem Chandra Lal Das (1993), worked on agricultural efficiency in India. He also classified efficiency into three categories and differentiated, agricultural efficiency and productivity. Dayal (1984), calculated agricultural productivity of India. Chaskar, et.al. (1987), studied the agricultural efficiency of Vidarbha region of Maharashtra. Patil (2002) worked on agricultural productivity in Upper Bhima and Upper Krishna Basin. E. Delikats, et al. (2005), presented a comparative discussion by agricultural efficiency and

productivity growth, between European Union and Turkey. A. Nin, et.al. (2009), calculated the total factor productivity in China and India. V. Shahabinejad and A. Akbari (2010), worked on measuring agricultural productivity growth in developing eight. Shyamal Dutta (2012), worked on assessment of agricultural efficiency and productivity of Hugli District in West Bengal.

3. Database and Methodology

To study agricultural efficiency and productivity in the fringe of Raipur city, data have been collected from 13 sample villages out of 130 villages. The Sample villages have been selected on the basis of accessibility of roads and 10% household has been taken from each centre village through random survey method. This study is entirely based on primary data. Primary data regarding agricultural land, irrigated land, crop production etc. has been accumulated by interview schedule.

There are so many methods to measure agricultural efficiency and productivity like Ganguli (1938), Kendal (1939), M. Shafi (1960), Khusro (1964), Horing (1964), Sharma (1965), Bhatia (1967) and Jasbir Singh (1979). In this study Bhatia's method is applied to measure agricultural efficiency which is as follows -

$Iy_n = (Y_i/Y) \times 100$

Where Iy_n = percentage of Yield Crop n

Y_i = Yield of individual Crop in an aerial unit

Y = Yield of Individual Crop in the total area

$E_i = \{(IY_1C_1 + IY2C_2 + IY_3C_3 + \ldots\ldots\ldots\ldots\ldots + IY_nC_n)/(C_1 + C_2 + C_3 + \ldots\ldots\ldots\ldots\ldots\ldots + C_n)\}$

Where, E_i = Agricultural efficiency

$IY_1, IY_2, IY_3 \ldots\ldots\ldots\ldots\ldots$ LY_1 = The Indices of different crops

$C_1, C_2, C_3 \ldots\ldots\ldots\ldots\ldots\ldots$ C_n = Percentage of Cropped area to total cropped area

To measure agricultural productivity Enyedi's method (1964) have been applied which is as follows:

Productivity index = $(\frac{Y}{Yn} \div \frac{T}{Tn}) \times 100$

Where Y = Production of the respective crop in the unit area.

Y_n = Total production of the crop in entire region

T = Area under selected crop in a unit area

T_n = Area under selected crop in entire region

This study focuses on the production efficiency in the sample villages of fringe of Raipur City. The agricultural efficiency index is calculated for 13 selected sample villages, viz;

Dondekhurd, Sejbahar, Mana, Dhaneli, Jora, Siltara, Dhusera, Kanhera, Darba, Nagargaon, Tulsi, Hatband and Kandul. For the calculation of productivity index, 6 crops have been considered viz; Rice, Wheat, Maize, Pulses, Groundnut and Gram.

4. Discussion

Agricultural efficiency has been divided into three categories, viz; technical efficiency, allocative efficiency and production efficiency. Agricultural productivity, is a part of agricultural efficiency and efficiency of certain factors are responsible for agricultural productivity (Hem Chandra Lal Das, 1993). Agricultural efficiency techniques measure by above formula based on the yield of six major crops (Paddy, Wheat, Maize, Pulses, Groundnut and Gram) cultivated in the selected villages of fringe of Raipur City.

