

ANALYSIS OF RETURNS ON COTTON CULTIVATION
IN AMARAVATI (MAHARASHTRA)

A Dissertation submitted to the Panjab University, Chandigarh for the award of degree of Master of Arts (Public Administration and Public Policy), in partial fulfilment of the requirement for the Advanced Professional Programme in Public Administration (2024-25) under the guidance and supervision of

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Submitted by

Deputy Inspector General Rajesh S Gandhe



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INDIAN INSTITUTE OF PUBLIC ADMINISTRATION

NEW DELHI

CERTIFICATE

It is hereby declared that this dissertation is my original piece of work and to the best of my knowledge and belief, it contains no material previously published or written by any other person. I am aware of the University's norms and regulations regarding plagiarism including the disciplinary action that it may invite. Any use of the works by any other author, in any form, is adequately acknowledged at their point of use or in the Bibliography.

Date: April 2025

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I have the pleasure to certify that Deputy Inspector General Rajesh S Gandhe, has pursued his research work and prepared the present dissertation titled '*Analysis of returns on cotton cultivation in Amaravati (Maharashtra)*' under my guidance and supervision. The same is the result of research done by him and to the best of my knowledge; no part of the same has been part of any monograph, dissertation or book earlier. This is being submitted to the Panjab University, Chandigarh, for the purpose of Master of Arts in Public Administration and Public Policy in partial fulfilment of the requirement for the Advanced Professional Programme in Public Administration (APPPA) of Indian Institute of Public Administration (IIPA), New Delhi.

I recommend that the dissertation of Deputy Inspector General Rajesh S Gandhe is worthy of consideration for the award of Master of Arts degree of the Panjab University, Chandigarh.

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ACRONYMS

| | |
|---------|---|
| Bt | Bacillus Thuringiensis |
| 2D | 2 Dimensional |
| ANOVA | Analysis of Variation |
| BBF | Broad Bed and Furrow Method |
| CCI | Cotton Corporation of India |
| COCP | Committee on Cotton Production and Consumption |
| DAS | Days After Sowing |
| DBT | Direct Bank Transfer |
| FYM | Farm Yard Manure |
| HTBt | Herbicide Tolerant Bt Cotton |
| ICRISAT | International Crop Research Institute For The Semi Arid Topics |
| ITI | Industrial Training Institute |
| Kg | Kilogram |
| KVK | Krushi Vigyan Kendra |
| MoSPI | Ministry of Statistics and Programme Implementation |
| N:P:K | Nitrogen, Phosphorus, And Potassium |
| NAFED | National Agriculture Cooperative Marketing Federation Of India |
| NSS | National Sample Survey |
| PDKV | Panjabarao Deshmukh Krishi Vidyapith |
| PKV | Panjabarao Deshmukh Krishi Vidyapith Released Cotton Variety For Vidarbha |
| RRBt | Roundup Ready Bt Cotton |
| Sq Kms | Square Kilometres |
| USDA | United States Department of Agriculture |
| WASDE | World Agriculture Supply And Demand Estimates |

EXECUTIVE SUMMARY

1. Cotton is one of the most important cash crops in India, providing livelihoods to millions of farmers and their families. However, cotton farmers in India face numerous challenges, including low yields, high input costs, and fluctuating market prices. This dissertation analyses the returns on cotton cultivation in Amaravati, Maharashtra, with a focus on input factors, yield and production, marketing and sales and financial performance.

2. The study reveals that Bt cotton has had a significant impact on the yield and production of cotton in Amaravati. The study brings out several challenges faced by farmers such as high input cost, labour shortages, and market fluctuations, etc. The study finds that farmers with smaller land holdings are more vulnerable to these challenges, and that they always struggle to make desired returns from cotton cultivation.

3. The study examined awareness among the farmers on the various government schemes and programs and it reveals that they often face difficulties in accessing available schemes and programs.

4. Based on the study, it is recommended to include promotion of sustainable farming practices, improving market access, enhancing farmer education and training, support crop insurance and to cover risk, and foster

collaboration and partnerships. This is likely to improve to improve the livelihoods of cotton farmers in Amaravati District.

5. To mitigate the gaps, it is expected that awareness on various schemes may be created among Marginal and Small land holding farmers to improve their livelihood. Farmers may be encouraged to adopt sustainable farming practices. Stakeholders should work together to improve market access, enhance farmer education and training, and support crop insurance and risk management.

6. Overall, this study contributes to the existing literature on cotton cultivation in Amaravati, and provides valuable insights. The study highlights the need for a more sustainable and equitable approach to cotton cultivation, one that prioritizes the needs and livelihoods of Marginal and Small land holding farmers.

CHAPTER 1 - INTRODUCTION

1. Amravati district is situated right in the centre of the northern border of Maharashtra. It lies between 20°32' north to 21°46' north latitudes and 76°37' east to 78°27' east longitudes. It is bounded in north by state of Madhya Pradesh, in the east by Nagpur and Wardha districts, and in the south and south-west by Yavatmal, Akola and Buldhana districts. According to census 2011 total population of district was 28,87,826 and population density is 237 people per Sq. Kms. Amravati District is located in the Deccan plateau, and has covered an area of 12626 Sq. Kms.



Figure 1 GEOGRAPHICAL LOCATION OF AMARAVATI DISTRICT

2. The district has a diverse pattern of crop production, influenced by factors like climate, soil type, irrigation facilities and market demand. The major crops (Singh, 2020) grown in the district are: -

(a) **Kharif Season (June to September)**. Cotton (Main crop, account for over 50% of total cropped area), Soybean (Second crop, account for 20% of the area), Jowar (Sorghum, 10%), Bajra (Pearl Millet, 5%), Tur (Pigeon Pea 3%), Urad (Black Gram, 2%), Mung (Green Gram, 1%).

(b) **Rabi Season (October to March)**. Wheat (Main crop, account for 40% of the total cropped area), Gram (Chickpea, Second most important crop, account for around 20% of the area), Jowar (Sorghum, 15%), Linseed (5%), Sunflower (3%) and Coriander (2%).

(c) **Other Crops**. Sugarcane, Vegetables like tomatoes, onions and chillies, fruits like oranges, bananas and grapes, grown in some parts of the district.

3. Cotton has been and continues to be one of the most important commercial crops in India. In terms of production of this crop, India is ranked 2nd in the World (Ministry of Textiles, 2024). Research indicates that over the past decades, cotton cultivation in India has undergone significant

transformations, influenced by factors such as technological advancements, market dynamics, and government policies. Govt of India statistics (COCP, Directorate of Economics and Statistics year 2024, 2024) brings out that Maharashtra is the highest producer of cotton in India. In the crop year 2020-21, Maharashtra produced 7.2 million bales (of 170 Kg. each) of cotton, accounting for 25% of India's total cotton production. The state has a long history of cotton cultivation, dating back to the 17th century. The major cotton producing districts in Maharashtra are Yavatmal, Akola, Amravati, Wardha, and Nagpur. These districts are known for its fertile lands, favourable climate with adequate rainfall, sunshine and account for over 80% of Maharashtra's cotton production. The state is also a major exporter of cotton, with its cotton being exported to countries such as China, Bangladesh and Pakistan.

4. Cotton production in India accounts for around 23% (Bhardwaj, 2023) 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 people engaged in related activity such as cotton processing & trade. Cotton is also one of the largest contributor to India's net foreign exchange by way of exports in the form of raw cotton, intermediate products such as yarn and fabrics to ultimate finished products in the form of garments, made ups and knitwear. Due to its economic importance in India, it is also termed as "White-Gold" (Textile, 2023).

5. **Chapterisation Scheme**. The study has been chaptered through separate chapters like Introduction, Literature Review, Practices for Cotton Cultivation, Methodology and Hypothesis, Analysis & Results, and Conclusion & Recommendations.

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CHAPTER 2 - LITERATURE REVIEW

NATIONAL PERSPECTIVE

1. With a share of about 23%, India is one of the largest producers of cotton as well as a leading exporter of raw cotton in the World (Textiles, <https://www.textmin.nic.in>, 2024). India stands 1st in the World in cotton acreage with 130.61 lakh hectares in year 2022-23 under cotton cultivation i.e. around 40% of World area of 324.16 lakh hectares. Approximately, 67% of India's cotton is produced on rain-fed and 33% on irrigated lands (Textiles, <https://texmin.nic.in>, 23). It is vital pillar of Indian textile industry (AD Dhunde, 2022) and contributes significantly globally (Huckell, 1993). On the contrary, study also indicates degradation of soil due to use of irrigation water (Deepak Padekar, 2016). In terms of productivity, India is on 39th rank with yield of 447 Kg/ha. Details of cotton produced in India with acreage and yield since year 1995-96 till 2022-23 (P) are tabulated and placed along with representation through line graph at Appendix 'I'.

2. Increasing cost of cotton cultivation and limited institutional credit to cope in case of crop or market failure increases farmers risk of indebtedness. This study is short on controlled irrigation, adoption on climate resilient crop varieties and cash crop cultivation (Ritu Bhardwaj, 2023). Literature shows cotton production and climate variable are having a strong relationship at district level (Saurabh M Kelkar, 2020). Research by AR Reddy (2018) indicates

that declining profitability has percolated growing discontentment among Indian cotton farmers because of increase in production costs, yield stagnation and volatile output prices. Cost of cultivation data from the Directorate of Economics and Statistics for the period 2000-01 to 2014-15 was used for the analysis. He has brought out that selective mechanization for curtailing human labour consumption and judicious use of fertilizers are options to lower the cost of cotton cultivation (A.R. Reddy, 2018). Subject study though highlights price realisation and cost of cultivation, all determinants like fixed and variable costs needs to be understood towards cotton price realisation.

3. Maharashtra had raw cotton (procurement, processing and marketing) Act 1971 passed on 23 Dec 1971 and still exists with few amendments (Godebole, 1999). Soil in Vidarbha, particularly Nagpur, Wardha, Amaravati, and border sharing districts is dark in colour due to presence of montmorillonite and is commonly known as 'Black Cotton Soil'. It is very fertile and conducive to the cultivation of cotton (Sontakke, 2022). Maharashtra irrigation cover is about 16.80% with seventh ranking among major irrigated states and Amaravati is 9.6%. Beyond this more than 80% of Maharashtra's cultivation depends on monsoon (Dnyandev Talule, 2023). Amaravati District of Maharashtra is one of the largest producer of cotton (GoI, 2024). And drought or erratic rainfall causes the cotton crop to fail.

4. Though Maharashtra state got 1nd place in the cotton acreage and 2nd in production (behind Gujarat) among all the states, there is no significant growth

in both parameters in last 30 years. In factual, trend indicates varying yield Kgs/ Hectare. Details of cotton production and acreage in Maharashtra from 1994-95 to 2022-23 has been drawn through line graph and is placed at Appendix 'II'.

5. The growth and instability in area, production and yield of cotton in Maharashtra before and after introduction of Bt cotton varieties revealed significant increase after the introduction of Bt hybrids technology (Barik, 2009). Bt cotton is genetically modified by the insertion of one or more genes from a common soil bacterium, *Bacillus thuringiensis*. Bt cotton hybrids improved the yield and production and in some extent were also responsible for area expansion but the yield and production performance of cotton after the introduction of Bt was not stable and is without return analysis. Enhancement in yield was the major factor responsible for improvement in cotton production in Maharashtra state compared to area (Sachin More, 2020). Further, E Market use by farmers in six states of India has indicated realisation of 3.75% higher prices than the conventional market for farm produce (Chandra SR Nuthalapati, 2022), (Trinadh Nookathoti, 2022). However, present research seeks and identify the area specific factors which has caused improved production from pre Bt cotton i.e. 1995-96 to 2001-02 to post Bt cotton era i.e. 2002-03 to 2022-23 with respect to return on cotton cultivation.

6. India's cotton production is expected to decrease by 7% due to reduced acreage and damage from excessive rainfall (Bureau, 2024).

INTERNATIONAL PERSPECTIVE

7. For the cotton season 2024-25 (highest in 7 years), global production is projected to increase to 1205 lakh bales, driven by higher production in China and the United States (Kent Lanlos, 2025). The U.S. is expected to remain the largest exporter in 2024-25 with Brazil to be a stronger competitor (Walker, Feb24). Production in India is also projected to be up by 10 Lakh bales to 250 Lakh bales on higher yield (USDA, Global Cotton Year 2024-25 cotton production to rise by over 1.2 mn bales, Dec24).

8. Vietnam's 2024/25 (Aug-Jul) cotton imports and consumption are projected at a record 74 Lakh bales and expected to surpass the previous year by more than 10% (USDA, Cotton: World Markets and Trade, Feb 2025). Vietnam imports cotton from India and would like to see Indian investment there. The government of Vietnam was focussing on cotton aiming to double its contribution by 2035 by encouraging PPP investment. This indicates growth in cotton requirement. (Rumel Dahiya, 2015). India, once was exporter to Bhutan, Kuwait (dahiya, 2014). India, China, Australia, Burkina Faso and Mexico mostly cultivates genetically modified cotton (Bt) for better lint and productivity (Stone, 2010).

JUSTIFICATION FOR THE STUDY

9. Cotton plays a key role in economic and social affairs of the World. It is unescapable component of Indian Textile Industry. Comparative analysis on

price realisation from report on Situation Assessment of Agriculture Households, and Land, and Holdings of Household in Rural India 2013 (70th round) and 2019 (77th round) is viz.

FARMERS AVERAGE MONTHLY INCOME
FROM FARM AND NON-FARM ACTIVITY

(Rupees)

| NSS Report | Average Monthly Income | | |
|--|------------------------|---------------|------------|
| | Farm | Non-farm | Total |
| 70th Round (2012-13) | 5152 | 1275 | 6427 |
| 77th Round (2018-19) | 7995 | 2223 | 10218 |
| % age Rise | 35.5% | 42.64% | 37% |

Table 2.1 Source - SITUATION ASSESSMENT SURVEY OF AGRICULTURE HOUSEHOLDS AND LAND HOLDINGS OF HOUSEHOLD IN RURAL INDIA 2019 (77TH ROUND) AND 2013 (70TH ROUND), MOSPI, NEW DELHI

10. In general, rise in monthly average farm and non-farm income together over 6 years i.e. from 2012-13 (70th round) to 2018-19 (77th round) is 37%, which has individually risen from 35.5% to 42.64% respectively and is considered much less. Also, farmers income though increasing has not increased as expected and is a reason for area specific study of returns on cotton cultivation w.r.t. pre and post Bt cotton era. This is done by considering data on cotton cultivation since 1994-95 till date. Also, factors of price realisation in cotton yield needed to be understood.

11. **Statement of the Problem:** Cotton production in India is estimated to decline by 4% (2023-24) and by 7% (2024-25). Deceleration in growth trend

in cotton needs more efforts to enhance its production through improvement in yield along with area expansion. However, India's imports are estimated to be lower with significant jump in exports due to high opening stocks (COCP, Annual Report on Cotton Production, 2024). Cotton being the most preferred natural fibre is considered to be a leading non-food commercial crop. Cotton prices in India mostly hovers above Minimum Support Price (MSP). Latest estimates (2023-24) of United States Department of Agriculture (USDA) for World cotton supply, utilisation and trade anticipate an increase in supply for year 2023-24 over the previous year while global production (USDA, Cotton: World Market and Trade, 2025) is expected to decline.

12. Amaravati, a prominent cotton-producing district in Maharashtra, grapples with challenges impacting farmer's economic sustainability. Despite the extensive study of cotton as a significant crop, research focused on the Amaravati district's specific characteristics, such as cotton cultivation returns, aiming to uncover strategies that can encourage farmers' financial recovery in the face of fluctuating yields, prices and input costs, remains limited. There is a need for a detailed understanding of how these factors interact to affect yields and profitability at the farm level. Further, it is an attempt to examine whether realisation of cotton price is in line with sustainable growth on farm income.

13. **Objective.** This study aimed to analyse returns on cotton cultivation in Amaravati district of Maharashtra. It identified the drivers of return by dissecting cost components, price realisation, thus returns on cotton cultivation in Amaravati, Maharashtra for the period 1995-96 to 2022-23.

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CHAPTER 3 - METHODOLOGY AND HYPOTHESIS

RESEARCH DESIGN

1. Both quantitative and qualitative research design have been adopted for this study. Quantitative methods has contributed to assess the determinants of profitability and returns on cotton cultivation. Qualitative research, on the other hand, has given insights into the economic environment for cotton cultivation in Amaravati. Thus, the research design worked out to be mixed type.

DATA COLLECTION

2. Both primary and secondary data have been used.
- (a) **Primary Data**. Primary data has been collected through structured interviews conducted with 70 randomly selected cotton cultivating farmers in Amaravati District. Data has been collected on various aspects of costs of input, price realisation, and returns generated by farmers. Questionnaire used for structured interviews is placed at Appendix 'III'.
- (b) **Secondary Data**. Secondary data has been sourced from published sources from Government reports-both the Central, and State, and publications of repute.

3. A random sampling technique was employed for selecting farmers of various farm holding sizes in Amaravati district. Structured questionnaire has been canvassed to collect detailed data to capture insights.

CONDUCT OF INTERVIEWS

4. Amaravati District has 14 blocks (Talukas). These blocks are spread across six sub divisions viz.

(a) **Amaravati**. Includes Amravati, Bhatukali, and Nandgaon Khandeshwar talukas.

(b) **Daryapur**. Includes Anjangaon and Daryapur talukas.

(c) **Achalpur**. Includes Achalpur and Chandur Bazar talukas.

(d) **Morshi**. Includes Warud and Morshi talukas.

(e) **Dharni**. Includes Dharni and Chikhaldara talukas.

(f) **Chandur (Railway)**. Includes Chandur (Railway), Tiosa, and Dhamangaon talukas.

5. As part of conducting the structured interview, I visited Amaravati district from 08 to 14 Feb 25 covering Teosa, Chandur (Railway), Dhamangaon, Morshi, Bhatukali and Nandgaon Khandeshwar talukas. I intended to interview 30 cotton growing farmers from Amaravati District. Accordingly, I interviewed

so in person. Visited cotton farms and interacted with the farmers on the field at various places in Amaravati District.



Figure 2 VISIT TO COTTON FARMS AND INTERACTION WITH FARMERS

6. Visited Krishi Vigyan Kendra (KVK) Ghatkhed, in Amaravati District to study the available technology as well as practices of cotton cultivation/ agriculture being followed. KVK Ghatkhed is located about 15 Kms on Chandur Railway road and has a land size of 39 Acres including area for demonstration unit, crop plantations, horticulture and nursery, etc. Few photographs of visit are given below.



Figure 3 VISIT TO KRISHI VIGYAN KENDRA GHATKHED, AMARAVATI



Figure 4 TEAM KVK INDICATING CROP PRACTICES IN THE FARM

7. Subsequently during deliberations with Dr Kalaskar, Director, Krushi Vigyan Kendra (KVK) Ghatkhed, about significance of cotton and latest trend in Amaravati District, it emerged that there are few cotton growing farmers associated with said KVK. And as per Directors request I shared the google form to those farmers through KVK Ghatkhed to fill it. Thereby, the number of responses has risen to 70 (Sample size).

8. Deliberation with Dr Kalaskar and his team involved with cotton cultivation brought out that cotton harvesting is mostly manual due small land holder farmers. Further, shortage of labour add to untimely sowing, picking,

spraying of pesticides as well as fertilisers and is also a factor for varying cotton production.

9. **Data Analysis:** Both quantitative and qualitative data have been analysed by using appropriate statistical tools and thematic analysis respectively.

HYPOTHESIS

10. Thus Hypothesis for subject study was considered viz.

(a) **Null Hypothesis (H₀):** Returns on cotton cultivation has not changed in Amaravati (Maharashtra) from pre Bt period i.e. 1995-96 to 2001-02 to post Bt period i.e. 2002-03 to 2022-23.

(b) **Alternate Hypothesis (H₁):** Returns on cotton cultivation has changed in Amaravati (Maharashtra) from pre Bt period i.e. 1995-96 to 2001-02 to post Bt period i.e. 2002-03 to 2022-23.

11. Hypothesis were tested through analysis tools like trend analysis on linear graph, regression analysis and ANOVA. The tests results have been analysed subsequently in Chapter 5 i.e. Analysis of Results.

LIMITATIONS

12. The study is limited by its focus on a single district, which may not capture the entire gamut of cotton farming conditions in the entire state of Maharashtra.

SIGNIFICANCE OF STUDY

13. This study contributes to a nuanced understanding of the economic aspects of cotton farming in Amaravati District, particularly concerning factors like input costs, labour issues, lack of awareness of farmers on latest trends and market price fluctuations.

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CHAPTER 4 - PRACTICES COTTON CULTIVATION

COTTON CULTIVATION PRACTICES

1. Practices for cotton cultivation (Cotton Research Station, 2023) followed in Amaravati zone of Maharashtra has been extracted from Cotton research station, Dr. Panjabarao Deshmukh Krushi Vidyapith (PDKV), Akola. Brief on the same is enumerated below.

2. Crop season for cotton is June to February-March. Land preparation is done through ways given below: -
 - (a) For rainfed, it is necessary to plough the soil once after three years and for irrigated cotton ploughing every year is necessary.

 - (b) Two harrowing after Ploughing and third harrowing before sowing after receipt of monsoon rains to reduce the weed infestation.

 - (c) Min 12-15 cartloads of well rotten Farm Yard Manure (FYM) or compost for rainfed cotton and 20-25 cartloads (5 tons/ha) of FYM/ compost to irrigated cotton before sowing to reduce the dose of chemical fertilizers. Use 2.5 tons of vermi compost if available with FYM/ Compost and mix in soil before sowing.

SEED TREATMENT

3. Treat the seed with fungicide and insecticide and biofertilizers before sowing. Treat the seed with Imidachloprid or Thiomixom @7.5 gms/kg of cotton seed. To avoid the fungal diseases of cotton treat the seed with Thirum/Captan @ 3 Gms/kg cotton seed. Seed treatment of biofertilizers viz. Azatobactor (25 Gm/kg seed) and Phosphate solublizing bacteria (20 Gm/kg seed) is required for nitrogen fixation and phosphate solublization.

TIME OF SOWING

4. Different methods of sowing are in practice. Details on same is as follows: -

- (a) **Irrigated Cotton (Pre-monsoon)**. On the day between 20-30 May when the temperature is below 40⁰ C. Irrigate the land before sowing of cotton. Sow the cotton on broad-bed furrow for good drainage.
- (b) **Dry Sowing**. Sow the straight varieties for dry seeding in first or second week of June 7-8 days before the monsoon rains arrives.
- (c) **Monsoon Sowing**. On the day between 15-30 June after receipt of 75-100 mm of rainfall.

5. For every type of sowing, variety of seeds, factors like spacing, plant population in an acre and seed rate vary. Details for all combinations have been extracted from secondary source and are as tabulated below.

FACTORS RESPONSIBLE FOR SOWING OF COTTON

| Sl | Variety/ Hybrids | Method of sowing | Spacing (Medium heavy soil) cms | Plant population/ Acre (00) | Seed rate Kg/ Acre |
|--------------|-----------------------------|--------------------------------|--|-----------------------------------|--------------------------|
| (a) | Irrigated Cotton | | | | |
| | Hybrid/ Cotton | Bt BBF*, Drip irrigation | 120X90 | 3.8 | 0.8 – 1 |
| (b) | Rainfed Cotton | | | | |
| | PKVDH-1 | Drilling | 60x45 | 15 | 1.2 - 1.5 |
| | PKV Suvarna | | 60x45 | 15 | 1.2 - 1.5 |
| | American Hybrids | Drilling | 90x60 | 7.5 | 1.5 -1.6 |
| | PKV Hybrid-2 | | 90x60 | 7.5 | 1.5 – 1.6 |
| PKV Hybrid-4 | | 60x60 | 11.25 | 1.8 - 2 | |
| | PKV Hybrid-5 | | | | |

Table 4.1 SOWING METHODOLOGY OF Bt AND HYBRID COTTON

*BBF – Broad Bed and Furrow method

INTERCROPPING IN COTTON

6. In cotton for getting higher monetary returns, it is recommended to take the intercropping system like:-

- (a) Cotton + Green gram (1:1 ratio),
- (b) Cotton + Blackgram (1:1 ratio),
- (c) Cotton + soybean early varieties (1:1 ratio) or

(d) Cotton + Sorghum + Pigeon pea + Sorghum (6:1:2:1 ratio).

7. In addition Gap filling/ Thinning need to be catered on germination of plants. For maintaining the optimum plant population in cotton, the gaps are filled immediately in 3-5 days after emergence and undertake the thinning operation for keeping the desired plant population per acre.

FERTILIZER MANAGEMENT

8. Fertiliser dose and time of application is crucial and plays important role for growth of plants. Details on same have been tabulated below: -

FERTILIZER DOSE AND TIME OF APPLICATION

| Bt Cotton | Dose/ Acre | | |
|--|-----------------------|---------------------|--------------------|
| | At Sowing time | Top Dressing | |
| | N:P:K | N at 30 DAS | N at 60 DAS |
| Irrigated | 40:60:60 | 40 | 40 |
| Rainfed | 30:30:30 | 30 | -- |
| Dose of chemical fertilizer should be based on the soil testing data before sowing | | | |

Table 4.2 FERTILISER DOSE WITH TIME OF APPLICATION

9. The application of basal dose of fertilizer to dibbled cotton crop should be given at the time of sowing by ring method 5 to 6 cm away from dibbled seed. Delay application of basal dose of fertilizers reduces the yield of seed cotton to the tune of 10 to 40% with in late duration period of 10 to 30 DAS. Spraying of 2% urea at flowering stage DAP at the rate of 2% at the time of

boll development stage gives 10 to 20% higher seed cotton yield as well as avoid the redding of cotton.

10. Fertilizer management through Drip Irrigation is also considered significant. In Cotton for increasing the productivity, economic returns and nutrient use efficiency, it is recommended to apply 100 per cent N and K in five splits through soil application as per the following table: -

FERTILISER DOSES THROUGH DRIP

| Fertilizer dose through drip | Days after sowing |
|-------------------------------------|--------------------------|
| 10% recommended dose of N and K | At the time of sowing |
| 20% recommended dose of N and K | 20 DAS |
| 25% recommended dose of N and K | 40 DAS |
| 25% recommended dose of N and K | 60 DAS |
| 20% recommended dose of N and K | 80 DAS |

Table 4.3 FERTILISER MANAGEMENT

PEST MANAGEMENT

11. Use of right pesticide at right time helps crop grow healthy keeping away weeds, worm, fungi, flies, mites and insect attack on plants. Types of pesticides in use are viz.

