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# Impact of CROPSAP Scheme on Cotton Growers: A Probit Regression Approach

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**ABSTRACT: In the present study economic impact of CROPSAP scheme on beneficiary and non-beneficiary cotton growers have been assessed. This was based mainly on primary data which was collected through personal interview method with the help of pre-tested schedules. An investigation was conducted in the Jalna district of Maharashtra state purposively on the basis of 2nd highest area under cotton crop. Multistage sampling technique was used for selection of district, tehsils and villages. Total sample size was 160 where 80 was beneficiary and 80 non-beneficiary cotton growers. Probit regression model was fitted to access the impact of CROPSAP scheme on beneficiary and non-beneficiary cotton growers. CROPSAP provide a larger canvas for pest management implementation in term of technological use, number of stakeholders, number of crops, area covered, skill imparted and employment generated. The pest affected area across cotton is implemented with scientifically based pest management practice across Maharashtra state of jalna district. In view of limited time, resources, the study is restricted to certain variables which may have influences on impact of Crop Pest Surveillance and advisory project on farmers. Application of only recommended pesticides at right dosages using proper application equipment and technique have brought in judicious use of chemical and reduces the occupational hazards. Probit model is a way to perform regression for binary outcome variable with two possibilities like beneficiary and non-beneficiary of cotton growers. In probit regression model factors like $X_2$ (spacing) was significant at 1 per cent level, $X_4$ (plant protection under CROPSAP) was also significant at 1 per cent level, and factor $X_6$ (Yield) significant at 10 per cent level. Hence this result indicated that the above significant factors are greatly influenced on farmers towards adoption of the CROPSAP scheme. Our result show that the CROPSAP scheme is helpful to increase the income level of cotton growers and it is also helpful in future to increase the income level and reduce losses of crops which are affected by insect/pest.**

**Keywords:** Cotton, beneficiary and non-beneficiary, Jalna, CROPSAP scheme, Probit model etc.

## INTRODUCTION

Cotton is one of the most important commercial crops cultivated in India and accounts for around 25% of the total global cotton production. Cotton, Genus *Gossypium* belongs to the family malvaceae and includes in all 35 species. It is said to have two centers of origin of cotton in which one is the old world *viz*., India, Indonesia and Tropical Africa while the other is the New World viz., Mexico or Central America. The word cotton is derived from the Arabic word "Qutn". Generally, four cotton species are grown namely *Gossypium arboreum, Gossypium hirsutum, Gossypium barbadense* and *Gossypium herbaceum* (Salihu and Singh 2020). India is having 1st place in the world with estimated production of 362.18 lakh bales (6.16 Million Metric Tonnes during cotton season 2021-22 i.e., 23% of world cotton production of 1555 lakh bales (26.44 Million Metric Tonnes). India is also the 2nd largest consumer of cotton in the world with estimated consumption of 338 lakh bales (5.75 Million Metric Tonnes i.e. 22% of world cotton consumption of 1507 lakh bales (25.63 Million Metric Tonnes). In Maharashtra major cotton growing districts are namely Aurangabad, Jalna, Beed, Parbhani, Nanded, Hingoli, Latur, Osmanabad in Marathwada region while Akola, Amaravati, Buldhana, Chandrapur, Dhule, Jalgaon, Nagpur, Wardha, and Yavatmal in Vidarbha region. Marathwada region contributes an area of 1.07 million hectares (11.89 per cent) with annual production of 0.14 million tonnes of lint (0.75 million bales). Cotton is dominantly grown under rainfed condition in the region.

During 2008-09, there was a severe pest outbreak of *Spodoptera litura* L. (Fabricus) coupled with *Helicoverpa armigera* L. (Hubner) and other leaf eating caterpillars in cotton-soybean based cropping system.

Such a preventive action required a strong pest monitoring and advisory mechanism to be put in place. A series of meetings were held between March and May 2009 amongst the team of scientists of Indian Council of Agricultural Research (ICAR) crop based institutes and State Agricultural Universities (SAUS) of Maharashtra with State Agriculture Department of Maharashtra to develop the modalities of the programme including the area of operation, roles and responsibilities of different stakeholders, and preparation of project document for funding under Rashtriya Krishi Vikas Yojana (RKVY) by the Commissionerate of Agriculture, Government of Maharashtra. The State Agriculture Department of Maharashtra is the CROPSAP implementation authority with the funding through RKVY of Central Government till 2012 followed by Government of Maharashtra from 2013 till date (Nand *et al*., 2022).

