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Research Article

Sekayam Subdistrict's Food System Activities and Local Food Security

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ABSTRACT

This study analyzes Sekayam subdistrict's local food system and local food security. Based on an analysis of local food vendor interviews, this research sheds light on the local food system based on five food groups modified from seven food groups of household dietary diversity scale measurement, according to the local condition. The stages of data analysis in this study adhered to the data analysis process modified from Neuman. The result indicates that the Sekayam subdistrict is self-sufficient in rice, vegetables, and freshwater fish but depends on other places for meat, seafood, and other foodstuffs such as cooking oil, milk, eggs, and sugar. Taken together, the research findings highlight the importance of developing some potential food sources to fulfill a community need so that Sekayam subdistrict in the future no longer depends much on other places supplied, to pursue better local self-sufficiency and better local food security. This paper strongly recommends policymakers, stakeholders, and local farmers, as well as the community, to plan and take some actions to pursue local self-sufficiency and better local food security in the future. The activity includes food production, processing and packaging, distribution and retailing, and consumption.

Keywords: *sekayam subdistrict, local food system, food security, self-sufficiency, Indonesia*

Introduction

As defined by the High-Level Panel of Experts [HLPE] (2014) on Food Security and Nutrition of the Committee on World Food Security, "a food system gathers all elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation, and consumption of food, and the outputs of these activities, including socio-economic and environmental outcomes" (as depicted by Figure 1). The scheme highlights that food system activities and outcomes do contribute to food security, but, at the same time, they do not determine it, as other drivers also influence the four food security dimensions (Grando et al., 2020).

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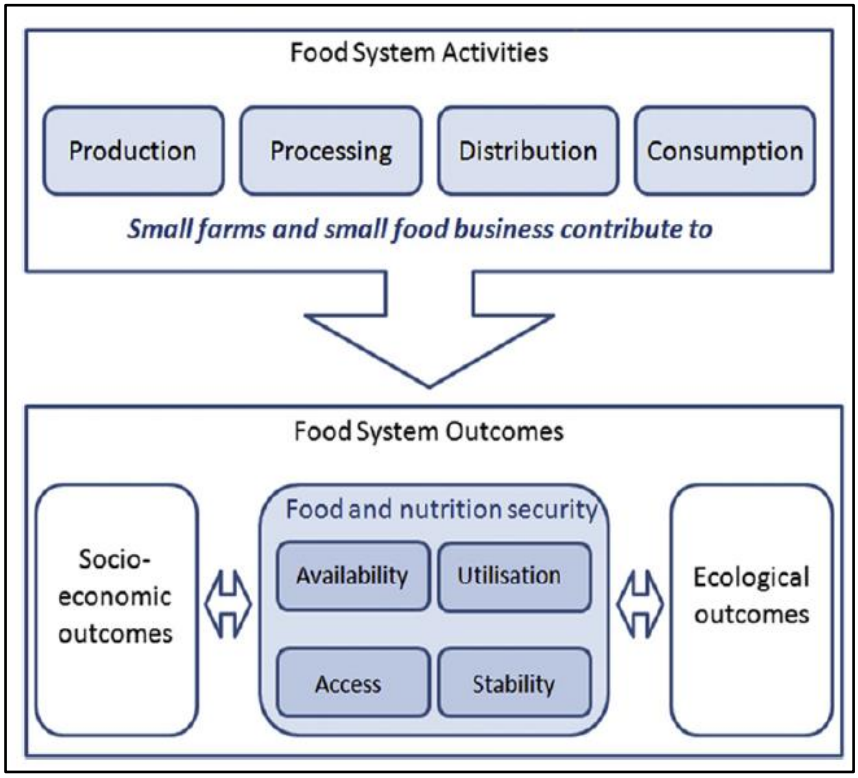

Figure 1. Food system conceptualization (image provided by Grando et al. (2020))

Several studies related to food systems emphasize the role and strategy of small family farms in the food system (Palmioli et al., 2019; Rivera et al., 2020: Grando et al., 2020). However, this paper focuses on food system activities according to Ericksen (2008) and Ingram (2011), particularly related to food production, processing, and food packaging, as well as distribution and retailing food.

This research is significant in that the Sekayam subdistrict is an intercountry area because food prices in Indonesia are higher than those in neighboring countries (World Bank, 2016), especially in border areas. A common problem exacerbates this condition in border areas: the lack of access to infrastructure that affects the limitations of food distribution. It makes prices of food commodities higher than those in other places.

To the best of our knowledge, no food system analysis related to local food security has been published, especially in the intercountry border area between Indonesia and Malaysia. Local food system analysis will provide a guideline to pursue local food self-sufficient and local food security. Hence, by conducting this research, it is expected that policymakers and small farmers or rural communities in the Sekayam subdistrict will get input and references regarding steps that can be taken so that the Sekayam subdistrict has more resilient food security in the future. This study assessed Sekayam subdistrict's food system's activities and their relation to local food security. The following are further described: 1) food system activities in Sekayam subdistrict, 2) the obstacles and supporting factors of the local food systems, and 3) further food system activities for better local food security.

