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### Knowledge and adoption of maize production technology among farmers of Buldhana district

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#### Abstract

Maize is an important cereal crop in India, valued as food, feed, and industrial raw material, and its cultivation is expanding into non-traditional areas like Vidarbha region of Maharashtra. However, farmers' yields often remain below potential, largely because knowledge of improved practices does not always translate into adoption. This study was conducted among 120 maize growers from ten villages in Buldhana and Chikhli talukas of Buldhana district, using an exploratory research design, with data collected through structured personal interviews and analysed using frequency, percentage, mean and standard deviation. Farmers showed good knowledge of basic practices such as land preparation, sowing time and spacing, and harvesting (85–97%), but knowledge was considerably lower for technical practices like early-maturing varieties (29.17%) and maize–black gram intercropping (16.67%). Majority of the respondents (65.00%) had medium knowledge, with a mean Knowledge Index of 70.68. Adoption followed a similar trend but with wider gaps in technical practices, with only 28.33 per cent applying compost/FYM and 7.50 per cent practicing gap filling, indicating that knowledge did not fully translate into practice. Majority (70.83%) had medium adoption, with a mean Adoption Index of 61.57. The findings suggest that focused extension efforts on variety selection, seed treatment, and timely intercultural operations, along with better input access, could help bridge the gap between farmers' knowledge and actual practices.

**Keywords:** Maize cultivation, farmer knowledge, technology adoption, Buldhana district

#### 1. Introduction

Maize (*Zea mays* L.) is one of the most important cereal crops grown in India, used both as human food and as a key raw material for industries such as poultry feed, starch, and processed foods. India's maize production has grown steadily in recent years, reaching an estimated 43.41 million tonnes in 2024-25, making it one of the leading coarse cereals in terms of both area and output nationally <sup>[2]</sup>. Maharashtra continues to figure among the leading maize-producing states of the country, with the crop expanding into non-traditional pockets such as the Vidarbha region, where farmers have increasingly adopted maize as a preferred kharif alternative to more water-demanding crops.

Despite this expansion in area, the yield realised by farmers in the field is often lower than what is demonstrated at research stations. This gap is not always due to non-availability of improved technology; it more commonly

stems from farmers either not being fully aware of recommended practices, or being aware but not applying them correctly. Improved maize technology includes practices such as hybrid seed use, correct spacing, balanced fertilizer application, timely plant protection, and efficient irrigation scheduling. When farmers possess sound knowledge of these practices and apply them consistently, this yield gap can be narrowed considerably.

A farmer may be aware of a recommended practice yet choose not to adopt it, due to cost, risk perception, or limited conviction in its benefit. This makes it important to study not just what farmers know, but how much of that knowledge is actually converted into field-level practice. With this understanding, the present study was undertaken to assess the knowledge and adoption of improved maize production technology among farmers of Buldhana district.

## 2. Methodology

The present study was carried out using an exploratory research design of social research. Buldhana district of western Vidarbha was selected as the study area, being one of the leading maize-growing districts of the region. Within the district, Buldhana and Chikhli talukas were purposively selected on the basis of having the largest area under maize cultivation during 2024–25. From each of these two talukas, five villages with higher area under maize crop were selected, making a total of ten study villages. From each selected village, twelve maize growers with at least three years of experience in maize cultivation were chosen randomly, giving a total sample of 120 respondents. Primary data were collected through face-to-face interviews using a structured and pre-tested interview schedule. The collected data were then tabulated and analysed using suitable statistical tools such as frequency, percentage, mean and standard deviation to draw meaningful conclusions from the study.

## 3. Results and Discussion

### 3.1. Profile characteristics of maize farmers

The data presented in Table 1 reveals that a majority

(57.50%) of the respondents belonged to the middle age group (36 to 50 years), with regard to education, majority (32.50%) of the respondents had completed secondary schooling, whereas majority (37.50%) of the respondents had small land holding (1.01 to 2.00 ha), while slightly over one third of the respondents (78.33%) were reported agriculture as their main occupation.

With respect to area under maize cultivation, majority (63.33%) of the respondents cultivated maize on a marginal area of up to 1 hectare. With regard to annual income, more than half (51.67%) of the respondents had an annual income ranging between Rs. 3,46,534 and Rs. 5,91,066/- whereas income from maize crop, 65.83 per cent respondents reported they earned up to Rs. 1,21,333 per annum.

Majority (97.50%) of the respondents reported tubewell or well as their primary source of irrigation and more than half (55.83%) of the respondents had possessed medium experience (11-20 years) in maize cultivation. With respect to sources of information, slightly half (49.17%) of the respondents utilized a medium category of information sources, and more than one third (80.00%) of the respondents had medium level of risk orientation.

