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SCIENTIFIC REVIEW

Impact of Agricultural Technology among Santal Community in Bangladesh: Implications for Livelihood and Cult ure

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ABSTRACT

The Santals are known as one of the largest tribal people living in the North and Northwestern regions of Bangladesh. The implementation of agricultural innovations can greatly influence the way of life and traditions of this Santal community. Technology adoption can enhance the living standards of households and alleviate poverty; however, it encounters obstacles linked to government assistance and training for farmers. This study assesses their current livelihood status and analyses the livelihood changes resulting from adopting agricultural technology within the Santals community. By using a simple random sampling technique, the study selected 90 respondents. The quantitative data was collected by interviewing 90 respondents using a household survey, and the qualitative data were collected

by conducting FDGs (4) and KIIs (3) with purposively selected participants in the study area. The quantitative analytical tools employed to attain the specific objectives included various descriptive statistical measures and the Problem Confrontation Index (PCI) by adoption technology. The study delves into the various agricultural technologies introduced in the region, such as high-yield crop varieties, mechanized farming equipment, and sustainable irrigation methods, and analyses their impact on crop yield, income generation, and overall livelihood improvement. The findings reveal a substantial increase in agricultural productivity and income among the Santal people due to the implementation of modern technologies. Income increased from 30% to 60% after adoption, showing a substantial +100% change. Food security improved from 45% to 70% after adoption, indicating a +55.6% change. Employment opportunities doubled from 20% to 40% after adoption, resulting in a +100% change. Health and well-being rose from 60% to 75% after adoption, reflecting a +25% change. Education Access grew from 25% to 45% after adoption, representing an +80% change. The vulnerability indicators also changed food security changed from 50% to 70%, climate resilience changed from 30% to 60%, market access changed from 405 to 70%, and income stability changed from 60% to 80% after technology adoption. Technology adoption has facilitated increased community engagement. Average Income (Taka/year): Before the adoption, the community had an average income of 25,000 taka per year. After the adoption, their income increased to 45,000 taka/year, marking a substantial improvement of +80%. The significance of technology adoption in improving the overall wellbeing of the Santal community cannot be understated.

***Keywords**: Agricultural technology, Santals, Livelihood, Culture, Sustainable livelihood, etc.*

JEL classification: Q16

INTRODUCTION

Bangladesh is a densely populated country where people from different religions, races, and castes have been living together since ancient times. The majority of its 158.6 million [1] population is Bengalis, but it is also quite rich in ethnic culture as is inhabited by Indigenous ethnic minorities belonging to over 45 different ethnic groups. Bangladesh has been enriched with the culture of different Adivasi ethnic. The word Adivasi is derived from the Sanskrit language, where 'Adi' means original and Vasi means inhabitant [2]. The Adivasi may also mean indigenous people. The terms Indigenous people describe social groups with a social and cultural identity distinct from the dominant society that makes them vulnerable to being disadvantaged in the development process [3]. Bangladeshi laws and policy documents use several terms, such as Indigenous people, Aboriginals, Ethnic minority groups, Adivasi, Pahari, Upajati, Jhumma, and the scheduled tribes to refer to these people [4]. Among the 45 different ethnic populations, the Santal is 8.96% [5].

The Santals are known as one of the largest tribal people living in the North and Northwestern regions of Bangladesh. They are also claimed to be Adivasi and are known as one of the oldest tribal communities in Bangladesh, having their religion, traditions, and customs [6]. The demographic information regarding the Santal community has been presented in Tab. 1.

Tab. 1: Demographic overview of the Santal community globally and in Bangladesh [7]

Indicator	Value
World Population	9,373,200
Total Countries	4 [Bangladesh, Bhutan, India, Nepal]
	Population In Bangladesh
Division-Wise Population in Bangladesh	Rangpur (616,000), Sylhet (215,000), Rajshahi (198,000), Chittagong (7,000), Khulna (6,900), Dhaka (4,000), Barisal (1280)
People Name General	Santal
Alternate Names	Hor, Majhi, Santhal, Satar, Sattar, Munda
Religion	Donation

Most of the people of Bangladesh are dependent on agricultural activities directly and indirectly. Agriculture is one of the largest producing sectors of the economy, which comprises 13.31 % of GDP. 43% of agrarian employees are involved in the total labor force [8]. Therefore, in such a country, agrarian development should form the foundation for national development. In Bangladesh, agrarian technology has a great impact on the livelihoods and culture of the Santal community. Livelihoods are mainly a mixture of various sources of economic activities, changeable over a period [46]. Livelihoods constitute various types of working opportunities for each number of households and it is usually even for each working member during the time of one year [9]. The simplest definition offered by psychologists,

anthropologists, and sociologists is: "Culture is defined as the class of responses of any hominid individual learned from any other hominid individual." [10] Some authors define culture as "traditional behavior" which passed on from one generation to another [11].