Materials and methods

The qualitative approach was adopted in this study to analyze the data using inductive and descriptive analyses, to obtain in-depth and accurate data adjusted to the condition in the field (Neuman, 2006). Several interview sessions were held with two agricultural extension workers and five vendors (two food item sellers, a meat and fish seller, a vegetable seller, and a fruit seller). The indicators used during the interviews are listed in Table 1.

Table 1. Indicators applied during the interviews.

No.	Indicators
1.	Food items to sell and where to get them? How many were bought and sold? Purchase price and selling price? Where to sell? The profit made in one month?
2.	The number of similar traders in the area and the estimated amount of food sold in the area per month
3.	The obstacles faced as a vendor? The supporting factors in running the business?
4.	Government program for the business? The impact of the program to farmer, seller, and community? (if any)
5.	Hopes and suggestions to the government and the community, farmers, or entrepreneurs to improve food self-sufficiency in this hamlet/village? So that people can quickly get the food needed, and business/sales of food/agricultural products/processing of farm products can be increased?

This chapter looked into the food system from three out of four categories of food system activities in accordance with Ericksen (2008) and Ingram (2011):

1) Producing food includes all activities involved in the production of raw food materials.
2) Processing and packaging of food include the various transformations that raw food materials (vegetable, fruit, and meat) undergo before being sent to the retail market for sale.
3) Distribution and retailing of food include all activities involved in moving the food from one place to another and marketing it.
4) Consuming food involves everything from deciding what to select through to preparing, eating, and digesting food.

The first three food system activities, namely production, processing, and distribution (five groups of food), are described. The food groups include 1) rice as a local staple food; 2) pulses and legumes, vegetables, roots, and tubers; 3) meat and fish; 4) fruits; and 5) oil, milk, eggs, and other food items (modified from Swindale and Bilinsky, 2006). The stages of data analysis in this study adhered to the data analysis process modified from Neuman (2006), as follows: Data 1 are raw data gathered from an interview in the field. Data 2 refer to data recording and physical documents derived from the interview (sound recording). Data 3 are obtained from data selection or the final report from data 2 and other resources (agency documents and the literature). Figure 2 illustrates the data analysis process.

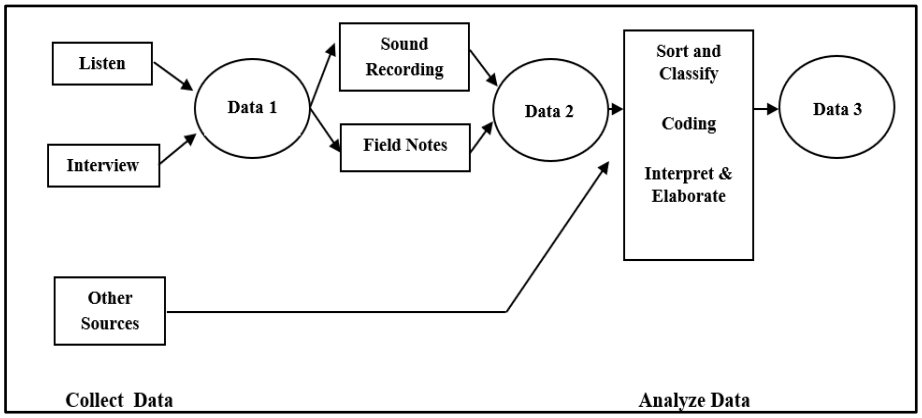

Figure 2. Data Analysis Process (Modified from Neuman, 2006)

Sekayam subdistrict

The Sekayam subdistrict is part of Sanggau regency located in Kalimantan Barat province. It has an area of 841.01 km^2 or 6.54% of the total area of Sanggau regency. It is located 120 km from Sanggau (the capital of the regency) and

can be reached by land transportation. Administratively, the Sekayam subdistrict boundaries are 1) North: East Malaysia, 2) East: Sintang regency, 3) South: Noyan subdistrict, and 4) West: Entikong subdistrict. Sekayam subdistrict has ten villages, where Malenggang village is the widest village with 116.56 km^2 or 13.86% of the entire Sekayam subdistrict. Figure 3 illustrates the location of Sekayam subdistrict.

