Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 8, Issue, 10, pp. 21029-21035, October, 2017

ISSN: 0976-3031

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

SUSTAINABLE AGRICULTURE DEVELOPMENT USING STRUCTURAL EQUATION MODEL APPROACH (CASE STUDY OF SIMALUNGUN REGENCY - INDONESIA)

Sri Rosliana Lubis*

Lecture, Akademi Pariwisata Medan, North Sumatera, Indonesia

DOI: http://dx.doi.org/10.24327/ijrsr.2017.0810.1002

ARTICLE INFO

Article History:

Received 15th July, 2017
Received in revised form 25th August, 2017
Accepted 23rd September, 2017
Published online 28th October, 2017

Key Words:

Sustainable Development, Farmers Welfare.

ABSTRACT

This research was conducted in Simalungun District. Instruments are tools used to collect data to be efficient and systematic. The research instrument used is questionnaire. The data collected were tested using path analysis. The path coefficient of sustainability influence to red chili farmers is 0.860, where the structural equation can be written as follows: $\hat{Y}$ = 0,860 X, R-square = 0,739 and $\hat{Y}$ = 0,430 X, R-square = 0,169. Direct effect of sustainable agriculture (X) on the welfare of farmers (Y) by 0.860. Development of sustainable agriculture to increase the highland vegetable farming income in the agropolitan area in Simalungun Regency will be possible to be realized by improving the quality of human resources (community), and empowering the community through various counseling, training and coaching programs conducted in an integrated manner, improve the quality and skills of farmers. Establish cooperative relationships and develop business partnership patterns to distribute agricultural products, in order to achieve maximum productivity and income.

INTRODUCTION

Since 2002, the Indonesian Department of Agriculture has reintroduced the concept of agropolitan as a form of implementation of the development of an agribusiness system linked to the implementation of regional autonomy. Initially the Department of Agriculture together with the Local Government developed 8 locations (districts) as pilot projects, then developed into 24 districts. In North Sumatra, the first pilot project was conducted in 2003, namely the Agropolitan Area of Bukit Barisan Plateau of North Sumatra covering 5 districts (now 8 districts due to pemekaran). The districts in question are Karo, Dairi, Pakpak Bharat, North Tapanuli, Humbang Hasundutan, Toba Samosir, Samosir and Simalungun.

Agropolitan area development as spatial implementation and agribusiness system, based on economic theory that is economic of location and economics of scale. Local economic theory guides where up-stream and down-stream agribusiness industries must be developed so that the movement of goods and services in space is efficient. While the theory of economies of scale will guide how large the scale of down-stream and up-stream business should be developed. Subsystem support services will follow where on-farm, up-stream, and down-stream locations are developed.

Based on local economic theory, economic activity which has material index (physical ratio between raw material and final product) is bigger than one, economic activity must be close to its raw material. Therefore, the agricultural processing industry (down-stream) should be developed in agricultural production centers. Whereas less than one material index (such as up-stream agribusiness) should be developed close to the center of consumption i.e. farmers in rural areas.

Based on these economic principles, in an area will be developed agribusiness activities from up-stream agribusiness, on-farm agribusiness, down-stream agribusiness and service for agribusiness. This is the so-called "agricultural city" (agropolitan).

Thus, the development of agropolitan is not to build / establish new cities or industrial areas in agricultural / rural areas. Agropolitan development is the development of all agri-business / business activities involving all rural farming areas, which as a whole serves as an agricultural city.

There are three main things that are the targets of agropolitan development. First, produce competitively agribusiness products (world quality and competitive price). Secondly, increasing regional economic capacity in providing job opportunities and endeavors and increasing people's income sustainably. Third, prevent and slow the flow of urbanization.

During this time, the result of more urban-based development (urban bias) has led to urbanization of resources from rural to urban areas. The most adverse urbanization of rural areas is

Corresponding author:* **Sri Rosliana Lubis
Lecture, Akademi Pariwisata Medan, North Sumatera, Indonesia

capital-drainage and urban-based rural-urban consumption of brain drain. As a result rural areas suffer from lack of capital and quality human resources, while urban areas are over-investment and overpopulation.

By developing the agropolitan area, it is expected to slow or prevent such urbanization. It is even expected to reverse urbanization, namely to recall capital and quality human resources from urban to rural agropolitan areas. This long-term reversal process is expected to lead to a balance of regional development.

Simalungun Regency has superior vegetable commodities with very large crop productivity based on production and land area. But in the implementation in the field of agropolitan development concept there are still many weaknesses obtained both social, economic, environmental, institutional and technological and information aspects. Thus, it is still necessary to increase the productivity of human resources, especially the farmers who manage the vegetables in the highlands.

