**Productivity of Major Pulse Crops in Pulse-Based Cropping Systems Adopted by Farmers in Chhattisgarh Plains**

**ABSTRACT**

Present study was conducted in four district comprising 320 pulse based cropping system practicing farmers in Chhattisgarh plains to ascertain their knowledge, production and productivity about the different crops. The selected pulse growing farmers were interviewed by personally with the help of a well-structured and pre-tested interview schedule. The findings of the study shows that the productivity of various crops grown by the farmers as majority of (35.94%) rice growing respondents productivity is between 40.1 to 48 q/ha followed by soybean (56.91%) up to 5 q/ha, wheat (39.88%) between 12.1 to 14 q/ha, gram (67.50%) between 8 to 10 q/ha, arhar (49.78%) between 7.1to 9 q/ha, mung (54.32%) 6.1to 8 q/ha, urd (56.47%) between 5.1 to 7 q/ha, Lathyrus, (51.61%) 5.1 to 7 q/ha lentil (56.77%) up to 6 q/ha yield, peas (67.70%) between 5.1to 7 q/ha. Regarding cultivation of different varieties of the respondents, majority of the respondents cultivated local variety of gram crop followed by mung (local variety), arhar (local variety) urd (local variety), lentil (local variety) pea (local variety) lathyrus crop all of the respondents grown local variety.

***Keywords -*** *Productivity, Pulse based cropping system, Chhattisgarh state*

**1. INTRODUCTION**

Chhattisgarh state was established on November 1, 2000, comprises 33 districts, and has a total cultivated area of approximately 5.9 million hectares (Sharma et al., 2014). The state is geographically classified into three distinct Agro-climatic zones viz., Chhattisgarh Plains, Bastar Plateau, and Northern Hills zone covering 51%, 28%, and 21% of the geographical area, respectively. The climate of Chhattisgarh falls under the hot and humid category, with an annual average rainfall ranging between 1200-1400 mm. Agriculture with diverse cropping patterns is the backbone of the state. Paddy, wheat, maize, groundnut, pulses, and oilseed crops are the major crops cultivated in the state.  Among the other crops, the state has contributed only 1 % in area and production to the pulses-producing states in India (Seth et al. 2022). Pulses are major sources of proteins among the vegetarians in India, and complement the staple cereals in the diets with proteins, essential amino acids, vitamins and minerals. They contain 22-24% protein, which is almost twice the protein in wheat and thrice that of rice. India is the largest producer and consumer of pulses in the world. Major pulses grown in India include chickpea or bengal gram (Cicer arietinum), pigeonpea or red gram (Cajanus cajan), lentil (Lens culinaris), urdbean or black gram (Vigna mungo), mungbean or green gram (Vigna radiata) etc. More popular among these are chickpea, pigeonpea, mungbean, urdbean and lentil. India has key place in global pulses production and contributes about 25% to the total pulse basket. About a dozen of pulse crops, namely chickpea, pigeon pea, mung, urd, lentil, field pea, lathyrus, cowpea, moth bean, horse gram and ricebean are cultivated in different agro-ecological regions. Among the major pulse crops, gram is an important crop of Chhattisgarh and occupies a premier position with regards to both area and production in the state. The major pulse growing district in Chhattisgarh states are Rajnandgaon, Durg, Balod, Bemetara and Kabidham etc. Considering the importance of pulse crops, the present research is an attempt to study the productivity of major pulse crops in pulse-based cropping systems adopted by farmers in Chhattisgarh plains.

**2. METHODOLOGY**

The present investigation was conducted in four major pulse growing districts of Chhattisgarh plains. Each district two blocks were selected for the study randomly. Each selected blocks four villages were selected randomly. Thus, a total of thirty-two villages were selected for the purpose of drawing the sample of respondents for the study. Ten farmers from each village were selected randomly to comprise a sample of 320 respondents for the study purpose. The data were collected with the help of predesigned structured interview schedule. Information was collected through personal interview method. The purpose of interview was clearly explained to each respondent. Collected data were tabulated and analyzed using formula.