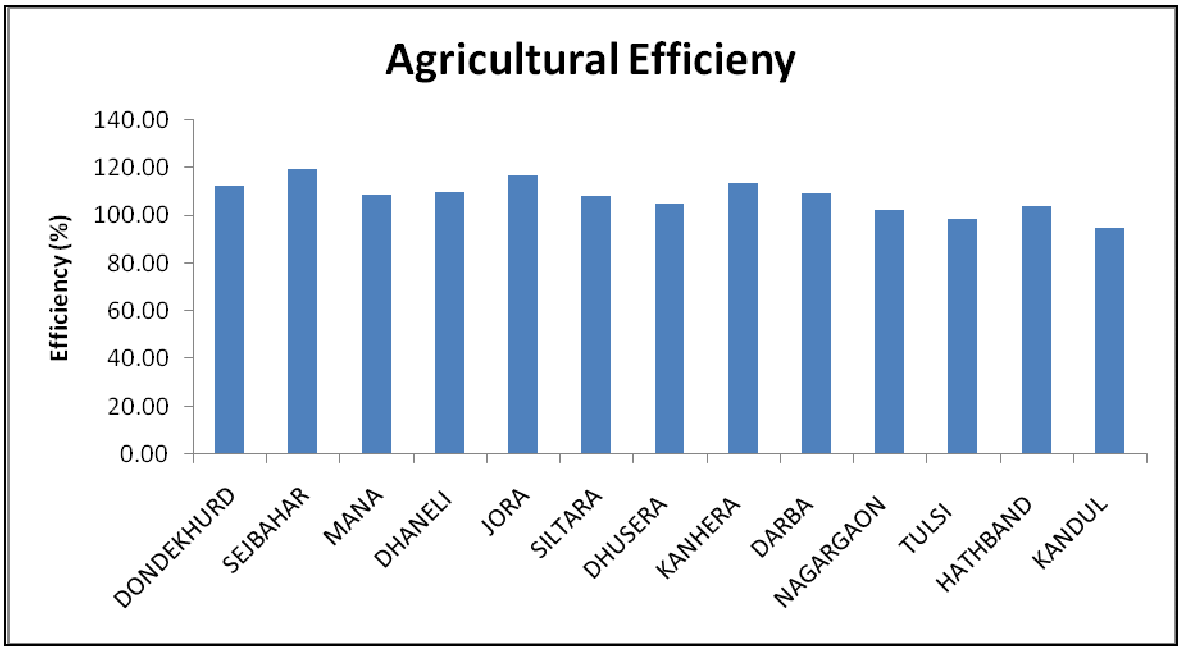

Figure 2

4.1. Agricultural Efficiency Index

Appendix1 denotes that the average agricultural index in the selected sample villages of fringe of Raipur City is about 101.08 and the highest value is recorded in the village Sejbahar (119.86) followed by Jora (117.11), kanhera (113.92), Dondekhurd (112.70), Dhaneli (109.83), Durba (109.59), Mana (109.13), Siltara (108.33), Dhusera (105.19), Hatband (104.03), Nagargaon (102.23), Tulsi (98.49) and kandul (95.9). The Diagram No. 1 reveals that the efficiency of agriculture is much better in road side sample villages than remote sample villages. The average efficiency in road side sample villages and remote sample villages are 112.83 and 104.09 respectively. Agriculture efficiency among these selected sample villages has been classified into three categories, like

i. High Efficiency: The range of efficiency index is 111.64 – 119.87 in this zone. Village Dondekhurd, Sejbahar, Jora, Kanhera, are under this class. In these villages per hectare production of Paddy, Wheat, Maize, Pulses, Groundnut and Gram is higher than others sample villages of fringe of Raipur City, because of irrigation facilities availability of HYV Seeds, sufficient fertilizers use of good transportation system, those components help villagers to carry agricultural equipments and modern mechanism within minimum time and least cost in agricultural fields in easily. In high efficiency zone the highest efficiency value is recorded by the village Sejbahar (119.86) followed by Jora (117.11), Kanhera (113.92), and Dondekhurd (112.70)
ii. Moderate Efficiency: The village Mana, Dhanely, Siltara Dhusera, Darba and Hatband are under moderate efficiency zone, the value ranges from 103.41 – 111.64, because of very few land are under irrigation in this villages and relatively low productivity of Rice, Wheat, Maize, Pulses, Gram and Groundnut. The highest efficiency in this zone is about 109.83, recorded by the village Dhaneli and lowest efficiency found in Hatband Village (104.03).
iii. Low efficiency: The efficiency value ranges from 95.18 – 103.41 in this zone, which is found in Tulsi, Nagargaon and Kandul village. The lowest efficiency index recorded in the village kandul (95.19). Low agricultural efficiency indicates s the minimum productivity of crops because of lack of irrigation facilities in agricultural land, in sufficient use of Fertilizer per hectare, those are the main problem for agriculture in Tulsi, nagargaon and kandul village.

