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Farmers information needs for good agricultural practices in Dinajpur district

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Abstract

The study aimed to assess farmers information needs regarding Good Agricultural Practices (GAPs), examine the relationships between selected farmers' characteristics and their information needs, and identify the major constraints to GAP adoption. The study was conducted among 104 farmers from three unions, namely Betdighi, Aladipur, and Khayerbari, of Phulbari Upazila, Dinajpur, Bangladesh. Data were collected through face-to-face interview using a structured interview schedule during 9 March to 2 April, 2023. Farmers' information needs were measured using 20 items under four GAP dimensions on a four-point rating scale. Information needs scores ranged from 17 to 53, with a mean of 36.29. More than two-thirds (68.3%) of the farmers had medium information needs, while 28.8% had high and only 2.9% had low information needs. Among the four GAP dimensions, sustainable and healthy production ranked highest, while "appropriate cultivation practices according to GAP policies" achieved the highest Information Needs Index. Age, educational qualification, agricultural training, knowledge of GAPs, and interaction with information sources were negatively associated with information needs, whereas attitude towards GAPs showed a positive relationship. The major perceived constraint was the lack of specialized skills required to implement complex GAP technologies and methods.

Keywords: Good agricultural practices, farmers' information needs, information needs index, Bangladesh

Introduction

Good Agricultural Practices (GAPs) are the basic environmental and operational conditions necessary for the production of safe, wholesome fruits and vegetables (FAO 2020). The purpose of GAPs is to suggest practices that address environmental, economic, and social sustainability for on-farm processes and result in safe and quality food and non-food agricultural products (FAO 2003). The scope of Good Agricultural Practices (GAP) in Bangladesh is significant and holds great potential for the country's agricultural sector (Hasan *et al.* 2025). Sandhi *et al.* (2017) found a positive response from farmers practicing GAP, who were reported to benefit from practicing GAP. However, the Bangladeshi fresh food sector has not yet been able to realize its full potential in terms of export market share. Bangladesh's exports to European and American markets remain very low as they do not comply with stringent quality standards (Kashem and Ali 2022). Some of the challenges relate to a lack of knowledge on food safety standards, quality compliance, and GAPs (Okpala and Korzeniowska 2023). Although GAPs' importance for food safety, market access, and sustainable production is well established, systematic research on farmers' information needs for GAPs - including how such needs relate to farmers' characteristics - remains scarce. Moreover, while general barriers to GAPs adoption have been documented in other contexts, farmers' own perceived problems in adopting GAPs have not yet been addressed. Considering all these facts the present study has been undertaken to determine and describe information needs of farmers for good agricultural practices (GAPs), with the following specific objectives: i) To assess the information needs of farmers for good agricultural practices (GAPs); ii) To explore the relationship between farmers' selected characteristics with their information needs for good agricultural practices (GAPs); iii) To determine the problems perceived by farmers in adopting good agricultural practices (GAPs).

Methodology

Research design: The study adopted a cross-sectional research design to assess farmers' information needs regarding Good Agricultural Practices (GAPs), examine the relationships between selected farmers' characteristics and their information needs, and identify the major

constraints to GAP adoption. A systematic research process was followed, including problem identification, literature review, development and pre-testing of the research instrument, data collection, statistical analysis, and interpretation of the findings (Ray and Mondal 2004). The cross-sectional design was considered appropriate for collecting data from the respondents at a single point in time (Hasan *et al.* 2018).

Study area: The study was conducted in Phulbari Upazila of Dinajpur District, Bangladesh. Three unions, namely Betdighi, Aladipur, and Khayerbari, were purposively selected because agriculture is the predominant livelihood in these unions, and farmers were actively involved in crop production under the extension programs of the Department of Agricultural Extension (DAE). Moreover, these unions have relatively better road communication and accessibility, which facilitated efficient field data collection and regular interaction between farmers and extension personnel (BBS 2022). Therefore, the study area was considered appropriate for investigating farmers' information needs regarding Good Agricultural Practices (GAPs). The location of the study area is presented in Figure 1.

Population and sampling: The target population comprised 1,042 farmers who were directly involved in agricultural programs implemented by the Department of Agricultural Extension (DAE) in the selected unions. A sample of 104 farmers, representing approximately 10% of the population, was selected using the simple random sampling technique. The sample was allocated proportionately among the three selected unions. In addition, a reserve list of 10 farmers was prepared to replace any respondent who was unavailable during the survey. The distribution of the sample is presented in Table 1.

