***Original Research Article***

**TECHNOLOGICAL GAP IN RICE FARMING: A COMPARATIVE STUDY BETWEEN CHHATTISGARH AND MANIPUR**

**ABSTRACT**

The present study was conducted in Raipur District of Chhattisgarh and Imphal East District of Manipur during the year of 2021-22 and 2022-23 to determine the extent of technological gap in recommended rice production technology by the farmers. A total of four blocks namely Arang and Abhanpur blocks from Chhattisgarh and Keirao and Khsetrigao blocks from Manipur were chosen randomly for the study. Five villages belonging to each selected block were chosen randomly in both the States. 10 rice growing farmers were chosen randomly from each of the selected villages from both the States for data collection so as to make a total of 100 respondents from each State. The data were collected through personal interview, then compiled, tabulated and analysed by using various suitable and appropriate statistical tools for measurement to derive appropriate answer for the specific objective of the study. The study found that 97.00 % and 99.00 % of respondents of Chhattisgarh and Manipur were found to have technological gap in seed treatment and among all the cultivation practices of rice the highest technological gap index was observed in bio-fertilizer application and seed treatment. The average technological gap index shown by the respondents of Chhattisgarh was 47.76 % and 50.41 % shown by the respondents of Manipur resulting in the difference of -5.54 % between the States. But both the States had medium level in extent technological gap with a difference of -7.44 % in terms of extent of technological gap.

***Keywords:*** *Adoption, Rice Farming, Technological Gap, Production Technology*

1. **INTRODUCTION**

Rice is the staple food crop of more than 60 % of the world’s population. About 90 % of all rice grown in the world is produced and consumed in Asian region. Rice is the principal crop in the State and the central plains of Chhattisgarh are known as “Rice bowl of central India”. About 80 % of the population in the State is engaged in agriculture and 43 % of the entire arable land is under cultivation. In terms of production of rice, Chhattisgarh comes in seventh position in India with 9.81 million tonnes growing in the area of 3.77 million ha and its productivity was 2602 kg/ha during 2022-23. Rice is also the staple food crop of NE region. Manipur, one of the seven sisters of the north eastern region of India resembling most of the northern states of India, the economy of State primarily depends on agriculture and allied activities. Though the total land under agriculture in Manipur is only 6.74 % of the total geographical area, it provides livelihood of more than 52 % of the total population of the State. In the State of Manipur, the area under rice crop is about 219.10 thousand ha, with the productivity of 2940 kg/ha with total production of 643.30 thousand tonnes. The growth in agriculture in the country has been quite uneven resulting in inequitable distribution of benefits in the recent years. High cost technologies with liberal use of inputs have resulted increase in production and productivity in agricultural endowed environment. However, in the State like Chhattisgarh and Manipur where majority of farmers are medium, small and marginal in constrained environment have benefited only marginally. Therefore, it is high time to pay attention to such farming through systematic studies about their occupational growth and examine whether these farming communities have responded as per expectation with regard to the acceptance and application to the scientific production technologies and techniques in their farming systems.

Various technologies are evolved by scientists including high yielding varieties for increasing productivity level and share profits to cultivators but still due to non-adoption of certain technologies, the productivity level is low. So, there still exists large and exploitable rice yield gap in India. This may be due to lack of technical know-how and either no or poor adoption of recommended technologies by the growers. Apart from this, personal, economic, psychological characteristics and situational and communication attributes of the growers may affect yield level. Thus, there may be technological gap between recommended package of practices and actual adoption of the recommended rice production technology by rice growers. Productivity level of farmers may be increased by finding technological gap in adoption of recommended rice production technology.

1. **METHODOLOGY**

The methodology covers the research design for investigation. The technique of study which entails data collecting, association, inquiry, and ultimately outcome presentation, was planned in this manner. Hence, it gives information about scientific procedure adopted for the present investigation to draw rational, logical and meaningful conclusions. The present study was carried out in the States of Chhattisgarh and Manipur during the year of 2021-22 and 2022-23.

Raipur district and Imphal East district were chosen randomly from Chhattisgarh and Manipur, respectively. Out of four blocks of Raipur district, two blocks namely Arang and Abhanpur blocks were chosen for the study in the State of Chhattisgarh. Similarly, out of four blocks in Imphal East district of Manipur two blocks namely Keirao and Khsetrigao blocks were chosen for data collection. Five villages belonging to each selected block had been chosen randomly to complete the proposed study so as to make a total of 20 villages (10 from Chhattisgarh and 10 from Manipur). 10 rice growing farmers had been chosen randomly from each of the selected villages for collection of data. In this way, the total number of respondents were 200 rice growers (100 from Chhattisgarh and 100 from Manipur) for the current investigation.

