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Customer Value Proposition for Precision Farming

Dharmik V. Sojitra [a++] and Chetan R. Dudhagara [b#*]

[a] International Agribusiness Management Institute, Anand Agricultural University, Anand, India.
[b] Department of Communication and IT, International Agribusiness Management Institute, Anand Agricultural University, Anand, India.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

A company's value proposition is established by the distinctive benefits and values it offers to its clients. Site-specific crop management (SSCM) and precision agriculture (PA) are farming management techniques that use technology to monitor and evaluate certain areas and crops. Between 2023 and 2030, the market for precision agriculture is anticipated to increase at a CAGR of 12.6%, reaching $15.6 billion. Precision farm planning, field maps, crop scouting, yield maps, and the estimation of input quantities are driving factors in this growth, along with the Internet of Things and advanced analytics. A company's commitment to influencing the attitudes, beliefs, and behavior of its target market is stated in its value proposition. The goal of the study was to address agricultural issues and increase productivity and profitability for banana farmers in the Anand and Umreth Talukas. Educate stakeholders, decision-makers, and service providers on how to support precision farming techniques. The study, conducted in Anand and Umreth Taluka, Gujarat, involved 50 banana growers with over 2 ha of land, using a descriptive design and semi-structured survey. Formulating a customer value proposition for identifying the problems faced by banana growers will

[++] Research Scholar;
[#] Assistant Professor & Head;
**Corresponding author: E-mail: drchetan32@gmail.com;*

help in understanding the current issues and areas of improvement within the agricultural sector. The findings of this research were contributing to the knowledge and understanding of precision farming in Anand and Umreth Talukas. Customers place a premium on product quality, the accessibility of the sales staff, and price, while farmers must deal with issues including disease, weather, nutrition, insect pests, and irrigation. Irrigation was viewed as less significant than weather and illness, which were found the major problems in the study area. Decision-making in agriculture depends heavily on weather forecasts and practices. A substantial effort was needed to improve agricultural practices because of the influence of climate change, input market accessibility, and remote farm access.

Keywords: Estimation; productivity; profitability; weather; nutrition; pest and disease; irrigation.

1. INTRODUCTION

Agriculture, an essential activity for human civilization, entails the cultivation of crops, the raising of livestock, and the production of vital resources such as food, fiber, and other agricultural products. The previous two years have seen brisk expansion in the agriculture industry. The industry, which employs the most people, contributed a significant 18.8 percent of the country's (GVA) in 2021–22, growing by 3.6 percent in 2020–21 and 3.9 percent in 2021–22.

A customer value proposition represents the distinctive advantages and value that a business provides to its customers. It encompasses the compelling reasons why customers should select a specific product or service from a company amidst other available options [1,2]. An effective customer value proposition effectively communicates the unique benefits, relevance, and differentiation of the product or service, establishing its value proposition to potential customers.

The terms precision agriculture (PA) and site-specific crop management (SSCM) refer to a technology-enabled farming management strategy that monitors, gauges, and assesses the requirements of specific fields and crops. The third revolution will be driven by cutting-edge analytical skills and continually evolving IoT capabilities, such as drones for precision agriculture. Precision farming aims to boost effectiveness and production, lower input costs, and enhance environmental sustainability [3-5].

The worldwide precision farming market was worth USD 9,476.3 million in 2022 and is predicted to increase at a compound annual growth rate (CAGR) of 12.6% between 2023 and 2030. By 2030, the market for precision agriculture is anticipated to reach $15.6 billion. Precision agriculture is growing due to the expanding ubiquity of the Internet of Things (IoT) and farmers' usage of advanced analytics. Precision farm planning, field maps, crop scouting, yield maps, and the determination of the precise quantity of inputs to be applied to fields are all created using computer-based software [6-8]. The capacity to create a sustainable agriculture plan, which aids in reducing expenses and increasing yields, is one advantage of this approach.

In India, Banana (Musa sp.) is the second most significant fruit crop after mango. It is the most popular fruit across all social classes because to its year-round availability, low cost, wide variety, flavor, nutritional value, and therapeutic properties [8]. It has strong export potential as well. High-tech crop production is a financially feasible venture that increases productivity, improves produce quality, and enables early harvest maturity with premium pricing [9,10]. Worldwide 113.2 lac tonnes of banana is produced per year. India is the largest banana producer in the world with 29.12 lac tonnes production volume per year.

Rosario & Raimundo [11] concluded that the value proposition is a declaration of the firm's promises and dedication to influencing the attitudes, perceptions, and behaviors of its target market in favour of rivals.

