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Research Article

MEASURING THE SUSTAINABILITY OF RED CHILI AGRIBUSINESS SYSTEM IN NORTH SUMATERA PROVINCE, INDONESIA

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Abstract
Sustainable agriculture is an important factor in preserving sustainable development in an area. Red chili is a commodity that has a strategic role in the agricultural sector. This research aims to measure the endemic index in the red chili agribusiness system in North Sumatera Province. Data collection was carried out through in-depth interviews involving farmers, marketers, extension workers, and local governments using five dimensions of climbing. The data analysis method used was Multi-Dimensional Scaling (MDS), called RAP-Chili (Rapid Appraisal for Chili). The results show that the combined index for the red chili agribusiness system in this province is quite sustainable, with an index value of 58.94. Only one dimension is included in the high desire index level (78.35), namely the environmental dimension. Meanwhile, the other four dimensions are at the level of the quite desirable category, namely the economic dimension (52.82), the socio-cultural dimension (57.30), the partnership dimension (54.24), and the institutional dimension (51.98). Overall performance can be improved by making improvements in each dimension. Therefore, policy planning for developing the red chili agribusiness system must improve weak indicators and impact existing dimensions. Environmental aspects regarding land suitability, climate, and fertility must continue to be improved, considering that agriculture in Indonesia is still very dependent on natural resource factors.

Keywords: Agribusiness, Multi-Dimensional Scalling, Red Chili, Sustainability

INTRODUCTION

Developing countries focus on the potential utilization of natural resources in order to be able to increase regional economic growth (Wint and Williams, 2002). Indonesia as an agricultural country has a main development focus on the agricultural sector. Agricultural development is faced with the challenge of how to achieve economic growth so as to be able to increase farmers' income in a sustainable manner. The agricultural development paradigm must have goals that will be achieved if

carried out with policies that are planned, implemented and comprehensively evaluated (Ministry of Agriculture, 2020). The development process must be carried out through optimizing the use of natural resources in a sustainable manner with supervision and by paying attention to the potential impacts that result (Fifekova and Nemcova, 2015). The perspective of regional development through the utilization of potential natural resources as centers of economic growth is carried out to maintain and increase development in an equitable and balanced manner so that increased community economic productivity increases (Tamura et al., 2019). Developing the potential of a region requires several appropriate approaches so that the efforts made are efficient and effective (Adri et al., 2022).

North Sumatera Province is one of the provinces in Indonesia where agriculture is the main sector in the regional economy. The agricultural sector is the main contributor to GRDP and is the sector with the largest employment absorption compared to other sectors. One commodity that is a mainstay that requires further development is the red chili commodity. The red chili commodity is one of the national strategic horticultural commodities as stipulated in the Minister of Agriculture Regulation number 131 of 2014. North Sumatera Province is the second largest producer in Indonesia. Based on the average production for 2017-2021, North Sumatera Province contributed 13.96% to red chili production in Indonesia.

From the perspective of farmers' welfare as indicated by the farmer's exchange rate (NTP), it can be seen that the FTT in the horticulture sub-sector is still below the other sub-sectors and also below the general average in North Sumatera Province. NTP below 100 indicates that farmers in North Sumatera are in the category that is not yet prosperous due to the low purchasing power of farmers. The details of NTP in North Sumatera Province are as table 1.

Table 1. The Development of Farmers' Exchange Rates (NTP) in North Sumatera Province

Sub-Sector of Agriculture	2018	2019
Crops	96.58	91.74
Horticultural	91.22	91.74
Smallholder's Plantation	91.23	99.20
Farm	113.62	114.80
FIshery	103.79	103.63
All in	97.31	99.08

Source: Central Bureau of Statistics (2020)

Various problems in the red chili commodity in North Sumatera Province include price fluctuations, disparities in producer and consumer prices, inefficient supply chains, farmer welfare and production which tends to be seasonally based which is heavily influenced by weather factors. These problems indicate that the development of a more holistic red chili commodity is not yet optimal. Development with a more holistic approach is interpreted as a form of solving problems that occur by looking at all related things. This is what is said to be the development of an agribusiness approach.

The development of agricultural development must be based on agribusiness, especially for regional potential commodities, which must be oriented towards optimizing the potential utilization of natural resources and human resources as a functional unit. Effective agricultural development requires planning in an appropriate system that includes all planning components so that it is able to handle the complexity, diversity and dynamics that occur in the agricultural environment (Dillon et al., 2019), (Apriyanti, 2019).

The agribusiness system is a system capable of developing in an integrated and sustainable manner in increasing agricultural productivity. The concept of sustainable agriculture is not a concept that has a single meaning (Gomez et al.2009). Increasing productivity is carried out through various aspects, namely environmental, economic and social in a sustainable manner (Rotz et al., 2019). While agribusiness includes 5 main parts, namely (i) input, (2) farming, (3) postharvest, (4) marketing and (5) support (Downey, 2004; Saragih, 2010). However, the problem that often occurs is that development only looks at the cultivation aspect, especially increasing production and increasing land area. Development orientation on commodities is no longer suitable to be applied in agricultural development (Sarasutha et al., 2014; Gustiana, 2017).

The development of the red chili agribusiness system is directed towards integrated development both vertically and/or horizontally with various consolidation policies based on economic

actors in the community. Implementation of this policy must be based on the principle of sustainability. The difference between this research and other research is the sustainability dimension used, namely by separating the institutional and partnership dimensions separately from the other dimensions. For this, this study aims to analyze (1) the status of sustainability of red chili agribusiness in North Sumatera Province, and (2) the dominant attributes that affect the sustainability of red chili agribusiness in North Sumatera Province in terms of the five dimensions of sustainability namely environmental, economic, socio-cultural, institutional and partnership.

RESEARCH METHOD

The type of data used in this research is primary data. This primary data is data from attributes or parameters related to the five dimensions of the sustainability of the red chili agribusiness system, namely environmental, economic, socio-cultural, institutional and partnership dimensions. Each dimension consists of several parameters that have been modified from various literature searches published by Arbor et al (2004); Pitcher and Preikshot (2001); Theresia et al (2015); Pattimahu (2010); Leha (2020), and the results of observations and interviews. Primary data comes from interviews with selected respondents and experts, as well as observations at the research location.

The data analysis method used in this research is Rapid Appraisal For Fishery (RAP-FISH) based on Multidimensional Scaling (MDS) which has been modified into Rapid Appraisal for Chile (RAP-Chili) to determine the sustainability of the red chili agribusiness system in North Sumatera Province (Pitcher and Preikshot, 2001). The advantage of this method is that it can measure (Tjahjo et al., 2005) and describe the sustainable condition of resources in a place or region and can analyze all aspects of fisheries sustainability in a simple and comprehensive manner (Fauzi and Anna, 2002). The MDS approach has the advantage of stability compared to other multivariate analyzes (Fadilah et. Al., 2021). The MDS method is a process for mapping observed objects or points in one space, where the same objects or points are mapped close to each other and different objects or points are mapped far apart (Fauzi & Anna 2002). MDS analysis is an assessment of the attributes in each dimension of sustainability and assessing these attributes based on actual data through field observations, interviews with experts, and literature review (Dzikrillah et al., 2017). The results of the MDS analysis are expressed in index values (0-100) which reflect the sustainability status of the object of study based on actual conditions and their coordination in each dimension (Table 2)

Table 2. Sustainability index and status

Index Value	Category
0.00 – 25.00	Bad: Unsustainable
25.01 – 50.00	Less: Less Sustainable
50.01 – 75.00	Sufficient: Sufficiently Sustainable
75.01 – 100.00	Good: Highly Sustainable

Source: Pitcher and Preikshot, 2001

In general, there are three stages in the analysis of sustainability, namely (1) determining the attributes of each dimension of sustainability; (2) attribute assessment on each dimension of sustainability using a research questionnaire; (3) assessment of sustainability index and status through ordination analysis, sensitivity analysis (leverage analysis) and anomaly analysis (Monte Carlo analysis). Based on these three stages, the sustainability status of the area under study will be known.

