Journal of Consumer Behavior, Marketing, and Management (JCBMM)

ISSN: 3070-5673 (ONLINE)

VOLUME 2 ISSUE 1 (2026)



PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA

Journal of Consumer Behavior Marketing, and Management (JCBMM)
Volume 2 Issue 1, Year 2026
ISSN: 3070-5673 (Online)
DOI: https://doi.org/10.54536/jcbmm.v2i1.9047
https://journals.e-palli.com/home/index.php/jcbmm

Mango Production Processes and Marketing Strategies in Bangladesh

Shree Sujit Kumar Das[1*], Md Masud Rana[1], Srikanto Mondal[2], Akter Bristy[3]

Article Information

Received: August 29, 2026

Accepted: November 09, 2026

Published: November 23, 2026

Keywords

Bangladesh, Environmental Context, Harvesting, Mango Processing, Mango Production, Marketing Strategies, PLS-SEM

ABSTRACT

In essence the marketing of mango is contingent on the linkage between production possibilities, product status and environment in which the decision is made. The study investigated the relationship between mango cultivation, harvesting, processing, the environment and regulatory framework and marketing strategies in the context of Canada's production environment in Chapainawabganj, Bangladesh. Judgement sampling was used to get responses from professionals and business participants that are associated with the mango value chain in a quantitative survey. A total of 210 questionnaires were analysed from 260 questionnaires received. The responses were measured on a 5-point Likert scale, and examined using the partial least squares structural equation modelling in the software SmartPLS with 5000 bootstrap resamples. The composite reliabilities were between 0.782 and 0.862, while the AVEs were between 0.550 and 0.719. The strongest positive relationships were seen between harvesting ($\beta = 0.380$, $p < 0.001$), the environmental and regulatory context ($\beta = 0.202$, $p = 0.017$) and processing ($\beta = 0.192$, $p = 0.037$). The association between cultivation was positive but not statistically significant ($\beta = 0.100$, $p = 0.219$). The model had an explained variance of 40.6% and a reported Q^2 of 0.258 and standardised root mean square residual of 0.077 for marketing strategies. The results suggest an integrated marketing strategy, which focuses on the readiness to harvest, coordinated handling and distribution, suitable processing, and flexibility in response to seasonal and policy factors. Practical recommendations include tying production decisions to buyer needs and employing perceptual product attributes that can be verified to position and communicate.

INTRODUCTION

Production and Marketing in the Mango Value Chain

The value chain of mango in Bangladesh is linked with agriculture, trading, processing, transport and retailing. The commercial value of the crop comes from the flow of the fruit in these activities and/or the ability of the enterprises involved to provide the products that the buyer is looking for. Production is the physical aspect of the supply while marketing is the aspect of presenting, pricing, distributing the product and making it available in terms of supply in response to demand (Ravi *et al.*, 2023). To understand their relation, one needs to address the activities which give fruit its commercial value and how it maintains that value.

Production is more than orchard management. Cultivation sets the stage for the development of the mangoes, harvest influences the entrance of the fruit in the commercial chain and processing provides the raw material for specific applications and markets. At each stage specific decisions to make include timing, quality, allocation of resources, and destination of markets. Marketing strategies thus rely on the use of a number of operational capabilities in coordination. The quality of the products can be convincingly communicated by a business if the production and handling operations ensure that the quality mentioned to the buyers is realized (Parihat *et al.*, 2022).

Chapainawabganj is an important location for exploring these relationships as mango production is a key aspect in its agricultural character. The mango varieties and knowledge of cultivation in the region creates a commercial and cultural quality to production. Product positioning can be based on regional identity, the condition, consistency and availability of fruit will determine if the positioning can be maintained through distribution (Santos, 2023). The relevance of the locality comes from the linkages with an analysis of the relationship between production activities and the marketing strategies, thus influencing the formulation and realization of the marketing strategies.

The Marketing Significance of Production Decisions

The volume and quality of fruit available for sale depends on the cultivation decisions made. The production environment in which commercial decisions are made is influenced by knowledge of orchard management, availability of investment and management of pest & disease pressures (Moniruzzaman *et al.*, 2022). Their value as marketing factors is dependent upon the manner in which orchard attributes are converted into marketable attributes. While a cultivation practice can help improve production conditions, its commercial value only becomes obvious when it results in product quality, reliable product supply, or other characteristics that are valued by buyers and can be conveyed by the enterprises (Roy & Rahman, 2022).

Harvesting holds a very short-term nexus between agriculture production and delivery to market. The value of the fruit offered to the intermediaries, processors

[1] MBA, School of Economics and Management, Chang'an University, China
[2] School of Economics and Management, Master's Student, Chang'an University, Xi'an, Shaanxi Province, 710064, China
[3] Southwest University of Political Science and Law, China
[*] Corresponding author's e-mail: mdmasudrana94k@gmail.com

and market buyers is determined by decisions made on maturity, and the tools and methods used in the collection process. Another aspect related to harvest timing is the time available for handling and distribution. This is because it is at the stage of harvest that direct link can be observed between the product condition and the promises stated in marketing strategy. Harvesting with the destination in mind can help to meet buyers' needs more consistently (Tarekegn & Kelem, 2022).

It also brings processing and additional commercial opportunities. Mangoes are value-added by washing, sorting and packing for their marketing and are further value-added through their transformation to pulp, juice or dried product. The level of technicall required in these activities vary, as do do their respective markets. What they have in common is their strategy of aligning the fruit attributes to a viable product offering (Sari *et al.*, 2019). Processing is thus related to operational preparation as well as market opportunities that fit with the enterprise resources and capabilities.

Decision making is also influenced by the surrounding of production and marketing. Fruit availability, weather and government policies may affect the time of availability and the distribution plans of businesses. In the current study, the dimension of environmental regulations is represented by the items pertaining to weather, seasonality and policy influence (Mossie *et al.*, 2023). Interpretation will, therefore, include perceived environmental and regulatory conditions. Knowing this can help companies plan their production, value proposition, and marketing messages to the purchasers.

Research Problem and Study Objectives

The key issue of central research is whether the different stages of mango production are linked to marketing strategies in a shared analytical framework. Aggregating the various production activities together may mask important distinctions between cultivating and harvesting, as well as between harvesting and production. These are linked but are located at different points in the value chain and provide different opportunities for commercial coordination. Assigning production performance to their entities is an insufficient answer as it doesn't give a precise framework for managerial priorities (Roy & Rahman, 2022).

