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ORIGINAL ARTICLE

IMPACT OF PRECISION FARMING PRACTICES ON CROP PRODUCTIVITY AND INCOME OF FARMERS AND CONSTRAINTS FACED BY THE FARMERS

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Abstract : The present study was conducted in Bagalkot, Belgaum, Dharwad and Haveri district of Karnataka State during the year 2013-14. The Ex-post-facto research design was used for the study. These districts are purposively selected for research study as Precision Farming Project under RKVY was implemented by UAS Dharwad in these districts during the year 2011-2012. All the 76 farmers covered under Precision Farming Project implemented by UAS Dharwad constituted the sample of the study. The findings of the study revealed that, percentage increase in average yield of sugarcane, cotton and chilli after adopting precision farming were 17.80, 36.26 and 26.08, respectively and significant increase in yield as revealed by t-test. The percent increase in income of sugarcane, cotton and chilli after adoption of precision farming practices were 24.51, 75.63 and 29.63, respectively and significant increase in income as revealed by t-test. The major constraint faced by the farmers in precision farming was high initial cost (96.05%), difficulty in formation of grids based on soil variability (93.42%), difficulty in the soil variability analysis (92.11%), difficulty in identifying the pest and diseases grid wise (88.16%), difficulty to take plant protection measures grid wise (86.64%), difficulty to apply nutrients based on soil variability analysis (85.53%), lack of knowledge about precision farming technologies (84.21%) and non availability of required inputs (78.95%) were other major constraints faced by the farmers.

Key words : Perception, Precision farming, t-test, Productivity.

1. Introduction

Precision agriculture (PA) or precision farming (PF) generally refers to a system that assesses within-field variability in soil and crops. Information gathered in these assessments is then used to develop site-specific management practices to optimize crop production. Precision farming is a form of agriculture where site specific management practices are adopted giving due considerations to the spatial variability of land in order to maximize crop production and minimize the environmental damage [Harshal *et al.* (2006)]. Precision farming requires information about soil properties, landscape, elevation and how these characteristics affect the plant growth and crop progress throughout the field each season. Precision farming arisen mainly in response to advances in technology, rather than through development in the fundamental sciences which supports agriculture. Precision farming envisages packages of crop cultivation at micro level, which enables to increase the productivity and maintain sustainability. It minimizes the environmental damages and helps to make judicious utilization of resources [Sangeetha *et al.* (2012)]. Two characteristics are likely to drive the adoption of precision agriculture technologies. First, considering that they improve the efficiency of input use in mechanized agriculture, they are likely to be adopted first in those places where input use is already relatively efficient. Second, because these technologies use costly capital to automate human information processing, they will be most attractive where capital is abundant relative to management labour. Keeping the above facts in mind, the present study was designed to understand the impact of precision farming practices on crop productivity and income of farmers and constraints faced by the farmers.

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2. Materials and Methods

The study was an "Expost-facto" research carried out in Bagalkot, Belgaum, Dharwad, Haveri district of Karnataka. These districts are purposively selected for research study as Precision Farming Project under RKVY implemented by UAS Dharwad in these districts during the year 2011-2012. All the 76 farmers covered under Precision Farming Project implemented by UAS Dharwad constituted in sample of the study. To know the constraints faced in adoption of precision farming practices from the farmer's point of view a list of constraints were prepared after extensive review of literature, consulting expert in the field and the respondents were asked to give their opinion by answer 'Yes' or 'No'. The frequency and percentage for each constraint is calculated and ranked accordingly. The data were collected by interviewing the respondents with the help of a structured interview schedule developed for the purpose.

3. Results and Discussion

Impact of precision farming practices on crop productivity of the farmers

The results presented in Table 1 indicated the impact of precision farming practices on productivity of the farmers with respect to sugarcane, cotton and chilli. The average yield of sugarcane crop before adoption of precision farming was 43.80 t/ac whereas the average yield after the adoption of precision farming was 51.60 t/ac indicating 7.80 t/ac increases. The percentage increase in average yield was found to be 17.80. Further, the difference in average yield of sugarcane growers before and after the adoption of precision farming practices was significant at one per cent level of probability as revealed by 't' values. The average yields of cotton crop before and after the adoption of precision farming practices were 9.10 q/ac and 12.40 q/ac, respectively with a increase of 3.30 q/ac. The percentage increase in average yield was found to be 36.26. The increase in average yield of cotton before and after the adoption of precision farming practices was significant at one per cent level of probability as revealed by 't' values. The average yield of chilli crop before and after the adoption of precision farming practices were 4.60 q/ac and 5.80 q/ac, respectively, with an increase of 1.30 q/ac. The percentage increase in average yield was found to be 26.08. The increase in average yield of chilli before and after the adoption of precision farming practices was significant at one per cent level of probability as revealed by 't' values. The findings were in conformity with the results of Savita (2008) and Shabnam *et al.* (2012).

Table 1 : Impact of precision farming practices on crop productivity.