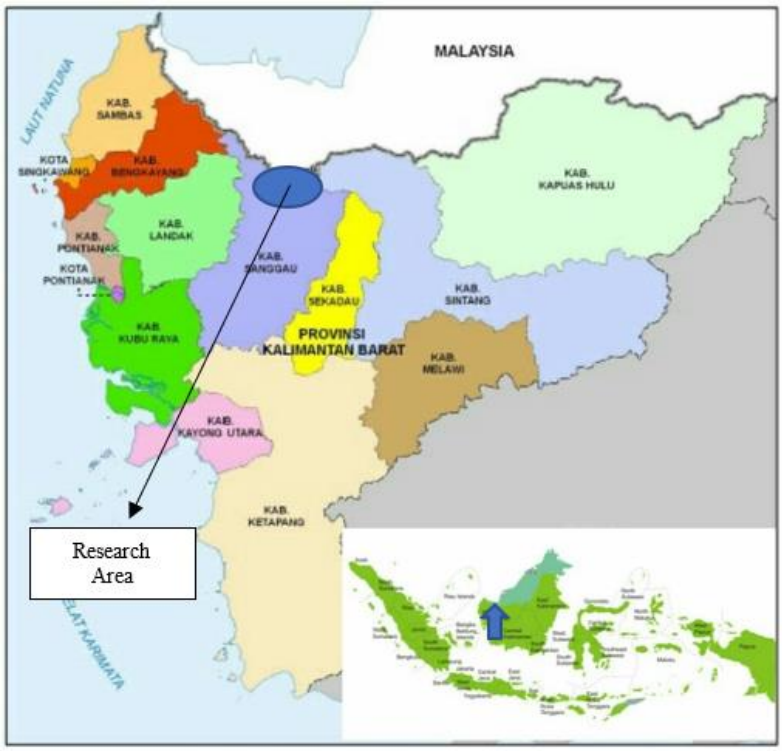

Figure 3. Sekayam Subdistrict as the Research Area

The record by Central Bureau of Statistics (BPS) in 2018 indicated that Sekayam subdistrict was resided by 35,141 people (18,328 males and 16,813 females). Balai Karangan Village has the highest population density with 145.93 people per km^2, whereas Sei Tekam Village has the smallest population density (26.32 people per km^2). The male to female ratio is 109:100 (Table 2).

Table 2. Total population by gender and gender ratio in Sekayam subdistrict by village

Village	Man	Woman	Total	Ratio
Pengadang	1,353	1,282	2,635	106
Kenaman	1,281	1,162	2,443	110
Bungkang	1,526	1,456	2,982	105
Sotok	1,450	1,236	2,686	117
Raut Muara	1,514	1,380	2,894	110
Engkahan	1,236	1,171	2,407	106
Balai Karangan	4,999	4,783	9,782	105
Lubuk Sabuk	1,655	1,395	3,050	119
Malenggang	1,964	1,753	3,717	112
Sungai Tekam	1,350	1,195	2,545	113
TOTAL	18,328	16,813	35,141	109

Source: BPS (2019)

In the agricultural sector, from the 84.101 ha of land in Sekayam subdistrict, 3.49% is wet farmland, 36.98% is dry farmland, and the remaining 59.53% is non-agricultural land. Of the 2,935 ha of wet farmland, 67.12% is irrigated rice fields and 32.88% is rainfed lowland areas. The paddy production in Sekayam subdistrict was dominated by wetland rice at 8,366 tons in 2015. Meanwhile, dryland paddy production was only 2.358 tons for the same year. The secondary crops in this area in 2015 were dominated by cassava with 3,823 tons of total production and sweet potatoes with 25 tons of total production (Table 3).

Table 3. Paddy and secondary crops in Sekayam subdistrict for 2015

Type of crops	Harvest area (ha)	Production (tons)
Paddy	2,935	10,724
Wet farmland	1,970	8,366
Dry farmland	965	2,358
Secondary crops		
Cassava	306	3,823
Sweet potatoes	3	25
Peanuts	3	3

Source: BPS (2019)

As depicted in Table 4, the highest production of vegetables in Sekayam subdistrict in 2018 was eggplant (up to 9 tons); the most fruit production was bananas (up to 800 tons), and the most legume/nut production was peanuts (up to 3,24 tons). Most of the plantations encountered in Sekayam subdistrict are oil palm, rubber crops, and pepper, with production in 2018 of 75,693, 1,987, and 468 tons, respectively.

Table 4. Vegetables, fruits, legumes/nuts, and plantation crops in Sekayam subdistrict in 2018

Type of crops	Harvest area (ha)	Production (ton)	Type of crops	Harvest area (ha)	Production (ton)
Vegetables			Legumes/nuts		
Eggplant	4	9	Peanuts	3	3.24
Chili	8	9	Long beans	2	2
Water spinach	6	6	String beans	2	1.6
Fruits			Plantation crops		
Bananas		800	Oil palm	25,831	75,693
Rambutans		750	Rubber	4,786	1,987
Durians		600	Pepper	924	468

Source: BPS (2019)

By contrast, for the livestock, more than 2,559 keepers resided in Sekayam subdistrict in 2018 with 48,805 heads of livestock population. The population for large livestock was 1.91%, whereas 23.67% and 74.42% represented small cattle and poultry, respectively. The largest livestock population was pigs (n = 7,530), whereas free-range chicken (n = 19,500) dominated the poultry livestock (Table 5).

Table 5. Livestock and poultry populations in Sekayam subdistrict in 2018

Types of Livestock	Population	Types of Poultry	Population
Cattle	500	Free-range chicken	19,500
Goat	725	Purebred chickens	17,300
Pig	7,530	Ducks	224

Source: BPS (2019)

As for the fishery sector, 818 ponds (including *pagong*) covered 26.21 ha in this subdistrict. In 2018, the total freshwater fish production was 184 tons, which comprised goldfish, tilapia, pomfret, catfish, and other local fish (Table 6).