The attributes used to determine the status of sustainability of horticultural agribusiness in North Sumatera are mapped into 5, namely the dimensions of sustainability namely environmental dimensions (11 attributes), economic (16 attributes), socio-cultural (15 attributes), institutional (5 attributes) and Partnership (13 attributes). The selection of attributes receives careful attention because the measured data will influence the calculation of sustainability dimensions (Latruffe et al, 2016). In details are summarized in Table 3.

Table 3. Attributes of Sustainability of the Red Chili Agribusiness System in North Sumatera Province

No	Sustainability Dimension	Sustainability attribute
1	Enviromental	1. Pollution from Pesticides & Chemical Fertilizers 2. Availability of Water Sources 3. Land Quality 4. Level of production risk 5. Land suitability 6. Use of Certified Seeds 7. Transfer of Function of Agricultural Land to non-agriculture 8. Intensity of OPT/Pest/Disease 9. Use of Organic Fertilizers 10. Use of Pesticide 11. Use of Chemical Fertilizers
2	Economic	1. Conditions of the Marketing Chain 2. Productivity 3. Product Quality 4. Capital Independence 5. Capability of Farmers 6. Efficient Use of Factors of Production 7. Credit Utilization 8. Production Costs 9. Processing of Derivative Products 10. Contribution to Local Original Revenue 11. Price stability at the consumer level 12. Profits received by marketers 13. Profits received by farmers 14. Price stability at the farm level 15. Consumer prices 16. Chili prices at the farm level
3	Social Cultural	1. Knowledge Level of Farmers 2. Labor availability 3. Farmer Empowerment Activities 4. Farmer Innovation 5. Adoption of technology by farmers 6. Perceptions and Desires of Farmer 7. Farmers' motivation in farming 8. Independence of farmers in decision making 9. Accessibility of farmers to production factors 10. Farmer Capacity 11. Intensity of Land Conflict 12. Intensity of Training Extension 13. Land Ownership Status 14. Education Level of Farmers 15. Number of Farmers
4	Institutional	1. Implementation of Training and Assistance 2. Implementation of Extension Activities 3. Territorial Policy 4. Government Commitment 5. Availability of extension workers 6. Availability of Risk Management Institutions 7. Availability of Derivative Product Processing Institutions 8. Number of extension workers 9. Availability of Production Sampling Agency 10. Availability of Marketing Institutions 11. Availability of Financial Institutions

No	Sustainability Dimension	Sustainability attribute
5	Partnership	12. Existence of farmer groups 1. The Role of Universities 2. Coordination between agencies 3. Government protection against commodity prices 4. The role of farmer groups in improving farming performance 5. Cooperation of farmers/farmer groups with the business world 6. Partnership for various facilities 7. Impact of government policies on farming performance 8. Solving problems together 9. Involvement of farmer groups in regional agricultural planning 10. Role of Government 11. The effectiveness of cooperation between farmers and financial institutions 12. The effectiveness of petunia cooperation with marketers 13. Solidarity among farmers

RESULTS AND DISCUSSION

3.1. Index and Sustainability Status of Red Chili Agribusiness System in North Sumatera

The results of the multidimensional analysis (MDS) show that the sustainability status of the red chili agribusiness system in North Sumatera Province is in the Sufficiently Sustainable category with an index value of 58.94 (Figure 1).

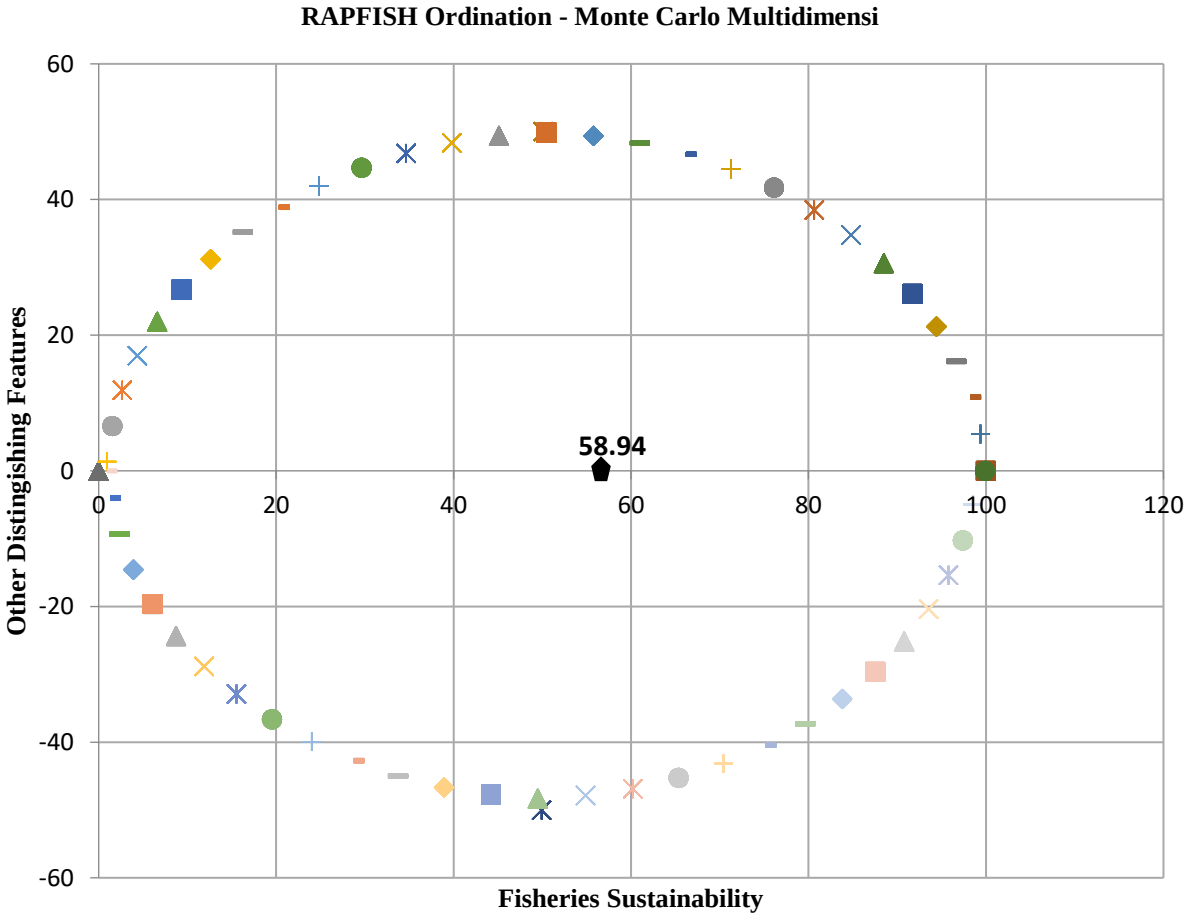

Figure 1. Results of the Multidimensional Ordination Analysis of the Sustainability of the Red Chili Agribusiness System

3.2. Sustainability Status and Dominant Attributes in Each Dimension

1) Economic Dimension

The MDS results with RAPFISH, red chili agribusiness systems show an economic dimension sustainability index of 52.82 which indicates that from an economic point of view the availability system has a fairly sustainable status. The sustainability index value of the economic dimension is higher when compared to the institutional dimension, but lower when compared to the environmental, socio-cultural and partnership dimensions. In order for the economic dimension index value to increase in the future, it is necessary to improve the attributes that are sensitive to the dimension index value. The economic dimension sustainability index is shown in Figure 2.