Therefore, it is necessary to support the related sub sectors in an integrated and sustainable manner. Given the importance of highland vegetable areas in supporting agricultural development, especially for stakeholders. Therefore, it is necessary to develop sustainable agropolitan for the development of highland vegetable farming in Simalungun Regency.

Theoretical Framework

The concept of sustainable development began to be formulated in the late 1980s as a response to previous development strategies that focused more on the main objectives of high economic growth, and which proved to have degraded the production capacity as well as the environmental quality resulting from excessive resource exploitation. Initially this concept was formulated in the Bruntland Report as a result of the congress of the World Commission on Environment and Development of the United Nations in 1987. Simply stated that sustainable development is the development that realizes (fulfilling) the needs of life today without reducing the ability of future generations to realize the needs of his life.

Implementation of economic development with social justice done without sacrificing the environment, so that the current development should have been thinking about the next generation of life needs.

Given the importance of sustainable development in all aspects of human life, in 1992, all world leaders met at a world conference in Rio de Janeiro, Brazil, which discussed the concept of sustainable development for all aspects of social, economic, cultural and environmental life known as Agenda 21. One of the 21 agendas directly related to the agricultural sector is the Sustainable Agriculture and Rural Development (SARD) program. The moral message to create a better environment for all generations is universally accepted by world leaders, so sustainable agriculture is a basic principle of agricultural development throughout the world, including Indonesia.

The international community's efforts to tackle the decline of environmental conditions in the context of economic development and social development have begun in Stockholm, Sweden in 1972. Then the United Nations Environment Program (1982) held a special session commemorating the 10th anniversary of the world environmental movement (1972-1982) in Nairobi, Kenya, as a reaction to dissatisfaction over the handling of the environment so far that tends to no longer or neglect the sustainability of nature. At the hearing it was agreed that the establishment of the World Commission on Environment and Development (WCED). In 1992 a continuing session of sustainable development in Rio de Janeiro, Brazil and the last in 2002 took place in Johannesburg, South Africa.

The term "sustainable development" was introduced in the World Conservation Strategy published by the United Nations Environment Program (UNEP) in 1980. The United Nations Conference on Environment and Development (UNCED), held in Rio de Libya in 1992 has established basic principles and action programs to achieve sustainable development. Then the Johannesburg Summit, in addition to redefining the political commitment of all levels of the international community, has also laid the groundwork that should be used as a reference in implementing sustainable development at all levels and sectors or aspects of development.

Since the early 1980s coinciding with the issuance of the World Conseravtion Strategy Document by the IUCN (International Union for the Conservation of Nature), many definitions of sustainable development by experts and scientific organizations have been raised. The generally accepted definition of the international community, however, is the definition set forth by the Bruntland Commission, that sustainable development is development to meet current needs, without degrading or impairing the ability of future generations to meet their living needs (WCED 1987, Dahuri, 1998).

As with most sustainable development definitions composed by most of the deep ecologists, the above definition does not prohibit economic development activity, but recommends it with the requirement that the rate of development activity does not exceed the caryying capacity of the natural environment. Thus, future generations may have the same natural resource assets and environmental services (enviromental services), or if they are better than the present generation.

According to the Triangle Conceptual Development Framework, a development activity (including agriculture and agribusiness) is declared sustainable, if the activity is economically, ecologically and socially sustainable (Srageldin 1996 in Dahuri 1998). Economically sustainable means a development activity should be able to produce economic growth, capital maintenance and efficient use of resources and investment. Ecologically sustainable means that these activities must be able to maintain the integrity of the ecosystem, maintain the carrying capacity of the environment and the conservation of natural resources including biodiversity biodiversity. While socially sustainable, it requires that a development activity should be able to create equitable development outcomes, social mobility, social cohesion and institutional development. While many variations of the definition of sustainable development, including sustainable agriculture, are widely accepted are based on three pillars: economic, social, and ecological (Munasinghe, 1993). In other words, the concept of sustainable agriculture is oriented towards three dimensions of sustainability, namely: the sustainability of economic enterprises (profit), the sustainability of human social life (people), and the sustainability of the natural ecology (planet).

Hall (2004) states that the assumption of sustainability at least lies in the three basic axioms; (1) present and future treatments that place a positive value over the long term; (2) recognizing that environmental assets contribute to economic wellbeing; (3) to know the constraints due to the implications that arise in the environmental assets.