**Table 1:** Profile characteristics of maize farmer (n=120)

| Sr. No. | Variable                        | Category                      | Frequency | Percentage |
|---------|---------------------------------|-------------------------------|-----------|------------|
| 1.      | Age                             | Young age (up to 35)          | 18        | 15.00      |
|         |                                 | Middle age (36 to 50)         | 69        | 57.50      |
|         |                                 | Old age (Above 50)            | 33        | 27.50      |
| 2.      | Education                       | Illiterate                    | 02        | 01.67      |
|         |                                 | Primary                       | 06        | 05.00      |
|         |                                 | Middle school                 | 13        | 10.83      |
|         |                                 | Secondary school              | 39        | 32.50      |
|         |                                 | Higher secondary              | 31        | 25.83      |
|         |                                 | College and above             | 29        | 24.17      |
| 3.      | Land holding                    | Marginal (Up to 1.00 ha)      | 06        | 05.00      |
|         |                                 | Small (1.01 to 2.00 ha)       | 45        | 37.50      |
|         |                                 | Semi-Medium (2.01 to 4.00 ha) | 41        | 34.17      |
|         |                                 | Medium (4.01 to 10.00 ha)     | 28        | 23.33      |
|         |                                 | Large (more than 10.00 ha)    | 00        | 00.00      |
| 4.      | Occupation                      | Agriculture + labour          | 07        | 05.83      |
|         |                                 | Agriculture (Farming)         | 94        | 78.33      |
|         |                                 | Agriculture + Allied Activity | 13        | 10.83      |
|         |                                 | Agriculture + Business        | 02        | 01.67      |
|         |                                 | Agriculture + Service         | 04        | 03.33      |
| 5.      | Area under maize crop           | Marginal (Up to 1 ha)         | 76        | 63.33      |
|         |                                 | Small (1.01 to 2 ha)          | 36        | 30.00      |
|         |                                 | Semi-medium (Above 2 ha)      | 08        | 06.67      |
| 6.      | Annual income                   | Up to Rs.346,533              | 34        | 28.33      |
|         |                                 | Rs.346534 to Rs.591066        | 62        | 51.67      |
|         |                                 | Above Rs.591066               | 24        | 20.00      |
| 7.      | Income from maize crop          | Up to Rs.121333               | 79        | 65.83      |
|         |                                 | Rs.121334 to Rs.214666        | 33        | 27.50      |
|         |                                 | Above Rs.214666               | 08        | 06.67      |
| 8.      | Source of irrigation            | No source                     | 00        | 00.00      |
|         |                                 | River                         | 02        | 01.67      |
|         |                                 | Tubewell / Well               | 117       | 97.50      |
|         |                                 | Canal                         | 00        | 00.00      |
|         |                                 | Farm pond                     | 01        | 00.83      |
| 9.      | Experience in maize cultivation | Up to 10 years                | 31        | 25.83      |
|         |                                 | 11 to 20 years                | 67        | 55.83      |
|         |                                 | Above 20 years                | 22        | 18.33      |
| 10.     | Sources of information          | Low                           | 27        | 22.50      |
|         |                                 | Medium                        | 59        | 49.17      |
|         |                                 | High                          | 34        | 28.33      |
| 11.     | Risk orientation                | Low                           | 06        | 05.00      |
|         |                                 | Medium                        | 96        | 80.00      |
|         |                                 | High                          | 18        | 15.00      |

### 3.2. Knowledge of farmers regarding maize production technology

The data depicted in Table 2. revealed that farmers had good knowledge with regard to maize production technology. More than one tenth (95.83%) of the respondents aware about deep ploughing and harrowing practices, and a similar proportion (95.00–96.67%) were aware about maturity stage

of maize crop and expected yield of maize.

More than one tenth (93.00%) of the respondents had knowledge with regard to recommended sowing time, spacing for the maize crop.

On the other hand, slightly below one third (29.17%) of the respondents had known about early-maturing maize varieties.

