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Analysis of the Performance of the Agribusiness Subsystem in the Development of Horticultural Commodities in Kehiran Village

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ABSTRACT

The agribusiness sector plays a strategic role in producing food for the community. The agribusiness sector consists of several interrelated subsystems. When a disruption occurs in one subsystem, it will affect the other subsystems. The purpose of this study was to analyze the performance of the agribusiness subsystem in vegetable farming in Kehiran Village, East Sentani District, Jayapura Regency. Based on the results of the study, it shows various agribusiness index scores, namely: the production input procurement subsystem was 15.80, the farming subsystem was 19.90, and the marketing subsystem was 5.80. All four subsystems are in the good category. The service and support subsystem index was 4.55, indicating a poor category. The agribusiness system index score in vegetable farming was 13.486. The maximum value of the agribusiness system was 18.090, so the performance of the agribusiness system in vegetable farming was in the poor category. Based on this, the development of vegetable farming in Kehiran Village must be supported by other aspects. For example, ease of access to capital loans for farmers, intensity of extension activities, formation of farming cooperatives, and the active role of farmer groups as a means of learning and a source of information for farmers.

Keywords: Agribusiness Performance; Jayapura Regency; Subsystems; Vegetable Farming; Village Development

INTRODUCTION

The potential of natural resources owned by Indonesia is an important factor in efforts to increase economic growth and improve community welfare. Indonesia has various important sectors as a support in improving community welfare. Some of these sectors include agriculture, livestock, fisheries, and forestry. Especially the agricultural sector, which plays an important role in absorbing labor in rural areas. According to Soekartawi (2007) and Sumastuti (2011), the agricultural sector also has a very strategic role in meeting food needs for the community. In addition to playing a role in producing food, the agricultural sector also plays an important role in absorbing labor (Kusumaningrum, 2019). The agricultural sector accommodates most of the workforce (75%) and has proven to be relatively stable in facing the economic crisis (Sumastuti, 2011).

Human needs for agricultural commodities are not limited only to food products to meet consumption needs. However, there are several other types of needs, such as clothing, boards (building materials from wood, paper), energy, and pharmaceutical and cosmetic products. According to Saragih (2001), these product groups are basic needs for society produced from the agribusiness sector. According to Suryanto (2004), agribusiness is a system that includes five subsystems, namely production facilities, production subsystems, processing subsystems, marketing subsystems, and institutional subsystems. Each subsystem cannot be separated from the others.

Based on the definition put forward by Suryanto (2004), the components in agribusiness cannot be separated from each other. This means that several components are interrelated because the agribusiness sector is not limited to farming activities. The definition above shows that what is meant by agribusiness includes all activities from producing and distributing inputs to distributing agricultural products. On-farm or farming as an activity that is often referred to in general as agriculture, is only one part of agribusiness. If so, agribusiness must view agriculture as a whole, not only seeing activities producing agricultural products at the farm level.

Because it has a very strategic role in the development of the agribusiness sector, it must be ensured that all aspects contained in the agribusiness sub-system are met optimally. This is done to ensure that the regions, as the basis for the development of the agribusiness sector, especially in Jayapura Regency, Papua Province, are able to provide various community needs and are able to improve the welfare of farmers. Based on data from the Central Agency of Statistics of Jayapura Regency (BPS Kabupaten Jayapura, 2023), the Gross Regional Domestic Product (GRDP) value of the Agriculture, Forestry, and Fisheries sector has the highest value compared to other sectors. The GRDP value of this sector in 2020 was 2,019.97 (billion rupiah), in 2021 it was 2,033.78 (billion rupiah), and in 2022 it was 2,097.39 (billion rupiah). One of the horticultural commodities developed by farmers in Jayapura Regency is vegetables. Based on data, total vegetable production in Jayapura Regency in 2019 was 3.80 tons, in 2020 it was 4.46 tons, and in 2021 it was 4.18 tons.

The agribusiness sector must ensure that it is able to meet the needs of the community in Jayapura Regency, considering the increasing population. Based on data from BPS Kabupaten Jayapura (2023), the population of Jayapura Regency in 2020 was 166,171 people, in 20221 it was 168,476 people, and in 2022 it was 171,331 people. Therefore, in developing the agribusiness sector in Jayapura Regency, it must be viewed as a system. The agribusiness system views the agricultural sector not only as an activity to produce primary agricultural products, but also as all related activities from the provision of agricultural inputs to the marketing of agricultural products. Agribusiness needs to be viewed as an integrated system, consisting of several sub-systems.

The agribusiness sector plays a vital and strategic role in ensuring food availability for the community. It operates as an integrated system composed of several interrelated subsystems, each contributing to the overall performance of agricultural production and distribution. Disruptions in one subsystem can directly affect the efficiency and productivity of others. Recognizing this interdependence, the objective of this study is to analyze the performance of each agribusiness subsystem, particularly in the development of horticultural commodities in Kehiran Village, East Sentani District, Jayapura Regency.

The significance of this research lies in its ability to provide empirical data and analytical insights into the performance of agribusiness subsystems within horticultural development. By evaluating these subsystems, namely the production input procurement, farming, processing, and marketing components, this study offers valuable information for policymakers, practitioners, and farmers. Such data can support the formulation of effective development strategies to strengthen the agricultural sector in Jayapura Regency.

When the indicators within each agribusiness subsystem are not optimally met, it negatively affects the subsystem's performance and, consequently, the entire agribusiness system. Poorly functioning subsystems lead to reduced availability and quality of agricultural products, limiting the sector's capacity to meet market demand. Product quality and quantity, in turn, directly influence selling prices and farmers' income. High-quality agricultural commodities tend to command higher market prices, increasing profitability for farmers, while stable production volumes help maintain affordable prices for consumers, ensuring both producer and consumer welfare.