On the basis of the above discussion it is clear that road side sample villages belong to high and moderate efficiency zone and on the other hand, except Kanhera village the maximum numbers of remote sample villages are under low or moderate efficiency zone. In road side sample villages, the availability of road and road transport encourage Farmer to apply modern techniques and mechanism in agricultural fields because of they easily occupy fertilizer HYV seeds trend labour and modern agricultural equipments. Therefore, per hectare crop production as well as agricultural efficiency is relatively higher in road side sample villages and the efficiency index is more stable in value in road side sample villages (3.81) than remote sample villages (5.65).

4.2. Correlation between Irrigated Area and Agricultural Efficiency

The value of product moment correlation co efficient between irrigated area and agricultural efficiency is +0.52, which indicates that there is moderately positive correlation substantial between them. Fig. 3 expresses the nature of relationship between irrigated area and agricultural efficiency. Trend line on this graph evaluates the positive relation between these two variables because of an increase in Y value (agricultural efficiency) with an increase in X value (Irrigated Area).

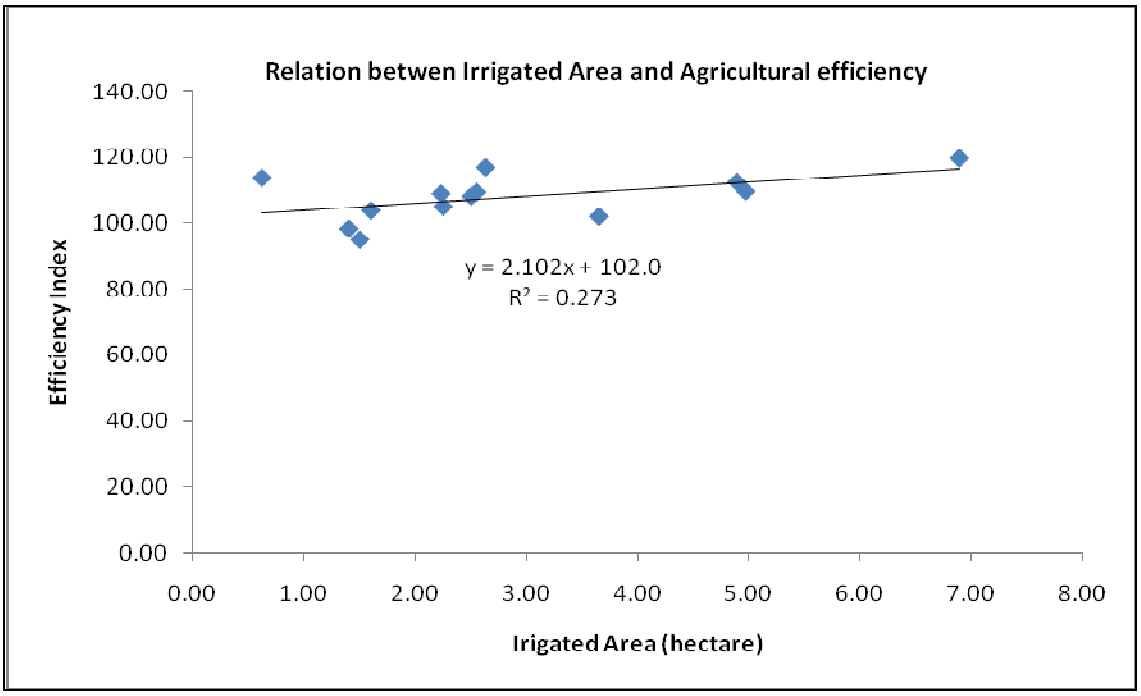

Figure 3

4.2.1. Test of Significance

In the selected sample villages of fringe of Raipur City, the correlation coefficient between irrigated area (hectare) and agricultural efficiency is +0.52 with the degrees of freedom {do=(n-2) or 11}. Therefore, for a one tailed test (H_1:p>0), the critical value of 'r' at the 0.05 significance level with 11 degree of freedom is +0.0.476. When p=0, the probability of a random sample of 11 individual producing a coefficient as extreme as r≥ 0.476 is 0.05. This is sufficient to enable the null hypothesis to be rejected in favour of a directional alternative hypothesis at the 0.05 significance level.

