**Assessing Knowledge and Adoption of Millets Cultivation Practices in the Bundelkhand Region, India: A Study of Farmer Perspectives**

**ABSTRACT**

 This study investigates the knowledge and adoption levels of millet cultivation practices among farmers in the Bundelkhand region of Uttar Pradesh, India, during the 2024-25 agricultural season. A purposive sample of 240 farmers from two blocks each in Banda and Chitrakoot districts was surveyed. Results indicate that 58.33% of respondents possessed a medium level of knowledge about millet cultivation practices, with near-universal awareness (100%) of sowing time and harvesting practices. High knowledge levels were also observed for interculturing (99.58%), seed rate (98.33%), and soil type (97.08%). Regarding adoption, 72.91% of farmers exhibited a medium level of adoption, with the highest adoption rates for sowing time (91.66%), harvesting (95%), interculturing and soil type (88.75%), and seed rate (74.16%). Despite millets' resilience and nutritional benefits, low adoption of advanced practices such as biofertilizer use and nursery management highlights the need for targeted extension interventions to enhance scientific adoption and optimize millet production in the region.

**Keywords:** Millets, Knowledge, Adoption, Bundelkhand, Farmer Practices

**INTRODUCTION**

Millets, small-grained cereal grasses, are among the oldest cultivated crops, valued for their resilience and nutritional superiority (Tomar & Singh, 2017). These crops thrive in semi-arid environments, making them vital for food and fodder security in regions like Bundelkhand, where marginal soils and erratic rainfall challenge conventional agriculture (IIMR) Millets, including pearl millet (Pennisetum glaucum), finger millet (Eleusine coracana), kodo millet (Paspalum setaceum), proso millet (Panicum miliaceum), foxtail millet (Setaria italica), little millet (Panicum sumatrense), and barnyard millet (Echinochloa utilis), are well-suited to low-rainfall areas (250–700 mm annually) and poor soils, offering sustainable yields where major cereals falter.

Millets are nutritionally superior, rich in protein (11.6%), carbohydrates (65.5%), crude fibre (1.2%), calcium (42 mg/100g), iron (8.0 mg/100g), and other micronutrients such as zinc, magnesium, and vitamins (Kutyauripo & Mutombo, 2020). Pearl millet, a staple in semi-arid regions, provides 361 kcal per 100g and supports diverse food products like flatbreads, porridges, and beverages, as well as poultry feed. Despite these advantages, millet adoption remains low globally, underscoring the need to understand farmer knowledge and practices.

India, the world’s largest millet producer, contributes over 18% to global production, with pearl millet (38.4%) and sorghum (7.21%) leading the way (APEDA, 2022). In Uttar Pradesh, millets are a preferred kharif crop after paddy and wheat, with the Bundelkhand region accounting for 36.6% of the state’s millet area and 34% of its production (Sah et al., 2021). Banda and Chitrakoot districts are key contributors, yet gaps in scientific knowledge and adoption of recommended practices persist, necessitating this study to assess farmer perspectives and identify intervention opportunities.

**METHODOLOGY**

This study was conducted in the Bundelkhand region of Uttar Pradesh, focusing on Banda and Chitrakoot districts due to their significant millet production. Two blocks per district—Naraini and Kamasin (Banda) and Mau and Pahari (Chitrakoot)—were purposively selected for their high millet cultivation. From each block, three villages were randomly chosen, and 20 millet growers per village were selected via simple random sampling, yielding a total sample of 240 respondents.

A structured interview schedule was used to collect data through personal interviews. Knowledge was assessed using a farmer-oriented test developed in consultation with agricultural scientists, with responses scored as “Yes” (2) or “No” (1). Adoption was measured on a three-point scale: complete adoption (3), partial adoption (2), and non-adoption (1). Respondents were categorized into low, medium, and high levels of knowledge and adoption based on mean and standard deviation. Data were analysed using frequency, percentage, mean, and standard deviation.

**RESULTS AND DISCUSSION**

**Knowledge of Millet Cultivation Practices**

Table 1 presents the distribution of respondents’ knowledge about millet cultivation practices. All respondents (100%) were fully aware of recommended sowing time and harvesting practices, reflecting strong traditional knowledge. High knowledge levels were also observed for interculturing (99.58%), seed rate for pearl millet (98.33%) and sorghum (97.91%), soil type (97.08%), land preparation (96.25%), and irrigation (95.41%). However, knowledge was notably lower for biofertilizer use (14.58%), nursery management (17.08%), and transplanting in high-rainfall areas (34.16%), indicating gaps in awareness of modern practices.