The novelty of this study lies in its comprehensive analysis of all agribusiness subsystems within the context of vegetable farming. Previous studies have typically focused on individual subsystems, such as farming or marketing, without examining the systemic interconnections between them. In contrast, this research evaluates the performance of all subsystems collectively, allowing for a more holistic understanding of the agribusiness framework in Kehiran Village.

The contribution of this study is twofold. First, it identifies which performance indicators within each subsystem have not been optimally implemented, providing a clear direction for targeted interventions by local governments, agricultural practitioners, and farmer groups. Second, the findings serve as a reference for future researchers conducting performance analyses of agribusiness systems in other regions or commodity sectors. Through these contributions, the study enhances the understanding of agribusiness dynamics and supports the advancement of sustainable horticultural development in local communities.

LITERATURE REVIEW

Agribusiness

The term "Agribusiness" was first known to the American public in 1995, when John H. Davis and Ray Goldberg brought agribusiness back to the public through their book entitled "A Conception of Agribusiness" (Fusonie, 1995). According to its origins, the word agribusiness comes from the word "agribusiness," which comes from the word "agriculture," meaning farming or profit-oriented activities. So, simply put, agribusiness is any agricultural business or activity, including anything related to it, that is profit-oriented (Akuriba et al., 2021).

The term agribusiness was introduced in Indonesia in the 1980s as an effort to transform traditional farming patterns into modern, market-oriented, commercial agriculture that adopts modern management practices, including the necessary technology. Agribusiness is essentially a business based on agriculture or other supporting sectors (Lainawa et al., 2019; Sokolova & Litvinenko, 2020). In addition to being product-oriented, agribusinesses must also seriously consider the sustainability of natural resources. In Indonesia, environmentally conscious development is an implementation of the concept of sustainable development.

Agribusiness studies profit-making strategies by managing aspects of cultivation, raw material supply, post-harvest, processing, and marketing. This definition allows us to define the scope of agribusiness as encompassing all agricultural activities, starting with the manufacture and distribution of farm supplies, farm production, and marketing of farm products and their derivatives. These three activities are closely interconnected, so disruptions to any one activity will impact the smooth running of all business activities. Therefore, agribusiness is described as a system consisting of three subsystems, plus one additional subsystem, namely supporting institutions (Komariyati et al., 2022; Lainawa et al., 2021).

Agribusiness Sub-System

According to Davis and Goldberg (1957), agribusiness is seen not only as production activities on the farm (on-farm), but also includes activities outside the farm (off-farm) that are related. The same understanding was also put forward by Downey & Erickson (1989) and Downey & Trocke (1981), that agribusiness includes activities on the farm and off the farm related to the procurement of agricultural inputs, processing of products, and marketing of products.

An agribusiness system is a comprehensive structure composed of interrelated and interdependent subsystems. As an integrative system, agribusiness encompasses several key components, including the production facility procurement subsystem (upstream agribusiness), the farming subsystem, the agricultural processing and industrial subsystem, the marketing subsystem, and the service or support subsystem. These subsystems are closely connected, meaning that disruptions in one component can significantly affect the performance and efficiency of the others (Saragih, 2001).

According to Saragih (2003), the upstream agribusiness subsystem plays a fundamental role in providing essential production inputs such as seeds, fertilizers, pesticides, agricultural tools, and machinery. The development of the agribusiness sector in Jayapura Regency, for instance, depends heavily on the availability and accessibility of these inputs, which are necessary for the subsequent primary production subsystem. The primary agribusiness subsystem, or on-farm agribusiness, focuses on the direct production of agricultural goods. It includes activities such as food crop cultivation, horticulture, medicinal plant production, plantations, livestock farming, fisheries, and forestry. The performance of this subsystem is highly dependent on the efficiency of input procurement and distribution. In the case of Jayapura Regency, the level of vegetable production is largely determined by the availability of agricultural inputs supplied by the upstream subsystem.

The downstream agribusiness subsystem functions to process primary agricultural products into semi-finished or finished goods, thereby adding economic value to agricultural commodities. However, its development relies on the consistency of the primary production subsystem, which provides the necessary raw materials. In turn, the marketing subsystem is responsible for distributing and selling agricultural products. The growth of this subsystem is contingent on the effectiveness of the preceding

components, as markets can only expand when production is able to meet consumer demand in terms of quantity, quality, and timeliness.

Finally, the supporting institution subsystem serves as the foundation that ensures the smooth functioning of the entire agribusiness system. This component includes institutions and services related to marketing, transportation, research and development, government policies, agricultural extension, consultancy, and other forms of technical or institutional support. These supporting services are essential for coordinating and sustaining the performance of all other subsystems.

In essence, all subsystems within the agribusiness framework form a mutually dependent network, where the success of one directly influences the others. A well-integrated agribusiness system, supported by reliable input supply, efficient production, value-added processing, effective marketing, and strong institutional services, is crucial for achieving sustainable agricultural growth and regional economic development.

RESEARCH METHOD

Analysis of the performance of the agribusiness subsystem in the development of horticultural commodities was conducted in Kehiran Village, East Sentani District, Jayapura Regency. The determination of the research location was carried out using the purposive sampling method, considering that Kehiran Village is one of the villages that develop vegetable cultivation businesses. The data used in the study are primary data. Primary data collection was carried out using the interview method, using a questionnaire. In the questionnaire, respondents were given two or three answer choices for indicators within the agribusiness subsystem. These answer choices had different weights, and each answer choice determined the performance of the agribusiness system. The respondents used in this study were limited to 40 farmers developing vegetable cultivation businesses, and sampling was conducted using a random sampling method.

Data analysis was conducted using quantitative descriptive analysis methods, and data processing was performed using Microsoft Excel. The description of the research data was based on the agribusiness system index score, which includes the subsystems of production facility procurement, farming, processing, marketing, and supporting services (Nursidiq et al., 2020; Virgiana et al., 2020; Yasmin et al., 2022). The indicators used to assess the performance of each agribusiness subsystem in the development of horticultural commodities follow the approach of Yasmin et al. (2022).

