**Farmers’ Constraints in the Adoption of Custom Hiring Centres Services in Buxar District of Bihar**

**Abstract**

The agricultural sector in India has experienced slower economic progress compared to the industrial and service sectors, leading to a widening income disparity between rural and urban areas. The study was administered to assess the level of constraints of farmers in the adoption of farm machinery in custom hiring centres in the Buxar district of Bihar. The well-structured schedule was prepared, and data concerning the status of custom hiring centres were solicited from 180 farmers during field and farm visits through personal interviews. All respondents were recruited randomly. **The major constraints faced by the farmers in custom hiring of machines were - “Less number of government custom hiring centres compared to private custom hiring centres” having highest weighted mean score (WMS) of 2.36, followed by “Less extension link of rural farmers with KVKs” (2.34), “**Lack of straw management machineries in custom hiring centres” (2.34) and constraint “Small and fragmented land holdings of farmers**” (2.23). The findings prioritised the need to expand** government CHCs, awareness programmes for the small and marginal farmers for promoting CHCs and integrating CHCs with Krishi Vigyan Kendra for enhancing sustainable agricultural mechanisation and farm productivity. The study demonstrates a strong correlation between farm size and the adoption of mechanised practices. Small and marginal farmers remain at a disadvantage, highlighting the need for targeted interventions such as subsidised machinery, better access to custom hiring centres, and tailored extension services.

**Keywords:** Custom hiring centres (CHCs) services, farm machinery, mechanisation, constraints, weighted mean score (WMS).

1. **Introduction**

Agriculture is the main engine for economic development and feeding the world’s population in many countries. According to the World Bank, 65% of working poor adults made their living from agriculture in 2016. In the Indian economy, agriculture contributes to about 20% of the national gross domestic product (GDP), while about 58% of the Indian population depends on agriculture for their livelihood, directly or indirectly (Debbarma *et al*., 2021). The agricultural sector in India has experienced slower economic progress compared to the industrial and service sectors, leading to a widening income disparity between rural and urban areas (Khan, 2021). Mechanisation in agriculture is a crucial factor in enhancing both productivity and output, especially in developing nations **(N.S.L. Srivastava, 2014).** Agricultural mechanisation is crucial for achieving Sustainable Development Goals by increasing productivity, food quality, resource efficiency, and climate change mitigation. However, the current uptake suggests significant disparities in mechanisation adoption among smallholder farmers across developing countries. Recognising the importance of agricultural mechanisation for SDGs, scholars have identified factors influencing the farm, local, and regional adoption rates and the need to improve sustainable mechanisation (Winarno *et al*., 2025; Warren, 2023). In India, farms are generally small in size, averaging around 1.16 hectares, with about 85% of land holdings categorised as small or marginal (less than 2 hectares) **(Mehta C. R. *et al*., 2014).** As cropping intensity increases, the interval between harvest and the next planting season has significantly reduced, making it difficult to manage harvesting and land preparation efficiently within a limited timeframe—unless sufficient farm power is available.

Over the past five decades, India has seen a substantial increase in farm power availability, rising from approximately 0.25 kW/ha in 1951 to around 1.35 kW/ha by 2001. There has also been a significant transition from traditional power sources to mechanical and electrical alternatives. While animate sources (like human and animal labour) contributed about 97.4% of farm power in 1951, their share dropped to 18% by 2001. Meanwhile, the role of mechanical and electrical power rose from 2.6% to about 82% during the same period. In Punjab, for example, farm power availability reached over 3.5 kW/ha in 2001, in contrast to states such as Odisha, Rajasthan, Himachal Pradesh, Jammu & Kashmir, Chhattisgarh, Jharkhand, Gujarat, Assam, Madhya Pradesh, and Maharashtra, where it remained below 0.90 kW/ha **(Mehta C. R. et al., 2014).** There is a clear correlation between farm power availability and agricultural productivity, as observed in mechanised states like Punjab, where approximately 30% of the power is sourced from electricity and about 48% from diesel engines.

