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Development model of food self-sufficient program based on the assistance of agriculture extension, poor households, and aid types in South Sumatra, Indonesia

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Abstract

The food self-sufficiency program in South Sumatra sought to shift the societal mindset from purchasing to producing their own food, particularly to satisfy their own requirements for vegetables, chicken, and fish, by utilizing vacant land or home yards for production. There are main factors that influence the achievement of food self-sufficiency program, namely internal and external factors originating from agriculture extension, poor households, and aid types provided. The study's objective was to develop a development model for a food self-sufficient program in South Sumatra based on the assistance of agriculture extension, poor households, and aid types. The research used a survey method with a sample collection using a disproportionate stratified random sampling method. The sample was 144 samples, consisting of 24 agriculture extensions and 120 poor households received aid. The results showed that the development strategy of the food self-sufficient program in South Sumatra was in quadrant I (positive, positive). The term implies that the strengths and opportunities are greater than the weaknesses and threats. The formulated strategies based on SWOT analysis were: (1) improve the quality and quantity of agriculture extension to households, (2) provide the required aid, (3) empower productive poor households, and (4) making high farming experience a guarantee in maintaining the aid until it produces, thus meeting daily needs, especially for vegetables, chicken, and/or fish.

Keywords: agricultural development, household food security, innovative program, land optimization, sustainable food provision

1. Introduction

Agriculture is a critical component of Indonesia's national economy, as it is an agrarian nation. The number of individuals or laborers who reside and work in the agricultural sector serves as an indicator of this. In 2023

there were 28.64% of the population working in the agricultural sector [1]. Although the majority of individuals believe that agriculture is exclusively conducted in rural areas, agricultural activities are now being developed in urban areas as well [2].

One important factor that contributes to agricultural development is information. Extension is a sequence of information delivery actions that are implemented gradually and consistently until behavior changes (ability, knowledge, and attitudes) [3]. Before delivering, educating, and training farmers in agricultural methods and techniques, agricultural extension workers who bridge the gap between agricultural institutions and farmers must possess sufficient and current information on agricultural practices. Local governments need to establish a policy environment and institutional framework that encourages and supports the transfer of agricultural technology to benefit rural farmers [4]. The success of an extension worker is determined by his competence, for that extension workers must have good communication skills, be knowledgeable, and be independent. In this case, extension workers must have the ability to develop learning plans that will be implemented through effective and efficient learning methods and media according to the needs of the community [5].

Agricultural extension officers are obligated to offer farmers advice in order to ensure the sustainability of agribusiness. This guidance is carried out with the aim of increasing the knowledge and skills and attitudes of farmers towards a better one [6]. Agricultural extension workers require urgent information innovation in their search for information, which should be followed by information on extension services and the role of extension workers [7], and also enhance local extension by fortifying the human and material resources of the national extension system [8]. In order to reflect the role of agricultural extension in agricultural development, extension necessitates the development of new capacities at the individual, organizational, and environmental levels of the enabling system [9].

Achieving food self-sufficiency at the household level is the most fundamental approach. The food poverty line is the minimum food expenditure that is equivalent to 2100 calories per capita per day. Mobility restrictions also cause unmet minimum food needs of the population below the poverty line [10]. Concretely, households need to plant consumption crops in their yards, in addition to chicken and catfish livestock included in the South Sumatra self-sufficient program. According to [11], one of the main characteristics of poor farmers is the narrow control of cultivated land and yard land, poor farmers are generally faced with the pressure of daily needs which include food and non-food needs, with these two conditions, efforts to empower poor farmers to develop agricultural businesses should be focused on agricultural businesses that do not require relatively large land, have high value and can generate income in a relatively short time. In this regard, developing chicken and vegetable farming can be said to be the right choice. The problem of poverty in Indonesia is not only in cities but also in villages, where most poverty occurs in rural areas. The factors described above are problems that will exacerbate the economic conditions that cause poverty. The degree of poverty is principally determined by three values: 1) the quality of life, presuming that the health status of over 30% of the population in underdeveloped countries is so low that it is unrealistic to expect them to live beyond the age of 40, 2) The level of basic education, which is determined by the percentage of the adult population that is illiterate, with specific emphasis on the loss of education rights for women, and 3) The level of economic capability, which is determined by the percentage of the population that lacks access to health facilities and clean water, as well as the percentage of children under the age of five who are malnourished [12].

