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RESEARCH PAPER

Influence of precision farming technology on chilli (*Capsicum annuum* L.) cultivation in Maharashtra

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ABSTRACT

Chilli (*Capsicum annuum* L.) is one of India's major export commodities. The study was conducted in Satara district of Maharashtra in village Goregaon (Wangi). Precision farming is tools in hands of village farmer give beneficial result in increasing the socio-economic status of farmer. 91 farmers having 228 acre total land were selected for precision farming. Chilli crop was selected for *Kharif* session in 2013. In this experiment comparative study of conventional chilli cultivation and use of precision technology in chilli cultivation was undertaken. The result indicated that precision farming increased social and economic status of farmer by increasing, yield (25 t/ha), quality of produce (93.40%), economic use of water (97.80%) and C : B ratio. The C : B ratio of precision farming is higher (1.94) than conventional farming (1.55). The strength and weakness of precision farming was also studied.

Key Words : Precision farming, Chilli, Cost of cultivation, India

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The focus on enhancing the productivity during the Green Revolution coupled with total disregard of proper management of inputs and without considering the ecological impacts, has resulted into environmental degradation. The only alternative left to enhance productivity in a sustainable manner from the limited natural resources at the disposal, without any adverse consequences, is by maximizing the resource input use efficiency. Precision farming involves looking at the increased efficiencies that can be realized by understanding and dealing with the natural variability found within a field. The goal is not to obtain the same yield everywhere, but rather to manage and distribute inputs on a site specific basis to maximize long term cost/benefit. Applying the same inputs across the entire field may no longer be the best choice. Precision farming is helping many farmers worldwide to maximize the effectiveness of crop inputs. Precision Farming is generally defined as an information and technology based farm management system to identify, analyze and manage variability within fields for optimum profitability, sustainability and protection of the land resource (Singh, 2012).

Chilli (*Capsicum annuum* L.) is one of India's major export commodity. Precision agriculture gives farmers the ability to use crop inputs more effectively including fertilizers, pesticides, tillage and irrigation water. More effective use of inputs means greater crop yield and/or quality, without polluting the environment. Chilli is annual plant, comes in a wide variety of shapes, sizes, colours and in different degrees of pungency. However, the conventional definition of precision farming is suitable when the land holdings are large and enough variability exists between the fields. In India, the average land holdings are very small even with large

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and progressive farmers. It is necessary to define revised definition of precision farming in the context of Indian farming while retaining the basic concept of precision farming. The more suitable definition for precision farming in the context of Indian farming scenario could be: Precise application of agricultural inputs based on soil, weather and crop requirement to maximize sustainable productivity, quality and profitability. Today because of increasing input costs and decreasing commodity prices, the farmers are looking for new ways to increase efficiency and cut costs. Precision farming technology would be a viable alternate to improve profitability and productivity (Mathur *et al.*, 2000).

The potential of precision farming for economic and environmental benefits could be visualized through reduced use of water, fertilizers, herbicides and pesticides besides the farm equipment's. Instead of managing an entire field based upon some hypothetical average condition, which may not exist anywhere in the field, a precision farming approach recognizes site-specific differences within fields and adjusts management actions accordingly. Farmers usually are aware that their fields have variable yields across the landscape. These variations can be traced to management practices, soil properties and/or environmental characteristics. Soil characteristics that affect yields include texture, structure, moisture, organic matter, nutrient status and landscape position. Environmental characteristics include weather, weeds, insects and diseases (Singh, 2012).

RESEARCH METHODOLOGY

The objective of our work was to find out how chilli cultivation by precision farming technology make socio-economic changes in village farmer and to find out the strength, weakness, of precision farming in village level of Satara district in Maharashtra. The study was conducted in Satara district of Maharashtra in village Goregaon (Wangi). Precision farming is tools in hands of village farmer give beneficial result in increasing the socio-economic status of farmer. 91 farmers having 228 acre total land were selected for precision farming. Chilli crop, Nandita cultivar was selected for *Kharif* session in 2013. In this experiment comparative study of conventional chilli cultivation and use of precision technology in chilli cultivation was undertaking. The strength and weakness of precision farming was studied by preparing simple questionaries' with a view of use of precision farming technology in the village. The sample for the present study was taken after receiving the list of precision farm practitioners which were engaged in chilli cultivation from last three year and now totally shifting their farming by precision farming technology.

RESULTS AND REMONSTRATION

The results obtained from the present investigation as well as relevant discussion have been summarised under following heads:

Economics :

The data revealed from the Table 1. The precision farming played vital role in increasing the socio-economic status of farmer by using precision technologies. In the present study it was found that the yield of precision farming technology was maximum over conventional method. The maximum yield (25t/ha) was recorded in precision farming which was more than yield (8t/ha) observed in conventional chilli cultivation. The maximum C : B ratio (1:1.94) was recorded in precision farming as compare to conventional chilli cultivation (1 : 1.55).