The data were collected by personal interview with the help of well prepared, structured and pretested interview schedule. Collected data were tabulated and processed by using appropriate statistical methods.

Table 1: Selection of districts, blocks, villages and number of respondents

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Chhattisgarh** | | | | **Manipur** | | | |
| **Raipur District** | | | | **Imphal East District** | | | |
| Selected  Block | Selected  Villages | No. of respondents | | Selected  Block | Selected  Villages | No. of respondents | |
| Arang | Rasni  Arang  Bhilai  Baihar  Bothali | | 10  10  10  10  10 | Keirao | Andro  Angtha  Makting  Langdum  Chanam-Sandrok | | 10  10  10  10  10 |
| Abhanpur | Jhanki  Bendri  Baktara  Abhanpur  Thelka-Bandha | | 10  10  10  10  10 | Khsetrigao | Keikhu  Naharup  Porompat  Loumanbi  Thambalkhong | | 10  10  10  10  10 |
| 2 | 10 | | 100 | 2 | 10 | | 100 |

1. **RESULTS** 
   1. **Distribution of respondents according to their technological Gap**

The findings regarding percentage distribution of respondents according to their technological gap is considered in Table 2. The data introduce that the majority (97.00 %) respondents of Chhattisgarh was found to have technological gap in seed treatment followed by 96.00 % respondents in bio-fertilizer application, followed by 85.00 %, 81.00 % and 80.00 % respondents were having technological gap in SRI method, selection of rice variety, seed rate and disease management, respectively.

Table 2: Percentage distribution of respondents according to their technological gap

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Practices** | **Chhattisgarh (n=100)** | | | | **Manipur (n=100)** | | | |
| **Complete** | **Partial** | **Nil** | **Total Gap** | **Complete** | **Partial** | **Nil** | **Total Gap** |
| 1. | Selection of rice variety | 40.00 | 41.00 | 19.00 | 81.00 | 43.00 | 36.00 | 21.00 | 79.00 |
| 2. | Seed rate | 60.0 | 21.00 | 19.00 | 81.00 | 74.00 | 22.00 | 4.00 | 96.00 |
| 3. | Seed treatment | 86.00 | 11.00 | 3.00 | 97.00 | 80.00 | 19.00 | 1.00 | 99.00 |
| 4. | Transplanting | 2.00 | 23.00 | 75.00 | 25.00 | 3.00 | 44.00 | 53.00 | 47.00 |
| 5. | Broadcasting | 4.00 | 16.00 | 80.00 | 20.00 | 0.00 | 21.00 | 79.00 | 21.00 |
| 6. | SRI method | 66.00 | 19.00 | 15.00 | 85.00 | 64.00 | 22.00 | 14.00 | 86.00 |
| 7. | Line Sowing | 24.00 | 39.00 | 37.00 | 63.00 | 3.00 | 50.00 | 47.00 | 53.00 |
| 8. | Seedling transplanting | 6.00 | 5.00 | 89.00 | 11.00 | 0.00 | 26.00 | 74.00 | 26.00 |
| 9. | Farm yard manure application | 25.00 | 27.00 | 48.00 | 52.00 | 16.00 | 45.00 | 39.00 | 61.00 |
| 10. | Chemical fertilizer application | 38.00 | 25.00 | 37.00 | 63.00 | 58.00 | 19.00 | 23.00 | 77.00 |
| 11. | Bio-fertilizer application | 81.00 | 15.00 | 4.00 | 96.00 | 69.00 | 21.00 | 10.00 | 90.00 |
| 12. | Irrigation drainage | 42.00 | 19.00 | 39.00 | 61.00 | 38.00 | 35.00 | 27.00 | 73.00 |
| 13. | Weed management | 4.00 | 45.00 | 51.00 | 49.00 | 30.00 | 42.00 | 28.00 | 72.00 |
| 14. | Insect and pest management | 44.00 | 26.00 | 30.00 | 70.00 | 45.00 | 28.00 | 27.00 | 73.00 |
| 15. | Disease management | 46.00 | 26.00 | 28.00 | 72.00 | 50.00 | 27.00 | 23.00 | 77.00 |
| 16. | Harvesting | 7.00 | 55.00 | 30.00 | 70.00 | 11.00 | 53.00 | 36.00 | 64.00 |
| 17. | Post-harvest management | 4.00 | 45.00 | 51.00 | 49.00 | 0.00 | 26.00 | 74.00 | 26.00 |
|  | Average number of respondents |  |  |  | 61.70 |  |  |  | 66.47 |
|  | Difference between Chhattisgarh and Manipur | | |  |  | -7.73 % | |  |  |

70.00 % respondents were found to have technological gap both in insect and pest management and harvesting which is also followed by 63.00 % respondent both in line sowing and chemical fertilizer application. Further, the technological gap was also found in weed management (61.00 %), farm yard manure application (52.00 %). 49.00 % respondents were found to have technological gap both in weed management and post-harvest management, followed by 25.00 % and 20.00 % in transplanting and broadcasting, respectively.