Food security and self-sufficiency are closely related to the ability of farming households to fulfill their food needs. If the farmer household is able to meet its consumption needs from its own production, or from the income it earns to buy food, it is said that the household is included in food independence and vice versa if the results of its farming business are not able to fulfill it, it can be said to be not independent in terms of meeting its food needs [13]. Food security and independence of farming households are two different concepts. Food security is the fulfillment of household food for the purposes of a healthy and active life, while food independence is the fulfillment of food needs that come from the results of their own efforts. It can happen

that households are food secure, but not independent in meeting food needs, and or households are not food secure but independent in meeting their food needs [14]. Household income is a critical indicator of welfare. This is due to the fact that the level of income influences numerous aspects of welfare. The basic necessities that must be satisfied, including food, clothing, shelter, health, and employment, will be influenced by the income [15]. Food security is closely related to food self-sufficiency. Food self-sufficiency is the capacity of the state and nation to produce a variety of food from within the country that can satisfy the individual's food needs by leveraging the potential of natural, human, social, and economic resources, as well as local wisdom, with dignity. To realize national food security, South Sumatra takes a role. South Sumatra is targeted to be the national food barn. Even in its current condition, South Sumatra has a surplus of agricultural products [16].

Based on the description above, the author encouraged to conduct research with aimed to formulating the development model of self-sufficient food in South Sumatra, Indonesia.

2. Research method

A survey methodology was implemented in the investigation. The sampling method employed disproportionate stratified random sampling, which was conducted in three regencies/cities in South Sumatra. The selected locations are 3 regencies/cities in South Sumatra, including: East OKU Regency, Lahat Regency, and Palembang City which are the targets of the South Sumatra self-sufficient food program. The types of agriculture in South Sumatra are represented by these three locations: food crop and horticulture agriculture, plantation agriculture, and urban agriculture. The South Sumatra self-sufficient food program was implemented at four agricultural extension centers with each location being acquired. Furthermore, each agricultural extension center had 10 Poor Households, 4 agricultural extension workers, and 4 coordinators of the agricultural extension center, so total sample was 144 samples.

The data collection methods used interviews, questionnaires, and direct measurement. The data collected consist of characteristics of field agricultural extension workers (age, gender, education, employment status, number of family members, income), poor households characteristics (education, occupation, age, number of family members, income), characteristics of the types of aid provided (horticultural seeds, chicken, fish), and involvement of field agricultural extension workers, poor households and types of aid in the food self-sufficient program. All data were analyzed descriptively using the SWOT (Strength, Weakness, Opportunities, and Threats) analysis. SWOT analysis has proven to be a tool in formulating strategic development models for agriculture [17], [18].

3. Results and discussion

3.1 Characteristics of field agricultural extension workers

The characteristics of field agricultural extension workers who became respondents in this study were described in terms of age, gender, education, and employment status. Detailed information regarding the characteristics of field agricultural extension workers from the three research locations is provided in Table 1.

Table 1. Characteristics of field agricultural extension workers in selected locations.

Locations	Age (year) (%)				Gender (%)		Education (%)			Employment status (%)	
	20-30	31-40	41-50	51-60	Male	Female	Senior high school	Associate/ Bachelor	Master	Civil servant	Non-civil servant
East OKU	28,75	45,69	14,06	11,50	62,94	37,06	7,67	92,33	0,00	17,89	82,11
Lahat	23,74	20,22	29,60	26,71	66,28	33,20	42,96	56,60	0,44	25,99	74,01
Palembang	34,29	35,71	24,29	5,71	50,00	50,00	2,86	90,00	7,14	47,14	52,86

Table 1 explained that the majority of field agricultural extension workers assigned to the East OKU are in the 31–40-year-old, non-civil servant, male, and bachelor degree. In the Lahat, majority of agricultural extension workers are in the 41–50-year-old, non-civil servant, male, and bachelor degree. Meanwhile, in Palembang majority of agricultural extension workers are 31-40 years old, non-civil servant, same of men and women ratio, and bachelor degree. In general, the age of field agricultural extension workers is a productive age which is very capable of assisting and fostering poor households in agricultural cultivation.

The average sex ratio of 60%: 40% (male/female) will enable the extension workers to assist with the heavy work involved in agricultural cultivation of poor households. As in [19] reported that male-dominated participants increased the success of farmer assistance. Reference [20] stated that gender is a factor that needs to be considered in the success of agricultural extension programs. Furthermore, the results showed that the education level of field agricultural extension workers is bachelor's degree. The success of extension activities is significantly influenced by the competence or self-ability of extension workers, including their educational background [21]. This fact will greatly support the improvement of agricultural knowledge of poor households, especially in agricultural cultivation. However, the majority of employment status is non-civil servants at certain times slightly hampering the self-sufficient food South Sumatra program, especially when making decisions and at any time this status can be lost. Nonetheless, the addition of non-civil servant extension workers is urgently needed to accelerate food self-sufficiency [21].