Another issue is related to the external operating context. Businesses need to develop marketing strategies in an environment influenced by seasonality, weather and public policy. These factors are applicable during operational planning and product communication. It can be seen in conjunction with production activities to provide a better understanding of the situation of the marketing strategies. The analysis therefore connects the capacities of enterprises with their external environment in which they perform their market activities.

The overall goal of the study was to explore the linkage between production system and marketing strategies of mango in Bangladesh. The specific objectives were: to test the relationships between cultivation, harvesting and processing and marketing strategies separately; to test the relationship between environmental and regulatory context and marketing strategies; and finally, to formulate action suggestions for interfacing production and marketing activities. These goals focus on relationships which can be assessed with the survey measures and reported structural results.

The study looks into the aspect of the relationship between cultivation, harvesting, processing and environmental and regulatory consideration in mango marketing. It provides a background of the stage specific production and marketing in a Bangladesh agricultural setting. Its practical relevance will be the identification of where there can be a closer linkage between commercial planning and operational decisions. Implications of these findings are considered as relationships between stakeholders' perceptions and recommendations to growers, processors, marketers and mango supporting institutions are provided.

LITERATURE REVIEW

Agri Food Marketing as Coordinated Value Creation

Agri-food marketing refers to activities involved in preparing, positioning, exchanging and delivering of agricultural products. These activities link the attributes related to production with the needs of specific buyers in a mango value chain (Ravi *et al.*, 2023). Marketing encompasses all the elements of the product offer, the price, the market chosen and the distribution, in addition to the promotion. Co-ordination of these elements is key to being able for the enterprise to present a coherent offer and product condition and service linked to this offer (Santos, 2023).

A value-chain approach puts these marketing actions into their context of successive actions. Orchard practices affect the fruit available for harvest; harvesting affects the condition of the fruit at harvest; processing and handling affect the suitability for distribution and/or further transformation. The commercial success of one stage thus hinges partly on what was decided at another stage (Parihat *et al.*, 2022). This approach offers a foundation for appraising the individual production stages and also for understanding that the marketing strategies have to be coordinated with those of production, if they are to relate to the marketing activities as a whole, in their service to buyers (Moniruzzaman *et al.*, 2022).

This attitude is balanced by a market orientation that emphasizes customers' needs. In a market oriented system enterprises take account of the destination of mangoes as well as their intended use, while planning their production and post harvest operations. Maturity, size, packaging, delivery dates, and product form requirements turn into inputs in making operational decisions (Roy & Rahman, 2022). Market orientation is not an alternative to production knowledge, rather it is a commercial direction for applying that knowledge in production. A relationship between the production capability and marketing strategy

can thus be grasped in terms of matching the output of an enterprise with the needs of its prospective customers (Tarekegn & Kelem, 2022).

Cultivation Capabilities and Commercial Positioning

Cultivation is the base of the mango enterprise for agriculture. It requires information and methods associated with the upkeep of orchards and production of marketable fruit. Useful skills include understanding about growing, investing in technology and being aware of pests and diseases (Sari *et al.*, 2019). These capabilities set the conditions for the production of fruit. They can also assist with marketing by helping to create consistency, production planning and product features around which an enterprise can create its offer (Mossie *et al.*, 2023).

The strategic linkage between cultivation and marketing is through the "translation" of cultivation decisions to market relevant characteristics. The resulting product or fruit will be the one that the buyers usually encounter instead of the cultivation activity itself (Mohamad *et al.*, 2022). Therefore, production information is useful and marketable if it can be perceived, communicated and supported via the product. These can include consistent product specifications and the ability to fulfil an agreed supply schedule. Such reasoning indicates a positive relationship and also takes into account the commercial implementation of cultivation proficiency which requires further value-chain coordination (Zavala Martínez *et al.*, 2023).

Within this work the cultivation construct refers to enabling situations, as well as to a statement about pest and disease control problems. The construct thus reflects respondents' evaluations of the cultivation domain and not only an exclusively positive index of technical excellence (Zahid *et al.*, 2023). It needs to be understood within that substantive scope with regard to its relationship to marketing strategies. It is important to retain this distinction to link the survey evidence with the general proposition that there are a number of operational and organisational processes between agricultural foundations and their commercial consequences (Ermias, 2021).

Harvesting as the Transition to the Market

Harvesting turns orchard production into a product which needs to be manipulated and sold in appropriate time. The knowledge of selecting appropriate ripeness and availability of efficient harvesting tools affect how this transition is managed (Luquez Gaitan *et al.*, 2022). The stage is commercially relevant as decisions made during collection impact fruit at the time it is introduced into distribution. Marketing considerations related to the freshness of product, product quality and delivery reliability are thus closely associated with the capacities exercised at harvest time (Rasmikayati, 2018).

This correlation to harvest readiness and market choice is particularly significant. Immediate consumers can have different collection and delivery requirements than those for fruit going to a longer distribution line or to a processing plant. Decisions for harvesting should thus be synchronised with the product destination (Waryat & Nurawan, 2022). This coordination may mean communications between growers, collectors, transport providers and buyers. The theoretical hypothesis is that those with higher levels of harvesting knowledge and higher use of appropriate harvesting techniques will also rate the linkage of their production and marketing activities as higher (Bakewell-Stone, 2025).

Harvesting also provides a link between control of operations and marketing claims. A collection activity involving a product promise with regard to condition or readiness shall be consistent with the expectation of purchasers. When harvest activities are considered in conjunction with dispatch and distribution, commercial communication can be closer to what the delivery capability is. This relationship gives a good argument for separately considering harvesting and cultivation. Both are farming operations, but harvesting, as with other activities, is a point where the product enters the market facing component of the value chain (Gao *et al.*, 2022).

Processing and the Development of the Product Offer

Processing encompasses a variety of activities and different levels of processing change. Basic preparation involves washing, sorting and packing and further processing converts the fruit into pulp or juice. The difference is important for marketing analysis as each activity appeals to other customers and you will need different resources (Roy *et al.*, 2022). The current framework sees processing as a domain in which the available mangoes are managed in terms of an offer and in which the participation in processing and its preparation activities is central, as well as the perceived creation of new markets (Kwasi Bannor *et al.*, 2023).

