

**RESEARCH ARTICLE :**

# Identification of cropping pattern and input utilization pattern of major crops on small farms in Parbhani district of Marathwada region: An economic analysis

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**SUMMARY :** The present paper attempts to identify cropping pattern and input utilization pattern of major crops on small farms. A multi-stage random sampling method followed by a farm survey with structured interview schedule. For personal interview a total of 60 respondent farmers being selected, this revealed that the cropping pattern of selected farms was dominated by *Kharif* crops with an area of 1.47 ha. and cropping intensity was 126.06 per cent. The Inputs utilization for various crops at overall level showed that per hectare utilization of human (166.3 man days) and bullock (31.98 pair days) labour were highest in case of sugarcane crop. Utilization of machine labour was highest for *Rabi jowar* crop (3.05 hours). Seed utilization per hectare for crops was as per recommendations. Regarding manures, highest quantity was used for sugarcane crop (31.96 q/ ha). Analysis of per hectare total cost of cultivation of different crops showed that maximum cost was incurred in sugarcane (Rs. 85247.88) followed by cotton (Rs. 42563.09). Per hectare total returns from sugarcane was the highest (Rs. 154678.50) followed by cotton (Rs. 80821.50). Regarding the profitability of crop enterprise, cotton was most profitable crop as its input-output ratio was 1.89 followed by sugarcane (1.81).

**KEY WORDS:**

Cropping pattern,  
Input utilization, Cost,  
Returns, Profitability

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**BACKGROUND AND OBJECTIVES**

Agriculture is the most important sector of Indian economy. Agriculture sector employs more than 58 per cent of population and contribute 13.9 per cent of GDP in economy during the 2013-14. During the year

1950-51, the food grain production was 50 million tonnes and now it has reached to 263.20 million tonnes in the year 2013-14. Advanced estimates (Anonymous, 2013). Basavaraj and Zunnal (1986) in his study has clearly opined that inputs used in sorghum production on small and large farms were

mainly human labour, bullock labour, seed and fertilizers. Of these inputs, the most limiting were seed and bullock labour. On the other hand, some inputs were underutilized indicating the possibility of increasing productivity and total output.

Cropping systems of a region are decided by large a number of soil and climatic parameters which determine overall agro-ecological setting for nourishment and appropriateness of a crop or set of crops for cultivation. The cropping pattern defined as the pattern of crops for a given piece of land, over the period. Pagare *et al.* (2013) reported in their study that on an average total land holding of sample farms was 03.71 ha. While with respect to small, medium and large farmers the size of land holding was 01.49, 03.32 and 06.32 ha., respectively. In general average size of land holding for irrigated and unirrigated as a whole was 01.52 and 02.18 ha. and general average size of uncultivated land was 00.18 ha. The net cultivated land was 03.50 ha. For small farmers, it was 01.44 ha., for medium, it was 03.01 ha and 06.13 ha. for large farmers. In case of cropping pattern on an average proportionate area under *Rabi jowar* crop was 22.26 per cent. At overall level cropping intensity of *Rabi jowar* farm was 147.00 per cent. On the contrary Asmatoddin *et al.* (2009) studied socio-economic status and cropping pattern of medium farm owner in Marathwada region. Based on all these the present investigation was attempts to identify cropping pattern and input utilization pattern of major crops on small farms in Parbhani district of Marathwada region of Maharashtra state.

## RESOURCES AND METHODS

### Sampling technique and data description:

The data was collected for the research during November - December 2012 with multi-stage sampling technique. Parbhani district was selected purposively as study area in the first stage; in the second stage Parbhani tehsil was selected. In third stage four villages were selected in the tehsil. And in fourth stage small farmers including marginal farmers were selected randomly from each village. Thus, 60 small farmers were selected for the study. Well structured questionnaires were used for personal interview from sample farmers.

### Functional analysis :

Different types of costs have been worked out in

the study. In cost A depreciation on fixed capital, interest on working capital and cost on different inputs etc. have been included. Cost A2, was obtained by adding rent paid for leased-in-land to cost A1 and cost B was obtained by adding rental value of land and interest on fixed capital to cost A1. Whereas cost C was obtained by adding sum total of cost A and Cost B, imputed value of family labour and supervision charges.