Despite being home to some of the most fertile lands in the country and having nearly 75% of its population reliant on agriculture, Bihar continues to record productivity levels lower than the national average and significantly behind states like Punjab and Haryana that benefited from the Green Revolution. As Bihar’s population continues to grow, the pressure to increase food and fibre production also rises. Mechanisation can significantly impact all stages of production—from land preparation and planting to harvesting and post-harvest processing. To make expensive machinery like combine harvesters, paddy transplanters, potato harvesters, and laser land levellers accessible, there is a need to develop a rental or custom hiring service model, either through private initiatives or government-backed institutions. Establishing farm machinery banks that provide equipment on a rental basis in less mechanised areas can help bridge this gap. Providing subsidies or financial aid for machinery procurement, either for individual ownership or custom hiring, would further encourage adoption.

Numerous studies have been conducted to evaluate the status of Custom Hiring Centres (CHCs), their acceptance among farmers, and the challenges faced. States such as Punjab and Uttar Pradesh have already seen the implementation of such models with varying degrees of success **(Agarwal et al., 2020)**, Tamil Nadu **(Murugesan, 2019)**,Karnataka **(Kadaraiah et al., 2022)**, Madhya Pradesh **(Kisku U., 2022), Uttarakhand (Awasthi V., 2024),** etc. However, it was deduced that maximum work pertaining to farm mechanisation was carried out in various states of India. However, very inadequate work has been conducted in Bihar state of India, relating to the scenario of custom hiring services centres, as the state constitutes about 89.5% of the total rural population **(DOS, Government of Bihar).**

Therefore, an attempt was made to analyse farmers’ constraints towards adoption of agricultural machines through CHCs and assess their services to the native farmers of Buxar district of Bihar.

1. **Materials and methods**

The study was conducted to assess the level of mechanisation and constraints of farmers in the adoption of farm machinery in custom hiring centres in Buxar district of Bihar. The well-structured schedule was prepared, and data concerning the status of custom hiring centres were solicited from 180 farmers during field and farm visits through personal interviews. All respondents were recruited randomly. The socio-economic profile was also determined which considers age, education, land holding, income and extension contact of farmers in the selected district. The majority of interviewed farmers belong to villages adjoining the tehsils, viz. Baruna, Brahmapur, Raghunathpur and Dumraon (Table 1).

**Table 1** Blocks of the Buxar district of Bihar

|  |  |  |  |
| --- | --- | --- | --- |
| S. No. | **Blocks** | **Villages/towns of the native farmers** | **Frequency** |
| 1. | Baruna | Basauli, Panditpur, Lachmanpur | 45 |
| 2. | Brahmapur | Dharauli’ Maharajganj, Raghunathpur | 45 |
| 3. | Simri | Puraini, Naya Bhojpur, Chilahri | 45 |
| 4. | Dumraon | Pratap Sagar, Mustafapur, Twining Ganj | 45 |

**2.2 Constraints and perception of farmers regarding CHC's services**

The farmers’ reaction to assessing constraints, was recorded on a three-point continuum, *viz.,* strongly serious, serious and not so serious and the corresponding scores were given as 3, 2, 1, respectively. Subsequently, the frequency of farmers falling in the domain was multiplied by the score (3, 2 or 1) and the total weighted score was ascertained. Afterwards, the weighted mean score (WMS) was obtained by dividing the total weighted score by the total respondents (n=180). Accordingly, the weighted mean score rank order was allotted.