Sorting and packaging can facilitate product differentiation by segregating fruits based on those attributes that are significant to the buyers. Graded offers can be used to match various market requirements with the condition and presentation of the products (Sukandi & Landy, 2023). These choices are part of the processing options in market segmentation and positioning. Further transformation can enable another type of offer, namely the change of its format or use of the product. The commercial logic is based on the fit of raw material, processing capacity, distribution network and the demand of the product chosen (Waryat & Nurawan, 2022).

It is, therefore, a strategic and not merely an activity increase process of value addition. A commercial value only becomes an issue with a processing decision if a buyer for the processed product is available and the conditions for the supply of the product are viable. Packaging, information about the product, delivery systems and price need to match the processing activity performed (Bhowmik *et al.*, 2026). This view underlies the hope that there will be a positive relationship between processing and marketing strategies and that a separation

between preparation of fresh fruit and more extensively transformed products will be maintained (Bakewell-Stone, 2025).

Environmental Conditions and Regulatory Influence

The influence of the external operating context on agricultural marketing stems from its seasonal, climatic and institutional operating context. Weather can impact production and the time commercial activity can occur, and seasonal supply can impact availability of fruit and distribution scheduling (Loor Marquínez *et al.*, 2023). Government policies and regulations add another layer under which the businesses are run. Businesses that understand these factors can make modifications to product offering, delivery strategies and communication due to the environment they operate in.

This expanded domain is included in the area covered by the environmental regulations label used in the survey. Weather, seasonal changes in supply/demand and government policy influence are included in the retained indicators. The concept is therefore understood to be an environmental and regulatory context and not a specific compliance to a legal mandate (Le *et al.*, 2022). This functional sense is the one that has been accorded to the analysis at the level of the perceived operating conditions of the respondents. It enables an analysis that is both contextually responsive but not influenced by a particular policy instrument or weather event (Schulte & Abdulai, 2026).

Conceptually, there is a positive relationship between positive attitude towards the environment and marketing strategies because environmental awareness can be used to inform commercial planning. An awareness of the seasonal characteristics of product supply might help to determine product availability, and considering the policy context may affect the way businesses arrange the operations of market activities (Akrong *et al.*, 2021). When it comes to communication with buyers, schedules or product offers may need to be adjusted, and contextual awareness can help with this. The strategic capability of interest in this context is how much external factors are considered when making marketing decisions, not whether the same marketing arrangements will continue to suit the production process (Ravi *et al.*, 2023).

Marketing Strategies and the Integration of Capabilities

The study's main product is a set of marketing strategies. The questionnaire includes questions about marketing problems, packaging and transportation problems delivering quality products and perceived effectiveness of promotional problems. These dimensions relate to strategic intentions and to operational fulfilment (Parihat *et al.*, 2022). They understand that marketing performance is to some extent related to enterprise's ability to provide a product offer which is acceptable to its customer. Product presentation and promotion are, therefore, part of a larger commercial system that includes production and distribution (Moniruzzaman *et al.*, 2022).

In the managerial practice, the connection between capabilities and strategy is two directional, although it is specified in the empirical model as one directional. Production capabilities define feasible product offers and buyer requirements can be the basis to select operational priorities (Roy & Rahman, 2022). A value-chain interpretation thus focuses on aligning. The statistical model tests the proposed relationships between the constructs measured, and the overall discussion infers implications for enterprises to make coherent decisions across the production and marketing functions based on the relationships found (Tarekegn & Kelem, 2022).

Analytical Focus and Hypotheses

Cultivation, harvesting, processing and the surrounding environment are statistically analyzed simultaneously as variables predicting marketing strategies. This approach takes into account the requirement of differentiating activities contributing at various stages of the mango value chain (Roy *et al.*, 2022). It further incorporates the environment and policy issues into the same context as production practices. This model leads to a common ground for evaluating the relative pattern of association, and not assuming that all the production stages are equally related to marketing (Ermias, 2021).

The direct-effects analysis is based on four hypotheses: The hypothesis of the current research (H1) suggests that there is a positive relationship between the environment and regulatory context with marketing strategies. Directed by H2, it was put forward that mango cultivation has a positive relationship with marketing strategies. H3 puts forward a positive relationship between mango harvesting and marketing strategies. Based on the proposed H4, the study suggests that there is positive relationship between mango processing and mango marketing strategies. These hypotheses combine the value-chain argument and measurable relationships, providing the framework for reporting the empirical findings (Zahid *et al.*, 2023).

MATERIALS AND METHODS

Research Design and Study Setting

A quantitative survey design was used to explore association between mango production process, the environment and regulatory framework and marketing. The mango industry in Bangladesh constituted the substantive field as the geographical and production context of the investigation was informed by Chapainawabganj. The perceptions given by the respondents linked to various value chain functions was the subjects of the analysis. Instead of experimental manipulation of production activities, it explored the relationships among the measured constructs by using a structural equation model (Wang *et al.*, 2024).

Individuals who responded to the survey were considered the unit of observation. The participants included production, technical, advisory, inspection, research and

marketing. Responses represented a snapshot of the stakeholder views with regard to mango production and marketing. The use of this design facilitated the inclusion of a number of value chain actors in the study under a single analytic framework. The interpretation is only at the level of the measured stakeholder assessments and associations in the sample.

Sampling and Data Collection

Judgement sampling was applied in the identification of companies involved in the mango sector. The sampling method was based on professional duties and business activities that would enable individuals to have knowledge about cultivation, harvesting, processing or marketing. Agricultural extension agents, agricultural inspectors, agricultural marketing consultants, horticultural researchers, food scientists, processing technologists, farm owners and farm managers and marketing specialists were relevant roles. The selection of the subjects was purposive pertaining to the substantive needs of the study (Schwalbe & Finzel, 2024).

An online questionnaire that was created using Google Forms was used to gather data. The survey resulted in 260 returned questionnaires of which 210 questionnaires were kept after screening. Calculations showed the percent of questionnaire returns that were retained to be 80.8% (210/260 x 100). The percentage of questionnaires returned and analysed. The final analytical sample of 210 cases was used for the descriptive statistics and the reported structural model.