Against this backdrop, improved agricultural technology has been introduced to reconcile the socio-economic and environmental trade-offs. The implementation of agricultural innovations can greatly influence the way of life and traditions of the Santal community. Agricultural technology is becoming more crucial for sustainable agrarian progress since it enables farmers to enhance productivity while utilizing fewer natural resources to satisfy the rising need for food, fuel, and fiber [12]. The adoption of agricultural technologies has the potential to improve household livelihood status and reduce poverty but faces barriers related to government support and farmer training. Bangladesh is one of the world's most populous and low-middle-income nations [13]. This study is anchored in the Sustainable Livelihoods Framework (SLF), offering a lens to comprehend the diverse impacts of agricultural technology on Santals' livelihoods [14] [15]. The SLF emphasizes five key assets - human, natural, financial, physical, and social - which interact to shape livelihood strategies and outcomes. This framework aligns seamlessly with the study's exploration of the Santals' socio-cultural context in the Naogaon District.

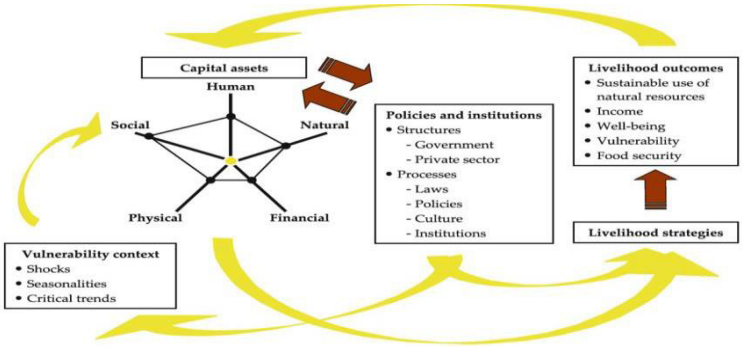

Fig. 1: Sustainable Livelihood Framework (SLF) [16]

The impact of agricultural technology on capital assets in the Santal community is multifaceted, reflecting both challenges and potential benefits. Many Santals, who previously worked as day laborers in agriculture, have found themselves unemployed as farmers increasingly rely on machinery and herbicides to enhance productivity [17]. Some members of the Santal community are beginning to adopt these technologies, which could enhance food security and economic stability if integrated effectively [18]. The Santals community is comfortable with nature, collecting food from the nearby pool of resources or CPR. The economic condition of the plainland Santals is significantly worse. 59.9 percent of the plainland Adibasi people in Bangladesh are poor, compared to only 39.9 percent of people in rural Bangladesh. Hardcore poverty is also more pronounced among the plainland Adibasi than that of the rural Bangladeshis [19]. Studies show that the Santals community possesses fewer household assets than the other plainland Adibasi communities [19]. The physical capital which includes infrastructure, tools, and equipment used for productivity is fewer among the Santals community. In the past, the majority of the Santals were landowners, but due to various causes, they became the poorest of the poor. At present, nearly 80 percent of the Santals are landless, being forced to earn their livelihood relying on the

mercy and availability of work in the fields of their Muslim or Hindu neighbors for their mere subsistence [19]. Nowadays, the mobility and interaction of the Santals with the mainstream population have increased due to the expansion of market mechanisms and employment opportunities outside their villages. The government and nongovernment organizations rarely have undertaken different development programs (i.e., education, infrastructural development, rural electrification, and health facilities) in most of the populated tribal areas of Bangladesh [20].
Therefore, the influence of agricultural technology on the Santal community's livelihoods and culture is complex, involving economic advantages, cultural changes, and social consequences. Traditionally reliant on indigenous farming practices, the Santal people have seen a shift in their agricultural productivity due to mechanized tools, improved seeds, and modern irrigation methods [21]. This shift has increased crop yields, provided greater food security, and enhanced income opportunities. Mechanization has also reduced the need for labor-intensive tasks that are used to bring families and communities together, potentially eroding social cohesion [22]. This study sought to investigate the socio-demographic characteristics of sample farmers, to analyze the livelihood changes resulting from adopting agricultural technology within the Santals community. Furthermore, this study hunted the challenges faced by the Santals in adapting to technological changes in their livelihoods.

RESEARCH METHODS

Research Approaches

Research methods can be classified into two main types: quantitative and qualitative [23]. The mixed method, which incorporates both quantitative and qualitative approaches, is beneficial for the research as it relies on objective data while

providing a deeper understanding of realworld issues.

Selection of the Study Area

Choosing the study area is a crucial research step, greatly influenced by the study's goals [24]. Thus, thorough consideration was given to selecting an area that can meet the mentioned objectives. The location of the study area was Patnitala Upazila under the Naogaon district of Rajshahi division. The Naogaon district was selected for this study because in this district, the Santal people are abundant in number and the study was conducted in one Upazila under the Naogaon district. By following a similar technique, the one Upazila namely Patnitala is selected for this study.

Fig. 2: Study area map (Patnitala, Naogaon District)

Sample Size, Sampling Methods & Data Collection

Sample size will be calculated using the following equation [25]:

$$n = \frac{N^2 Z^2 p^2 (1-p)}{Nd + Z\,p\,(1-P)}$$ where,

n = calculated sample size

N = total number of households

Z = confidence level (95% confidence level is 1.96)

P = population proportion (0.50, this maximizes the sample size)

d = error margin of 5% (0.05)

The research endeavors to study the extent of Santal people's attainment by the economically active in agriculture in the study area. About 90 households were purposively interviewed to assess the impact of agricultural technology on the Santal people's livelihood and culture. These households were identified through a simple random sampling method. Necessary data were collected through personal interviews with the individual men and women of Santal people. Data were related to basically Santal people using different types of agricultural machinery and technologies in the field through field preparation, irrigation, intercultural operation, and post-harvest management as well as the barriers to using this machinery. A total of 6 FGDs & 3 KIIs were conducted by the researcher with the Santal people in the study area. To have secondary data, various books, periodicals, reports, magazines, newspapers, and articles through websites are accessed. The respondents were available during the period of data collection and primary data were collected during the period of 20 August to 04 September 2023.