**3. RESULT AND DISCUSSION**

**1. Productivity**

**1.1. Productivity of different crops**

The data pertaining to the productivity of various crops grown by the respondents in the study area in different seasons are assembled in Table 1 and Fig. 1. The results revealed that the majority of rice growing respondents (35.94%) arrive between 40.1 to 48 q/ha productivity, followed by 23.43 per cent respondents got upto 32 q/ha, 20.94 per cent respondents 32.1 to 40 q/ha, and 19.69 per cent who received the rice productivity over 48 q/ha. The results showed that the majority of soybean growing respondents (56.91%) obtained up to 5 q/ha, followed by 30.89 per cent respondents between 5.1to 8 q/ha and 12.20 per cent who received the productivity over 8 q/ha. The results indicated that the majority of wheat growing respondents (39.88%) arrive between 12.1 to 14 q/ha productivity, followed by 36.20 per cent respondents obtained up to 12 q/ha, and 23.92 per cent who received the wheat productivity over 14 q/ha.

**Table 1: Distribution of respondents according to productivity of different crops**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S. No | Crop | Productivity (q/ha) | Frequency | Percentage |
| 1. | Rice (n=320) | Up to 32 | 75 | 23.43 |
| 32.1 to 40 | 67 | 20.94 |
| 40.1 to 48 | 115 | 35.94 |
| Above 48 | 63 | 19.69 |
| Average Productivity (q/ha) | 39.98 |  |
| 2. | Soybean(n=123) | Up to 5 | 70 | 56.91 |
| 5.1 to 8 | 38 | 30.89 |
| Above 8 | 15 | 12.20 |
| Average Productivity (q/ha) | 5.34 |  |
| 3. | Wheat (n=163) | Up to 12 | 59 | 36.20 |
| 12.1 to 14 | 65 | 39.88 |
| Above 14  | 39 | 23.92 |
| Average Productivity (q/ha) | 6.5 |  |
| 4. | Arhar ( n=229) | Up to 7 | 35 | 15.28 |
| 7.1 to 9 | 114 | 49.78 |
| 9.1 to 11 | 75 | 32.76 |
| Above 11  | 5 | 2.18 |
| Average Productivity (q/ha) | 8.58 |  |
| 5. | Gram (n=320) | Up to 8 | 75 | 23.43 |
| 8.1 to 10 | 216 | 67.50 |
| Above 10 | 29 | 9.07 |
| Average Productivity (q/ha) | 8.82 |  |
| 6. | Lathyrus(n=124) | up to 5 | 53 | 42.74 |
| 5.1 to 7 | 64 | 51.61 |
| Above 7 | 7 | 5.65 |
| Average Productivity (q/ha) | 5.25 |  |
| 7. | Lentil(n=155) | Up to 6 | 88 | 56.77 |
| 6.1 to 8 | 64 | 41.29 |
| above 8 | 3 | 1.94 |
| Average Productivity (q/ha) | 3.92 |  |
| 8. | Pea(n=96) | Up to 5 | 16 | 16.67 |
| 5.1 to 7 | 65 | 67.70 |
| Above 7 | 15 | 15.63 |
| Average Productivity (q/ha) | 5.96 |  |
| 9. | Mung (n=197) | Up to 6 | 84 | 42.63 |
| 6.1 to 8 | 107 | 54.32 |
| above 8 | 6 | 3.05 |
| Average Productivity (q/ha) | 6.28 |  |
| 10. | Urd(n=255) | Up to 5 | 103 | 40.39 |
| 5.1 to 7 | 144 | 56.47 |
| Above 7 | 8 | 3.14 |
| Average Productivity (q/ha) | 5.19 |  |