The questionnaire made it clear that the information was for academic research purposes and would be kept confidential. The analytical presentation is based on general results, not the responses of particular individuals. In addition to the substantive measurement items, demographic and occupational data were collected (Sharma *et al.*, 2021). The following background variables can be used to give a picture of the participating stakeholders and helps to interpret the perspective of the professions represented in the sample.

Survey Measures and Construct Specification

A five-point response scale was adopted in the questionnaire with the responses ranging between 1 (strongly disagree) and 5 (strongly agree). It spanned five constructs that were substantive: mango cultivation, mango harvesting, mango processing, environmental regulations and marketing strategies. The complete descriptive output had 22 items. There were four items pertinent to cultivation, four for marketing, five for harvesting and five for environmental regulations and four for processing (Cornesse *et al.*, 2020).

The cultivation focused issues related to livelihood engagement, knowledge and training, investment capacity and pest and disease problems. Items harvested covered knowledge on appropriate ripeness, harvesting practices, harvesting tools and techniques, careful handling and post harvest treatments. Market creation, perceived quality and shelf-life benefits came up in processing items, along with participation in preparation activities and exploration of value-added products. These measures identify the production stages without affecting the continuity with the overall commercial entity.

Climate, investments in environmentally relevant technologies, weather, seasonal supply-demand, and policy influence were among the environmental regulation items. Retained environmental indicators are weather, seasonality and policy. Marketing strategy items included marketing problems, product quality and delivery, regulatory knowledge, and the effectiveness of promotion. The marketing indicators that remained final are MS1, MS2 and MS4. Interpretation takes place in line with the reported measures, word for word and line for line.

The measurement model that was reported included 13 indicators: ER3, ER4 and ER5 representing the environmental context; MC2, MC3 and MC4 for cultivation; MH1 and MH3 for harvesting; MP1 and MP2 for processing; and MS1, MS2 and MS4 for marketing strategies. The final model thus reflects the elements represented by these selected indicators. This specification serves as the foundation for the reliability, validity and the structural outcomes of the manuscript.

Data Screening and Descriptive Analysis

Basic validations comprised checking the range of responses and consistency of the entries in questionnaires. For all substantive items, a descriptive report was returned that included 210 observations. Respondent characteristics were summarised as frequencies and responses to the items were summarised as mean and standard deviation. Descriptive statistics were analyzed and interpreted with regard to wording of the items in the survey, specifically when a statement was referring to a challenge issue or outside influence instead of just a clearly favorable ability (Mirzaei *et al.*, 2022).

Cook's distance was reported for this diagnostic assessment and no case exceeded 1. This was regarded as a diagnostic about influential observations. Assessment of distributional description was not found. Using the reported descriptive statistics, the response pattern was characterised and measurement and structural models evaluated in order to analyse the relationships posited in the hypotheses.

Measurement and Structural Model Assessment

In SmartPLS, the partial least squares structural equation modelling (PLS-SEM) was used. The measurement assessment focused on three facets: indicator loadings, composite reliability, and average variance extracted (AVE); and construct correlation versus the square root of AVE. The composite reliability was assessed using 0.70, and the average variance extracted against 0.50 (Mirzaei *et al.*, 2022). To examine the discriminant validity of the measurement model reported, the comparison of correlation with square roots of AVEs method was

applied.

For structural assessment, standardised path coefficients, bootstrap standard errors, t statistics, p values and confidence intervals were tested. Bootstrapping used 5,000 resamples. The direct relations were tested statistically at 0.05 level. The coefficient of determination addressed the explained variance in marketing strategies and the reported Q^2 statistic addressed predictive relevance using the blindfolding procedure. The missing distance for someone who was blindfolded was 7.

Inner variance inflation factors were investigated to check the collinearity between the predictors. The standardised root mean square residual was given as the model diagnostic. The substantive interpretation of the paths was taken into account when considering these statistics. A positive coefficient does not mean that there is an association, but an association that is supported by statistical analysis, and the results of the direct-effects analysis were used as the basis for structuring the discussion of stages of production and contextual conditions.

RESULTS AND DISCUSSION

Respondent Profile and Analytical Sample

A total of 210 respondents comprising of various occupational groups involved in mango production and marketing were selected for the final sample. The largest individual group were farm owners or managers, followed by food scientists employed in industry or farming. There were also extension agents, processing technologists, researchers, consultants and marketing professionals. This composition categorises the results in a group of responsibilities that span the value chain production, technical and commercial.

Table 1: Occupational profile of respondents

Occupational category	Frequency	Percent
Agricultural extension agent	20	9.5
Agricultural inspector	29	13.8
Agricultural marketing consultant	17	8.1
Food innovation specialist	17	8.1
Horticultural researcher	19	9.0
Industry food scientist	22	10.5
Industry processing technologist	21	10.0
Mango farm owner or manager	33	15.7
Market research analyst	14	6.7
Marketing specialist	13	6.2
Other	5	2.4
Total	210	100.0

Percentages are rounded to one decimal place.

The 31-40 age group had the highest number of respondents with 44.3% (Frequency 93) of the sample. The remainder (40.0%) were between 41 and over and 33 respondents (15.7%) were under 30 years old. The sample thus contained a significant number of middle and higher age brackets. These figures represent the make up of the sample of respondents, not differences in structural relationships between the age groups.

Several occupations are represented, providing the marketing results with a cross-functional context. The farm participants face production and selling decisions and the technical and advisory professionals are involved with the practices that influence product condition and readiness for the market. Marketing practitioners offer an insight on commercial organisation. The model combines these stakeholders' assessments of each other and analyses the relationships between the production stages, as well as the marketing strategies, in the participating sample (Santos, 2023).

Descriptive Pattern of Responses

The item indicates a general score above the centre score of the five-point scale. Cultivation was in the range of 3.562 - 4.100, harvesting was in the range of 3.952 - 4.276

Table 2: Descriptive ranges across questionnaire domains

Domain	Items	Mean range	SD range
Cultivation	4	3.562–4.100	0.912–1.237
Harvesting	5	3.952–4.276	0.740–0.980
Marketing strategies	4	4.000–4.233	0.817–0.954
Environmental context	5	3.971–4.386	0.683–1.026
Processing	4	4.100–4.381	0.781–1.042

N = 210 for every item. Ranges summarise item statistics, not construct scores. SD = standard deviation.

and marketing strategy was in the range of 4.000 - 4.233. Environmental context refers to the range 3.971 - 4.386, processing refers to the range 4.100 - 4.381. The ranges represent general consensus on many of the statements on the questionnaires dependent on the content of the individual items.