Table 6. Fishery potentials in Sekayam subdistrict by village in 2018

Village	Ponds		Fishery Production (tons)				
	Amount	Area (ha)	Goldfish	Tilapia	Pomfret	Catfish	Local
Pengadang	83	7.52	0.40	6.00	0.75	3.10	1.90
Kenaman	71	5.65	0.35	2.40	0.35	3.70	2.60
Bungkang	192	3.55	11.50	38.90	2.70	22.10	7.20
Sotok	54	3.56	0.20	0.85	0.80	2.10	2.45
Raut Muara	65	2.55	0.28	2.60	0.40	3.90	2.80
Engkahan	63	3.53	0.30	2.95	0.35	4.45	2.70
Balai Karangan	76	5.56	0.50	9.70	0.90	15.50	3.70
Lubuk Sabuk	90	4.56	0.21	1.80	0.70	5.60	3.10
Malenggang	70	7.55	0.26	1.20	0.60	1.60	2.80
Sungai Tekam	54	2.53	0.15	0.85	0.26	1.20	2.30
TOTAL	818	26.21	14.15	67.25	7.81	63.25	31.55

Source: BPS (2019)

Results and discussion

Food System Activities

As described in the material and methods section, there were five food groups in this study: 1) rice as a local staple food; 2) pulses and legumes, vegetables, roots, and tubers; 3) meat and fish; 4) fruits; and 5) oil, milk, eggs, and other food items.

Rice

The first food group refers to the staple food in the study area, which is rice. According to a food item vendor, food items were obtained from within the country (Pontianak city) and abroad (Malaysia), including rice. Based on the results of interviews with sellers (sellers 4 and 5), food items are obtained from within the country (Pontianak) and abroad (Malaysia). For rice, seven tons of rice can be sold within 1 month. Balai Karangan is the center of Sekayam subdistrict with 33 grocery stores, so the estimation of rice sold in Sekayam subdistrict per month can be seen in Table 7.

Table 7. Rice sold / month estimation in Sekayam subdistrict (ton)

No.	Vendor	Location	Number of Vendors	Rice Sold / Month Estimation (on)	Total (on)
1	Grocery	Balai Karangan I & II	2	7	14
2	Grocery	Balai Karangan III	15	7	105
3	Grocery	Balai Karangan IV	10	7	70
4	Indomart Market	Balai Karangan	5	7	35
5	Alfamart Market	Balai Karangan	1	7	7
Total			33	7	231

Vegetables, pulses and legumes, roots, and tubers

The second food group refers to vegetables, including pulses and legumes, roots, and tubers. The vegetables were derived from Rintau hamlet in this subdistrict and Pontianak (the capital city of West Kalimantan province). Long beans, eggplants, kangkong, chili, mustard greens, and spinach are some vegetables originally derived from this area. Meanwhile, mustard, radish, cucumber, pumpkin, chayote, and many others were obtained from Pontianak. A vendor asserted, "Here, there are containers for vegetables, pulses and legumes, and roots and tubers from Pontianak, and there are suppliers; we are just retailers. Onions come from Malaysia and Pontianak, but it seems that more of them come from Malaysia because goods come in and out every day from neighboring countries, but from Pontianak, they do not come every day" (seller 3). Besides onions, there are carrots, potatoes, cabbage, and mustard shampoos that come from Malaysia. Potatoes and carrots also come from Pontianak, and they are supplied from Java. However, those from Malaysia are bigger, better, and more salable in this area.

Vegetable vendors take the products they sell from anywhere they are available. The composition is mixed among local, from Pontianak (Indonesia), and from Malaysia, without any fixed composition. Table 8 lists the origin of vegetables, pulses and legumes, and roots and tubers found at the traditional market in Sekayam subdistrict.

Table 8. Leavy vegetables, pulses and legumes, and roots and tubers found at the traditional market

Plant Origin	Leavy Vegetables	Pulses and Legumes	Roots and Tubers
Local	Eggplants, kangkong, chili, mustard greens, and spinach	Long beans, peanuts, tofu, and tempeh	None
Inter market: From Pontianak/ Java	Mustard, radish, cucumber, pumpkin, and chayote	Soy	Potatoes, onions, garlics, and carrots
Malaysia	Cabbage and mustard shampoos	None	Potatoes, onions, garlics, and carrots

Unsold, withered, and rotten vegetables were the risk faced by vegetable retailers. Approximately 60% of the items sold were leavy vegetables with a price of 2,000 rupiah for a bundle (approximately 250 g per bundle), in which 1,000 rupiah was the price from farmers or suppliers, and 1,000 rupiah was the benefit gained. It was difficult to calculate retailers' precise monthly income, but the estimated daily income earned by a vendor was 50,000 rupiah. Apart from the 60 merchant stalls in the traditional market of Sekayam subdistrict, other sellers sold their goods along the road in front of the market. As observed, the number of sellers along the road was nearly equal to that of sellers in the traditional market.

Meat and fish

The third group refers to meat and fish. The vendors sell freshwater fishes (e.g., catfish, patin catfish, and pomfret fish), sea fishes (e.g., cobs, bloat fish, and sardines), chicken, beef, tripe (e.g., liver, kidney, heart, and other organ meats), and sausages. They take sea fishes from a supplier at the market, where the supplier takes those fish from the Mempawah regency. There is only one supplier of sea fishes in this market. They do not take fish directly from the fishermen but at the Fish Auction Place (TPI). Thus, fish come from anglers to TPI and is then bought by supplier, supplied by vendors, and eventually sold directly to consumers.

