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RESEARCH ARTICLE

An Assessment of Technological Gap in Adoption of Recommended Maize Cultivation Practices in Assam

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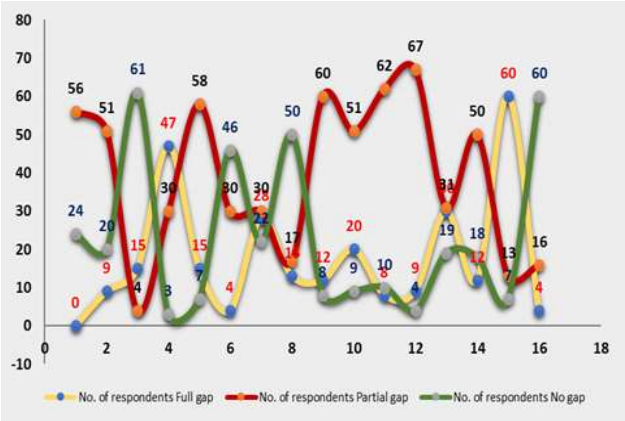
HIGHLIGHTS

- The Government of India has started a new Central Sector Scheme titled "Formation and Promotion of 10,000 Farmer Produce Organisations (FPOs)
- Respondents are the shareholders of FPOs
- 61.25% respondents had medium overall technological gap
- 20.00% of the respondents had high overall technological gap
- 18.75% of the respondents had low technological gap

GRAPHICAL ABSTRACT



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ABSTRACT

Introduction: Maize is a widely grown commercial crop that provides raw materials to numerous agro-based businesses. In comparison to other grains, maize is less expensive, easier to process. For this study, Sonitpur district was chosen for its association with a Farmers Producer Company specializing in commercial maize cultivation, known as Nameri Valley Agro Producer Company Limited. Producer Company means a commercial body having objects or condition specified in section 581B and registered as Producer Company under this Act.

Context: There's a need to encourage our growers to produce advanced-quality goods, with better technology, finance, inputs, and requests. With a popular provision of Rs 6865 crore, the Government of India has started a new Central Sector Scheme named" conformation and Promotion of 10,000 Farmer Produce Organisations (FPOs)" with the thing of forming and promoting 10,000 new FPOs throughout the nation.

Objectives: The study was conducted in Sonitpur of Assam with an objective to assess the extent of technological gap in relinquishment of recommended maize civilization practices by the shareholders.

Methods: From an aggregate of 122 shareholders, a sample of 80 shareholders was selected as respondents of the study by following a Random Sampling Technique. The data were collected with the help of a pre tested schedule by interview system.

Results & Discussion: The maximum average technological gap was set up in insect pest control practices (75.00). A total of thirty-five per cent of the respondents had full gap in operation of phosphatic fertilizer application. None of the respondents had full gap in recommended seed rate practices of Maize civilization.

Agriculture, as a prominent sector, contributes approximately 21 per cent to the gross state domestic product and provides employment to over 70 per cent of the population in agriculture and its allied sectors. India has implemented several steps to support this industry, including price support, crop insurance, credit support, knowledge support, and farm marketing reforms. These policies were put in place to help the people who are actually benefiting the land (Nagamani, 2023). It is one of the most significant cereal crops in India and the rest of the world.After rice and wheat, maize is the third most significant cereal crop in the world. Corn is known by its American Indian name, maize, which literally translates to "that which sustains life" (Rathod, 2014). Among the countries that cultivate maize, India ranks 4th in terms of area and 7th in production. This represents approximately 4 per cent of the world's maize area and 2 per cent of total production. During the 2018-19 period in India, the maize cultivation area expanded to 9.2 million hectares. In contrast, back in 1950-51, India produced only 1.73 million metric tons (MT) of maize. However, by 2018-19, this production had surged to 27.8 million MT, marking an impressive 16-fold increase. The average productivity during this period also witnessed substantial growth, rising 5.42 times from 547 kg/ha to 2965 kg/ha.

Assam being the most well-known sector in agriculture, rice remains the staple food and is extensively grown throughout the state, while other cereal crops such as maize, wheat, and millet are also cultivated. The state experiences a sub-tropical climate with warm and humid summers and cool, dry winters. Additionally, it is situated in a high rainfall zone, receiving an annual average rainfall of 2297.4 mm (Goswami, 2023). Assam's maize crop has grown significantly over the past few decades in terms of both area and productivity; in 2021–2022, the state produced 170000 MT of maize from 43000ha. (Singh *et al.,*2018; Annon, 2021–22). However, farmers' adoption practices for crops other than maize varied significantly (Rathore *et al.,* 2003; Gupta and Chauhan, 2004). Recognized as a primary raw material by most feed companies, maize cultivation in the state spans 31,000 hectares, yielding 91,000 tonnes, with a productivity rate of 2911 kg/ha as of 2017–18 (Kalita *et al.,* 2019).To lessen moderate to severe hazards in agriculture, there are a number of viable adaptation strategies (Oinam *et al.,* 2019). Maize grains offer significant nutritional value due to their composition. They contain: 72 per cent starch, 10 per cent protein, 4.8 per cent oil, 8.5 per cent Fiber, 3.0 per cent sugar, 1.7 per cent ash. Maize cultivation is popular among small-scale farmers due to its affordability and high nutritional value, benefiting rural communities (Huma, 2019).