Knowledge and training had an average score of 4,100 in cultivation while the average score was 3,824 in investment capability. The mean of the pest and disease management statement is 3.981. The combination indicates consensus on knowledge available and cultivation issues. It illustrates how a higher construct score does not necessarily mean good agricultural performance: it needs to be interpreted using the language of the indicators that constitute the construct.

In harvesting, there was a consensus in the statements related to ripeness, method, tools, handling and post harvest preparation. The means of the retained indicators were as follows: knowledge about the appropriate ripeness (3.952), and use of efficient harvesting techniques (4.071). These items all link the construct to actual readiness at the collection time. Their contents align with the interpretation of harvesting as a capability towards the market (Mossie *et al.*, 2023).

Responses were collected and responses showed agreement in terms of participation in preparation activities as well as awareness that processing opens new markets. The corresponding means were 4.100 and 4.257. However, agreement was also very high for the statement on quality and shelf-life benefits, but this was not included in the reported final measurement model (Mohamad *et al.*, 2022). The descriptive pattern reflects thus favourable perceptions in respect to processing throughout the questionnaire and the structural interpretation reflects the narrower retained specification.

There was high level of agreement with respect to the environmental items; weather, seasonality and policy impact marketing activities. Seasonal variations in supply and demand had the highest mean with a score of 4.386 among the items retained. This is substantively important as seasonal availability is linked to physical product production and offer and delivery. It suggests that respondents identified contextual influences on marketing prior to statistical analysis of relationships among constructs.

Measurement Quality and Construct Relationships

The minimum composite reliability was for the environmental context with a value of 0.782, while the maximum value was for cultivation with 0.862. The average variance extracted (AVE) varied between 0.550 and 0.719. The composite reliability and average variance extracted criteria were surpassed for each construct. These results indicated that the proposed final measurement model was internally consistent and convergent. They serve as a foundation for explaining the relationships among the five constructs.

Table 3: Reliability and convergent validity

Construct	Retained items	CR	AVE
Environmental context	3	0.782	0.550
Cultivation	3	0.862	0.675
Harvesting	2	0.836	0.719
Processing	2	0.794	0.669
Marketing strategies	3	0.807	0.583

CR = composite reliability; AVE = average variance extracted.

There were differences in the loadings of the indicators that were retained across constructs. Cultivation loadings varied from 0.798 to 0.849 and harvesting loadings were 0.867 and 0.828. Marketing strategy loadings were between 0.723 and 0.827. Environmental context had loadings between 0.605 and 0.878 and processing had loadings of 0.978 and 0.618. These figures reflect contribution from individual indicators retained and dovetail the results on reliability and convergence at the construct level (Zavala Martínez *et al.*, 2023).

Discriminant validity was evaluated by comparing the square root of average variance extracted of each construct with the correlation that the construct had with the other. Diagonal values were found to be between 0.742 and 0.848 and were greater than all interconstruct values in the diagonal. The highest correlation coefficient

Table 4: Construct correlations and discriminant validity

Construct	ER	MC	MH	MP	MS
Environmental context	0.742	—	—	—	—
Cultivation	0.258	0.822	—	—	—
Harvesting	0.263	0.594	0.848	—	—
Processing	0.467	0.344	0.189	0.818	—
Marketing strategies	0.418	0.444	0.529	0.393	0.763

Diagonal entries are square roots of AVE. ER = environmental context; MC = cultivation; MH = harvesting; MP = processing; MS = marketing strategies.

observed was between cultivation and harvest (0.594). It is a pattern that is consistent with the conceptual expectation that there are relations between the production stages, but they remain distinguishable within the measurement model.

The correlation analysis between the harvesting and marketing strategies was 0.529, while the correlation for cultivation, the environmental context, and processing was 0.444, 0.418, and 0.393 respectively. These are bivariate relationships and differ from the structural ones that takes the predictors together in consideration. The difference gains more relevance in the area of cultivation; a positive correlation with the marketing strategies can exist alongside with a nonsignificant conditional path in the model with the other predictors (Zahid *et al.*, 2023).

Direct Relationships with Marketing Strategies

The structural analysis revealed that all four predictors had positive coefficients. Three routes were statistically significant at $p< 0.05$: Environmental and regulatory context, harvesting, and processing. The cultivation coefficient was positive but not significant to that value. The outcomes thus validate H1, H3 and H4 and not H2. This pattern is used to distinguish the stages of production and serves as the main framework for the managerial discussion.

Table 5: Direct relationships with marketing strategies

Path	β	SE	t	p	95% CI	Decision
H1 ER → MS	0.202	0.085	2.386	0.017	0.026 to 0.358	Supported
H2 MC → MS	0.100	0.081	1.229	0.219	−0.058 to 0.263	Not supported
H3 MH → MS	0.380	0.084	4.543	<0.001	0.213 to 0.541	Supported
H4 MP → MS	0.192	0.092	2.081	0.037	0.020 to 0.391	Supported

β = standardised path coefficient; SE = bootstrap standard error; CI = confidence interval. Bootstrap resamples = 5,000.

The standardised coefficient, β, that was largest for harvesting was 0.380 (bootstrap standard error = 0.084; t statistic = 4.543). The 95% confidence interval was (0.213, 0.541) and did not contain zero. This outcome shows that harvesting construct is positively associated with marketing strategies as the other predictors of the model are taken into account. Given its relative size, the harvesting sector is at the heart of the empirical description of production and market alignment.

The environmental and regulatory context was equal to 0.202 with a standard error of 0.085 and a t of 2.386. Its p value was 0.017, with a confidence interval from 0.026 to 0.358. The result supports a positive association between the perceived external context and marketing strategies. The association is understood on the basis of the retained aspects of weather, seasonality and policy influence (Luquez Gaitan *et al.*, 2022).

Processing had a coefficient of 0.192 with a standard error of 0.092 and a t statistic of 2.081. The p value was 0.037 and the confidence interval was 0.020 to 0.391. This finding is consistent with the hypothesized positive association between the processing construct that was retained and marketing strategies (Waryat & Nurawan, 2022). It connects participation with the preparation activities and perceived market creation with the marketing outcome that is shown on the questionnaire.