- (a) **Tonic**. Not a pesticide, but used as a growth promoter or plant nutrient.

(b) **Nimbodi Ark**. Nimbodi Ark is a local name for a pesticide derived from the neem tree (*Azadirachta indica*). The English translation is Neem Oil or Neem Extract. Neem oil is used as an insecticide, fungicide, and miticide. It is effective against a wide range of pests, including: -

(i) **Insect Pests**. Aphids, whiteflies, spider mites, and caterpillars

(ii) **Fungal Diseases**. Powdery mildew, rust, and leaf spot

(iii) **Mites**. Spider mites and other mite species

INTERCULTURE AND WEED MANAGEMENT

12. Keep the field weed free up to 60 days after sowing (9 weeks) by adopting three to four hoeing followed by 2 to 3 manual weedings. If the labours are not available, to keep the cotton field free from weeds, use pre-emergence herbicide Pendimethalin 38.7 % @ 1.5 to 1.75 Kg commercial product per hectare (20-25 ml in 10 litre of water) or use pre-emergence herbicides Diuron 80WP @ 1 - 2 kg commercial product per hectare (20 – 30 gm per 10 litre of water). Use 700 litre of water /ha and spray the pre-emergence herbicides on soil after sowing of cotton up to 48 hrs.

13. For controlling weeds after emergence, use recommended post emergence herbicide at proper time and in recommended dose. At 30-40 days after sowing use post emergence herbicide Pyriithiobac sodium 10% EC @ 0.625 - 0.750 kg commercial product per hectare (12.5-15 ml per 10 litre of water)

and for controlling grassy weeds in cotton use Quizalofop ethyl 5% @1.0 litre per hectare (20 ml in 10 litre of water) as a post emergence herbicide. Use Knapsack sprayer and flat fan nozzle for spraying the herbicides in cotton.

14. **In-Situ Moisture Conservation**. For moisture conservation in cotton, it is recommended to open the furrow at the time of last hoeing operation by tying the ropes to the tyne of the hoe. Generally, it is recommended to open the furrow at 40-60 days after sowing.

IRRIGATION MANAGEMENT

15. **Rainfed cotton**. At flowering and at boll development stage in the situation of dry spell give 2-3 protective irrigations at an interval of 10-12 days in alternate row. Crop should not be exposed to water stress at flowering and boll development stage as it will reduce the yield and quality of produce.

16. **Irrigated cotton**. Irrigate the crop as and when required and as per the stage of the crop. In drip irrigation, irrigate the crop as per the daily evaporation data at an alternate day to keep the field always at field capacity level and to provide sufficient moisture to cotton crop.

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CHAPTER 5 - ANALYSIS OF RESULTS

1. The questionnaire was designed to study the different components of cotton cultivation like identifying Input cost factors, Yield and Production, Returns, Cultivation Practices used in the District, Marketing and Sales, Financial Performance, and Social Demography of farmers.
2. Data from 70 (sample size) randomly selected cotton growing farmers of the district spread across complete social geography has been analysed. The component wise finding through structured interviews of the farmers and analysis thereon has been enumerated in subsequent paragraphs.

RETURN ANALYSIS

3. For return analysis on cotton cultivation in Amaravati (Maharashtra) for a year 2023-24, Input cost which includes cost of seeds, fertilisers, pesticides, irrigation, cotton picking, land preparation prior sowing to post harvest readiness, price realisation from cotton yield and subsequent return have been captured on the received data sheet. Data was collected with respect to Acres of land and converted to Hectares for relative comparison with secondary data.
4. Before proceeding to return analysis, the extract of data on land used for cotton cultivation and return aspect is placed at Appendix 'IV'. The land holding is categorised in to **Marginal** (Less than 1 Hectare), **Small** (1.0 to 2.0

Hectares), **Semi-Medium** (2.0 to 4.0 Hectares), **Medium** (4.0 to 10.0 Hectares), and **Large** (10.0 Hectares and above). Sample size of interviewed farmers on every category has been drawn for understanding the land holding and acreage under cotton cultivation. Tabulated details along with line graph are as follows: -

CATEGORY OF LAND HOLDING AND COTTON ACREAGE

(Hectares)

| CATEGORY OF HOLDING | SAMPLE SIZE | TOTAL LAND | AVG TOTAL LAND | TOTAL COTTON ACREAGE | AVG COTTON ACREAGE |
|----------------------------|--------------------|-------------------|-----------------------|-----------------------------|---------------------------|
| Marginal | 11 | 8.499 | 0.773 | 8.094 | 0.736 |
| Small | 27 | 35.714 | 1.323 | 26.305 | 0.974 |
| Semi-Medium | 13 | 29.947 | 2.304 | 12.546 | 0.965 |
| Medium | 14 | 97.206 | 6.943 | 26.373 | 1.884 |
| Large | 5 | 76.487 | 15.297 | 16.188 | 3.238 |
| Total | 70 | | | | |

Table 5.1 CATEGORY OF LAND HOLDING & COTTON ACREAGE

5. Return details on cotton cultivation along with weighted average are as shown in tabular form: -

RETURN ON COTTON CULTIVATION, 2023-24

(Land in Hectares, Cost, Price and Returns in Rs X Lakh)

| SL | CATEGORY OF HOLDING | SAMPLE SIZE | AVG LAND UNDER COTTON | TOTAL COST | TOTAL PRICE REALISATION | TOTAL RETURNS | TOTAL COST/ HA (g=d/c) | TOTAL PRICE REALISATION/ HA (h=e/c) | TOTAL RETURN/ HA (j=f/c) | % RETURN (K=j*100/g) |
|----|---|-------------|-----------------------|------------|-------------------------|---------------|---------------------------|--|-----------------------------|-------------------------|
| | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h) | (j) | (k) |
| 1 | Marginal | 11 | 0.736 | 9.33 | 16.57 | 7.23 | 12.69 | 22.53 | 9.83 | 77.53 |
| 2 | Small | 27 | 0.974 | 25.25 | 47.64 | 22.39 | 25.91 | 48.90 | 22.99 | 88.71 |
| 3 | Semi - Medium | 13 | 0.965 | 11.18 | 20.15 | 8.97 | 11.59 | 20.89 | 9.29 | 80.25 |
| 4 | Medium | 14 | 1.884 | 11.89 | 22.37 | 10.48 | 6.31 | 11.88 | 5.56 | 88.10 |
| 5 | Large | 5 | 3.238 | 3.90 | 9.40 | 5.51 | 1.21 | 2.91 | 1.70 | 141.07 |
| | Total / Weighted Average | 70 | | | | | 15.49 | 28.86 | 13.37 | 86.33 |

Table 5.2 RETURN ON COTTON CULTIVATION, 2023-24

6. Graphical presentation of returns on cotton cultivation is as shown below: -

RETURN ON COTTON CULTIVATION, 2023-24

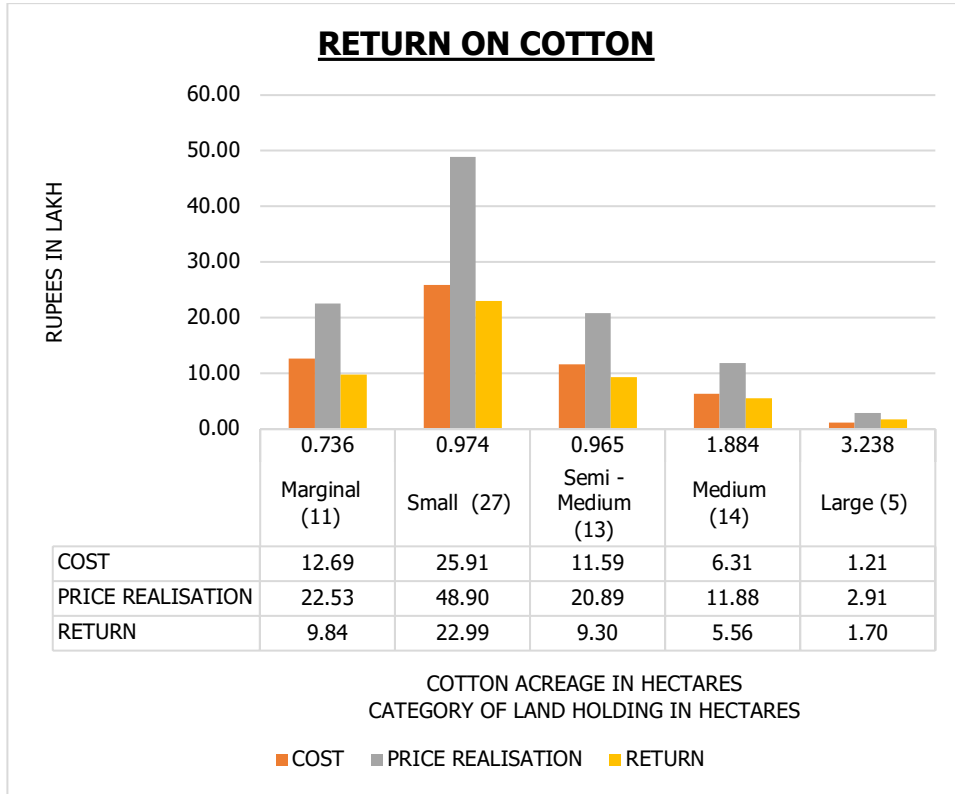


Figure 5 RETURN ON COTTON, 2023-24

RETURN ON COTTON IN PERCENTAGE

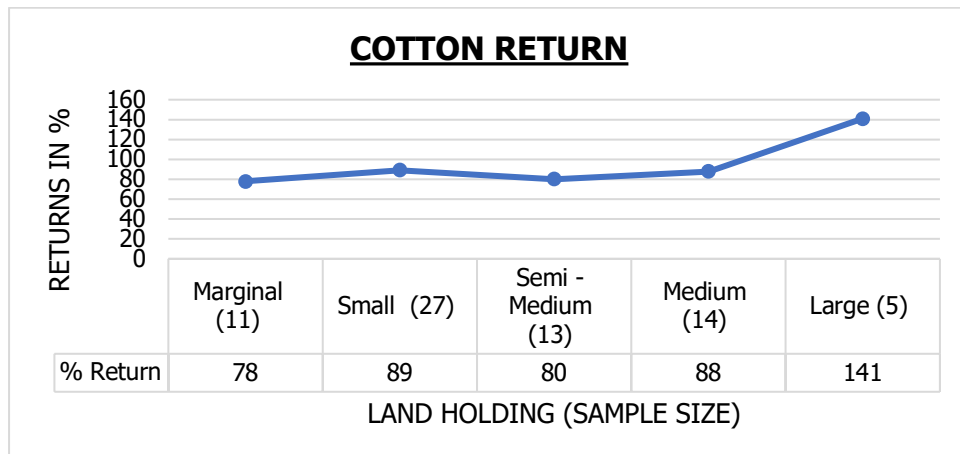


Figure 6 RETURN IN PERCENTAGE, 2023-24

7. **Interpretation** on return of cotton cultivation for the year 2023-24 is as follows: -

(a) Returns with respect categories of landholding indicate that farmers holding **Small Category** of land (1.0 to 2.0 Hectares) have 89% returns which is more than, **Marginal, Semi-Medium, and Medium Category**. Whereas, farmers under **Large Category** landholding have 141% returns.

(b) Only in large category of land holding (10 Hectares and above) return is more than cost incurred.

(c) Weighted average on cost, price realisation and returns with respect to sample size indicates that cotton cultivation has given overall 86.33% returns for all sample sizes.

(d) In a sample size of 70 cotton growing farmers in Amaravati District of Maharashtra, maximum landholding is 18.211 Hectares and minimum landholding is 0.405 Hectares. Land used for cotton cultivation, however, is maximum 4.047 and minimum is 0.405 Hectares.

(e) Data in table 5.1 indicates that about 50% interviewed farmers have less than 2 Hectares of land holding. Cotton acreage used by farmers for cotton cultivation has a decreasing trend with rise in total land holding.

(f) Farmers with large category of landholding have used proportionately less acreage for cotton growing compare to the cotton growing farmers in other categories.

ANOVA ANALYSIS

8. For the return analysis on cotton cultivation in Amaravati District for Pre Bt (1994-95 to 2001-02) and Post Bt (2002-03 to 2022-23) period, secondary data from various sources like International Crop Research Institute For The Semi-Arid Topics (ICRISAT), annual reports of COCPC, Reports of Central Institute for cotton Research Nagpur, KVKs in Amaravati Districts, etc. have been used. The data has been collected on Cotton acreage in Hectares, Yield in Kg per Hectares, Production in Tons, District Male and female labour rates in rupees per day, Total fertiliser used in Kgs and MSP in rupees for medium as well as long staple and is placed at Appendix 'V'. Post Bt period has been taken up to 2017-18 for analysis purpose as the use of fertiliser details beyond that year could not be found. Every single data point (measurement) is linked to input, price realisation, and return cost. In subject case, for pre and post Bt period, all other groups are independent (unrelated) groups. Therefore, to compare the means of two or more groups to determine if there are statistically significant differences among them, ANOVA (Analysis of Variance) has been carried out. ANOVA single factor analysis has been placed at Appendix 'V'. Interpretation and conclusion of ANOVA test is given below.

(a) **ANOVA interpretation on pre Bt period**

Interpretation

(i) The **F-statistic** (161.78) is significantly larger than the **F-critical** value (2.249), suggesting that there is a statistically significant difference between the means of the groups.

(ii) The **P-value** (2.78645E-27) is extremely small (much smaller than the typical significance level of 0.05), indicating strong evidence against the null hypothesis, which suggests that at least one of the groups differs significantly from the others.

Conclusion. We can reject the null hypothesis and conclude that there is a significant difference in the means of at least one of the groups in the analysis (Area, Production, Yield, District Male Field Labour, District Female Field Labour, Fertilizer, Medium Staple MSP, and Long Staple MSP). This means that some of these factors are likely to differ from others in terms of their values.

(b) **ANOVA interpretation on post Bt period**

Interpretation

(i) The **F-statistic** (64.82) is much larger than the **F-critical** value (2.087), suggesting that there is a statistically significant difference between the means of the groups.

(ii) The **P-value** (8.59274E-38) is extremely small, well below the typical significance level of 0.05. This indicates strong evidence against the null hypothesis, meaning that at least one of the groups differs significantly from the others.

Conclusion. We can reject the null hypothesis and conclude that there is a significant difference in the means of at least one of the groups (Area, Production, Yield, District Male Field Labour, District Female Field Labour, Fertilizer, Medium Staple MSP, and Long Staple MSP). This implies that some factors in these groups have distinct average values.

9. **Interpretation.** The ANOVA single factor analysis indicates that Null Hypothesis i.e. "Returns on cotton cultivation has not changed in Amaravati (Maharashtra) from pre Bt period i.e. 1995-96 to 2001-02 to post Bt period i.e. 2002-03 to 2022-23." is rejected due to significant difference in the means of at least one of the groups on input and return cost, thus, indicating that returns on cotton cultivation in Amaravati District (Maharashtra) have changed from Pre to post Bt period.

TREND AND REGRESSION ANALYSIS

10. Individual data points like cotton acreage, production, yield, use of fertiliser, and cost of district male and female labour in both pre and post Bt

period have also been analysed through linear graph trend and regression analysis. This analysis has helped to understand trend as well as co relation of every data point (group) with respect to both pre and post Bt period indicating rising or dropping trend with significance of correlation. Use of trend and regression analysis with interpretation is as enumerated.

11. Linear Trendlines ($Y=mX+C$) in graphical representation of independent and dependent variable is to be interpreted viz: -

(a) Y is the dependent variable (the value which can be tried to predict).

(b) X is the independent variable (the factor influencing the dependent variable).

(c) m is the rate of change of Y for every unit increase in X. A positive slope means Y increases as X increases, and a negative slope means Y decreases as X increases.

(d) C (Y intercept) is a value of Y when X is 0. It is a point where the trendline crosses the Y axis.

12. Regression analysis is used to study the relationship between variables, predict outcomes, and understand how changes in one variable influence another, making it useful for forecasting, identifying key drivers, and making informed decisions in various fields.

COTTON PRODUCTION (AMARAVATI)

13. Data point on Cotton production has been extracted from the secondary source i.e. International Crop Research Institute For The Semi-Arid Topics (ICRISAT) (ICRISAT, 2025) and is placed at Appendix 'VI'. Linear representation of the Cotton acreage of the Amaravati District from year 1995-96 to 2023-24 is as shown.

14. **Pre Bt Period (1995 to 2001)**. Trendlines and regression analysis on the line graphs of cotton acreage, yield, and production during pre Bt era has been carried out.

(a) Graphical representation showing Cotton area of the Amaravati District along with trendline is as viz.

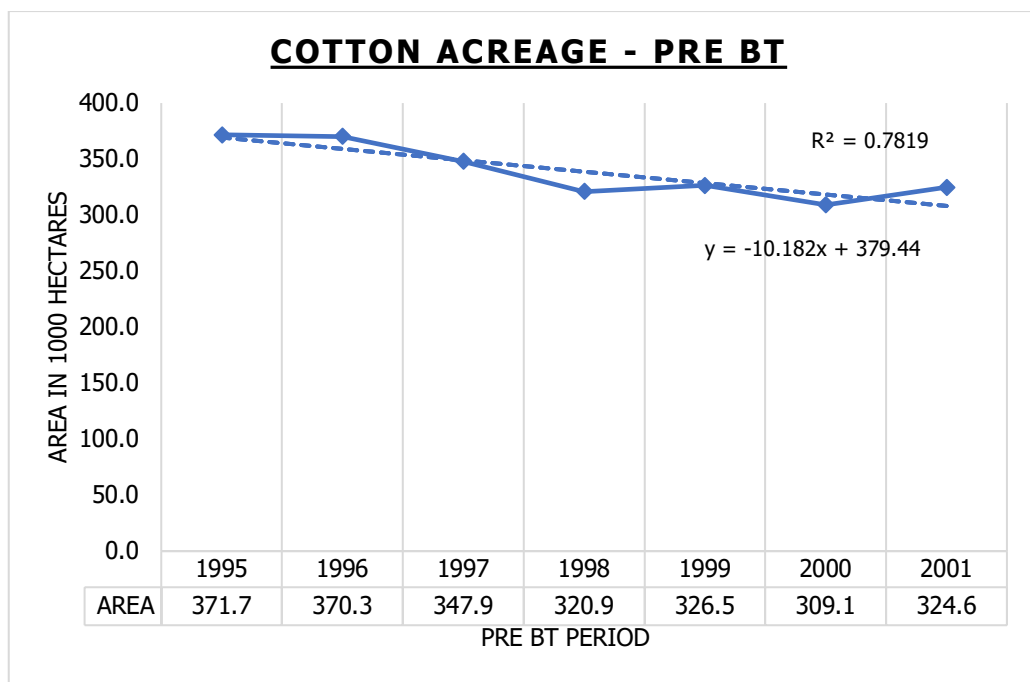


Figure 7 COTTON ACREAGE PRE Bt PERIOD

(b) Graphical representation showing Production and yield of the Amaravati District along with trendline is as viz.

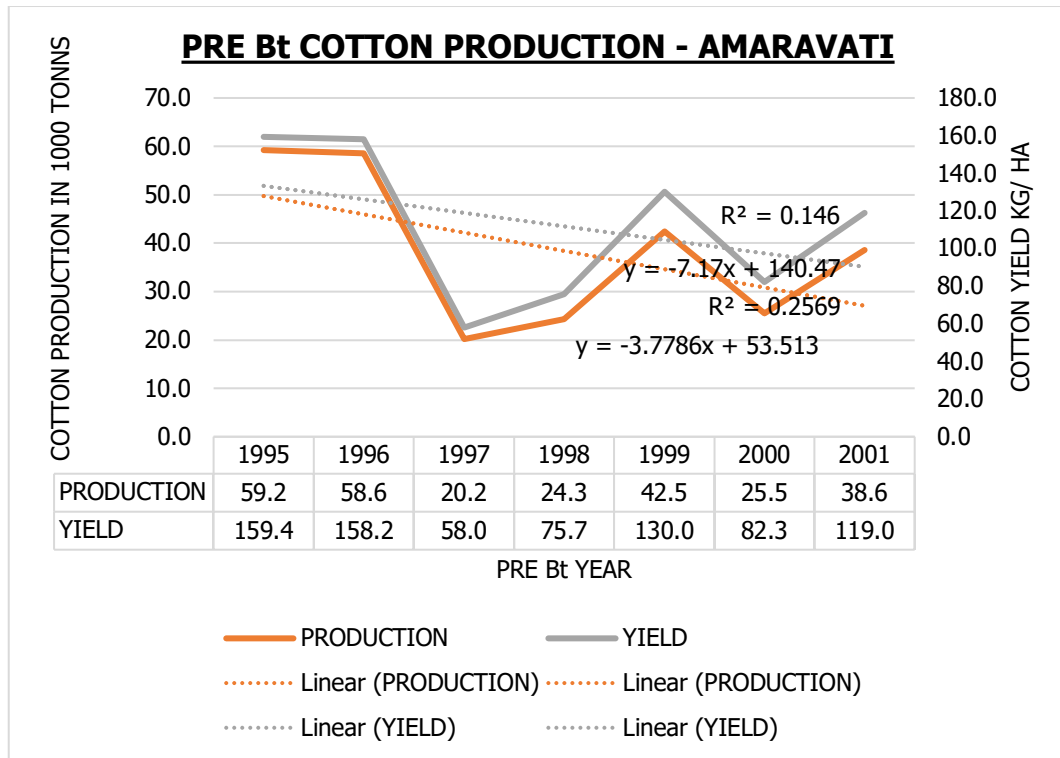


Figure 8 COTTON PRODUCTION PRE Bt PERIOD

15. Both trendlines and R^2 values have been analysed and interpretations are as tabulated (Refer Figure 7, 8).

INTERPRETATION OF PRE Bt ERA

| | Area | Yield | Production |
|------------------------------|--|---|--|
| Pre Bt (1995 to 2001) | | | |
| Trendlines | $Y = -10.182X + 379.44$ | $Y = -3.7786X + 53.513$ | $Y = -7.17X + 140.47$ |
| Interpretation | Downward slope, decreasing acreage. For every year the decrease is -10.182 times of Y variable | Downward slope, decreasing cotton yield. For every year the decrease is -3.7786 times of Y variable | Downward slope, decreasing cotton production. For every year the decrease is -7.17 times of Y variable |

| | Area | Yield | Production |
|------------------------------------|--|--|--|
| Pre Bt (1995-96 to 2001-02) | | | |
| R² Value | 0.7819 | 0.146 | 0.2569 |
| Interpretation | Approx. 78.19% of the variation in acreage explained by the linear trend over years. A strong correlation between the years and acreage. | Approx. 14.6% of the variation in yield explained by the linear trend over years. Very weak correlation between the years and yield. | Approx. 25.69% of variation production explained by the linear trend over years. Very weak correlation between the years and production. |
| Value in 1995-96 | 371700 hectares | 159.35 kgs/ hectares | 59230 Tonnes |
| Value in 2001-02 | 324600 hectares | 118.98 kgs/ hectares | 38620 Tonnes |

Table 5.3 COTTON AREA, YIELD AND PRODUCTION PRE Bt ERA

16. **Post Bt Period (2002 to 2024).** Trendlines and regression analysis on the line graphs of cotton acreage, yield, and production during post Bt era has been carried out.

(a) Graphical representation showing Cotton area of the Amaravati District along with trendline is as viz.

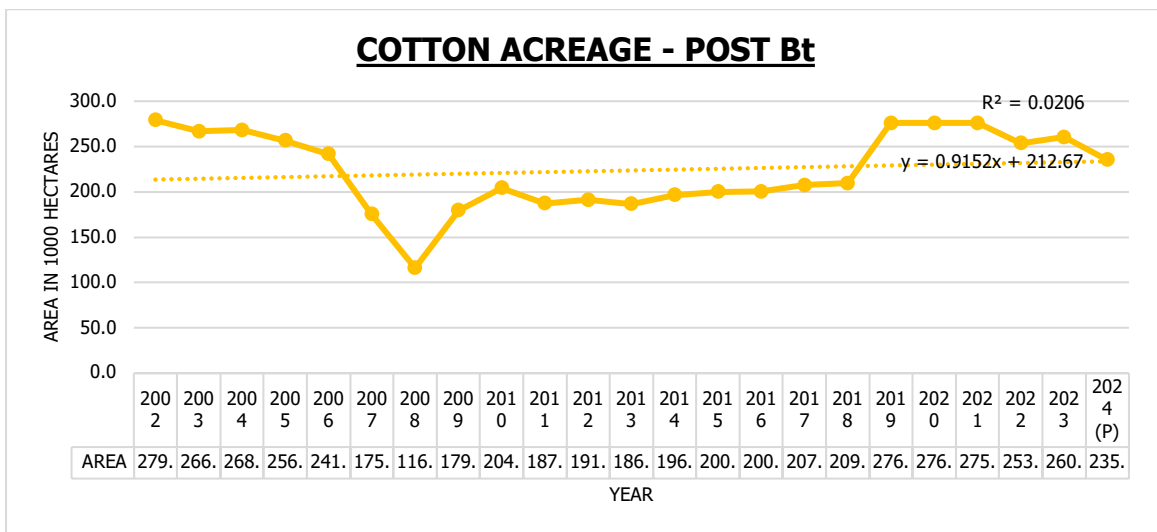


Figure 9 COTTON AREA POST BT

(b) Graphical representation showing Production and yield of the Amaravati District along with trendline is as viz

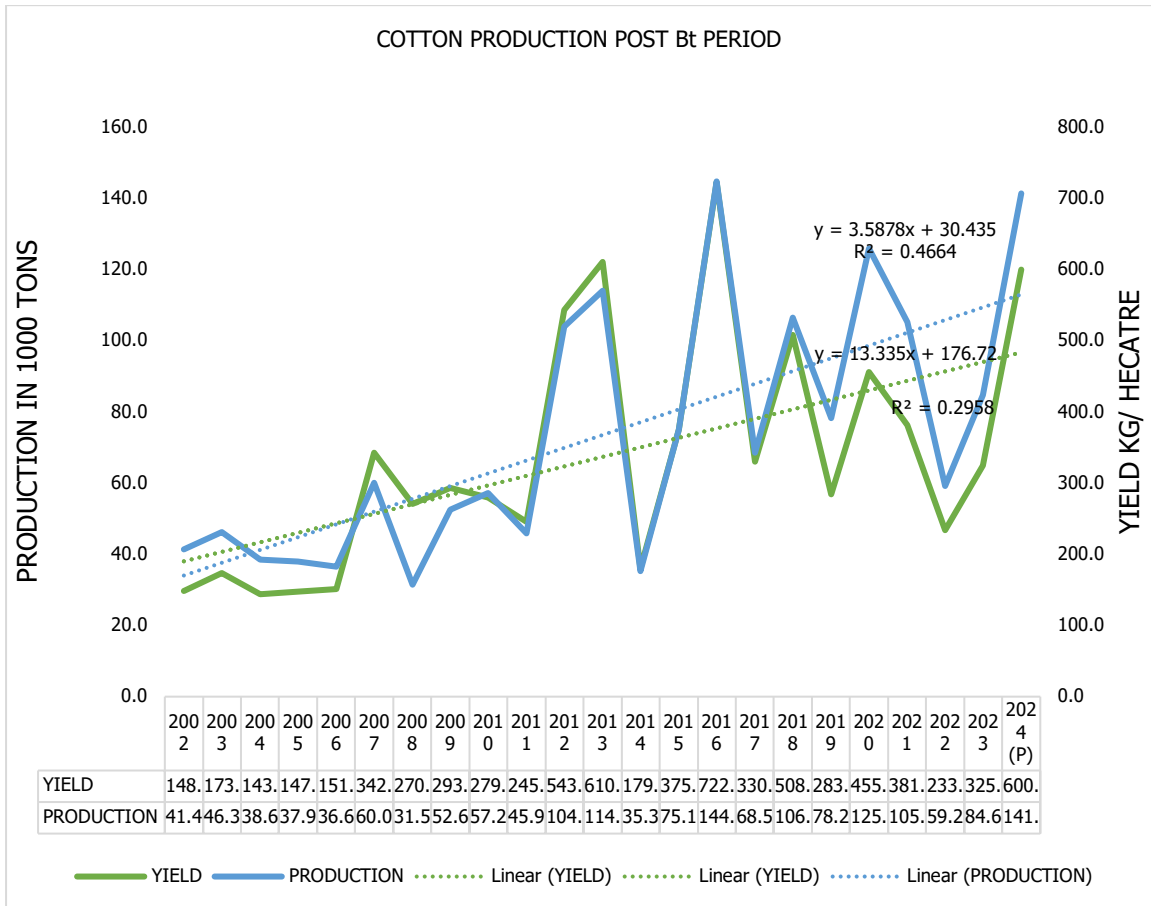


Figure 10 COTTON PRODUCTION POST Bt PERIOD

17. Trendlines and regression analysis carried out on the line graphs of cotton acreage, yield, and production by cotton growing farmers during post Bt era. Both trendlines and R² values have been analysed and interpretations are as tabulated (refer Figure 9, 10).