Maize stands out as a crucial cereal crop with extensive production, adaptability, and diverse uses. As there is a significant discrepancy between technology and its application in practical situations (Khan 2005), therefore the Farmers' Producer Organizations (FPOs) are established with an aim to boost agricultural output, improve productivity, increase profitability and market linkage for farmers. As FPOs operate on a voluntary basis and are governed by their farmer members, who actively contribute to shaping policies and decision-making processes.

Therefore, to reduce geographical variations in country's maize production as well as the gap between potential and actual yields at the farmer's field, it is crucial to understand how scientifically reliable farming techniques have been adopted in the various regions of the country (Patodiya, 2018).

In the state of Assam one of the FPC namely the Nameri Valley Agro Producer Company Limited located in Sonitpur district, solely focussed on the maize cultivation was selected for the present study. As there is a gap between the adoption practices and the recommended practices, therefore the study primarily focussed on the technological gap of the respondents of the Nameri Valley Agro Producer Company Limited. The respondents selected for the study are the shareholders of the concerned FPC.

METHODOLOGY

The research was conducted in the state of Assam, situated in the North-Eastern region of India, spanning latitudes 24º to 28º18' north and longitudes 89º50' to 97º4' east. Assam covers an area of 78,523 sq.km (78,523,000 ha) and has a population exceeding 311 lakh (as per the 2011 census). The state is divided into 33 administrative districts, with the study focusing on the Sonitpur district.

Sonitpur district was chosen for its association with a Farmers Producer Company specializing in commercial maize cultivation, known as Nameri Valley Agro Producer Company Limited, located in the Balipara Development Block was purposively selected

for the research. The map of Sonitpur district showing the research area is presented below in Figure 1.

At the time of the study, there were 122 shareholders and they were distributed across four villages namely: Buragaon Chapori, Kolabari, Lokhra, and Sonainepali. From this pool, 80 shareholders (65.57%) were chosen using a proportionate random sampling technique, ensuring representation from all four villages. The inclusion criterion was a minimum of three years of experience in maize cultivation. The sample selection process employed a proportionate-cum-random sampling technique, with the sample size of 80 respondents being representative for the study. the 'technological gap' was determined by aggregating scores assigned to individual practices based on farmers' responses. The technological gap for each maize cultivation practice was assessed in terms of three categories: full gap, partial gap, and no gap. If a farmer adhered to a recommended practice, it was categorized as 'no gap' and assigned a score of 0. Deviation from the recommended practice was labelled as a 'partial gap' with a corresponding score of 1. Farmers who completely disregarded the recommended practice were categorized as having a 'full gap' and received a score of 2. The assessment of technological gaps was conducted for 16 selected cultivation practices, as recommended by Assam Agricultural University and the Department of Agriculture, Government of Assam. The overall score for a respondent was computed by summing the technological gap scores across all practices followed by that respondent.

The tabulated data were analyzed using appropriate statistical technique *viz.,* frequency, per centage, mean, S.D, t-test, correlation coefficient, C.V.

Fig 1 : Map showing the research area

RESULTS

An attempt was made to access the frequency of respondents according to practice wise technological gap in which the maximum average technological gap was found in disease control practices (75.00 %), majority of the respondents (83.75%) of the respondents had partial gap in the chemical weed control practices and majority of the respondents (76.25%) of the respondents had no gap against the recommended seed rate practices of maize crop. Therefore, the detailed distribution of respondents according to practice wise technological gap is discussed in Table 1.