The procurement of production facilities subsystem consists of 18 indicators: land, seeds/seedlings, timing of agricultural input availability, planting location, ridge making, organic fertilizers, pearl fertilizers, SP36 fertilizers, KCL fertilizers, insecticides, fungicides, herbicides, mulch, agricultural machinery, labor, agricultural input storage, and pesticide labeling. The farming subsystem performance is measured using 22 indicators, including land use, use of seeds/seedlings, application of organic fertilizers, pearl fertilizers, SP36, and KCL fertilizers, and the use of insecticides, fungicides, and herbicides. Additionally, it includes land preparation, planting, fertilization, pest and disease (OPT) control, irrigation, harvesting, post-harvest handling, cleaning facilities, farm record-keeping and traceability, use of personal protective equipment (PPE), productivity, and income.

The processing subsystem is analyzed using seven indicators: transportation of fresh red chilies, cleaning, sorting, use of processing equipment, packaging, quality standardization, and workplace safety and security. Meanwhile, the marketing

subsystem index is examined through 8 indicators: transportation of fresh red chilies, transportation of ground chilies, market structure for both fresh and ground chilies, pricing for each type, and the marketing efficiency of both fresh and ground chilies. Lastly, the supporting services subsystem is assessed using eight indicators: the presence of farmer groups, access to financial institutions (banks), extension services, government policies, transportation facilities, communication, cooperatives, and agricultural input supply stores.

The performance of the agribusiness system shows smoothness if the agribusiness index value is high. The higher the agribusiness index value, the smoother the performance of the agribusiness system, and vice versa (Soegiri, 2012). In other words, if the performance of one of the agribusiness subsystems is not optimal, the performance of the entire system will not be optimal (Saragih, 2001). The agribusiness index values in each subsystem are then made into intervals referring to the Struges formula (Marhaendro, 2024). Two is the number of classes in the agribusiness index, namely good and not good.

$$Z = \frac{(X-Y)}{k} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

Where:
Z = Class interval
X = Highest value
Y = Lowest value
k = Number of classes

The agribusiness index value is the highest total score from each indicator interval for each agribusiness subsystem. To determine whether an agribusiness subsystem falls into the "Good" or "Not Good" category, the average total score for each agribusiness subsystem is used. This average total score is then compared to the agribusiness index value to determine whether the average total score falls into the "Good" or "Not Good" interval.

The agribusiness index assessment in the production facility procurement subsystem is 0.00-9.50 (not good) and 9.51-19.00 (good). The agribusiness index assessment in the farming subsystem is 0.00-13.00 (not good) and 13.01-26.00 (good). The agribusiness index assessment in the processing subsystem is 0.00-2.00 (not good) and 2.01-4.00 (good). The agribusiness index assessment in the marketing subsystem is 0.00-3.50 (not good) and 3.51-7.00 (good). The agribusiness index assessment in the supporting service subsystem is 0.00-7.50 (not good) and 7.51-15.00 (good). After the score for each subsystem is obtained, each indicator is weighed using the formula (Soegiri, 2012) to see the overall agribusiness index.

$$\hat{I} = \frac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(2)}$$

Where:
Î = Weighted average index (current indicator)
Xi = Value of the i-th aspect of the agribusiness index
Wi = Weight of the i-th data
N = Number of data

The calculations in determining the maximum value of the weighted agribusiness index in this study are as follows (Misrianti et al., 2024; Yasmin et al., 2022):

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$$\hat{I} = \frac{(18x19) + (19x25) + (4x4) + (6x7) + (8x15)}{18 + 19 + 4 + 6 + 8} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

$$\hat{I} = \frac{995}{55} = 18{,}091$$

The maximum value of the weighted agribusiness index in this study was 18.09. This shows that if the weighted agribusiness index score obtained is closer to 18.09, then the performance of the agribusiness system run by vegetable farmers in Kehitran Village is getting better. According to Virgiana et al. (2020), the closer to the maximum value, the better the agribusiness system.

RESULTS

Respondent Characteristics

Respondents in this study were categorized based on certain characteristics, namely, based on age level, farming experience, and area of cultivated land. The number of respondents used in this study was 40. Respondents were vegetable farmers in Kehiran Village, East Sentani District, Jayapura Regency. The types of commodities developed by farmers in Kehiran Village are quite diverse. The commodities developed consist of spinach, water spinach, chili, mustard greens, and tomatoes. The data in Table 1 describe the profile of respondents in the study based on age, farming experience, and area of cultivated land.

Table 1. Profile of Vegetable Farmer Respondents in Kehiran Village

Respondent Age (Years)		
Interval (Year)	Number of Respondent	Percentage (%)
35-45	3	7.5
46-56	26	65
57-65	11	27.5
Amount	40	100
Farming Experience		
Interval (Year)	Number of Respondent	Percentage (%)
< 3	1	2.5
3-10.33	9	22.5
10.34-20.67	17	42.5
20.68-33	13	32.5
Amount	40	100
Land area		
Interval (hectares)	Number of Respondent	Percentage (%)
0.05-1.98	35	87.5
1.99-3.97	3	7.5
3.98-6	2	5
Amount	40	100

The data in Table 1 describe the profile of respondents in the study based on age, farming experience, and area of cultivated land. Most respondents were within the 46–56 years age range, comprising 26 individuals or 65%. Those aged 57–65 years amounted to 11 individuals or 27.50%, while only 3 respondents or 7.50% were in the 35–45 years age group. These figures indicate that the majority of respondents are still within the productive age category, with only 1 respondent falling into the non-productive age group.

