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Impact assessment of CROPSAP scheme on cotton growers: A probit analysis

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Abstract
The CROPSAP scheme was started in year 2009-10 in the Maharashtra state with aim provide to farmer for advisory of pest surveillance of cotton crops. The State Agriculture Department Maharashtra is the CROPSAP "crop pest surveillance and advisory project" Cotton (*Gossypium* spp.) the 'white gold' and 'king of fiber'. Cotton is one of the most important commercial crops cultivated in India. In year 2022-2023, an investigation in Parbhani district. The research identified that the Economic Impact of CROPSAP scheme beneficiary and non-beneficiary cotton growers in Parbhani district of Maharashtra state. Having analyzed the findings on the information collected for findings of the Economic impact of cotton growers The adoption of the CROPSAP scheme show the positive impact on beneficiary cotton grower. This finding are estimated by Probit Regression Model.

Keywords: Impact, CROPSAP, cotton growers, probit regression model

Introduction
The CROPSAP scheme was started in year 2009-10 in the Maharashtra state with aim provide to farmer for advisory of pest surveillance of cotton crops. The State Agriculture Department Maharashtra is the CROPSAP "crop pest surveillance and advisory project" implementation authority with the funding through RKVY of Central Government till 2012 followed by Government of Maharashtra from 2013 till date. Nearly 44000 villages across 348 talukas of 34 districts from 8 division of Maharashtra are being covered under this programme by Nand Sagar *et al*., (2022) [10]. We may have clear picture of the nature and working of CROPSAP by knowing. Project modality: Software was developed and implemented for data feeding, interpretation, report generation, GIS based pest mapping and advisory dissemination by Ahire and Kharde, (2013) [1], mote and sonanse (2012) [9].
Cotton (*Gossypium* spp.) the 'white gold' and 'king of fiber', (Reddy *et al*, 2011) [23]. 'Queen of fibers' is multipurpose crop grown in various agro-climatic conditions (Munjunath *et al*., (2013) [18]. Cotton is one of the most important commercial crops cultivated in India and accounts for around 25% of the total global cotton production. It plays a major role in sustaining the livelihood of an estimated 6 million cotton farmers and 40-50 million. producing countries are namely China, India, U.S.A., Pakistan, Brazil, Uzbekistan, Australia, Turkey, Turkmenistan and Syria, which totally account for 93.2

million bales of cotton production. India got 1st place in the world in cotton acreage with 120.69 lakh ha under cotton cultivation i.e. around 36 percent of the world area of 333 lakh ha around 67 percent of India's cotton is grown on irrigated area. In terms of productivity, India is on 38th rank with yield of 510 kg/ha. Gujrat is the largest producer of cotton in India. cotton is one of the most important fiber crops and cash crops in India. the top ten cotton producing state of India are as follows: Gujrat, Maharashtra, Telangana, Andhra Pradesh, Madhya Pradesh, Karnataka, Haryana, Rajasthan, Panjab, Odisha by Ministry of Textiles (COCPC, 2021).
Maharashtra has the highest area and production of cotton in the country. It has 3.953 million hectares area under cotton crop with production of 1.21 million metric tons in the year 2021- 2022. The productivity of cotton is 336 kg/ha seed cotton yield (national average 568 kg/ha). The major cotton growing districts are namely, Aurangabad, Jalana, Beed, Parbhani, Nanded, Hingoli, Latur, in Marathwada region (10 per cernt) while Akola, Amaravati, Buldhana, Chandrapur, Dhule, Jalgaon, Nagpur, Wardha, and Yavatamal, in Vidarbha region (25 percent) by Shrey and Kamble (2014) [13]. The Parbhani district 1.99 lakh ha production 3.98 lakh bale and productivity 339 kg lint /ha (Anonymous, 2020) [2].
In this said study to access the impact of CROPSAP scheme by cotton growers very few researches was available on this topic of research.