Data collection: Data were collected through face-to-face interviews using a structured interview schedule comprising both open-ended and closed-ended questions (Kothari 2004). The interview schedule was developed based on the study objectives and relevant literature and was pre-tested with 10 farmers outside the sample

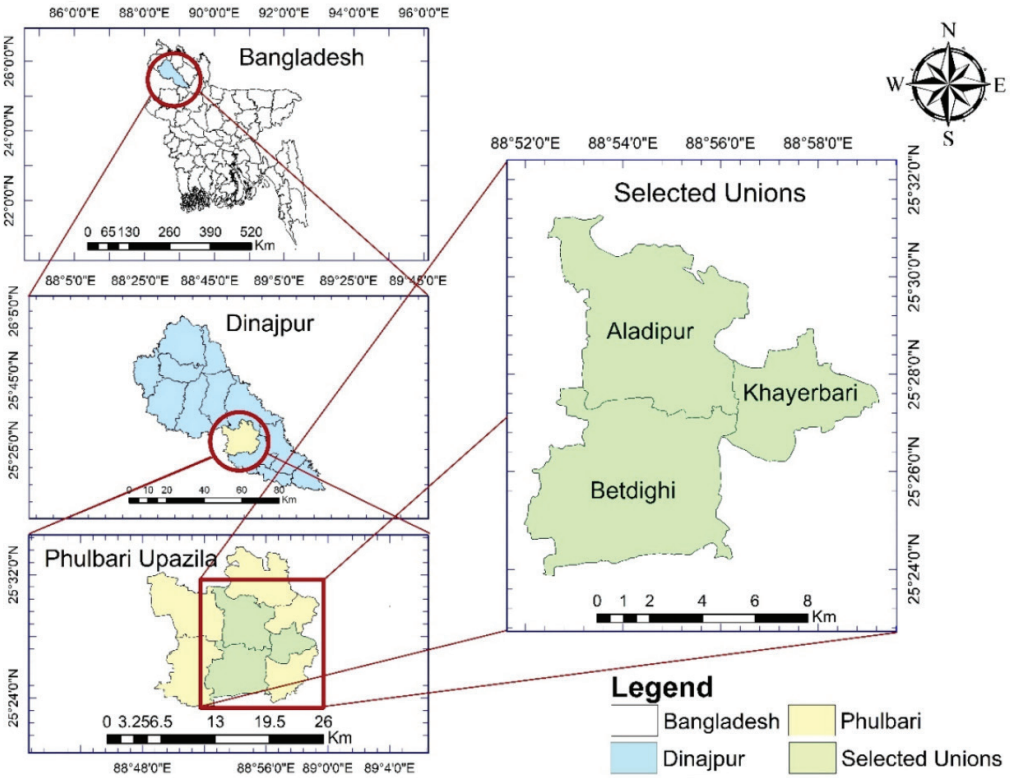


Figure 1. Map showing the geographic location of the study area - Aladipur, Betdighi, and Khayerbari unions of Phulbari Upazila, Dinajpur District, Bangladesh.

Table 1. Distribution of population and sample

Name of the union	Population	Sample	Reserve list
Betdighi	495	50	5
Aladipur	547	54	5
Khayerbari	441	23	2
Total	1483	127	12

to ensure clarity, relevance, and consistency. Necessary modifications were incorporated before the final survey. Data collection was conducted from 9 March to 2 April 2023 following standard survey procedures (Kumar 2018).

Measurement of the selected characteristics: A questionnaire for data collection was designed by incorporating ten independent variables. The measurement techniques of the independent variables are presented in Table 2.

Measurement of farmers' information needs for Good Agricultural Practices (GAPs): The farmers' information needs regarding Good Agricultural Practices (GAPs) constituted the focus variable of the study. The variable was measured using 20 items distributed under four dimensions of GAPs developed in accordance with the four pillars of GAP (Rahman *et al.* 2024). The dimensions included: (i) sustainable and healthy production (6 items), (ii) crop quality maintenance and environmental protection (5 items), (iii) agricultural workers' and consumers' health protection (5 items), and (iv) marketing and export quality

Table 2. Measurement and scoring criteria of independent variables

Variables	Scoring method	Scales/Score
Age	Number of years since birth	-
Educational qualification	Years of schooling. Average of the total educational scores of the household members	1for each year of completion†, 0.5for can sign name only, 0for cannot read and write
Family size	Number of members in the family	-
Farm size	Hectare	-
Annual income	Thousand BDT	-
Agricultural training received	Number of days	-
Environmental stewardship	A total of eight statements (4 positives and 4 negatives) were used to measure environmental stewardship. The Likert-type scale was used for scoring.	For positive statements: Strongly agree = 4, Agree = 3, Disagree = 2, Strongly disagree = 1, Reverse for the negative ones
Knowledge on good agricultural practices	Responses to 10 questions of different weights regarding difficulty levels	
Sources of information	Extent of contact with 14 selected information sources	frequently =3, occasionally =2, rarely =1, not at all=0
Attitude towards good agricultural practices (GAPs)	A total of twelve statements (6 positives and 6 negatives) were used to measure attitude towards good agricultural practices. The Likert-type scale was used for scoring	For positive statements: Strongly agree = 4, Agree = 3, Disagree = 2, Strongly disagree = 1, Reverse for the negative ones

*Thousand BDT equals approximately $ 8.15; †If a respondent completed 5 years of education, his/her score was 5.

of high-value crops (4 items). The items were selected based on an extensive review of the relevant literature and the GAP framework. The measurement procedure was adapted from the approaches used by Tabassum (2017) and Sultana (2015), with necessary modifications to suit the objectives of the present study.