INTERPRETATION OF POST Bt ERA

| | Area | Yield | Production |
|-------------------------------|---|--|--|
| Post Bt (2002 to 2024) | | | |
| Trendlines | $Y = 0.9152X + 212.67$ | $Y = 13.335X + 176.72$ | $Y = 3.5878X + 30.435$ |
| Interpretation | Upward slope, increasing cotton acreage. For every year the increase is 0.9152 times of Y variable | Upward slope, increasing cotton production. For every year the increase is 13.335 times of Y variable | Upward slope, increasing cotton yield. For every year the increase is 3.5878 times of Y variable |
| R² Value | 0.0206 | 0.2985 | 0.4664 |
| Interpretation | Approx. 2.06% of the variation in cotton acreage explained by the linear trend over time. No significant correlation between the year and cotton acreage. | Approx. 29.85% of the variation in cotton production explained by the linear trend over time. A weak to moderate correlation between the year and cotton production. | Approx. 46.64% of the variation in cotton yield explained by the linear trend over time. A moderate correlation between the year and cotton yield. |
| Value in 2002-03 | 279000 hectares | 148.49 kgs/ hectares | 41430 Tonnes |
| Value in 2023-24 | 235420 hectares | 600 kgs/ hectares | 1412500 Tonnes |

Table 5.4 COTTON AREA, YIELD AND PRODUCTION POST Bt ERA

LABOUR RATES FOR MALES AND FEMALES

18. The increase in wages/ day for both males and females segment have been indicated by trendlines $Y = 10.535X + 43.874$, and $Y = 7.3448X + 25.655$ respectively and is also represented by the line graph below. The upward slope in both male and female labour case indicates increasing labour cost both during pre and post Bt period. The increase of labour cost is consistent.

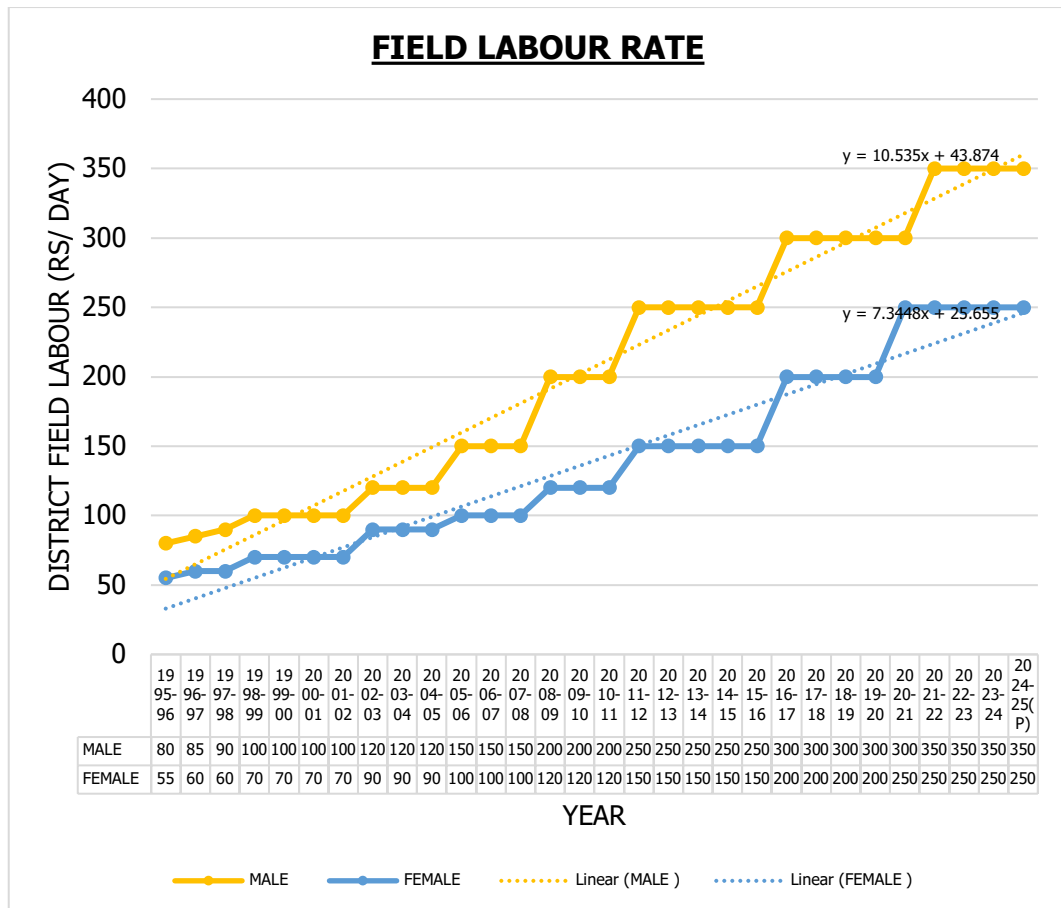


Figure 11 LABOUR RATE MALE AND FEMALE

19. **Findings**

(a) Traditional cotton cultivation (Pre Bt period) indicates decreasing acreage of cotton with strong co relation between acreage and years (Figure 7). However, Post Bt period though indicates upward slope (increase in cotton acreage) in trendline has no significant correlation between the year and cotton acreage (Figure 9). Area under cotton acreage is steadily falling down in both pre and post Bt cotton periods though decrease of acreage during post Bt period is with a positive coefficient i.e. 0.9152.

(b) Yield and production has been decreasing during pre Bt era with very weak correlation between yield as well as production over years (Figure 8). However, post Bt era both yield and production are found increasing with moderate correlation over time (Figure 10). Thus, it is indicative of having significant impact of Bt cotton on the yield and production on cotton output.

(c) The positive slope of the trend line (Figure 10) post Bt period indicates that cotton production and yield has been increasing over the years, but the relationship is not very strong. This suggests that other factors, such as Climate and weather patterns, Market demand and prices, Technological advancements in agriculture may be influencing the production more significantly.

(d) Labour cost for both males and females have been increasing from both pre Bt and post Bt era (Figure 12). The rise is seen consistent.

YIELD AND PRODUCTION FROM 1995 TO 2024

20. Comprehensive acreage on cotton cultivation from 1995-96 to 2023-24 is represented through following graphs: -

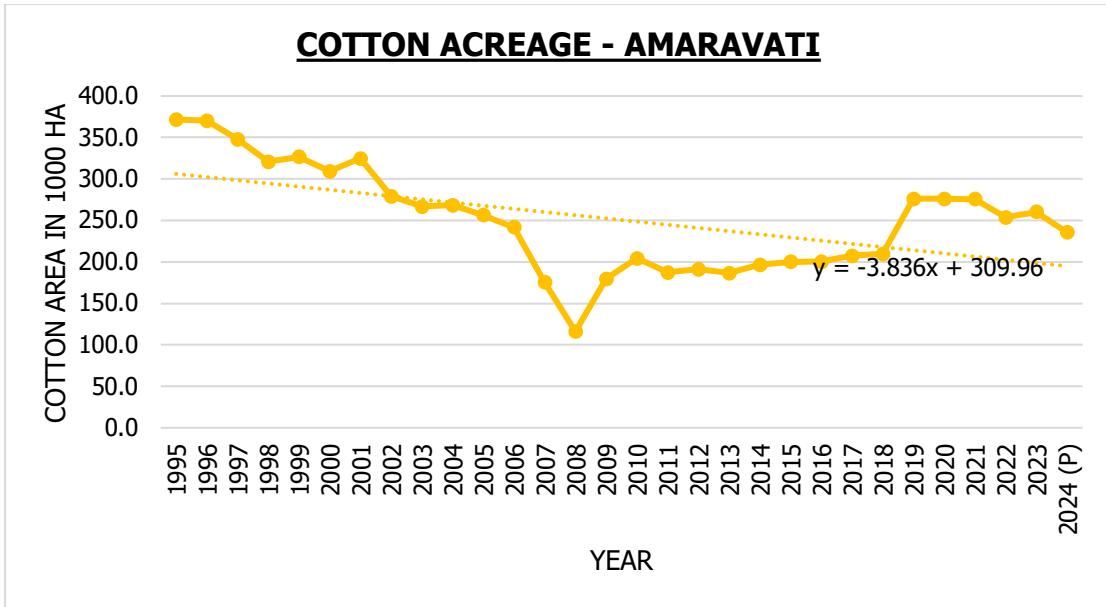


Figure 12 LINEAR REPRESENTATION OF THE COTTON AREA

21. Linear representation of the Cotton Production and yield of the Amaravati District from year 1995-96 to 2023-24 is as shown.

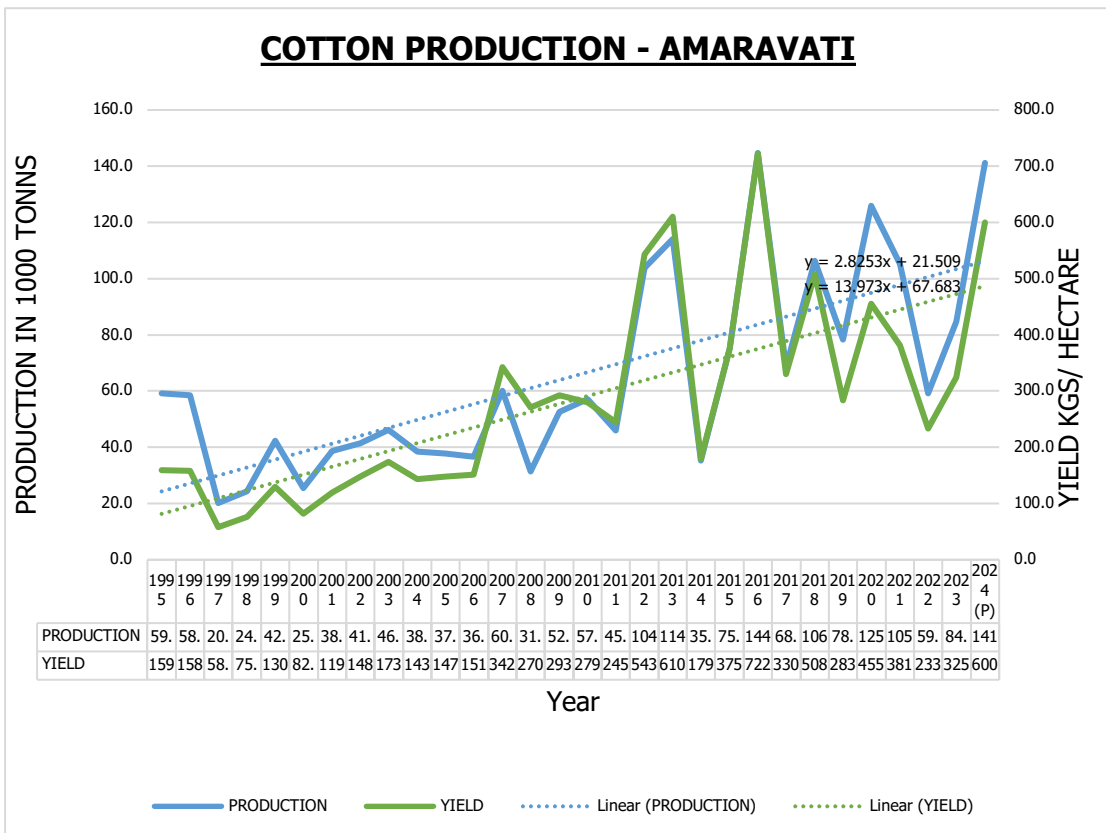


Figure 13 LINEAR REPRESENTATION OF THE PRODUCTION AND YIELD OF THE AMARAVATI DISTRICT

22. **Interpretation** of the three parameters are as enumerated.

(a) **Area under Cotton Acreage**. The trendline of cotton acreage (Figure 12) from year 1994-95 to 2023-24 is $Y = - 3.836X + 309.96$. The line has a downward slope. It indicates that over years from 1994-95 till 2023-24 cotton acreage is decreasing. For every year the decrease is -3.836 times of Y variable. The cotton acreage has dropped from 371700 to 235420 hectares from year 1994-95 to 2023-24 respectively.

(b) **Cotton Production**. The trendline of cotton production (Figure 13) from year 1994-95 to 2023-24 is $Y = 2.8253X + 21.509$. The line has an upward slope. It indicates that over years from 1994-95 till 2023-24 cotton production has been on rise. For every year the increase is 2.8253 times of Y variable. The cotton production has increased from 59230 Tonnes to 141250 Tonnes from year 1994-95 to 2023-24 respectively.

(c) **Cotton Yield**. The trendline of cotton yield (Figure 13) from year 1994-95 to 2023-24 is $Y = 13.973X + 67.683$. The line has an upward slope. It indicates that over years from 1994-95 till 2023-24 cotton yield has been on rise. For every year the increase is 13.973 times of Y variable. The cotton yield has increased from 159.35 Kgs/ hectare to 600 Kgs/ hectare from year 1994-95 to 2023-24 respectively.

FERTILISER USE (AMARAVATI)

23. Use of fertiliser has been extracted from the secondary source i.e. International Crop Research Institute For the Semi-Arid Topics (ICRISAT) (ICRISAT, 2025) and is placed at Appendix 'VII'. Linear representation of the Nitrogen, Potash, Phosphate and total fertiliser of the Amaravati District from year 1995-96 to 2017-18 is explained through line graph in subsequent paragraphs.

24. **Pre Bt Period (1995-96 to 2001-02)**. Graphical representation showing use of Nitrogen, Potash, Phosphate and total fertiliser of the Amaravati District along with trendline is as viz.

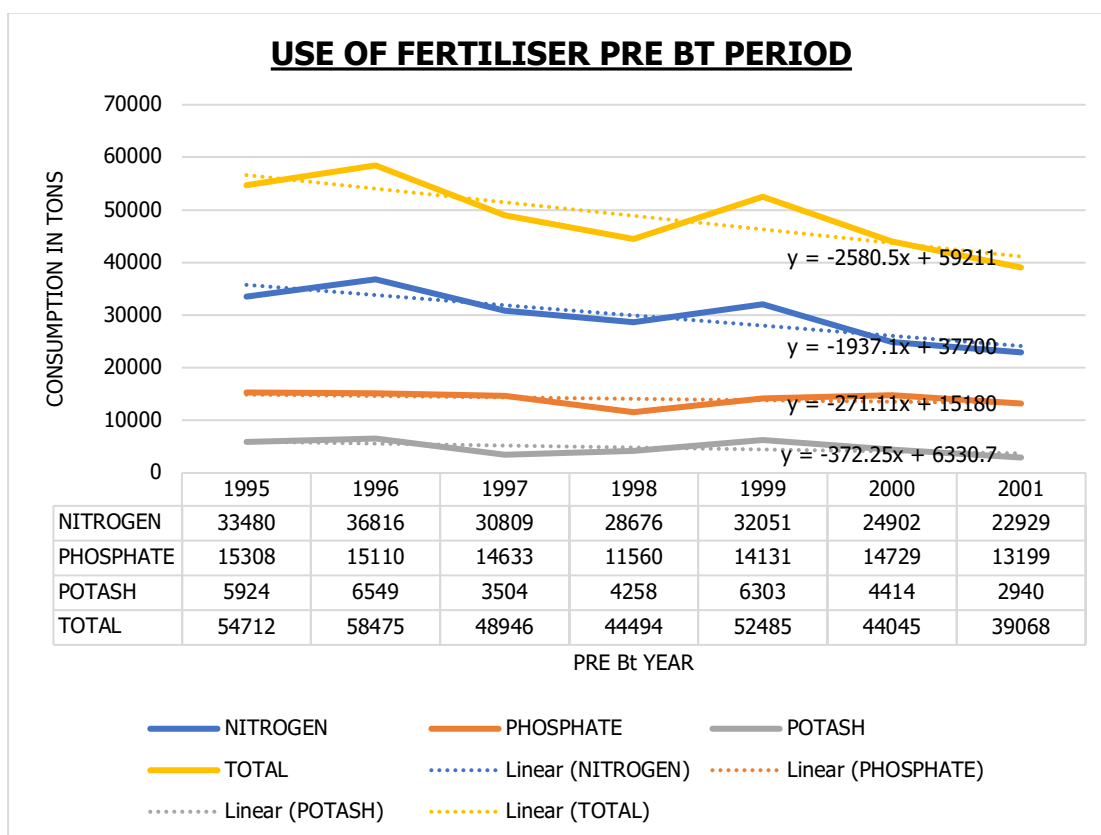


Figure 14 USE OF FERTILISER PRE Bt PERIOD

25. Trendlines and regression analysis carried out on the line graphs of fertilisers used by cotton growing farmers during pre Bt era. Both trendlines and R^2 values have been analysed and findings are tabulated as below (refer Figure 14).

INTERPRETATION OF PRE Bt ERA

| | Nitrogen | Potash | Phosphate |
|------------------------------------|--|--|---|
| Pre Bt (1995-96 to 2001-02) | | | |
| Trendlines | $Y = -1937.1X + 37700$ | $Y = -372.25X + 6330.7$ | $Y = -271.11X + 15180$ |
| Interpretation | Downward slope, decreasing use of Nitrogen. For every year the decrease is -1937.1 times of Y variable | Downward slope, decreasing use of Potash. For every year the decrease is -372.25 times of Y variable | Downward slope, decreasing use of Phosphate. For every year the decrease is -271.11 times of Y variable |
| R² Value | 0.7443 | 0.3193 | 0.1974 |
| Interpretation | Approx. 74.43% of the variation in nitrogen use explained by the linear trend over years. A strong correlation between the years and nitrogen use. | Approx. 31.93% of the variation in potash use explained by the linear trend over years. A moderate correlation between the years and potash use. | Approx. 19.74% of the variation in phosphate use explained by the linear trend over years. Very weak correlation between the years and phosphate use. |
| Value in 1995-96 | 33480 Tonnes | 5924 Tonnes | 15308 Tonnes |
| Value in 2001-02 | 22923 Tonnes | 2940 Tonnes | 13199 Tonnes |

Table 5.5 PRESENTATION OF FERTILISER USE PRE Bt ERA

26. **Post Bt Period (2002-03 to 2017-18).** Graphical representation showing use of Nitrogen, Potash, Phosphate and total fertiliser of the Amaravati District along with trendline is as viz.

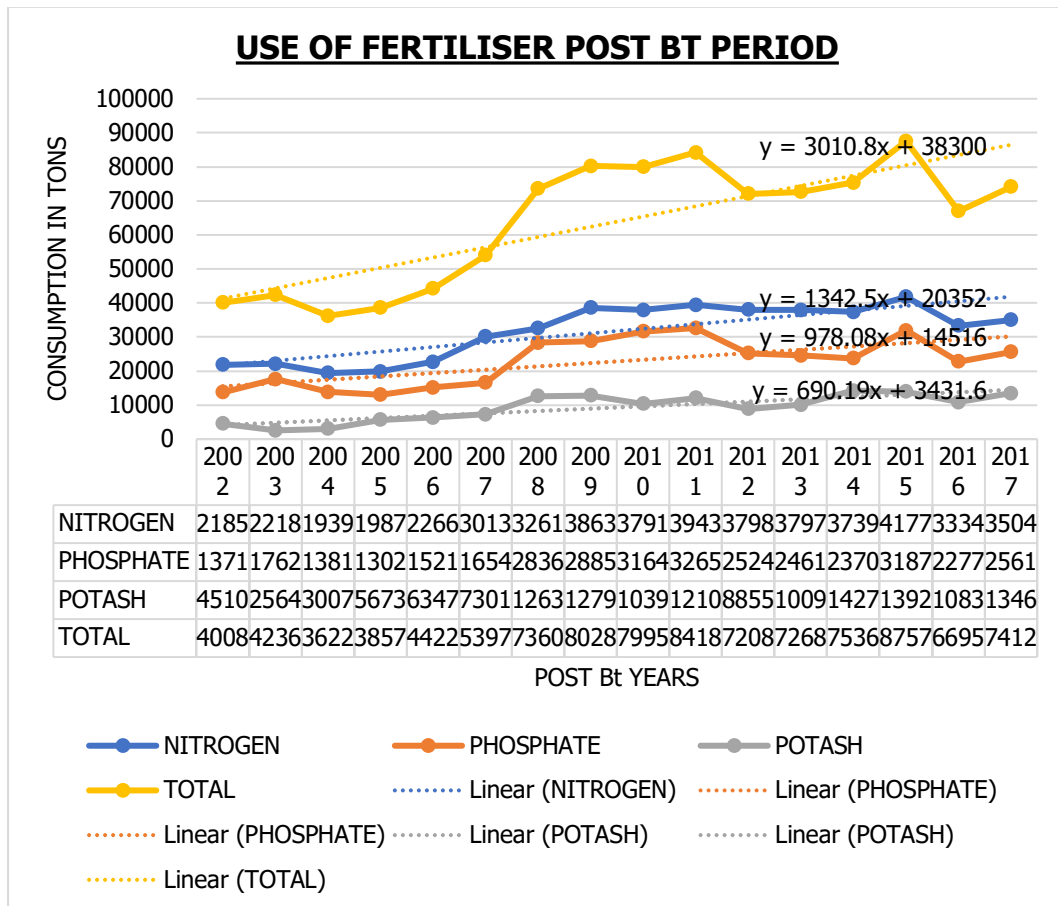


Figure 15 USE OF FERTILISER POST BT PERIOD

27. Trendlines and regression analysis carried out on the line graphs of fertilisers used by cotton growing farmers during post Bt era. Both trendlines and R^2 values have been analysed and finding are tabulated as below (refer Figure 15).

INTERPRETATION OF POST BT ERA (Figure 15)

| | Nitrogen | Potash | Phosphate |
|-------------------------------------|---|---|--|
| Post Bt (2002-03 to 2017-18) | | | |
| Trendlines | $Y = 1342.5X + 20352$ | $Y = 690.19X + 3431.6$ | $Y = 978.08X + 14516$ |
| Interpretation | Upward slope, increasing use of Nitrogen. For every year the increase is 1342.5 times of Y variable | Upward slope, increasing use of Potash. For every year the increase is 690.19 times of Y variable | Upward slope, increasing use of Phosphate. For every year the increase is 978.08 times of Y variable |
| R² Value | 0.6541 | 0.6957 | 0.4484 |
| Interpretation | Approx. 65.41% of the variation in nitrogen use explained by the linear trend over years. A strong correlation between the year and nitrogen use. | Approx. 69.57% of the variation in potash use explained by the linear trend over years. A strong correlation between the year and potash use. | Approx. 44.84% of the variation in phosphate use explained by the linear trend over years. A moderate correlation between the years and phosphate use. |
| Value in 2002-03 | 21856 Tonnes | 4510 Tonnes | 13718 Tonnes |
| Value in 2017-18 | 35041 hectares | 13467 Tonnes | 25616 Tonnes |

Table 5.6 PRESENTATION OF FERTILISER USE POST Bt ERA

28. **Findings**

(a) Trend analysis (Figure 14) indicates downward slope thereby reducing use of fertiliser during traditional cotton cultivation (Pre Bt period). However, trendline (Figure 15) on use of fertiliser post Bt period shows upward slope indicating steady rise in use of fertiliser.

(b) The strong positive trend in fertilizer consumption post Bt era has significant implications indicating rise in input cost.

(c) R^2 values (Figure 14, 15) are not extremely high (e.g., above 0.9) for both pre and post Bt period, indicating that there may be other factors influencing fertilizer consumption that are not captured by the linear trend. These factors could be changed in agricultural practices, soil quality, non-proportional use of fertiliser, use of FYM, etc.