Methodology
In Parbhani district 5 tahsil was selected Parbhani, Jintur, Manavat, Pathari, Gangakhed. and each tahsil 4 village was selected and each village 4 adopter and 4 non-adopter cotton growers was selected in each village the same categories was used by Kaviraju *et al*., (2018) [21] total sample size of CROPSAP adopter was 80 and non-adopter was 80. Total number of cotton growers was 160 were selected for present study. The same methodology was used by the collection of data Jyothsna priyadarshabi *et al*., (2022) [8], Nand Sagar *et al*., (2022) [10], Shrey and Kamble (2014) [16] Venkatachalam *et al*., (2013) [25].
The impact of said collected to study scheme was studied by using probit regression model.

Probit Regression Model
The probit regression model is fitted to access the impact of CROPSAP scheme on beneficiary and non-beneficiary cotton growers. Probit model is a way to perform regression for binary outcome variable with two possibilities like adopters and non-adopters of cotton growers. this model was used by P. Sadashivappa (2012) [12], Cappellari and Jenkins (2003) [4], Fikiru *et*, *al*., (2017) [6]. The probit regression equation explained above takes the following form,

$$Y_{it} = \beta X_{it} + (q_i + \mu_i) + \mu_{it}$$

Where,
Y = Dependent variable
X = Independent variable
μ_i = Error term
β = Coefficient of regression

Table 1: Variables and Nature

Variables	Nature
Adopter/non-adopter	Binary (Adopter =1), (Non-adopter =0)
Cotton area (X1)	Continuous
Sowing time (X2)	Ordinal
Spacing (X3)	Ordinal
Plant population (X4)	Continuous
Plant protection (X5)	Continuous
Insecticides/pesticides(X6)	Continuous
Yield (X7)	Continuous

Results and Discussion

Table 2: Impact of CROPSAP scheme on cotton grower by adoption of probit regression model

Sr.no.	Variables	Coefficient	Standard error
1	Cotton area (X1)	0.08590*	7.91e-01
2	Sowing time(X2)	0.00134***	1.78e-01
3	Spacing (X3)	0.13716	2.26e-01
4	Plant population(X4)	0.14466	3.86e-06
5	Plant protection (X5)	0.00642***	4.33e-02
6	Insecticides / Pesticides (X6)	0.32991	1.51e-01
7	Yield (X7)	0.00022***	2.23e-02

Note: *** significant at 1 percent, ** significant at 5 percent, * significant at 10 percent

Impact of CROPSAP scheme on cotton growers
The findings of the present study is depicted in table 1. Estimate the Impact of CROPSAP scheme on cotton growers to analyzed by a probit regression model. where some factors *viz*. X1, X2, X3, X4, X5, X6 are used to describe Sowing time, Spacing, Plant population, Plant protection Practices recommended by CROPSAP scheme, Insecticides and Pesticides and Yield this variable can be used to analyze the impact respectively. This factor are responsible for increasing the attitudes of farmers towards adoption of CROPSAP scheme.
The adoption of the CROPSAP scheme show the positive impact on beneficiary cotton grower from the table 2 where X1 (Cotton area), X2 (Sowing time), X5 (Plant protection by CROPSAP sche me) and X7 (Yield) were highly significant effect of CROPSAP scheme on beneficiary cotton grower. X5 (plant protection practices by CROPSAP scheme) X2 (Sowing time) and X7 (Yield) significant at 10 percent and X1 (Cotton area) significant at 1 percent. similar findings have been reported by Tejpara *et al*., (2018) [24].

The result indicate that the sowing time, plant protection practices recommended by 'Crop pest surveillance and advisory project (CROPSAP)'scheme helps to increasing the level of yield and it helps to increase in area of cotton cultivation.

Conclusion
The said study was concluded that the CROPSAP scheme is responsible to get higher yield along with more monetary benefits to adopter rather than non-adopter. it is also noted that proper utilization of package practices under CROPSAP would be assured to enhance the attitude of cotton growers towards adoption of the prescribed scheme.

Policy Implication
The Government agencies, Research institutes NGOs, etc. has to take appropriate actions to emphasize awareness of CROPSAP scheme among villages to get more economic stability to farmers.

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