Analytical Techniques

- Socioeconomic characteristics: To assess the socioeconomic and socio-demographic characteristics of the respondents, descriptive statistics, including frequency, percentage, and cross-tabulation [26], have been used. MS Excel 2013 was used to calculate these attributes.

- Livelihood Outcome with Technology Adoption: To calculate the percentage change for each livelihood outcome from the table, need to follow these steps for each outcome:
  - Identify the Initial (Before Adoption) and Final (After Adoption) Values
  - Apply the Percentage Change Formula: Use the following formulas to calculate the percentage change:

    Percentage Change = (After Adoption – Before Adoption*Before Adoption) ×100 Percentage Change = (Before Adoption*After Adoption−Before Adoption) ×100
- Computation of Problem Confrontation Index (PCI): The Problem Confrontation Index (PCI) is a measure of determining problems and constraints where problems are shown in tabulated form according to their severity [27]. By using a structured questionnaire, the respondents were asked to give their opinions on some selected problems during data collection [28]. The Problem Confrontation Index (PCI) was computed by using this formula [27]:
  - Problem Confrontation Index (PCI) = $P_h \times 3 + P_m \times 2 + P_l \times 1 + P_n \times 0$,

Where,

P_h = total number of Santal people that expressed "high" problems;
P_m = total number of Santal people of the expressed "medium" problem;
P_l= total number of Santal people that expressed "low" problems;
P_n = total number of Santal people that expressed "not at all" problems.

Econometrics Technique

A standard deviation (or σ) is a measure of how dispersed the data

is about the mean [29]. Low, or small, standard deviation indicates data are clustered tightly around the mean, and high, or large, standard deviation indicates data are more spread out.
To calculate the standard deviation, use the following formula [30]:

$$\sigma = \sqrt{\frac{\sum(x_i - \mu)^2}{N}}$$

Where, σ = the standard Deviation
n xi = each data point in the set μ =the mean and
N = the total number of data points
X_i = represents each data point

RESULTS

Socio-Demographic and Economic Profile of Char Respondents

Several variables describe the demographic characteristics of the respondents. The variables included in this analysis were the household head's age, education level, family size, household landholding, and average annual income as well. Total count frequency is used to interpret the results as some variable's data were collected from family members (Tab. 2). Tab. 2: Socio-demographic profile of the respondent

Characteristic	Scoring system	Categories	Mean	Standard Deviation	
			Respondent		
				N	%
		Small (up to 4)		14	15.5
Household size	Number	Medium (5-7)		72	79.5
	5.68		1.214		
		Large (>8)		4	5
		Young (16-25 years)		9	10
Age	Years	Middle-aged (26-45		65	71.6
	45.46		12.65		
years)					
		Old-aged (>46 years)		16	18.3
		Illiterate (No schooling)		30	33.6
Education	Year of	Primary (Up to 5)		39	43.3
	2.64		2.51		
	schooling	Secondary (6 to SSC)		15	16.6
		Higher studies (> HSC)		6	8.3
No land (Only own					
		homestead area)		9	10
		Minor (0.5 – 1.00)		15	16.6
Household					
landholding	Acres	Little (1.01 – 2.00)		30	33.3
	0.77		0.30		
Intermediate (2.01 –					
		3.00)		32	36.6
		Big (> 3.01)		3	3.3
		Low income (up to 350)		24	26.6
Average annual					
household	000’ Tk	Medium (351-450)		60	66.7
	388.71		107.27		
income					
		High income (>450)		6	6.7

The age of a person plays a critical role in determining various

factors of his / her livelihood in a society and such livelihood is said to be valid in a nation like Bangladesh. A study conducted by [31] in rural Bangladesh found that middle-aged (25-40 years) persons enjoy better livelihoods than the old ones (45+ years). Thus, a large proportion of the respondents (71.66 percent) were middle age category. Old-aged respondents might have valuable opinions on management practices. Moreover, middle-aged people are generally receptive to new ideas and bought. They would have possessed high knowledge of agricultural technologies, and if necessary, steps would be taken to disseminate new technologies and practices by the extension personnel.

From Tab. 2 household size of the respondents in the sample ranged from 2 to 8. The mean household size was 5.68 and the standard deviation was 1.214. The findings indicate that the highest proportion of the respondents' household size (80 percent) was medium category compared to 15 percent small category and 5 percent belonged to the large size household category. Thus, a large proportion of the respondents (80 percent) had medium household size which is supportive of the average household size (4.6 members) in Bangladesh [1]. The respondents had an average household size of 5.68. According to the [32] survey, the average household size in rural regions is 4.30. This Fig. is consistently higher than that of urban areas across all survey years.