The sustainability of development is a continuous improvement of the quality and welfare of the people / residents in which they live and live, including the availability of various types of adequate and adequate food. Food security must be seen from the context of improving the quality of life of the population and the environment in rural areas. Pearce et al. (1994) stated that Sustainable Development has broader meaning and purpose than sustainable economic growth. Economic, social and economic goals at a certain level can work together. However, in certain conditions in the field, all three can compete with each other and are less supportive. When this happens, the concept of sustainability leads to the need for a right balance between the three dimensions. Policy options need to be carefully defined taking into account the interrelated dimensions.

Sustainable agriculture prioritizes the management of agricultural ecosystems that have diversity or high biodiversity. According to FAO Agricultural Biodiversity includes the variations and variability of plants, animals and micro-organisms needed to support key functions of agricultural ecosystems, structures and processes to strengthen and contribute to food production and food security (Ukabe, 2007). High-diversity, more stable and shock-resistant ecosystems, less risk of financial loss, can reduce the impact of drought and floods, protect crops from pests and diseases and other natural constraints. Diversification can also reduce economic stress due to increased prices of fertilizers, pesticides and other inputs. Therefore Food Security is one of the main objectives of Sustainable Agriculture.

The use of these various sources of financing supports Conyers' (1990) opinion that planning allows for the maximum use of available resources to achieve certain objectives. The resources in question include anything deemed by the decision maker as potential to be used to achieve the objectives, in this case including the source of development funds.Thus this is consistent with the opinion of Faludi (1992), that the substance of policy formulation or development program becomes the discipline area another science to cultivate and analyze it, in this case the science of agriculture.

Participatory approaches play a role in capturing the aspirations of stakeholders as the basis of technocratic planning, as well as to foster a sense of community responsibility for the implementation of the plan prepared. This is consistent with Conyers' (1992) opinion that the importance of involving the community in the planning process is: 1) to obtain information about the conditions, needs, attitudes of the local community, without which the development program and projects will fail; 2) increase public trust in development programs or projects that will be implemented because they know the ins and outs of the project and have a sense of ownership of the project; 3) that participation is a democratic right of society. Community aspirations are obtained directly in the socialization of organic agricultural development activities, as well as indirectly through the results of deliberations and suggestions. This is in accordance with the statement submitted by Abe (2005) that participation can be done directly or indirectly.

The selection of high economic value commodities for the development of organic agriculture is in accordance with the research results Naik and Nagadevara (2010), that the development of organic agriculture is prioritized on commodities that are cultivated by many local people and have high economic value. In addition, through the selection of superior commodities, it is expected that development efforts can be appropriately targeted and the allocation of funds that have been issued gives real development results in the form of increased production both in terms of quality and quantity of superior products.

Selection of area concept for the development of organic agriculture in accordance with the results of research that indicates the need for an organic farming pilot in each region. This pilot can be an example for the surrounding area to change, because the characteristics of the farming community are in need of an example figure. The approach of the area is also appropriate for the condition of farmers' communities whose land ownership is small on average. This is in line with the results of the Naik and Nagadevara (2010) research that the application of cluster / area patterns for the development of organic farming in India has proved to be helpful in small areas to participate in applying organic farming patterns. better quality control of outputs, reduced certification costs and enabling extensive farmers.

In essence, the implementation of sustainable development requires integration in three ways, namely: 1) inter-sector development; 2) actors / executors; 3) policy, commitment and oversight by various levels of government both from central to regional level (Breton, 2007).

Thus top managers are still not optimal handling important responsibilities for effective strategic management in the opinion of Hunger and Wheelen (2003), including: 1) fulfilling the main role; 2) provide executive leadership, 3) manage the strategic planning process. This is also related to the position of the top manager held by the Head of Service has not had a strong legitimacy in shaping the team's commitment. In the end the implementation of less than the maximum activity, one of which is shown by only a few parties who actively carry out their role, namely PPL in the guided village area.