Table 1. Distribution of respondents according to practice wise technological gap

Practices	No. of respondents		
	Full gap	Partial gap	No gap
Land preparation	0 (0.00)	56 (70.00)	24 (30.00)
Time of sowing	9 (11.25)	51 (63.75)	20 (25.00)
Seed rate	15 (18.75)	4 (5.00)	61 (76.25)
Seed treatment with fungicide	47 (58.75)	30 (37.50)	3 (3.75)
Seed treatment with biofertilizer	15 (18.75)	58 (72.50)	7 (8.75)
Application of nitrogenous fertilizer	4 (5.00)	30 (37.50)	46 (57.50)
Application of phosphatic fertilizer	28 (35.00)	30 (37.5)	22 (27.50)
Application of potassium fertilizer	13 (16.25)	17 (21.25)	50 (62.50)
Application of nitrogenous fertilizer after sowing	12 (15.00)	60 (75.00)	8 (10.00)
Interculture (Earthing up)	20 (25.00)	51 (63.75)	9 (11.25)
No. of hand weeding	8 (10.00)	62 (77.50)	10 (12.5)
Chemical weed control	9 (11.25)	67 (83.75)	4 (5.00)
Total number of irrigation	30 (37.50)	31 (38.75)	19 (23.75)
Insect control	12 (15.00)	50 (62.50)	18 (22.50)
Disease control	60 (75.00)	13 (16.25)	7 (8.75)
Stage of harvesting	4 (5.00)	16 (20.00)	60 (75.00)

An analysis of the respondents according to the overall technological gap revealed that majority of the respondents (61.25%) had medium overall technological gap in adoption of scientific practices of maize cultivation. The partial acceptance of some of the recommended cultivation techniques by the grower's was the cause of the medium level of technological gap. The findings are in conformity with Kakki *et al*. (2022).

The 18.75 per cent respondents with low overall

Table 2. Distribution of respondents according to overall technological gap in adoption of scientific practices of maize cultivation

Technological gap category	Score range	No.	%
Low overall technological gap	Up to 13	15	18.75
Medium overall technological gap	14 to 23	49	61.25
High overall technological gap	Above 24	16	20.00
	Total	80	100
Mean	18.77		
S.D.	5.01		
C.V.	26.69		

Table 3. Relationship between extent of technological gap in adoption of maize cultivation practices and selected independent variables

Independent variables	(r)	t-values
Age	-0.904**	18.724
Education level	-0.432**	4.239
Family type	-0.234*	2.131
Institutional linkage	-0.264*	2.417
Operational land holding	-0.453**	4.490
Experience as a maize grower	-0.780**	11.041
Exposure to training on maize cultivation	-0.332**	3.112
Risk bearing ability	-0.030	0.267

*Significant at 0.05 level of probability;
**Significant at 0.01 level of probability;
r = Correlation coefficient

technological gap in adoption of scientific practices of maize cultivation. 20.00 per cent was found with high technological gap in adoption of scientific practices of maize cultivation. The findings are in conformity with Nagamani (2023). The per centage wise distribution of the respondents according to the overall technological gap was presented in Table 2

An access was made to identify the distribution of respondents according to overall technological gap in which 61.25 per cent of the respondents belong to the medium overall technological gap. 20.00 per cent and 18.75 per cent of the respondents belong to high and medium overall technological gap respectively. The results are presented in Table 2.

An attempt was made to access the relationship between the assessment of technological gap and the independent variables selected for the study. The Table 3 shows the relationship between the variables.

DISCUSSION

A critical look at Table 1 revealed that there was substantial extent of technological gap in adoption of recommended maize cultivation practices by the shareholders. The maximum average technological gap was found in disease control practices (75.00 %) followed by seed treatment with fungicide and total number of irrigations with average technological gap scores being 58.75 per cent and 37.50 per cent respectively. 35.00 per cent of the respondents had full gap in application of phosphatic. fertilizer followed by 25.00 per cent of the respondents who had full gap in recommended interculture practices. 18.75 per cent of the respondents had full gap against the recommended seed rate and seed treatment with biofertilizer respectively. 16.25 per cent of the respondents had full gap in application of potassium fertilizer. 15.00 per cent of the respondents had full gap insect control practices 11.25 per cent of the respondents had full gap in proper time of sowing the maize seed and chemical weed control practices. 10 per cent of the respondents had full gap in the number of hand weeding practices and 5 per cent of the respondents had fill gap in application of nitrogenous fertilizer and at the stage of harvesting None of the respondents had full gap in recommended seed rate practices of maize cultivation. Majority of the respondents (83.75%) of the respondents had partial gap in the chemical weed control practices, followed by 77.50 per cent of the respondents who had partial gap in adoption of recommended number of hand weeding practices. 75.00 per cent of the respondents had partial gap in application of nitrogenous fertilizer after sowing. 72.50 per cent of the respondents had partial gap against the adoption of the recommended seed treatment with biofertilizer practices. 70.00 per cent of the respondents had partial gap in the land preparation practices. 63.75 per cent of the respondents had partial gap in interculture practices and recommended time of sowing of maize seed respectively 62.50 per cent of the respondents had partial gap in insect control practices followed by 38.75 per cent of the respondents had partial gap in total number of irrigations. 37.50 per cent of the respondents had partial gap against the recommended application of fungicide, application of nitrogenous fertilizer and the application of phosphatic fertilizer respectively. 21 per cent of the respondents had partial gap in application of potassium fertilizers. 20.00 per cent of the respondents had partial gap against the recommended stage of harvesting of maize