The vendors bought chicken supply from two suppliers at the market, who derived and supplied chicken from the Mempawah regency. A vendor explained, "The suppliers take the chicken from the farms in the form of live chickens. Then, they process the chickens, by, for example, slaughtering, cleaning, and cutting them into pieces. We buy clean and ready-to-sell chicken meat from the suppliers" (seller 2).

In the case of beef, they sold it in small amounts; a stock of only two boxes per selling cycle with each box consisting of 10 kg of meat. About 20 kg of beef was sold out in 3 days, mainly because the meat was rarely bought by common customers, except for several sellers in the market who mostly bought beef. Interestingly, some questions were posed for clarification about the origin of patin catfish and pomfret fish, in which they responded that those items came from Malaysia. The vendors were probed about beef supply and the vendors claimed that it was supplied from Malaysia, although Malaysia imports beef from Australia and India. Apparently, many sellers hid the fact that many food items were from Malaysia because they were illegal at the time of this study (they are now legal).

As observed, ten vendors in the market had similar selling cycles and income levels. Table 9 presents the estimated average amount of meat and fish sold in the traditional market by multiplying the number of sellers with the sales made. As a result, 32.1 tons of meat and 10.65 tons of fish (sea and freshwater fish) were sold every month. Only catfish was locally supplied, and the rest originated from outside, both local and imported. The estimation reflected the minimum amount of sales at the traditional market, which excluded a peak of sales that occurred five times a year during Moslem celebrations (Eid al-Fitr and Eid al-Adha), Christmas, New Year's Eve, and Gawai (a harvest festival of the local people). Sales of meat and fish rose four-fold during each event.

Table 9. Estimation of meat and fish sales at the Balai Karangan market

Meat and fish	Sold / day (kg)	Monthly (30 days) Estimation (kg)	Total in kg (×10 vendors)	Origin
Meat	107	3,210	32,100	Local and other
Chicken	100	3,000	30,000	regencies
Beef	7	210	2,100	Imported
Fish				
Sea Fish (*cobs, bloat fish, and sardines*)	35.5 9	1,065 270	10,650 2,700	Other regencies
Freshwater fish				
➢ *Patin catfish*	6.5	195	1,950	Imported
and pomfret	20	600	6,000	Local
➢ *Catfish*				
Total	142.5	4,275	42,750	

Fruits

The next food group is fruits. The study area was rather famous for its production of bananas, with a total production of 800 tons in 2018 (BPS, 2019). The bananas were sold to markets in Malaysia and domestic markets in Sanggau (capital of Sanggau regency) and Pontianak. The supply for other fruit types was supplied locally (other regions in Indonesia) and imported from abroad. A fruit vendor mentioned that they sell local fruits, such as oranges, watermelons, snake fruits (salak), dragon fruits, mangos, and imported fruits. Salaks and mangos are from Java island, whereas oranges, watermelons, and dragon fruits come from Sambas regency and Kubu Raya regency. Imported fruits sold by them included apples (e.g., Fuji, Washington, Royal Gala, and green apples) and Sunkist oranges. They get our fruits from fruit agents in Pontianak, and they sometimes get them from those who deliver fruits in this area.

A minimum estimation of fruits that flow from the market area was determined based on the information gathered, as mentioned by seller 1, "there is another big fruit seller in this market, and he has two fruit stalls, in front of his shop and at the fruit market. He sells fruit and other merchandise. Then, there is another fruit seller from Pontianak who sells by car. He

focuses at one place and sells a large number of fruits. He also sells fruits to other retailers, who then sell the fruits to some villages by motorcycle. There are some small fruit stalls in the vegetable market, and it is difficult to make an estimation of their sales" (see Table 10).

Table 10. Minimum estimation of fruits sold in Balai Karangan market

Origin	Fruits	Monthly Sales (kg)	Total in kg (×3 vendors)	Note
Local	Banana			Sold 800 tons/year to other markets
	Rambutan			750 tons/year
	Durian			600 tons/year
Other regions	Orange	1,000	3,000	20% rotten
	Dragon fruit	500	1,500	
	Watermelon	1,750	5,250	
	Snake fruit (salak)	500	1,500	
	Mango	500	1,500	
Import	Sunkist orange	34	102	
	Apples (*Fuji, Washington, Royal gala, and green apples*)	750	2,250	20% rotten
Total		5,034	15,102	

Cooking oil, milk, eggs, and other food items

According to a vendor (seller 5), these food items mostly originated from Pontianak city and Malaysia. The vendor sells 30 boxes of sweetened condensed milk imported from Malaysia and 20 boxes of condensed milk from Pontianak in a month. There is 24 kg of milk from Malaysia per box and 48 cans (370 grams per can) of Indonesian milk in each box. The vendor also sell 30 boxes of cooking oil from Malaysia per month, whereas they sell 15 boxes of Indonesian cooking oil in a month. Malaysian cooking oil is 17 kg per box, whereas the Indonesian oil is 14.9 kg per each box.

Other food items sold by food vendors included eggs and sugar. Within a month, ±1,000 eggs and ±3 tons of sugar could be sold out (seller 4). Another vendor claimed selling ±1,300 eggs and ±4 tons of sugar every month. Based on the information, Table 11 lists a simple estimation of food items sold in a month in Balai Karangan, which involved 33 vendors.