**Table 2:** Knowledge of farmers regarding maize production technology (n=120)

| Sr. No     | Knowledge                                                                                                                                                              | Yes             | No              |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------|
|            |                                                                                                                                                                        | Freq. (%)       | Freq. (%)       |
| <b>(A)</b> | <b>Preparatory tillage</b>                                                                                                                                             |                 |                 |
| 1          | Selection of soil (medium to black, well drained)                                                                                                                      | 106<br>(88.33%) | 14<br>(11.67%)  |
| 2          | One deep ploughing and two harrowings                                                                                                                                  | 115<br>(95.83%) | 05<br>(04.17%)  |
| 3          | Application of FYM/compost 25 carts / ha)                                                                                                                              | 95<br>(79.17%)  | 25<br>(20.83%)  |
| <b>(B)</b> | <b>Seed</b>                                                                                                                                                            |                 |                 |
| 4          | Early varieties of maize – Phule champion, Vivek sankar maka – 21 and Vivek sankar maka – 27 (80-90 days)                                                              | 35<br>(29.17%)  | 85<br>(70.83%)  |
| 5          | Medium variety of maize – PDKV Arambha, Phule umed (90-100 days)                                                                                                       | 50<br>(41.67%)  | 70<br>(58.33%)  |
| 6          | Late variety of maize - Bio – 9681, HQPM-1 (100-110 days)                                                                                                              | 65<br>(54.17%)  | 55<br>(45.83%)  |
| 7          | Seed rate (15-20 kg/ha.)                                                                                                                                               | 110<br>(91.67%) | 10<br>(08.33%)  |
| <b>(C)</b> | <b>Seed treatments</b>                                                                                                                                                 |                 |                 |
| 8          | Seed treatment with Azotobacter / thiram / PSB                                                                                                                         | 80<br>(66.67%)  | 40<br>(33.33%)  |
| <b>(D)</b> | <b>Sowing</b>                                                                                                                                                          |                 |                 |
| 9          | 20 June to 7 July in kharif season                                                                                                                                     | 112<br>(93.33%) | 08<br>(06.67%)  |
| 10         | First week of October in rabi season                                                                                                                                   | 113<br>(94.17%) | 07<br>(05.83%)  |
| 11         | Spacing (60 X 20 cm)                                                                                                                                                   | 114<br>(95.00%) | 06<br>(05.00%)  |
| 12         | Type of climate required for maize (warm and moist condition)                                                                                                          | 109<br>(90.83%) | 11<br>(09.17%)  |
| <b>(E)</b> | <b>Application of chemical fertilizer</b>                                                                                                                              |                 |                 |
| 13         | Recommended dose of fertilizer (NPK 120:60:30 kg/ha)                                                                                                                   | 80<br>(66.67%)  | 40<br>(33.33%)  |
| 14         | Application of fertilizer NPK as split dose first half nitrogen and full dose of P <sub>2</sub> O <sub>5</sub> and K <sub>2</sub> O at the time of sowing (basal dose) | 92<br>(76.67%)  | 28<br>(23.33%)  |
| 15         | Application of half nitrogen dose-one month after sowing                                                                                                               | 89<br>(74.17%)  | 31<br>(25.83%)  |
| 16         | Method of application of top dressing of nitrogen (Broadcasting/Ring/ row application)                                                                                 | 98<br>(81.67%)  | 22<br>(18.33%)  |
| <b>(F)</b> | <b>Intercultural operations</b>                                                                                                                                        |                 |                 |
| 17         | Gap filling and 2 to 3 hoeing                                                                                                                                          | 45<br>(37.50%)  | 75<br>(62.50%)  |
| 18         | Time of gap filling (Just after complete emergence)                                                                                                                    | 39<br>(32.50%)  | 81<br>(67.50%)  |
| 19         | Weed management with atrazin 0.5 to 1 kg / ha in 700 lit water before germination                                                                                      | 54<br>(45.00%)  | 66<br>(55.00%)  |
| 20         | Hand weeding at proper stage (20 and 40 DAS)                                                                                                                           | 104<br>(86.67%) | 16<br>(13.33%)  |
| <b>(G)</b> | <b>Irrigation management</b>                                                                                                                                           |                 |                 |
| 21         | Proper stage of irrigation (Silking and tasseling, Grain filling)                                                                                                      | 102<br>(85.00%) | 18<br>(15.00%)  |
| <b>(H)</b> | <b>Intercropping/ Mixed cropping</b>                                                                                                                                   |                 |                 |
| 22         | maize + black gram (Udid) intercropping system                                                                                                                         | 20<br>(16.67%)  | 100<br>(83.33%) |
| <b>(I)</b> | <b>Plant protection measures</b>                                                                                                                                       |                 |                 |
| 23         | Major pest of maize (Stem borer, fall army worm, shoot fly, corn ear worm, aphids)                                                                                     | 110             | 10              |