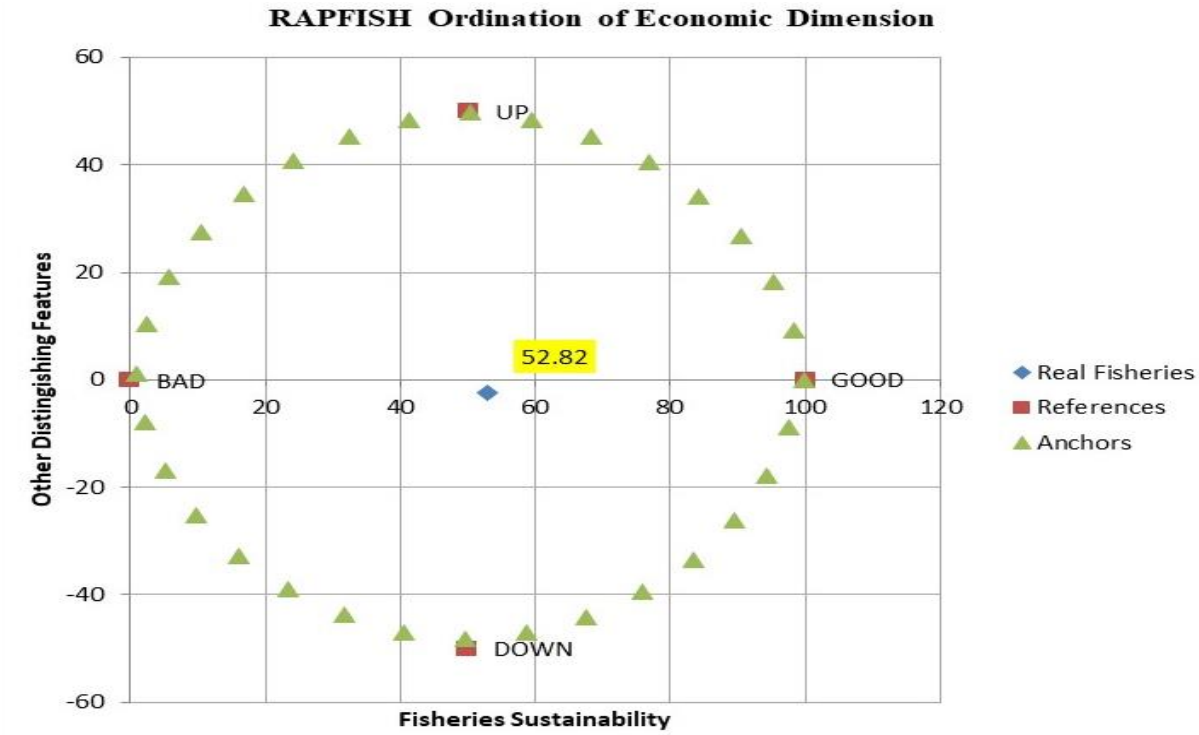

Figure 2. Results of the Analysis of the Economic Dimensions of the Sustainability of the Red Chili Agribusiness System

The status of sustainability in the economic dimension is due to the sixteen supporting attributes of the economic dimension observed, one of which is included in the sensitive category. This attribute is the cost of production. Based on the results of the most sensitive leverage analysis, it is necessary to prioritize and improve it, namely production costs with a value of 1.97.

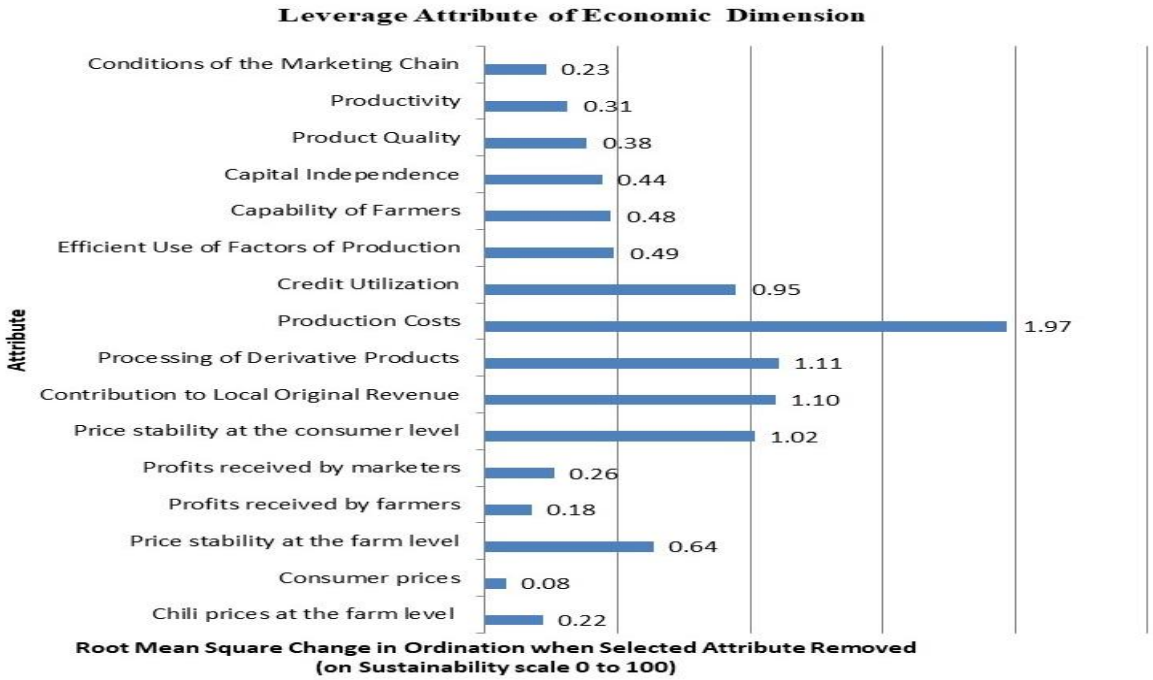

Figure 3. Attribute Sensitivity Value of the Economic Dimensions of the Red Chili Agribusiness System

The results of the sustainability analysis for the economic dimension show that the production cost attribute has an index value that is included in the "high" category, with an index value of 1.97. This means that red chili production costs must be paid close attention to by intervening in production factors so as not to experience fluctuations in input prices and scarcity. The high cost of production of red chili farming is a problem that must be faced by farmers. Red chili farmers incur a number of costs that cannot be adjusted freely with changes in the selling price of chilies.

The attribute that has the least influence is the price of red chilies at the consumer level i with an index of 0.08 which is in the "low" category. The price of red chilies at the consumer level will not be a problem for the sustainability of the red chili agribusiness system because according to data the price of red chilies on the market in 2021 is quite high.

2) Socio-Cultural Dimension

The results of the MDS with RAPFISH, red chili agribusiness systems show a socio-cultural dimension sustainability index of as large as indicating that from a social point of view the availability system has a fairly sustainable status. The value of the social dimension's sustainability index is higher when compared to the economic dimension and the environmental dimension. In order for the index value of the social dimension to increase in the future, it is necessary to improve the attributes that are sensitive to the value of the index dimension. The social dimension sustainability index is shown in Figure 4.