Table 11. Estimation of food items sold in a month in Sekayam subdistrict

No.	Food items	Sold / month estimation	Number of Vendors	Total (kg)
1	Cooking Oil			
	-from Malaysia	30 boxes (×17 kg)	33	16,830
	-from Indonesia	15 boxes (14.9 kg)	33	7,375
2	Milk			
	-from Malaysia	30 boxes (×24 kg)	33	23,760
	-from Indonesia	20 boxes (17.7 kg)	33	11,682
3	Eggs	1,150 eggs	33	37,950 eggs
4	Sugar	3,500 kg	33	115,500

Obstacles and Supporting Factors of the Local Food System

Several vendors were approached to gain an overview of the obstacles and supporting factors of the local food system and their businesses in the study area.

Obstacles in the local food system

The first obstacle faced was the purchasing power of the people, which had decreased at the time of this study because of the fall in prices of agricultural commodities. A vendor claimed that the main obstacle is declining purchasing power among the people (due to the fall in the selling price of agricultural commodities, such as the selling price of pepper, rubber, and oil palm fruits), whereas prices of other necessities have increased. This condition was exacerbated by the problem of farming input accessibility. The cost of fertilizers was high, whereas agricultural products had a lower selling price. This scenario had affected the farmers, mainly through the impact of fruit sales and purchase of other goods with low purchasing power. In the long term, the affected farming productivity would decrease the income of farmers and subsequently lead to low purchasing power.

The second obstacle was competition among vendors. Many sellers, on one side, are good for the food system because they imply wider market network for small farmers and small producers. Essentially, wider choices lead to better selling price opportunities. Nonetheless, excessive competition denotes decreasing income for the vendors. Some other constraints faced by groceries were the drastic rise of prices of goods, empty stock of goods, and delay in arrival of goods. The volatile prices of goods imposed a problem in food accessibility. Farmers in this area also faced volatility in crops' selling price, which decreased their access to food. They might not lose the access, but it may decrease because of lower crops' selling prices in the midst of rising prices of goods. Lack of goods in certain conditions due to the distribution issue affected food availability and stability. This condition then contributes to food consumption and food utilization problems, whereby those in poverty adopt the coping strategy to keep providing food for their families.

In the traditional market, food distribution may be disrupted by bad weather and poor quality of products, as mentioned by a seller, "One of the constraints faced in trading is the weather. The rainy season contributes to the decreasing number of buyers. The second constraint is the lousy quality of the product, which can make buyers feel less interested" (seller 2).

Supporting factors of the local food system

One of the supporting factors of local food system was technological progress. Information about benefits of consuming certain food types could be easily retrieved using mobile phones. This information encouraged people to buy and consume the food (e.g., fruits). The next supporting factor was high purchasing power for some food items, such as chicken and fish. This was supported by the availability of those food items (vegetable, chicken, and fish), which signified smooth production and distribution of the food items at the area.

Infrastructure helps vendors to reach people in villages and hamlets. Some vendors brought their merchandises by car and mostly in motorcycles to sell their goods. Financial availability is crucial for businesses that support the food system to keep them running and to flourish their trading. A seller claimed, "Strategic location of the shop is important for us, and then, the availability of financial services that are never problematic, thank God they are always available" (seller 2). Another vendor explained how he gained financial access from a loan to start a business. They borrowed money from the bank; at that time, there was a KUR (People's Business Credit) from BRI. The last factor was the unique character of the local people in the area, which reflected high prestige. According to a fruit vendor, the locals at Balai Karangan bought high-quality fruits when they had sufficient money.

Figure 4 portrays the local food system and the impact of obstacles and supporting factors on local food security, based on the description given above.

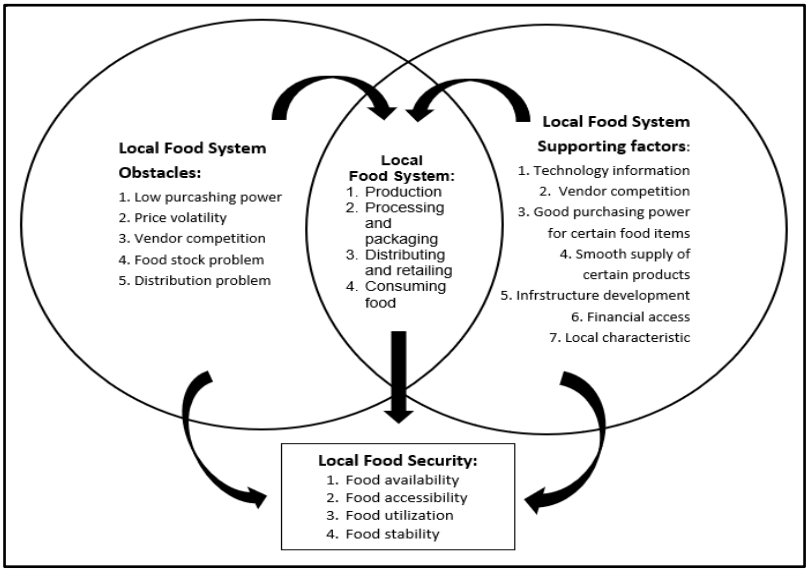

Figure 4. Local food system with the impact of obstacles and supporting factors on local food security