Each respondent was asked to indicate the extent of information needed for each item using a four-point rating scale, where high information need, medium information need, low information need, and no information need were assigned scores of 3, 2, 1, and 0, respectively. The individual scores for all 20 items were summed to obtain the overall information needs score of each respondent. Thus, the possible score ranged from 0 to 60, where a higher score indicated a greater need for information regarding Good Agricultural Practices.

To determine farmers' information needs under each dimension, the scores of the respective items were summed separately. Accordingly, the possible scores ranged from 0 to 18 for sustainable and healthy production (6 items), 0 to 15 for crop quality maintenance and environmental protection (5 items), 0 to 15 for agricultural workers' and consumers' health protection (5 items), and 0 to 12 for marketing and export quality of high-value crops (4 items). Higher scores under a particular dimension indicated greater information needs in that aspect of GAP.

Furthermore, the Information Needs Index (INI) was computed for each item to determine the relative importance of farmers' information needs. The items were ranked according to their respective INI values, where a higher INI indicated a greater information need. The Information Needs Index was calculated using the following formula (adapted from Tabassum, 2017; Sultana, 2015):

$INI = (I_{nh} \times 3) + (I_{nm} \times 2) + (I_{nl} \times 1) + (I_{nn} \times 0)$

Where,

INI = Information Needs Index

I_{nh} = Number of respondents having high information needs

I_{nm} = Number of respondents having medium information needs

I_{nl} = Number of respondents having low information needs

I_{nn} = Number of respondents having no information needs

Measurement of farmers' perceived problems in adopting Good Agricultural Practices (GAPs): Among the various problems, ten problems perceived by the farmers in adopting good agricultural practices (GAPs) were selected. The farmers were asked to mention the extent to which they perceived each of the ten problems in adopting good agricultural practices (GAPs), measured using a closed form of questions (Kothari 2004). A four-point rating scale was used, where high problem, medium problem, low problem, and no problem were assigned scores of 3, 2, 1, and 0, respectively, as shown in Table 3.

Problem Perception Index (PPI) was computed for each of the ten problems, and the rank order of each of the problems was determined based on the obtained PPI score (Azad *et al.* 2014). The Problem Perception Index (PPI) was computed using the following formula:
$PPI = (P_h \times 3) + (P_m \times 2) + (P_l \times 1) + (P_n \times 0)$

Where,

PPI = Problem Perception Index

P_h = Number of respondents perceiving high problem

P_m = Number of respondents perceiving medium problem

P_l = Number of respondents perceiving low problem

P_n = Number of respondents perceiving no problem

Data analysis and processing: Different descriptive statistics like frequency, percentage, mean, standard deviation, indices, and rank order were used for categorization and describing the variables, and inferential statistics such as the Product Moment correlation coefficient (r) were employed to examine the correlations between the variables in question. The Statistical Package for the Social Sciences (SPSS) (version 25) was used to analyze the data.

Table 3. Four-point rating scale for farmers'perceived problems

Extent of perceived problems	Weights
Not at all	0
Low	1
Medium	2
High	3

Results and discussion

Ten selected characteristics of the farmers were selected to describe the characteristics profile of the farmers. The categorical distribution of these characteristics is given in Table 4.

The findings revealed that nearly two-thirds (62.5%) of the farmers were young, while about one-third (34.6%) were middle-aged and only 2.9% were old, indicating that an overwhelming majority (97.1%) of the respondents belonged to the economically active age group (Zhang *et al.* 2024). This suggests that the farming community has considerable potential to adopt improved agricultural technologies and sustainable farming practices because younger and middle-aged farmers are generally more receptive to innovations (Rizzo *et al.* 2024). Regarding education, more than two-thirds (68.3%) had primary education, followed by about one-fourth (23.1%) with secondary education and only 8.7% with higher secondary education. Thus, over nine-tenths (91.4%) of the respondents possessed education ranging from primary to secondary level, indicating that although literacy is widespread, higher educational attainment remains limited. This level of education may facilitate understanding of agricultural recommendations, but additional technical support is still necessary (Vecchio *et al.* 2020). The study also showed that more than two-thirds (70.2%) of the respondents belonged to small families, while 17.3% had large families and 12.5% had medium-sized families. Smaller families may face constraints in managing farm operations efficiently, especially during peak agricultural periods like planting and harvesting.

Table 4. Distribution of the farmers according to their socio-economic characteristics

Characteristics	Scoring method	Range Possible (observed)	Categories	Respondents		Mean (SD)
				No	Percent	
Age	No. of years	Unknown (18-60)	Young (18-20)	65	62.5	35.28 (9.9
			Middle-aged (36-55)	36	34.6	
			Old (above 55)	3	2.9	
Educational Qualification	Years of schooling	Unknown (1-17)	Primary level (1-5)	71	68.3	5.61 (3.56)
			Secondary level (6-10)	24	23.1	
			Higher secondary level (above 10)	9	8.7	
Family size	No. of members	Unknown (2-14)	Small (up to 4)	73	70.2	4.97 (2.147)
			Medium (5-6)	13	12.5	
			Large (above 6)	18	17.3	
Farm size	Hectare	Unknown (0.01-7.95)	Landless (<0.021)	2	1.9	0.96 (1.10)
			Marginal (0.021-0.200)	8	7.7	
			Small (0.201-1.000)	66	63.5	
			Medium (1.001-3.000)	21	20.2	
			Large (above 3.000)	7	6.7	
Annual income	'000' Taka	Unknown (50-600)	Low (up to 100.000)	10	9.6	185.16 (99.11)
			Medium (100.001-300.000)	82	78.8	
			High (above 300.000)	12	11.5	
Agricultural training received	No. of days	Unknown (0-45)	No training (0)	43	41.3	7.66 (11.14)
			Low (1-15)	46	44.2	
			Medium (16-30)	11	10.6	
			High (above 30)	4	3.8	