Vishali and Sudha [12] found that IoT is utilised to enhance many agricultural fields. Efficiency in terms of time, water saving, crop monitoring, soil management, pesticide and insect spray safety, etc. Agriculture might use the Internet of Things (IoT) to boost yields and better manage all agriculture related operations.

Sheth JN. [13] concluded that value creation is a fundamental aspect of capitalism, and there are various ways in which it can be achieved. The paper discusses three main approaches to value

creation: insourcing, outsourcing, and value co-creation. Value co-creation is seen as a strategic approach for the future survival and growth of both customer and supplier companies.

1.1 Aim of the Study

Formulate a customer value proposition specifically for banana farmers in Anand and Umreth Talukas. Identify the problems faced by banana farmers in agriculture. Assist in enhancing the productivity and profitability of banana farmers. Provide valuable insights for stakeholders, policymakers, and service providers in the agriculture sector to make informed decisions and develop effective strategies to support farmers in adopting precision farming practices. The study was conducted with the objectives (i) To formulate customer value proposition for Banana farmers (ii) To identify problems faced by Banana farmers in agriculture

2. RESEARCH METHODOLOGY

The research follows a descriptive research design, utilizing a non-probability sampling method, specifically purposive sampling. The sample unit comprises farmers who have more than 2 ha agriculture land. The study was conducted in Anand and Umreth Taluka of Gujarat. A total of 50 banana growers were studied in the study area. The survey was conducted using a semi-structured research instrument.

3. RESULTS AND DISCUSSION

The study was conducted with the 50 sample size of banana growers in Anand and Umreth taluka. The detail analysis of the responses received from the farmers are as follows:

3.1 Age of the Growers

According to the report, a key demographic that affects purchasing behavior and decision-making in Anand areas was the average age of farmers. The majority of the sample population falls in the age group of 41 to 55 years old, with 58.00% of the total individuals. We may claim that middle-aged folks dominated the area. Older farmers, or more than 55 years, made up 6.00% of the sample, while younger farmers, or those between 25 to 40 years old, made up 36.00%.

3.2 Education of the Growers

Table 2 shows that 78.00% of the farmers in the sample population have an SSC-level education, making them the majority of the population. This shows that the completion of secondary school was the greatest education level attained by the majority of the sample's participants. 14.00% of respondents from the sample's population had earned an HSC-level education. Only 4.00% of respondents had graduation-level education. Farmers' literacy means they do their duties with complete knowledge, which were beneficial for farming-related activities. They can broaden their knowledge and read market circumstances.

Table 1. Age of the farmers

Age	Frequency	Percentage
25-40	18	36.00
41-55	29	58.00
More than 55	3	6.00
Total	50	100.00

(Source: Field Survey, 2023)

Table 2. Education of the farmers

Education qualification	Frequency	Percentage
Illiterate	2	4.00
SSC	39	78.00
HSC	7	14.00
Graduation	2	4.00
Total	50	100

(Source: Field Survey, 2023)

3.3 Formulate Customer Value Proposition

A customer value proposition represents the distinctive advantages and value that a business provides to its customers. It encompasses the compelling reasons why customers should select a specific product or service from a company amidst other available options. An effective customer value proposition effectively communicates the unique benefits, relevance, and differentiation of the product or service, establishing its value proposition to potential customers.

Businesses should prioritize delivering high-quality products to meet customer expectations. Additionally, training sales staff to be friendly and helpful can have a positive impact on customer satisfaction. While other factors are still important, they may not be as critical in influencing customer decisions.

Factors such as the fast response of the service staff, the expertise of the service staff, money

back guarantee, and reliability of the products received lower mean values and ranks. This suggests that while these factors are still important to customers, they were considered relatively less important compared to product quality and the behavior of sales staff.

3.4 Problems Faced by Banana Growers

It can be inferred that Disease and Weather was perceived as the most critical issues. Nutrition and Insect pest follow closely behind, suggesting that these factors are also significant concerns in the given context. On the other hand, Irrigation had least important, indicating that it was perceived as the least significant problem among the options provided.

Disease having the highest mean score of 88.50, followed by Weather 86.64, Nutrition 83.22, Insect Pest 79.04, and Irrigation 78.38. These scores and rankings suggest that Disease and Weather were considered the most pressing problems, while Irrigation was perceived as the least significant.

3.4.1 Disease

According to the ratings and rankings supplied, yellow sigatoka was seen as the most significant concern, followed by bunchy top. In terms of significance, Panama and Banana Streak Virus (BSV) were placed lower.