In analyzing people's livelihood, many scholars [33-35], have highlighted the significance of higher educational attainment in achieving superior positions in society. The primary level of education (43.33 %) was higher than the secondary level of education (16.67 %) in the study area. A very insignificant portion of respondents were found to pass the higher secondary level of education (8.33 %) in the study area. Compared to the national average literacy rate (76.66 percent) [36] it is visible that the respondent’s education level is acceptable because the literacy rate seems to be higher than that of the national average.

In South Asian societies, the size of landholding by people is one of the key determinants of achieving high economic status in both rural and urban areas [33]. Results of Tab. 2 indicate that 10 % households of the respondents didn't own any cultivable land (except homestead area) and 16.67 % of households of the respondents were holding land in the range of 0.05 to 1.00 acres and thus enjoyed the status of marginal land owners. About 70% households of the respondents held land in the range of 1.01 to 3.00 acres and thus enjoyed the status of medium or intermediary land owners, whereas only 3% were big land owners.

Average annual household income is also an important determinant of the economic status and livelihood diversification of people residing in a society [37]. The distribution of the respondents according to their annual family income is shown in Table 2. Data showed that the highest proportion of the respondents (66.67 %) were in the medium-income category, where 26.66 % of them were in the low-income category and 6.67 % had higher incomes. The findings indicate that most of the respondents were medium-income category.

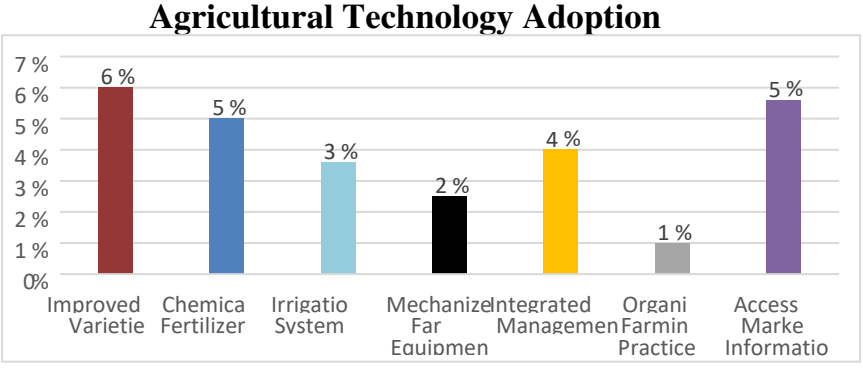

Fig. 3: Percentage distributions of respondents based on technology used in different operations

Our survey findings indicate a varying degree of technology

adoption among Santal households. From Fig. 3, improved seed varieties have the highest adoption rate, with 60% of households adopting them. This suggests that a majority of Santal farmers recognize the benefits of improved seed varieties in enhancing crop yields and quality [38]. Chemical fertilizers and access to market information are also widely adopted, with adoption rates of 50% and 56%, respectively. The adoption of chemical fertilizers reflects the community's recognition of the importance of soil nutrient management in achieving better yields. Access to market information highlights the Santal community's efforts to engage with broader agricultural markets [39]. On the other hand, technologies like mechanized farm equipment and organic farming practices have relatively lower adoption rates, at 24% and 10%, respectively. These lower adoption rates may be attributed to various factors, including limited access to financial resources, lack of awareness, or cultural preferences for traditional farming methods.

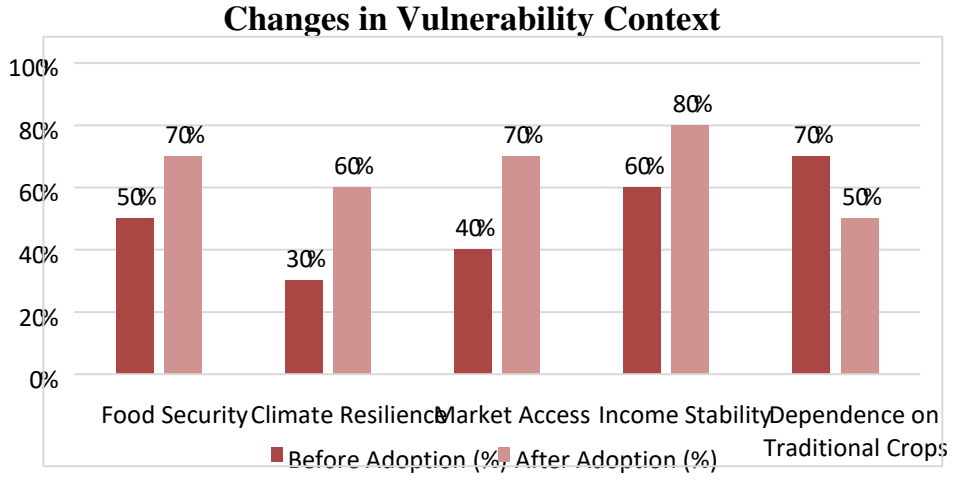

Fig. 4: Changes in vulnerability context with % adoption

Fig. 4 summarizes the changes in the vulnerability context with

percentage adoption values for the Santal community in the Naogaon District. These values reflect the percentage shifts in various vulnerability indicators before and after the adoption of new agricultural technology.