Characteristics	Scoring method	Range Possible (observed)	Categories	Respondents		Mean (SD)
				No	Percent	
Environmental stewardship	Score	8-40 (15-32)	Low (8-19)	8	7.7	25.75 (3.66)
			Medium (20-30)	92	88.5	
			High (>30)	4	3.8	
Knowledge on good agricultural practices	Score	0-22 (5-21)	Inadequate (up to 7)	8	7.7	18.27 (3.46)
			Moderate (8-14)	91	87.5	
			Adequate (above 14)	5	4.8	
Sources of information	Score	0-42 (11-39)	Low (up to 14)	24	23.1	20.0 (6.54)
			Medium (15-28)	69	66.3	
			High (>28)	11	10.6	
Attitude towards good agricultural practices (GAPs)	Score	12-60 (12-46)	Slightly favorable (12-28)	18	17.3	32.99 (8.25)
			Moderately favorable (29-44)	77	74.0	
			Highly favorable (above 44)	9	8.7	

*SD stands for standard deviation

This may impact their ability to adopt good farming methods, which are labor-intensive. Likewise, nearly two-thirds (63.5%) of the farmers operated small farms, followed by about one-fifth (20.2%) with medium-sized farms, reflecting the dominance of smallholder agriculture in the study area. Furthermore, more than three-fourths (78.8%) of the respondents belonged to the medium annual income category, whereas only 9.6% and 11.5% fell into the low- and high-income categories, respectively. These findings indicate that although most farmers possessed moderate financial resources, limited landholdings may restrict their investment capacity for improved agricultural technologies and sustainable farm management (Vijayakumar *et al.* 2025).

With respect to training, more than two-fifths (41.3%) of the farmers had not received any formal agricultural training, while comparatively fewer respondents had medium or high levels of training. Despite this limitation, the overwhelming majority (88.5%) exhibited medium environmental stewardship, whereas only 7.7% and 3.8% demonstrated low and high environmental stewardship, respectively. Similarly, the overwhelming majority (87.5%) possessed moderate knowledge of good agricultural practices (GAPs), compared with 7.7% having inadequate knowledge and only 4.8% possessing adequate knowledge. Farmers' interaction with information sources also remained predominantly moderate, with about two-thirds (66.3%) having medium interaction, while nearly one-fourth (23.1%) had low and only 10.6% had high interaction. In terms of attitude, nearly three-fourths (74.0%) expressed a favorable attitude toward GAPs, followed by 17.3% with a slightly favorable attitude and only 8.7% with a highly favorable attitude.

Overall, the findings indicate that the respondents possessed moderate socioeconomic capacity, moderate environmental stewardship, moderate knowledge of GAPs, and a generally favorable attitude toward sustainable agricultural practices. However, the relatively low participation in formal agricultural training and limited interaction with agricultural information sources may have hindered the development of higher levels of knowledge and stewardship. Similar findings have been reported by previous studies, which concluded that education, training, and effective extension services significantly enhance farmers' knowledge, environmental awareness, and adoption of good agricultural practices (Al Ferdous Noman and Yeasmin 2026).

The overall information needs scores of the respondents ranged from 17 to 53 against a possible range of 0 to 60, with a mean score of 36.29 and a standard deviation of 6.13 as presented in Figure 2.

The findings revealed that more than two-thirds (68.3%) of the respondents had a medium extent of information needs for good agricultural practices (GAPs), while more than one-fourth (28.8%) had a great extent of information needs and only 2.9% had a low extent. Overall, an

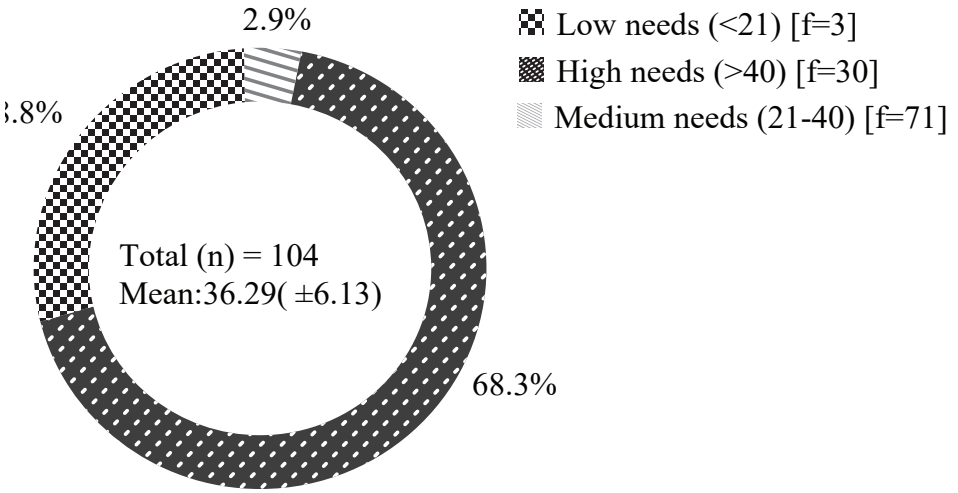


Figure 2. Farmers' overall information needs categorized into low, medium, and high levels (n = 104)