Weighted mean score =  **=**

where

w = number of respondents

x = value of seriousness i.e. Very Serious (x1)-3, Serious (x2)-2 and Not so serious (x3)-1 and

n = total number of respondents

**3. Results and discussions**

**3.1 Socio-economic profile of the farmers in Buxar district**

The socio-economic profile of farmers in the Buxar district of Bihar, detailing various categories such as age, education, landholding size, annual income, and extension contacts, is listed in Table 2. The results indicated that the majority of selected farmers were in the middle age group (41-55 years), constituting 48.33per cent of the sample. The young age group (21-40 years) makes up 17.78%, while the old age group (55-75 years) accounts for 33.89%. The educational background of farmers was also taken into consideration, which indicates that the level of education of farmers is directly proportional to the sagacious methods followed in the utilisation of farm machinery. It was ascertained that the largest group of farmers have matriculation education (31.67%). A notable number were illiterate (20.00%), and another 15.00% had a primary education. Middle-level education is reported by 10.56% of farmers, while 13.33% have completed higher secondary education. A small proportion (8.33%) were graduates, and only 2 farmers (1.11%) have attained postgraduate education (Table 1).

From a land holding point of view, the majority of farmers in the district have small landholdings: 42.78% possess between 1 to 2 hectares of land. Marginal farmers (those with less than 1 hectare) make up 23.33% of the sample. Semi-medium farmers (owning 2 to 4 hectares) account for 24.44%, while medium farmers (4 to 10 hectares) and large farmers (owning more than 10 hectares) represent only 7.22% and 2.22%, respectively, as illustrated in Table 1.

As far as annual income is concerned, the majority of farmers have low income (<3.6 lakh), representing 53.89% of the sample (Table 2). It was assessed that 34.44% of farmers fall in the medium-income range (3.6 to 7.78 lakh), and only 11.67% have a high income (greater than 7.78 lakh). The extension contact of the district farmers was also ascertained for evaluating the need for expert advice (for enhancing the efficiency of operations and increasing productivity of output) from the extension personnel, researchers and scientists to the district farmers. It was deduced that a significant portion of farmers report low extension contact, making up 76.67%. It was assessed that 17.22% have medium extension contact, and only 6.11% have high extension contact, indicating a limited reach of agricultural advisory services.

**Table 2:** Socio-economic profile of the farmers of Buxar district

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Category** | **Frequency** | **Percentage** |
| **Age** | Young (21-40 Years) | 32 | 17.78 |
| Middle (41-55 Years) | 87 | 48.33 |
| Old (55-75 Years) | 61 | 33.89 |
| **Education** | Illiterate | 36 | 20.00 |
| Primary | 27 | 15.00 |
| Middle | 19 | 10.56 |
| Metric | 57 | 31.67 |
| Higher secondary | 24 | 13.33 |
| Graduate | 15 | 8.33 |
| Postgraduate | 2 | 1.11 |
| **Land holding** | Marginal (<1ha) | 42 | 23.33 |
| Small (1 to 2 ha) | 77 | 42.78 |
| Semi medium (2 to 4 ha) | 44 | 24.44 |
| Medium (4 to 10 ha) | 13 | 7.22 |
| Large (>10 ha) | 4 | 2.22 |
| **Annual income** | Low (<3.6 lakh) | 97 | 53.89 |
| Medium (3.6-7.78 lakh) | 62 | 34.44 |
| High (>7.78 lakh) | 21 | 11.67 |
| **Extension contacts** | Low | 138 | 76.67 |
| Medium | 31 | 17.22 |
| High | 11 | 6.11 |

This profile provides valuable insights into the socio-economic characteristics of farmers in Buxar, revealing a predominantly middle-aged, low-income group with limited access to educational opportunities and agricultural extension services.