4.2.2. Agricultural Productivity

Productivity is the ratio between input and output in agriculture, where input refers to land, labour, production value of crops and output refers market value of producing crops (Singh,1966). However, productivity indicates total factors of productivity, such as partial productivity, labour productivity, land productivity etc (Ayan Kumar Pujari,2005), but here we measure land productivity to evaluate yield rate of a particular crop in entire area.

Village Name	Rice	Wheat	Maize	Pulses	Ground Nut	Gram
DONDEKHURD	105.99	103.72	102.89	109.34	92.56	149.16
SEJBAHAR	106.13	106.13	110.04	123.21	109.93	104.68
MANA	103.68	97.79	100.32	97.32	94.81	82.18
DHANELI	99.83	100.01	95.59	112.31	105.18	95.47
ZOWRE	103.39	103.15	114.79	121.49	108.83	91.85
SILTARA	98.59	103.60	98.22	104.56	102.70	88.75
DHUSERA	97.82	85.60	103.88	79.07	90.30	83.79
KANHERA	99.99	97.41	94.53	99.13	88.46	101.40
DARBA	94.83	95.26	96.03	105.43	96.22	91.85
NAGARGAON	99.48	95.67	85.12	77.64	94.60	70.90
TULSI	94.88	90.44	103.42	85.86	99.63	58.01
HATHBAND	100.72	98.87	0.00	102.86	0.00	101.40
KANDUL	89.00	86.74	99.84	103.76	91.57	82.18
Average	99.56	97.26	92.67	101.69	90.37	92.43

Table 2: Productivity Index

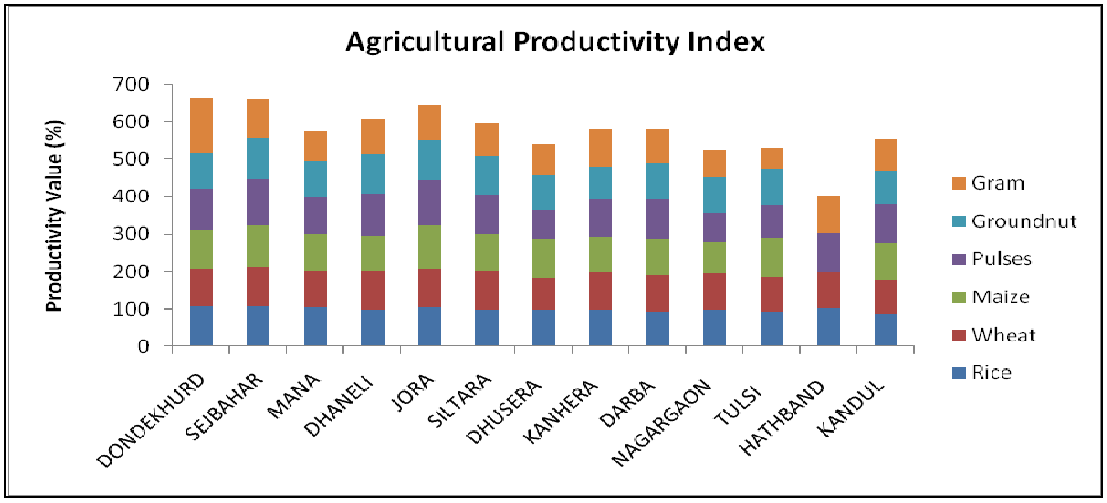

Figure 4

Table:2 reveals that the average agricultural productivity of Rice is 99.56, Wheat 97.26, Maize 92.67, Pulses 101.69, Groundnut 90.37 and Gram 92.43 in the selected sample villages of fringe of Raipur City. In the case of Paddy production, the highest productivity index is recorded by the village Sejbahar (106.13), followed by Dondekhurd (105.99), Mana (103.68), Jora (103.39), Hatband (100.72), Kanhera (99.99), Dhaneli (99.83), Nagargaon (99.48), Siltara (98.50), Dhusera (97.82), Tulsi (94.88), Darba (94.83) and kandul (89.00). The highest productivity of Pulses is in Sejbahar village (123.21) and the lowest productivity of Gram in Tulsi village (58.01).

