

Analysis of the Level of Sustainability of Agricultural Extension Models for Millennial Farmers in West Java, Indonesia

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Abstract

Many government extension programs covering several aspects of sustainable agriculture have been carried out. It turns out that these extension programs have not been fully effective in encouraging farmers to implement sustainable agriculture. Realizing how important the role of agricultural instructors is, agricultural instructors in the current digital era should be able to become facilitators who play a role in the process of assisting the transfer of technology and innovation to millennial farmers. The aim of this research is to analyze the level of sustainability and analyze sensitive factors or attributes that influence the level of sustainability of the millennial farmer extension model in West Java. The research used a survey method on 400 millennial farmers. Data were analyzed using Multidimensional Scaling (MDS) in the RAP-Farmer Extension technique. The research results show that the sustainability of the millennial farmer extension model in West Java is quite sustainable (54.14). Sustainability in this research is analyzed through economic dimensions, social dimensions, environmental dimensions, institutional dimensions and technological dimensions. The institutional dimension has the highest value because extension institutions are run by government and private institutions. Meanwhile, the lowest value is the technological dimension i . the sustainability of the technological dimension is influenced by internet networks and use of social media.

Keywords: Sustainability, Model, Extension, Farmers, Millennials.

INTRODUCTION

Low public interest in the agricultural sector causes slow regeneration of farmers and has the potential to threaten food sovereignty. Several facts show that the regeneration of farmers in Indonesia is slow and relatively low. This condition is shown by the smaller portion of young farmers compared to older farmers. Data from the agricultural census of the Central Statistics Agency in 2013 (BPS 2013) shows that young farmers (<35 years) are only 12.87 percent, very few compared to elderly farmers (54 years), namely 32.76 percent and middle age (35 – 54 years). year 54.37 percent. Furthermore, the share of farmers over the last 10 (ten) years has decreased by around 15 percent. This can be seen from the results of a comparison between the 2003 agricultural census and the 2013 agricultural census data. The results of the 2003 census (BPS 2003) show that there are 31,232,184 farming households out of a total of 56,041,000 households or 55.73 percent. Furthermore, the 2013 census results (BPS 2013) recorded 26,135,469 farming households out of a total of 64,041,200 households or 40.81 percent. The latest data on the state of the workforce in February 2022, B PS noted that young farmers (<35 years) are only 23 percent, still less than older farmers (>54 years), namely 37 percent and middle age (35 - 54 years). 40 percent. This fact indicates that the majority of farmers in Indonesia are elderly and proves that there is a decline in the population engaged in agriculture, especially among the younger generation.

Referring to several research results, it reports things that are thought to be the cause of the slow regeneration of farmers in Indonesia. The younger generation has motivation as shown by their low interest in activities in the agricultural sector. Wiyono et al.'s research. (2015) noted that the interest of the younger generation, which includes indicators of interest, aspirations and desire to become farmers, is relatively low in both food crops

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and horticulture commodities. This research not only shows the interest of the younger generation but also the interest of parents in their children's activities in the agricultural sector, which turns out the results are also relatively low. Furthermore, the younger generation has a bad perception of the agricultural sector. The research results of Wiyono et al. (2015) also stated that the majority of the younger generation stated that agricultural conditions were worrying, both for food crops and horticultural commodities. Another cause is that the capacity of the younger generation in the agricultural sector is relatively limited. Anwarudin (2017) stated that the younger generation is a generation that does not have much experience, even though many of the younger generation are children of farmers, they are not necessarily involved in the agricultural sector in their daily lives. Therefore, it is still very necessary to increase the capacity of the younger generation to carry out activities in the agricultural sector. Likewise, the younger generation who have been active in the agricultural sector are slow to achieve independence. As stated by Setiawan (2015), the lack of agribusiness experience, lack of support, weak attraction and the long adaptation process make it slow for young agribusiness actors to achieve independence. It was further stated that only farmers with more than 10 years of experience and who are innovative are truly empowered and independent.

The slow and relatively low regeneration of farmers is actually not only happening in Indonesia, this is also happening in developed countries. Hamilton et al. (2015), Zagata and Sutherland (2015) report that developed countries in Europe are experiencing a decline in the number and aging of farmers, while the younger generation is less interested in agriculture. However, they have tried to create policies with various training programs and protection for domestic commodities as well as maintaining adequate profit margins. Several other developed countries have implemented dumping policies to maintain domestic agricultural commodity prices so that farmers' livelihoods are maintained.