**3.2 Perceived constraints of farmers in the adoption of farm machines on custom hiring basis**

The perceived constraints of farmers in the adoption of farm machines through a custom hiring basis are listed in Table 3. The following results were obtained and are discussed below:

1. Top Constraints (Ranks I to III): Majority of farmers opined that the “Less number of government custom hiring centres compared to private custom hiring centres (C12)” was the major constraint with weighted mean score of 2.36 followed by “Less extension link of rural farmers with KVKs” (C7) with WMS of 2.34 (Table 3). It was revealed that the lower linkage of rural farmers with KVKs reflects systemic and structural issues, such as insufficient government-backed CHCs, a lack of straw management machines, and poor connectivity with Krishi Vigyan Kendras (KVKs). These issues indicate the need for policy intervention, equipment supply, and extension system strengthening.
2. Middle Constraints (Ranks IV to VII): Maximum farmers were in favour of constraint “Small and fragmented land holdings of farmers” (C3) having weighted mean score of 2.23 followed by “Lack of extension facility in guiding farmers” (C6) (WMS of 2.28) and “Lack of proper knowledge about custom hiring centres (C1)” with WMS of 2.22 (Table 4.6). These constraints were moderate and less significant compared to the major constraints. Although these constraints affect the farmers in conducting farm operations effectively and deal with accessibility and affordability issues, such as fragmented landholdings, weak extension support, and high rental costs. These are operational challenges that could be improved through training programs, cooperative farming, or targeted subsidies.
3. Lower Constraints (Ranks VIII to XII): Though still significant, these issues are more logistical and managerial, including peak season demand, technical expertise, and outdated machinery. Solutions could involve operator training, predictive booking systems, and machine replacement programs.

**Table 3:** Illustration of perceived constraints of farmers in the adoption of straw management machineries through a custom hiring basis

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| S. No. | Constraints of farmers related to CHCs | Strongly serious (%) | Serious (%) | Not so serious  (%) | Total Weighted Score | Weighted Mean Score | Rank Order |
| 1. | Lack of proper knowledge about custom hiring centres (C1) | 78  (43.33) | 65  (36.11) | 37  (20.56) | 401 | 2.22 | VI |
| 2. | Lack of straw management machinery in custom hiring centres (C2) | **85**  **(47.22)** | **72**  **(40.00)** | **23**  **(12.78)** | **422** | **2.34** | **II** |
| 3. | Small and fragmented land holdings of farmers (C3) | 79  (45.56) | 65  (35.00) | 35  (6.11) | 402 | 2.23 | IV |
| 4. | High and exorbitant custom hiring costs (C4) | 65  (36.11) | 81  (45.00) | 34  (18.89) | 391 | 2.17 | VII |
| 5. | Obsolescence and the old condition of existing machinery (C5) | 38  (21.11) | 41  (22.78) | 101  (56.11) | 297 | 1.65 | XI |
| 6. | Lack of extension facility in guiding farmers (C6) | 89  (49.44) | 52  (28.89) | 39  (21.67) | 410 | 2.28 | V |
| 7. | Fewer extension links of rural farmers with KVKs (C7) | **92**  **(51.11)** | **47**  **(26.11)** | **51**  **(28.33)** | **421** | **2.34** | **II** |
| 8. | High advance reservation of available farm machines during peak season (C8) | 56  (31.11) | 77  (42.78) | 47  (26.11) | 369 | 2.05 | IX |
| 9. | Less weightage to advanced paddy residue management machineries (C9) | 33  (18.33) | 49  (27.22) | 98  (54.44) | 295 | 1.64 | XII |
| 10. | Lack of technical expertise among operators (C10) | 56  (31.11) | 73  (40.56) | 51  (28.33) | 365 | 2.02 | X |
| 11. | During peak seasons, there are not enough CHCs to meet the huge demand (C11) | 67  (37.22) | 59  (32.78) | 54  (30.00) | 373 | 2.07 | VIII |
| 12. | A smaller number of government custom hiring centres compared to private custom hiring centres (C12) | **91**  **(50.56)** | **63**  **(35.00)** | **26**  **(14.44)** | **425** | **2.36** | **I** |