The Figure:4 represents that almost road side sample villages have higher productivity index than remote sample villages because there is better yield of crops.

5. Conclusion

The above discussion concludes that there is regional imbalance in agricultural development between road side and remote villages of fringe of Raipur City. The high productivity indicates multi-crop agriculture and commercial farming, which is based on demand in market, and a common feature in road side villages. In the remote villages, viz; Dhusera, Kanhera, Nagargaon, Kandul are facing low level of production due to lack of irrigation, unavailability of agricultural equipments, insufficient road and traffic volume. For improvement in agricultural productivity and abolish regional imbalance in the agriculture, good transportation network, increased irrigated area and application of modern techniques in the field of agriculture are most essential in the fringe of Raipur City.

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Appendix-1

Agricultural Efficiency																					
Village Type	Village Name	Rice			Wheat			Maize			Pulses			Ground nut			Gram			Irrigated Area in Hectare	Agricultural Efficiency Index (Ei)
		Area (%)	Production (kg/ hectare)	Iy_n	Area (%)	Production(kg/ hectare)	Iy_n	Area (%)	Production (kg/ hectare)	Iy_n	Area (%)	Production(kg/ hectare)	Iy_n	Area (%)	Production(kg/ hectare)	Iy_n	Area (%)	Production(kg/ hectare)	Iy_n		
ROAD SIDE VILLAGE	DONDEKHURD	64.63	1695	109.66	12.12	1268	111.68	0.28	1143	111.06	4.86	467	116.96	2.23	745	115.57	2.84	1543	177.14	4.89	112.70
	SEJBAHAR	69.79	1698	109.80	6.71	1297	114.27	3.40	1222	118.78	2.93	526	131.80	2.42	885	137.27	7.01	1083	124.31	6.89	119.86
	MANA	78.81	1658	107.26	2.70	1195	105.30	2.31	1114	108.29	2.14	415	104.11	1.81	764	118.39	0.66	850	97.59	2.23	109.13
	DHANELI	68.70	1597	103.28	5.91	1222	107.68	2.31	1062	103.18	3.45	479	120.14	6.90	847	131.33	2.28	988	113.38	4.97	109.83
	JORA	76.04	1654	106.97	6.24	1261	111.06	1.76	1275	123.91	3.56	519	129.95	3.56	877	135.90	1.76	950	109.07	2.63	117.11
	SILTARA	74.52	1577	102.00	3.58	1266	111.55	3.98	1091	106.02	3.98	446	111.85	2.66	827	128.24	2.01	918	105.40	2.50	108.33
REMOTE VILLAGE	DHUSERA	79.84	1565	101.20	3.06	1046	92.17	0.61	1154	112.13	3.77	338	84.59	1.04	727	112.76	2.83	867	99.50	2.25	105.19
	KANHERA	84.38	1599	103.45	0.78	1190	104.89	0.74	1050	102.04	4.81	423	106.03	2.96	713	110.47	1.52	1049	120.41	0.62	113.92
	DARBA	82.64	1517	98.11	8.57	1164	102.56	1.32	1067	103.66	0.88	450	112.78	1.76	775	120.16	0.88	950	109.07	2.55	109.59
	NAGARGAON	74.68	1591	102.92	3.30	1169	103.01	2.67	945	91.88	4.17	331	83.06	2.04	762	118.12	0.36	733	84.19	3.65	102.23
	TULSI	73.78	1518	98.17	0.60	1105	97.38	3.84	1149	111.64	5.12	366	91.84	2.57	802	124.41	0.64	600	68.89	1.40	98.49
	HATHBAND	68.62	1611	104.20	6.25	1208	106.46	0.00	0	0.00	5.34	439	110.03	0.00	0	0.00	5.34	1049	120.41	1.60	104.03
	KANDUL	64.46	1424	92.08	3.22	1060	93.39	6.50	1109	107.77	4.51	443	110.99	5.15	738	114.34	2.58	850	97.59	1.50	95.19
	Total/Average	73.91	1546	100	4	1135	100	2	1029	100	4	399	100	2	645	100	2	871	100	37.67	101.08

Source: Personal Survey, 2010 – 2011.