The results showed that the majority of gram-growing respondents (67.50%) arrive between 8 to 10 q/ha productivity, followed by 23.43 per cent respondents obtained up to 8.1 q/ha, and 9.07 per cent who received the gram productivity over 10 q/ha. The majority of respondents received yields for arhar production of between 7.1to 9 q/ha (49.78%) and between 9 and 11 q/ha (32.76%), respectively. although it was found that 15.28 and 2.18 percent of respondents had yields of up to 7 q/ha and more than 11 q/ha, respectively. Regarding mung production, 54.32 percent of respondents attained between 6.1to 8 q/ha, followed by 42.63 percent who attained up to 6 q/ha, and 3.05 percent who attained more than 8 /ha. Regarding productivity of urd crop, the findings indicate that most of the urd growing respondents (56.47) harvested between 5.1 to 7 q/ha, followed by 40.39 per cent urd growers obtained up to 5 q/ha. It was also found that 3.14 per cent respondents obtained above 7 q/ha productivity respectively.

Fig. 1 Respondents wise average productivity of different crops

 Regarding Lathyrus, the majority of those who reported cultivating it (51.61) harvested 5.1 to 7 q/ha, while 42.74 and 5.65 percent of those who reported growing it received up to 5 q/ha and over 7 q/ha yields, respectively. The data regarding productivity of lentil reveals that 56.77 per cent of the lentil growing respondents got up to 6 q/ha yield, followed by 6 to 8 q/ha and above 8 q/ha yield was obtained by 41.29 and 1.94 per cent of the respondents, respectively. The results show that most respondents who cultivate peas (67.70%) have productivity levels between 5.1to 7 q/ha, whereas 16.67 and 15.63 per cent of respondents had productivity levels up to 5 and above 7 q/ha, respectively. The result of average yields regarding major pulse crops produced by the respondents in the study area were showed that the gram 8.82q/ha, mung, 6.28q/ha, and 8.58 q/ha arhar got by the respondents, on the other hand the productivity of urd 5.19q/ha, lathyrus, 5.25q/ha, lentils, 3.92q/ha, and pea 5.96 q/ha were found in the study area.

**1.2 Variety wise productivity of major pulse crops**

 The data pertaining to cultivation of different varieties of the respondents and its productivity scenario are compiled in Table 2. The findings indicated that variety wise distribution regarding gram crop, majority of the respondents (72.18%) were growing local variety with the average productivity of 4.6 q/ha, followed by JG-11 (14.06%) with average productivity of 11.3 q/ha, vaibhav (7.5%) with 9.2 q/ha productivity, JG-74 (6.25%) with 9.5 q/ha yield. Regarding mung crop, about 75.12 per cent of the respondents were growing the local variety with the average productivity of 4.1 q/ha, followed by pairi mung (10.16%) with average productivity of 7.3 q/ha and HUM-16 (9.65%) with an average yield of 8.2 q/ha. Regarding arhar crop about 65.06 per cent of the respondents were growing local variety with the average productivity of 6.4 q/ha, followed by popular asha variety grown by 34.92 per cent respondents with average productivity of 9.3 q/ha, Regarding urd crop majority of the respondents (77.25%) were growing the local variety with the average productivity of 4.5 q/ha, followed by TAU-1 (15.69%) with average productivity of 8.1 q/ha and TAU-94-2 (7.06%) with an average yield of 6.3 q/ha. In case of lathyrus all of the respondents used to grow the local varieties with the average productivity of 3.6 q/ha. Regarding lentil crop about 80 per cent of the respondents were growing the local variety with the average productivity of 3.2 q/ha, followed by JL-3 (20.00%) with average productivity of 5.2 q/ha and. Regarding pea crop, majority of the respondents (85.41%) were growing the local varieties with the average productivity of 3.5 q/ha, followed by Prakash (14.59%) with average productivity of 6.5 q/ha.