**Table 1: Distribution of Respondents by Knowledge of Millet Cultivation Practices**

**(N-240)**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Cultivation practices** | **Yes** | **No** |
| **F** | **%** | **f** | **%** |
| 1. | Soil | 233 | 97.08 | 7 | 2.91 |
| 2. | Land preparation | 231 | 96.25 | 9 | 3.75 |
| 3. | Sowing Time | 240 | 100 | 00 | 00 |
| 4. | A. Seed rate: 5 to 7 kg/ha. (Bajra), | 236 | 98.33 | 4 | 1.66 |
| B. Seed rate: 8 to 10 kg/ha. (Jowar)  | 235 | 97.91 | 5 | 2.08 |
| 5. | Seed should be sown at a depth of 3-4 cm.  | 228 | 95 | 12 | 5 |
| 6. | For transplanting preparation of seedlings on raised beds and transplanting after 3 to 4 weeks.  | 94 | 39.16 | 146 | 60.83 |
| 7. | Sowing by seed drill in low rain fall area.  | 140 | 58.33 | 100 | 41.66 |
| 8. | Transplanting from nursery in high rainfall area.  | 82 | 34.16 | 158 | 65.83 |
| 9. | Improved varieties: (A) Bajra  | 92 | 38.33 | 148 | 61.66 |
| 1. Jower
 | 93 | 38.75 | 147 | 61.25 |
| 10. | Seed Treatment | 150 | 62.50 | 90 | 37.50 |
| 11. | Biofertilizer | 35 | 14.58 | 205 | 85.41 |
| 12. | Nursery Management | 41 | 17.08 | 199 | 82.91 |
| 13. | Nutrient management | 206 | 85.83 | 34 | 14.16 |
| 14. | Interculturing: (A) Thinning after 15 to 20 days from sowing. | 239 | 99.58 | 1 | 0.41 |
| 1. Spraying of weedicides
 | 164 | 68.33 | 76 | 31.66 |
| 15. | Irrigation | 229 | 95.41 | 11 | 4.58 |
| 16. | Crop Protection: (A) fungicides  | 124 | 51.66 | 116 | 48.33 |
| (B) Insecticides and pesticides | 171 | 71.25 | 69 | 28.75 |
| 17. | Harvesting | 240 | 100 | 00 | 00 |
| 18. | Yield  | 205 | 85.41 | 35 | 14.58 |

 Table 2 categorizes respondents by overall knowledge level. The majority (58.33%) exhibited medium knowledge (mean = 37.45, SD = 3.33), while 22.50% and 19.16% fell into low and high knowledge categories, respectively. This distribution aligns with findings from Singh et al. (2017) and Kamaldinni et al. (2021), attributing medium knowledge levels to factors such as moderate income, farming experience, media exposure, and extension contact.

**Table 2: Overall Knowledge Levels of Millet Cultivation Practices**

**(N-240)**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Categories** | **Frequency** | **Percentage** |
| 1. | Low (up to 34) | 54 | 22.50 |
| 2. | Medium (34 to 40) | 140 | 58.33 |
| 3. | High (above 40) | 46 | 19.16 |
|  | **Total** | **240** | **100** |

 **Mean-37.45, S.D.-3.33**

 **Adoption of Millet Cultivation Practices**

Table 3 details the adoption of recommended millet cultivation practices. Harvesting (95%) and sowing time (91.66%) were the most adopted practices, followed by interculturing and soil type (88.75%) and seed rate (74.16% for pearl millet, 72.50% for sorghum). Conversely, adoption was extremely low for biofertilizer use (0.83%), nursery management (0.83%), and transplanting in high-rainfall areas (0.41%), likely due to limited awareness and access to resources.