### Cost benefit analysis:

For measuring the production efficiency benefit cost ratio can be worked out as follows:

$$\text{Benefit cost ratio} = \frac{\text{Gross return from sell of output}}{\text{Total cost of input used}}$$

## OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

### Cropping pattern :

The cropping pattern is an important factor influencing costs and returns on the farm. It also determines employment potential as different crops requires varying quantities of labour units. Table 1 gives

Table 1: Average cropping pattern of selected farmers

(Figures in ha)			
Sr. No.	Season /crop	Samples average	Percentage
1.	<b>Kharif season</b>		
	Cotton	0.98	47.11
	Soybean	0.42	20.19
	Pigeonpea	0.05	2.40
	<i>Kharif</i> vegetables	0.02	0.96
	Total (a+b+c+d)	1.47	70.67
2.	<b>Rabi season</b>		
	<i>Rabi</i> jowar	0.39	18.75
	Wheat	0.03	1.44
	<i>Rabi</i> vegetables	0.01	0.48
	Total (a+b+c)	0.43	20.67
3.	<b>Perennial crops</b>		
	Sugarcane	0.18	8.65
	Napier	0.01	0.48
	Total (a+b)	0.18	8.65
	Total cropped area	2.08	100
	Cropping intensity (%)	126.06	-

an idea about the area under different crops in different seasons on sample farms. It is seen from Table 1 that, the cropping pattern of the sample farmers was dominated by *Kharif* crop. The total area under *Kharif* crop was 70.67 per cent (1.47 ha.), of which 47.11 per cent (0.98 ha) was under cotton, 20.19 per cent (0.42 ha) under soybean, 2.40 per cent (0.05 ha) under pigeonpea and 0.96 per cent (0.02 ha) was under vegetables. Total cropped area on sample farms was 2.08 ha. The area under *Rabi* crop was 0.43 ha, which was 20.67 per cent of total cropped area. In *Rabi* season cropping pattern was dominated by *Rabi jowar* i.e. 18.75 per cent (0.39 ha.) followed by wheat 1.44 per cent (0.03 ha.) area and vegetables on 0.48 per cent (0.01 ha.) area. The area under perennial crops like sugarcane was 0.18 ha. (8.65%) and napier 0.01 ha (0.48%). Thus, the total cropped area of the selected farmers was 2.08 ha with cropping intensity of 126.06 per cent. Results was in supported with results of Bansode and Nimbalkar (2013) who reported that average holding size of marginal farm was 0.75 hectare in which proportionate irrigated area was 28.00 per cent. Large numbers of crops were grown on marginal farm in which proportionate area of cereals and pulses was 29.63 per cent followed by cash crops (25.92%), horticultural crops (10.19 %) and oilseeds (4.63%). Wheat, soybean and cotton were major crops grown on marginal farm. Shidhe *et al.* (2013) observed 144% cropping intensity with net and gross cropped area of 0.95 ha. and 1.37 ha. in their study. Similarly Singh *et al.* (2014) also reported that the cropping intensity of four categories of farms in Bihar, India. The cropping intensity was comparatively high on marginal households (183) and low on medium households (163%). However, cropping intensity was identical on sub marginal and small households. There is no clear cut trend of cropping intensity on different size of farm holdings but upper category of farm households had the lowest level of

cropping intensity.

### Crop production enterprise :

#### Use of physical inputs in crop production:

Per hectare physical inputs utilized for production of different crops on sample farms are given in Table 2. This physical input includes human labour, bullock labour, machine labour, seed, manure, plant protection chemicals and fertilizers.

#### Human labour:

Labour is an important input in crop production. In case of seasonal crops like cotton, *jowar* etc. labour was extensively used for all operations i.e. from preparatory tillage to harvesting. For cotton crop, per hectare total human labour used was 102.98 days of which male and female labour use was 56.79 days and 46.19 days, respectively. In case of soybean crop, utilization of male and female labour was 47.95 days and 37.8 days respectively. For *Rabi* crops like *Rabi jowar* and wheat male labour used was 41.89 days and 49.86 days, respectively. While, female labour used was 28.10 days and 29.99 days, respectively. For perennial crop like sugarcane total human labour used were 166.30 which was comparatively more than other crops, of which male labour used was 128.78 days and female labour used was 37.52 days. It was observed from Table 2 that, quantum of male labour used was more than female labour for all the crops in the study area.