Before technology adoption, the community's food security was at 50%. After adopting the new technology, their food security increased to 70%, marking a positive change of +20%. This suggests they are now better at meeting their food requirements. Following the adoption, climate resilience increased to 60%, representing a substantial improvement of +30%. This implies they are better equipped to cope with and adapt to climate-related challenges. Similarly, market access & income stability experienced a positive change after adoption. After adopting the technology, dependence on traditional crops decreased to 50%, showing a significant change of -20%. This indicates a reduction in reliance on traditional crops and an increased diversification of their agricultural activities [40].

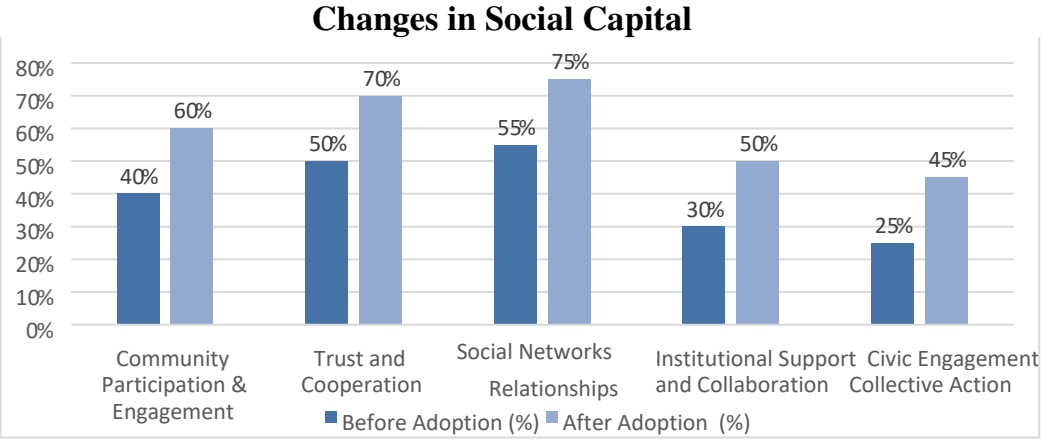

Fig. 5: Changes in social capital

Fig. 5 provides a concise overview of the changes in social capital for the Santal community in the Naogaon District, following the

adoption of new agricultural technology. Community participation and engagement increased from 40% to 60% after adoption, indicating a +50% change. Higher engagement fosters a sense of belonging and community, leading to stronger relationships among members [18]. Institutional support and collaboration rose from 30% to 50% after adoption, showing a +66.7% change. Similarly, social networks relationships, and civic engagement also experienced a significant positive change after technology adoption. Positive change in social capital is a great indication of community development [41].

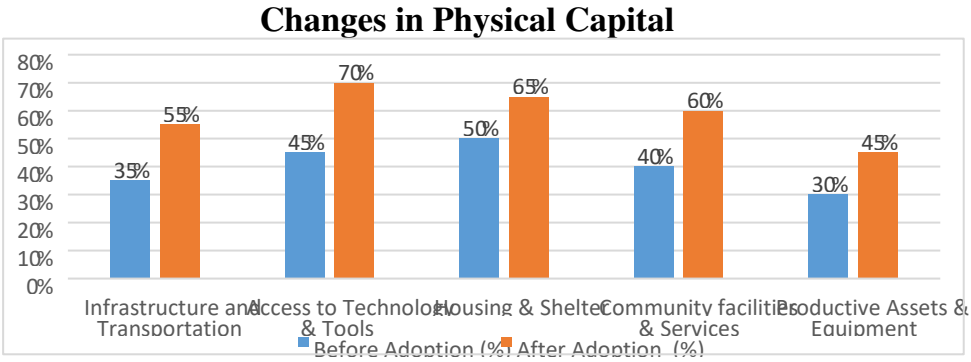

Fig. 6: Changes in physical capital

Fig. 6 provides a concise overview of the changes in physical capital for the Santal community in the Naogaon District. Infrastructure and transportation enhanced from 35% before adoption to 55% after adoption, reflecting a +57.1% change. Enhanced infrastructure can lead to improved economic opportunities, attracting investments and enabling better trade and commerce [42]. Furthermore, access to technology and tools also enjoyed an increase from 45% to 70% after adoption, indicating a +55.6% change, suggesting a significant focus on modernizing tools and technological resources, which could drive productivity and innovation. Other variables such as housing, community

facilities, and productive assets and equipment showed a significant positive change after agricultural technology adoption.