3.2 Characteristics of poor households

The characteristics of poor households that served as the basis for this investigation were obtained from East OKU, Lahat, Palembang, presented in Table 2.

Table 2. Data Poor households, including education, occupation, age, the number of family members, and income.

Criteria	Amount	Percentage (%)
Education		
Not in school- elementary school graduate	65	54,2
Junior high school graduate	28	23,3
Senior high school graduate	26	21,7
Bachelor degree	1	0,8
Occupation		
Farmer	66	55
Trader	3	2,5
Laborer	31	25,8
Housewife	18	15
Self-employed	2	1,7
Age		
23-41	29	24,2
42-59	58	48,3
60-77	33	27,5
Number of Family Members		
1-3	36	30,0
4-6	73	60,8
7-8	11	9,2
Income		
500.000-2.330.000	99	82,5
2.340.000-4.170.000	20	16,7
4.180.000-6.000.000	1	0,8

The highest level of education is at the elementary school level, as evidenced by Table 2, which reports that 65 individuals (54.2%) of the total number of poor household samples are in this category. This shows that the level of education in East OKU, Lahat, and Palembang is not good enough, which means that the government must work hard to train poor households to become independent. Some of the roles of the government that can be carried out, for example, through the assistance and guidance of field agricultural extension officers starting from data collection, placement of assistance, cultivation to marketing of yields even until a sustainable cultivation cycle. On the other hand, poor households as respondents in this study in East OKU, Lahat, and Palembang are mostly farmers, namely 66 people (55%) of the total livelihoods, meaning that this will make it easier for poor households to cultivate because they are already familiar with agricultural activities. Thus, this reality needs to be optimized through regional agriculture programs to enable poor households to reach food independently [22].

Based on the results of field research, the majority of respondents in East OKU, Lahat, and Palembang are in the productive age category, so farming can be carried out optimally because it is done by productive workers. The number of family members of respondents in the three locations amounted to 4 to 6 people in one family with a total of 70 households (60.8%). This will facilitate farm work because they can take turns in maintaining and caring for the farm. The family income of poor households in East OKU, Lahat, and Palembang is 500.000 to 2.330.000, with 99 households (82.5%). The relatively low income encourages poor households to get additional income by utilizing the yard or vacant land. Reference [23] confirmed that optimizing yard land and vacant land will increase community food independence and resilience.

3.3 Characteristics of the types of aid provided

The primary objective of this initiative is to transform the consumptive mindset into a productive one that facilitates the production of agricultural products, thereby enabling individuals to independently satisfy their food requirements. The food self-sufficiency program assists poor households in achieving the goal of national food security by providing them with a variety of assistance, including horticultural seeds such as chili seeds, eggplants, tomatoes, shallots, beans, and other types of horticultural plants. Other types of aid are chicken and feed, and catfish seeds complete with feed and rearing tanks. The following is the realization until 2023, which received 3 types of aid (Table 3).

Table 3. Realization of the types of aid received by poor households in 2023.

Locations	Number of respondents	Type of aid		
		Horticulture	Chicken	Fish
East Oku	40	92,5%	25%	45%
Lahat	40	87,5%	20%	52,5%
Palembang	40	90%	27,5%	37,5%

The types of aid were horticultural seeds, chicken, feed and tubs. Aid in East OKU was 92.5% horticulture, 25% chicken and 45% fish. Meanwhile in Lahat 87.5% horticulture, 20% chicken, and 52.5% fish. In Palembang, 90% horticulture, 27.5% chicken, and 37.5% fish. Horticultural crops, poultry, and fish are important parts that need to be developed to maintain household food security [24], [25].

Many types of aid provided by the government sometimes did not necessarily make poor households prosperous. There are several factors that determine the success of the aid provided, namely the suitability of the type of aid with the living conditions of poor households, available land, available equipment, the type of aid provided, the time of aid provision and knowledge of the activity program. As in [26] stated that agricultural assistance implemented effectively will increase agricultural productivity.

3.4 Strategy model for development of South Sumatra food self-sufficiency program

The results indicated that the development model of the self-sufficient food South Sumatra program was influenced by a variety of factors, including internal and external factors. Internal factors of the food self-

sufficient South Sumatra program which are strengths include: 1) Available labor, 2) productive, and age 3) Farming experience. Meanwhile, internal factors that are weaknesses are 1) Low education level and 2) narrow and inadequate land and incomplete equipment. The calculation of IFAS weights for strength and weakness variables is illustrated in Table 4.

Table 4. Internal Factor Analysis Summary (IFAS) matrix.