In terms of farming experience, the longest recorded duration among respondents is 33 years. Only 1 respondent, or 2.50% has less than 3 years of experience; this individual

is a member of the TNI (Indonesian National Armed Forces) and engages in farming as a secondary occupation. A total of 13 respondents, or 32.50%, have between 20.68–33 years of experience, 17 respondents, or 42.50%, fall within the 10.34–20.67 years range, and the remaining 9 respondents have 3–10.33 years of farming experience.

Regarding the area of cultivated land, which is a key factor affecting production, the land size owned by respondents varies, with the smallest being 0.05 hectares. Most respondents—35 individuals or 87.50%—own land ranging from 0.05–1.98 hectares. Another 3 respondents or 7.50% own between 1.99–3.97 hectares, while the remaining 2 respondents or 5% have land areas between 3.98–6 hectares

Analysis of Agribusiness Sub-System Performance

The agribusiness system is a system consisting of interrelated subsystems. Agribusiness is a concept of an integrative system and consists of several subsystems, namely (1) the procurement of production facilities subsystem (upstream agribusiness), (2) the farming subsystem, (3) the processing and agricultural product industry subsystem, (4) the marketing subsystem, and (5) the service/support subsystem. These subsystems are closely related so that disruptions in one subsystem or activity will affect the smooth running of other subsystems in the business (Kohls & Uhl, 2002; Saragih, 2003). This study will analyze the performance of the agribusiness subsystem in the development of vegetable farming in Kehiran Village, East Sentani District, Jayapura Regency. The analysis in this study describes the performance of several agribusiness subsystems, as described below:

Performance of Production Facilities Procurement Subsystem

The subsystem of procurement of production facilities is an activity of providing production facilities for vegetable farming activities, including land, seeds/seedlings, fertilizers, pesticides, and agricultural machinery. The results of measuring the performance of the subsystem of procurement of production facilities in vegetable farming are described in Table 2.

Table 2. Performance of the Production Facilities Procurement Subsystem

Indicator	Interval Value	Information	Average Score
Land	0 – 1	0 = not certified 1 = certified	0.73
Seed	0 – 1 – 2	0 = not certified 1 = certified, not hybrid 2 = certified, hybrid	1.78
Time of availability of agricultural inputs	0 – 1	0 = After Planting Season 1 = Before Planting Season	1.00
Soil analysis	0 – 1	0 = not analyzed 1 = analyzed	0.98
Planting location	0 – 1	0 = close to market/industry 1 = far from market/industry	0.63
Making ridges	0 – 1	0 = are not done 1 = done	0.90
Organic fertilizer/manure	0 – 1	0 = do not use 1 = use	0.83
Mutiara Fertilizer	0 – 1	0 = do not use 1 = use	0.88
KCL Fertilizer	0 – 1	0 = do not use 1 = use	0.65

Indicator	Interval Value	Information	Average Score
SP36 Fertilizer	0 – 1	0 = do not use 1 = use	0.55
Insecticide	0 – 1	0 = not adapted to Plant Pest Organisms (OPT) 1 = adapted to Plant Pest Organisms (OPT)	0.93
Fungicide	0 – 1	0 = not adapted to Plant Pest Organisms (OPT) 1 = adapted to Plant Pest Organisms (OPT)	0.95
Herbicide	0 – 1	0 = not adapted to Plant Pest Organisms (OPT) 1 = adapted to Plant Pest Organisms (OPT)	0.98
Mulch	0 – 1	0 = do not use 1 = use	0.83
Agricultural tools and machinery	0 – 1	0 = not easy to use 1 = easy to use	0.95
Storage of agricultural inputs	0 – 1	0 = in one room 1 = in a different room	0.20
Pesticide labels	0 – 1	0 = not listed 1 = tregistered	0.98
Water	0 – 1	0 = contains hazardous materials 1 = does not contain any hazardous materials	1.00
Total			15.80

The results of the study in Table 2 showed that the agribusiness index score of the production facilities procurement subsystem was 15.80. The score is at 9.51-19.00; thus, it can be said that the performance of the production facilities procurement subsystem is included in the good category. This can be seen from the average score approaching 1 and 2. This means that most of the indicators used in this analysis have been implemented well by vegetable farmers in Kehiran Village.

Farming Subsystem Performance

Farming is a production organization where farmers, as implementers, organize nature, labor, and capital shown in production in the agricultural sector, whether based on profit seeking or not. Natural conditions and climate also have an influence on the production process. To achieve production results, quite intensive arrangements are needed in the use of costs, capital, and other factors in farming fields (Hermanto, 1996). Based on this definition, it shows that the aspect of farming has a very important role in efforts to achieve maximum results. The performance of the farming subsystem is described in Table 3.

Table 3. Performance of Farming Subsystems

Indicator	Interval Value	Information	Average Score
Land	0 – 1	0 = used partially 1 = used all	0.18
Land status	0 – 1	0 = land owned but not certified 1 = rented, leased or borrowed land 2 = land owned and certified	0.95