RESEARCH METHODOLOGHY

The location of the research is on Agropolitan Area of Highland Vegetable Farming in Simalungun Regency. This area is selected by "purposive sampling". The population for this research is the people who are in highland vegetable farming area of Simalungun Regency spread in 4 subdistricts, namely: Silimakuta Sub district, Purba Sub district, Pematang Silimahuta Sub district, and Dolok Silou Sub district. To determine the sample size is to use the Cochran formula, ie the determination of the sample size should be based on the measurement scale. The sample distribution can be seen in Table 1 below:

Table 1 Samples of Red Chili Farmers from each Sub-district

No	Sub-district	Alocation of Proporsional Sampel	n_{ps}
1	Silimakuta	(164/800) x 200	41
2	Pematang Silihmahuta	(250/800) x 200	62
3	Purba	(238/800) x 200	60
4	Dolok Silou	(148/800) x 200	37
	Total		200

Primary data retrieval requires an instrument. Instruments are tools used to collect data to be efficient and systematic. The research instrument used is questionnaire. The questionnaire is a list of questions given to other people (respondents) who are willing to provide a response or assessment in accordance with the request of the researcher. Questionnaires to be disseminated on the respondents first tested the validity and reliability, then prepared variables and indicators that can be measured by using instruments that have measurement scale.

Table 2 Variable and Research Indicators

Variable		Indicators	Scale
Social Aspect (X_1)	$X_{1.1}$	Level of education	Ratio
	$X_{1.2}$	Farmer's Experience	Ratio
	$X_{1.3}$	Farmers' Participation	Rasio
Economic Aspect (X_2)	$X_{2.1}$	Productivity Level	Ratio
	$X_{2.2}$	Land lease	Ratio
	$X_{2.3}$	Labor	Ratio
	$X_{2.4}$	Acceptance of Agricultural Products	Ratio
Environment Aspect (X_3)	$X_{3.1}$	Intensification	Ratio
	$X_{3.2}$	Extensification	Ratio
	$X_{3.3}$	Diversification	Ratio
Sustainable Farming (X)	X	Sustainability	Ratio
Farmer Welfare (Y)	$Y_{1.1}$	Farmers Exchange Rate	Ratio
	$Y_{1.2}$	Farmer's Income	Ratio
	$Y_{1.3}$	Agricultural Production	Ratio
	$Y_{1.4}$	Development of Prime Commodity	Ratio

In a business phenomenon, a dependent variable can be affected by several independent variables at once. Some free variable are also able to affect several variables depending on the same way that resulted in the research model becomes very complicated. This complex model can be basically analyzed using regression analysis and path analysis, but in practice it will become inefficient each sub-structure should be analyzed and then merged into a whole model. The complicated problems can be analyzed using Structural Equation Modeling (SEM) analysis, using AMOS program, LISREL, PLS. SEM technique to test multiple dependent variables at once, with some independent variables. SEM technique allows a researcher to test several dependent variables at once, with some independent variables.

FINDINGS AND DISCUSSION

General Condition of Research Areas

Simalungun Regency Area 4.372.50 Km2 is the 3rd largest regency in North Sumatera Province after Deli Serdang and Langkat regency. Simalungun Regency has a strategic location and is located in the tourist area of Lake Toba-Parapat. Total population of Simalungun in 2013 as many as 833,251 people is the fourth largest contribution (6.25%) to the population of North Sumatra after Medan City.

Simalungun regency consists of 31 districts with the widest sub district is District Raya whereas the smallest is Haranggaol Horison sub district with average distance to the capital District 51.42 km where the farthest distance is Silhou Kahean District 127 km and Ujung Padang 113 km.

Simalungun is flanked by 8 districts of Serdang Bedagai, Deli Serdang, Karo, Tobasa, Samosir, Asahan, Batu Bara, and Pematang siantar City. Its astronomical location between 02 ° 36'- 03 ° 18 'North Latitude and 98 ° 32'- 99 ° 35' East Longitude with an area of 4,372.50 km2 is at an altitude of 0-1.400 meters above sea level where 75 percent of its land is on a slope 0-15%.

Table 3 Area of Simalungun Regency According to Four Subdistricts in Simalungun Regency

No	Sub-district	Area (Km^2)	Persentage
1	Silimakuta	74,16	1,70
2	Pematang Silimahuta	79,68	1,82
3	Purba	172,71	3,95
4	Dolok Silou	302,66	6,92
	Jumlah	629,21	14,39

Silimakuta sub-district is 74.16 Km2 or 1.70%, Pematang Silimakuta sub-district is 79.68 Km2 or 1.82%, Purba is 172.71 Km2 or 3.95%, and Dolok Silou sub-district by 302.66 km2 or equal (6.92%). Of the total area of the Four Sub-districts totaled 629.21 Km2 or 14.39%.

Climate

The average air temperature in 2013 is 25.2 ° C, with the lowest temperature of 21.1 ° C. and the highest temperature is 30.4 ° C. Sun radiation averaged 5.2 hours per day with an average wind speed of 0.21 m per second and 3.08 millimeters of evaporation per day and 85% air humidity. The average air temperature is the same as in 2012.