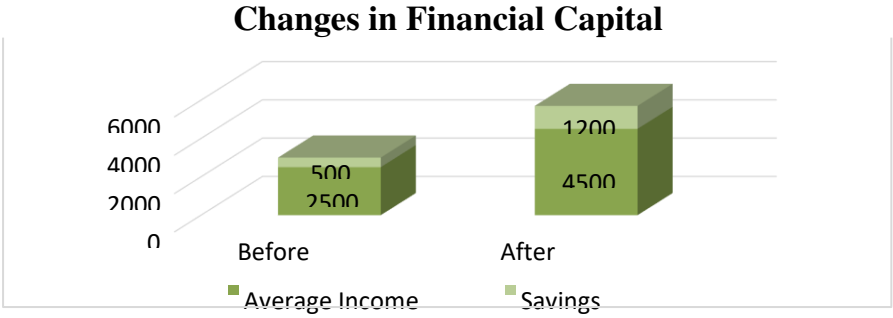

Fig. 7: Changes in Financial Capital

Fig. 7 provides a concise overview of the changes in financial capital for the Santal community in the Naogaon District, following the adoption of new agricultural technology. Financial Capital The adoption of new agricultural technology, such as improved crop varieties and mechanized farming, has resulted in increased income for the Santal community. Average Income increased significantly from 25,000 Taka per year before adoption to 45,000 Taka per year after adoption. This 80% rise in income suggests a substantial improvement in economic opportunities or productivity following the intervention [43]. In terms of savings, (Taka/year) initially they had savings of 5,000 Taka per year. After the adoption, their savings grew to 12,000 Taka per year, showing a significant improvement of +140%. Access to credit before the adoption, their access to credit was limited. After adopting the technology, their access improved. Overall, the intervention seems to have positively impacted financial stability, as both income and savings show notable growth.

Changes in Human Capital (Percentage Values)

Tab. 3: Changes in human capital (Percentage values)

Indicator	Before Adoption (%)	After Adoption (%)	Change (%)
Knowledge and Skills in Modern Farming	Limited (45%)	Enhanced (75%)	Improved (+30%)
Training and Education Access	Limited (40%)	Increased (65%)	Improved (+25%)
Understanding of Pest Management	Basic (50%)	Advanced (80%)	Enhanced (+30%)
Access to Market Information and Techniques	Limited (35%)	Improved (65%)	Improved (+30%)
Ability to Adapt to Climate Change	Limited (40%)	Enhanced (70%)	Improved (+30%)

From Tab. 3, before adopting new technology, the community had limited knowledge and skills in modern farming (45%). After the adoption, their knowledge and skills were enhanced (75%), marking a substantial improvement of +30%. Enhanced training and educational access further bolster farmers' ability to adopt climate-resilient strategies, promoting sustainability in agricultural practices. Improved access to market information empowers participants to make informed decisions, potentially boosting income and market engagement. Such advancements are crucial for fostering sustainable agricultural practices and improving the overall socioeconomic conditions of the community [44].

Livelihood Outcomes with Percentage Values

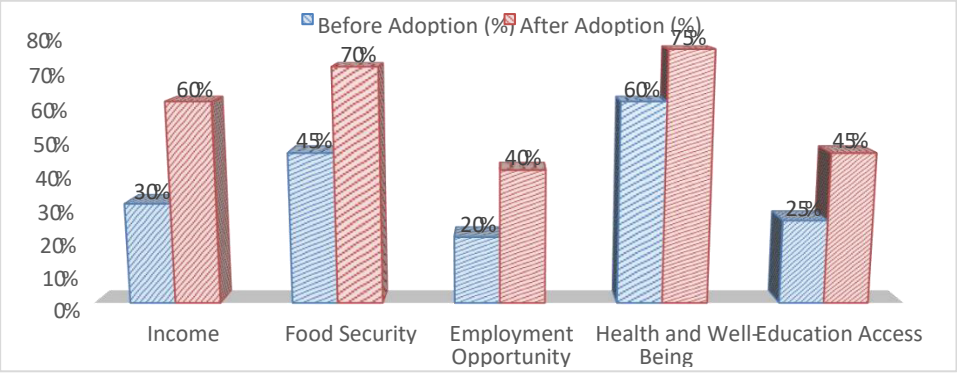

Fig. 8: Livelihood outcomes with percentage values

Fig. 8 summarizes the changes in human capital with percentage values for the Santal community in the Naogaon District. These values reflect the percentage improvements in various human capital indicators before and after the adoption of new agricultural technology.

Income levels doubled, rising from 30% to 60%, likely due to improved economic opportunities and resources, which enhance participants' earning potential. Food Security experienced a substantial boost from 45% to 70%, indicating that households have better and more reliable access to nutritious food, possibly reducing malnutrition and food-related stress. Education Access also improved, moving from 25% to 45%, which likely enhances participants' skills, knowledge, and future economic opportunities. Access to education is a critical factor in breaking cycles of poverty and promoting long-term development, as it enables individuals to adapt to challenges more effectively [45].