The coefficient, standard error and t statistic for cultivation were 0.100, 0.081 and 1.229 respectively. The confidence interval was from −0.058 to 0.263, with a p value of 0.219. Positive estimate is not statistically supporting H2 at the specified error level. What this means is that the model failed to form a different cultivation association once the other predictors were added into the model; this is not an indication of a negative relationship.

Explanatory Performance and Model Diagnostics

The coefficient of determination of the marketing strategy was 0.406. The four predictors thus explained 40.6% of the variance of the marketing strategy construct in the sample. This gives a numerical measure on the performance of the specified model in explaining. The reported Q^2 value was 0.258, which showed that the

Table 6: Explanatory performance and collinearity diagnostics

Statistic	Value
R^2 for marketing strategies	0.406
Q^2 for marketing strategies	0.258
Standardised root mean square residual	0.077
Inner VIF for environmental context	1.333
Inner VIF for cultivation	1.691
Inner VIF for harvesting	1.588
Inner VIF for processing	1.385

VIF = variance inflation factor. Q^2 was obtained using blindfolding with omission distance 7.

model has positive predictive relevance as assessed by the blindfolding approach used in the present study.

The value of the RMSR (standardised) was 0.077. Inner VIFs varied between 1.333 and 1.691, with the largest VIF being that for cultivation. These values show that there was no strong collinearity between the predictors under the model diagnostics employed. The explanatory and diagnostic statistics together offer information for the interpretation of the structural paths. The Q^2 result is not interpreted as evidence from a separate external prediction sample, and is related to the reported blindfolding procedure (Waryat & Nurawan, 2022).

Why Harvesting Occupies a Central Commercial Position

The harvesting association reflects the role that harvest operations play in the orchard-market segment. The retained harvesting measures relate to an understanding of appropriate maturity and the appropriate tools and techniques. These capabilities apply to product going to distribution (Bakewell-Stone, 2025). Their linkage with marketing strategies implies a close relationship between commercial planning and readiness for harvesting in the perception of the stakeholders involved.

One practical consequence is that harvest decisions should be made based on the market destination. All of these aspects can be discussed together – collection timetables, product readiness, dispatch plans, and buyers' expectations. A business concerned with supplying fruit on a certain delivery date calls for coordination between the orchard and the distribution function. This outcome encourages a greater emphasis on harvesting in this planning process, especially when marketing communication is making claims about the condition or readiness for consumption of the product (Akrong *et al.*, 2021).

This finding also brings focus on organization of responsibilities. Harvest readiness usefulness for commercial purposes where information is transferred from production to selling and delivery. Effective communication on the product condition and expected dates of collection can enhance the coherence of the product offer. These are not further outcomes of the structural model, but are rather managerial implications of the association.

Processing as a Connection Between Preparation and Opportunity

The positive processing path helps to understand processing in the context of commerce development. The kept indicators are related to: participation in washing, participation in sorting, participation in packaging and perception that processing opens new markets. This specification relates directly to the preparation of the product and the market opportunity. It indicates a positive relationship between marketing activities and the manner enterprises are organising fruit for sale and their attitude towards the marketing opportunities which they believe are available as a result of their marketing activities.

Priorities on item processing should be based on the purpose of the product and its market. If the fresh mangoes are offered to a specific channel, grading and appropriate packaging may be part of the offer (Parihat *et al.*, 2022). Transformed products also need to be considered in terms of technical requirements, product specifications and distribution agreements. The current findings seem to justify integration of processing and marketing planning and the selection of a specific investment should be determined by the requirement of the product and market suggested.

The ship's position is also derived from the relationship. Marketing claims about a product that relates to consistency of presentation, product preparation or suitability for a particular use should reflect actual processing practice. Organization's can structure their communication in terms of things that can be shown and repeated. This method relates processing decisions with buyer confidence based on verifiable product attributes and it does not assume that all processing activities lead to a comparable level or kind of commercial value (Schulte & Abdulai, 2026).

Environmental Responsiveness in Marketing Decisions

Contextual association: Weather, seasonality, policy influence seems to belong in the commercial planning context. Respondents who identified these influences, also indicated a greater marketing strategy construct in the model. Substantive implication: The operating environment must be considered in relation to decisions concerning availability, distribution and communication (Le *et al.*, 2022). When production and marketing plans have assumptions that are consistent with each other in terms of timing and supply, the plans become more coherent.

One real-world application is seasonal planning. Planned product availability can be used to predict product promotion and communication with buyers, as well as fruit allocation between channels. Coordinating collection and delivery can take into account weather-related conditions (Bhowmik *et al.*, 2026). The information of Policies can guide the decisions required by relevant organisations. These applications are a translation of the contextual finding to a planning approach, but maintain the difference between the survey construct and any particular environmental or legal measure (Sukandi & Landy, 2023).

The outcome also highlights the need for transparency of information. Decisions can be aided by extension organisations, sector associations and commercial partners disseminating relevant production and market information in an accessible way. This type of messaging provides a way for businesses to connect with the outside world and associate their product offers with what is happening out there. The recommendation relates to the use of contextual information in management and was based on the observed relationship not on the data from the survey assuming a specific information service was assessed.

Interpreting the Cultivation Result Within the Value Chain

The nonsignificant cultivation path is significant as this allows an appreciation of the foundations of agriculture as opposed to the direct organisation of marketing. However, cultivation is still essential for the fruit which is sold by businesses. However, the model was not able to determine a distinct statistically significant link for the cultivation construct that was retained when harvesting, processing, and contextual factors were added (Kwasi Bannor *et al.*, 2023). This outcome has been beneficial, in the sense that it is more likely to provide a more accurate representation of the relationship between production domains and marketing than it is to assume that any one production domain directly impacts marketing (Roy *et al.*, 2022).

The result is put into perspective by the positive correlation between cultivation and harvesting of 0,594. Stages can be linked substantively but conditionally related to the outcome in different ways. There is no estimation of the indirect effect between cultivation and marketing through harvesting. Likewise coordination between these stages is assumed as a managerial aspect and mediation as a result of an empirical study is not presented.