Topography

According to table 4. Based on altitude above sea level in Silimakuta sub district with 501-1000 total area of 351 ha, and altitude of 1.001-1.500 area of 13,842. Pematang silimakuta sub-district with altitude of place based on unknown area. District Purba with an altitude of 501-1000 total area of 1.778 ha, and an altitude of 1.001-1.500 area of 15,422. and Dolok Silou Sub district with an altitude of 101-500 area of 4,428 ha, 501-1.000 total area of 11,001 ha, and a height of 1,001-1,500 land area of 13,300.

Table 4 Elevation from above Sea Surface by Four Sub-districts in Simalungun Regency

No	Sub-district	Height		
		101-500	501-1.000	1001-1500
1	Silimakuta	-	351	13.842
2	Pematang Silimahuta	-	-	-
3	Purba	-	1,778	15.422
4	Dolok Silou	4.428	11.001	13.300
	Jumlah	4.428	13.130	42.564

Land Use

Land use in Silimakuta sub district of 173 ha of red chili, 747 ha of potato, 1,112 ha cabbage, 22 ha of carrot, eggplant 30 ha, 80 ha tomato, 125 ha petai, 28 ha beans, with total area 2,318 ha. Land use in Sub District Pemantang Silimakuta shallot plant 31 ha, red chili 56 ha, potatoes 171 ha, cabbage 135 ha, carrots 14 ha, tomatoes 60 ha, petsai 15 ha, 110-hectare, with the total area of 592 ha. Land use in Purba Sub district of pepper plant 428 ha, potatoes 1,224 ha, cabbage 1,215 ha, eggplant 21 ha, 368 ha tomato, 732 ha puree, 195 ha beans, with total area 4,383 ha. Land use in Dolok Silou Sub district onion plant 21 ha, red chili 237 ha, potato 37 ha, cabbage 80 ha, carrot 3 ha, eggplant 35 ha, tomatoes 34 ha, beans 5 ha, with total area of 452 ha.

Table 5 Area of Land Usage in Four Sub-districts in Simalungun Regency

No	Land Use	Sub-district							
		Silimakuta		Pematang Silimakuta		Purba		Dolok Silou	
		Ha	%	Ha	%	Ha	%	Ha	%
1	Red onion	-	-	31	5.24	-	-	21	4.65
2	Red chili pepper	173	7.46	56	9.46	428	9.77	237	52.43
3	Potato	747	32.23	171	28.89	1,224	27.93	37	8.19
4	Cabbage	1,112	47.97	135	22.8	1,415	32.28	80	17.7
5	Carrot	22	0.95	14	2.36	-	-	3	0.66
6	Eggplant	30	1.29	-	-	21	0.48	35	7.74
7	Tomato	80	3.45	60	10.14	368	8.4	34	7.52
8	Petai	126	5.44	15	2.53	732	16.7	-	-
9	Bean	28	1.21	110	18.58	195	4.45	5	1.11
	Area	2,318	100	592	100	4,383	100	452	100

Economic Overview of Simalungun Regency

The biggest contribution of Simalungun's GDP is derived from agriculture sector 53.66 percent, mining and quarrying sector 0.45 percent, manufacturing sector 16.63 percent, construction sector 2.01 percent, Trade and Hotel sector 8.93 percent, Transportation and communications sector 3.33%, financial sector of rents and services 2.45% and services sector 11.70%. This shows the structure of the economy in Simalungun Regency has not changed significantly is still dominated by the agricultural sector and the manufacturing sector.

Table 6 Gross Regional Domestic Product (PDRB) Distribution by Industrial Original at Current Prices

No	Business field	2009	2010	2011	2012	2013
1	Agriculture	54,62	54,56	54,43	54,08	53,66
2	Mining & Quarrying	0,45	0,44	0,43	0,44	0,45
3	Processing industry	17,17	17,03	16,76	16,63	16,63
4	Construction	1,81	1,82	1,87	1,93	2,01
5	Trade, Hotel & Restaurant	8,24	8,42	8,61	8,76	8,93
6	Transportation & Communication	3,4	3,31	3,29	3,30	3,33
7	Finance, Rental & Services	1,92	1,99	2,24	2,40	2,45
8	Sector Services	11,62	11,63	11,61	11,62	11,70

Complete Procedural Model Analysis

Analysis of farmer exchange rate factors, farmer's income, agricultural production and red chili commodity development on farmer's welfare in agropolitan area in Simalungun Regency.