#### Bullock labour :

It is observed from Table 2 that the bullock labour utilized for all crops, mainly the operations like ploughing, inter culture etc. Which were carried out with the help of bullock power due to the small size land holding. Per hectare utilization of bullock labour in cotton, soybean, *Rabi jowar*, wheat and sugarcane crops were 16.26 pair

**Table 2: Per hectare crop wise physical inputs used**

Sr. No.	Crop	Physical inputs										
		Human labour (days)			Bullock Labour/ days	Machine labour (hours)	Seed (kg/ tonnes)	Manures (q)	Fertilizer (kg)			Plant protection (liters)
		Male	Female	Total					N	P	K	
1.	Cotton	56.79	46.19	102.98	16.26	1.68	1.92	12.67	67.02	43.71	23.91	2.15
2.	Soybean	47.95	37.80	85.75	11.54	2.15	73.33	16.06	25.05	46.68	19.87	3.16
3.	<i>Rabi jowar</i>	41.89	28.10	69.99	14.54	3.05	11.77	12.28	38.54	48.20	8.80	0.50
4.	Wheat	49.86	29.99	79.85	16.66	2.61	99.99	-	45.32	66.66	44.32	0.71
5.	Sugarcane	128.78	37.52	166.30	31.98	2.55	6.68	31.96	205.94	89.09	48.94	1.27

days, 11.54 pair days, 14.54 pair days, 16.66 pair days and 31.98 pair days, respectively in the study area.

#### Machine labour :

It was observed from Table 2 that machine labour was mainly use for ploughing purpose in the study area. Per hectare utilization of machine labour in cotton, soybean, *Rabi jowar*, wheat and sugarcane crops were 1.68 hours, 2.15 hours, 3.05 hours, 2.61 hours and 2.55 hours, respectively in the study area.

#### Seed :

Table 2 also revealed that the per hectare quantity of seed used for cotton, soybean, *Rabi jowar*, wheat and sugarcane were 1.92 kg, 73.33 kg, 11.77 kg, 99.99 kg and 6.68 tonne sets, respectively. The recommended seed rate for cotton, soybean, *Rabi jowar*, wheat and sugarcane was 1.5- 2 kg (Bt), 75-80 kg, 8-12 kg, 100-125 kg and 5-8 tonne sets, respectively. It is clear from Table 2 that use of seed for all the crops was as per with the recommended rate.

#### Manures:

Selected farmers were found to use manure for all the crops except wheat in which they were using dung cakes for burning as rab material. Per hectare use of manure for cotton, soybean, *Rabi jowar* and sugarcane was 12.67 q, 16.06 q, 12.28 q and 31.96 q, respectively.

#### Fertilizers:

Chemical fertilizers are the important source of nutrients for healthy crop growth. They also boost the productivity level of crops. Table 2 showed, per hectare use of nitrogen, phosphorus and potassium for cotton was 67.02 kg, 43.71 and 23.91 kg, respectively. Whereas, in case of soybean farmers used 25.05 kg, 46.68 kg and 19.87 kg nitrogen, phosphorus and potassium, respectively. For *Rabi jowar*, per hectare nitrogen, phosphorus and potassium used by farmers was 38.54 kg, 47.20 kg and 8.80 kg, respectively. Whereas, in case of wheat crop, 45.32 kg nitrogen, 66.66 kg phosphorus and 44.32 kg potassium per hectare was used by selected farmers. For sugarcane crop, per hectare utilization of nitrogen, phosphorus and potassium was 205.94 kg, 89.09 kg and 48.94 kg, respectively.

#### Plant protection chemicals:

Plant protection is also an important input in crop

production for protection of crop from insects, pests and diseases. Per hectare use of plant protection chemical for cotton, soybean, *Rabi jowar* and sugarcane was 2.15 liters, 3.16 liters, 0.5 liter, 0.71 liter and 1.27 liters, respectively in the study area.

#### Costs and returns from crop enterprise:

The study of costs and returns of every farm enterprise forms an important base in determining the relative profitability of different farm enterprises. By comparing net profits of various activities, one can arrive to the conclusion that which activity should be profitably carried out on the farm. Analysis is done for these and results were presented in Table 3.