Conditions in West Java Province, based on population projection calculations from the 2020 Population Census, in 2021 it is estimated that there will be 48.78 million people in West Java. If proportioned, youth in West Java reaches 24.74 percent with the largest composition aged 19-24 years (39.67%) and aged 25-30 years (39.60%) compared to those aged 16-18 years (20.73%). In fact, the data collection results show that there are more youth living in urban areas than youth living in rural areas (80.12% compared to 19.88%). This also has an impact on the characteristics of the main livelihood of youth in West Java, at least in the agricultural sector (7.22%) compared to manufacturing (33.15%) and services (59.63%). If the results of the analysis of the census data described above are not taken seriously, it is feared that the number of farmers in Indonesia will continue to decline.

The deal is that farmer regeneration can continue sustainably for several reasons. Farmer regeneration is a condition for achieving sustainability (Adewole 2015). Agricultural development is currently focusing on sustainable *agriculture*. Sustainable agriculture can realize just and sustainable agriculture so that it can guarantee the food needs of the present generation without reducing the fulfillment of the food needs of future generations.

Regeneration of farmers is important for realizing food security. The current focus of agricultural development is also on food security. Food security is characterized by the availability of food and a person's ability to access that food. Food security is a measure of resilience to disruption or absence of important food supplies in the future. To ensure future food security, future agricultural conditions are determined. The future state of agriculture will be determined by the existence of today's young generation. Thus, realizing future food security really depends on the regeneration of farmers.

Regeneration of farmers is also important to support the realization of food self-sufficiency in Indonesia, the world's food basket by 2045. According to FAO estimates (2012), with an increase in population of 2 billion people in 2050, food production must be increased by 70% to meet world food needs. Even developing countries such as those in the Asia Pacific region, including Indonesia, must be able to increase food production by up to 100% (Sulaiman *et al.* 2018). To realize this requires farmers who are available on an ongoing basis. In fact, currently many farmers in Indonesia are elderly. Therefore, farmer regeneration is needed as a replacement for these old farmers entering retirement.

The opportunity for involvement of the younger generation is actually quite large considering that Indonesia has experienced a demographic bonus since 2015. The demographic bonus is characterized by the dominant number of the productive age population compared to the non-productive age population. Moreover, the population of productive age is also dominated by millennials (Kemen PPPA and BPS 2018) who are starting to get more involved in marketing agricultural products. Permani *et al.* (2020) estimates that more than 80% of millennials are involved in agrifood e-commerce.

The Ministry of Agriculture, through the Agricultural Extension and Human Resources Development Agency (BPPSDMP), is trying to accelerate the regeneration of farmers by facilitating millennial farmers to become strong and qualified entrepreneurs through the Youth Entrepreneurship and Employment Support Services (YESS) Program. This program was held thanks to collaboration with the International Fund for Agricultural Development (IFAD for the 6 year program running (2019-2025).

The YESS program is implemented in four provinces in 15 districts, namely South Kalimantan Province (Banjarbaru District, Tanah Laut District and Tanah Bumbu District); South Sulawesi Province (Bantaeng District, Bone District, Bulukumba District and Maros District); West Java Province (Sukabumi Regency, Cianjur Regency, Tasikmalaya Regency and Subang Regency); and East Java Province (Malang Regency, Malang Regency, Tulungagung Regency and Pacitan Regency). The program targets are young people in rural areas from disadvantaged families; as well as young people who are at great risk of poverty. The target to be achieved during the 6 years of this program is 320,000 young people in rural areas (Ministry of Agriculture, 2019).

The YESS program in West Java has the potential to produce 19 thousand millennial farmers. After three years, these millennial farmers need to obtain in-depth information about the impact of the program and the sustainability of their farming both with and without the program. It is also necessary to explore appropriate extension models for millennials to attract their interest in working in the agricultural sector. Based on this background, the author will research and design an agricultural extension model that suits the character and capacity of millennial farmers to attract millennials' interest in working in the agricultural sector as an effort to overcome the slow regeneration of farmers in West Java Province.