Table 7 Measurements of Y Variables (Red Chili Farmers)

No	Variable	Interaction Quality		
		Load.	Load. 2	Error
1	Y1. 1	0,72	0,52	0,52
2	Y1.2	0,64	0,41	0,41
3	Y1.3	0,79	0,62	0,63
4	Y1.4	0,81	0,65	0,65
	Total	2,96	2,2	2,21

Test results loading factor values for each indicator of variable Y (red chili farmers) showed that the value of loading on the four indicators above 0.5. In this research, in calculating reliability using composite (construct) reliability with cut of value is minimum 0,7. The calculation of the reliability of the construct is as follows:

$$Construct\ Reliability = \frac{(\sum Std.Loading)^2}{(\sum Std.Loading)^2 + \sum \varepsilon j}$$

$$Construct\ Reliability = \frac{(2{,}96)^2}{(2{,}96)^2 + 2{,}21} = 0{,}7985$$

Based on the calculation result obtained the value of construct reliability around 0.7985. The indicator that contributes to the variables (Y) the farmer's welfare is (Y1.1) the farmer exchange rate contributes 0.72, (Y1.2) the income of the farmer contributes 0.64, (Y1.3) agricultural production contributes of 0.79, and (Y1.4) the development of the leading commodities contributed 0.81. The biggest contribution to the variables (Y) of farmers' welfare is the development of superior commodities and agricultural production.

Table 8 Social Aspect of Red Chili Commodity

No	Variabel	Interaction Quality		
		Load.	Load. 2	Error
1	X 1.1	0,44	0,19	0,20
2	X 1.2	0,80	0,64	0,63
3	X 1.3	0,46	0,21	0,21
	Total	1,7	1,04	1,04

Test results loading factor values for each indicator of the variable X1 (social aspect of red chili commodity) showed that the value of loading on the indicator above 0.5, the variable X1.2 of 0.80. In this research, in calculating reliability using composite (construct) reliability with cut of value is minimum 0,7. The calculation of the reliability of the construct is as follows:

$$Construct\ Reliability = \frac{(\sum Std.Loading)^2}{(\sum Std.Loading)^2 + \sum \varepsilon j}$$

$$Construct\ Reliability = \frac{(1{,}7)^2}{(1{,}7)^2 + 1{,}04} = 0{,}7353$$

Based on the calculation result obtained the value of construct reliability around 0.7353. Indicators contributing to social (X1) variables (X1.1) education and training levels contributed 0.44, (X1.2) farmers' experience contributed 0.80, and (X1.3) farmer participation contributed 0.46. The greatest contribution to the social (X1) variables is the farmers' experience and the participation of farmers.

Table 9 Economic Aspects of Red Chili Commodity

No	Variable	Interaction Quality		
		Load.	Load. 2	Error
1	Y 2.1	0,28	0,08	0,08
2	Y 2.2	0,56	0,31	0,31
3	Y 2.3	0,84	0,70	0,71
4	Y 2.4	0,80	0,64	0,63
	Total	2,48	1,73	1,73

Test results loading factor values for each indicator of variable X2 (economic aspect of red pepper crops) showed that the value of loading on the indicator above 0.5, the variable X2.2 of 0.56, variable X2.3 of 0.84 , and the X2.4 variable is 0.80. In this research, in calculating reliability using composite (construct) reliability with cut of value is minimum 0,7. The calculation of the reliability of the construct is as follows:

$$Construct\ Reliability = \frac{(\sum Std.Loading)^2}{(\sum Std.Loading)^2 + \sum \varepsilon\, j}$$

$$Construct\ Reliability = \frac{(2{,}48)^2}{(2{,}48)^2 + 1{,}73} = 0{,}7804$$

Based on the calculation results obtained by construct reliability value ranges from 0.7804. The indicator that contributes to the variable (X2) economic aspect is (X2.1) the productivity level contributes 0.28, (X2.2) agricultural land rent contributes 0.56, (X2.3) labor contributes of 0.84, and (X2.4) of agricultural income contributed 0.80. The biggest contribution to the variable (X2) economic aspect is labor and receipt of agricultural products.