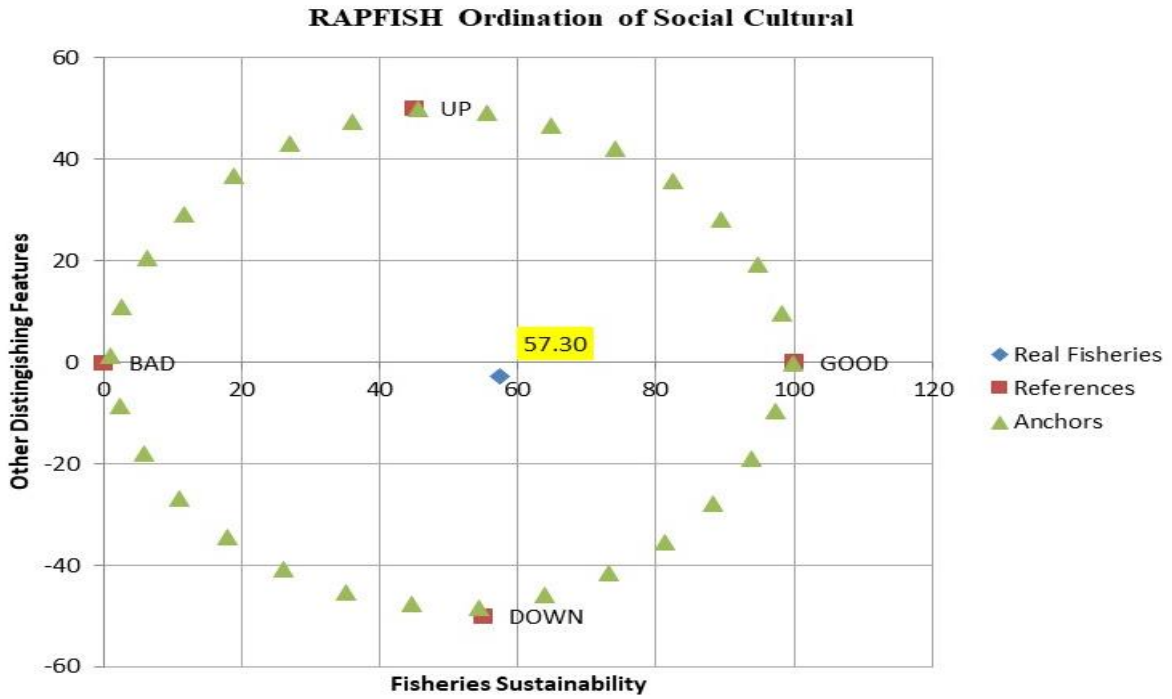

Figure 4. Results of the Analysis of Socio-Cultural Dimensions of the Sustainability of the Red Chili Agribusiness System

The status of sustainability on the social dimension is due to the fifteen supporting attributes of the socio-cultural dimension observed, two of which are included in the sensitive category. These two attributes are the farmers' motivation in farming red chilies, and the intensity of land conflicts. Based on the results of the most sensitive leverage analysis, it is necessary to pay attention to and improve it, namely the motivation of farmers in red chili farming with a value of 2.20.

The results of the sustainability analysis for the socio-cultural dimension show that the attributes of farmers' motivation in farming red chilies, and the intensity of land conflicts have an index value that is included in the "high" category, with an index value of 2.20 and 1.44. This means that the motivation of farmers in red chili farming, and the intensity of land conflicts must always be considered, the motivation of farmers in red chili farming is still lacking due to the large number of farmers who change their interest in farming red chilies to other commodities.

The intensity of land conflicts must always be considered because it occurs quite often among farmers due to the lack of agricultural land area for planting red chili caused by the conversion of red chili agricultural land to quite a lot of non-agricultural land, causing conflicts between farmers over red chili agricultural land. The results of the leverage analysis can be seen in Figure 5.

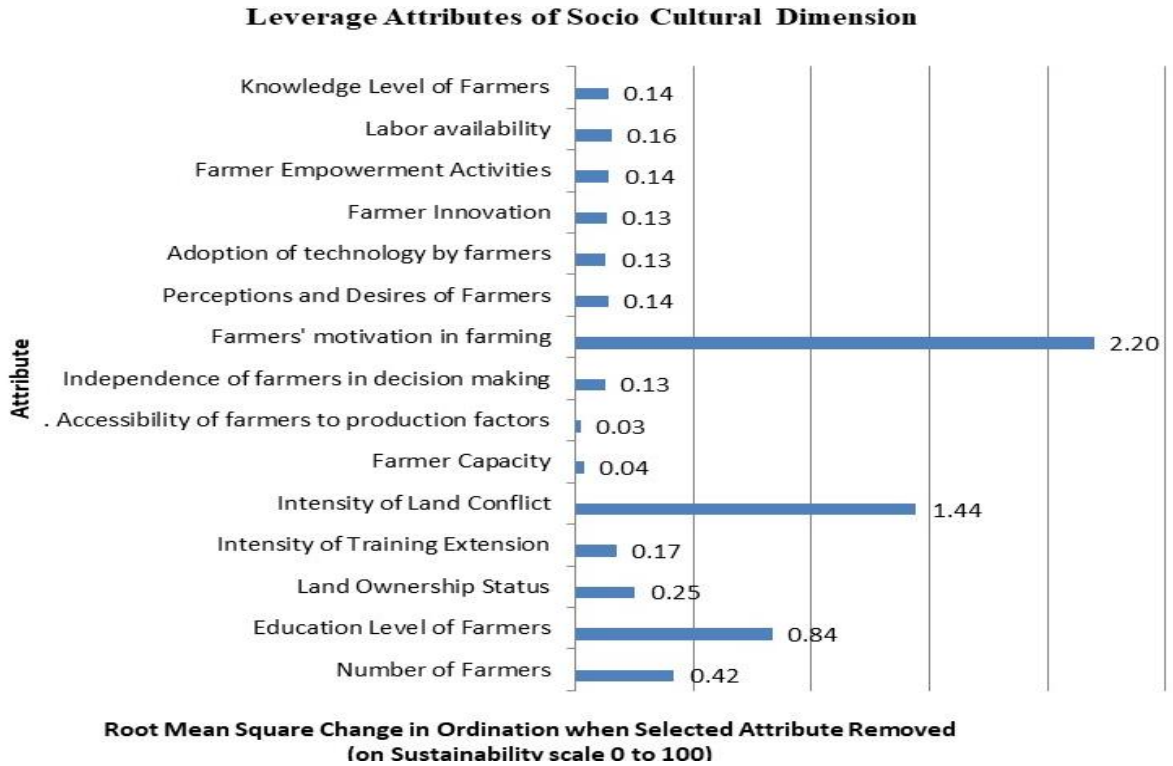

Figure 5. Attribute Sensitivity Value of Socio-Cultural Dimensions of Red Chili Agribusiness System

The attribute that has the lowest influence is the accessibility of farmers to production factors with an index of 0.03 in the "low" category. Accessibility of farmers to factors of production is not a problem for the sustainability of the red chili agribusiness system because it is quite easy for farmers to gain access to factors of production, for example by having farmer groups and extension workers who can open access to these factors of production.

3) Environmental Dimensions

The MDS results with the RAP-FISH, red chili agribusiness system show an environmental dimension sustainability index of 78.35 which indicates that from an environmental point of view the availability system has a very sustainable status. The sustainability index value of the environmental dimension is the highest of the other four dimensions. Meanwhile, a study in Brazil (Agostinha, 2023), shows that the performance of the environmental dimension is lower than the economic and social dimensions. This condition may be different, because agronomically, Indonesia is still a country with good soil fertility and a supportive climate.However, in order for the environmental dimension index value to continue to increase in the future, it is necessary to improve the attributes that are sensitive to the index dimension value. The environmental dimension sustainability index is shown in Figure 6.