Strategic factors	Rating (R)	Score (B)	Total score (R x B)
Strength			
Available labor	2,48	0,19	0,47
Productive age	1,98	0,15	0,30
Farming experience	2,28	0,17	0,39
Total	6,73	0,51	1,15
Weakness			
Low education level	2,33	0,17	0,40
Narrow and inadequate land	2,06	0,15	0,31
Incomplete equipment	2,26	0,17	0,38
Total	6,64	0,49	1,09
Total A-B			**0,06**

Furthermore, external factors are opportunities and threats, external factors that are opportunities, namely 1) assistance from agricultural extension workers, 2) complete types of aid, 3) fulfillment of their own needs. While those included in the threats include 1) not supported by the village government and the private sector, 2) not on target, 3) aid does not develop. The EFAS weights for opportunity and threat variables are calculated in Table 5.

Table 5. External Factor Analysis Summary (EFAS) matrix.

Strategic factors	Rating (R)	Score (B)	Total score (R x B)
Opportunity			
Agricultural extension assistance	2,39	0,18	0,43
Type of aid complete	2,31	0,17	0,39
Daily needs fulfilled	2,57	0,20	0,51
Total	7,27	0,55	1,33
Threat			
No support from village government and private sector	1,98	0,15	0,30
Not on target	2,31	0,18	0,42
Aid does not develop	1,58	0,12	0,19
Total	5,87	0,45	0,90
Total A-B			**0,43**

After conducting a SWOT analysis, the score values of internal and external factors are matched. The purpose is to ascertain the model's location in the quadrant and to ascertain the focus of the strategy that should be implemented in the future. The cumulative score will indicate the extent to which internal and external environmental factors influence the development of policies that promote food self-sufficiency.

Internal factors are depicted on the X axis, while external factors are utilized on the Y axis. The X value is the difference between the total strengths and the total weaknesses, as determined by the matrix values in Tables 4 and 5. The Y value is the difference between the total opportunities and the total threats. The results of the x-value and y-value matrices are as follows in detail:

$$X = \sum S - \sum W$$

$$X = 1{,}15 - 1{,}09$$

$$X = 0{,}06$$

$$Y = \sum O - \sum T$$

$$Y = 1{,}33 - 0{,}90$$

$$Y = 0{,}43$$

Based on the scores obtained through the IFAS and EFAS matrix analysis, whether opportunities (+) or threats (-), and whether strengths (+) outweigh weaknesses (-), it can be seen in the SWOT analysis quadrant in Figure 1.

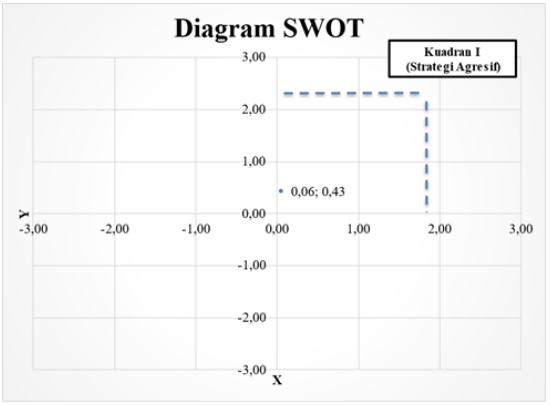

Figure 1. The results of quadrant analysis represented by SWOT diagram.

Based on Figure 1 showed that the strategy is in quadrant I (positive, positive). This position suggests that the strength and opportunity factors outweigh the weakness and threat factors, allowing them to leverage existing strengths and opportunities to overcome weaknesses and threats. The strategy that must be implemented in this quadrant is to advocate for policies that promote rapid growth. This is due to the fact that the position in quadrant I suggests that the conditions are highly favourable, as the strengths and opportunities in possession are capable of surpassing existing weaknesses and threats.

The SWOT matrix is employed to identify alternative strategies during the final stage. In Table 6, the SWOT matrix is employed to identify strategies that are categorized into four categories: SO, WO, ST, and WT.

Table 6. SWOT matrix analysis.