Table 10 Environmental Aspects of Red Chili Commodity

No	Variable	Interaction Quality		
		Load.	Load. 2	Error
1	X 3.1	0,67	0,45	0,45
2	X 3.2	0,67	0,45	0,44
3	X 3.3	0,51	0,26	0,51
	Total	1,85	1,16	1,4

The result of loading factor loading test for each indicator of X3 variable (environmental aspect of red pepper plant commodity) shows that the value of loading on the three indicators above 0.5. In this research, in calculating reliability using composite (construct) reliability with cut of value is minimum 0,7. The calculation of the reliability of the construct is as follows:

$$Construct\ Reliability = \frac{(\sum Std.Loading)^2}{(\sum Std.Loading)^2 + \sum \varepsilon\, j}$$

$$Construct\ Reliability = \frac{(1{,}85)^2}{(1{,}85)^2 + 1{,}4} = 0{,}7096$$

Based on the calculation results obtained the value of construct reliability ranges from 0.7096. Indicators contributing to the (X3) environmental aspect variables (X3.1) intensification contributed 0.67, (X3.2) extensification contributed 0.67, and (X3.3) diversified contributed by 0, 51. The largest contribution to the environmental aspects (X3) variable is intensification and extensification.

Structural Equation Model Analysis

Measurement of farmer welfare variables (Y), Sustainable Agriculture (X), Social Aspect Variables (X1), Economic Aspects (X2), Environmental Aspects (X3), using structural equation modeling model. The test results with structural equation modeling model with the complete AMOS 21 program can be seen in Appendix 1. The model is said to be good when it meets the requirements of the goodness of a model as measured by some theoretical statistics.

Furthermore, some goodness of fit test results from the default model can be seen in Table 11 where the results show that the model is not feasible to be used for hypothesis proof. Thus, it is necessary to modify the model.

Table 11 SEM Conformity Index Initial Phase of Red Chili Farmers

Criteria	***Cut-off* Value n = 200 ; df = 61; alpha = 0,05**	AMOS Output	Result
Degree of Freedom (df)	>0	61	Qualify
Chi – Square	<72.153	57,922	Qualify
P-value	P value ≥ 0.05	0,1039	Qualify
CMIN/DF	≤ 2,00	1,233	Qualify
Root Mean Square Error of Approximation (RMSEA)	< 0.08	0,024	Qualify
Goodness of Fit Index (GFI)	≥ 0.90	0,975	Qualify
Adjusted Goodness of Fit Index (AGFI)	≥ 0.90	0,957	Qualify
Tucker Lewis Index (TLI)	≥ 0.95	0,991	Qualify
Comparative Fit Index (CFI)	≥ 0.95	0,994	Qualify

Table 11 shows that all criteria used to assess a model have qualified values. Compared to the early-stage model, more criteria can be met by the modified model than the original model. Because of the improved modification model, this model will be interpreted in this research. Furthermore, it can be seen the coefficient of the relationship path between the exogenous and endogenous variables used in the study to test 10. The coefficient of the path can be seen in table 11.

Based on the results of SEM analysis, the causality relationship between variables then hypothesis testing can be explained in table 12 as follows:

Table 12 Result of Testing Effect of Sustainable Agriculture on Red Chili Farmers

Variable	Model	Estimate	CR	Sig (p)	Result
Sustainable Agriculture (X)→Farmer Welfare(Y)	*Regression*	0.606	6,979	< 0.001	Signifikan
	Standardized Regression	0,860			

The path coefficient of sustainability influence to red chili farmers is 0.860, where the structural equation can be written as follows: $\hat{Y} = 0{,}860\ X$, R-square = 0,739. From the previous description has been explained about the indicators that can determine whether or not a hypothesis is accepted. Based on Table 12 the path coefficient interpretation is as follows. The results of AMOS calculations presented in Table 12 show that sustainability farming (X) affects significantly and positively by farmer's welfare (Y). It can be seen from the coefficient of positive sign with critical value (CR) of 6,797 (greater than 1,96) and the probability significance (p) is <0,001. This value is smaller than the specified significance level (α) of 0.05. Thus the research hypothesis has been answered, whereas Sustainable Agriculture (X) has a significant effect on Farmers Welfare (Y) proven true. In other words it can be said the direct effect of Sustainable Agriculture (X) on Farmers Welfare (Y) is equal to 0.860. For red chili farmers.

Factors Contributing Against Sustainable Agriculture on Red Chilies in Simalungun Regency

In structural equations involving many variables and paths between variables there are influences among variables that include direct influence, indirect influence and total influence.

For that will be discussed in detail each of these influences. Direct relationship occurs between exogenous latent variables Sustainable Agriculture (X) with endogenous latent variables Farmers Welfare (Y). Presents the results of direct impact testing occurring among exogenous and endogenous latent variables.