Definition of internal counseling Law No.16 of the Year 2006 concerning Agriculture, Fisheries and Extension Systems Forestry implies the importance of education regarding sustainable agriculture. In this law Extension is defined as a learning process for the main actors and business actors so that they are willing and able to help and organize themselves in access market information, technology, capital, and other resources, in an effort to improve productivity, business effectiveness, income and welfare, as well as increasing awareness in preserving environmental functions.

Sustainable agriculture is an approach to fulfilling food for humans without destroying nature with low input (Van and Yapwattanaphun, 2015). Sustainable agriculture requires that the environment be maintained because it will have an impact on the welfare of farmers in the future. The extension sustainability system can be viewed from economic, social, environmental, institutional and technological dimensions.

West Java Province BPS data (2023) shows that poverty occurs in villages where the majority of their livelihoods are as farmers. The BPS data also shows instability in horticultural productivity. In accordance with existing facts and laws, the implementation of outreach regarding sustainable agriculture in the field of horticulture or what can be called sustainable horticulture needs to be implemented.

Government extension programs that cover several aspects of sustainable agriculture have been widely implemented, such as Climate Field Schools (SLI), Field Schools-Integrated Crop Management (SL-PTT), Field Schools-Integrated Pest Control (SL-PHT), *General Agricultural Practices-Standard Operating Procedure* (GAP-SOP) and the Sustainable Environmentally Friendly Agricultural Development Acceleration model (m-AP2RL2). It turns out that these extension programs have not been fully effective in encouraging farmers to implement sustainable agriculture.

Realizing how important the role of agricultural instructors is, agricultural instructors in the current digital era should be able to become facilitators who play a role in the process of assisting the transfer of technology and innovation to a farmer group. A facilitator is expected to be able to facilitate what farmers need and help

overcome problems that arise and require appropriate solutions in handling them in the field. In particular, the problem faced by an extension agent in the current digital era tends to be delays in delivering information related to developments and even related to basic agricultural agribusiness managerial concepts. However, the real obstacle in extension activities for millennial farmers is whether they still use the old methods. Meanwhile technology is developing rapidly in line with the needs of millennial farmers in managing their farming businesses. Therefore, this research aims to analyze the level of sustainability and analyze sensitive factors or attributes that influence the level of sustainability of the extension model for millennial farmers in West Java. The results of this research provide an empirical reference for increasing the level of sustainability of agricultural extension models for millennial farmers, especially in West Java and generally in Indonesia.

RESEARCH METHODS

This research was designed using quantitative methods. According to Creswell (2014), quantitative design allows researchers to collect numerical data through statistical analysis of samples using predetermined instruments, accompanied by survey research methods. This research uses primary and secondary data. Primary data is a data source obtained not from intermediary media, but a data source obtained directly from the original source. Primary data is the result of observations of an object or physical object, event or activity and test results and can be in the form of opinions of subjects or individual people or groups, in this case millennial farmers. Secondary data is a source of data obtained indirectly through intermediary media or obtained and recorded by other parties. In this research secondary data only supports initial data collection as research *output*. The data in question is data obtained from the Central Statistics Agency, Ministry of Agriculture, and other related institutions.

The sampling technique used is *Proportional Random Sampling*. According to Sugiyono (2017) *proportional random sampling* is a method of taking samples from members of the population using a random method without paying attention to strata. Determining the number of samples in this research was carried out using the Slovin formula (Ellen, 2020).

Determination of the sample size was calculated using the Slovin formula with the desired level of accuracy or confidence being 9.5 % or with an expected level of precision of 5 % based on the consideration that for social research the error rate can still be tolerated up to 10%. So the large number of samples obtained from a population of 400 respondents. The number of samples was then taken using *proportional random sampling* based on the number of millennial farmers in the four districts of the Youth Entrepreneurship and Employment Support Services (YESS) Program in West Java, presented in Table 1 below.

Table 1. Details of the Research Sample

No	Research sites	Population	Sample
1.	Cianjur Regency	12,227	129
2.	Sukabumi Regency	11,909	116
3.	Subang Regency	9,490	101
4.	Tasikmalaya Regency	4,088	44
		37,714	400

The data analysis used in this research is sustainability analysis carried out using the *Multi Dimensional Scaling* (MDS) approach, which is a *multidisciplinary rapid appraisal technique* with a number of attributes that are easy to scroll. *Multi Dimensional Scaling* (MDS) is a statistical technique used to measure proximate (closeness) between objects in the form of Fauzan et al (2016). According to Mawarsari and Noor (2020), the stages of data analysis in this research include: determining attributes, assessing each attribute, coordinating analysis with MDS, assessing sustainability indices and status, sensitivity analysis (*Leverage Analysis*), and uncertainty analysis (*Monte Carlo Analysis*).