overwhelming majority (97.1%) of the farmers exhibited medium to high information needs, suggesting a substantial demand for agricultural information in the study area. These findings indicate that although farmers are actively engaged in agricultural production, they continue to experience considerable gaps in accessing timely, accurate, and practical information related to good agricultural practices. The predominance of medium to high information needs suggests that existing extension and advisory services have not been sufficient to fully address farmers' information requirements (Anderson and Feder 2007). The high level of information needs may also be attributed to the increasing complexity of modern agriculture, where farmers are expected to adopt environmentally sustainable and market-oriented production practices while complying with food safety standards (Han and Niles 2023). Field observations further revealed that the respondents were eager to obtain information on improved crop management, safe input use, pest and disease control, soil fertility management, post-harvest handling, and other recommended GAPs.

Previous studies have similarly reported that farmers in developing countries often possess strong motivation to adopt improved agricultural technologies but require continuous access to extension services, training programs, and reliable information sources to make informed management decisions (Boufous *et al.* 2023). Therefore, strengthening agricultural extension systems, improving farmers' access to diverse information channels, and organizing regular training and demonstration programs could effectively reduce existing information gaps and promote the wider adoption of good agricultural practices, ultimately contributing to sustainable agricultural production and improved farm productivity (Begho *et al.* 2022).

Dimension-wise information needs of farmers were measured on a scale of 0 to 15. The observed ranges were different for each dimension. Based on the mean score, the rank order of the four dimensions of good agricultural practices (GAPs) has been shown in Figure 3.

Among the four dimensions of good agricultural practices (GAPs), farmers expressed their highest need for information for 'sustainable and healthy production' (Mean 11.01), followed by 'crop quality maintenance and environmental protection' (Mean 10.49), 'marketing, and export quality of high-value crops' (Mean 7.45) and 'agricultural workers and consumers health protection' (Mean 7.33) respectively. Access to information on sustainable and healthy crop production enables farmers to adopt practices that reduce environmental impacts, enhance efficiency, and ensure the production of high-quality crops, thereby supporting long-term agricultural sustainability and food security (Viana *et al.* 2022). Moreover, farmers need information about crop quality maintenance and environmental protection to ensure the production of high-quality crops while minimizing

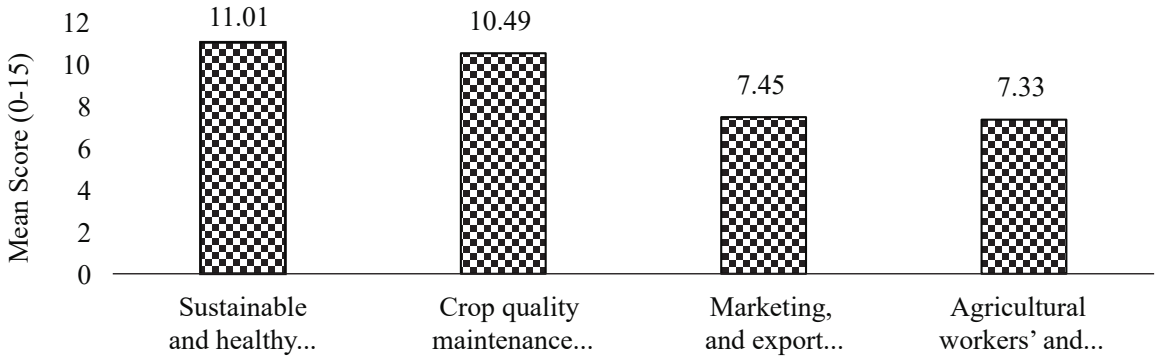


Figure 3. Dimension-wise mean information needs score of farmers (0-15 scale)

negative impacts on the environment. This knowledge empowers them to implement practices that preserve crop quality throughout the production process. Additionally, by adopting environment friendly practices, farmers can protect ecosystems, conserve natural resources, and contribute to the long-term sustainability of agricultural systems (EEA 2019). The relatively low level of information needs expressed by farmers in relation to marketing and export quality of high-value crops reflects the limited direct involvement of farmers in export-oriented value chains, which are often mediated through intermediaries, contract arrangements, or specialized exporters, rather than through individual smallholders. Strengthening farmers' linkages to market information systems could help bridge this gap and support diversification into higher-return production streams. The relatively low information needs reported for workers' and consumers' health protection may indicate a gap in farmers' awareness of the risks associated with unsafe input use, such as pesticide handling and residue management, rather than an actual absence of need. Raising awareness on occupational safety and food safety standards could therefore be an important, currently underserved, component of GAP-related training programs.