Similarly, the findings also disclose regarding the respondents of Manipur in which almost all (99.00%) and 96.00 % respondents were seen to have technological gap in seed treatment and seed rate followed by 90.00 %, 86.00 per cent and 79.00 % respondents in bio-fertilizer application, SRI method and selection of rice variety, respectively. It was also found that 77.00 % and 73.00 % respondents were having the technological gap in both chemical fertilizer application and disease management as well as in both irrigation drainage and insect and pest management, respectively followed by 72.00 %, 64.00 %, 61.00 %, 53.00 % and 47.00 % in weed management, harvesting, farm yard manure application, line sowing and transplanting, respectively. The data reveal that 26.00 % of respondents had technological gap both in seedling transplanting and post-harvest management. Further, technological gap was found in broadcasting by 21.00 % respondents.

The average number of respondents who had technological gap was 61.70 % in Chhattisgarh while it was 66.47 % respondents in Manipur. The difference between Chhattisgarh and Manipur was found to be -7.73 % which meant that the respondents of Chhattisgarh were having seven times lesser technological gap than that of Manipur.

**3.2 Technological gap index in recommended rice production technology**

The data regarding technological gap index is presented below in Table 3. From the study, it was found that in the State of Chhattisgarh, among all the cultivation practices of rice the highest technological gap index was found in bio-fertilizer application (92.50 %), followed by seed treatment (91.50 %), SRI method (75.50 %) and seed rate (70.50 %). Further, the technological gap index in selection of rice variety, disease management, insect and pest management, chemical fertilizer application, line sowing, farm yard manure application, harvesting and weed management were found to be 60.50 %, 59.00 %, 57.00 %, 51.50 %, 50.50 %, 43.50 %, 38.50 %, and 34.50 %, respectively. The technological index of 26.50 % was found both in irrigation drainage and post-harvest management. Thus, the lowest technological gap index was found in transplanting (13.50 %), broadcasting (12.00 %) and seedling transplanting (8.50 %).

Similarly, as per the responses of respondent farmers of Manipur, the highest technological gap index was reported in seed treatment (89.50 %), seed rate (85.00 %), bio-fertilizer application (84.50 %) and SRI method (75.00 %). Moreover, the technological gap index in chemical fertilizer application, disease control measures, selection of rice variety, pest control measures, irrigation drainage, inter-cultural practices, farm yard manure application and harvesting accounted to be 67.50, 63.50, 61.00, 59.00, 55.50, 51.00, 38.50 and 37.50 %, respectively. The lowest technological gap index was observed in line sowing (28.00 %), transplanting (25.00 %), seedling transplanting (13.00 %) and post-harvest management (13.00 %) and broadcasting (10.50 %).

Table 3: Technological Gap Index in recommended rice production technology by the respondents

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl. No.** | **Practices** | **Technological Gap Index** | | | |
| **Chhattisgarh**  **(n=100)** | | **Manipur**  **(n=100)** | |
|  |  | % | Rank | % | Rank |
| 1. | Selection of rice variety | 60.50 | V | 61.00 | VII |
| 2. | Seed rate | 70.50 | IV | 85.00 | II |
| 3. | Seed treatment | 91.50 | II | 89.50 | I |
| 4. | Transplanting | 13.50 | XIV | 25.00 | XIV |
| 5. | Broadcasting | 12.00 | XV | 10.50 | XVI |
| 6. | SRI method | 75.50 | III | 75.00 | IV |
| 7. | Line Sowing | 43.50 | X | 28.00 | XIII |
| 8. | Seedling transplanting | 8.50 | XVI | 13.00 | XV |
| 9. | Farm yard manure application | 38.50 | XI | 38.50 | XI |
| 10 | Chemical fertilizer application | 50.50 | IX | 67.50 | V |
| 11. | Bio-fertilizer application | 92.50 | I | 84.50 | III |
| 12. | Irrigation drainage | 51.50 | VIII | 55.50 | IX |
| 13. | Weed management | 26.50 | XIII | 51.00 | X |
| 14. | Insect and pest management | 57.00 | VII | 59.00 | VIII |
| 15. | Disease management | 59.00 | VI | 63.50 | VI |
| 16. | Harvesting | 34.50 | XII | 37.50 | XII |
| 17. | Post-harvest management | 26.50 | VIII | 13.00 | XV |
|  | Average Technological Gap Index | 47.76 |  | 50.41 |  |
|  | Difference between Chhattisgarh and Manipur -5.54 % | | | | |