Table 13 Direct Effect between Variables Research

Effect Between Unobserved Variable	Direct Effect
X ⟶ Y	0,86
X ⟶ X_1	0,98
X ⟶ X_2	0,94
X ⟶ X_3	0,97

From table 13, we can explain the direct effects of exogenous latent variables on endogenous latent variables. Direct Effects of Sustainable Agriculture (X) on Farmers Welfare (Y) of 0.86. While on Sustainable Agriculture (X) is formed by three aspects, where Social Aspect variable (X1) contributes 0,98 to Sustainable Agriculture (X), Economic aspect variable (X2) contributes 0,94 to Sustainable Agriculture (X) and Aspects of Environmental Aspects (X3) contributed 0.97 to Sustainable Agriculture (X). Thus direct influence gives a significant result with positive predictive value (standardized estimates).

CONLUSSION AND RECOMMENDATION

Based on the analysis of farmer exchange rate factor, farmer income, agricultural production and red chili commodity development obtained the value of construct reliability around 0.7985 and farmer income, agricultural production and red chili commodity development obtained value of construct reliability around 0.7991. Based on the results of testing with the model of structural equation (modeling equation modeling) with the AMOS 21 program in the final stage of the stage after the modification of the model gives the goodness of the model (goodness of fit model) better. The path coefficient of sustainability influence to red chili farmers is 0.860, where the structural equation can be written as follows: $\hat{Y}$ = 0,860 X, R-square = 0,739 and $\hat{Y}$ = 0,430 X, R-square = 0,169. Direct effect of sustainable agriculture (X) on the welfare of farmers (Y) by 0.860. Development of sustainable agriculture to increase the highland vegetable farming income in the agropolitan area in Simalungun Regency will be possible to be realized by improving the quality of human resources (community), and empowering the community through various counseling, training and coaching programs conducted in an integrated manner, improve the quality and skills of farmers.

Establish cooperative relationships and develop business partnership patterns to distribute agricultural products, in order to achieve maximum productivity and income. Providing capital credit assistance to farmers, for it needs to be established developed financial institutions such as cooperatives that can help provide additional capital to farmers in Simalungun regency. To achieve the development of highland vegetable farming, a development strategy that is fully supported by the government and community in Simalungun Regency should be developed. Empower farmers to be more active and able to participate in various programs that can provide knowledge about the development of agropolitan area of highland vegetable farming in Simalungun Regency.

References

1. Breton, Albert. *et al*., (eds). 2007. *Environmental Governance and Decentralization.* Massa-chussets: Edward Elgaer Published.
2. Conyers, Diana and Peter Hills. 1990. *An Introduction to Development Planning in the Third World,* Scotland: C.R. Barber & Partners.
3. Dahuri, R. 1998. Pembangunan Pertanian Berkelanjutan: Dalam Perspektif Ekonomi, Sosial dan Ekologi. Agrimedia Volume 4 Nomor 1; Februari 1998.
4. Faludi, Andreas. 1976. *Planning Theory.* New York: Pergamon Press.
5. Hall, C. A. S. 2004. The Myth of sustainable development: Personal reflections on energy, its relation to neoclassical economics, and Stanley Jevons. Journal of Energy Resources Technology. 126: 86-89.
6. Hunger, J. David dan Thomas L. Wheelen. 2003. *Manajemen Strategis.* Penerjemah: Julianto Agung. Yogyakarta: Penerbit Andi.
7. Miles, Matthew B. dan A. Michael Huberman. 1992. *Analisis Data Kualitatif: Buku Sumber tentang Metode-metode Baru.* Penerjemah Tjejep Rohendi R. Jakarta: Penerbit Universitas Indonesia (UI Press).
8. Munasinghe. M. 1993. Environmental Economics and Sustainable Development.
9. Naik, Gopal dan Vishnuprasad Nagadevara. 2010. “Spatial Clusters in Organic Farming (A Case Study of Pulses Cultivation in Karnataka)”. *Indian Institute of Management Bangalore.* Hal. 1-19.
10. Pierce, D.A., Markandya and E.B. Barbier. 1994. Blueprint for a Green Economy/Earthscan Publ. Ltd. London, 192 pp.
11. Ukabe. 2007. Agricultural Biodeiversity for Food and Livelihood Security and Food Sovereignity, http://kasumbogo.staff.ugm.ac.id/?satoewarna=index&winoto=base&action=listmenu&skins=1& id=137&tkt=2

How to cite this article:

Sri Rosliana Lubis.2017, Sustainable Agriculture Development Using Structural Equation Model Approach (Case Study of Simalungun Regency - Indonesia). *Int J Recent Sci Res.* 8(10), pp. 2102-21035.
DOI: http://dx.doi.org/10.24327/ijrsr.2017.0810.1002

****