29. In addition to above there are few more details obtained from the interview of cotton growing farmers. Analysis and finding on such data points are given in subsequent paragraphs

PICKING OF COTTON

30. This component includes number of picking of cotton by each farmers, production per picking for the season and picking methodology. Picking is done manually by the female labour in general in Amaravati District. Cotton is stocked till completely picked for the season. Details have been extracted from the interviews of the farmers, tabulated and placed at Appendix 'VIII' . Interpretation thereon is appended below: -

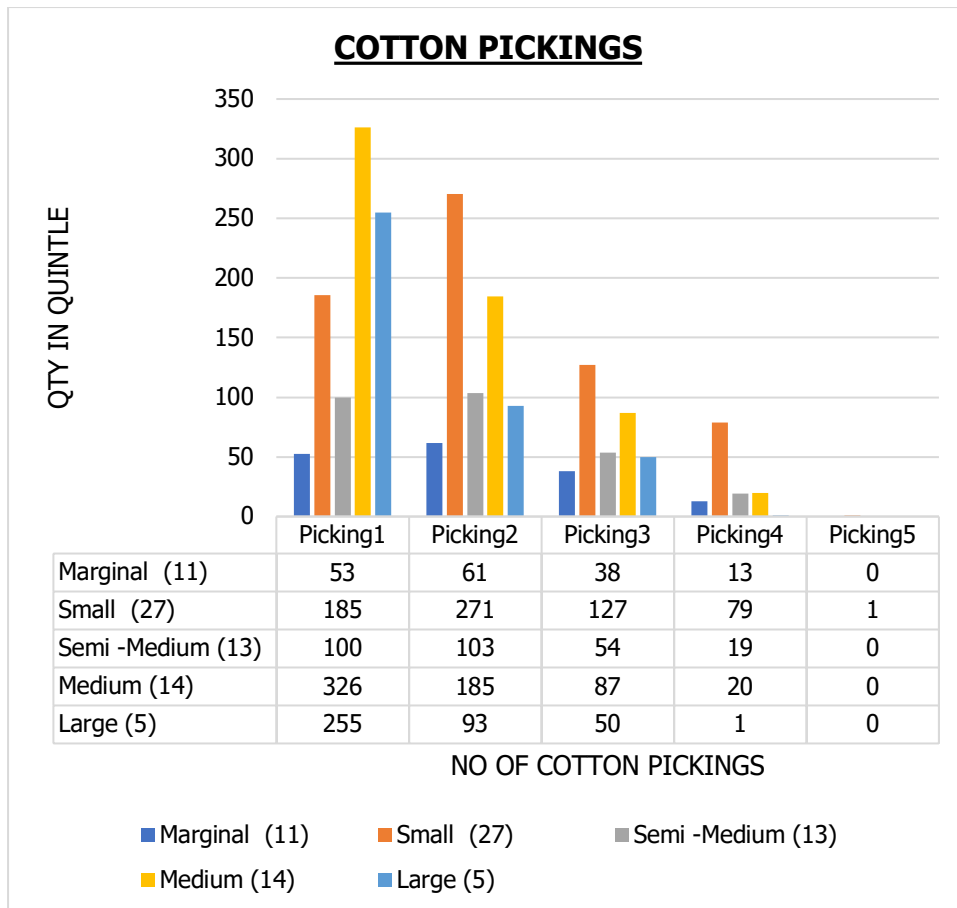


Figure 16 COTTON PICKINGS

(a) Number of picking has varied from three to five. Three cotton pickings are 100%. Whereas fourth picking has been done by 41 farmers and fifth picking is done by only one farmer.

(b) Second picking across Marginal, Small and Semi-Medium category has been more than first picking. In other two categories, first two pickings have been more.

(c) First two pickings has given good yield whereas comparatively last three picking indicates thinner cotton yield.

(d) Average yield of cotton is 2395 kgs per hectare. Whereas maximum and minimum yield per hectare is 5680 Kgs and 617 Kgs respectively.

(e) The picking is manual. KVK Ghtakhed during interaction has brought out that harvesting of cotton by machine works out to be costlier than manual. As the land holding by the farmers is very small, manual method is preferred.

CULTIVATION PRACTICES

31. Details on cultivation practices by the cotton growing farmers have been extracted from the interview, tabulated and are placed at Appendix 'IX'. Findings on cultivation practices have been represented through charts and are placed at Appendix 'X'. Detailed interpretation on same is as follows: -

(a) Bt cotton is sown by 97% farmers with Hybrid Bt and Non Bt by 1 farmer each respectively. Farmers have also indicated of sowing HT Bt which is presently not approved by Govt due non availability of its impact on soil and water.

(b) Source of irrigation by the cotton growing farmers indicates that majority of cotton cultivation is dependent on rainfall.

(c) 100% intercrop as well as crop rotation practices have been followed with cotton in segment of interviewed farmers.

(d) 65 farmers have used cotton seeds up to 5 Kgs per hectare for sowing. Whereas 3 farmers have used from 5.1 up to 7 Kgs of seeds per hectare. It indicates that either they are not aware of the standard practices or the lost crop due failed germination has been made up through sowing it again to recover thinned cropping.

(e) Variation in use of fertilisers quantity also indicate vagaries of nature, soil condition, urge of farmer to have more cotton production by using more quantity of fertiliser, inadequate awareness about soil condition, etc.

(f) Variation in use of pesticides indicate attacks by various infectious weeds, insects, worms, redding on plants, etc and use by the farmers to counter.

(g) Cultivation practices of Bt cotton with cause and effect considering socio economic and bio physical factors is as represented below: -

CAUSE AND EFFECT DIAGRAM ON LOW PRODUCTIVITY – Bt COTTON

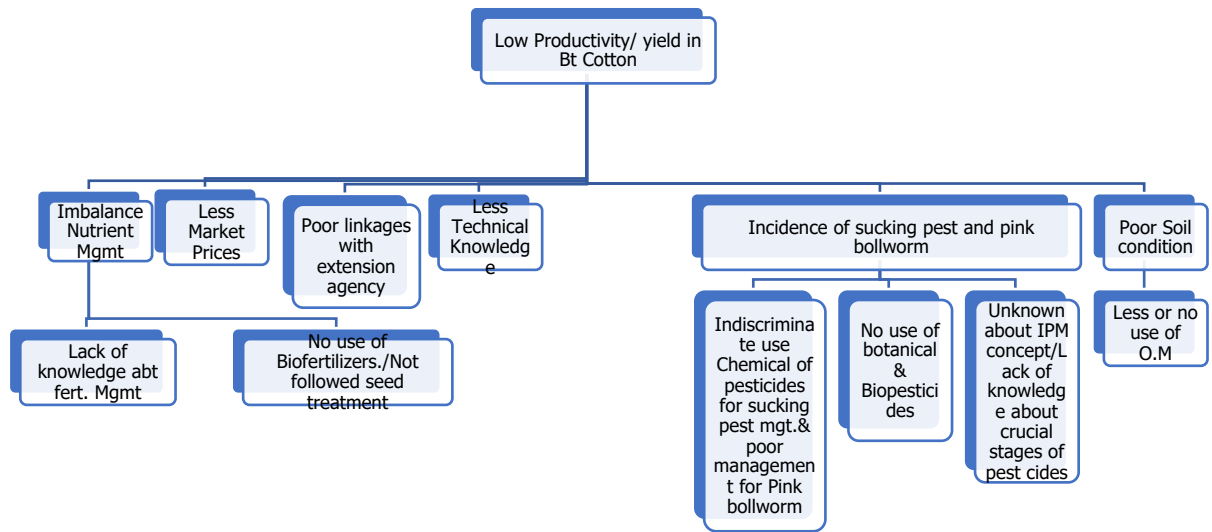


Figure 17 CAUSE AND EFFECT DIAGRAM SHOWING BOTH SOCIO ECONOMIC AND BIO PHYSICAL FACTOR

INPUT COST

32. Findings and analysis on input cost components placed at Appendix 'IV' are appended below: -

- (a) Bt cotton seeds usage per Hectare sowing is between 2 to 5 kgs in general considering spacing and seed rate. Accordingly, quantity of seeds has been used by the farmers which also includes filling the gaps of non-germinated seeds after 3 to 5 days post initial sowing. Average cost of seeds per hectare work out to be Rs. 6123/- (Rs Six Thousand One Hundred Twenty Three only). Wherein the min value is Rs. 1977/-

(One Thousand Nine Hundred Seventy Seven only) and maximum is Rs. 12809/- (Rs Twelve Thousand Eight Hundred Nine only).

(b) Average cost of fertiliser per hectare works out to be Rs. 3706/- (Rs. Three Thousand Seven Hundred Six only). Wherein the min value is Rs. 2224/- (Rs. Two Thousand Two Hundred Twenty Four only) and maximum is Rs. 18532/- (Rs Eighteen Thousand Five Hundred Thirty Two only).

(c) Pesticides usage per hectare is also varying from Rs 2471/- (Rs Two Thousand Four Hundred Seventy One only) to Rs 18532/- (Rs. Eighteen Thousand Five Hundred Thirty Two only) with average cost per hectare as Rs. 3706/- (Rs. Three Thousand Seven Hundred Six only). Use of pesticide is also dependent on various factors as brought out at Chapter 4.

(d) Irrigation cost has been shown as zero, though, in few cases the irrigation is undertaken by well water. However, labour cost for irrigation is a factor in irrigation.

(e) Average cost of labour towards land preparation prior sowing cotton seeds to post harvest per hectare is Rs. 29652/- (Rs Twenty Nine Thousand Six Hundred Fifty Two only), with maximum as Rs. 61775/- (Rs Sixty One Thousand Seven Hundred Seventy Five only) and

minimum as Rs. 9884/- (Rs. Nine Thousand Eight Hundred Eighty Four only).

33. **Findings on Input Components**

(a) Quantity of seeds sowed has been on higher side. KVK Ghatkhed has brought out that the farmers are not following sowing non Bt seeds on the periphery of farm to reduce impact of worm/ insect attack. Lack of training or un willingness to do so may be the reason. Same goes for fertiliser and pesticides.

(b) Input cost have gone up with rise in cost of cotton seeds, fertiliser, pesticides, land preparation, tilling, weed removal, harrowing, etc. In addition the labour costs for both male and female have been steadily on rise since 1995-96.

(c) KVK Ghatkhed has brought out that Bt cotton gene is effective as anti-worm for 90 to 100 DAS wherein about two pickings are done. Bt cotton is modified to sustain the vagaries of weather for a longer period. Every Bt cotton variety of seeds have 20% non Bt and 80% worm resistant seed (Bt). Non Bt seeds need to be sowed on the corners of the farm. 45 days onwards non Bt plants get affected. Hibernation of bollworms start after 90 to 100 DAS.

FINANCIAL PERFORMANCE

34. This component of cotton cultivation includes total cost, price realisation and returns. Details have been extracted from the interviews of the farmers, tabulated and placed at Appendix 'IV'. Interpretation thereon is appended below: -

(a) Average cost per hectare is Rs. 100845/- (Rs. One Lakh Eight Hundred Forty Five only), wherein maximum and minimum cost is Rs. 135655/- (Rs. One Lakh Thirty Five Thousand Six Hundred Fifty Five only) and Rs. 66035/- (Sixty Six Thousand Thirty Five only) respectively. It includes cost on land preparation from sowing to end of harvest, labour cost of fertiliser spreading, spraying of pesticide and picking of cotton, etc.

(b) Average price realisation per hectare is Rs. 161122/- (Rs. One Lakh Sixty One Thousand One Hundred Twenty Two only), wherein maximum and minimum price realisation per hectare is Rs. 218461/- (Rs. Two Lakh Eighteen Thousand Four Hundred Sixty One only) and Rs. 103782/- (Rs. One Lakh Three Thousand Seven Hundred Eighty Two only).

(c) Average return per hectare is Rs. 60277/- (Rs. Sixty Thousand Two Hundred Seventy Seven only), wherein maximum and minimum

return per hectare is Rs. 82806/- (Rs Eighty Two Thousand Eight Hundred Six only) and Rs. 37747/- (Rs Thirty Seven Thousand Seven Hundred Forty Five only) respectively.

(d) In addition 30 farmers have additional income from other sources.

MARKETING AND SALES

35. This component includes Market availability of cotton, receipt of any government subsidy by the farmer and his awareness about government schemes. Details have been extracted from the interviews of the farmers, tabulated and placed at Appendix 'XI'. Findings and analysis thereon is appended below: -

- (a) 69 farmers have sold their cotton yield to local traders.
- (b) Only 1 farmer has sold his yield to cooperative society through CCI rates.
- (c) 64 farmers have indicated no support or subsidy by the government.
- (d) 06 farmers have, however, intimated receipt of support through DBT with a reason of either crop failure or insurance.
- (e) All farmers were aware of crop insurance and cash support by the government in case of failure of the crop.

(f) Farmers are aware of cotton produce purchase by NAFED and CCI through 7/12 certificate at MSP. Raymond factory at Nandgaon also purchases the cotton directly from farmers. However, farmers opine that the MSP shall be declared by the Govt prior start of the season so that farmer can decide on the type of crop to be cultivated.

36. **Minimum Support Price of Cotton** (RS, 2019). For both Pre and Post Bt period is as tabulated. The data indicates regular rise in the MSP of cotton.

TABULATION OF MINIMUM SUPPORT PRICE

| Year | Medium Staple* | | | Long Staple** | | |
|---------|----------------|------------|------------|---------------|------------|------------|
| | MSP (Rs/Q) | Rise in Rs | % age rise | MSP (Rs/Q) | Rise in Rs | % age rise |
| 1995-96 | 1150 | 150 | 15.00 | 1350 | 150 | 12.50 |
| 1996-97 | 1180 | 30 | 2.61 | 1380 | 30 | 2.22 |
| 1997-98 | 1330 | 150 | 12.71 | 1530 | 150 | 10.87 |
| 1998-99 | 1440 | 110 | 8.27 | 1650 | 120 | 7.84 |
| 1999-00 | 1575 | 135 | 9.38 | 1775 | 125 | 7.58 |
| 2000-01 | 1625 | 50 | 3.17 | 1825 | 50 | 2.82 |
| 2001-02 | 1675 | 50 | 3.08 | 1875 | 50 | 2.74 |
| 2002-03 | 1675 | 0 | 0.00 | 1875 | 0 | 0.00 |
| 2003-04 | 1725 | 50 | 2.99 | 1925 | 50 | 2.67 |
| 2004-05 | 1760 | 35 | 2.03 | 1960 | 35 | 1.82 |
| 2005-06 | 1760 | 0 | 0.00 | 1980 | 20 | 1.02 |
| 2006-07 | 1770 | 10 | 0.57 | 1990 | 10 | 0.51 |
| 2007-08 | 1800 | 30 | 1.69 | 2030 | 40 | 2.01 |
| 2008-09 | 2500 | 700 | 38.89 | 3000 | 970 | 47.78 |
| 2009-10 | 2500 | 0 | 0.00 | 3000 | 0 | 0.00 |

| Year | Medium Staple* | | | Long Staple** | | |
|---------------------|----------------|------------|------------|---------------|------------|------------|
| | MSP (Rs/Q) | Rise in Rs | % age rise | MSP (Rs/Q) | Rise in Rs | % age rise |
| 2010-11 | 2500 | 0 | 0.00 | 3000 | 0 | 0.00 |
| 2011-12 | 2800 | 300 | 12.00 | 3900 | 900 | 30.00 |
| 2012-13 | 3600 | 800 | 28.57 | 4000 | 100 | 2.56 |
| 2013-14 | 3700 | 100 | 2.78 | 4050 | 50 | 1.25 |
| 2014-15 | 3750 | 50 | 1.35 | 4050 | 0 | 0.00 |
| 2015-16 | 3800 | 50 | 1.33 | 4100 | 50 | 1.23 |
| 2016-17 | 3860 | 60 | 1.58 | 4160 | 60 | 1.46 |
| 2017-18 | 4020 | 160 | 4.15 | 4320 | 160 | 3.85 |
| 2018-19 | 5150 | 1130 | 28.11 | 5450 | 1130 | 26.16 |
| 2019-20 | 5255 | 105 | 2.04 | 5550 | 100 | 1.83 |
| 2020-21 | 5515 | 260 | 4.95 | 5825 | 275 | 4.95 |
| 2021-22 | 5726 | 211 | 3.83 | 6025 | 200 | 3.43 |
| 2022-23 | 6080 | 354 | 6.18 | 6380 | 355 | 5.89 |
| 2023-24 | 6620 | 540 | 8.88 | 7020 | 640 | 10.03 |
| 2024-25 Estimate | 7121 | 501 | 7.57 | 7521 | 501 | 7.14 |

Table 5.7 MSP FIXED BY MINISTRY OF AGRICULTURE (Source: [https://: texmin.nic.in](https://texmin.nic.in))

Note. * Staple length 24.5 mm - 25.5 mm & Miconaire 4.3 - 5.1, ** Staple length 29.5 mm - 30.5 mm & Miconaire 3.5 - 4.3

37. **Interpretation**

(a) Farmers are aware of procurement by Govt agencies through CCI and NAFED on MSP rates. But in general they have opined that the procedure is cumbersome, transportation cost, holding cost of the transport till emptying at ginning, documentation and related additional

expenses make them to sell the cotton to local traders who picks the product from home.

(b) Though farmers are not aware of many subsidies by Govt, they are aware of the crop insurance and have taken benefit of the same.

SOCIAL DEMOGRAPHY

38. Details on social demography extracted from the resultant answers of the cotton growing farmers in Amaravati District have been enumerated below. Representation of the same through different charts have been placed at Appendix 'XII'.

(a) 32% farmers are in age group of 51 – 60 years, 27% are in an age group of 41 – 50 years, 23% farmers are above 61 years, 18% farmers are below 40 years of age.

(b) 63% of interviewed cotton growing farmers were having more than 15 years of cotton sowing experience, 21% between 11 to 15 years whereas 16% farmers have the experience below 10 years.

(c) On educational ground though the count is 23% (maximum) at 12th standard, 20% and 13% are graduate and post graduate respectively. Balance are spread across Diploma in Engg, upto 9th std, ITI, etc.

39. Details of total land holding of interviewed cotton growing farmers, land used for cotton cultivation along with %age and dependent family members is tabulated and placed at Appendix 'XIII'. Observed details are as enumerated:-

(a) **Family Members involved in Farming.** Details of family members involved is as follows: -

(i) 25 farmers have 2 and 1 farmer has 1 family member involved in farming

(ii) 16 farmers have 3 members involved in farming

(iii) 11 farmers have 4 members involved in farming

(iv) 3 farmers have 5 members involved in farming

(v) 5 farmers have 6 members involved in farming

(vi) 9 farmers have more than 7 members involved in farming

(b) 63% farmers have 15 years of experience, 27% farmers are in age group of 41 – 50 years with good education background. These demographical factors can be used towards sustainable farming practices.

40. **Interpretation.** Age and cotton growing experience indicates that farmers into cotton cultivation since pre Bt period. Interviewed farmers are

literate enough to get trained on sustainable farming practices if imparted training adequately.

MISCELLENEOUS

41. This component of cotton cultivation include challenges faced, training on scientific practices, willingness to adopt organic farming, training/ assistance by KVK to the cotton growing farmers. Graphical representation of miscellaneous component is placed at Appendix 'XIV'. Brief on the same is as follows: -

- (a) 54 % cotton growing farmers have indicated that major challenge in their hand is pest management. 23% each, however, intimated that water scarcity and diseases are the challenges respectively.
- (b) 70% farmers have received training on the good practices of cotton cultivation including assistance in soil testing through KVKs. Soil testing is not done for all farmers. For KVK, it is a target. In addition, if the farmer approaches them, KVK do it a free of cost.
- (c) 66% farmers have shown interest in adopting organic/ sustainable cotton practices
- (d) KVK has provided assistance to 69% farmers in cultivating cotton.

42. **Interpretation.** Farmers are willing to involve into sustainable farming to enhance the profitability. Organic farming however, needs good quantum of labour and time. The farmers prefer readymade vermi compost, organic pesticides than putting additional resources in generating them.

COMPREHENSIVE FINDINGS

43. Comprehensive analysis of all components of study has brought out following: -

(a) Weighted average on cost, price realisation and returns with respect to sample size indicates that cotton cultivation has given overall 86.33% returns among all sample sizes. Only farmers having large category of land holding has shown more returns than cost.

(b) ANOVA single factor analysis indicates that Null Hypothesis i.e. "Returns on cotton cultivation has not changed in Amaravati (Maharashtra) from pre Bt period i.e. 1995-96 to 2001-02 to post Bt period i.e. 2002-03 to 2022-23." is rejected due to significant difference in the means of at least one of the groups on input and return cost, indicating that returns on cotton cultivation in Amaravati District (Maharashtra) have increased from Pre to post Bt period.

(c) Cotton acreage from pre to post Bt period is decreasing. However, Cotton Yield and production has been increasing with moderate correlation during post Bt period indicating significant impact of Bt cotton on the yield and production on cotton production. The strong positive

trend in fertilizer consumption post Bt era has significant implications indicating rise in input cost. Cost of labour has increased consistently.

(d) R^2 values in regression analysis on use of fertiliser are not extremely high (e.g., above 0.9) for both pre and post Bt period, indicating that there may be other factors influencing fertilizer consumption that are not captured by the linear trend. These factors could be changed in agricultural practices, soil quality, non-proportional use of fertiliser, use of FYM, etc.

(e) Second picking across Marginal, Small and Semi-Medium category has been more than first picking. In other two categories, first two pickings have been more. First two pickings has given good production whereas comparatively last three picking indicates thinner cotton production.

(f) Bt cotton is sown by 97% farmers, Source of irrigation by the cotton growing farmers indicates that majority of cotton cultivation is dependent on rainfall. 100% intercrop as well as crop rotation practices have been followed with cotton in segment of interviewed farmers.

(g) Farmers are aware of procurement by Govt agencies through CCI and NAFED on MSP rates. But in general they have opined that the procedure is cumbersome, transportation cost, holding cost of the transport till emptying at ginning, documentation and related additional expenses make them to sell the cotton to local traders who picks the product from home.

(h) Age and cotton growing experience indicates that farmers into cotton cultivation since pre Bt period. Interviewed farmers are literate enough to get trained on sustainable farming practices if imparted training adequately.

(j) Farmers are willing to involve into sustainable farming to enhance the profitability. Organic farming however, needs good quantum of labour and time. The farmers prefer readymade vermi compost, organic pesticides than putting additional resources in generating them.

-----X-----X-----

CHAPTER 6 - CONCLUSION AND RECOMMENDATIONS

CONCLUSION

1. Based on the study of Cotton growers in Amaravati, it emerges that returns of Large Category farmers at 141% is highest among farmers of all other holding sizes category. However, returns of Small Category farmers of land at 89% is more than those of Marginal (78%), Semi-Medium (80%), and Medium (88%) Category farmers. Weighted average on return across all holding size classes is 86.33%.
2. Analysis of variation for pre (1994-95 to 2001-02) and Post Bt (2002-03 to 2022-23) period groups like Cotton acreage in hectares, Yield in Kg per hectares, Production in tons, District Male and female labour rates per day in rupees, Total fertiliser used in kgs and MSP in rupees have rejected the Null Hypothesis as there is a significant difference in the means of at least one of the groups. Thus, ANOVA rejected the null hypothesis indicating that there is a change in returns on cotton cultivation from pre to post Bt period.
3. Trend analysis indicated that cotton acreage in Amaravati is steadily decreasing. Both production and yield levels have also decreased during Pre Bt period and have increased in post Bt period. Details on absolute values are as tabulated.

ABSOLUTE VALUES OF ACREAGE, PRODUCTION AND YIELD

| COMPONENT | PRE Bt PERIOD | | POST Bt PERIOD | |
|-------------------------------|---------------|---------|----------------|---------|
| | 1994-95 | 2001-02 | 2002-03 | 2023-24 |
| Acreage in hectares | 371700 | 324600 | 279000 | 235420 |
| Production in tons | 59230 | 38620 | 41430 | 1412500 |
| Yield kgs per hectares | 159.35 | 118.98 | 148.49 | 600 |

Table 5.8 PRE AND POST Bt DATA

4. Thus, the study brings out that Bt cotton has had a significant impact on the yield, production of cotton along with use of fertiliser, labour cost. However, the study also highlights several challenges faced by farmers, including high input costs, labour shortages, market dynamics, and pest management.

5. To augment farmers' income, it is imperative to promote sustainable farming practices, improve market access, impart training, and provide extension services support crop insurance and risk management, and foster collaboration and partnerships.

RECOMMENDATIONS

6. Based on the findings and analysis of this study, the following recommendations are made.

- (a) **Training and Education**. Farmers need to be imparted training and made aware of the proper use of Bt cotton seeds, fertilizers, and pesticides. Provide farmers with regular extension services on best farming practices, soil health management, technological advancement,

and integrated pest management to improve their productivity and thus income. This can help reduce the excessive use of these inputs, promote sustainable farming practices and improve returns.

(b) **Crop Diversification**. Farmers, specially the small farm holders, should be encouraged to adopt crop diversification and rotation practices to reduce their dependence on cotton cultivation and promote soil health.

(c) **Market Support**. The government should establish robust market linkages to ensure that farmers receive at least minimum support prices for their produce, thereby increasing their income levels.

(d) **Promote Sustainable Farming Practices**. Encourage farmers to adopt sustainable farming practices, such as crop diversification, crop rotation, and efficient irrigation management, to reduce their dependence on chemical fertilizers and pesticides. Further, their willingness to undertake sustainable farming need to be encouraged through conducive environment.

(e) **Support Crop Insurance and Risk Management**. Promote crop insurance schemes and risk management strategies to protect farmers from crop failures, natural disasters, and market fluctuations, thereby reducing their propensity to incur losses.