|     |                                                             |                 |                |
|-----|-------------------------------------------------------------|-----------------|----------------|
|     |                                                             | (91.67%)        | (08.33%)       |
| 24  | Insecticide used to control stem borer                      | 57<br>(47.50%)  | 63<br>(52.50%) |
| 25  | Major diseases of maize (leaf spot, rust and leaf blight)   | 112<br>(93.33%) | 08<br>(06.67%) |
| 26  | Fungicide for seed treatment to control leaf blight disease | 53<br>(44.17%)  | 67<br>(55.83%) |
| 27  | Fungicide for seed treatment to control leaf spot disease   | 43<br>(35.83%)  | 77<br>(64.17%) |
| 28  | IPM for control insect of maize                             | 94<br>(78.33%)  | 26<br>(21.67%) |
| (J) | <b>Harvesting</b>                                           |                 |                |
| 29  | Proper stage of harvesting of early varieties               | 83<br>(69.17%)  | 37<br>(30.83%) |
| 30  | Proper stage of harvesting of late and medium varieties     | 105<br>(87.50%) | 15<br>(12.50%) |
| 31  | Maturity sign of the maize                                  | 116<br>(96.67%) | 04<br>(03.33%) |
| 32  | Average yield (80-100 q / ha.)                              | 114<br>(95.00%) | 06<br>(05.00%) |

**Table 3:** Distribution of respondents according to their overall knowledge level about maize production technology (n=120)

| Sr. No.      | Category             | Respondent (n=120) |            |
|--------------|----------------------|--------------------|------------|
|              |                      | Frequency          | Percentage |
| 1            | Low (<63.91)         | 18                 | 15.00      |
| 2            | Medium (63.91-77.45) | 78                 | 65.00      |
| 3            | High (>77.45)        | 24                 | 20.00      |
| Total        |                      | 120                | 100.00     |
| Mean = 70.68 |                      | S.D. = 6.76        |            |

The data shown in Table 3. revealed that, majority of the respondents (65.00%) possessed medium level of knowledge about improved maize cultivation practices, followed by 20.00 per cent with high knowledge and 15.00 per cent with low knowledge. These findings were in conformity with the findings of [1, 5, 6, 7].

### 3.3. Adoption of farmers regarding maize production technology

Table 4. indicates that farmers showed high adoption for basic operations. Recommended preparatory tillage practices were adopted fully by 76.67% to 85.00% of respondents, majority (84.17%) of the respondents followed recommended sowing time for maize cultivation, whereas 87.50 per cent of the respondents harvested their crop at proper maturity stage.

However, adoption was considerably lower for some of the more technical practices. Only 28.33% of farmers had fully adopted application of compost/ FYM, while nearly half (52.50%) had not adopted them at all. Gap filling was neglected by a majority of farmers, with more than two-thirds reporting no adoption.

**Table 4:** Adoption of farmers regarding maize production technology (n=120)

| Sr. No | Adoption                                                                                                                                                                       | Fully adopted   | Partially adopted | Not adopted    |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------|----------------|
|        |                                                                                                                                                                                | Freq. (%)       | Freq. (%)         | Freq. (%)      |
| (A)    | <b>Preparatory tillage</b>                                                                                                                                                     |                 |                   |                |
|        | a) Selection of soil (medium to black, well drained)                                                                                                                           | 92<br>(76.67%)  | 28<br>(23.33%)    | 00<br>(00.00%) |
|        | b) One deep ploughing and two harrowing                                                                                                                                        | 102<br>(85.00%) | 18<br>(15.00%)    | 00<br>(00.00%) |
|        | c) Application compost/ FYM (25carts/ha)                                                                                                                                       | 34<br>(28.33%)  | 63<br>(52.50%)    | 23<br>(19.17%) |
| (B)    | <b>Seed ad sowing</b>                                                                                                                                                          |                 |                   |                |
|        | a) Seed rate (15-20 kg/ha)                                                                                                                                                     | 104<br>(86.67%) | 16<br>(13.33%)    | 00<br>(00.00%) |
|        | b) Use improved and hybrid variety of maize (PDKV Aarambha, PKVM Shatak, Phule Umed, Phule Madhu, BIO 9681, HQPM-1, African tall) and any other improved high yielding variety | 59<br>(49.17%)  | 47<br>(39.17%)    | 14<br>(11.67%) |
|        | c) Recommended sowing time of maize (20 Jun to 7 July)                                                                                                                         | 101<br>(84.17%) | 19<br>(15.83%)    | 00<br>(00.00%) |
|        | d) Spacing (60 cm X 20 cm)                                                                                                                                                     | 58<br>(48.33%)  | 45<br>(37.50%)    | 17<br>(14.17%) |
|        | e) Seed treatment with Thiram before sowing (2-2.5g /kg)                                                                                                                       | 81<br>(67.50%)  | 22<br>(18.33%)    | 17<br>(14.17%) |
|        | f) Seed treatment with Azotobacter and PSB before sowing (15 g/kg)                                                                                                             | 78<br>(65.00%)  | 24<br>(20.00%)    | 18<br>(15.00%) |
| (C)    | <b>Fertilizer management</b>                                                                                                                                                   |                 |                   |                |
|        | a) Recommended fertilizer dose i.e. NPK 120:60:30 kg /ha                                                                                                                       | 52              | 68                | 00             |