**Table 3: Per hectare cost of cultivation for different crops**

Sr. No.	Crop	Cost category	Values (Rs.)	Percentage value
1.	Cotton	Cost `A`	20374.49	47.87
		Cost `B`	34439.43	80.91
		Cost `C`	42563.09	100
2.	Soybean	Cost `A`	16502.35	50.46
		Cost `B`	26064.82	79.71
		Cost `C`	32700.45	100
3.	<i>Rabi jowar</i>	Cost `A`	15734.56	53.43
		Cost `B`	23444.49	80.17
		Cost `C`	29225.75	100
4.	Wheat	Cost `A`	18241.92	58.43
		Cost `B`	24736.39	76.52
		Cost `C`	32326.58	100
5.	Sugarcane	Cost `A`	44695.37	52.43
		Cost `B`	71680.09	84.08
		Cost `C`	85247.88	100

#### Per hectare cost of cultivation of different crops:

There were five major crops cultivated in the area. The crops were cotton, soybean, *Rabi jowar*, wheat and sugarcane. Cotton and soybean were the *Kharif* season crops, while *Rabi jowar* and wheat were *Rabi* season crops and sugarcane was perennial crop. Crop wise per hectare cost A, cost B and cost C incurred is shown in Table 3. It is also clear from Table 3 that in case of cotton crop per hectare cost of cultivation worked out to Rs. 42563.09 (Cost-C) of which share of cost-A was 47.87 per cent (Rs. 20374.49) and that of cost-B was 80.91 per cent (Rs. 34439.43). In case of soybean crop, per hectare cost (cost-C) was Rs. 32700.45, while

share of cost-A was 50.46 per cent (Rs. 16502.35) and share of cost-B was 79.71 per cent (Rs. 26064.82).

In case of *Rabi jowar* per hectare cost of cultivation (cost-C) was Rs. 29225.75 of which cost-A accounted for Rs. 15734.56 (53.78 %) and cost-B was 23444.49 (80.17 %). In case of wheat, per hectare cost of cultivation *i.e.* cost-C was Rs. 32326.58 of which cost-A was 58.43 per cent (Rs. 18241.92) and cost-B was 76.52 per cent (Rs. 24736.39). In case of sugarcane, per hectare cost of cultivation (cost-C) was Rs. 85247.88, of which proportion of cost-A was Rs. 44695.37 (52.45 %) and that of cost-B was Rs. 71680.09 (84.08 %).

#### Per hectare returns from different crops :

The returns from crop production were calculated

Sr. No.	Crop	Qty	Value (Rs.)
1.	<b>Cotton</b>		
	Main produce (q)	18.19	76398
	By produce (q)	29.49	4423.5
	Total	-	80821.50
2.	<b>Soybean</b>		
	Main produce (q)	17.56	52680
	By produce (q)	9.35	1870
	Total	-	54550
3.	<b>Rabi jowar</b>		
	Main produce (q)	14.48	36200
	By produce (q)	31.76	6352
	Total	-	42522
4.	<b>Wheat</b>		
	Main produce (q)	26.62	34606
	By produce (q)	9.99	1998
	Total	-	36604
5.	<b>Sugarcane</b>		
	Main produce (t)	100.9	151350
	By produce (t)	9.51	3328.50
	Total	-	154678.50

by adding value of main produce and value of by produce. Per hectare production of main and by produce with their values for different crops is given in Table 4.

It is observed from the Table 4 that, per hectare production of cotton, soybean, *Rabi jowar*, wheat and sugarcane was 18.19 q., 17.56 q., 14.48 q., 26.62 q. and 100.9 tonnes, respectively. Considering per unit sale price

and value of by produce, the per hectare gross returns worked out to Rs. 80821.5 for cotton, Rs. 54550 for soybean, Rs. 42522 for *Rabi jowar*, Rs 36604 for wheat and Rs. 154678.5 for sugarcane.

#### Input-output relationship in crop production :

The input-output relationship (B: C ratio) have been worked out for each crop grown on the farm and the information is presented in Table 5. It is observed from Table 5 that, cotton had the highest input-output ratio (1.89) followed by sugarcane (1.81), soybean (1.67), *Rabi jowar* (1.45) and wheat (1.13). This ratio was more than unity in case of all the crops. This indicated that cultivation of cotton was most profitable in *Kharif* season, while cultivation of *Rabi jowar* in *Rabi* season. Though the

Sr. No.	Crop	B:C ratio
1.	Cotton	1.89
2.	Soybean	1.67
3.	<i>Rabi jowar</i>	1.45
4.	Wheat	1.13
5.	Sugarcane	1.81

cultivation of wheat was not too profitable, but farmers were growing wheat because it was the main food grain crops of the study area.