COTTON PRODUCED IN INDIA WITH ACREAGE AND YIELD SINCE YEAR 1995-96 TILL 2022-23 (P) ALONG WITH REPRESENTATION THROUGH LINE GRAPH

1. **COTTON PRODUCTION IN INDIA** (Lakh Hectares, Lakh Bales, Kgs per Hectares)

| YEAR | AREA | PRODUCTION | YIELD |
|-------------|-------------|-------------------|--------------|
| 1994-95 | 78.7 | 118.9 | 257 |
| 1995-96 | 90.4 | 128.6 | 242 |
| 1996-97 | 91.2 | 142.3 | 265 |
| 1997-98 | 88.7 | 108.5 | 208 |
| 1998-99 | 92.9 | 165 | 302 |
| 1999-00 | 87.3 | 156 | 304 |
| 2000-01 | 85.8 | 140 | 278 |
| 2001-02 | 87.3 | 158 | 308 |
| 2002-03 | 76.7 | 136 | 302 |
| 2003-04 | 76.3 | 179 | 399 |

| YEAR | AREA | PRODUCTION | YIELD |
|-------------|-------------|-------------------|--------------|
| 2004-05 | 87.9 | 243 | 470 |
| 2005-06 | 86.8 | 244 | 478 |
| 2006-07 | 91.4 | 280 | 521 |
| 2007-08 | 94.1 | 310 | 553 |
| 2008-09 | 94.1 | 290 | 524 |
| 2009-10 | 103.1 | 305 | 502 |
| 2010-11 | 112.4 | 339 | 517 |
| 2011-12 | 121.76 | 367 | 512 |
| 2012-13 | 119.8 | 370 | 525 |
| 2013-14 | 119.6 | 398 | 566 |
| 2014-15 | 128.46 | 386 | 511 |
| 2015-16 | 122.92 | 332 | 459 |
| 2016-17 | 108.26 | 345 | 542 |
| 2017-18 | 125.86 | 370 | 500 |
| 2018-19 | 126.14 | 333 | 449 |
| 2019-20 | 134.77 | 365 | 460 |
| 2020-21 | 132.85 | 352.48 | 451 |

| YEAR | AREA | PRODUCTION | YIELD |
|-------------|--------|------------|-------|
| 2021-22 | 123.17 | 311.17 | 428 |
| 2022-23 (P) | 130.61 | 343.47 | 447 |

Table 2.2 COTTON PRODUCTION IN INDIA

2. COTTON ACREAGE OF INDIA, 1995-96 TO 2022-23 (P)

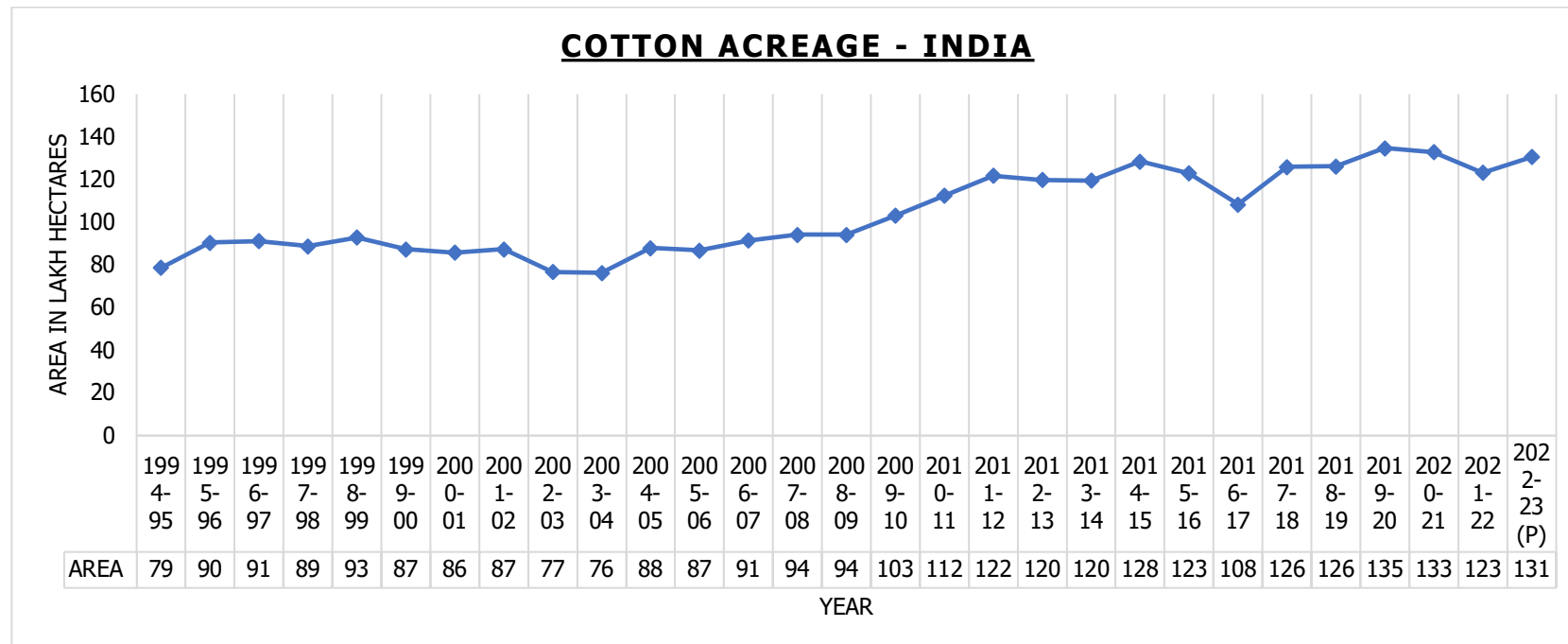


Figure 18 COTTON ACREAGE IN INDIA (1995-96 TO 2022-23)

3. **COTTON PRODUCTION IN INDIA**

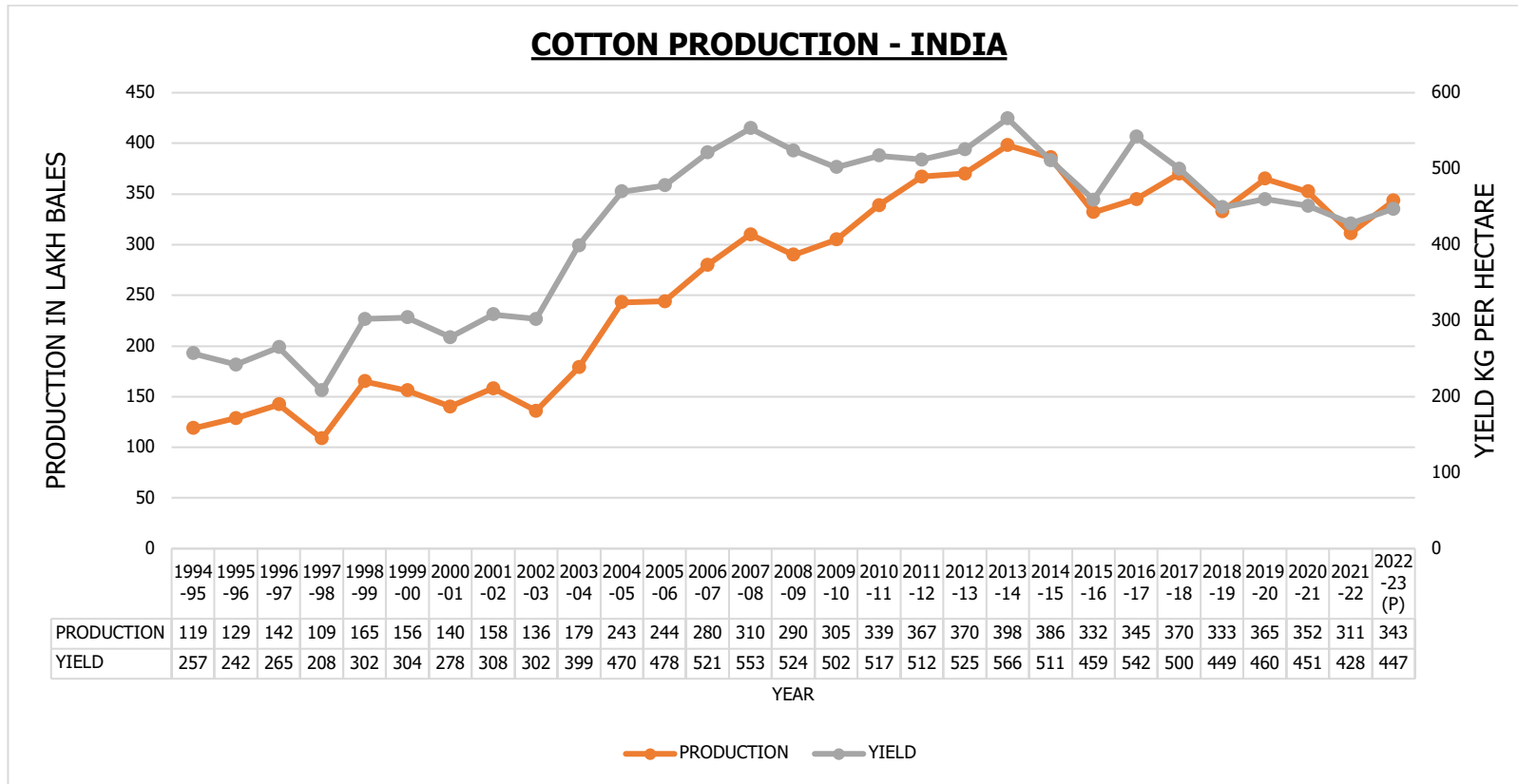
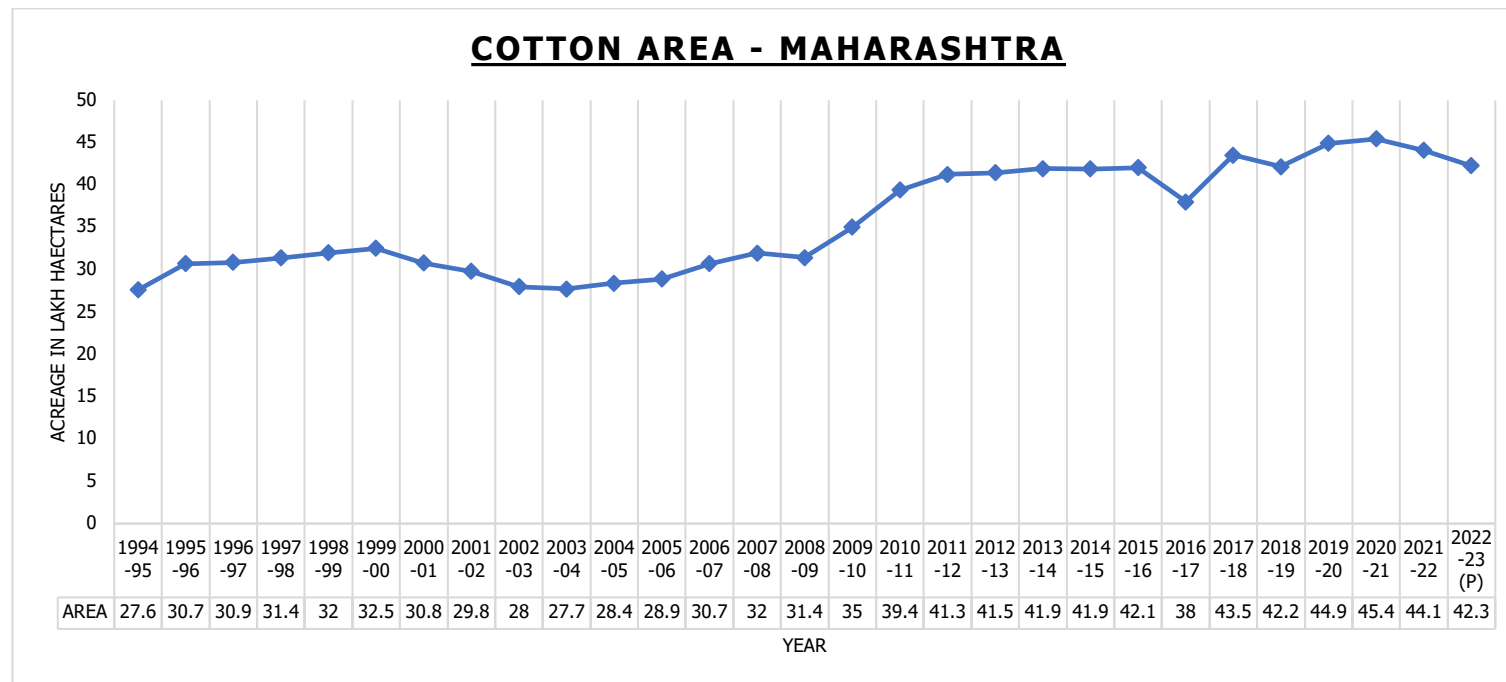


Figure 19 COTTON PRODUCTION W.E.F. 1994-95

(Source: As per Meeting of the Committee on Cotton Production and Consumption(COCP) held on 01.06.2023. P-Provisional and ICAR, Min of Agriculture and farmer welfare Govt of India.)

COTTON PRODUCTION AND ACREAGE IN MAHARASHTRA, 1994-95 TO 2022-23**1. COTTON ACREAGE IN MAHARASHTRA***Figure 20 COTTON ACERAGE IN MAHARASHTRA IN LAST 30 YRS*

2. COTTON PRODUCTION AND YIELD

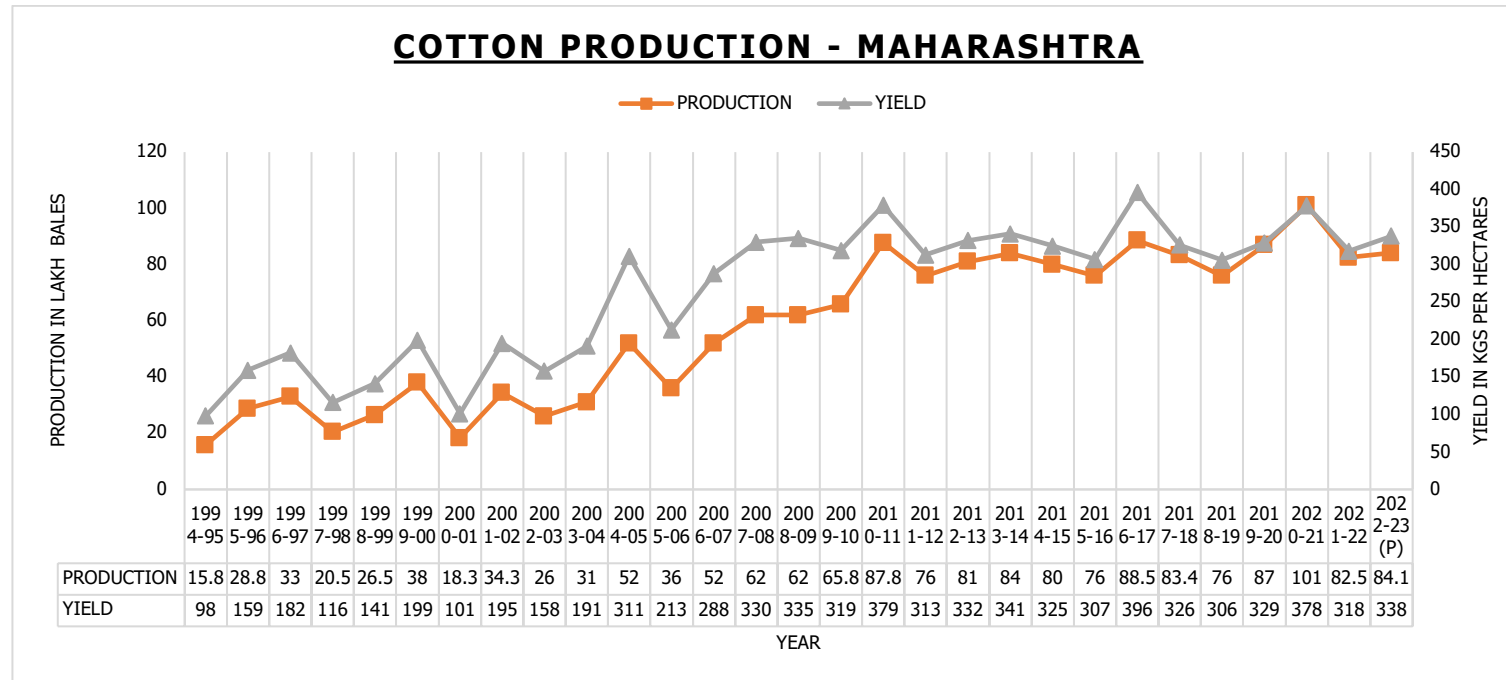


Figure 21 COTTON ACREAGE AND PRODUCTION IN MAHARASHTRA IN LAST 30 YRS

Source - International Crop Research Institute for Semi Arid Tropics data state level and Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, New Delhi, Committee on Cotton Production and Consumption(COCP)

QUESTIONNAIRE ON
ANALYSIS OF RETURNS ON COTTON CULTIVATION IN AMARAVATI
(MAHARASHTRA)

BLOCK I - Identification

1. What is your name?
2. What is your age?
3. How many years of experience do you have in cotton cultivation?
 - (a) 0-10
 - (b) 11-15
 - (c) 15 and above
4. What is your educational background?
5. What is the size of your landholding (in acres)?
6. How much land did you use this year for cotton cultivation?

7. How many of your family members are involved in farming?

BLOCK II - Cultivation Practices

8. What variety of cotton do you cultivate ?

- (a) Bt
- (b) Non-Bt
- (c) Hybrid

9. How much cotton seed (in Kgs) did you use?

10. How much fertilizers (in Quantity) did you use for cotton?

11. How much pesticides (in Quantity) did you use for cotton?

12. What is your primary source of irrigation?

- (a) Well
- (b) Canal
- (c) Rainfall

13. Do you follow crop rotation practices? If yes, what crops do you rotate with cotton?

BLOCK III - Input

14. What is your input cost of cotton seeds?
15. What is your cost of fertilizers?
16. What is your cost of pesticides?
17. What is your labor cost?
18. What is your irrigation cost?

BLOCK IV - Yield and Production

19. How many pickings did you get this season?
 - (a) One
 - (b) Two
 - (c) Three
 - (d) Four
 - (e) Five
 - (f) More than five

20. What is your production per picking in Kgs this season?

- (a) First -
- (b) Second -
- (c) Third -
- (d) Fourth -
- (e) Fifth -
- (f) Total -

21. Do you use mechanical harvesting or manual picking?

BLOCK V. Marketing and Sales

22. Who did you sell your cotton to

- (a) Local traders
- (b) Cooperative societies
- (c) Online platforms

23. Did you receive any government support or subsidies for cotton cultivation last season?

24. If Yes, for what reason.

25. Are you aware of any government schemes for cotton farmers?

- (a) Crop insurance
- (b) Input subsidies
- (c) Other

BLOCK VI - Financial Performance

26. What is your income from cotton cultivation?

27. What is your annual profit/loss from cotton cultivation?

28. Do you have any other sources of income besides cotton cultivation?

BLOCK VII - Miscellaneous

29. What challenges did you face

- (a) Pest management
- (b) Water scarcity
- (c) Other - explain

30. Have you received any training or extension services for cotton cultivation?

31. Are you interested in adopting organic or sustainable cotton practices?

32. Has KVK been useful in assisting you in cultivation?

COST, PRICE REALISATION AND RETURNS**1. EXTRACT OF DATA ON LAND USED FOR COTTON CULTIVATION AND PRICE REALISATION, 2023-24**

(Land in Hectares, Cost, Return and Profit in Rs per Hectare)

| SL | NAME OF FARMER | TOTAL LAND | COTTON ACREAGE | COST | | | | | | | |
|----|-----------------------------|------------|----------------|-------|------------|-----------|--------|---------|-----------|------------------------|-------------------|
| | | | | SEED | FERTILISER | PESTICIDE | LABOUR | PICKING | TOTAL/ HA | PRICE REALISATION / HA | RETURN / HA |
| | | | | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h)=(c+d+e+f+g)/b |
| 1 | Durga Vasantao Dhok | 0.405 | 0.405 | 3456 | 1000 | 2000 | 12000 | 20490 | 96236 | 218461 | 122226 |
| 2 | Prashant Madhukar Dehankar | 0.809 | 0.405 | 3000 | 3000 | 1200 | 12000 | 24600 | 108230 | 245617 | 137388 |
| 3 | Ramu Sabale | 0.809 | 0.809 | 2000 | 4000 | 4000 | 8000 | 7000 | 30888 | 43243 | 12355 |
| 4 | Harshal Sabale | 0.809 | 0.809 | 6912 | 10000 | 10000 | 24000 | 18000 | 85141 | 121079 | 35938 |
| 5 | Manoj Narayan Wankhade | 0.809 | 0.809 | 6912 | 3000 | 7000 | 24000 | 32800 | 91071 | 153943 | 62872 |
| 6 | Priti Nilesh Junghare | 0.809 | 0.809 | 6912 | 3200 | 7000 | 26500 | 34600 | 96631 | 159132 | 62501 |
| 7 | Ramdas Kisanrao Dhumankhede | 0.809 | 0.809 | 10368 | 6000 | 12000 | 15000 | 18000 | 75820 | 103782 | 27962 |
| 8 | Sachin Ramesh Wankhede | 0.809 | 0.809 | 6912 | 3000 | 5000 | 25500 | 35200 | 93419 | 159132 | 65714 |

| SL | NAME OF FARMER | TOTAL LAND | COTTON ACREAGE | COST | | | | | | | |
|----|-----------------------------|------------|----------------|------|------------|-----------|--------|---------|-----------|------------------------|-------------------|
| | | | | SEED | FERTILISER | PESTICIDE | LABOUR | PICKING | TOTAL/ HA | PRICE REALISATION / HA | RETURN / HA |
| | | | | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h)=(c+d+e+f+g)/b |
| 9 | Suresh Uttamrao Kale | 0.809 | 0.809 | 6912 | 14700 | 7000 | 20300 | 21000 | 86376 | 122809 | 36432 |
| 10 | Ramesh Uttamrao Kale | 0.809 | 0.809 | 6912 | 5000 | 4000 | 20300 | 21000 | 70685 | 122809 | 52123 |
| 11 | Vishnu Sukhadev Malode | 0.809 | 0.809 | 6912 | 5880 | 8500 | 25000 | 34000 | 99201 | 207564 | 108363 |
| 12 | Ashok Shankarrao Sawwalakhe | 1.012 | 0.809 | 6912 | 8500 | 11000 | 24000 | 33400 | 103550 | 169511 | 65961 |
| 13 | Dipak Sureshrao Sardar | 1.012 | 0.809 | 6912 | 11760 | 8500 | 29500 | 38600 | 117709 | 202375 | 84666 |
| 14 | Sachin Niranjan Dhote | 1.012 | 0.809 | 6912 | 5400 | 15000 | 24000 | 45000 | 118993 | 216213 | 97219 |
| 15 | Sachin Niranjan Dhote | 1.012 | 0.809 | 6912 | 5400 | 6000 | 20000 | 48000 | 106638 | 224861 | 118223 |
| 16 | Subhash Panditrao Dhande | 1.012 | 0.809 | 6912 | 5000 | 4500 | 24000 | 37800 | 96631 | 209294 | 112663 |
| 17 | संदिप शालीकराव ठाकरे | 1.012 | 0.809 | 6912 | 6750 | 3000 | 25000 | 24000 | 81125 | 121079 | 39954 |
| 18 | Ganesh Thakare | 1.012 | 1.012 | 3500 | 4500 | 7500 | 24000 | 32000 | 70671 | 193726 | 123056 |
| 19 | Sanjay Madhukar Lanjewar | 1.012 | 1.012 | 8640 | 12000 | 12000 | 30000 | 49930 | 111264 | 233371 | 122107 |
| 20 | Gajanan Shriram Sawant | 1.214 | 0.809 | 6912 | 8500 | 8500 | 28000 | 35240 | 107676 | 168127 | 60451 |
| 21 | Manikrao Punaji Maske | 1.214 | 0.809 | 6912 | 8820 | 8500 | 23000 | 31000 | 96656 | 159132 | 62477 |

| SL | NAME OF FARMER | TOTAL LAND | COTTON ACREAGE | COST | | | | | | | |
|----|-----------------------------|------------|----------------|-------|------------|-----------|--------|---------|-----------|------------------------|-------------------|
| | | | | SEED | FERTILISER | PESTICIDE | LABOUR | PICKING | TOTAL/ HA | PRICE REALISATION / HA | RETURN / HA |
| | | | | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h)=(c+d+e+f+g)/b |
| 22 | Pramod M Sawant | 1.214 | 0.809 | 6912 | 5200 | 6000 | 30000 | 37000 | 105156 | 181619 | 76463 |
| 23 | Tushal Mukundrarao Junghare | 1.214 | 0.809 | 6912 | 14700 | 8500 | 27000 | 31800 | 109851 | 141835 | 31985 |
| 24 | Sanjay Madhukar Lanjewar | 1.214 | 1.012 | 8640 | 12000 | 12000 | 25000 | 49930 | 106322 | 233371 | 127049 |
| 25 | Vimal Shesharao Junghare | 1.214 | 1.012 | 8640 | 4500 | 6000 | 32000 | 37350 | 87464 | 153943 | 66480 |
| 26 | Sangita Sabale | 1.214 | 1.214 | 10000 | 14000 | 10000 | 24000 | 27000 | 70012 | 121079 | 51067 |
| 27 | Shubham Vitthal Rao Raut | 1.214 | 1.214 | 10368 | 9000 | 7600 | 36000 | 23500 | 71221 | 129728 | 58507 |
| 28 | Onkar Keshav Ronghe | 1.518 | 1.214 | 9000 | 9000 | 5000 | 36000 | 53600 | 92745 | 200645 | 107900 |
| 29 | Narhari Shankar Junghare | 1.619 | 0.809 | 6912 | 3000 | 2000 | 28000 | 32600 | 89589 | 176429 | 86841 |
| 30 | Pravin Purushottam Junghare | 1.619 | 0.809 | 6912 | 4000 | 4500 | 31000 | 36140 | 101993 | 171067 | 69074 |
| 31 | Satish Purushottam Junghare | 1.619 | 0.809 | 6912 | 4000 | 4000 | 28500 | 35000 | 96878 | 176429 | 79551 |
| 32 | Surendra Shankar Sawant | 1.619 | 1.012 | 8640 | 10000 | 7000 | 22000 | 35700 | 82373 | 148754 | 66381 |
| 33 | Narendra Shankarrao Sawant | 1.619 | 1.012 | 6912 | 6500 | 3500 | 30000 | 35700 | 81654 | 148754 | 67100 |