The Information Needs Index (INI) was calculated to determine the item-wise information needs of the farmers regarding Good Agricultural Practices (GAPs). Twenty items covering different dimensions of GAPs were considered, and their respective INI values are presented in figure 4.

The findings indicate that "appropriate cultivation practices according to GAP policies" (INI = 288) ranked first, suggesting that farmers had the greatest need for information on GAP-compliant cultivation practices. This highlights farmers' interest in improving crop production through environmentally sustainable and food-safe farming practices. Similar findings have emphasized the importance of strengthening farmers' knowledge of GAP guidelines to promote sustainable agricultural production (Pretty and Bharucha 2015). The second highest ranked item was "provisions of certification based on GAP standards" (INI = 285), indicating considerable demand for information on GAP certification procedures and compliance requirements. Farmers increasingly recognize certification as a means of ensuring product quality, food safety, and better market access (MOA 2020). The third-ranked item was "soil, water, and waste management" (INI = 254), reflecting farmers' need for information on sustainable resource management to enhance productivity while protecting the environment. Effective management of these resources is widely recognized as a key component of sustainable agricultural systems (Dhanaraju *et al.* 2022).

The lowest-ranked information needs were "price setting and market of quality agricultural products" (INI = 101), "handling of agricultural goods from harvesting to post-harvest and marketing stage" (INI = 116), and "balanced application of fertilizers, pesticides, and irrigation" (INI = 139). This mirrors the dimension-level pattern discussed earlier, where marketing and export-related needs also came out lowest — likely because farmers have limited

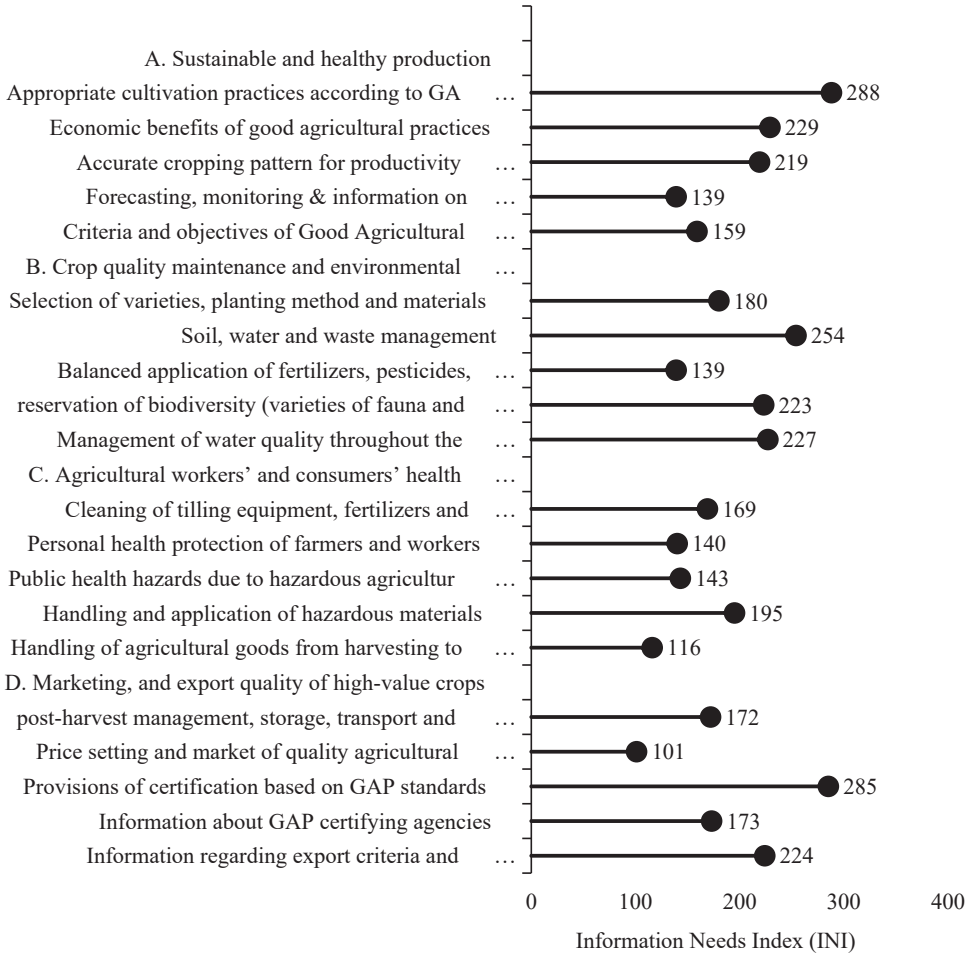


Figure 4. Item-wise Information Needs Index (INI) of farmers across four dimensions

direct involvement in pricing and post-harvest marketing, decisions that are often left to intermediaries or local traders. The relatively low demand for information on balanced fertilizer, pesticide, and irrigation use may similarly reflect farmers' confidence that they already know these routine practices well, even though scientifically balanced application still matters a great deal for both productivity and environmental safety. Even so, these remain essential elements of GAPs, and extension and training programs should continue to include them to support well-rounded adoption of good agricultural practices (Begho et al. 2022).