**Table 3: Distribution of respondents according to their adoption of millets cultivation practices.**

 **(N-240)**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Millets cultivation practices** | **Adoption**  |
| **Complete** | **Partial** | **No** |
| **f** | **%** | **f** | **%** | **F** | **%** |
| 1. | Soil | 213 | 88.75 | 18 | 7.50 | 9 | 3.75 |
| 2. | Land preparation | 162 | 67.50 | 69 | 28.75 | 9 | 3.75 |
| 3. | Sowing Time | 220 | 91.66 | 20 | 8.33 | 00 | 00 |
| 4. | Seed rate: (A) 5 to 7 kg/ha. Bajra | 178 | 74.16 | 58 | 24.16 | 4 | 1.66 |
| (B) 8 to 10 kg/ha. Jowar  | 174 | 72.50 | 59 | 24.58 | 7 | 2.91 |
| 5. | Seed should be sown at a depth of 3-4 cm.  | 127 | 52.91 | 100 | 41.66 | 13 | 5.41 |
| 6. | For transplanting preparation of seedlings on raised beds and transplanting after 3 to 4 weeks  | 2 | 0.83 | 6 | 2.50 | 232 | 96.66 |
| 7. | Sowing by seed drill in low rain fall area.  | 6 | 2.50 | 35 | 14.58 | 199 | 82.91 |
| 8. | Transplanting from nursery in high rainfall area.  | 1 | 0.41 | 9 | 3.75 | 230 | 95.83 |
| 9. | Improved varieties: (A) Bajra | 26 | 10.83 | 54 | 22.50 | 160 | 66.66 |
| (B) Jower  | 18 | 7.50 | 49 | 20.41 | 173 | 72.08 |
| 10. | Seed Treatment | 15 | 6.25 | 63 | 26.25 | 162 | 67.50 |
| 11. | Biofertilizer | 2 | 0.83 | 8 | 3.33 | 230 | 95.83 |
| 12. | Nursery Management | 2 | 0.83 | 4 | 1.66 | 234 | 97.50 |
| 13. | Nutrient management | 11 | 4.58 | 98 | 40.83 | 131 | 54.58 |
| 14. | Interculturing: Thinning after 15 to 20 days from sowing. | 213 | 88.75 | 21 | 8.75 | 6 | 2.50 |
|  Spraying of weedicides. | 37 | 15.41 | 63 | 26.25 | 140 | 58.33 |
| 15. | Irrigation | 6 | 2.50 | 103 | 42.91 | 131 | 54.58 |
| 16. | Crop protection: fungicides  | 16 | 6.66 | 72 | 30 | 152 | 63.33 |
| Insecticides and pesticides | 76 | 31.66 | 78 | 32.50 | 86 | 35.83 |
| 17. | Harvesting | 228 | 95 | 12 | 5 | 00 | 00 |
|  |  |  |  |  |  |  |  |
| 18. | Yield | 9 | 3.75 | 107 | 44.58 | 124 | 51.66 |

**Table 4: Overall Adoption Levels of Millet Cultivation Practices**

**(N-240)**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No.** | **Categories** | **Frequency** | **Percentage** |
| 1. | Low (up to 36) | 33 | 13.75 |
| 2. | Medium (36 to 45) | 175 | 72.91 |
| 3. | High (above 45) | 32 | 13.33 |
|  | **Total** | **240** | **100** |

 **Mean-41.125, S.D.-4.526**

 Table 4 shows that 72.91% of respondents had a medium adoption level (mean = 41.125, SD = 4.526), with 13.75% and 13.33% in low and high adoption categories, respectively. These findings, consistent with Manojbhai (2019) and Harish & Maraddi (2023), suggest that limited awareness and resource constraints hinder full adoption of advanced practices.

**CONCLUSION**

This study illuminates the agricultural landscape of millet farming in the Bundelkhand region, revealing that most farmers exhibit a moderate level of expertise and adherence to recommended cultivation practices. Their profound awareness and consistent application of optimal sowing schedules, harvesting techniques, interculturing methods, and soil-type considerations underscore a robust foundation of traditional knowledge, honed over generations. However, a marked shortfall in the adoption of modern innovations—such as biofertilizers, nursery management, and transplanting in high-rainfall zones—exposes critical gaps in contemporary agronomic practices. These findings highlight an urgent need for targeted, dynamic extension programs to elevate scientific understanding and integrate advanced techniques among farmers. By bridging these divides, developmental agencies can significantly enhance millet production, harnessing the crop’s inherent resilience and exceptional nutritional value to fortify food security and promote sustainable agriculture in the region.

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