Table 1 : Cultivation cost of chilli

Sr. No.	Particulars	Conventional cultivation	Precision farming
1.	Preparation of land	9,000	9,000
2.	Cost of mulch paper	------	28,000
3.	Drip irrigation	------	20,000*
4.	Seedling	15,000	40,000
5.	Fertilizer	24,000	50,000
6.	Insecticide	13,000	17,000
7.	Fungicide	9,000	11,000
8.	Transport and market cost	3,000	7,000
9.	Labour	30,000	75,000
10.	Yield/ha	8t/ha	25t/ha
11.	Rate/kg	20 Rs/kg	20 Rs/kg
12.	Income/ha	1,60,000	5,00,000
13.	C: B ratio	1:1.55	1:1.94

* Note- 1 ha.costis Rs. 1,00,000/- but due to 5 year life consider Rs. 20,000/-year

Strength and weakness analysis of PF :

During the course of study the strength of precision farming was investigated by employing the group discussion with 91 farmers. Most of farmers were benefited due the adoption of PF. It was observed from the Table 2 that increased crop yield, uniform water distribution, economised use of water, improved product quality, surface and ground water conservation, greatest return on investment on each input and effective and efficient pest management were perceived as major strengths in adopting PF techniques by more than 90 per cent of the sample. With the available water, more crops could be cultivated in aunitareaina year through drip fertigation system. The major focus of PF was the economised use of water, which could be acted as a cause for such an outcome. The other strengths, technical support from agriculture university, Change of cropping pattern, mini missed fertiliser loss and increased area of cultivation were stated by more than 80 per cent of the respondents. Similar results were also proposed by Robert *et al*. (1994) and Khosla (2008).

Among the 10 weaknesses in PF expressed by the sample, High initial investment cost (93.40 %) occupied the first position. This was closely followed by, damage of driplines by rats and rodents, fragmentation of land holdings, additional maintenance cost, requirement of skilled labour, selectivity in usage of PF technologies, requires quality water,

Table 2 : Strengths of precision farming **(n=91)**

Sr. No.	Statements	More		Least	
		No.s*	%	No.s*	%
1.	Increases crop yield	89	97.8	2	2.2
2.	Benefit by using mulch paper	82	90.1	9	9.9
3.	Improved product quality	85	93.4	6	6.6
4.	Effective and efficient pest management	83	91.2	8	8.8
5.	Environment friendly	72	79.12	19	20.88
6.	Technical support from agriculture university	75	82.24	16	17.6
7.	Sharing of information with the forum members	85	93.4	6	6.6
8.	Increases area of cultivation	79	86.81	12	13.19
9.	Decreases human health risk	70	76.92	21	23.08
10.	Uniform water distribution	82	90.1	9	9.9
11.	Surface and ground water conservation	85	93.4	6	6.6
12.	Economised use of water	89	97.8	2	2.2
13.	High economic efficiency	84	92.3	7	7.7
14.	Minimised fertiliser loss	80	87.91	11	12.09
15.	Change of cropping pattern	76	83.51	15	16.49
16.	Easy disposal of produce	72	79.12	19	20.88
17.	Gained skill in grading the produce	76	83.51	15	16.49
18.	Greatest return on investment on each input	85	93.4	6	6.6

*Numbers of farmer

Table 3 : Weaknesses of precision farming **(n=91)**

Sr. No.	Statements	More		Least	
		No.s*	%	No.s*	%
1.	No initiative for assessing in-field variation	68	74.72	23	25.28
2.	Selectivity in usage of PF technologies	75	82.24	16	17.60
3.	High initial investment cost	85	93.40	06	6.60
4.	Requires skilled labour	79	86.81	12	13.19
5.	Additional maintenance cost	82	90.10	09	9.90
6.	Requires quality water	75	82.24	16	17.60
7.	Clogging of emitters	72	79.12	19	20.88
8.	Difficulty in intercultural operations	75	82.24	16	17.60
9.	Fragmentation of landholdings	82	90.10	09	9.90
10.	Damage of drip lines by rats and rodents	83	91.20	08	8.80

*numbers of farmer

difficulty in intercultural operations, clogging of emitters and no initiative for assessing in-field variation, which were indicated as weaknesses (74.72 - 91.20 %) by the farmers (Table 3). In line with the study conducted by Kavitha (1999) on drip irrigation, even in this study, high initial investment cost was expressed by 69 per cent of the PF practitioners.

Conclusion :

In the present study it was found that the maximum yield (25t/ha) recorded in precision farming was more than yield (8t/ha) observed in conventional chilli cultivation. In relation to strength and weakness, the increases crop yield, uniform water distribution, economised use of water, improved product quality, surface and ground water conservation, greatest return on investment on each input and effective and efficient pest management were perceived as major strengths in adopting PF. Among the10 weaknesses in PF expressed by the sample, high initial investment cost occupied the first position.

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