Pearson's Product Moment Correlation Coefficient (r) was used to determine the relationships between the selected characteristics of the farmers and their information needs for Good Agricultural Practices (GAPs). The results are presented in Table 5.

The analysis revealed that attitude towards Good Agricultural Practices (GAPs) had a significant positive relationship with farmers' information needs, indicating that farmers with a more favorable attitude expressed greater demand for GAP-related information. A positive attitude often reflects farmers' willingness to adopt improved production practices, comply with food safety standards, and enhance environmental sustainability. This finding is consistent with the view that attitude is an important determinant of farmers' information-seeking behaviour and technology adoption (Bora et al. 2021).

On the other hand, age showed a significant negative relationship with farmers' information needs, indicating that younger farmers tended to have greater information needs than older farmers. As a result, they actively seek information on modern production technologies and sustainable farming practices.

Table 5. Correlation between farmers' characteristics and information needs for good agricultural practices (GAPs)

Focus issue	Selected characteristics	Pearson's correlation coefficient (r) with d.f. = 102
Farmers' information needs for good agricultural practices (GAPs)	Age	-0.219*
	Educational qualification	-0.206*
	Family size	-0.068
	Farm size	-0.102
	Annual income	0.158
	Agricultural training received	-0.234*
	Environmental stewardship	0.054
	Knowledge on good agricultural practices	-0.256**
	Sources of information	-0.300**
	Attitude towards good agricultural practices (GAPs)	0.282**

** Correlation is significant at the 0.01 level of probability (2-tailed test) and * Correlation is significant at the 0.05 level of probability (2-tailed test); d.f. is degrees of freedom. Tabulated value for 0.05 level of probability= ±0.194; for 0.01 level of probability= ±0.252.

A significant negative relationship was also observed between educational qualification and information needs. Farmers with higher educational attainment exhibited lower information needs, possibly because education enhances their ability to access, understand, and utilize agricultural information from various sources. Better educated farmers are also more capable of independently acquiring technical knowledge, thereby reducing their dependence on additional information services.

Similarly, agricultural training received was negatively associated with information needs, suggesting that trained farmers required less additional information than those who had received little or no training. Trained farmers are likely to possess greater confidence in managing their farming operations and therefore express lower unmet information needs. Likewise, knowledge of Good Agricultural Practices exhibited a significant negative relationship with information needs. Farmers possessing greater knowledge of GAPs generally required less additional information because they were already familiar with recommended production practices, food safety measures, and environmental management techniques. This finding suggests that improving farmers' knowledge through effective extension programs can substantially reduce existing information gaps.

Finally, interaction with information sources had a significant negative relationship with information needs. Farmers who maintained frequent contact with extension personnel, fellow farmers, mass media, and other agricultural information sources tended to report lower information needs because continuous access to reliable information enables them to remain updated with improved technologies and recommended farming practices. This finding underscores the importance of strengthening agricultural extension services and diversifying information delivery channels to ensure that farmers receive timely and relevant information for effective implementation of Good Agricultural Practices. Family size, farm size, annual income, and environmental stewardship showed no significant relationship with farmers' information needs, meaning that variation in these characteristics did not significantly influence farmers' demand for GAP-related information.

The rank order of each of the problems was determined based on the respondents' obtained Problem Perception Index (PPI). The PPI values and rankings of the ten identified problems are presented in Figure 5.

The findings revealed that "lack of specialized skills in practicing complex GAP technologies and methods" (PPI = 299) was the most severe problem perceived by the respondents. The high score suggests that farmers lacked the technical know-how needed to successfully apply contemporary GAP technologies. Inadequate technical skills may impede the successful adoption of GAPs because it involves knowledge-intensive practices

like integrated pest management, efficient input use, and precision farming. Similar findings have been reported by FAO (2016) and the World Bank (2019), emphasizing that insufficient technical capacity remains a major constraint to GAP adoption. The second most important problem was "cost and financial constraints in implementing GAP through new technologies, equipment, and infrastructure" (PPI = 286). This finding suggests that the initial investment required for improved technologies, irrigation facilities, storage structures, and other GAP-related infrastructure discourages many farmers, particularly smallholders, from adopting recommended practices. Financial limitations have consistently been identified as a major barrier to agricultural technology adoption (Shiferaw et al. 2014). The third-ranked problem was "lack of awareness and knowledge regarding new methods and technologies" (PPI = 252). This indicates that many farmers still have inadequate knowledge of improved agricultural technologies and GAP principles, limiting their ability to adopt sustainable farming practices. The finding highlights the importance of strengthening agricultural extension services, farmer training, and information dissemination to improve awareness and technical knowledge, which are essential for successful GAP implementation (Davis and Heemskerk 2012).