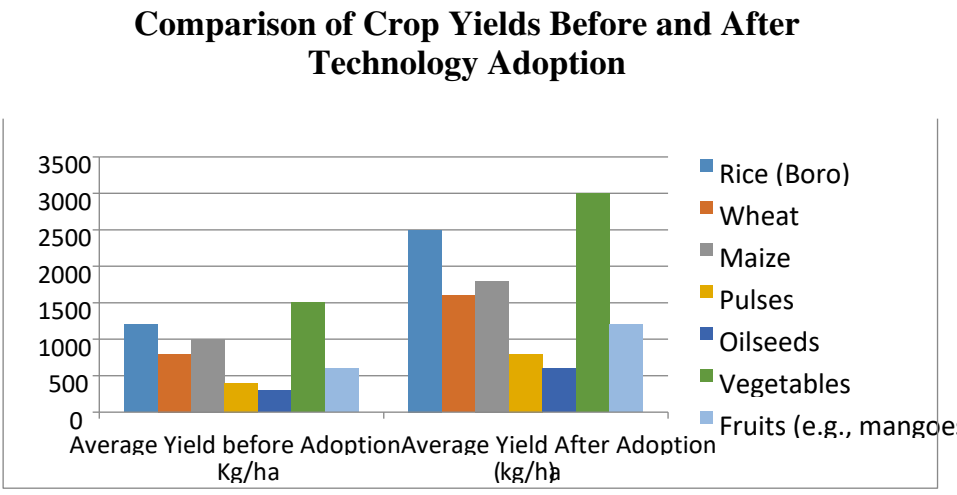

Fig. 9: Comparison of crop yields before and after technology adoption

The data in Fig. 9 reveals a significant increase in crop yields across various crop types after the adoption of agricultural technology. Notably, rice (Boro) yields increased from an average of 1,200 kg/ha before adoption to 2,500 kg/ha after adoption. This substantial increase suggests that the adoption of improved seed varieties, chemical fertilizers, and irrigation systems has had a positive effect on rice cultivation. Similar trends are observed in other crops, including wheat, maize, pulses, oilseeds, vegetables, and fruits.

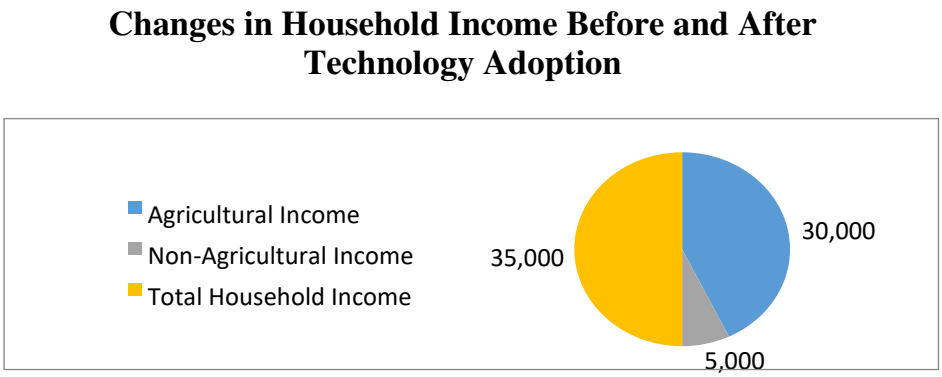

Fig. 10: Changes in household income before technology adoption (Tk/Year)

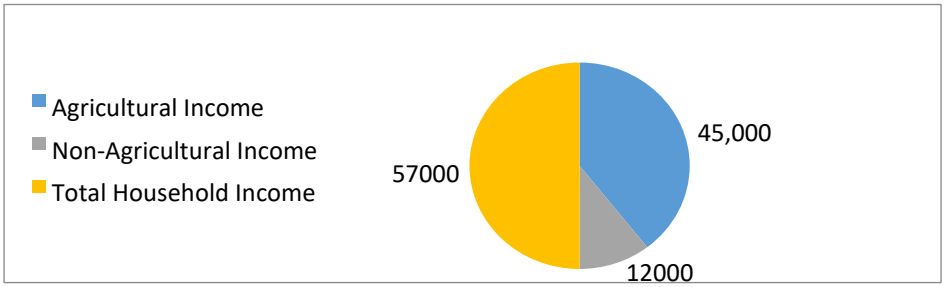

Fig. 11: Changes in household income after technology adoption (Tk/Year)

One of the most significant and immediate benefits of technology adoption in the Santal community is the substantial increase in income [40]. From Fig. 10 & 11, the average household income has risen from 35,000 (before adoption) to 57,000 (after adoption), reflecting a remarkable 62.85% increase. The introduction of modern farming techniques has resulted in increased productivity in rice and vegetable production, resulting in increased agricultural income from 30,000 to 45,000. Agricultural advancements have led to a significant rise in crop yields since the early 1980s, contributing to improved economic conditions for the Santals [44].

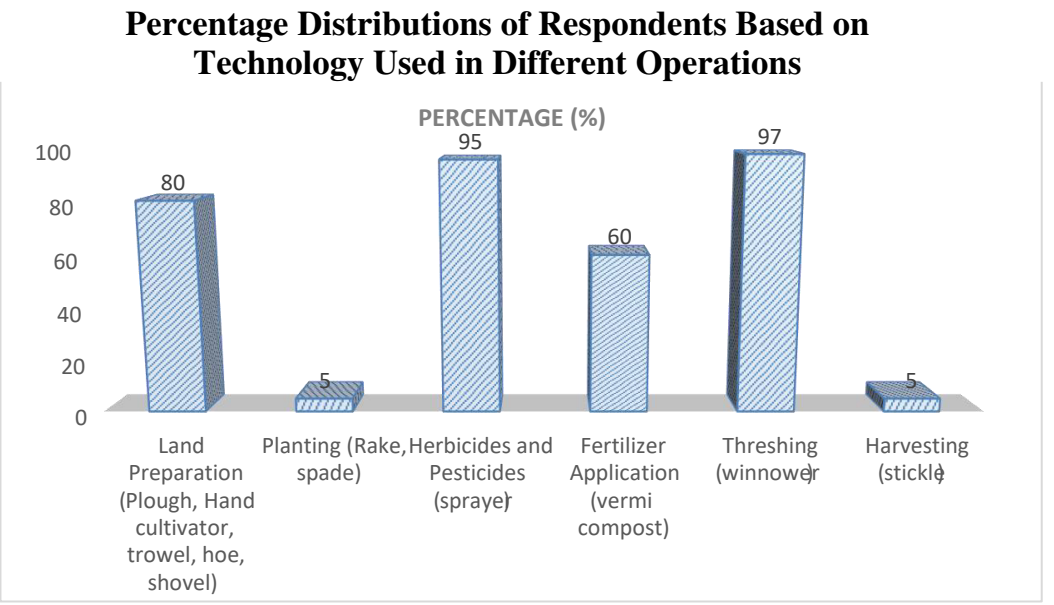

Fig. 12: Distributions of respondents based on technology used in different operations