| SL | NAME OF FARMER | TOTAL LAND | COTTON ACREAGE | COST | | | | | | | |
|----|----------------------------|------------|----------------|-------|------------|-----------|--------|---------|-----------|------------------------|-------------------|
| | | | | SEED | FERTILISER | PESTICIDE | LABOUR | PICKING | TOTAL/ HA | PRICE REALISATION / HA | RETURN / HA |
| | | | | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h)=(c+d+e+f+g)/b |
| 34 | Shriram Shankararao Sawant | 1.619 | 1.012 | 8640 | 5000 | 4000 | 22000 | 38200 | 76937 | 145295 | 68358 |
| 35 | Shrikant Shankarrao Sawant | 1.619 | 1.012 | 8640 | 6000 | 4000 | 22000 | 38200 | 77925 | 145295 | 67369 |
| 36 | Atul Daychand Chandak | 1.619 | 1.619 | 13824 | 4000 | 8000 | 62000 | 77600 | 102191 | 181619 | 79428 |
| 37 | Vijay Namu Badre | 1.619 | 1.619 | 12000 | 5400 | 4000 | 48000 | 82000 | 93527 | 207564 | 114037 |
| 38 | Sachin Babarao Mehare | 1.821 | 0.809 | 1728 | 1800 | 2000 | 20000 | 29500 | 67987 | 203240 | 135253 |
| 39 | Anil Kaka | 2.023 | 0.809 | 3200 | 8500 | 2000 | 24000 | 15000 | 65111 | 112431 | 47320 |
| 40 | Ranjit Shubhash Ronghe | 2.023 | 0.809 | 7000 | 10000 | 10000 | 24000 | 36200 | 107736 | 188537 | 80802 |
| 41 | Rana Subhash Ronghe | 2.023 | 0.809 | 10368 | 10000 | 10000 | 24000 | 36200 | 111897 | 188537 | 76641 |
| 42 | Abhijit Subhash Ronghe | 2.023 | 1.012 | 7000 | 5000 | 3000 | 24000 | 50300 | 88264 | 199953 | 111689 |
| 43 | Ashok Subhash Ronghe | 2.023 | 1.012 | 12960 | 9000 | 5000 | 30000 | 50300 | 106016 | 199953 | 93938 |
| 44 | Atul Dnyaneshwar Wagh | 2.023 | 1.012 | 12960 | 10000 | 11000 | 30000 | 41910 | 104642 | 182449 | 77807 |
| 45 | Ramrao Dnyaneshwar Wagh | 2.023 | 1.012 | 12960 | 10000 | 3000 | 30000 | 42210 | 97031 | 184524 | 87493 |
| 46 | Sheshrao Annaji Junghare | 2.023 | 1.012 | 8640 | 4500 | 10500 | 28000 | 35250 | 85882 | 150484 | 64602 |

| SL | NAME OF FARMER | TOTAL LAND | COTTON ACREAGE | COST | | | | | | | |
|----|-----------------------------|------------|----------------|-------|------------|-----------|----------|---------|-----------|------------------------|-------------------|
| | | | | SEED | FERTILISER | PESTICIDE | LABOUR | PICKING | TOTAL/ HA | PRICE REALISATION / HA | RETURN / HA |
| | | | | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h)=(c+d+e+f+g)/b |
| 47 | Ajay Gorade | 2.428 | 0.809 | 3600 | 7500 | 2000 | 24000 | 12000 | 60663 | 86485 | 25822 |
| 48 | Rajendra Ramchandra Chinchu | 2.428 | 0.809 | 6912 | 5400 | 4000 | 24000 | 24000 | 79457 | 155673 | 76216 |
| 49 | Sharad Talan | 2.833 | 1.012 | 4250 | 3500 | 10000 | 30000 | 33000 | 79813 | 159132 | 79319 |
| 50 | Rajesh Mahore | 2.833 | 1.214 | 6000 | 8000 | 5000 | 36000 | 22000 | 63422 | 103782 | 40360 |
| 51 | Dipak Kale | 3.238 | 1.214 | 7000 | 12000 | 4000 | 36000 | 24000 | 68364 | 103782 | 35418 |
| 52 | Ghanshyam Tulshiram Kale | 4.047 | 1.012 | 8640 | 11400 | 16000 | 32000 | 39910 | 106698 | 154774 | 48076 |
| 53 | Girish Khaikar | 4.856 | 1.619 | 9000 | 15000 | 5500 | 48000 | 41500 | 73512 | 140538 | 67026 |
| 54 | Nileshbhai Mohture | 5.666 | 0.809 | 3600 | 9000 | 10000 | 24000 | 27000 | 90933 | 155673 | 64740 |
| 55 | Swapnil Mohekar | 5.666 | 1.619 | 7200 | 30000 | 12000 | 48000 | 36000 | 82284 | 121079 | 38795 |
| 56 | Gopal Kaka | 6.070 | 2.023 | 9000 | 20000 | 8000 | 60000 | 44000 | 69682 | 130765 | 61083 |
| 57 | Nandu Gohatre | 6.070 | 2.428 | 10800 | 28000 | 24000 | 72000 | 101000 | 97110 | 181619 | 84508 |
| 58 | Savarkar | 6.880 | 1.214 | 5400 | 4200 | 10000 | 25000 | 21500 | 54444 | 83602 | 29158 |
| 59 | Sharad Gondse | 7.285 | 1.619 | 7200 | 5200 | 16000 | 48000 | 27000 | 63875 | 82161 | 18285 |
| 60 | Vinayak Wagh | 8.094 | 0.809 | 4000 | 15000 | 12000 | 50000 | 28500 | 135287 | 220537 | 85250 |
| 61 | Sunil Bokade | 8.094 | 1.619 | 3600 | 13000 | 4000 | 48000 | 50000 | 73265 | 172970 | 99705 |
| 62 | Madhukar Patil | 8.094 | 2.833 | 13000 | 28000 | 7000 | 84000 | 80000 | 74836 | 172970 | 98134 |
| 63 | Ramrao Hive | 8.094 | 4.047 | 20000 | 45000 | 12000 | 1,20,000 | 146000 | 84755 | 211023 | 126268 |
| 64 | Subhash Bokade | 8.768 | 4.047 | 21600 | 36667 | 40000 | 120000 | 163333 | 94293 | 178736 | 84442 |
| 65 | Annaji Dive | 9.522 | 0.674 | 1778 | 8889 | 2222 | 20000 | 26660 | 88287 | 230604 | 142316 |
| 66 | Vivek B Deshmukh | 10.117 | 2.023 | 8500 | 22500 | 20000 | 60000 | 125000 | 116631 | 397831 | 281200 |

| SL | NAME OF FARMER | TOTAL LAND | COTTON ACREAGE | COST | | | | | | | |
|----|------------------|------------|----------------|-------|------------|-----------|--------|---------|-----------|------------------------|-------------------|
| | | | | SEED | FERTILISER | PESTICIDE | LABOUR | PICKING | TOTAL/ HA | PRICE REALISATION / HA | RETURN / HA |
| | | | | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h)=(c+d+e+f+g)/b |
| 67 | Ravi Tekade | 14.164 | 4.047 | 16600 | 40000 | 40000 | 50000 | 86000 | 57475 | 93404 | 35928 |
| 68 | Gopal Raut | 16.188 | 4.047 | 8000 | 38000 | 12000 | 120000 | 130000 | 76107 | 172970 | 96863 |
| 69 | Bhushan Lawankar | 17.807 | 4.047 | 22000 | 48000 | 12000 | 120000 | 120000 | 79566 | 172970 | 93404 |
| 70 | Nilesh Raut | 18.211 | 2.023 | 7500 | 10000 | 5000 | 60000 | 40000 | 60540 | 103782 | 43243 |

Table 5.9 LAND USED FOR COTTON CULTIVATION AND PRICE REALISATION

Note – Irrigation cost has been zero even though few farmers have irrigation through well and canal

2. **EXTRACT OF DATA ON NUMBER OF PICKING AND PICKING COST, 2023-24**

(Land in Hectares, Pickings in Kgs and Cost in Rs)

| SL | NAME OF FARMER | COTTON ACREAGE | NO OF PICKINGS | | | | | PICKING COSTS | | | |
|----|-----------------------------|-------------------|----------------|--------|-------|--------|-------|----------------|----------------|-----------------------------|-----------------|
| | | | FIRST | SECOND | THIRD | FOURTH | FIFTH | FIRST | SECOND | THIRD, FOURTH , FIFTH | TOTAL |
| | | | (a) | (b) | (c) | (d) | (e) | (f)=(a *10) | (g)=(b *10) | (h)=(c +d+e) *30 | (j)=(f+g +h) |
| 1 | Durga Vasanttrao Dhok | 0.405 | 210 | 660 | 360 | 33 | 0 | 2100 | 6600 | 11790 | 20490 |
| 2 | Prashant Madhukar Dehankar | 0.405 | 480 | 420 | 370 | 150 | 0 | 4800 | 4200 | 15600 | 24600 |
| 3 | Ramu Sabale | 0.809 | 200 | 200 | 100 | 0 | 0 | 2000 | 2000 | 3000 | 7000 |
| 4 | Harshal Sabale | 0.809 | 800 | 400 | 200 | 0 | 0 | 8000 | 4000 | 6000 | 18000 |
| 5 | Manoj Narayan Wankhade | 0.809 | 360 | 670 | 410 | 340 | 0 | 3600 | 6700 | 22500 | 32800 |
| 6 | Priti Nilesh Junghare | 0.809 | 450 | 580 | 490 | 320 | 0 | 4500 | 5800 | 24300 | 34600 |
| 7 | Ramdas Kisanrao Dhumankhede | 0.809 | 600 | 300 | 200 | 100 | 0 | 6000 | 3000 | 9000 | 18000 |
| 8 | Sachin Ramesh Wankhede | 0.809 | 310 | 690 | 480 | 360 | 0 | 3100 | 6900 | 25200 | 35200 |
| 9 | Suresh Uttamrao Kale | 0.809 | 320 | 760 | 340 | 0 | 0 | 3200 | 7600 | 10200 | 21000 |
| 10 | Ramesh Uttamrao Kale | 0.809 | 320 | 760 | 340 | 0 | 0 | 3200 | 7600 | 10200 | 21000 |
| 11 | Vishnu Sukhadev Malode | 0.809 | 1200 | 700 | 500 | 0 | 0 | 12000 | 7000 | 15000 | 34000 |
| 12 | Ashok Shankarrao Sawwalakhe | 0.809 | 530 | 740 | 410 | 280 | 0 | 5300 | 7400 | 20700 | 33400 |
| 13 | Dipak Sureshrao Sardar | 0.809 | 630 | 950 | 500 | 260 | 0 | 6300 | 9500 | 22800 | 38600 |
| 14 | Sachin Niranjana Dhotre | 0.809 | 500 | 1000 | 500 | 500 | 0 | 5000 | 10000 | 30000 | 45000 |
| 15 | Sachin Niranjana Dhotre | 0.809 | 500 | 1000 | 500 | 500 | 100 | 5000 | 10000 | 33000 | 48000 |
| 16 | Subhash Panditrao Dhande | 0.809 | 680 | 1060 | 450 | 230 | 0 | 6800 | 10600 | 20400 | 37800 |
| 17 | संदिप शालीकराव ठाकरे | 0.809 | 500 | 400 | 500 | 0 | 0 | 5000 | 4000 | 15000 | 24000 |

| SL | NAME OF FARMER | COTTON ACREAGE | NO OF PICKINGS | | | | | PICKING COSTS | | | |
|----|-----------------------------|-------------------|----------------|--------|-------|--------|-------|----------------|----------------|-----------------------------|-----------------|
| | | | FIRST | SECOND | THIRD | FOURTH | FIFTH | FIRST | SECOND | THIRD, FOURTH , FIFTH | TOTAL |
| | | | (a) | (b) | (c) | (d) | (e) | (f)=(a *10) | (g)=(b *10) | (h)=(c +d+e) *30 | (j)=(f+g +h) |
| 18 | Ganesh Thakare | 1.012 | 1200 | 1400 | 200 | 0 | 0 | 12000 | 14000 | 6000 | 32000 |
| 19 | Sanjay Madhukar Lanjewar | 1.012 | 1120 | 1443 | 450 | 360 | 0 | 11200 | 14430 | 24300 | 49930 |
| 20 | Gajanan Shriram Sawant | 0.809 | 224 | 930 | 360 | 430 | 0 | 2240 | 9300 | 23700 | 35240 |
| 21 | Manikrao Punaji Maske | 0.809 | 230 | 980 | 630 | 0 | 0 | 2300 | 9800 | 18900 | 31000 |
| 22 | Pramod M Sawant | 0.809 | 800 | 500 | 500 | 300 | 0 | 8000 | 5000 | 24000 | 37000 |
| 23 | Tushal Mukundrarao Junghare | 0.809 | 280 | 590 | 380 | 390 | 0 | 2800 | 5900 | 23100 | 31800 |
| 24 | Sanjay Madhukar Lanjewar | 1.012 | 1120 | 1443 | 450 | 360 | 0 | 11200 | 14430 | 24300 | 49930 |
| 25 | Vimal Shesharao Junghare | 1.012 | 680 | 790 | 290 | 465 | 0 | 6800 | 7900 | 22650 | 37350 |
| 26 | Sangita Sabale | 1.214 | 1000 | 800 | 300 | 0 | 0 | 10000 | 8000 | 9000 | 27000 |
| 27 | Shubham Vitthal Rao Raut | 1.214 | 1200 | 1000 | 50 | 0 | 0 | 12000 | 10000 | 1500 | 23500 |
| 28 | Onkar Keshav Ronghe | 1.214 | 1130 | 1410 | 620 | 320 | 0 | 11300 | 14100 | 28200 | 53600 |
| 29 | Narhari Shankar Junghare | 0.809 | 500 | 930 | 390 | 220 | 0 | 5000 | 9300 | 18300 | 32600 |
| 30 | Pravin Purushottam Junghare | 0.809 | 370 | 790 | 410 | 408 | 0 | 3700 | 7900 | 24540 | 36140 |
| 31 | Satish Purushottam Junghare | 0.809 | 420 | 890 | 390 | 340 | 0 | 4200 | 8900 | 21900 | 35000 |
| 32 | Surendra Shankar Sawant | 1.012 | 530 | 910 | 420 | 290 | 0 | 5300 | 9100 | 21300 | 35700 |
| 33 | Narendra Shankarrao Sawant | 1.012 | 530 | 910 | 420 | 290 | 0 | 5300 | 9100 | 21300 | 35700 |
| 34 | Shriram Shankararao Sawant | 1.012 | 350 | 890 | 580 | 280 | 0 | 3500 | 8900 | 25800 | 38200 |
| 35 | Shrikant Shankarrao Sawant | 1.012 | 350 | 890 | 580 | 280 | 0 | 3500 | 8900 | 25800 | 38200 |
| 36 | Atul Daychand Chandak | 1.619 | 860 | 1560 | 910 | 870 | 0 | 8600 | 15600 | 53400 | 77600 |
| 37 | Vijay Namu Badre | 1.619 | 1000 | 2100 | 1200 | 500 | 0 | 10000 | 21000 | 51000 | 82000 |
| 38 | Sachin Babarao Mehare | 0.809 | 1300 | 750 | 300 | 0 | 0 | 13000 | 7500 | 9000 | 29500 |
| 39 | Anil Kaka | 0.809 | 800 | 400 | 100 | 0 | 0 | 8000 | 4000 | 3000 | 15000 |

| SL | NAME OF FARMER | COTTON ACREAGE | NO OF PICKINGS | | | | | PICKING COSTS | | | |
|----|-----------------------------|-------------------|----------------|--------|-------|--------|-------|----------------|----------------|-----------------------------|-----------------|
| | | | FIRST | SECOND | THIRD | FOURTH | FIFTH | FIRST | SECOND | THIRD, FOURTH , FIFTH | TOTAL |
| | | | (a) | (b) | (c) | (d) | (e) | (f)=(a *10) | (g)=(b *10) | (h)=(c +d+e) *30 | (j)=(f+g +h) |
| 40 | Ranjit Shubhash Ronghe | 0.809 | 550 | 910 | 490 | 230 | 0 | 5500 | 9100 | 21600 | 36200 |
| 41 | Rana Subhash Ronghe | 0.809 | 550 | 910 | 490 | 230 | 0 | 5500 | 9100 | 21600 | 36200 |
| 42 | Abhijit Subhash Ronghe | 1.012 | 800 | 1020 | 480 | 590 | 0 | 8000 | 10200 | 32100 | 50300 |
| 43 | Ashok Subhash Ronghe | 1.012 | 800 | 1020 | 480 | 590 | 0 | 8000 | 10200 | 32100 | 50300 |
| 44 | Atul Dnyaneshwar Wagh | 1.012 | 830 | 1030 | 777 | 0 | 0 | 8300 | 10300 | 23310 | 41910 |
| 45 | Ramrao Dnyaneshwar Wagh | 1.012 | 830 | 1060 | 777 | 0 | 0 | 8300 | 10600 | 23310 | 42210 |
| 46 | Sheshrao Annaji Junghare | 1.012 | 620 | 880 | 380 | 295 | 0 | 6200 | 8800 | 20250 | 35250 |
| 47 | Ajay Gorade | 0.809 | 700 | 200 | 100 | 0 | 0 | 7000 | 2000 | 3000 | 12000 |
| 48 | Rajendra Ramchandra Chinche | 0.809 | 600 | 900 | 300 | 0 | 0 | 6000 | 9000 | 9000 | 24000 |
| 49 | Sharad Talan | 1.012 | 900 | 900 | 500 | 0 | 0 | 9000 | 9000 | 15000 | 33000 |
| 50 | Rajesh Mahore | 1.214 | 1000 | 600 | 200 | 0 | 0 | 10000 | 6000 | 6000 | 22000 |
| 51 | Dipak Kale | 1.214 | 1000 | 500 | 300 | 0 | 0 | 10000 | 5000 | 9000 | 24000 |
| 52 | Ghanshyam Tulshiram Kale | 1.012 | 440 | 920 | 580 | 297 | 0 | 4400 | 9200 | 26310 | 39910 |
| 53 | Girish Khairkar | 1.619 | 2000 | 800 | 400 | 50 | 0 | 20000 | 8000 | 13500 | 41500 |
| 54 | Nileshbhou Mohture | 0.809 | 900 | 450 | 450 | 0 | 0 | 9000 | 4500 | 13500 | 27000 |
| 55 | Swapnil Mohekar | 1.619 | 1400 | 1000 | 400 | 0 | 0 | 14000 | 10000 | 12000 | 36000 |
| 56 | Gopal Kaka | 2.023 | 2500 | 970 | 310 | 0 | 0 | 25000 | 9700 | 9300 | 44000 |
| 57 | Nandu Gohatre | 2.428 | 2400 | 2000 | 1800 | 100 | 0 | 24000 | 20000 | 57000 | 101000 |
| 58 | Savarkar | 1.214 | 800 | 300 | 200 | 150 | 0 | 8000 | 3000 | 10500 | 21500 |
| 59 | Sharad Gondse | 1.619 | 900 | 600 | 300 | 100 | 0 | 9000 | 6000 | 12000 | 27000 |
| 60 | Vinayak Wagh | 0.809 | 1600 | 800 | 150 | 0 | 0 | 16000 | 8000 | 4500 | 28500 |
| 61 | Sunil Bokade | 1.619 | 2500 | 1000 | 500 | 0 | 0 | 25000 | 10000 | 15000 | 50000 |

| SL | NAME OF FARMER | COTTON ACREAGE | NO OF PICKINGS | | | | | PICKING COSTS | | | |
|----|------------------|-------------------|----------------|--------|-------|--------|-------|----------------|----------------|-----------------------------|-----------------|
| | | | FIRST | SECOND | THIRD | FOURTH | FIFTH | FIRST | SECOND | THIRD, FOURTH , FIFTH | TOTAL |
| | | | (a) | (b) | (c) | (d) | (e) | (f)=(a *10) | (g)=(b *10) | (h)=(c +d+e) *30 | (j)=(f+g +h) |
| 62 | Madhukar Patil | 2.833 | 4000 | 2500 | 400 | 100 | 0 | 40000 | 25000 | 15000 | 80000 |
| 63 | Ramrao Hive | 4.047 | 8000 | 3000 | 1000 | 200 | 0 | 80000 | 30000 | 36000 | 146000 |
| 64 | Subhash Bokade | 4.047 | 4000 | 3333 | 2000 | 1000 | 0 | 40000 | 33333 | 90000 | 163333 |
| 65 | Annaji Dive | 0.674 | 1200 | 800 | 222 | 0 | 0 | 12000 | 8000 | 6660 | 26660 |
| 66 | Vivek B Deshmukh | 2.023 | 10000 | 1000 | 500 | 0 | 0 | 10000 0 | 10000 | 15000 | 125000 |
| 67 | Ravi Tekade | 4.047 | 2000 | 1800 | 1500 | 100 | 0 | 20000 | 18000 | 48000 | 86000 |
| 68 | Gopal Raut | 4.047 | 6000 | 2500 | 1500 | 0 | 0 | 60000 | 25000 | 45000 | 130000 |
| 69 | Bhushan Lawankar | 4.047 | 6000 | 3000 | 1000 | 0 | 0 | 60000 | 30000 | 30000 | 120000 |
| 70 | Nilesh Raut | 2.023 | 1500 | 1000 | 500 | 0 | 0 | 15000 | 10000 | 15000 | 40000 |

Table 5.10 NUMBER OF PICKING AND PICKING COST, 2023-24

Note. Picking cost for first and second picking is Rs 10/ Kg and for third picking onwards it is Rs 30/ kg. Cost of picking for third picking onwards increases due to thinning of cotton bolls per hectare

FACTORS ON COTTON CULTIVATION**1. FACTORS OF COTTON CULTIVATION IN AMARAVATI DISTRICT APPLICABLE FOR RATE ANALYSIS**

(Area in Hectares, Yield in Kgs per Hectare, Production in 1000 Tons, Field labour in Rs per day, Fertiliser in Tons, MSP in Rs per quintal)

| YEAR | AREA | YIELD | PRODUCTION | MALE FIELD LABOUR | FEMALE FIELD LABOUR | FERTILISER USED | MSP MEDIUM STAPLE | MSP LONG STAPLE |
|-------------|-------------|--------------|-------------------|--------------------------|----------------------------|------------------------|--------------------------|------------------------|
| 1995-96 | 371700 | 159.35 | 59.23 | 80 | 55 | 54712 | 1150 | 1350 |
| 1996-97 | 370300 | 158.17 | 58.57 | 85 | 60 | 58475 | 1180 | 1380 |
| 1997-98 | 347900 | 580.1 | 20.18 | 90 | 60 | 48946 | 1330 | 1530 |
| 1998 - 99 | 320900 | 142.9 | 76.5 | 100 | 70 | 44494 | 1440 | 1650 |
| 1999 - 00 | 326000 | 249.6 | 130.9 | 100 | 70 | 52485 | 1575 | 1775 |
| 2000 - 01 | 309100 | 149.7 | 81.6 | 100 | 70 | 44045 | 1625 | 1825 |
| 2001 - 02 | 324600 | 227.2 | 119 | 100 | 70 | 39068 | 1675 | 1875 |
| 2002 - 03 | 279000 | 243.7 | 147.9 | 120 | 90 | 40084 | 1675 | 1875 |
| 2003 - 04 | 266600 | 272.3 | 173.4 | 120 | 90 | 42369 | 1725 | 1925 |
| 2004 - 05 | 268200 | 214.3 | 136 | 120 | 90 | 36221 | 1760 | 1960 |
| 2005 - 06 | 256400 | 222.9 | 147.9 | 150 | 100 | 38572 | 1760 | 1980 |

| YEAR | AREA | YIELD | PRODUCTION | MALE FIELD LABOUR | FEMALE FIELD LABOUR | FERTILISER USED | MSP MEDIUM STAPLE | MSP LONG STAPLE |
|-----------|--------|-------|------------|-------------------|---------------------|-----------------|-------------------|-----------------|
| 2007 - 08 | 175400 | 353.1 | 341.7 | 150 | 100 | 53979 | 1800 | 2030 |
| 2008 - 09 | 116100 | 185 | 270.3 | 200 | 120 | 73603 | 2500 | 3000 |
| 2009 - 10 | 179400 | 309.2 | 292.4 | 200 | 120 | 80287 | 2500 | 3000 |
| 2010 - 11 | 204300 | 336.2 | 280.5 | 200 | 120 | 79956 | 2500 | 3000 |
| 2011 - 12 | 187400 | 270.2 | 244.8 | 250 | 150 | 84189 | 2800 | 3900 |
| 2012 - 13 | 191300 | 611.5 | 544 | 250 | 150 | 72080 | 3600 | 4000 |
| 2013 - 14 | 186700 | 633.2 | 576.3 | 250 | 150 | 72681 | 3700 | 4050 |
| 2014 - 15 | 196500 | 196.2 | 170 | 250 | 150 | 75368 | 3750 | 4050 |
| 2015 - 16 | 200000 | 417 | 355.3 | 250 | 150 | 87571 | 3800 | 4100 |
| 2016 - 17 | 200300 | 804 | 681.7 | 300 | 200 | 66951 | 3860 | 4160 |
| 2017 - 18 | 207457 | 380.3 | 311.1 | 300 | 200 | 74124 | 4020 | 4320 |

Table 5.11 FACTORS OF COTTON CULTIVATION IN AMARAVATI DISTRICT APPLICABLE FOR RATE ANALYSIS

2. ANOVA ANALYSIS PRE BT (1995-96 TO 2001-02)

| Anova: Single Factor | | | | | |
|---|-------|---------|-------------|------------|--|
| SUMMARY | | | | | |
| Groups | Count | Sum | Average | Variance | |
| Area | 6 | 2045900 | 340983.333 | 699041667 | |
| Yield | 6 | 917730 | 152955 | 3706919870 | |
| Production | 6 | 426.98 | 71.16333333 | 1321.23403 | |
| DISTRICT MALE FIELD LABOUR (Rs per Day) | 6 | 555 | 92.5 | 77.5 | |

| Anova: Single Factor (contd..) | | | | | | |
|---|------------|-----------|------------|------------|----------------|---------------|
| DISTRICT FEMALE FIELD LABOUR (Rs per Day) | 6 | 385 | 64.1666667 | 44.1666667 | | |
| Fertiliser | 6 | 303157 | 50526.1667 | 33086332.6 | | |
| Medium Staple MSP (Rs/ Q) | 6 | 8300 | 1383.33333 | 39396.6667 | | |
| Long Staple MSP (Rs/Q) | 6 | 9510 | 1585 | 39640 | | |
| ANOVA | | | | | | |
| Source of Variation | SS | df | MS | F | P-value | F crit |
| Between Groups | 6.2838E+11 | 7 | 8.9769E+10 | 161.77798 | 2.7865E-27 | 2.24902433 |
| Within Groups | 2.2196E+10 | 40 | 554891044 | | | |
| Total | 6.5058E+11 | 47 | | | | |

Table 5.12 ANOVA ANALYSIS PRE BT (1995-96 TO 2001-02)

3. A one-way analysis of variance (ANOVA) comparing eight different groups: "Area," "Production," "Yield," "District Male Field Labour (Rs per Day)," "District Female Field Labour (Rs per Day)," "Fertilizer," "Medium Staple MSP (Rs/Q)," and "Long Staple MSP (Rs/Q)." Here's a breakdown of the results:-

Summary of the Data:

- (a) **Groups:** 8 groups
- (b) **Count:** 6 data points per group
- (c) **Sum:** The total sum of observations for each group.