**Table 2: Distribution of respondents according to variety wise productivity of**

**major pulse crops**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl. No** | **Crop** | **Variety** | **Respondents** | **Productivity** |
| **F** | **%** | **Max.** | **Min.** | **Avrg.** |
| 1 | Gram (n=320) | JG-11 | 45 | 14.06 | 14.3 | 8.3 | 11.3 |
| JG-74 | 20 | 6.25 | 13 | 6 | 9.5 |
| Viabhav | 24 | 7.5 | 13.5 | 5.0 | 9.2 |
| Radhey (Local) | 231 | 72.18 | 6.2 | 3.1 | 4.6 |
| 2 | Mung (n=197) | HUM-16 | 19 | 9.65 | 10.4 | 6 | 8.2 |
| HUM-12 | 10 | 5.07 | 8.3 | 4.3 | 6.3 |
| Pairi mung | 20 | 10.16 | 11.3 | 3.3 | 7.3 |
| Local | 148 | 75.12 | 6.1 | 2.1. | 4.1 |
| 3 | Arhar (n=229) | Asha | 80 | 34.92 | 12.2 | 6.4 | 9.3 |
| Local | 149 | 65.06 | 8.4 | 4.4 | 6.4 |
| 4 | Urd (n=255) | TAU-1 | 40 | 15.69 | 10.1 | 6.1 | 8.1 |
| TAU-94-2 | 18 | 7.06 | 8.3 | 4.3 | 6.3 |
| Local | 197 | 77.25 | 6 | 3 | 4.5 |
| 5 | Lathyrus (n=124) | Local | 124 | 100 | 5.1 | 2.1 | 3.6 |
| 6 | Lentil(n=155) | JL-3 | 31 | 20 | 7.2 | 3.2 | 5.2 |
| Local | 124 | 80 | 4.3 | 2.3 | 3.2 |
| 7 | Pea (n=96) | Prakash | 14 | 14.59 | 10 | 3 | 6.5 |
| Local | 82 | 85.41 | 5 | 2 | 3.5 |

**4. CONCLUSION**

 The findings towards productivity of major pulse crops show that respondents (67.50%) of gram obtained 8 to 10 q/ha productivity, regarding productivity of arhar crop, (49.78%) gained 7 to 9 q/ha. The data regarding productivity of mung reveals that 54.32 got 6 to 8 q/ha yield, the data also indicated that 56.47 per cent of the urd growing respondents gained 5 to 7 q/ha productivity, while regarding Lathyrus, majority of the Lathyrus growing respondents (51.61) harvested 5 to 7 q/ha, the data regarding productivity of lentil reveals that 56.77 per cent of the lentil growing respondents got up to 6 q/ha yield, whereas pea respondents (67.70%) received 5 to 7 q/ha productivity, popular pulse crops in the study area had an average yield of 8.82 and 6.28, 8.58q/ha. Gram, Mung, and Arhar are each however Urd, Lathyrus, Lentils, and Pea are each 5.19, 5.25, 3.92, and 5.96q/ha.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript

**COMPETING INTERESTS**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

**REFERENCES**

Gupta, N. K. (2015). A study on utilization pattern of leased forest land by the tribes of Bilaspur district of Chhattisgarh state. M.Sc. (Ag.) Thesis, IGKV, Raipur.

Gupta, N.K., Khan, M.A., Narbaria, S. and Beck, S. (2015). Constraints in adoption of modern agricultural technologies on leased forest land. P*lant Archives*, 15(2):843-845.

Nagaraja, G. N., Komala, C. N., Nanjunde, G.G. and Muthappa, P. P. (2011). Optimum dairy based farming system model for stable income of small farmers. *Indian Research Journal of Extension Education*, 11(2): 27-32.

Seth, M.K., Chandrakar, M.R. and Homendra Siwana. (2022). An Economic Analysis and Compound Growth Rate of Major Pulses in Northern part of Chhattisgarh. Economic Affairs, 67(01 Spl.): 93-100.

Sharma, M.L., Vikhe, V.A., Dale, N.S., Anap, V.N., Umbarkar, R.B. and Labade, G.B. (2014). Adoption of existing package of practices by the farmers in rice-utera cropping system in Chhattisgarh plains. International Journal of Communication and Business Management, 7(1) : 88-91

Singh, P.K. and Varshney, J.G. (2010). Adoption level and constraints in rice production technology. *Indian Research Journal of Extension Education,* 10 (1): 91-94.