The above presented results of analysis of cost and returns from crop enterprise were in line with the results of Parthasarathy and Satyanarayan (1976); Singh and Joshi (2008) and Rao (2014).

#### Conclusion :

The analysis concludes that the cropping pattern of selected farms was dominated by *Kharif* crops with an area of 1.47 ha. In *Kharif* season Cotton was major crop covered an area of 0.98 ha. The cropping intensity of area was 126.06 per cent. Inputs utilization for various crops at overall level showed that per hectare utilization of human labour was the highest in case of sugarcane (166.3 man days). In case of bullock labour, highest utilization was for sugarcane crop (31.98 pair days) and lowest for soybean crop (11.54 pair days). Utilization of machine labour was highest for *Rabi jowar* crop (3.05 hours) and lowest for cotton crop (1.68 hours). Whereas seed utilization per hectare for cotton, soybean, *Rabi jowar*, wheat and sugarcane was 1.92 kg, 73.33 kg, 11.77

kg, 99.99 kg and 6.68 tonne setts, respectively. Regarding manures, highest quantity was used for sugarcane crop (31.96 q/ ha.). In case of fertilizers, nitrogenous fertilizers were used in maximum quantity followed by phosphatic fertilizer and potash fertilizers except soybean crop (legume crop) where phosphatic fertilizers were used more, followed by nitrogenous and potash fertilizers.

Per hectare total cost of cultivation of different crops showed that maximum cost was incurred in sugarcane (Rs. 85247.88) followed by cotton (Rs. 42563.09), wheat (Rs. 32326.58), soybean (Rs. 32700.45) and *Rabi jowar* (Rs. 29225.75). Per hectare total returns from sugarcane was the highest (Rs. 154678.50) followed by cotton (Rs. 80821.50), soybean (Rs. 54550), *Rabi jowar* (Rs. 42522) and wheat (Rs. 36604). Regarding the profitability of crop enterprise, cotton was most profitable crop as its input-output ratio was 1.89 followed by sugarcane (1.81), soybean (1.67), *Rabi jowar* (1.45) and wheat (1.13).

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## REFERENCES

Anonymous (2013). *Govt. of India, Ministry of Agriculture*, Department of Agriculture and Co-operation, Directorate of Economics and Statistics.

**Asmatoddin, Md**, Jawale, S.V. and Ghulghule, J.N. (2009). Socio-

economic status and cropping pattern of medium farm owner in Marathwada region. *Internat. J. Com & Busi. Mgmt.*, **2** (1) : 37-41.

**Bansode, P.S.** and Nimbalkar, S.S. (2013). Study of land use pattern and cropping pattern of marginal farmers of Marathwada region of Maharashtra. *Agric. Update*, **8** (3) : 440-442.

**Basavaraj, H.** and Zunnal, L.B. (1986). Allxative efficiency of small and large farmers in hybrid *jowar* production in Dharwad district, Karnataka State. *J. Farm. Syst.*, **2** : 3-4.

**Pagare, K. H.**, More, S. S., Debnath, P. and Shrey, R. (2013). Land holding and cropping pattern of *Rabi Jowar* growers in Marathwada Region. *Sci. Res. Reporter*, **3**(1):15-19.

**Parthasarathy, R.B.** and Satyanarayan, K.S. (1976). Impact of increase input prices on profitability in sugarcane production – application of break even analysis. *Indian J. Agric. Econ.*, **31** (3) : 85 – 89.

**Rao, A.S.S.** (2014). Input use and cost of cultivation of sugarcane – A study in Telangana region of Andhra Pradesh. *IOSR J. Econ. & Finance*, **5** (5): 67-74.

**Shindhe, V.A.**, Sale, Y. C. and Kamble, B.T. (2013). Sustainability of farmers by integrated farming system in Maharashtra. *Sci. Weekly*, **1**(3), Print and Online.

**Singh, M.** and Joshi, A.S. (2008). Economic analysis of crop production and dairy farming on marginal and small farms in Punjab. *Agric. Econ. Res. Rev.*, pp. 251-257.

**Singh, R. K. P.**, Kumar, Abhay, Singh, K. M. and Kumar, Anjani (2014). Agricultural production performance on small farm holdings: Some Empirical Evidences from Bihar, India. 8th International Conference of Asian Society of Agricultural Economists (ASAE), Savar, Bangladesh, on 15<sup>th</sup> to 17<sup>th</sup> October 2014.

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