- (i) **Area:** 2,045,900
- (ii) **Production:** 917,730
- (iii) **Yield:** 426.98
- (iv) **District Male Field Labour (Rs per Day):** 555
- (v) **District Female Field Labour (Rs per Day):** 385
- (vi) **Fertilizer:** 303,157
- (vii) **Medium Staple MSP (Rs/Q):** 8,300
- (viii) **Long Staple MSP (Rs/Q):** 9,510

(d) **Average:** The mean value for each group.

- (i) **Area:** 340,983.33
- (ii) **Production:** 152,955
- (iii) **Yield:** 71.16
- (iv) **District Male Field Labour (Rs per Day):** 92.5
- (v) **District Female Field Labour (Rs per Day):** 64.17
- (vi) **Fertilizer:** 50,526.17
- (vii) **Medium Staple MSP (Rs/Q):** 1,383.33
- (viii) **Long Staple MSP (Rs/Q):** 1,585

(e) **Variance:** The variability in the data for each group.

- (i) **Area:** 699,041,666.7
- (ii) **Production:** 3,706,919,870
- (iii) **Yield:** 1,321.23
- (iv) **District Male Field Labour (Rs per Day):** 77.5
- (v) **District Female Field Labour (Rs per Day):** 44.17
- (vi) **Fertilizer:** 33,086,332.57
- (vii) **Medium Staple MSP (Rs/Q):** 39,396.67
- (viii) **Long Staple MSP (Rs/Q):** 39,640

4. **ANOVA Table**

(a) **Between Groups:**

- (i) **SS (Sum of Squares):** 6.28384E+11 (This represents the variability between the groups)
- (ii) **df (Degrees of Freedom):** 7 (Number of groups - 1)
- (iii) **MS (Mean Square):** 89,769,152,107 (SS / df)
- (iv) **F-statistic:** 161.78 (MS between / MS within)
- (v) **P-value:** 2.78645E-27 (A very small value, indicating strong statistical significance)
- (vi) **F-critical:** 2.249 (The critical value of F for the chosen significance level, usually 0.05)

(b) **Within Groups:**

- (i) **SS:** 22,195,641,744 (This represents the variability within each group)
- (ii) **df:** 40 (Total observations minus the number of groups)
- (iii) **MS:** 554,891,043.6 (SS / df)

(c) **Total:**

- (i) **SS (Total Sum of Squares):** 6.5058E+11 (Total variability across all data)
- (ii) **df:** 47 (Total number of observations - 1)

5. **ANOVA ANALYSIS POST BT (2002-03 TO 2017-18)**

| Anova: Single Factor | | | | | | |
|---|-------|---------|------------|------------|--|--|
| SUMMARY | | | | | | |
| Groups | Count | Sum | Average | Variance | | |
| Area | 16 | 3356857 | 209803.563 | 1818983296 | | |
| Yield | 16 | 5664300 | 354018.75 | 3.2603E+10 | | |
| Production | 16 | 4824.6 | 301.5375 | 27935.0772 | | |
| DISTRICT MALE FIELD LABOUR (Rs per Day) | 16 | 3260 | 203.75 | 3931.66667 | | |
| DISTRICT FEMALE FIELD LABOUR (Rs per Day) | 16 | 2080 | 130 | 1306.66667 | | |

| Anova: Single Factor (Contd...) | | | | | | |
|--|------------|-----------|------------|------------|----------------|---------------|
| Fertiliser | 16 | 1022257 | 63891.0625 | 327058542 | | |
| Medium Staple MSP (Rs/ Q) | 16 | 43520 | 2720 | 851830 | | |
| Long Staple MSP (Rs/Q) | 16 | 49340 | 3083.75 | 980335 | | |
| ANOVA | | | | | | |
| Source of Variation | SS | df | MS | F | P-value | F crit |
| Between Groups | 1.9708E+12 | 7 | 2.8155E+11 | 64.8159644 | 8.5927E-38 | 2.08677028 |
| Within Groups | 5.2126E+11 | 120 | 4343807267 | | | |
| Total | 2.4921E+12 | 127 | | | | |

Table 5.13 ANOVA ANALYSIS POST BT (2002-03 TO 2017-18)

6. One-way analysis of variance (ANOVA) comparing eight groups: "Area," "Production," "Yield," "District Male Field Labour (Rs per Day)," "District Female Field Labour (Rs per Day)," "Fertilizer," "Medium Staple MSP (Rs/Q)," and "Long Staple MSP (Rs/Q)." Here's a breakdown of the results:

Summary of the Data

- (a) **Groups:** 8 groups
- (b) **Count:** 16 data points per group
- (c) **Sum:** The total sum of observations for each group:
 - (i) **Area:** 3,356,857
 - (ii) **Production:** 5,664,300

- (iii) **Yield:** 4,824.6
- (iv) **District Male Field Labour (Rs per Day):** 3,260
- (v) **District Female Field Labour (Rs per Day):** 2,080
- (vi) **Fertilizer:** 1,022,257
- (vii) **Medium Staple MSP (Rs/Q):** 43,520
- (viii) **Long Staple MSP (Rs/Q):** 49,340

(d) **Average:** The mean value for each group:

- (i) **Area:** 209,803.56
- (ii) **Production:** 354,018.75
- (iii) **Yield:** 301.54
- (iv) **District Male Field Labour (Rs per Day):** 203.75
- (v) **District Female Field Labour (Rs per Day):** 130
- (vi) **Fertilizer:** 63,891.06
- (vii) **Medium Staple MSP (Rs/Q):** 2,720
- (viii) **Long Staple MSP (Rs/Q):** 3,083.75

(e) **Variance:** The variability in the data for each group

- (i) **Area: 1,818,983,296**

- (ii) **Production: 32,602,550,958**
- (iii) **Yield: 27,935.08**
- (iv) **District Male Field Labour (Rs per Day): 3,931.67**
- (v) **District Female Field Labour (Rs per Day): 1,306.67**
- (vi) **Fertilizer: 327,058,541.8**
- (vii) **Medium Staple MSP (Rs/Q): 851,830**
- (viii) **Long Staple MSP (Rs/Q): 980,335**

7. ANOVA Table

(a) **Between Groups**

- (i) **SS (Sum of Squares):** 1.97084E+12 (This represents the variability between the groups)
- (ii) **df (Degrees of Freedom):** 7 (Number of groups - 1)
- (iii) **MS (Mean Square):** 2.81548E+11 (SS / df)
- (iv) **F-statistic:** 64.82 (MS between / MS within)
- (v) **P-value:** 8.59274E-38 (A very small value, indicating strong statistical significance)
- (vi) **F-critical:** 2.087 (The critical value of F for the chosen significance level, typically 0.05)

(b) **Within Groups**

- (i) **SS:** 521,257,000,000 (This represents the variability within each group)
- (ii) **df:** 120 (Total observations minus the number of groups)
- (iii) **MS:** 4,343,807,267 (SS / df)

(c) **Total:**

- (i) **SS (Total Sum of Squares):** 2.49209E+12 (Total variability across all data)
- (ii) **df:** 127 (Total number of observations - 1)

COTTON YIELD AMARAVATI DISTRICT

(Area 1000 Ha, Production 1000 Tons, Yield Kg/ Ha)

| YEAR | COTTON AREA | COTTON PRODUCTION | COTTON YIELD |
|----------------|--------------------|--------------------------|---------------------|
| Pre Bt | | | |
| 1995 | 371.7 | 59.23 | 159.35 |
| 1996 | 370.3 | 58.57 | 158.17 |
| 1997 | 347.9 | 20.18 | 58.01 |
| 1998 | 320.9 | 24.29 | 75.69 |
| 1999 | 326.5 | 42.45 | 130.02 |
| 2000 | 309.10 | 25.45 | 82.34 |
| 2001 | 324.60 | 38.62 | 118.98 |
| Post Bt | | | |
| 2002 | 279.00 | 41.43 | 148.49 |
| 2003 | 266.60 | 46.29 | 173.63 |
| 2004 | 268.20 | 38.57 | 143.83 |
| 2005 | 256.40 | 37.89 | 147.78 |
| 2006 | 241.80 | 36.58 | 151.28 |
| 2007 | 175.40 | 60.03 | 342.25 |
| 2008 | 116.10 | 31.45 | 270.89 |
| 2009 | 179.40 | 52.57 | 293.03 |
| 2010 | 204.28 | 57.16 | 279.81 |
| 2011 | 187.40 | 45.94 | 245.14 |
| 2012 | 191.30 | 103.95 | 543.39 |
| 2013 | 186.70 | 113.98 | 610.50 |
| 2014 | 196.50 | 35.32 | 179.75 |
| 2015 | 200.00 | 75.06 | 375.30 |
| 2016 | 200.30 | 144.72 | 722.52 |
| 2017 | 207.46 | 68.45 | 329.97 |
| 2018 | 209.58 | 106.42 | 508.30 |
| 2019 | 276.08 | 78.25 | 283.90 |
| 2020 | 276.10 | 125.87 | 455.60 |
| 2021 | 275.84 | 105.22 | 381.45 |
| 2022 | 253.73 | 59.22 | 233.39 |
| 2023 | 260.40 | 84.63 | 325.00 |
| 2024 (P) | 235.42 | 141.25 | 600.00 |

Table 5.14 COTTON YIELD AMARAVATI DISTRICT

Appendix 'VII'**FERTILISER USE AMARAVATI DISTRICT**

(Tonnes)

| YEAR | NITROGEN CONSUMPTION | PHOSPHATE CONSUMPTION | POTASH CONSUMPTION | TOTAL CONSUMPTION |
|-------------|---------------------------------|----------------------------------|-------------------------------|------------------------------|
| 1995 | 33480 | 15308 | 5924 | 54712 |
| 1996 | 36816 | 15110 | 6549 | 58475 |
| 1997 | 30809 | 14633 | 3504 | 48946 |
| 1998 | 28676 | 11560 | 4258 | 44494 |
| 1999 | 32051 | 14131 | 6303 | 52485 |
| 2000 | 24902 | 14729 | 4414 | 44045 |
| 2001 | 22929 | 13199 | 2940 | 39068 |
| 2002 | 21856 | 13718 | 4510 | 40084 |
| 2003 | 22180 | 17625 | 2564 | 42369 |
| 2004 | 19398 | 13816 | 3007 | 36221 |
| 2005 | 19873 | 13026 | 5673 | 38572 |
| 2006 | 22663 | 15212 | 6347 | 44222 |
| 2007 | 30130 | 16548 | 7301 | 53979 |
| 2008 | 32612 | 28361 | 12630 | 73603 |
| 2009 | 38636 | 28853 | 12798 | 80287 |
| 2010 | 37910 | 31649 | 10397 | 79956 |
| 2011 | 39438 | 32650 | 12101 | 84189 |
| 2012 | 37984 | 25241 | 8855 | 72080 |
| 2013 | 37973 | 24615 | 10093 | 72681 |
| 2014 | 37393 | 23701 | 14274 | 75368 |
| 2015 | 41776 | 31873 | 13922 | 87571 |
| 2016 | 33341 | 22777 | 10833 | 66951 |
| 2017 | 35041 | 25616 | 13467 | 74124 |

Table 5.15 FERTILISER USE AMARAVATI DISTRICT

COTTON PICKING AND PRODUCTION

(Extract from structured answers and calculations thereon)

(Acreage in Hectares, Quantity in Kgs)

| SL | COTTON ACREAGE | NO OF PICKINGS | QUANTITY PER PICKING | | | | | TOTAL PRODUCTION | PRODUCTION /HA |
|-----|-------------------|-------------------|----------------------|--------|-------|--------|-------|---------------------|-------------------|
| | | | FIRST | SECOND | THIRD | FOURTH | FIFTH | | |
| | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h)=(c+d+e+f+g) | (j)=(h/a) |
| 1. | 0.405 | Four | 210 | 660 | 360 | 33 | 0 | 1263 | 3121 |
| 2. | 0.405 | Four | 480 | 420 | 370 | 150 | 0 | 1420 | 3509 |
| 3. | 0.809 | Three | 200 | 200 | 100 | 0 | 0 | 500 | 618 |
| 4. | 0.809 | Three | 800 | 400 | 200 | 0 | 0 | 1400 | 1730 |
| 5. | 0.809 | Four | 360 | 670 | 410 | 340 | 0 | 1780 | 2199 |
| 6. | 0.809 | Four | 450 | 580 | 490 | 320 | 0 | 1840 | 2273 |
| 7. | 0.809 | Four | 600 | 300 | 200 | 100 | 0 | 1200 | 1483 |
| 8. | 0.809 | Four | 310 | 690 | 480 | 360 | 0 | 1840 | 2273 |
| 9. | 0.809 | Three | 320 | 760 | 340 | 0 | 0 | 1420 | 1754 |
| 10. | 0.809 | Three | 320 | 760 | 340 | 0 | 0 | 1420 | 1754 |
| 11. | 0.809 | Three | 1200 | 700 | 500 | 0 | 0 | 2400 | 2965 |
| 12. | 0.809 | Four | 530 | 740 | 410 | 280 | 0 | 1960 | 2422 |

| SL | COTTON ACREAGE | NO OF PICKINGS | QUANTITY PER PICKING | | | | | TOTAL PRODUCTION | PRODUCTION /HA |
|-----|-------------------|-------------------|----------------------|--------|-------|--------|-------|---------------------|-------------------|
| | | | FIRST | SECOND | THIRD | FOURTH | FIFTH | | |
| | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h)=(c+d+e+f+g) | (j)=(h/a) |
| 13. | 0.809 | Four | 630 | 950 | 500 | 260 | 0 | 2340 | 2891 |
| 14. | 0.809 | Four | 500 | 1000 | 500 | 500 | 0 | 2500 | 3089 |
| 15. | 0.809 | Five | 500 | 1000 | 500 | 500 | 100 | 2600 | 3212 |
| 16. | 0.809 | Four | 680 | 1060 | 450 | 230 | 0 | 2420 | 2990 |
| 17. | 0.809 | Three | 500 | 400 | 500 | 0 | 0 | 1400 | 1730 |
| 18. | 1.012 | Three | 1200 | 1400 | 200 | 0 | 0 | 2800 | 2768 |
| 19. | 1.012 | Four | 1120 | 1443 | 450 | 360 | 0 | 3373 | 3334 |
| 20. | 0.809 | Four | 224 | 930 | 360 | 430 | 0 | 1944 | 2402 |
| 21. | 0.809 | Three | 230 | 980 | 630 | 0 | 0 | 1840 | 2273 |
| 22. | 0.809 | Four | 800 | 500 | 500 | 300 | 0 | 2100 | 2595 |
| 23. | 0.809 | Four | 280 | 590 | 380 | 390 | 0 | 1640 | 2026 |
| 24. | 1.012 | Four | 1120 | 1443 | 450 | 360 | 0 | 3373 | 3334 |
| 25. | 1.012 | Four | 680 | 790 | 290 | 465 | 0 | 2225 | 2199 |
| 26. | 1.214 | Three | 1000 | 800 | 300 | 0 | 0 | 2100 | 1730 |
| 27. | 1.214 | Three | 1200 | 1000 | 50 | 0 | 0 | 2250 | 1853 |
| 28. | 1.214 | Four | 1130 | 1410 | 620 | 320 | 0 | 3480 | 2866 |
| 29. | 0.809 | Four | 500 | 930 | 390 | 220 | 0 | 2040 | 2520 |
| 30. | 0.809 | Four | 370 | 790 | 410 | 408 | 0 | 1978 | 2444 |
| 31. | 0.809 | Four | 420 | 890 | 390 | 340 | 0 | 2040 | 2520 |
| 32. | 1.012 | Four | 530 | 910 | 420 | 290 | 0 | 2150 | 2125 |
| 33. | 1.012 | Four | 530 | 910 | 420 | 290 | 0 | 2150 | 2125 |

| SL | COTTON ACREAGE | NO OF PICKINGS | QUANTITY PER PICKING | | | | | TOTAL PRODUCTION | PRODUCTION /HA |
|-----|-------------------|-------------------|----------------------|--------|-------|--------|-------|---------------------|-------------------|
| | | | FIRST | SECOND | THIRD | FOURTH | FIFTH | | |
| | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h)=(c+d+e+f+g) | (j)=(h/a) |
| 34. | 1.012 | Four | 350 | 890 | 580 | 280 | 0 | 2100 | 2076 |
| 35. | 1.012 | Four | 350 | 890 | 580 | 280 | 0 | 2100 | 2076 |
| 36. | 1.619 | Four | 860 | 1560 | 910 | 870 | 0 | 4200 | 2595 |
| 37. | 1.619 | Four | 1000 | 2100 | 1200 | 500 | 0 | 4800 | 2965 |
| 38. | 0.809 | Three | 1300 | 750 | 300 | 0 | 0 | 2350 | 2903 |
| 39. | 0.809 | Three | 800 | 400 | 100 | 0 | 0 | 1300 | 1606 |
| 40. | 0.809 | Four | 550 | 910 | 490 | 230 | 0 | 2180 | 2693 |
| 41. | 0.809 | Four | 550 | 910 | 490 | 230 | 0 | 2180 | 2693 |
| 42. | 1.012 | Four | 800 | 1020 | 480 | 590 | 0 | 2890 | 2856 |
| 43. | 1.012 | Four | 800 | 1020 | 480 | 590 | 0 | 2890 | 2856 |
| 44. | 1.012 | Three | 830 | 1030 | 777 | 0 | 0 | 2637 | 2606 |
| 45. | 1.012 | Three | 830 | 1060 | 777 | 0 | 0 | 2667 | 2636 |
| 46. | 1.012 | Four | 620 | 880 | 380 | 295 | 0 | 2175 | 2150 |
| 47. | 0.809 | Three | 700 | 200 | 100 | 0 | 0 | 1000 | 1236 |
| 48. | 0.809 | Three | 600 | 900 | 300 | 0 | 0 | 1800 | 2224 |
| 49. | 1.012 | Three | 900 | 900 | 500 | 0 | 0 | 2300 | 2273 |
| 50. | 1.214 | Three | 1000 | 600 | 200 | 0 | 0 | 1800 | 1483 |
| 51. | 1.214 | Three | 1000 | 500 | 300 | 0 | 0 | 1800 | 1483 |
| 52. | 1.012 | Four | 440 | 920 | 580 | 297 | 0 | 2237 | 2211 |
| 53. | 1.619 | Four | 2000 | 800 | 400 | 50 | 0 | 3250 | 2008 |
| 54. | 0.809 | Three | 900 | 450 | 450 | 0 | 0 | 1800 | 2224 |

| SL | COTTON ACREAGE | NO OF PICKINGS | QUANTITY PER PICKING | | | | | TOTAL PRODUCTION | PRODUCTION /HA |
|-----|-------------------|-------------------|----------------------|--------|-------|--------|-------|---------------------|-------------------|
| | | | FIRST | SECOND | THIRD | FOURTH | FIFTH | | |
| | (a) | (b) | (c) | (d) | (e) | (f) | (g) | (h)=(c+d+e+f+g) | (j)=(h/a) |
| 55. | 1.619 | Three | 1400 | 1000 | 400 | 0 | 0 | 2800 | 1730 |
| 56. | 2.023 | Three | 2500 | 970 | 310 | 0 | 0 | 3780 | 1868 |
| 57. | 2.428 | Four | 2400 | 2000 | 1800 | 100 | 0 | 6300 | 2595 |
| 58. | 1.214 | Four | 800 | 300 | 200 | 150 | 0 | 1450 | 1194 |
| 59. | 1.619 | Four | 900 | 600 | 300 | 100 | 0 | 1900 | 1174 |
| 60. | 0.809 | Three | 1600 | 800 | 150 | 0 | 0 | 2550 | 3151 |
| 61. | 1.619 | Three | 2500 | 1000 | 500 | 0 | 0 | 4000 | 2471 |
| 62. | 2.833 | Four | 4000 | 2500 | 400 | 100 | 0 | 7000 | 2471 |
| 63. | 4.047 | Four | 8000 | 3000 | 1000 | 200 | 0 | 12200 | 3015 |
| 64. | 4.047 | Four | 4000 | 3333 | 2000 | 1000 | 0 | 10333 | 2553 |
| 65. | 0.674 | Three | 1200 | 800 | 222 | 0 | 0 | 2222 | 3294 |
| 66. | 2.023 | Three | 10000 | 1000 | 500 | 0 | 0 | 11500 | 5683 |
| 67. | 4.047 | Four | 2000 | 1800 | 1500 | 100 | 0 | 5400 | 1334 |
| 68. | 4.047 | Three | 6000 | 2500 | 1500 | 0 | 0 | 10000 | 2471 |
| 69. | 4.047 | Three | 6000 | 3000 | 1000 | 0 | 0 | 10000 | 2471 |
| 70. | 2.023 | Three | 1500 | 1000 | 500 | 0 | 0 | 3000 | 1483 |

Table 5.16 COTTON PICKING AND PRODUCTION

Appendix 'IX'**CULTIVATION PRACTICES**

(Extract from structured answers and calculations thereon)

(Cotton Seed and Fertiliser in Kgs, Pesticides in Ltrs)

| COTTON VARIETY | COTTON SEED | FERTILIZERS | PESTICIDES | PRIMARY SOURCE OF IRRIGATION | CROP ROTATION |
|-----------------------|--------------------|--------------------|-------------------|-------------------------------------|------------------------|
| Bt | 7.125 | 360 | 3 | Rainfall | Soybean |
| Bt | 7.125 | 450 | 4 | Rainfall | Soybean |
| Bt | 1.8 | 700 | 2 | Rainfall | Pigeon Pea |
| Bt | 1.8 | 540 | 2 | Rainfall | Pigeon Pea |
| Bt | 10.5 | 5000 | 16 | Rainfall | Pigeon Pea |
| Bt | 3.8 | 288 | 3.5 | Rainfall | Soybean |
| Bt | 7.6 | 288 | 7 | Rainfall | Soybean |
| Bt | 7.125 | 420 | 4 | Rainfall | Soybean |
| Bt | 7.125 | 320 | 3 | Rainfall | Soybean |
| Bt | 12 | 3500 | 12 | Rainfall | Pigeon Pea |
| Bt | 4 | 1000 | 3 | Rainfall | Pigeon Pea |
| Bt | 3.8 | 288 | 3.5 | Rainfall | Soybean |
| Bt | 1.9 | 76 | 2 | Rainfall | Soybean |
| Bt | 3.8 | 288 | 4 | Rainfall | Soybean |
| Bt | 2.8 | 130 | 6 | Well | Soybean |
| Bt | 4.75 | 180 | 6 | Rainfall | Soybean |
| Bt | 3.8 | 1300 | 5 | Rainfall | Soybean |
| Bt | 6 | 1450 | 5.5 | Rainfall | Soybean |
| Bt | 9 | 3200 | 12 | Rainfall | Soybean |
| Bt | 2 | 400 | 3 | Rainfall | Soybean |
| Bt | 4 | 700 | 6 | Rainfall | Soybean |
| Bt | 8 | 2300 | 7 | Rainfall | Soybean |
| Bt | 3.8 | 288 | 3.5 | Rainfall | Soybean |
| Bt | 3.8 | 144 | 4 | Rainfall | Soybean |
| Bt | 6 | 2000 | 10 | Rainfall | Pigeon Pea |
| Bt | 4.75 | 400 | 2 | Rainfall | Soybean |
| Bt | 3.8 | 320 | 3.5 | Rainfall | Soybean, pigeon pea |
| Bt | 3.8 | 144 | 4 | Rainfall | Soybean |

| COTTON VARIETY | COTTON SEED | FERTILIZERS | PESTICIDES | PRIMARY SOURCE OF IRRIGATION | CROP ROTATION |
|-----------------------|--------------------|--------------------|-------------------|-------------------------------------|-------------------------|
| Bt | 4.5 | 1200 | 4.5 | Well | Soybean |
| Bt | 2 | 350 | 2.1 | Rainfall | Soybean |
| Bt | 8.55 | 648 | 5 | Rainfall | Soybean |
| Bt | 3.8 | 200 | 3 | Rainfall | Soybean |
| Hybrid | 6 | 320 | 2 | Rainfall | Soybean |
| Bt | 3.8 | 288 | 4 | Rainfall | Soybean |
| Bt | 3.8 | 144 | 4 | Rainfall | Soybean |
| Bt | 3.8 | 200 | 4 | Rainfall | Soybean |
| Bt | 4 | 1200 | 4 | Rainfall | Pigeon Pea |
| Bt | 5.7 | 400 | 3 | Rainfall | Pigeon Pea |
| Bt | 20 | 3200 | 12 | Rainfall | Pigeon Pea |
| Bt | 3.8 | 288 | 4 | Rainfall | Soybean |
| Bt | 5.7 | 280 | 3 | Rainfall | Soybean |
| Non-Bt | 9 | 3500 | 16 | Rainfall | Pigeon Pea |
| Bt | 5.7 | 150 | 1.5 | Rainfall | Pigeon Pea |
| Bt | 3.8 | 200 | 4 | Rainfall | Turmeric |
| Bt | 3.8 | 200 | 3 | Well | Turmeric |
| Bt | 3.8 | 144 | 4.5 | Rainfall | Soyabean, Pigeon Pea |
| Bt | 21 | 500 | 6 | Well | Pigeon Pea |
| Bt | 4.75 | 400 | 3 | Rainfall | Soybean |
| Bt | 4.75 | 420 | 4 | Rainfall | Soybean |
| Bt | 3.8 | 300 | 3 | Rainfall | Soybean |
| Bt | 3 | 1000 | 4 | Rainfall | Soybean |
| Bt | 4 | 1500 | 5 | Rainfall | Soybean |
| Bt | 2.7 | 650 | 4 | Well | Soybean |
| Bt | 4.75 | 180 | 6 | Rainfall | Soybean |
| Bt | 3.8 | 360 | 4 | Rainfall | Soybean |
| Bt | 4.75 | 400 | 2 | Rainfall | Soybean |
| Bt | 5.7 | 300 | 3 | Rainfall | Soybean |
| Bt | 36 | 9600 | 48 | Rainfall | Soybean |
| Bt | 3.8 | 288 | 4.5 | Rainfall | Soybean |
| Bt | 3.8 | 1300 | 4 | Rainfall | Soybean |
| Bt | 3.8 | 280 | 2 | Rainfall | Soybean |
| Bt | 3.8 | 288 | 4 | Rainfall | Soybean |
| Bt | 4 | 1500 | 4 | Rainfall | Soybean |
| Bt | 3.8 | 144 | 4 | Rainfall | Soybean |

| COTTON VARIETY | COTTON SEED | FERTILIZERS | PESTICIDES | PRIMARY SOURCE OF IRRIGATION | CROP ROTATION |
|-----------------------|--------------------|--------------------|-------------------|-------------------------------------|----------------------|
| Bt | 11.4 | 200 | 3 | Rainfall | Pigeon Pea |
| Bt | 4.75 | 180 | 6 | Rainfall | Soybean |
| Bt | 2.4 | 1000 | 3.6 | Well | Soybean |
| Bt | 3.8 | 200 | 4 | Rainfall | Soybean |
| Bt | 9 | 3200 | 16 | Rainfall | Soybean |
| Bt | 3.8 | 500 | 3 | Rainfall | Soybean |