Indicator	Interval Value	Information	Average Score
Number of Seeds/Seedlings used	0 – 1	0 = not as recommended 1 = as recommended	0.83
Organic fertilizer	0 – 1 – 2	0 = do not use 1= using but not according to the instructor's recommendations 2 = use according to the instructor's recommendations	1.58
Mutiara fertilizer	0 – 1	0 = dosage not according to recommendations 1 = recommended dosage	0.95
KCL fertilizer	0 – 1	0 = dosage not according to recommendations 1 = recommended dosage	0.90
SP36 fertilizer	0 – 1	0 = dosage not according to recommendations 1 = recommended dosage	0.88
Insecticide	0 – 1	0 = dosage not according to recommendations 1 = recommended dosage	0.95
Fungicide	0 – 1	0 = dosage not according to recommendations 1 = recommended dosage	0.95
Herbicide	0 – 1	0 = dosage not according to recommendations 1 = recommended dosage	0.98
Land Cultivation	0 – 1	0 = not on time 1 = on time	0.98
Planting	0 – 1	0 = not following cultivation recommendations 1 = follow cultivation recommendations	1.00
Labor	0 – 1 – 2	0 = using labor outside the family 1= using only family labor 2 = using family and non-family labor	1.48
Fertilization	0 – 1 – 2	0 = does not meet the 5 right criteria (right time, method, type, quality, and quantity) 1 = meets some of the 5 criteria correctly (on time, method, type, quality, and quantity) 2 = meets the 5 right criteria (right time, method, type, quality, and quantity)	1.58
Control of Plant Pest Organisms (OPT)	0 – 1 – 2	0 = does not meet the 5 right criteria (right time, method, type, quality, and quantity) 1 = meets some of the 5 criteria correctly (on time, method, type, quality, and quantity) 2 = meets the 5 right criteria (right time, method, type, quality, and quantity)	1.50
Irrigation	0 – 1 – 2	0 = Never 1 = not every day 2 = every day	1.08
Harvest	0 – 1	0 = harvesting is not carried out according to harvest age	1.00

Indicator	Interval Value	Information	Average Score
		1 = Harvesting is carried out according to harvest age	
Post harvest	0 – 1	0 = no post-harvest handling is carried out 1 = post-harvest handling is carried out	0.98
Farm business bookkeeping	0 – 1 – 2	0 = no farm bookkeeping 1 = There is farm bookkeeping but it is incomplete 2 = Farm bookkeeping is complete	1.18
Total			19.90

The results of the study, as described in Table 3, show that the agribusiness index score of the farming subsystem is 19.90. This score ranges from 13.01 to 26.00, indicating that the performance of the farming subsystem is considered good. The farming subsystem is the stage where various production factors are combined to achieve maximum production levels.

Processing Subsystem Performance

The agricultural processing sector plays an important role in increasing added value. Agricultural processing activities are very important to do, because agricultural commodities have characteristics that are easily damaged, including vegetable commodities, which generally rot relatively quickly (Irawan, 2007). Likewise, vegetable products produced by farmers in Kehiran Village have implemented several actions for post-harvest processing (Table 4), although they are still relatively simple.

Table 4. Performance of Processing Subsystems

Indicator	Interval Value	Information	Average Score
Transportation	0 – 1	0 = exceeding recommended volume 1 = do not exceed the recommended volume	0.95
Cleaning	0 – 1	0 = are not done 1 = done	1
Sorting	0 – 1	0 = are not done 1 = done	0.975
Use of Special Equipment for harvesting	0 – 1	0 = not using harvesting tools (gloves, sacks, scales) 1 = using harvesting tools (gloves, sacks, scales)	1
Total			3.925

The data in Table 4 shows that the processing subsystem index score is 3.925. The score is at 2.01-4.00, which shows that the performance of the processing subsystem is included in the good category. This can be seen from the indicators used, as many as four indicators show a score of 0.95 - 1.00. The cleaning indicator shows a score of 1.00, which shows that all respondents clean the harvest before being marketed.

Marketing Subsystem Performance

Marketing is an activity to distribute goods or products from producers to consumers. Marketing activities will determine the level of acceptance and profit of farmers in each harvest season. In addition, the marketing aspect will determine the level of sustainability of farming. If profitable, then farming will be continued. The performance of the marketing subsystem is described in Table 5.

Table 5. Marketing Subsystem Performance

Indicator	Interval Value	Information	Average Score
Transportation of fresh harvests	0 – 1	0 = exceeding recommended volume 1 = do not exceed the recommended volume	0.975
Market Structure	0 – 1	0 = not perfectly competitive 1 = perfectly compete	0.95
Marketing Channels	0 – 1	0 = the harvest is sold to the final consumer 1 = the harvest is sold to collectors or retailers	1
Pricing	0 – 1	0 = farmers cannot determine prices 1 = farmers can determine prices	0.675
Selling price	0 – 1	0 = prices do not provide benefits to farmers 1 = prices provide benefits for farmers	1
Price Stability	0 – 1 – 2	0 = Selling prices experience major changes during the harvest season. 1 = Selling prices change during the harvest season but not significantly. 2 = price remains unchanged	1.2
Total			5.80

Based on the research results as described in Table 5, it can be seen that the marketing subsystem index score is 5.80. The figure is at 3.51-7.00; thus, the marketing subsystem index is in the good category. However, there is one indicator that has the lowest value, namely the price determination indicator with a score of 0.675.

Performance of Service Subsystems and Supporting Services

Supporting services have a very important role in the development of the agribusiness sector. There are various supporting services in the development of agribusiness, two of which are extension institutions and financial institutions. Extension institutions play a role in conveying technology in farming and as a source for solving problems faced by farmers. Analysis of the performance of the service subsystem and supporting services is described in Table 6.

Table 6. Supporting Service Subsystems

Indicator	Interval Value	Information	Average Score
Farmer group	0 – 1 – 2	0= none/not yet formed 1= there are, including as members of farmer groups, but less active 2= there is, including as a member and active in farmer groups	0.875
Financial institutions (cooperatives)	0 – 1 – 2	0 = There is not any 1 = there is, not utilized 2 = there is, utilized	0
Access to financial institutions (banks or cooperatives)	0 – 1	0 = it is difficult to get access to farm capital loans 1= easy to get access to farm capital loans	0
Extension institution	0 – 1 – 2	0 = There is not any 1 = exists, is utilized but does not function optimally 2 = exists, is utilized and runs optimally	0.075

Indicator	Interval Value	Information	Average Score
Government policy in developing vegetable farming businesses	0 – 1 – 2	0 = There is not any 1 = there is, not utilized 2 = there is, utilized	0.6
Special transportation for transporting harvested products	0 – 1 – 2	0 = There is not any 1 = there is, not utilized 2 = there is, utilized	1.05
Farming cooperative	0 – 1 – 2	0 = There is not any 1 = exists, is utilized but does not function optimally 2 = there is, it is used to run optimally	0
Agricultural input supply shop	0 – 1 – 2	0 = There is not any 1 = Yes, it does not provide all the input needs in farming 2 = there is, providing all the agricultural input needs in farming	1.95
Total			4.55

Based on the data in Table 6, the index score of the service and supporting service subsystem is 4.55. The score is at 0.00-7.50; thus, it can be said that the supporting service subsystem is still in the poor category. This is caused by several indicators that have the lowest scores, which are 0.