For management it means that the orchard investment has to be related to a clear business objective. Training, technology and cultivation planning are among the factors that can be taken into account in addition to the desired product specifications and delivery requirements. This approach maintains the centrality of cultivation, but focuses on the activities which make agricultural produce a market offer (Gao *et al.*, 2022). It motivates companies to evaluate the tie between production choices and the commitments towards the buyers along the value chain.

Integrated Implications for Product and Channel Strategy

The results from both are put together and are helpful to formulating a strategy that is organised around the match between product condition and market destination. Harvesting or readiness at collection, processing or preparation and product format, and contextual awareness or timing and adaptability are all factors that support your ability to build preparedness for the season. These can be a basis for deciding which customer to target and what product features to highlight. A realistic evaluation of the operational capability, therefore starts with an integrated approach and the marketing offer is built accordingly on the basis of what the company can provide consistently (Bakewell-Stone, 2025).

The use of channel should be made taking the handling and scheduling needs of the intended route into consideration. A delivery commitment also involves harvesting schedule, packaging, coordination of transport and communication with the buyer. These connections may be helpful for enterprises to consider when determining if the proposed channel aligns with their business operations (Mohamad *et al.*, 2022). The structural model does not make comparisons between specific channels, but the pattern of associations heuristically suggests seeing the channel choices as part of production coordination and not as a stand-alone promotional effort.

Pricing and communication can run along the same alignment lines. For describing the offer it can be helpful to have concrete information in the form of product grades, preparation activities and delivery arrangements. Prices should be differentiated, if at all, according to feature or service which can be substantiated by the enterprise. The communication can then appropriately convey the product condition, the product's specific purpose and conditions for delivery (Zahid *et al.*, 2023). These recommendations are based on the value chain interpretation of the findings, and offer a practical direction as regards the linkage between strategy and operational fulfilment.

CONCLUSION

In this study the relationships between mango cultivation, harvesting and processing and the environment/ regulatory environment and marketing strategies in Bangladesh were explored. A total of 210 stakeholders with production, technical services, research, inspection and marketing functions provided useful surveys for analysis. The results of measurement analysis confirmed the construct specification reported with composite reliability value and average variance extracted values exceeding the measurement benchmarks, in addition to the reported discriminant validity assessment.

Differentiated pattern for direct-effects results. The strongest positive relationships were found between harvesting and marketing strategies, and between the environmental and regulatory aspects and processing. The coefficient for cultivation was positive but not statistically significant in the model with the other predictors. The model was able to explain 40.6% of the variance in marketing strategies and had a positive blindfolding Q^2 value. The results give a stage-specific knowledge of the relation between the production and marketing.

The main conclusion drawn is that marketing strategy should be closely linked to operational decisions which influence fruit readiness, preparation and timing of marketing operations. The cultivation is the agricultural base, harvesting and processing are the more immediate interfaces with the product offer. The setting in which these activities are planned is influenced by contextual conditions. The key challenge is to manage these areas strategically to ensure that product positioning and commercial commitments are consistent with the ability to actually deliver them.

REFERENCES

Akrong, R., Mbogoh, S. G., & Irungu, P. (2021). What factors influence access to and the level of participation in high value mango markets by smallholder farmers in Ghana? *Heliyon, 7*(3), e06543. https://doi.org/10.1016/j.heliyon.2021.e06543

Bakewell-Stone, P. (2025). *Mangifera indica (mango)*

(p. 34505) [Data set]. https://doi.org/10.1079/cabicompendium.34505

Bhowmik, T. K., Rahman, M., Kashem, Md. A., Rudra, S., Alim, Md. A., Taum, A., Bhowmik, T., Orpa, P. D., Tabassum, U. S., & Tripura, S. (2026). Producer income, value addition and market linkages in high-value fruits and crops cultivation: An endline evaluation of value chain development in Chattogram, Bangladesh. *Journal of Current Research in Food Science, 7*(9), 01–07. https://doi.org/10.22271/foodsci.2026.v7.i9a.417

Cornesse, C., Blom, A. G., Dutwin, D., Krosnick, J. A., De Leeuw, E. D., Legleye, S., Pasek, J., Pennay, D., Phillips, B., Sakshaug, J. W., Struminskaya, B., & Wenz, A. (2020). A review of conceptual approaches and empirical evidence on probability and nonprobability sample survey research. *Journal of Survey Statistics and Methodology, 8*(1), 4–36. https://doi.org/10.1093/jssam/smz041

Ermias, D. (2021). Econometric analysis of factors affecting market outlet choice of mango fruit producers in Hadero Tunto Zuriya District, Southern Ethiopia. *Cogent Food & Agriculture, 7*(1), 1891660. https://doi.org/10.1080/23311932.2021.1891660

Gao, A., Luo, R., Huang, J., Zhao, Z., Chen, Y., Wang, Y., Yu, H., & Wei, T. (2022). Mango industry development status of China in 2020. *Advances in Agriculture, Horticulture and Entomology, 2022*(03). https://doi.org/10.37722/AAHAE.2022301

Kwasi Bannor, R., Osei, G., & Kyire, S. K. C. (2023). Meeting European exporting certification standards as a sustainable marketing choice among mango farmers in Ghana. *Cogent Economics & Finance, 11*(1), 2185344. https://doi.org/10.1080/23322039.2023.2185344

Le, T. D., Viet Nguyen, T., Muoi, N. V., Toan, H. T., Lan, N. M., & Pham, T. N. (2022). Supply chain management of mango (Mangifera indica L.) fruit: A review with a focus on product quality during postharvest. *Frontiers in Sustainable Food Systems, 5,* 799431. https://doi.org/10.3389/fsufs.2021.799431

Loor Marquínez, E. Y., Gabriel Ortega, J., Morán Morán, J., Narváez Campana, W., & Fuentes Figueroa, T. (2023). Situación actual y perspectivas del cultivo de mango (Mangifera indica l.) en el Sur de Manabi, Ecuador: Resumen. UNESUM-Ciencias. *Revista Científica Multidisciplinaria, 7*(1), 156–172. https://doi.org/10.47230/unesum-ciencias.v7.n1.2023.672

Luquez Gaitan, C. E., Gómez-Gómez, A. A., & Hernández-Mendoza, N. (2022). International positioning of Mexican mango, analysis of foreign trade competitiveness indices from 2005 to 2018. *Agro Productividad.* https://doi.org/10.32854/agrop.v15i4.2116