crop. 16.25 per cent of the respondents had partial gap in the disease control practices. Only 5.00 per cent of the respondents had partial gap against the recommended seed rate of maize. Majority of the respondents (76.25%) of the respondents had no gap against the recommended seed rate practices of maize crop. 75.00 per cent of the respondents had no gap in the recommended stage of harvesting of the maize crop, followed by 62.50 per cent of the respondents who had no gap against the application of potassium fertilizer in maize crop. 57.50 per cent of the respondents had no gap against the application of recommended nitrogenous fertilizer in the maize crop. Only 30.00 per cent of the respondents had no gap against the recommended land preparation practices followed by 27.50 per cent of the respondents who had no gap in the application of phosphatic fertilizer in maize crop. 25.00 per cent of the respondents had no gap against the recommended time of sowing of the maize seed.23.75 per cent of the respondents had no gap in the total number of irrigations followed by 22.50 per cent of the respondents who had no gap in insect control practices. 12.50 per cent of the respondents had no gap in the number of hand weeding practices followed by 11.25 per cent of the respondents who had no gap in the proper interculture operations. 10.00 per cent of the respondents had no gap against the application of nitrogenous fertilizer after sowing, followed by 8.75 per cent of the respondents who had no gap in the disease control practices and seed treatment with biofertilizer. 5.00 per cent of the respondents had no gap in chemical weed control practices followed by 3.75 per cent of respondents who had no gap in seed treatment with fungicide.

With regard to overall technological gap in adoption of the recommended maize cultivation practices, from Table 2. it was found that, more than half (61.25%) of maize growers belong to medium level followed by high level *i.e.* 20.00 per cent. The findings are in conformity with Sharma (2021).

Table 3 revealed that the variables age, education level, operational land holding, experience as a maize grower, exposure to training on maize cultivation had significant and negative correlation with the extent of technological gap in adoption of maize cultivation practices at 0.01 level of probability. The variables family type, institutional linkage for maize cultivation showed significant and negative correlation with the extent of technological gap in adoption of maize cultivation practices at 0.05 level of probability. Further the analysis of t value in Table 3 revealed that the variables age, education level, operational land holding, experience as a maize grower, exposure to training on maize cultivation had negative and significant correlation with the extent of technological gap thereby meaning that any negative relation *viz.,* age, education level, operational land holding, experience as a maize grower, exposure to training on maize cultivation would thereby result in decrease in the technological gap of maize by the respondents. Risk bearing ability of the respondents was not correlated with technological gap.

From Table 3, it can be inferred that the respondents with the increase in age of the respondents they become more mature and skilled and become expert with the adoption and cultivation practices and the result is supported by the work of Singh (1993), Singh (2023).

Education level was negatively and significantly related with that of technological gap, thus it may be inferred that higher the education level, lower would be the technological gap. In terms of the technological gap in maize production technology, education played a significant role. That may be because education raises farmers' awareness of these technologies; hence, it was a significant factor and the results were supported by the work of Bochalaya *et al,* (2005).

Family type is negatively and significantly related with that of technological gap, thus it can be inferred that, there would be reduced technological gap in case of more involvement of the respondents in maize cultivation practices. In case of land holding, it was negatively and significantly related with that of technological gap. Experience as a maize grower had negative and significant relationship with that of technological gap from which it can be inferred that the higher the experience as a maize grower, lower will be the technological gap. Exposure to training on maize cultivation is negatively and significantly related with that of technological gap, which indicates that there would be reduced technological gap if the respondents get exposure to various training.

Risk bearing ability had negative relationship and not correlated with that of technological gap.

CONCLUSION.

The study on the technological gap of the shareholders at the Nameri Valley Farmer

Producer Company thus concluded that majority of the respondents (61.25%) had medium overall technological gap, followed by 20.00 per cent of the respondents with high technological gap and 18.75 per cent of the respondents with low technological gap. As majority of the maize growers had exposed to only 1-day training on the recommended practices of maize cultivation, therefore the FPC should initiate actions to provide massive training or capacity building programs for maize growers so that they are motivated to adopt the recommended scientific practices of maize properly. Also the FPC should put more emphasis in order to motivate the shareholders and impart training on the scientific practices of maize cultivation to reduce the technological gap and to increase the adoption of recommended maize cultivation practices for higher production of maize crop.

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