%= Percentage

The study reveals that the average technological gap shown by the respondents of Chhattisgarh was 47.76 % and 50.41 per cent which was shown by the respondents of Manipur. So, the difference between Chhattisgarh and Manipur in terms of technological gap index was endowed to be -5.54 % which means technological gap index observed in respondents of Chhattisgarh was five times lesser than that of Manipur.

**3.3 Extent of technological gap in recommended rice production technology**

The findings regarding the percentage distribution of respondents according to the extent of technological gap is presented below in Table 4. The data reveal that 54.00 %, 32.00 % and 14.00 % of respondents of Chhattisgarh signified medium level, high level and low level of extent of technology, respectively. Similarly, the data also discloses that 49.00 %, 43.00 % and 8.00 % respondents of Manipur had medium level, high level and low level of extent of technological gap, respectively.

Furthermore, the study also perceived that the average level of technological gap as per indicated by the respondents of Chhattisgarh and Manipur were 49.09 % and 52.75 %, respectively. As a result, the difference between Chhattisgarh and Manipur discovered from the study was -7.44 %.

Table 4: Percentage distribution of respondents according to their extent of technological gap

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sl. No.** | **Extent of Technological Gap** | **Chhattisgarh (n=100)** | | **Manipur (n=100)** |
| 1. | Low level (Up to 33.33%) | 14.00 | | 8.00 |
| 2. | Medium level (33.34 to 66.66%) | 54.00 | | 49.00 |
| 3. | High level (Above 66.66%) | 32.00 | | 43.00 |
|  | Average level of technological gap | 49.09 | | 52.75 |
|  | Difference between Chhattisgarh and Manipur | | -7.44 % | |

%= Percentage

1. **DISCUSSION**

The findings indicate disparities between recommended package of practices and actual field-level adoption, highlighting the technological gap in both the States. The study attributed these gaps to a lack of complete knowledge and information about recommended package practices in rice cultivation. Factors contributing to these gaps include limited access to timely and comprehensible information, as well as constraints like low income and limited exposure to agricultural extension services reflecting slow adoption of recommended package of practices. It can be discussed specifically that in Chhattisgarh it has been working to modernize its agricultural sector, but gaps still exist due to limited mechanization and lack of irrigation facilities. In Manipur it may be due to geographic constraints, poor connectivity and market access, limited access to quality seeds, fertilizers, and mechanization and inadequate extension services for farmers.

The technological gap in the adoption of recommended practices for rice cultivation in Manipur, despite being marginally better in some practices, being higher than in Chhattisgarh can be attributed to several socio-economic, geographical, and agricultural factors. In the present study it was also found that agricultural extension services are more widespread in Chhattisgarh due to its relatively better-developed agricultural institutions while farmers of Manipur face limitations in terms of agricultural outreach programs, leading to lower awareness among farmers. It was also found that farmers of Chhattisgarh were found to have better access to credit and subsidies for fertilizer, seeds, machineries, *etc.* as compared to Manipur which may lead to lower the adoption of recommended package of practices resulting in higher technological gap.

1. **CONCLUSION**

The study concludes that the majority (97.00 %) respondents of Chhattisgarh was found to have technological gap in seed treatment while it was 99.00 % in ManipurIn terms of technological gap index, the highest technological gap index was found in bio-fertilizer application (92.50 %) in Chhattisgarh while it was in seed treatment with 89.50 % in Manipur. The study reveals that the average number of respondents who had technological gap was 61.70 % as compared to 66.47 % respondents who had technological gap in various cultivation practices of recommended package of practices for rice cultivation in Chhattisgarh and Manipur, respectively. Furthermore, the study also perceived that the average level of technological gap as per indicated by the respondents of Chhattisgarh and Manipur were 49.09 % and 52.75 %, respectively. The study attributed these gaps to a lack of complete knowledge and information about recommended package practices in rice cultivation. In Chhattisgarh it has been working to modernize its agricultural sector, but gaps still exist due to limited mechanization, lack of irrigation facilities, and dependency on traditional farming methods. In Manipur it may be due to geographic constraints, poor connectivity and market access, limited access to quality seeds, fertilizers, and mechanization and inadequate extension services for farmers.

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