Further Food System Activity for Better Local Food Security

This paper describes the food system activities based on the five food groups. Paddy production in Sekayam subdistrict was 10,724 tons for both wetland and dryland (BPS, 2019), whereas the demand for rice in the area was 3,373 tons a year. Rice consumption per person in the area was 8 kg per month or 96 kg per year, and the population in Sekayam subdistrict was 35,141 people (Indonesia rice consumption in average was 75.36 kg per year in 2017). In the Balai Karangan market, around 231 tons of rice was sold per month, or 2,772 tons of rice was sold annually. Thus, the Sekayam subdistrict is self-sufficient in rice commodity as 55% of its paddy production was converted into rice (5,898 tons). However, the fact that rice in the market originated from other regions in Indonesia and from Malaysia showed that most farmers planted paddy for their own family consumption. The local rice did not penetrate the local market because of issues in processing / packaging and distribution / retailing of local rice.

As for vegetables, according to a joint farmer group leader in Rintau hamlet, around 4 tons of vegetables go out from Rintau only on daily basis; the best quality of vegetables would enter the East Malaysia market, and the rest would go to the Balai Karangan traditional market. "There are four vegetable intermediaries in this hamlet, and each transports a ton of vegetables every early morning from this place" (farmer group leader). Hence, although the study area was self-sufficient for vegetables, it relied on other places for soy, as the main ingredient of tempeh and tofu, and for root and tuber plants (e.g., potatoes, onions, garlics, and carrots).

The Sekayam subdistrict heavily relied on other places for its meat needs. All beef meat sold at the traditional market originated from Malaysia and other regencies in Indonesia. This was the same case for chicken meat, which sold 30 tons per month (total 360 tons per year) in the market, while the poultry population in the area was below 19,500 chickens in 2018. For fish and sea food/sea fishes, they relied on other regions because of the location of the area, far from the sea. Although catfish (freshwater fish) in the market was supplied from the area, other types of freshwater fish originated from Malaysia and other parts of Indonesia.

The 800 tons of bananas yielded yearly were sold to Malaysia and other Indonesian areas. Other fruits sold in the local market of Sekayam subdistrict came from other regencies or were imported from other countries. Next, 65% of cooking oil, milk, eggs, and sugar supply were imported from Malaysia. Figure 5 illustrates the flow of food items in Sekayam subdistrict.

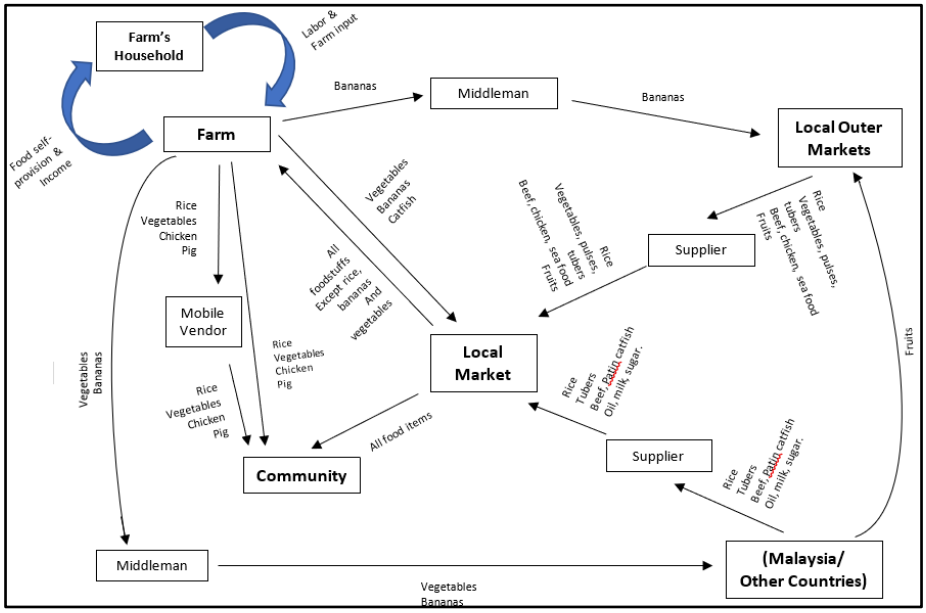

Figure 5. Flow of food items in Sekayam subdistrict

Figure 5 displays some potential food sources that could be developed to fulfill the needs of the community, so that the Sekayam subdistrict need not depend on food supplies from other areas. The first is the alternative staple food aside from rice. Despite the 3,823 tons of total cassava production (BPS, 2018), this food item was not considered to be a staple food substitute. Only a small amount was consumed, as it was mostly channeled to feed livestock. Second, as the local market supplied pulses and tuber plants from other areas, such as onion, garlic, potato, and carrot, the farmers might view this as a business opportunity. Next, beef completely originated from other places, whereas chicken meat production in the area was rather far from local consumption. This suggests that cattle and chicken farm activities can be crucial activities to develop in Sekayam subdistrict. Laying hens also appear to be a promising activity if well pursued and developed, considering that the entire egg supply came from elsewhere, including milk availability that totally depended on other places for supply. Other types of freshwater fish (apart from catfish) is also a lucrative business potential for the local farmers, whereas other types of fruit (excluding bananas) may be an option for the agricultural sector in the study area. As for seafood products, there was no option but to continue gaining supply from elsewhere. A fish and meat seller said, "We have never experienced shortage of meat and fish supply to sell. Although the procurement of goods came far from Mempawah, we have our daily supply. We are not tied to the supplier of products; if there is shortage of goods, we can always take the supply of chicken and fish from other suppliers" (seller 2). Although the study area is quite a distance from the coastline, the seafood supply from other regencies appeared reasonable.