Agribusiness System Performance

Table 7. Performance of Agribusiness Systems

Agribusiness Sub-System	Index Value (x_i)	Weight (w_i)	(X_i*w_i)	Weighted Average Index (Î)
Production Facilities Procurement Subsystem	18	15.8	284.4	13.486
Farming Subsystem	19	19.90	378.1	
Processing Subsystem	4	3.925	15.7	
Marketing Subsystem	7	5.8	40.6	
Supporting Services Subsystem	8	4.55	36.4	
Total (Σ)	56	49.975	755.2	-

The weighted agribusiness index assessment is used to see whether the agribusiness system in vegetable farming in Kehiran Village has been running well. Based on the results of the study in Table 7, the agribusiness system index score in vegetable farming is 13.486. The maximum value of the vegetable agribusiness system in this study is 18.090. Based on the results of the analysis carried out, the performance of the agribusiness system in vegetable development shows a category that is not good.

DISCUSSION

Performance of Production Facilities Procurement Subsystem

Although the production facilities procurement subsystem is categorized as good, efforts are still needed to maximize all indicators used in the analysis, particularly the production

facilities procurement subsystem. The indicators that achieved the maximum score were the indicator of the time of availability of inputs and the indicator of water used in farming. The indicator of the time of availability of inputs reached the maximum value of 1.00, meaning that all respondents were able to provide production facilities before the planting season.

Likewise, the indicator of water used in vegetable farming reached the maximum value of 1.00. This shows that the water used in vegetable farming does not contain hazardous materials. The availability of water in sufficient quantities plays a very important role in the development of vegetable farming. Research by Farida et al. (2017) shows that plant growth is influenced by the amount of water available, the environment, the nutrients provided, and the quality of the water. In addition to sufficient quantities, the thing that needs to be considered in the use of water in vegetable farming is the quality of the water used. The quality of water used in vegetable farming is very important to consider because it directly affects the quality of agricultural products (Diatara & Nurpilihan, 2019; Irianto, 2015).

On the other hand, based on the data in Table 2, there is still one indicator in the production facility procurement subsystem that has a very low average score. It can be seen that the value of the production facility storage indicator is 0.20. This shows that only 20% or 8 respondents store production facilities in one room. In comparison, the other 32 respondents indicated that the storage of production facilities was carried out in a different room. The storage space for production facilities can affect the quality of production facilities used in vegetable farming. This is because production facilities have different chemical content, so that they can affect each other if they are in one room (Misrianti et al., 2024).

Farming Subsystem Performance

Based on the findings, the land use indicator has a low score, which is 0.18. This shows that most of the land owned by farmers is not used for vegetable farming development. Based on the results of the study, only 7 respondents used the entire land area for vegetable farming activities. The low use of land for vegetable farming activities can be influenced by several factors, one of which is the limited availability of capital. In addition to meeting family needs, capital in the form of cash can be used to meet the needs of production facilities in farming (Wahab, 2023). If farmers have sufficient capital, this will certainly support the development of farming in increasing the quantity and quality of vegetable products. Hermawan (2019) stated that additional business capital assistance can have a significant impact on increasing input use, cost structure, and farm income.

Furthermore, there are two indicators that reach the maximum value. The first indicator is planting, which reaches a score of 1.00, meaning that planting activities are carried out according to recommendations in vegetable cultivation. Planting activities carried out according to recommendations can affect vegetable production. Cahyanda et al. (2022) found that the cultivation treatment that was tried had a significant effect on the fresh weight of the plant. The second indicator is the harvesting aspect, which has a score of 1.00. This shows that vegetable harvesting activities are carried out according to harvest age. According to Purnawati et al. (2015), the vegetables that are harvested must have reached the level of development of age and harvest physiology. Harvesting activities that are carried out on time will certainly have a direct impact on the quality of vegetable products. Furthermore, product quality will also affect the selling price and income of farmers.

Processing Subsystem Performance

Agricultural processing activities are very important to do, because agricultural commodities have characteristics that are easily damaged, including vegetable commodities that generally rot relatively quickly (Irawan, 2007). So, it takes treatment so that agricultural commodities can be available in fresh conditions for a fairly long period of time. According to Samad (2006), storage at low temperatures is needed for easily damaged vegetable commodities because this method can reduce damage due to microbial activity.

Almost all vegetable commodities that have been harvested experience physical contamination, especially dust or soil, so washing is needed (Samad, 2006). Cleaning vegetables after harvest is done to improve the quality of vegetables, because basically, vegetable cleanliness is also an indicator when buying vegetables from traders around the capital city of Jayapura Regency. The indicator of the use of special equipment for harvesting shows a score of 1.00. This shows that all respondents use special equipment in harvesting activities. The next indicator is sorting, the process of separating low-quality commodities (sorting) from high-quality ones needs to be done (Samad, 2006). Sorting carried out by vegetable farmers in Kehiran Village is based on several criteria, such as size, color, and condition of the harvest, whether it is damaged or good. This is done by farmers with the consideration of maintaining the quality of vegetables to be marketed; good quality vegetables will certainly have a higher price level.