IFE / **EFE**	**Strength (S)** 1. Available labor 2. Productive age 3. Farming experience	**Weakness (W)** 1. Low education level 2. Narrow and inadequate land 3. Incomplete equipment
Opportunities (O) 1. Agricultural extension assistance 2. Type of aid complete 3. Daily needs fulfilled	**Strategies (SO)** 1. Improve the quality and quantity of agricultural extension assistance to poor households 2. Complete the types of aid 3. Empower poor households who are in the productive to support the success of the food self-sufficient South Sumatra program	**Strategies (WO)** 1. Assistance by extension workers must start from planning to marketing results (onfram-offarm) 2. Implement urban farming according to the type of aid provided 3. Strengthen local government commitment to the allocation of

	4. Making high farming experience a guarantee that the assistance will be maintained until it produces, so that daily needs, especially vegetables, chicken and or fish, will be fulfilled.	types of aid in the form of adequate equipment.
Threats (T) 1. No support from village government and private sector 2. Not on target 3. Aid does not develop	**Strategies (ST)** 1. Intensive socialization of the South Sumatra food self-sufficiency program 2. Determination of potential beneficiaries by verified in the field 3. Coaching and mentoring of poor households that have farming experience and the number of available personnel so that the development of assistance can be sustainable.	**Strategies (WT)** 1. Training with village governments and poor households in support of South Sumatra food self-sufficiency program 2. Procurement of facilities and infrastructure by the village and regency 3. Utilization of land/yard of village hall for plant/fish nursery 4. Regular socialization of the importance of utilizing agricultural land to fulfill their own needs and types of aid adjusted to the conditions of poor households.

The results of the data accumulation showed that we assessed the strengths of the development of food self-sufficiency program in South Sumatra are the available workforce, productive age, and farming experience. Kliuchnyk et al. [27] reported that human resource development through improving worker abilities and skills is an important strategies to achieve food self-sufficiency. Meanwhile, the weaknesses that will be faced in this program are low education level, narrow and inadequate land, and incomplete equipment. Hii and Lau [28] confirmed that there was a positive effect of high levels of worker education on economic development of agriculture sector in Malaysia. Furthermore, opportunities that can be optimized for this program are agricultural extension assistance, complementary types of aid, and daily needs being met.

The strategy of the strengths and opportunities (SO) is to improve the quality and quantity of agricultural extension assistance to poor households, complete the types of aid, empower poor households who are at a productive age to support the success of the South Sumatra food self-sufficiency program, and make high farming experience a guarantee that the assistance will be maintained until it produces, so that daily needs, especially vegetables, chicken, and or fish, are still fulfilled. Agricultural programs need to be improved as an effort to encourage sustainable food independence without relying on financial assistance [29]. Meanwhile, strategies from the weaknesses of opportunities (WO), namely through counseling assistance must start from planning to marketing results (both on-farm and off-farm), implementing urban farming in accordance with the type of assistance provided, and strengthening local government commitment to the allocation of types of aid in the form of adequate equipment. Government regulations need to be more effective to realize agricultural productivity and sustainable food security [30]. On the other hand, the community needs to get information related to market dynamics in addition to cultivation methods [31].

In terms of threats, several things need to be considered for the success of this program, namely no support from the private sector village government, not on target, and assistance is not developed. Strategic results

from strengths and threats (ST) are intensive socialization of the South Sumatra food self-sufficiency program, determination of prospective beneficiaries by field verification, and coaching and mentoring of poor households who have farming experience and the number of available personnel so that the development of assistance can be sustainable. In the mentoring process, farmers must be motivated so that the program offered will be sustainable [32]. In the interim, the strategy of weaknesses and threats (WT) generates numerous solutions, including the collaborative training of village governments and impoverished households to assist the South Sumatra food self-sufficiency program, procurement of facilities and infrastructure by villages and districts, and Utilization of land / village halls for plant / fish nurseries, periodic socialization of the importance of utilizing agricultural land to meet their own needs and the type of assistance tailored to the conditions of poor households. Available facilities and infrastructure are an important part of extension to increase sustainable productivity [33].

4. Conclusions

The study revealed that SWOT analysis is in quadrant I (X = 0.06, Y = 0.43), thus the strategies that have been formulated have the potential to be implemented in realizing food self-sufficient program in South Sumatra. The development model of the South Sumatra self-sufficient food program is based on agricultural extension workers, poor households and types of aid can be represented through an aggressive development strategy by: 1) Improving the quality and quantity of agricultural extension assistance to poor households, 2) Equipping the types of aid needed, 3) Empowering poor households who are in productive age groups to support the success of the South Sumatra food self-sufficient program, 4) Making high farming experience a guarantee that the aid will be maintained until it produces, so that their daily needs, especially vegetables, chicken and or fish, will be met.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

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Author contribution

The contribution to the paper is as follows: DA: writing original manuscript and draft preparation; DA: data collection; DA, SS, RR, DB: data analysis and data interpretation; SS, RR, DB: refining the manuscript. All authors approved the final version of the manuscript.

Ethical approval statement

Ethical approval is not applicable for this research.

Informed consent

Informed consent for the publication of personal data in this article was obtained from the participant(s).

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