Fig. 12 indicates, the number of various agricultural machinery, equipment, and tools used in the study area. For land preparation, most of the respondents used a plough, hand cultivator, trowel, hoe, and shovel. Only 5 % of respondents get involved in planting operations with rake and spade equipment. 95 % of respondents get involved in Herbicides & pesticides operation. Almost every respondent has a sprayer. For fertilizer application most of the respondents used vermicomposting which is considered a high-nutrient biofertilizer with diverse microbial communities, it plays a major role in improving the growth and yield of different field crops vegetables, flower, and fruit crops. Few respondents have sickle for harvesting operation which is only 5 %. The sickle is one of the most common hand tools used for harvesting crops, and grass and cutting other vegetative matters. For threshing operation, 97 % of respondents get involved with this technique including

using a winnowing fan (a shaped basket shaken to raise the chaff) or using a tool (a winnowing fork or shovel) on a pile of harvested grain.

Computation of Problem Confrontation Index (PCI)

The Problem Confrontation Index (PCI) is a measure of determining problems and constraints where problems are shown in tabulated form according to their severity. By using a structured questionnaire, the respondents were asked to give their opinions on some selected problems during data collection [28]. Following the methodology, a four-point rating scale was used to compute the problem score of a respondent. Scores were assigned to those alternative responses as: "High" = 3, "Medium" = 2, "Low" = 1, and "Not at all" = 0, respectively.

Tab. 4: Computation of problem confrontation index (PCI)

SL No	Problems	High Problems (3)	Medium Problems(2)	Low Problems (1)	Not at all (0)	PCI	Rank
1	Lack of capital	25	18	17	0	128	4
2	Lack of adequate farm machinery	26	20	14	0	132	2
3	Lack of Land	22	19	19	0	123	5
4	Lack of Extension Service	18	24	18	0	120	6
5	Lack of Technical Knowledge	26	24	10	0	136	1
6	Lack of training facilities	23	26	11	0	132	3

7	Lack of transportation	0	12	48	0	72	7

From Tab. 4, the issue considered the most crucial is insufficient technical knowledge which is ranked first (PCI = 136), followed closely by insufficient agricultural machinery and insufficient training facilities (both PCI = 132). It underscores a fundamental gap in skills and knowledge necessary for effective agricultural practices. This suggests that participants believe that knowledge and equipment are essential for efficient agricultural practices. The supply of adequate tools, equipment, and machinery needs to be ensured at block level so that assured availability is ensured to the santal people as per their requirement. Training is more relevant when the technology involves tools and equipment where training in operation, repair, and maintenance is a must. Cash capital and investment are an important input for the enlargement of any farm. It is very difficult for the Santal people to collect capital. The majority of the respondents pointed out that lack of capital is one of the major problems in the study area. Out of 60 respondents, 25 santal people faced this problem at a high extent, 18 santal people faced this problem at a medium extent, and 17 santal people confronted this problem at a low extent. So that they could not large their farming as they needed. In this case, the computed value of PCI was 128. The main role of transport is to deliver agricultural products from farms to markets and cities worldwide. Lack of transportation was described as the lowest possible problem specifying seven problems faced by the rural santal people with PCI 72, which ranked as the 7th problem of the study area.

CONCLUSION

Overall development of the socio-economic situation of

Bangladesh fully depends upon the development of the rural and urban areas. No doubt santals people in this study area experience unfavourable social discrimination and economic inequality. The study found that Somali people have limited choices in education, health, the labor market, and creative work and earn less in comparison to mainstream Bengali people. As a result, their lack of education and awareness caused their backwardness in political and social participation. Their primary occupation was day laborer and they hardly got the facility of training for modern agricultural technology from the Government. At the outset, the study revealed that the majority of the respondents had moderate to high favorable perception of a greater extent of santal agricultural technology adoption but many of them had low to moderate favorable perception of their consequent attainment in the study area. This led to the conclusion that although the respondents had a favorable perception of a greater extent of santals adoption of agricultural technology, on average, their perceptions on the consequent impact attainment were not that favorable in the study area. Later on, the quantitative analysis done by this study brought into being that, overall santals agricultural technology adoption status was not satisfactory in the study areas, where there is huge scope to work. Various problems such as insufficient capital, lack of profit, inadequate training facilities, lack of adequate farm machinery, etc. problems are faced by the respondents in those areas. The study also demonstrated the way Santal people negatively impacted their livelihood and ultimately shattered their psychological strength as citizens of Bangladesh. As a result, nowadays the members of the santal community are engaged in a silent resistance to survive and thrive culturally as well as materially.

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