Crops	Average Yield		Difference in yield	%	t value
	Before Precision farming	After Precision farming			
Sugar cane (t/ac) (n=31)	43.80	51.60	7.80	17.80	12.233**
Cotton (q/ac) (n= 34)	9.10	12.40	3.30	36.26	4.318**
Chilli (q/ac) (n=11)	4.60	5.80	1.20	26.08	3.130**

%= Percentage, ** significant at 0.01%

Impact of precision farming on income of the farmers

The data in the Table 2 revealed that, the average per acre income of the sugarcane growers before adoption of precision farming was Rs. 55480/- whereas after adoption of precision farming was Rs. 69080/- with an increase of Rs. 13600/-. The per cent change

Table 2 : Impact of Precision Farming Practices on Income of farmers.

Crops	Average Yield		Difference in yield	%	t value
	Before Precision farming	After Precision farming			
Sugar cane (Rs.) (n=31)	55480	69080	13600	24.51	15.627**
Cotton (Rs) (n=34)	16877	29642	12765	75.63	10.365**
Chilli (Rs) (n=11)	44880	58181	13301	29.63	6.057**

%= Percentage, ** significant at 0.01%

in income was found to be 24.51 per cent. Further, the increase in average per acre income of sugar cane growers before and after the adoption of precision farming practices was highly significant at one per cent level of probability as revealed by 't' test. The average per acre income of the cotton growers before adoption of precision farming was Rs. 16877/- whereas after adoption of precision farming was Rs. 29642/- with an increase of Rs. 12765/-. The per cent change in income was found to be 75.63 Further, the difference in average per acre income of cotton growers before and after the adoption of precision farming practices was highly significant at one per cent level of probability as revealed by 't' test.

The data in the Table 2 also revealed that the average per acre income of the chilli growers before adoption of precision farming was Rs. 44880/- whereas after adoption of precision farming was Rs. 58181/- with an increase of Rs. 13301/-. The per cent change in per acre income was found to be 29.63. Further, the increase in average per acre income of chilli growers before and after the adoption of precision farming practices was highly significant at one per cent level of probability as revealed by 't' test. The findings were in conformity with the results of Savita (2008).

Constraints faced by the precision farming farmers in the adoption of precision farming practices

It was evident from the Table 3 that high initial cost (96.05%) was emerge as most important constraint faced by the farmers in adoption of precision farming followed by difficulty in formation grids in fields (93.42%), difficulty in the soil variability analysis (92.11%), difficulty in identifying the pest and diseases grid wise (88.16%), difficulty to take plant protection measures grid wise (86.64%), difficulty to apply nutrients based on soil variability analysis (85.53%), lack of knowledge about precision farming technologies (84.21%) and non-availability of required inputs (78.95%). Lack of local technical expertise (59.21%), lack of finance and credit facility (48.68%), in adequate training and demonstrations (46.05%), lack of renumarative prices based on quality of produce (43.42%), lack of skilled labour to operate and handle the equipments (40.78%), small size of landholdings for adoption of precision farming (31.58%) and heterogeneity of cropping system (28.95%) were the other constraints faced by the farmers in adoption of precision farming practices. The findings were in conformity with the results of Govindaraj (2012) and Sangeetha (2012).

Table 3 : Constraints faced in adoption precision farming practices. (n = 76)

Sl. No.	Constraints	Frequency	Percentage
1	High initial cost	73	96.05
2	Difficulty in formation of grids based on soil variability.	71	93.42
3	Difficulty in the soil variability analysis	70	92.11
4	Difficulty in identifying the pest and diseases grid wise.	67	88.16
5	Difficulty to take plant protection measures grid wise.	66	86.84
6	Difficulty to apply nutrients based on soil variability analysis.	65	85.53
7	Lack of knowledge about precision farming technologies.	64	84.21
8	Non -availability of required inputs.	60	78.95
9	Lack of local technical expertise	45	59.21
10	Lack of finance and credit facility	37	48.68
11	Inadequate training and demonstrations	35	46.05
12	Lack of enumerative prices based on quality of produce	33	43.42
13	Lack of skilled labour to operate and handle the equipments	31	40.78
14	Small size of landholdings for adoption of precision farming.	24	31.58
15	Heterogeneity of cropping system.	22	28.95

4. Conclusion

The findings of the study clearly reveal that, average yield levels and income of the farmers are significantly

increased after the intervention of precision farming practices. This tangible benefit could be exploited by the extension agencies to motivate other farmers for adoption of these practices. High initial cost was important constraint expressed by almost all the farmers. Formation of grids based on the soil variability, grid wise management of pest and diseases etc., are very labour and cost intensive practices. So, it is strongly suggested to develop cost and labour effective grid formation and nutrient application methods which could fit well into Indian farmers conditions and resource matrix. Other important constraints faced by the farmers were difficult in formation of grids based on soil variability and the soil variability analysis. These constraints can be ensured by arranging analysis of soil variability and helping the farmers in formation of grids based on soil variability by the extension agency.

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