Mirzaei, A., Carter, S. R., Patanwala, A. E., & Schneider, C. R. (2022). Missing data in surveys: Key concepts, approaches, and applications. *Research in Social and Administrative Pharmacy, 18*(2), 2308–2316. https://doi.org/10.1016/j.sapharm.2021.03.009

Mohamad, A. H. H., Ab-Rahim, R., & Mohamad, N. N. (2022). Competitiveness of mangoes in Southeast Asian region. *International Journal of Academic Research in Business and Social Sciences, 12*(5), 192–204. https://doi.org/10.6007/IJARBSS/v12-i5/13265

Moniruzzaman, M., Uddin, Md. S., Akhter, Md. A. E., Tripathi, A., & Rahaman, K. R. (2022). Application of geospatial techniques in evaluating spatial variability of commercially harvested mangoes in Bangladesh. *Sustainability, 14*(20), 13495. https://doi.org/10.3390/su142013495

Mossie, M., Gerezgiher, A., Ayalew, Z., Nigussie, Z., & Elias, A. (2023). Characterization of fruit production and market performance in northwest Ethiopia. *CABI Agriculture and Bioscience, 4*(1), 10. https://doi.org/10.1186/s43170-023-00149-3

Parihat, J., Yadav, P. K., & Sapkota, S. (2022). Analysis of mango marketing channels in Siraha, Nepal. *Vietnam Journal of Agricultural Sciences, 5*(1), 1389–1407. https://doi.org/10.31817/vjas.2022.5.1.07

Rasmikayati, E. (2018). Kajian potensi dan kendala dalam proses usahatani dan pemasaran mangga di Kabupaten Indramayu. *Sosiohumaniora, 20*(3), 215. https://doi.org/10.24198/sosiohumaniora.v20i3.15859

Ravi, S. C., Beer, K., Gupta, A. K., Amrutha, T., Mishra, M., Jaiswal, R., & Damodaran, T. (2023). A comprehensive analysis of the value chain dynamics of Dashehari mango in Uttar Pradesh, India. *The Journal of Applied Horticulture, 25*(03), 297–302. https://doi.org/10.37855/jah.2023.v25i03.53

Roy, R., Das, S., Sarkar, V., Das, B., Mondal, A., Rudra, B. C., Bhowmik, P., & Majumder, D. (2022). Marketing of mango: Perceived constraints during normality and due to lockdown in West Bengal. *Indian Journal of Extension Education, 58*(1), 176–179. https://doi.org/10.48165/IJEE.2022.58134

Roy, R., & Rahman, M. A. (2022). Assessing mango fruit value chain in Bangladesh: Mango value chain in Bangladesh. *SAARC Journal of Agriculture, 20*(1), 227–238. https://doi.org/10.3329/sja.v20i1.60547

Santos, E. R. D. J. (2023). Aplicabilidade do método PDCA (Plan, Do, Check & Act) à exportação de mangas entre Brasil e Estados Unidos. *Revista Científica Multidisciplinar Núcleo do Conhecimento,* 107–121. https://doi.org/10.32749/nucleodoconhecimento.com.br/engenharia-de-producao/pdca-a-exportacao-de-mangas

Sari, A. F., Rasmikayati, E., & Saefudin, B. R. (2019). Behavioral dynamics of farmers and first buyer in marketing mangoes in Sedong District, Cirebon Regency, West Java. *AGRIFOR, 18*(1), 63. https://doi.org/10.31293/af.v18i1.4072

Schulte, L., & Abdulai, A. (2026). The role of certifications in improving household food security among Peruvian farmers. *Agribusiness, 42*(2), 603–622. https://doi.org/10.1002/agr.70050

Schwalbe, G., & Finzel, B. (2024). A comprehensive

taxonomy for explainable artificial intelligence: A systematic survey of surveys on methods and concepts. *Data Mining and Knowledge Discovery, 38*(5), 3043–3101. https://doi.org/10.1007/s10618-022-00867-8

Sharma, A., Minh Duc, N. T., Luu Lam Thang, T., Nam, N. H., Ng, S. J., Abbas, K. S., Huy, N. T., Marušić, A., Paul, C. L., Kwok, J., Karbwang, J., De Waure, C., Drummond, F. J., Kizawa, Y., Taal, E., Vermeulen, J., Lee, G. H. M., Gyedu, A., To, K. G., … Karamouzian, M. (2021). A consensus-based checklist for reporting of survey studies (CROSS). *Journal of General Internal Medicine, 36*(10), 3179–3187. https://doi.org/10.1007/s11606-021-06737-1

Sukandi, P., & Landy, A. (2023). Pengembangan potensi buah mangga Gedong Gincu Majalengka ke pasar internasional. *JIIP - Jurnal Ilmiah Ilmu Pendidikan, 6*(4), 2318–2321. https://doi.org/10.54371/jiip.v6i4.1863

Tarekegn, K., & Kelem, F. (2022). Assessment of mango post-harvest losses along value chain in the Gamo Zone, Southern Ethiopia. *International Journal of Fruit Science, 22*(1), 170–182. https://doi.org/10.1080/15538362.2021.2025194

Wang, L., Zhang, X., Su, H., & Zhu, J. (2024). A comprehensive survey of continual learning: Theory, method and application. *IEEE Transactions on Pattern Analysis and Machine Intelligence, 46*(8), 5362–5383. https://doi.org/10.1109/TPAMI.2024.3367329

Waryat, W., & Nurawan, A. (2022). Keragaan penanganan pasca panen mangga di Kabupaten Cirebon. *Jurnal Ilmiah Respati, 13*(1), 64–74. https://doi.org/10.52643/jir.v13i1.2261

Zahid, M., Sharif, M. S., Ahmed, R., & Abbas, T. (2023). "Direction and destination pattern of mango export from Pakistan" A Markov chain approach. *Review of Education, Administration & Law, 6*(1), 75–82. https://doi.org/10.47067/real.v6i1.301

Zavala Martínez, J. M., Caamal Cauich, I., & Pat Fernández, V. G. (2023). Comportamiento de variables económicas y de indicadores de comercio del mango mexicano. *Agricultura, Sociedad y Desarrollo, 20*(3). https://doi.org/10.22231/asyd.v20i3.1454