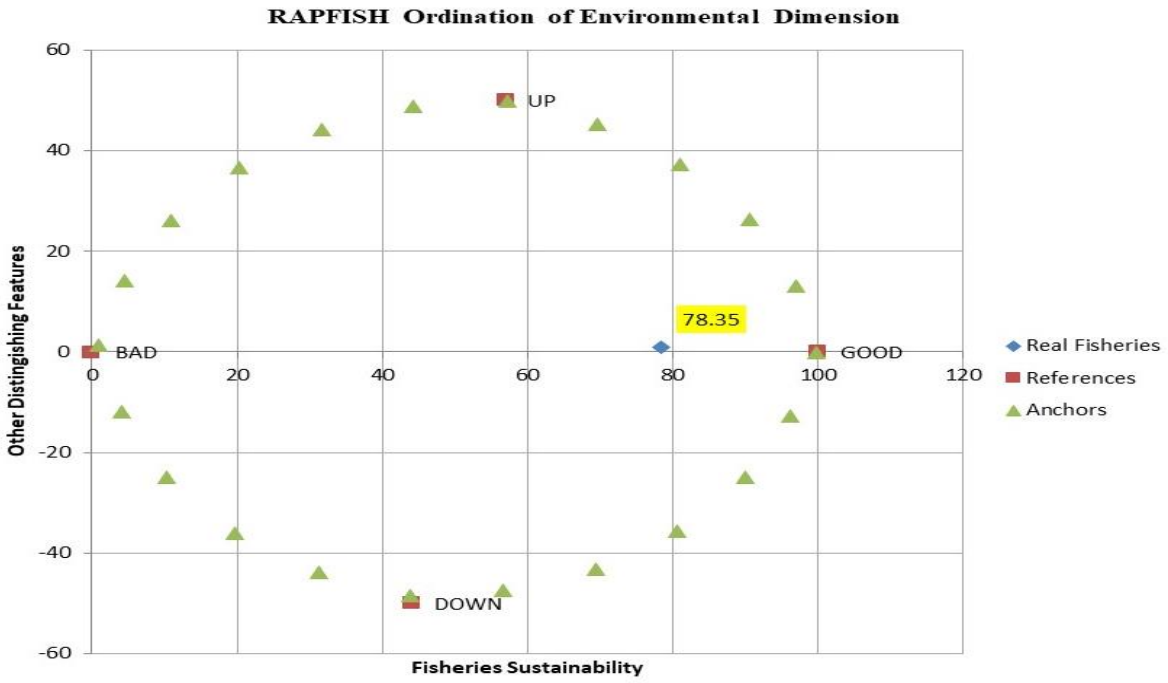

Figure 6. Results of the Environmental Dimensional Analysis of the Sustainability of the Red Chili Agribusiness System

The status of sustainability in the environmental dimension is caused by eleven supporting attributes of the environmental dimension observed, one of which is included in the sensitive category. This attribute is the conversion of agricultural land to non-agricultural land. Based on the results of the most sensitive leverage analysis, it is necessary to pay attention to and improve it, namely the conversion of agricultural land to non-agricultural land with a value of 5.73. The results of the leverage analysis can be seen in Figure 7.

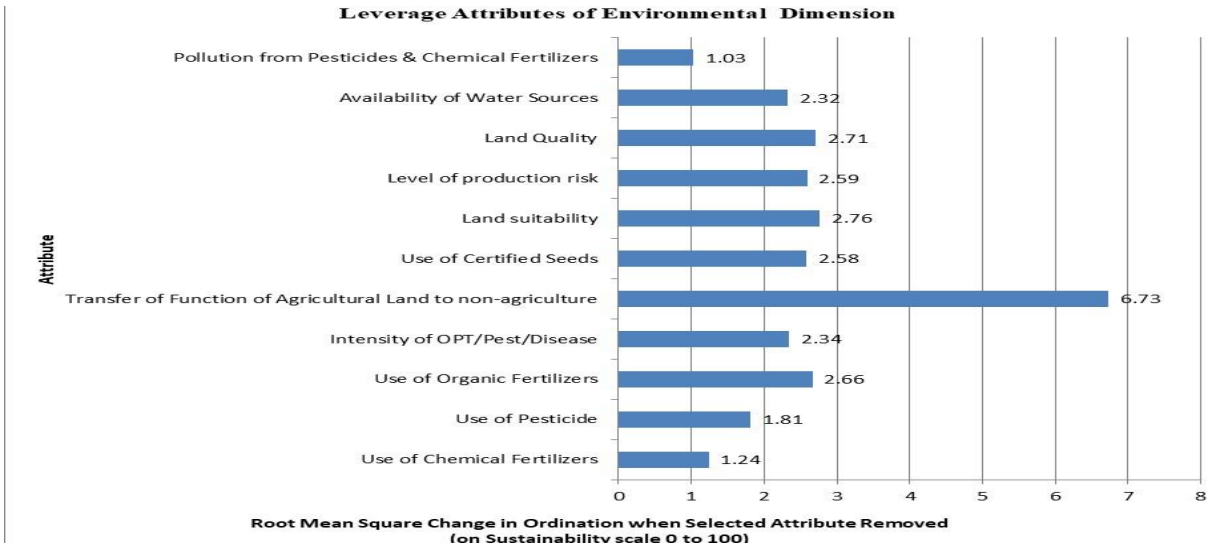

Figure 7. Attribute Sensitivity Value of the Environmental Dimensions of the Red Chili Agribusiness System

The results of the sustainability analysis on the environmental dimension show that the attribute conversion of agricultural land to non-agricultural land is included in the "high" category, with an index value of 5.73. This means that the amount of agricultural land is decreasing more and more due to the conversion of agricultural land to non-agricultural land, causing less and less agricultural land, especially red chilies. The conversion of red chili agricultural land to non-agricultural land will be a serious threat to the achievement of food security, especially for North Sumatera Province and also nationally. To control land conversion, it is necessary to socialize and implement regulations that

prohibit land conversion. There needs to be a policy in the form of commitment from the government and related stakeholders to the development of red chili commodities to become a priority scale. In recent years, the sustainability of the agricultural sector has been faced with a serious threat, namely the area of land that continues to shrink due to the massive conversion of land to non-agricultural uses. This causes the area which has been the center of red chili production to continue to decline along with land conversion.

The attribute with the lowest effect is residue/pollution from pesticides and chemical fertilizers with an index value of 1.03, which is included in the "low" category. Residues/pollution from pesticides and chemical fertilizers have the lowest effect, meaning that this attribute is not a problem for the sustainability of the red chili agribusiness system. In other words, the ability of farmers to avoid residues/pollution from pesticides and chemical fertilizers is good enough so that not much pollution results from the use of pesticides and chemical fertilizers.

4) Partnership Dimension

The MDS results with the red chili agribusiness system RAP-FISH show a partnership dimension sustainability index of 54.24 which indicates that from a partnership perspective the availability system has a fairly sustainable status. The sustainability index value of the partnership dimension is higher when compared to the economic and institutional dimensions, but lower when compared to the environmental and socio-cultural dimensions. In order for the partnership dimension index value to increase in the future, it is necessary to improve the attributes that are sensitive to the dimension index value. The partnership dimension sustainability index is shown in Figure 8.