In this research, there are attributes that are grouped into five dimensions, namely economic, social, environmental, institutional and technological. These attributes are grouped based on "good" or "bad" criteria which are then coordinated using the MDS method in the Rap- Farmer Extension (*Rap fish modified*). The

output from the results of this analysis is in the form of a sustainability index for the millennial farmer extension model from the five dimensions and each dimension is shown in the form of a score on a scale of 0-100 and depicted with a kite *diagram* .

The results of the MDS analysis in the form of a sustainability index are used as a score to determine the level of sustainability based on the sustainability level categories. The sustainability level assessment categories can be seen in Table 2.

Table 2. Sustainability Level Categories Based on RAP-Farmer Extension Index Results

Index Value	Category
0 – 25	Bad (Not Sustainable)
25.01 – 50	Less (Less Sustainable)
50.01 – 75	Sufficient (Sufficiently Sustainable)
75.01 – 100	Good (Very Sustainable)

Other results from the MDS analysis are the *S- Stress* (*Standardized Residual Sum of Square*) value and the coefficient of determination (R^2), both of which reflect the accuracy (*goodness of fit*) in the MDS analysis which is also used to see whether additional attributes or attributes need to be added. existing ones have reflected the accuracy of each dimension analyzed. A low *S- Stress* value indicates *good fit* and a high one indicates the opposite (Fauzi & Anna, 2002). The model is said to be good if the *S- Stress value* is less than 0.25 and R^2 is close to 1 (100%), which means these attributes can explain almost 100% of the existing model (Pitcher et al, 2013).

Leverage analysis is an analysis that describes the sensitivity of each attribute to sustainability value and is used to determine sensitive attributes. Sensitive attributes are obtained by changing the *Root Mean Square* (RMS) ordination on the X-axis or sustainability scale. The greater the RMS change value due to the loss of a particular attribute, the greater the role of that attribute in forming the sustainability index (Mawarsari & Noor, 2020). In the next stage, Monte Carlo analysis is a simulation method for evaluating the impact of random errors *carried* out on all dimensions (Fauzi & Anna, 2002). Monte Carlo analysis is used to estimate the influence of errors at a 95% confidence level, or in other words, taking into account *uncertainty* . The Monte Carlo index value is then compared with the MDS index value. The closer the Monte Carlo index value is to the MDS index value, it can be concluded that the MDS analysis has a small error rate. MDS analysis, leverage analysis and Monte Carlo analysis were carried out using *Rapfish 3.1 software* downloaded from www.Rapfish.org.

RESULTS AND DISCUSSION

RESULTS

The sustainability of the millennial farmer extension model in West Java is seen based on its sustainability status through established sustainability indicators. Sustainability status analysis was carried out using the *Multidimensional Scaling* (MDS) analysis method and the *Rapfish analysis tool* which was modified into *Rap-Farmer Extension* in a multidimensional manner and on the five dimensions of sustainability, namely the economic dimension, social dimension, environment, institutional dimension and technological dimension. The statistical parameters in this research consist of Monte Carlo analysis, *S-Stress* and R^2 values . The *Rap-Farmer Extension* analysis shows *the goodness of fit value* which reflects the magnitude of the *S-Stress* and R^2 values .

According to Kavanagh and Pitcher (2004), a good model is if the *S-Stress* value is <0.25 and R^2 is close to 1 (100%). The *S-Stress* value produced in each dimension and multidimensional has a value of <2.50 , the smaller than 0.25, the better the *S-Stress value* . The *S-Stress* and R^2 values indicate that all the attributes used and analyzed dimensionally and multidimensionally have met the statistical criteria and are worthy of explaining the sustainability of the millennial farmer extension model.