**3.3 Assessment of services rendered by custom hiring centres to the farmers**

Table 4 presents an assessment of various services provided by Custom Hiring Centres (CHCs) based on farmers' perceptions of their importance. Among the services evaluated, the provision of repairs and maintenance of farm machinery emerged as the most crucial, receiving the highest weighted mean score and ranking first. This indicates that farmers place significant value on the availability of maintenance support to ensure the continuous and effective operation of hired equipment. The availability of an advance booking facility was also highly appreciated, ranking second, suggesting that farmers prefer planning and timely access to machinery. On the other hand, services such as visiting farmers' fields after work completion and the availability of straw management machinery were considered less critical, as reflected by their lower rankings and higher percentages of farmers deeming them "not so serious." Overall, the findings highlighted that while modern equipment and skilled operators are beneficial, farmers prioritise timely maintenance, booking convenience, and service quality when using CHC's services.

The analysis of services delivered by Custom Hiring Centres (CHCs) revealed that farmers prioritize practical and efficiency-oriented features over supplementary services. The highest importance is placed on the **provision of repairs and maintenance,** followed by **advance booking facilities, quality of service,** and **reasonable hiring costs.** These services directly impact operational reliability and ease of access, which are critical during peak agricultural seasons. Conversely, services like **field visits post-operation** and **straw management machinery availability** are seen as less essential, indicating that farmers may not view them as immediate necessities. Therefore, for CHCs to enhance their effectiveness and farmer satisfaction, they should focus on strengthening maintenance support, streamlining booking processes, and ensuring service affordability and quality.

**Table 4: Enumeration of questionnaire process associated with farmers, indicating the services rendered by CHCS**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| S. No. | Services delivered by farmers through CHCs | Strongly serious | Serious | Not so serious | Total weighted Score | Weighted mean score | Rank order |
| 1. | Modern and advanced machinery/equipment is available in custom hiring services centres (S1) | 13  (7.22) | 31  (17.22) | 136  (75.56) | 237 | 1.32 | VIII |
| 2. | Availability of straw management machinery in custom hiring services centres (S2) | 21  (11.67) | 18  (10.00) | 141  (78.33) | 240 | 1.33 | VI |
| 3. | The advance booking service facility is available in the custom hiring services centres (S3) | 47  (26.11) | 59  (32.78) | 74  (41.11) | 333 | 1.85 | II |
| 4. | Proficient drivers and skilled operators are available in custom hiring services centres (S4) | 31  (17.22) | 46  (25.56) | 103  (57.22) | 288 | 1.60 | V |
| 5. | Quality and excellent service are available (S5) | 39  (21.67) | 43  (23.89) | 98  (54.44) | 301 | 1.67 | III |
| 6. | Visiting farmers' field after completion of the work (S6) | 16  (8.89) | 27  (15.00) | 137  (76.11) | 239 | 1.33 | VI |
| 7. | Provision of repairs and maintenance of farm machines in custom hiring services centres (S7) | 55  (30.56) | 74  (41.11) | 51  (28.33) | 364 | 2.02 | I |
| 8. | Reasonable and economical cost for hiring machinery in custom hiring services centres (S8) | 27  (15.00) | 59  (32.78) | 94  (52.22) | 293 | 1.63 | IV |

1. **Conclusion**

**The study demonstrates** a strong correlation between farm size and the adoption of mechanised practices. **Small and marginal farmers remain at a disadvantage,** highlighting the need for targeted interventions such as **subsidised machinery, better access to custom hiring centres, and tailored extension services.** Enhancing mechanisation for these groups can lead to more efficient farming operations, reduced labour burdens, and improved agricultural productivity across the board.

The reformation in the current scenario can enhance the mechanisation level in Bihar

* Expanding government CHCs: Particularly in underserved areas, to balance the dominance of private centres.
* Integrating CHCs with Krishi Vigyan Kendra (KVKs): To improve farmer education, advisory services, and awareness.
* Subsidising straw and residue management tools: This would help boost adoption and sustainability.
* Promoting CHCs' awareness campaigns: To bridge knowledge gaps (Constraint C1).
* Investing in machinery upgrades: Address obsolete equipment (C5) for improved efficiency.

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1.

2.

3.

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