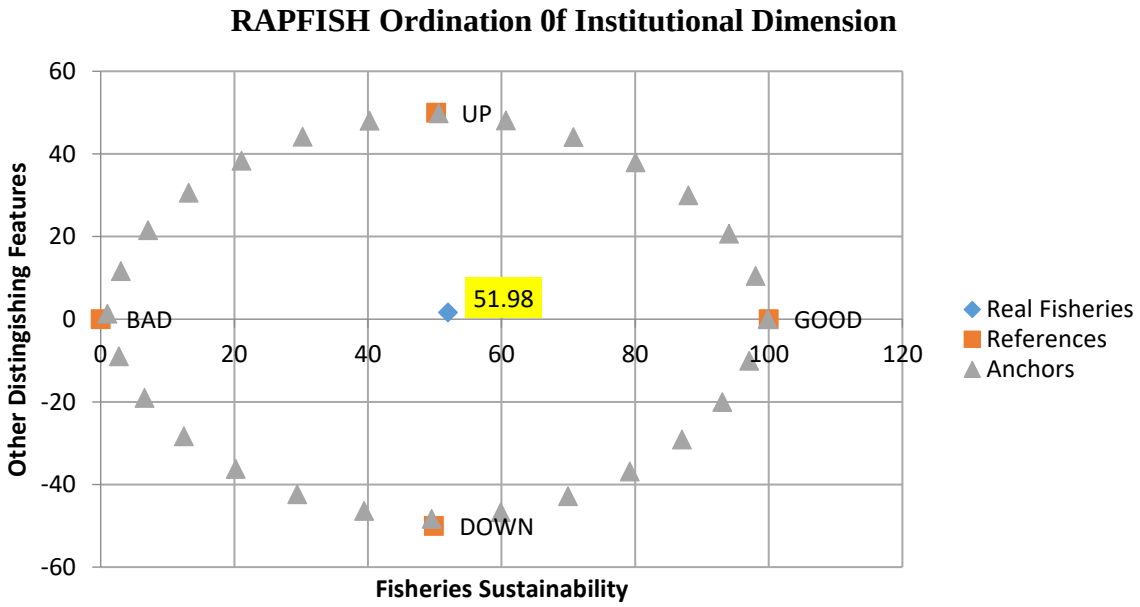

Figure 8. Results of the Dimensional Analysis of the Red Chili Agribusiness System Sustainability Partnership

The status of sustainability in the partnership dimension is due to the thirteen supporting attributes of the partnership dimension observed, two of which are included in the sensitive category. These attributes are the involvement of farmer groups in regional agricultural planning and the government's protection of red chili prices. Based on the results of the most sensitive leverage analysis so that it needs to be prioritized for attention and improvement, namely the involvement of farmer groups in regional agricultural planning with a value of 1.19. The results of the leverage analysis can be seen in Figure 9.

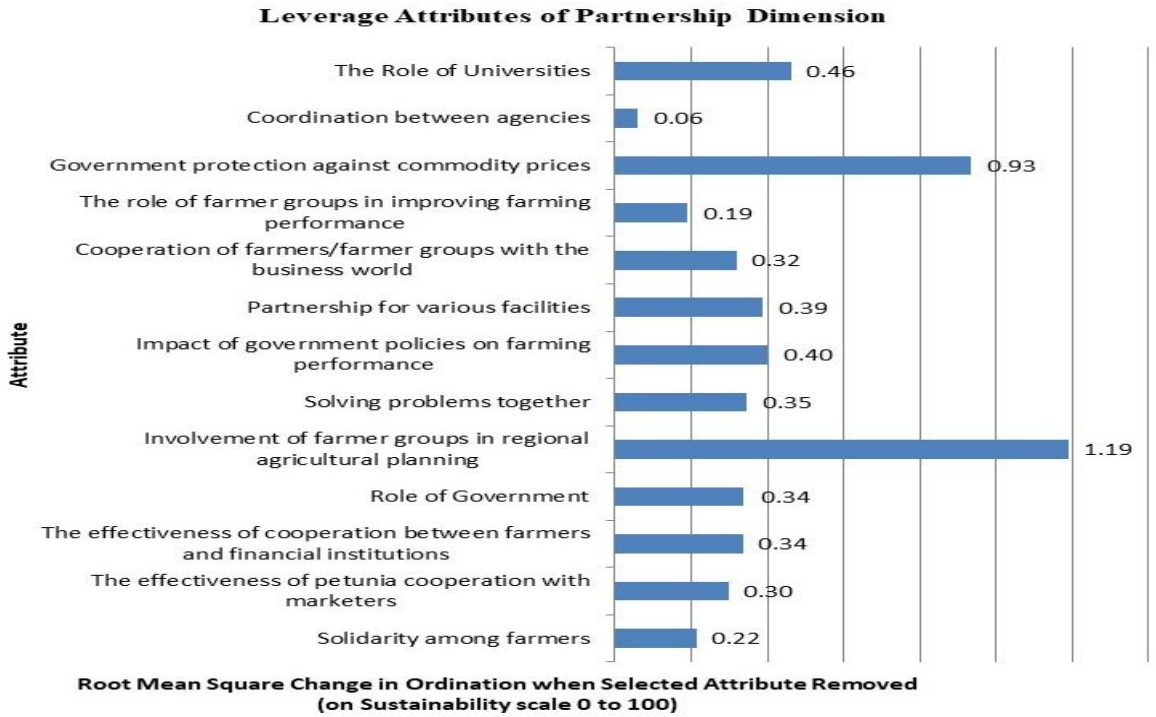

Figure 9. Attribute Sensitivity Value of Red Chili Agribusiness System Partnership Dimension

The results of the sustainability analysis on the partnership dimension show that the attributes of farmer group involvement in local agricultural planning and government protection of red chili prices are included in the "high" category, with an index value of 1.19 and 0.93. This means that the involvement of farmer groups in agricultural planning has a very large influence on the development system of horticultural agribusiness areas in North Sumatera, especially in the partnership dimension, because farmer groups are a forum for farmers to discuss and convey their aspirations and plan future agriculture. In addition, farmer groups also function as media to establish cooperation with other parties or institutions. Based on survey results and in-depth interviews, it is known that the existence of farmer groups in terms of numbers is sufficient, but intense assistance and institutional strengthening are still needed so that their existence is truly effective for farmers. This is important considering that farmer groups have a very close relationship with the progress of farmers in other matters that support the quality and productivity of farmers in the institutional dimension. Firdaus (20220 stated the same thing in his research, namely that partnerships in agriculture are important in formulating agricultural development strategies.

While the attribute that has the least influence, namely coordination between related agencies, is included in the "low" category with an index of 0.06. This means that coordination between related agencies is not an urgent need in relation to the sustainability of the red chili agribusiness system because coordination between farmers and related agencies can be said to be good.

5) Institutional Dimension

The results of the MDS with rap-chile red chili agribusiness systems show an institutional dimension sustainability index of 51.98 which indicates that from an institutional perspective the supply system has a fairly sustainable status. The institutional dimension's sustainability index value is the lowest among the other dimensions. In order for the institutional dimension index value to increase in the future, it is necessary to improve the attributes that are sensitive to the index dimension value. The institutional dimension sustainability index is shown in Figure 10.