3.4.2 Weather

Based on the provided scores and rankings, uneven rainfall was perceived as the most pressing issue, followed by wind and temperature fluctuation. Uneven rainfall refers to variations or irregularities in the distribution of rainfall, which can have significant impacts on various aspects such as agriculture, water resources, and ecosystems.

3.4.3 Nutrition

Quantity was the top priority, followed by quality, while the ripening of small size bananas was relatively less important. It suggests that the focus may be more on the quantity and quality aspects rather than the specific ripening process.

3.4.4 Insect Pest

According to the scores and rankings, nematodes were the most serious pest, followed by stem weevils. Aphids and thrips are considered less important.

3.4.5 Irrigation

Based on the provided scores and rankings, the amount of irrigation was perceived as the most pressing issue, followed by the high pH of water and the clogging problem.

Table 3. Factors for customer value proposition

Factors	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Quality of the products	0 (0.00%)	2 (4.00%)	9 (18.00%)	14 (28.00%)	25 (50.00%)
Satisfied with the value for money	1 (2.00%)	8 (16.00%)	13 (26.00%)	14 (28.00%)	14 (28.00%)
Reliability of the products	8 (16.00%)	15 (30.00%)	14 (28.00%)	10 (20.00%)	3 (6.00%)
Money back guarantee	4 (8.00%)	17 (34.00%)	19 (38.00%)	8 (16.00%)	2 (4.00%)
Expertise of the service staff.	1 (2.00%)	11 (22.00%)	24 (48.00%)	11 (22.00%)	3 (6.00%)
Sales people are friendly	3 (6.00%)	11 (22.00%)	14 (28.00%)	13 (26.00%)	9 (18.00%)
Fast response of the service staff	1 (2.00%)	13 (26.00%)	24 (48.00%)	10 (20.00%)	2 (4.00%)

(Source: Field Survey, 2023)

Table 4. Rank for customer value proposition

Factors	Mean	Rank
Quality of the products	4.24	1
Satisfied with value money	3.64	2
Sales people are friendly	3.28	3
The expertise of the service staff	3.08	4
The fast response of the service staff	2.98	5
Money back guarantee	2.74	6
Reliability of the products	2.70	7

(Source: Field Survey, 2023)

Table 5. Problems faced by banana growers

Problems	Rank given by respondents					Total	Average	Rank
	1st	2nd	3rd	4th	5th			
Disease	2300 (25)	1806 (21)	243 (03)	0 (00)	76 (01)	4425	88.50	1
Weather	1472 (16)	1978 (23)	648 (08)	234 (03)	0 (00)	4332	86.64	2
Nutrition	0 (00)	2150 (25)	1701 (21)	234 (03)	76 (01)	4161	83.22	3
Insect Pest	0 (00)	516 (06)	810 (10)	1638 (21)	988 (13)	3952	79.04	4
Irrigation	92 (01)	172 (02)	729 (09)	1482 (19)	1444 (19)	3919	78.38	5

(Source: Field Survey, 2023)

Table 6. Disease related problems

Problems	Rank given by Respondents				Total	Average	Rank
	1st	2nd	3rd	4th			
Yellow Sigatoka	2484 (27)	1118 (13)	810 (10)	0 (00)	4412	88.24	1
Bunchy Top	2024 (22)	1806 (21)	324 (04)	234 (03)	4388	87.76	2
Panama	92 (01)	860 (10)	2268 (28)	858 (11)	4078	81.56	3
Banana Streak Virus	0 (00)	516 (06)	648 (08)	2808 (36)	3972	79.44	4

(Source: Field Survey, 2023)

Table 7. Weather

Problems	Rank given by respondents			Total	Average	Rank
	1st	2nd	3rd			
Uneven Rainfall	3128 (34)	1204 (14)	162 (02)	4494	89.88	1
Wind	1012 (11)	2150 (25)	1134 (14)	4296	85.92	2
Temperature Fluctuation	460 (05)	1118 (13)	2592 (32)	4170	83.40	3

(Source: Field Survey, 2023)

Table 8. Nutrition

Problems	Rank given by respondents			Total	Average	Rank
	1st	2nd	3rd			
Quantity	2944 (32)	1548 (18)	0 (00)	4492	89.84	1
Quality	1380 (15)	1720 (20)	1215 (15)	4315	86.30	2
Ripening of Small Size Banana	276 (3)	1204 (14)	2673 (33)	4153	83.06	3

(Source: Field Survey, 2023)