Marketing Subsystem Performance

Based on the data in Table 5, the price determination indicator is still relatively low. This is because only 27 farmer respondents can determine their own selling prices for agricultural products. This shows that the bargaining position of farmers in vegetable marketing in Kehiran Village is still relatively low. Likewise, Irawan (2007), vegetable farmers have a relatively weak bargaining position in marketing their crops compared to fruit farmers. This condition can be influenced by market information that is not the same for traders and farmers. On the other hand, vegetable marketing in Kehiran Village involves 1-2 marketing institutions. Marketing channel I: Farmers-retailers-consumers, while the second marketing channel (II) is farmers-collectors-retailers-consumers. Kotler and Armstrong (2008) define marketing channels (distribution channels) as a group of interdependent organizations that help make products or services available for use or consumption by consumers or business users. Farmers do not sell directly to consumers, but the harvest is sold to collectors or retailers. The longer the marketing channel, the lower the level of profit that will be received by farmers (Puspitawati & Wardhani, 2013).

Although it still provides benefits for vegetable farmers in Kehiran Village, the selling price of vegetables always changes, although not significantly. Irawan (2007) found that fluctuations in the price of horticultural commodities cause the level of profit received by farmers to be unstable. Fluctuations in vegetable prices in Kehiran Village can be influenced by the demand and supply of vegetables. This means that if the amount of production increases, the selling price will decrease; conversely, if the amount of production decreases, the selling price will increase. However, when the selling price at the consumer level increases, the price level will not be the same as the price received by farmers. This condition is one of the causes of the low level of profit received by farmers. Moreover, in determining the selling price, traders have the power to determine the selling price at the consumer level. In a market with monopsony/oligopsony power, namely the behavior of traders who try to maximize their profits by providing imperfect price information to suppress the purchase price from farmers (Irawan, 2007).

Performance of Service Subsystems and Supporting Services

Supporting services have a very important role in the development of the agribusiness sector. There are various supporting services in the development of agribusiness, two of which are extension institutions and financial institutions. Extension institutions play a role in conveying technology in farming and as a source for solving problems faced by farmers. The results of the analysis by Prihantiwi et al. (2016) showed a significant relationship between the role of agricultural extension workers as mediators and the development of the cabbage agribusiness system at the supporting institutional stage. Likewise, financial institutions, in general, have very low capital for farmers. So that financial institutions can be a solution for farmers to get capital loans for developing agribusiness. The research conducted by Sa'diyah and Dyanasari (2014) shows that Microfinance Institutions (MFIs) have a very important role in the development of vegetable farming.

There are two indicators that cause the supporting service subsystem to be included in the category of not being good. The first indicator is the availability of financial institutions, with a score of 0. This shows that, according to farmers in Kehiran Village, there are no financial institutions in the form of cooperatives as a source for applying for capital loans. The availability of financial institutions in the form of cooperatives is very important to support the development of the agricultural sector. Basically, the capital owned by farmers is very limited. On the other hand, the income they receive will be allocated to meet living needs and as capital for farming in the next planting season. In this condition, of course, they must have the ability to manage finances so that farming as the main source of income will continue to run, and family needs will still be met.

The second indicator is access to financial institutions, with a score of 0. This shows that although there are financial institutions as a source for applying for capital loans, such as banks, farmers have difficulty in obtaining access to apply for capital loans. Likewise, the indicator of agricultural cooperatives also has a score of 0, which shows that in Kehiran Village, there are no agricultural cooperatives that can provide production facilities for farming. Furthermore, extension institutions are included in the low score, namely 0.075. This is based on the results of interviews with farmers; only one respondent stated that there are extension institutions, and they are utilized by farmers. In comparison, 39 other respondents stated that there are no agricultural extension institutions that can act as a means to obtain new information and knowledge for farmers.

Agribusiness System Performance

The results of the study in Table 7 show that the agribusiness system index score in vegetable farming is 13.486. The maximum value of the vegetable agribusiness system in this study is 18.090. Based on the results of the analysis conducted, the performance of the agribusiness system in vegetable development shows a category that is not good. This category is based on the agribusiness index value of 13.486, or only 74.55% of the maximum index value. The poor performance of the agribusiness system in vegetable farming in Kehiran Village is caused by several indicators in all agribusiness sub-systems that are not optimal. For example, in the production facility procurement sub-system, as many as 22 farmers (55%) use KCL fertilizer, while 18 farmers (45%) do not use KCL fertilizer. Likewise, in the use of SP36 fertilizer, only 26 farmers (65%) use SP36 fertilizer, while 14 other farmers (13%) do not use SP36 fertilizer. In addition, there are other indicators in the agribusiness sub-system with a very low index, namely the storage indicator of production facilities. In the storage of production facilities in the form of seeds, fertilizers, and pesticides, only 8 farmers (20%) store them in a separate room, while 32 other farmers (80%) store production facilities in the same room.

Although based on the weight value (w), it shows a good number, there are still indicators in the farming sub-system that are not good. These indicators are land use and farming bookkeeping. Most farmers do not use their land for vegetable farming, which is 33 farmers (82.50%). Meanwhile, farmers who use all their land for vegetable farming activities are only 7 farmers, or 17.50%. The low level of land use in vegetable farming is greatly influenced by the limited farming capital owned by farmers. Basically, the availability of capital owned by farmers will determine the planting area that can be achieved by farmers. This condition is also influenced by financial institutions in the form of cooperatives that can be utilized by farmers as a source of capital loans. Thus, the existence of financial institutions in the form of cooperatives can support the development of vegetable farming, which is a commodity developed by most farmers in Kehiran Village. In addition, in the farming sub-system, there are other indicators that are not good, namely, the farming bookkeeping indicator. Farming bookkeeping contains records of transactions made by farmers for the procurement of production facilities in one planting season. In addition, the bookkeeping of farm businesses also provides other information, such as the amount of production and the selling price received by farmers each time they market their harvest. Thus, bookkeeping of farm businesses will provide accurate information regarding the amount of farm costs and income each harvest season. However, in practice, there are still respondents who have not made farm bookkeeping, namely 2 farmers or 5%. As many as 29 farmers, or 72.50%, have made farm bookkeeping, but it is incomplete. This shows that not all transactions in the procurement of farm production facilities are recorded in the farm bookkeeping. While farmers who have made farm bookkeeping systematic and complete are only 9, or 22.50%.