Ranked fourth to sixth were "limited access to information and training services" (PPI = 230), "social and cultural factors influencing GAP adoption" (PPI = 227), and "poor research-extension-farmers linkage" (PPI = 224). Limited training access points to a gap in extension service delivery, while social and cultural norms likely shape how willing farmers are to take up new practices in the first place. The weak research-extension-farmers linkage, meanwhile, reflects a persistent breakdown in communication channels that continues to hold back GAPs adoption.

The remaining problems, "policy and regulatory issues" (PPI = 212), "lack of market incentives" (PPI = 186), "limited access to infrastructure and resource base" (PPI = 171), and "resistance to change towards innovations" (PPI = 158) were perceived as relatively less severe constraints. This pattern suggests farmers perceive institutional and market-level barriers - such as policy, infrastructure, and market incentives - as less pressing than the personal and resource-based constraints identified earlier (skills, cost, awareness). The low rank for resistance to change also

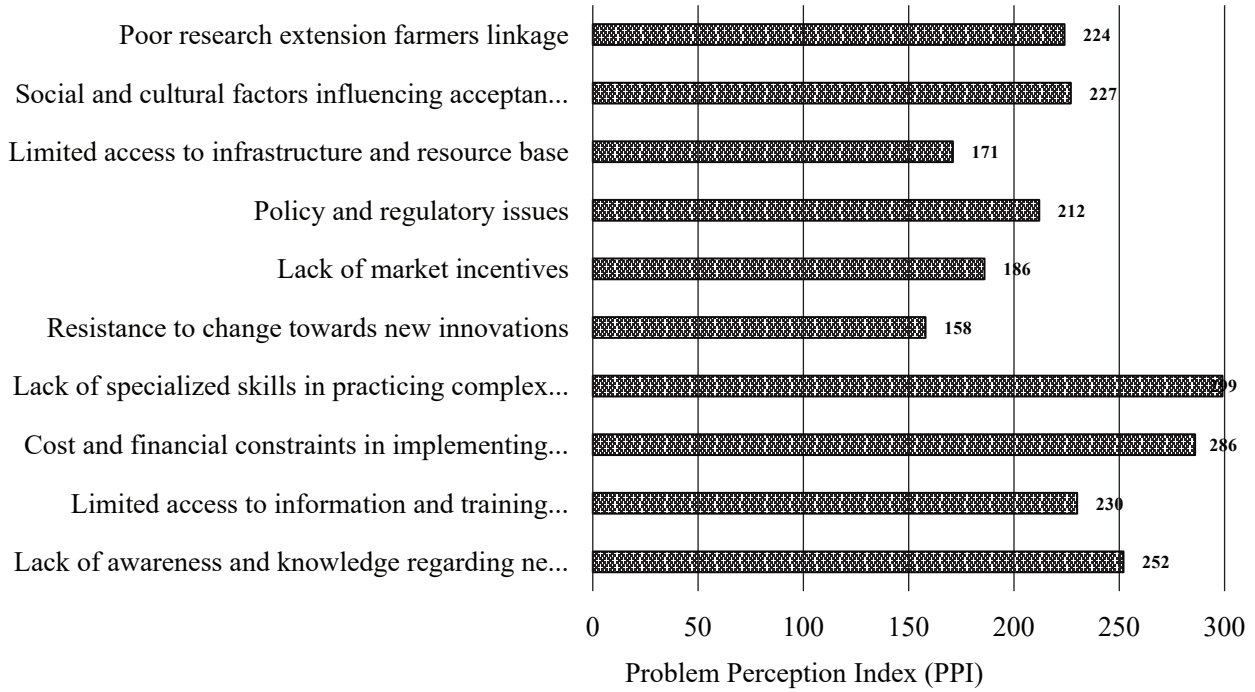


Figure 5. Farmers' Problem Perception Index (PPI) regarding adoption of Good Agricultural Practices (GAPs).

indicates farmers are generally open to adopting GAPs, provided the more immediate constraints are addressed. Although these issues received lower priority, they may still influence the long-term adoption and sustainability of Good Agricultural Practices and therefore warrant attention in future extension and policy interventions.

Conclusion and recommendations

The study concludes that the majority of farmers exhibited medium to high information needs regarding Good Agricultural Practices (GAPs), particularly on GAP-compliant cultivation practices, certification procedures, and sustainable soil, water, and waste management. Farmers with more favorable attitudes towards GAPs demonstrated greater information needs, whereas higher education, agricultural training, knowledge of GAPs, and greater interaction with information sources reduced their need for additional information. Lack of specialized technical skills, financial constraints, and inadequate awareness of modern GAP technologies were identified as the major barriers to GAP adoption. Therefore, strengthening need-based extension services through regular training, field demonstrations, farmer field schools, and digital advisory platforms is essential to improve farmers' technical capacity and promote wider adoption of GAPs. Financial support, such as subsidized credit and incentives for GAP certification and technology adoption, should also be considered to overcome economic constraints. However, the findings should be interpreted cautiously, as the study was conducted in a limited geographical area using a cross-sectional design and relied on self-reported data, which may restrict the generalizability of the results and introduce response bias. Future research covering broader geographical regions and employing longitudinal approaches is recommended to validate and extend the present findings.

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