Starting a new type of farm is indeed a challenge, as it demands much effort and knowledge. A fruit vendor claimed, "For fruit farming, in my opinion, the land is less suitable, unlike Sambas regency that is closer to the sea where the soil is more suitable to grow fruit. A farmer from Lampung had tried planting watermelons here. He said that the ground here has high acid content, so it is unsuitable for planting watermelons. It could grow, but the yields were less than optimal, and the fruit is small, only 1 kg at most per fruit. The cost incurred to cultivate land is higher, especially in making the soil fertile" (seller 1). Nonetheless, with a good technical approach, appropriate seeds and fertilizer, as well as sustainable experiment, farmers can crop larger amounts of fruit commodities or any other farm activities, so as to meet the need of certain food items in the area or to be more self-sufficient.

From the perspective of the food system, several points demand attention. The first point is the need for a program of flowing rice to the local market. Although the production of rice in this area was beyond consumption, it never penetrated the market because of packaging and distribution issues. The second point is the need to process raw material into a more valuable product. Two local productions, namely vegetables and bananas, flowed from this area to outer markets in the form of raw materials. Hence, the stakeholders may introduce an investment scheme to increase income using the processing and packaging technology. Moreover, small business actors, small traders, and small service business actors in the area claimed that they had never been assisted by government programs to develop their businesses. This was highlighted by some sellers when they were probed about a certain government program for them: "I do not know the government program for agriculture, but for us as vendors, there is no government program that we have received. We run this fruit trading business without the help of the government" (seller 1). "Based on my experience, all our chicken and meat sales efforts have been carried out by ourselves. I have never been involved in any particular government program to increase agricultural, livestock, or fishery products or to improve marketing results" (seller 2). Table 12 lists some actions to pursue local self-sufficiency and better local food security in the future.

Table 12. Future actions to pursue local self-sufficiency and better local food security

Food system acts/ Food security	Food production	Processing and packaging	Distribution and retailing	Consumption
Food availability	Alternative staple foods Cattle, chicken, eggs, milk Freshwater fishes (besides catfish) Root and tuber plants Pulses and legumes Fruits Other food items	Rice Bananas Cassava Rambutans Durians Jackfruits	Rice Bananas Cassava Rambutans Durians Jackfruits	
Food access			Sea food/fishes Cattle, chicken, eggs, milk Freshwater fishes (besides catfish) Root and tuber plants Pulses and legumes Fruits Other food items	All food items at all times
Food utilization				Alternative staple foods Consume all food groups.
Food stability	All food items	All food items	All food items	All food items

Conclusion

In the five food groups that have discussed in this paper, each group has a different condition: 1) rice is self-sufficient, but the local rice did not penetrate the local market because of issues in processing/packaging and distribution/retailing of local rice; 2) this area is self-sufficient for vegetables, but it relied on other places for soy, as the main ingredient of tempeh and tofu, and for root and tuber plants; 3) this area heavily relied on other places for meat and sea fish needs; 4) fruits sold in the local market of Sekayam subdistrict originated from other regencies or were imported from other countries, and 5) around 65% other food items were imported from Malaysia.

Recommendation

This paper strongly recommends policymakers, stakeholders, and local farmers, as well as the community, to plan and take some actions to pursue local self-sufficiency and better local food security in the future. This includes, firstly, supporting local production of alternative staple foods, cattle, chicken, eggs, milk, freshwater fishes (besides catfish), root and tuber plants, pulses and legumes, and many types of fruits. During that process, the distribution and retailing process of these food items from outsider markets must be smooth and accessible for the community. Secondly, the local activities of processing, packaging, distribution, and retailing of rice, bananas, cassava, rambutans, durians, and jackfruits should be supported to add value and link local food production to the consumer. Then, the consummation of alternative staple foods and all food groups by local community should be supported, on a daily basis.

With the result of this work, it is expected that policymakers, stakeholders, and small farmers or rural communities in the Sekayam subdistrict can increase local food security, have more resilient food security, and not rely much on other places for the fulfillment of the food needs for the local community in the future.

Limitations

1. The information in this study relied on local statistical data and information from interviewing five food vendors. This means that the description is mainly derived from the informants before being generalized into the research area context. So, we can say that in some points, what we gain are estimations rather than precise data, especially for some data that we were not able to obtain officially. However, at the end of the work, we can determine some agricultural opportunities to be developed in this area to achieve better local food self-reliance in the future.
2. This work was done before the COVID-19 situation, and it could have different results in the current situation. So, we strongly recommend further work to get better information about the resilience of the local food system amid the COVID-19 outbreak.

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