Table 9. Insect pest

Problems	Rank given by respondents				Total	Average	Rank
	1st	2nd	3rd	4th			
Nematode	2208 (24)	1720 (20)	324 (04)	156 (02)	4408	88.16	1
Stem weevil	2208 (24)	1204 (14)	972 (12)	0 (00)	4384	87.68	2
Aphids	184 (02)	860 (10)	2106 (26)	936 (12)	4086	81.72	3
Thrips	0 (0)	516 (06)	648 (08)	2808 (36)	3972	79.44	4

(Source: Field Survey, 2023)

Table 10. Irrigation

Problems	Rank given by respondents			Total	Average	Rank
	1st	2nd	3rd			
Amount of Irrigation	2484 (27)	1806 (21)	162 (02)	4452	89.04	1
High pH of Water	1472 (16)	1720 (20)	1134 (14)	4326	86.52	2
Clogging Problem	644 (07)	946 (11)	2592 (32)	4182	83.64	3

(Source: Field Survey, 2023)

Table 11. Features of precision farming

Features	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Weather forecast alerts	0 (0.00%)	1 (2.00%)	8 (16.00%)	16 (32.00%)	25 (50.00%)
Package of practices	0 (0.00%)	1 (2.00%)	14 (28.00%)	24 (48.00%)	11 (22.00%)
Forwarming of pest and disease	0 (0.00%)	5 (10.00%)	11 (22.00%)	21 (42.00%)	13 (26.00%)
Availability of input market	0 (0.00%)	3 (6.00%)	20 (40.00%)	20 (40.00%)	7 (14.00%)
Remote farm access	2 (4.00%)	7 (14.00%)	14 (28.00%)	19 (38.00%)	8 (16.00%)
Farming related videos	0 (0.00%)	8 (16.00%)	24 (48.00%)	16 (32.00%)	2 (4.00%)
Weather advisory	5 (10.00%)	10 (20.00%)	20 (40.00%)	13 (26.00%)	2 (4.00%)
Nutrition advisory	6 (12.00%)	11 (22.00%)	11 (22.00%)	17 (34.00%)	5 (10.00%)
Query management	4 (8.00%)	11 (22.00%)	14 (28.00%)	15 (30.00%)	6 (12.00%)
Crop calendar	1 (2.00%)	9 (18.00%)	20 (40.00%)	15 (30.00%)	5 (10.00%)
Precision irrigation scheduling	4 (8.00%)	6 (12.00%)	16 (32.00%)	16 (32.00%)	8 (16.00%)
Activity management	2 (4.00%)	4 (8.00%)	15 (30.00%)	22 (44.00%)	7 (14.00%)
News and articles	2 (4.00%)	5 (10.00%)	11 (22.00%)	21 (42.00%)	11 (22.00%)

(Source: Field Survey, 2023)

Table 12. Rank of features in precision farming

Features	Mean	Rank
Weather forecast alerts	4.3	1
Package of practices	3.9	2
Forwarming of pest and disease	3.84	3
Availability of Input market	3.62	4
Remote farm access	3.48	5
Farming related videos	3.24	6
Weather advisory	3.14	7
Nutrition advisory	2.98	8
Query Management	2.84	9
Crop calendar	2.74	10
Precision irrigation scheduling	2.64	11
Activity Management	2.28	12
News and Articles	2.28	12

(Source: Field Survey, 2023)

3.5 Features of Precision Farming

Weather forecast alerts and package of practices was given the highest importance, respondents also recognize the significance of factors like warming of pests and diseases, availability of input market, and remote farm access. The lower-ranked factors were perceived as relatively less crucial, indicating that they may not have a significant impact on agricultural decision-making according to the respondents' perspectives.

Weather forecast alerts have the highest 1st rank, indicating that they are considered the most important factor among the given options. Package of practices ranks 2nd with suggesting its significant influence in agricultural practices. Factors such as warming of pest and disease, availability of input market, and remote farm access also received relatively high mean values and ranks, indicating their perceived importance.

4. CONCLUSIONS

Customers consider the quality of the products as the most significant consideration, followed by the price and affection of the sales staff. Customers place a premium on product quality and anticipate a fair trade-off between the price they pay and the item's perceived worth. Disease, weather, nutrition, insect pest, and irrigation were the main concerns for farmers. Disease and weather, especially yellow Sigatoka, was seen as the most serious issues, whereas irrigation was thought to be the least important of the issues mentioned. Alerts from weather forecasts and adhering to a suggested set of packages of practices, followed by forwarming of pest and disease and availability of input market were found crucial components in agricultural related decision-making and having a substantial impact on agricultural practices. Activity management and news & articles were least important issue related to precision farming. Taking these issues seriously can result in enhanced agriculture.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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