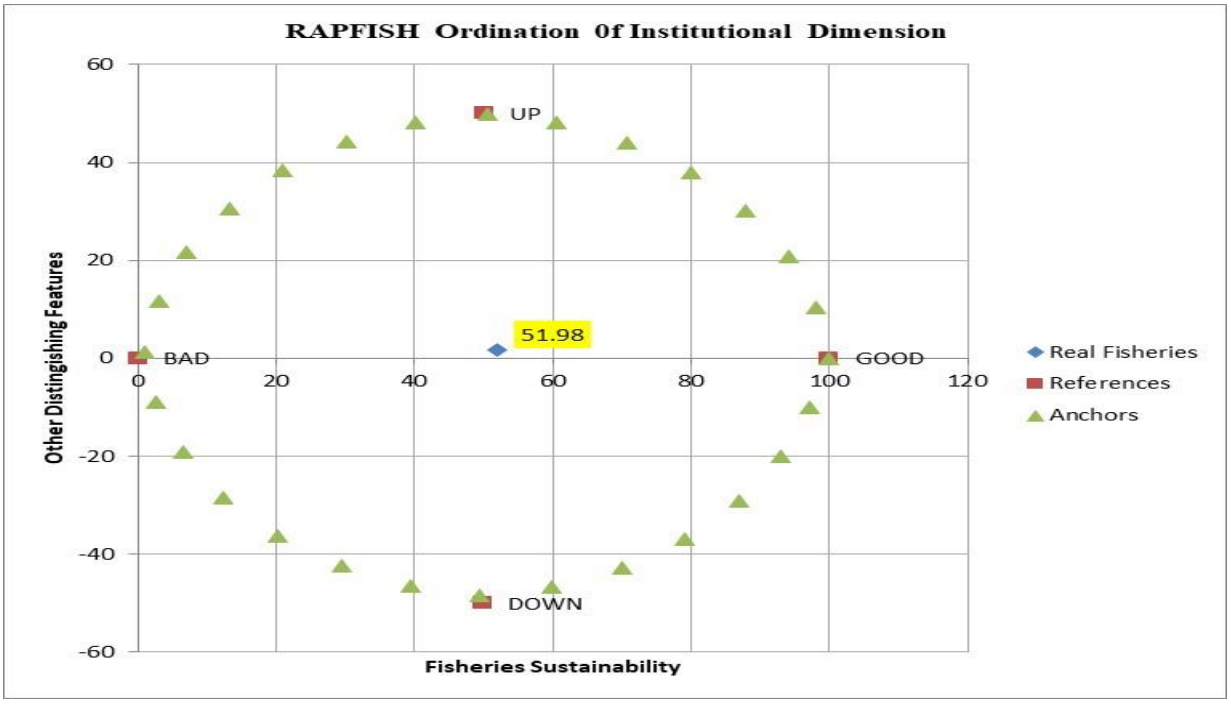

Figure 10. Results of the Institutional Dimensional Analysis of the Sustainability of the Red Chili Agribusiness System

The status of sustainability in the institutional dimension is due to the fourteen supporting attributes of the institutional dimension observed, two of which are included in the sensitive category. These attributes are the availability of risk/insurance agencies and the availability of red chili derivative product processing institutions. Based on the results of the most sensitive leverage analysis that needs to be prioritized for attention and improvement, namely the availability of risk/insurance agencies with a value of 2.42. The results of the leverage analysis can be seen in Figure 11.

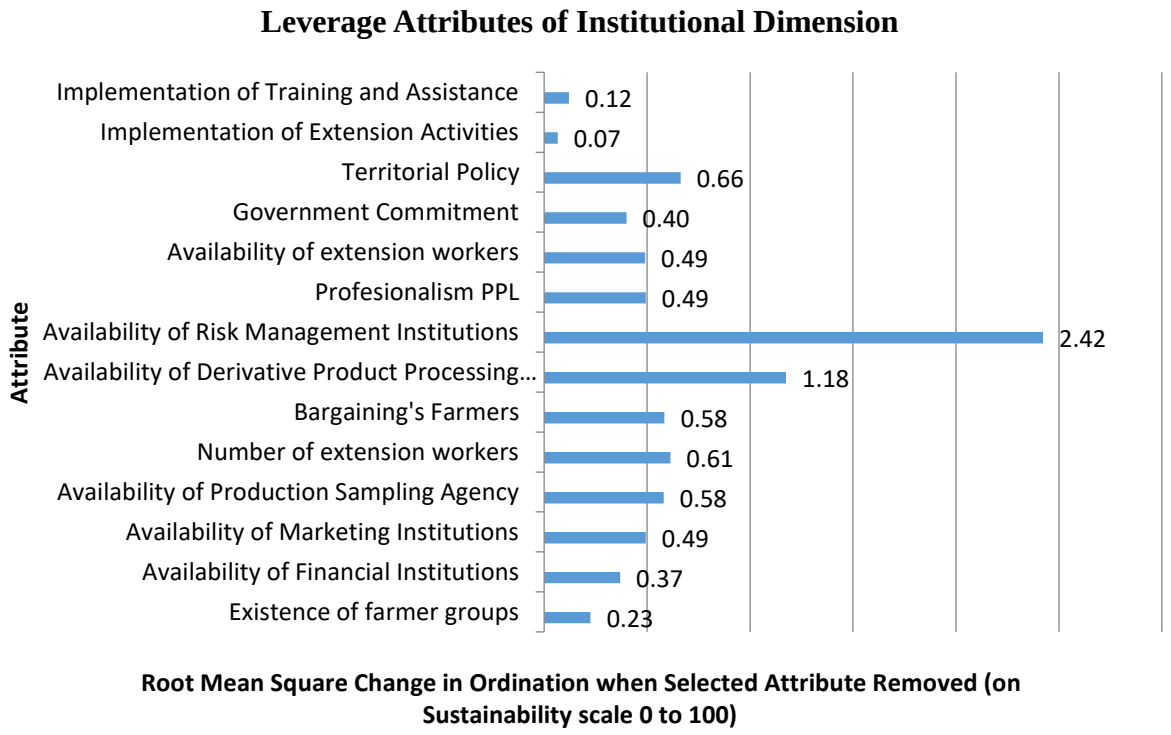

Figure 11. Attribute Sensitivity Value of the Institutional Dimension of the Red Chili Agribusiness System

The results of the sustainability analysis on the institutional dimension show that the attributes of the availability of risk-taking/insurance institutions and the availability of red chili-derived product processing institutions are included in the “high” category, with index values of 2.24 and 1.18. This means that the availability of risk/insurance institutions is still lacking to deal with farmers' concerns about the risks that will be faced in the future. The availability of processing institutions for red chili derivative products is also still very lacking so that red chili farmers are still confused about distributing agricultural products that can be processed so that the agricultural products produced are not only raw products but products that have been processed. The level of product processing must also be expanded and improved from simple processing to advanced processing that is applicable in a wider market.

While the attribute that has the least influence, namely the implementation of extension activities, is included in the "low" category with an index of 0.07. Implementation of intense counseling and training activities greatly affects the level of horticultural production. Based on the survey results, it is known that the intensity of the implementation of training and counseling activities provided by PPL is very high, so that red chili farmers can be educated about red chili farming which causes the implementation of extension activities to be considered as something that is not too urgent for the sustainability of the red chili agribusiness system.

The research results found that environmental and socio-cultural dimensions are the main factors in determining the sustainability of the development of the red chili agribusiness area in North Sumatra Province. The development of red chili agribusiness areas is strongly supported by farmers' disinterest in converting land, high farmer motivation for red chili cultivation and the small number of land conflicts that occur in red chili production center areas. This is certainly a concern in developing the red chili agribusiness area in the future.