|     |                                                                                                                                                                           |                 |                |                |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------|----------------|
|     |                                                                                                                                                                           | (43.33%)        | (56.67%)       | (00.00%)       |
|     | b) Application of fertilizer NPK as split dose first half nitrogen and full dose of P <sub>2</sub> O <sub>5</sub> and K <sub>2</sub> O at the time of sowing (basal dose) | 64<br>(53.33%)  | 56<br>(46.67%) | 00<br>(00.00%) |
|     | c) Application of half nitrogen dose one month after sowing                                                                                                               | 51<br>(42.50%)  | 50<br>(41.67%) | 19<br>(15.83%) |
| (D) | <b>Intercultural operations</b>                                                                                                                                           |                 |                |                |
|     | a) Gap filling                                                                                                                                                            | 09<br>(07.50%)  | 29<br>(24.17%) | 82<br>(68.33%) |
|     | b) Time of gap filling (immediately after complete emergence normally within 7 DAS)                                                                                       | 08<br>(06.67%)  | 31<br>(25.83%) | 81<br>(67.50%) |
|     | c) Hand weeding at proper stage (20 and 40 DAS)                                                                                                                           | 72<br>(60.00%)  | 38<br>(31.67%) | 10<br>(08.33%) |
|     | d) Use of herbicide (Atrazine/Tembotrione)                                                                                                                                | 71<br>(59.17%)  | 30<br>(25.00%) | 19<br>(15.83%) |
| (E) | Irrigation management (Silking and Tasseling, Grain filling)                                                                                                              | 76<br>(63.33%)  | 32<br>(26.67%) | 12<br>(10.00%) |
| (F) | <b>Plant protection measures</b>                                                                                                                                          |                 |                |                |
|     | a) To control stem borer 30% dimethoate in 10 lit water in concentration of insecticide with power sprayer (30 ml)                                                        | 71<br>(59.17%)  | 33<br>(27.50%) | 16<br>(13.33%) |
|     | b) To control turicum leaf blight and rust disease use of dithane (M 45 1.5 kg to spray / ha)                                                                             | 65<br>(54.17%)  | 40<br>(33.33%) | 15<br>(12.50%) |
| (G) | <b>Harvesting</b>                                                                                                                                                         |                 |                |                |
|     | a) Harvesting at maturity stage                                                                                                                                           | 105<br>(87.50%) | 13<br>(10.83%) | 02<br>(01.67%) |
|     | b) Harvesting of maize by threshing machine                                                                                                                               | 45<br>(37.50%)  | 47<br>(39.17%) | 28<br>(23.33%) |

**Table 5:** Distribution of respondents according to their overall adoption level about maize production technology (n=120)

| Sr. No.                  | Adoption             | Respondent (n=120) |            |
|--------------------------|----------------------|--------------------|------------|
|                          |                      | Frequency          | Percentage |
| 1                        | Low (<53.81)         | 14                 | 11.67      |
| 2                        | Medium (53.81-69.33) | 85                 | 70.83      |
| 3                        | High (>69.33)        | 21                 | 17.50      |
| Total                    |                      | 120                | 100.00     |
| Mean = 61.57 S.D. = 7.76 |                      |                    |            |

The data depicted in Table 5. revealed that nearly one third of the respondents (70.83%) had medium level of adoption, followed by 17.50 per cent with high adoption and 11.67 per cent with low adoption. Similar findings were observed by [1, 3, 5, 6].

#### 4. Conclusion

The study shows that maize growers in Buldhana district know the basic, traditional practices of maize cultivation well, but their knowledge of technical practices like early and late varieties, intercropping and gap filling is still limited. Majority of the respondents (65.00%) had medium level of knowledge. Majority of the farmers (70.83%) had medium level of adoption, and for practices like application of compost / FYM and gap filling, adoption remained much lower than knowledge showing that farmers often know what to do but are not fully able to apply it, likely due to cost or limited input availability. Thus, there is a clear gap between farmers' knowledge and actual adoption of improved maize technology, which can be reduced through easier access to inputs, field demonstrations, and regular follow-up by extension workers.

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