The agribusiness subsystem that has indicators with a category that is not good is the marketing subsystem. There are two indicators in this subsystem that must receive attention, namely the price determination indicator and price stability. In the price determination indicator, there are still 13 farmers, or 32.50%, who are not able to determine their own selling price for vegetables when marketing. This shows that these farmers have low bargaining power. The selling price of vegetables is determined by wholesalers or retailers; moreover, farmers do not have market price information, so that in this condition, it will cause the level of profit obtained by farmers to be very low. Meanwhile, based on the price stability indicator, the results of interviews with respondents show that as many as 30 respondents, or 75%, stated that the selling price during the harvest season experienced changes, although not significantly.

The last subsystem that has indicators with a category that is not good is the service and supporting service subsystem. There are at least seven indicators that still have low weights. The seven indicators include farmer groups, financial institutions (cooperatives), access to financial institutions (cooperatives), extension institutions, government policies in vegetable farming development, special transportation for transporting harvested crops, and farmer cooperatives. Based on this, there are several indicators that are the main focus of this analysis.

The first is farmer groups, based on the results of the study, as described in Table 6, it can be seen that the score of the farmer group indicator is 0.875. This shows that in Kehiran Village, farmer groups have been formed, but the farmer groups are less active. Farmer groups are defined as a group of farmers who informally consolidate themselves based on common interests in farming (Nuryanti & Swastika, 2016). Farmer groups have a very important role in increasing farmer knowledge. Farmer groups can be used as a vehicle for learning and can be used to exchange information among farmer group members. Hermanto and Swastika (2011), as a social community organization, farmer

groups function as a teaching and learning forum for their members to improve knowledge, skills, and attitudes, and as a means of cooperation.

The second indicator is the extension institution; this indicator has a fairly low weight of 0.075. This is based on the results of interviews with respondents, as many as 38 farmers, or 95%, stated that there were no agricultural extension institutions that could provide extension to vegetable farmers in Kehiran Village. This will certainly be an obstacle for farmers when they face problems in farming that cannot be solved by the farmers themselves. Agricultural extension workers have a very strategic role, especially in conveying agricultural technology to farmers (Sutrisno, 2016). Conventionally, the role of extension workers is limited to conveying innovations and providing information to the community. On the other hand, agricultural extension workers also act as mediators to convey to the government the obstacles or constraints faced by farmers in Kehiran Village in vegetable farming.

The third indicator that has a low weight in the service and supporting service subsystem is the indicator of the availability of agricultural cooperatives. The results of the study show that this indicator has a weight of 0, meaning that Kehiran Village does not yet have an agricultural cooperative. According to Law No. 25 of 1992, Article 1, paragraph 1 concerning cooperatives, Indonesian cooperatives are business entities whose members are people, individuals, or cooperative legal entities, based on cooperative principles, as well as people's economic movements based on the principle of family (Kartika, 2020). Agricultural cooperatives have a very significant role in the development of vegetable farming businesses. Agricultural cooperatives can play a role in meeting various needs in farming. For example, in Munara's (2021) analysis, the KSU Permata Gayo cooperative has an important role for coffee farmers, including playing a role in providing agricultural inputs, equipment, and information and assistance. Thus, to improve the quality and quantity of vegetable products cultivated by vegetable farmers in Kehiran Village, it is necessary to support the existence of agricultural cooperatives. The existence of cooperatives will provide easy access for farmers to obtain production facilities in vegetable farming when they face obstacles, especially the availability of farming capital.

CONCLUSION

The purpose of this study is to analyze the performance of each agribusiness subsystem, especially in the development of horticultural commodities in Kehiran Village, East Sentani District, Jayapura Regency. Based on the results of the analysis conducted, the following conclusions can be outlined: (i) there are four agribusiness sub-systems that have index scores in the good category in vegetable agribusiness in Kehiran Village. These sub-systems include the production facility procurement sub-system (upstream agribusiness); farming sub-system; agricultural product processing and industry sub-system; and marketing sub-system. (ii) The performance of the supporting service sub-system in the development of vegetable agribusiness in Kehiran Village has an index score in the category of not good. This occurs because there are several indicators that have very low index scores, namely 0.00 and 0.075. (iii) The performance of the agribusiness system in the development of vegetable agribusiness in Kehiran Village has an index value in the category of not good. This occurs because several indicators in the supporting service sub-system have very low scores, namely, the indicator of the availability of financial institutions in the form of cooperatives, the indicator of access to financial institutions, and the indicator of farming cooperatives have a score of 0.00. Likewise, the extension institution indicator has a relatively low score, namely only 0.075.

Based on the results of the analysis carried out, the author outlines the following suggestions: (i) Regional governments should formulate policies to make it easier for farmers to access capital loans from financial institutions. This is done so that in the development of vegetable commodities, farmers can provide production facilities, use more advanced technology, so that they can increase quality production and maximum production quantities; (ii) Local governments should establish farming cooperatives to facilitate access to agricultural production advice at lower prices for farmers. This includes providing access to farm capital loans for farmers who have difficulty obtaining loans from financial institutions such as banks, and (iii) Agricultural extension agencies should continue to provide intensive outreach to farmers in Kehiran Village. Agricultural extension agencies act as mediators between farmers and the government and research institutions. Furthermore, extension activities also serve as learning groups for farmers, thereby improving their knowledge and skills.

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DECLARATION OF CONFLICTING INTERESTS
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