CONCLUSION

Based on the results of the analysis of the sustainability of the red chili agribusiness system in North Sumatera Province, the following conclusions are obtained: The red chili agribusiness system in North Sumatera Province is in a fairly sustainable status for four dimensions, namely the economic, socio-cultural, institutional and partnership dimensions. Meanwhile, the environmental dimension is in a very sustainable status. The dominant attributes that affect the red chili agribusiness system in North Sumatera Province for each dimension are (1) The environmental dimension is influenced by the conversion of agricultural land to non-agricultural land and land suitability for red chili plants, (2) The Economic Dimension is influenced by the costs of production and processing of derivative products, (3) the Socio-Cultural Dimension is influenced by the motivation of farmers to plant red chilies and the intensity of land conflicts is less, (4) the Partnership Dimension is influenced by the involvement of farmer groups in agricultural planning and government protection of red chili prices, and (5) the institutional dimension is influenced by the availability of risk-bearing institutions and the availability of derivative product processing institutions.

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AUTHOR CONTRIBUTIONS

Conceptualization, T.S.; the Methodology, S.N.L., D.N.; Literature review, S.Z.; Data Collection and Analysis, D.N.; Data Analysis, D.N., T.S.; Data Interpretation, D.N., S.N.L., S.Z.

CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

REFERENCES

Abubakar, A. R., & Haque, M. (2020). Preparation of medicinal plants: Basic extraction and fractionation procedures for experimental purposes. *Journal of Pharmacy and Bioallied Sciences*, *12*(1), 1–10. https://doi.org/10.4103/JPBS.JPBS_175_19

Adri, et al. 2022. Identification of harvest, post-harvest and coffee farming institutions. *Jurnal Ilmiah Ilmu Terapan Universitas Jambi*, *6*(2), 192-200. https://doi.org/10.22437/jiituj.v6i2.22957.

Agostinha, F. et al. (2023). Sustainability dinamics of the Brazilian MATOPIBA region between 1990-2018: *Impacts of Agribusiness Expansion. Applied Geography Journal, 159*. https://doi.org/10.1016/j.apgeog.2023.103080

Agricultural Ministry of Indonesia. (2022). Red Chili Trading Performance Analysis. Center for Agricultural Data and Information Systems, Secretariat General of the Indonesian Ministry of Agriculture.

Apriyanti, T. M., & Chofyan, I. (2019). Red chili agribusiness development strategy in the agropolitan area of Ciamis regency. *PWK Journal, 16*(1). https://doi.org/10.29313/jpwk.v16i1.285

Bellon, M. R. et.al. (2020). To diversify or not to diversify, that is the question. pursuing agricultural development for smallholder farlmers in marginal areas of Ghana. *World Development. 125*. 104682. https://doi.org/10.1016/j.worlddev.2019.104682

Center for Agricultural Data and Information Systems. 2019. Outlook for Red Chilies: Agricultural Commodities in the Horticulture Subsector. Secretary General of the Ministry of Agriculture.

Central Bureau of Statistics. (2019). North Sumatera in Figures. BPS Province of North Sumatera

Central Bureau of Statistics. (2020). North Sumatera in Figures 2019. BPS North Sumatera Province

Dillon, B., Brummund, P., & Mwabu, G. (2019), Asymmetric non-separation and rural labor markets. *Journal of Development Economics, 139*, 78-96. https://doi.org/10.1016/j.jdeveco.2018.12.008

Dzikrillah, et al. (2017). Analysis of the sustainability of lowland rice farming in Soreang District, Bandung Regency. *Journal of Natural Resources and Environmental Management, 7*(2), 107-113. https://doi.org/10.29244/jpsl.7.2.107-113.

Downey, W. D., & Erickson, S. P. (2004). *Agribusiness Management, Edition 2*. Jakarta: Erlangga Publisher.

Fadulah, S. Et al. (2021). Multidimensional Scaling (MDS): Sustainability Assessment Model of Community Economic Empowerment. *Polish Journal of Mangement Studies*. *24*(2). https://doi.org/10.17512/pjms.2021.24.2.08

Fauzi, A., & Suzy, A. (2005). *Fisheries and Marine Resources Modeling. For Policy Analysis*. PT Gramedia Pustaka Umum. Jakarta.

Fauzi, A. & Anna, S. (2005). *Modeling fisheries and marine resources for policy analysis*. Gramedia Pustaka Utama, Jakarta

Fifeková, E., & Nemcová, E. (2015), Impact of FDI on economic growth: Evidence from V4 countries. *Periodica Polytechnica Social and Management Sciences, 23*(1), 7-14. https://doi.org/10.3311/PPso.7993

Firdaus, F., Adri, A., & Suharyon, S. (2022). Potensi dan strategi pengembangan perbenihan komoditas kayu manis di kabupaten kerinci [Potential and strategy for developing cinnamon seed commodities in Kerinci Regency]. *Jurnal Ilmiah Ilmu Terapan Universitas Jambi*, *6*(1), 47-55. https://doi.org/10.22437/jiituj.v6i1.19331

Gómez, L. J. A., Riesgo, L. (2009). Alternative approaches to the construction of a composite indicator of agricultural sustainability: An application to irrigated agriculture in the Duero basin in Spain. *Jour of Environ Manag, 90*(11), 3345–3362. https://doi.org/10.1016/j.jenvman.2009.05.023

Gustiana, C. (2017). Agriculture and rural economy development strategies through agribusiness-insighted business partnerships. *Agrisamudra Research Journal, 2*(1), 71-80. https://doi.org/10.33059/jpas.v2i1.236

Latruffe et al. (2016). Measurement of sustainability in agriculture: a review of indicators. *Studies in Agricultural Economics, 118*, 123-130. http://dx.doi.org/10.7896/j.1624.

Leha, E. (2020). Study of the Sustainability of Horticultural Agribusiness in West Sumba Regency. *Journal of Volume Analysis, 20*. https://doi.org/10.37478/als.v10i2.692

Ministry of Agriculture. (2012). General Instructions for Increasing Production and Value Added Programs for Horticultural Products. Jakarta (ID) : Directorate General of Horticulture, Ministry of Agriculture

Ministry of Agriculture. (2019). Outlook Chili. Center for Agricultural Data and Information Systems, Secretariat General of the Indonesian Ministry of Agriculture.

Ministry of Agriculture, (2020). Initial Draft Strategic Plan of the Ministry of Agriculture for 2020 – 2024

Minister of Environment Decree No. 201, (2004). Standard criteria and guidelines for determining mangrove damage. Ministry of Environment, Jakarta

Pattimahu, D. V. (2010). *Sustainable mangrove forest management policies in West Seram District, Maluku*. Dissertation. Bogor Agricultural Institute, Bogor

Pitcher, T. J., & Preikshot, D. (2001). Rapfish: A rapid appraisal technique to vvaluate the sustainability status of fisheries. *Fisheries Research, 49,* 255-270. https://doi.org/10.1016/S0165-7836(00)00205-8

Sarasutha, Igp, et al. (2014). Agribusiness-Based rice farming in the production center of Banggai Regency, Central Sulawesi. *Journal of Agricultural Technology Assessment and Development, 7*(1). https://doi.org/10.21082/jpptp.v7n1.2004.p%p

Saragih, B. (2010). *Agribusiness New Paradigm for Agriculture-Based Economic Development*. Bogor (ID): IPB Press

Tamura, R., Dwyer, J., Devereux, J., Baier, S. 2019, Economic growth in the long run. Journal of Development Economics, 137, 1-35. DOI: 10.1016/j.jdeveco.2018.10.010

Thahjo, et al. (2005). Development of the RAP FISH technique for determining performance indicators for sustainable capture fisheries in Indonesia. *Fisheries Economic Bulletin, VI* (1).

Theresia, A., & Toto. (2014). *Community-based development*. Alphabet Publisher, Jakarta

Wint, A.G., & Williams, D. A. (2002), Attracting FDI to developing countries: A changing role for government?. *International Journal of Public Sector Management, 15*(5), 361-374. DOI: https://doi.org/10.1108/09513550210435719