Table 5.17 CULTIVATION PRACTICES BY THE COTTON GROWING FARMERS

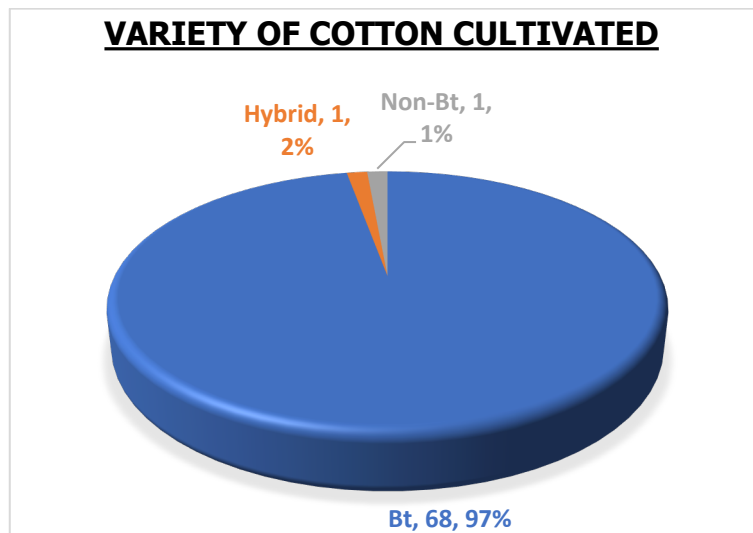
DEMONSTRATION OF COTTON CULTIVATION PRACTICES1. **Variety of Cotton Seeds Sown**

Figure 22 REPRESENTATION OF VARIETY OF COTTON CULTIVATED

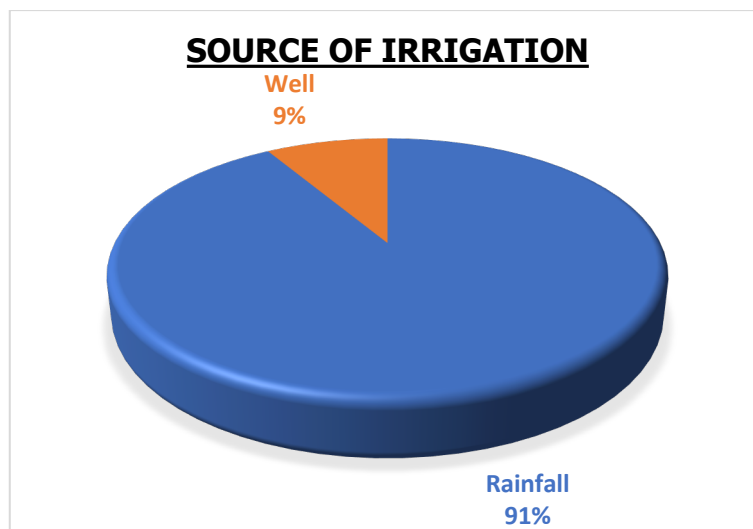
2. **Source of Irrigation**

Figure 23 REPRESENTATION OF SOURCE OF IRRIGATION

3. **Crop Rotation/ Intercrop Practices followed by the Interviewed Farmers**

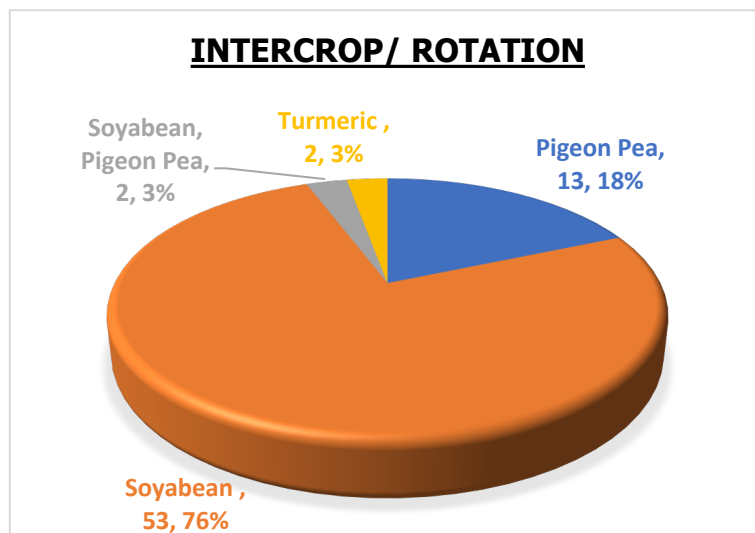


Figure 24 REPRESENTATION OF INTERCROP PRACTICES

4. **Use of Cotton Seeds by Farmers** (in Kgs/ Acres)

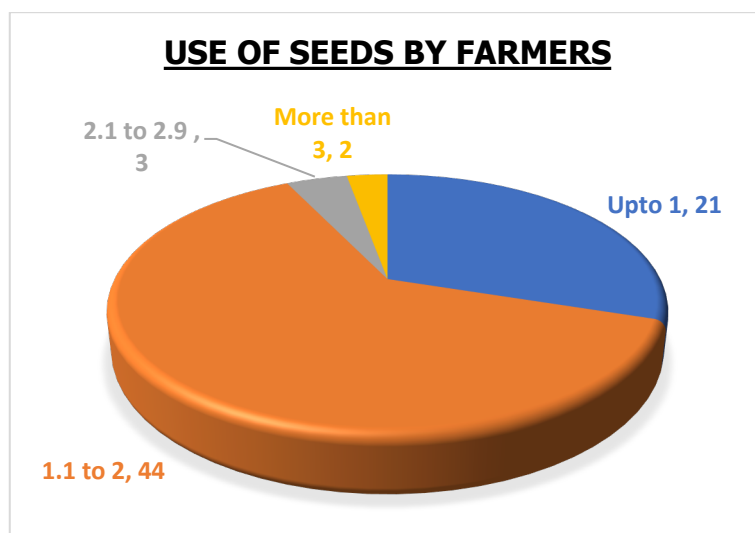


Figure 25 REPRESENTATION OF USE OF COTTON SEED IN KGS PER ACRE

5. **Fertilisers used by the farmers** (Kgs/ Acre)

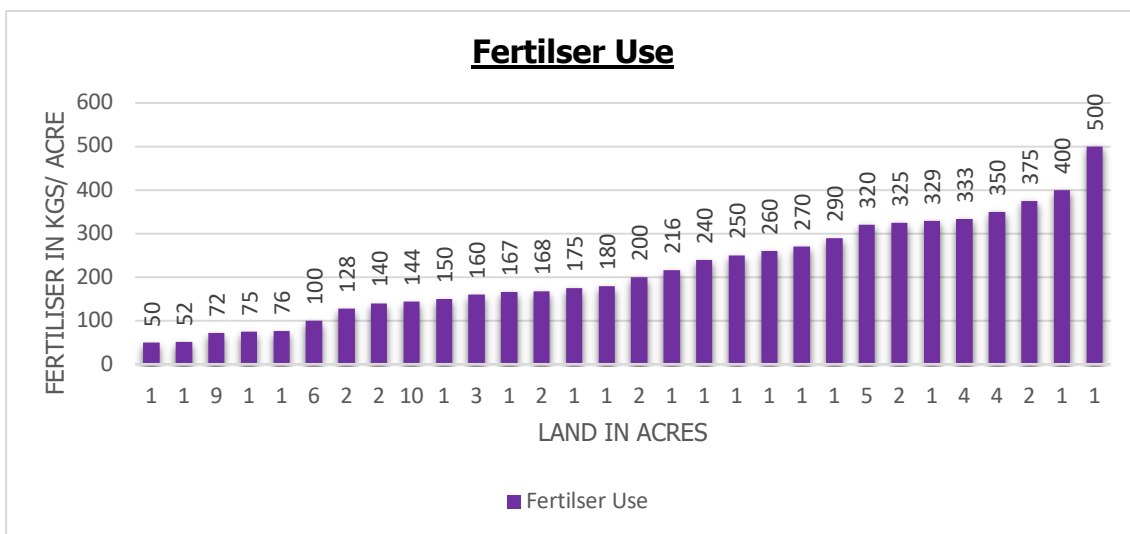


Figure 26 FERTILISER/ ACRE USED BY THE NUMBER OF FARMERS

6. **Use of Pesticides by Farmers** (Ltrs/ Acre)

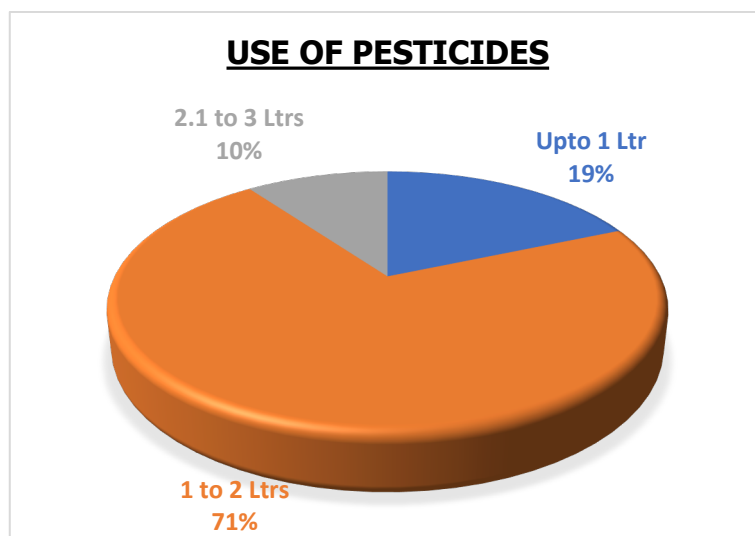


Figure 27 REPRESENTATION OF USE OF PESTICIDES/ ACRE

Appendix 'XI'**MARKETING AND SALES**

(Extract from structured answers and calculations thereon)

| COTTON SOLD TO | ANY GOVT SUPPORT OR SUBSIDIES FOR COTTON | IF YES, FOR WHAT REASON | AWARENESS ON GOVT SCHEMES |
|-----------------------|---|--------------------------------|----------------------------------|
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | Yes | Crop failure | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Cooperative societies | Yes | NA | Crop insurance |
| Local traders | Yes | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |

| COTTON SOLD TO | ANY GOVT SUPPORT OR SUBSIDIES FOR COTTON | IF YES, FOR WHAT REASON | AWARENESS ON GOVT SCHEMES |
|-----------------------|---|--------------------------------|----------------------------------|
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | no | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | Yes | Insurance | Crop insurance |
| Local traders | No | NA | Crop insurance |
| Local traders | No | NA | Crop insurance |

Table 5.18 DETAILS OF MARKETING AND SALES

**SOCIAL DEMOGRAPHY OF INTERVIEWED FARMERS
IN AMARAVATI DISTRICT**

1. **Age Group (in Yrs)**

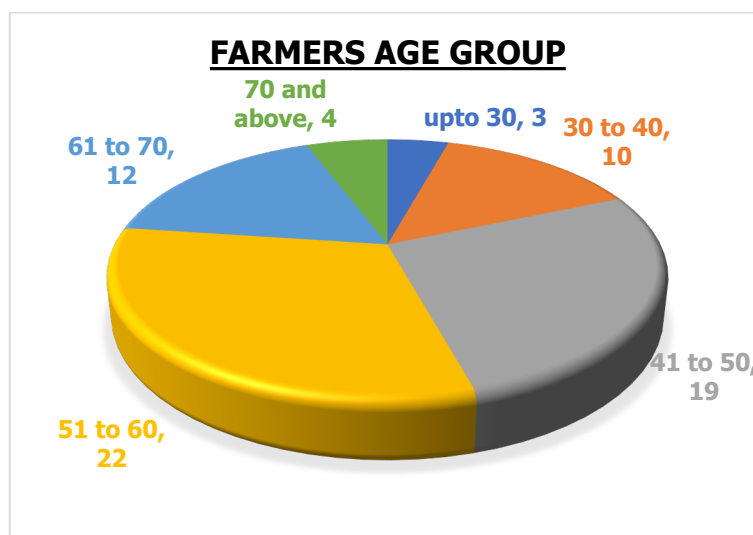


Figure 28 AGE GROUP OF COTTON GROWING FARMERS

2. **Experience on Cotton Cultivation (in Yrs)**

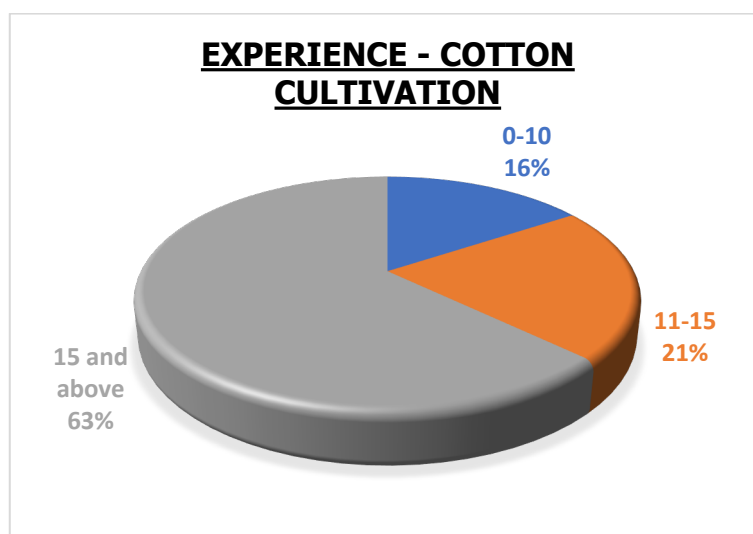


Figure 29 COTTON CULTIVATION EXPERIENCE

3. Educational Qualification

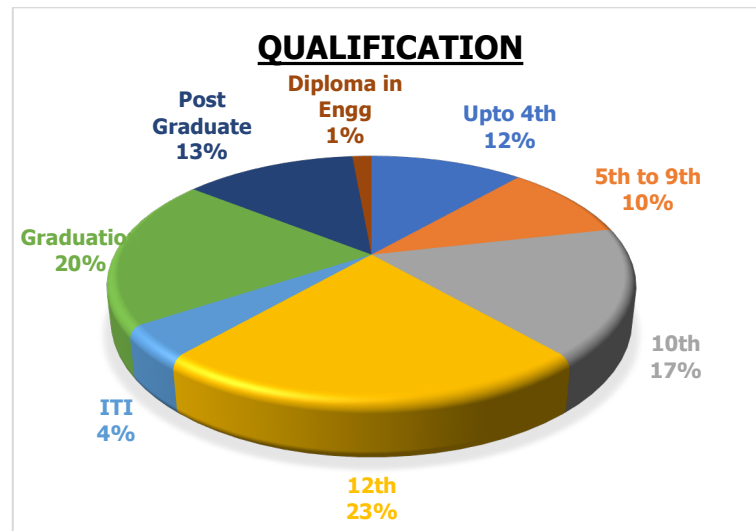


Figure 30 QUALIFICATION OF COTTON GROWING FARMERS

Appendix 'XIII'**TOTAL LAND HOLDING, LAND UNDER COTTON ACREAGE &
DEPENDENT FAMILY MEMBERS**

(Extract from structured answers and calculations thereon)

(Land in Hectares, Family Members in Number)

| SL | LAND HOLDING | LAND UNDER COTTON | FAMILY MEMBERS | %AGE LAND USED FOR COTTON |
|-----|--------------|-------------------|----------------|---------------------------|
| | (a) | (b) | (c) | (d)=(b*100/c) |
| 1. | 0.405 | 0.405 | 3 | 100 |
| 2. | 0.809 | 0.405 | 4 | 50 |
| 3. | 0.809 | 0.809 | 3 | 100 |
| 4. | 0.809 | 0.809 | 3 | 100 |
| 5. | 0.809 | 0.809 | 2 | 100 |
| 6. | 0.809 | 0.809 | 2 | 100 |
| 7. | 0.809 | 0.809 | 6 | 100 |
| 8. | 0.809 | 0.809 | 1 | 100 |
| 9. | 0.809 | 0.809 | 3 | 100 |
| 10. | 0.809 | 0.809 | 3 | 100 |
| 11. | 0.809 | 0.809 | 3 | 100 |
| 12. | 1.012 | 0.809 | 1 | 80 |
| 13. | 1.012 | 0.809 | 3 | 80 |
| 14. | 1.012 | 0.809 | 2 | 80 |
| 15. | 1.012 | 0.809 | 4 | 80 |
| 16. | 1.012 | 0.809 | 3 | 80 |
| 17. | 1.012 | 0.809 | 3 | 80 |
| 18. | 1.012 | 1.012 | 3 | 100 |
| 19. | 1.012 | 1.012 | 2 | 100 |
| 20. | 1.214 | 0.809 | 2 | 67 |
| 21. | 1.214 | 0.809 | 3 | 67 |
| 22. | 1.214 | 0.809 | 2 | 67 |
| 23. | 1.214 | 0.809 | 2 | 67 |
| 24. | 1.214 | 1.012 | 2 | 83 |
| 25. | 1.214 | 1.012 | 3 | 83 |
| 26. | 1.214 | 1.214 | 3 | 100 |
| 27. | 1.214 | 1.214 | 2 | 100 |
| 28. | 1.518 | 1.214 | 4 | 80 |

| SL | LAND HOLDING | LAND UNDER COTTON | FAMILY MEMBERS | %AGE LAND USED FOR COTTON |
|-----|--------------|-------------------|----------------|---------------------------|
| | (a) | (b) | (c) | (d)=(b*100/c) |
| 29. | 1.619 | 0.809 | 3 | 50 |
| 30. | 1.619 | 0.809 | 2 | 50 |
| 31. | 1.619 | 0.809 | 2 | 50 |
| 32. | 1.619 | 1.012 | 2 | 63 |
| 33. | 1.619 | 1.012 | 2 | 63 |
| 34. | 1.619 | 1.012 | 2 | 63 |
| 35. | 1.619 | 1.012 | 2 | 63 |
| 36. | 1.619 | 1.619 | 1 | 100 |
| 37. | 1.619 | 1.619 | 2 | 100 |
| 38. | 1.821 | 0.809 | 5 | 44 |
| 39. | 2.023 | 0.809 | 4 | 40 |
| 40. | 2.023 | 0.809 | 2 | 40 |
| 41. | 2.023 | 0.809 | 2 | 40 |
| 42. | 2.023 | 1.012 | 2 | 50 |
| 43. | 2.023 | 1.012 | 2 | 50 |
| 44. | 2.023 | 1.012 | 2 | 50 |
| 45. | 2.023 | 1.012 | 2 | 50 |
| 46. | 2.023 | 1.012 | 2 | 50 |
| 47. | 2.428 | 0.809 | 4 | 33 |
| 48. | 2.428 | 0.809 | 3 | 33 |
| 49. | 2.833 | 1.012 | 10 | 36 |
| 50. | 2.833 | 1.214 | 4 | 43 |
| 51. | 3.238 | 1.214 | 4 | 38 |
| 52. | 4.047 | 1.012 | 3 | 25 |
| 53. | 4.856 | 1.619 | 4 | 33 |
| 54. | 5.666 | 0.809 | 6 | 14 |
| 55. | 5.666 | 1.619 | 6 | 29 |
| 56. | 6.070 | 2.023 | 4 | 33 |
| 57. | 6.070 | 2.428 | 4 | 40 |
| 58. | 6.880 | 1.214 | 4 | 18 |
| 59. | 7.285 | 1.619 | 9 | 22 |
| 60. | 8.094 | 0.809 | 13 | 10 |
| 61. | 8.094 | 1.619 | 5 | 20 |
| 62. | 8.094 | 2.833 | 6 | 35 |
| 63. | 8.094 | 4.047 | 6 | 50 |
| 64. | 8.768 | 4.047 | 2 | 46 |
| 65. | 9.522 | 0.674 | 6 | 7 |
| 66. | 10.117 | 2.023 | 5.5 | 20 |
| 67. | 14.164 | 4.047 | 16 | 29 |
| 68. | 16.188 | 4.047 | 5 | 25 |

| SL | LAND HOLDING | LAND UNDER COTTON | FAMILY MEMBERS | %AGE LAND USED FOR COTTON |
|-----------|---------------------|--------------------------|-----------------------|----------------------------------|
| | (a) | (b) | (c) | (d)=(b*100/c) |
| 69. | 17.807 | 4.047 | 8 | 23 |
| 70. | 18.211 | 2.023 | 10 | 11 |

Table 5.19 TOTAL LAND HOLDING, LAND UNDER COTTON ACREAGE & DEPENDENT FAMILY MEMBERS

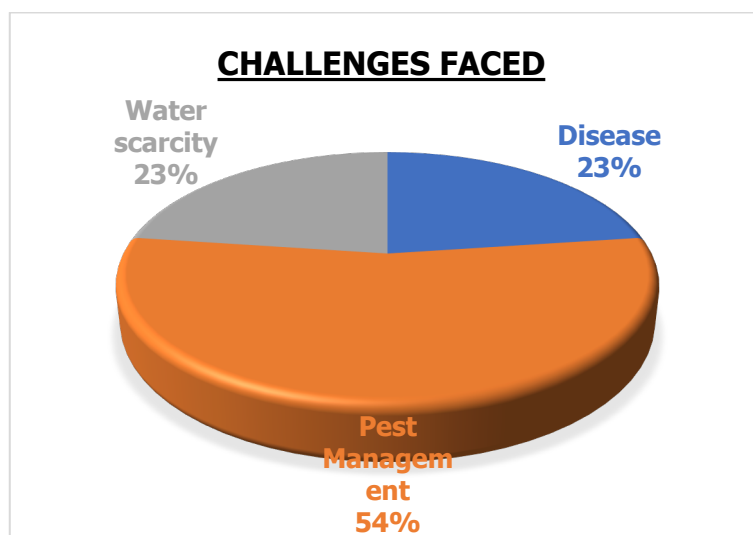
GRAPHICAL PRESENTATION OF MISCELLENEOUS COMPONENT1. **Challenges faced by Cotton Growing Farmers**

Figure 31 CHALLENGES FACED BY FARMERS

2. **Training or Extended Services Received by Cotton Growing Farmers From Government Agencies**

Figure 32 REPRESENTATION OF TRAINING RECEIVED BY FARMERS

3. **Cotton Growing Farmers Showing Interests In Organic As Well As Sustainable Practices**

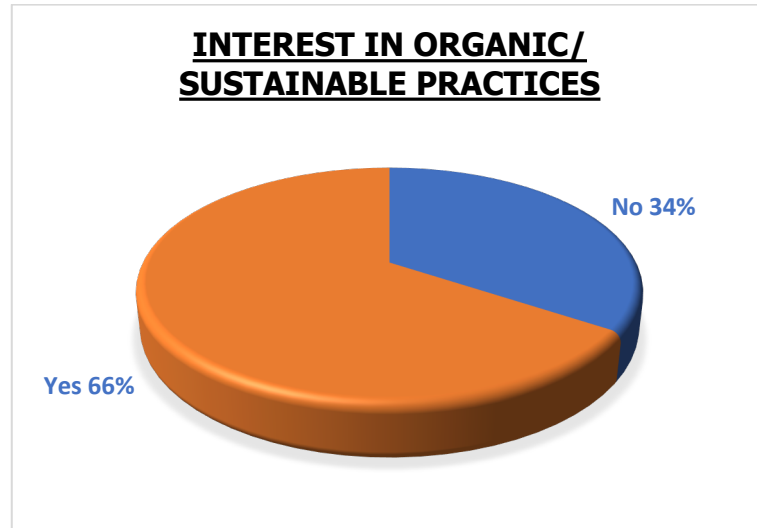


Figure 33 INTERESTS OF FARMERS TOWARDS SUSTAINABLE FARMING

4. **Assistance to Cotton Growing Farmers from Govt Agencies**

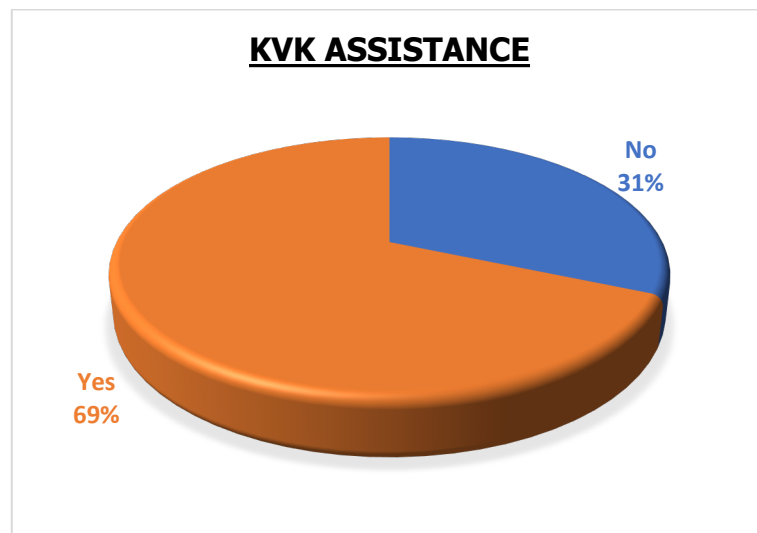


Figure 34 KVK ASSISTANCE

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