## METHODOLOGY

Multistage sampling design was employed to select the sample farmers. In the first stage, Jalna district was selected purposively from marathwada region on the basis of 2nd highest area under cotton crop. The district contributes area about 2957.59 ha, 8350.84 tonnes production, 480 kg/ha productivity. In the second stage, five tehsils - Bhokardan, Jafrabad, Jalna, Badnapur, and Ambad - were chosen from each district. In third stage, 4 villages was selected from each tehsils. In the fourth stage, four cotton growers—four beneficiaries and four non-beneficiaries were chosen from village. There were 80 cotton growers who were beneficiaries and 80 who were not, making up a total sample size of 160 from 20 communities (Kiresur and Inchangi 2011). Using a pretested questionnaire, data were collected through personal interviews. The data were related to various socio-economic characters such as farmer's details, family members, age, education, and occupation, size of holdings, inventory resources, income and expenditure of the selected farmers, cropping pattern have been collected.

**Analytical tools.** Probit regression model was 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 beneficiary and non beneficiary of cotton growers (Sadashivappa, 2015). The probit regression is given as,

$Y_{it} = \beta X_{it} + (qi + \mu i) + \mu_{it}$,

Where Y = Dependent variable

X = Independent variable

μi = Error term

β = Coefficient of regression

## RESULTS AND DISCUSSION

The study was undertaken with view to study the economic impact of CROPSAP scheme on beneficiary non-beneficiary cotton growers in Jalna district of Maharashtra state.

A probit regression model is used where the dependent variable can only take two values. (Freedman, 2009). Where, some factors such as $X_1$, $X_2$, $X_3$, $X_4$, $X_5$, $X_6$ which are sowing time, spacing, plant population, plant protection practices under CROPSAP, insecticides/pesticides and yield respectively are responsible factors for increasing the attitude of farmers towards adoption of CROPSAP scheme. The result of Probit regression model was given in Table 1 were $X_2$, $X_4$, $X_6$ significantly associated with probability of CROPSAP scheme affected on farmers. Where some factors, $X_2$ (spacing) was significant at 1 per cent level, $X_4$ (plant protection under CROPSAP) was also significant at 1 per cent level, and factor $X_6$ (Yield) significant at 10 per cent level. Similar result obtained by Kimbi (2021) for adoption of improved sorghum technologies among farmers in Tanzania. Hence this result indicated that the above significant factors are greatly influenced on farmers towards adoption of the CROPSAP scheme. Our result show that the exact spacing and mainly plant protection practices under CROPSAP scheme which are help to famers for increasing yield and reduces the losses due to infestation of insect and pest.

**Table 3: Results of Probit regression model.**

| Sr. No. | Factors | Coefficient | Standard error |
|---|---|---|---|
| 1. | Sowing time | 0.005 | 8.44 |
| 2. | Spacing | -0.232*** | 1.38 |
| 3. | Plant population | -1.075 | 6.39 |
| 4. | Plant protection practices under CROPSAP | 1.398 *** | 3.00 |
| 5. | Insecticides/Pesticides | -0.089 | 2.6 |
| 6. | Yield | 1.196 * | 8.41 |

**Note:** ** significant at 5 per cent level, *** significant at 10 per cent level

## CONCLUSIONS

In probit regression model factors like $X_2$ (spacing) was significant at 1 per cent level, $X_4$ (Plant protection under CROPSAP) was also significant at 1 per cent level, and factor $X_6$ (Yield) significant at 10 per cent level. Hence this result indicates that the above significant factors are greatly influenced on cotton growers towards adoption of CROPSAP scheme. The above result indicates that the proper spacing and use of plant protection recommended by CROPSAP helps to increase the yield and reduce the overuse of plant protection.

## FUTURE SCOPE

1. Development of crop planning tools and crop surveillance system with mobile apps (CROPSAP), weather data (AWS), and satellite-based indices.
2. Data Analytics for providing seasonal crop condition information and periodic advisories.
3. Crop yield modeling (process based/machine

learning) for pre-harvest assessment of crop yields/indicative crop yields for major crop cotton.
4. Software development for automation, dashboards, web tools, visualization, and decision support.
5. Crop insurance solutions-Monitoring the insurance coverage based on insurance and cadastral data, risk index for clustering, CCE data analysis, and feasibility studies for implementing smart sampling technique.

**Challenges of study:**

1. Monitoring crop sowing progress during initial phase of kharif season is technologically challenging due to very low spectral emergence.
2. Detecting the crop damage and crop stress at the local scale in near real-time with medium resolution satellite data is a major challenging in addressing crop insurance related issues.
3. Some of beneficiary farmers reported that the lack of reply facility to messages provided through CROPSP and non-availability of plant protection measure.

Contribution by CROPSAP scheme to benefit farmer are as follows.

1. Increasing awareness among farmers relating to pest management.
2. Timely surveys have helped in early detection of pest attack and in taking corrective measures.
3. Scientific advisories have helped farmers to avoid wasteful expenditures on pesticides.

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