Table 3. Results of the Sustainability Status of West Java Millennial Farmer Extension

Criteria	MDS	Monte Carlo	Difference	S-Stress	R^2
Multidimensional	54.14	52.87	1.27	0.17	0.93
Economy	48.54	47.52	1.02	0.17	0.93
Social	55.02	54.22	0.8	0.16	0.94
Environment	54.78	54.08	0.7	0.16	0.94
Institutional	55.23	54.22	1.01	0.15	0.94

Technology	46.11	45.35	0.76	0.17	0.93
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Source: Primary Data (processed)

Table 3 shows that the *S-Stress* value is between 0.15 – 0.17 and the R² value is 0.93 – 0.94, so it can be interpreted that the *goodness of fit* value in the *Rap-Farmer Extension analysis* has been fulfilled. According to (Kavanagh and Pitcher, 2004), the value of the coefficient of determination (R²) describes the attribute's ability to explain and contribute to the sustainability of the system being analyzed and if the *S-Stress* value is met then the attribute configuration can reflect the original data so that it can be stated that the indicator what has been analyzed is accurate and can be accounted for statistically.

The difference between MDS and Monte Carlo at the 95% confidence level or 5% error rate is between 0.7 - 1.27, so it can be interpreted that the impact of scoring errors in the analysis is relatively small. The difference value of this analysis is <5%, so the results of the MDS analysis are adequate as an estimator of the sustainability index (Kavanagh and Pitcher, 2004).

Rap-Farmer Extension analysis using the *Multi Dimensional Scaling* (MDS) method produced a sustainability index value for millennial farmer extension in West Java of 54.14, which means this value is in the range of 50 - 75 and is included in the "quite sustainable" category with a value of *S-Stress* 0.17 and R² value 0.93 as seen on the following ordination scale:

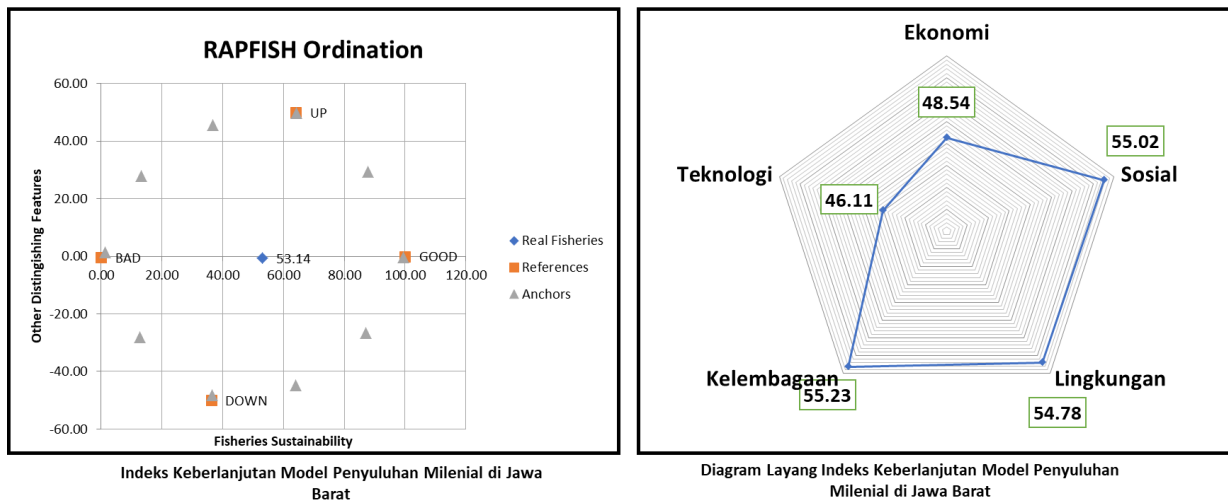


Figure 1. Sustainability of the Agricultural Extension Model for Millennial Farmers in West Java

Rap-Farmer Extension analysis in Figure 1, the sustainability index value of the millennial farmer extension model in West Java multidimensionally it is 54.14. This value is influenced by the calculation of a combined analysis between all dimensions (economic, social, environmental, institutional and technological) which is called multidimensional analysis. Thus, it can be concluded that the millennial farmer extension model in West Java is quite sustainable. in line with research by Mulia et al (2021); Hasdi et al (2015) stated that the multidimensional sustainability index value is quite sustainable.

Each dimension has attributes that are parameters for the sustainability of the millennial farmer extension model. The sustainability index value is obtained based on an assessment of 30 sustainability attributes from each dimension. The sustainability index value for each dimension projected in the flyover diagram (Figure 1) means that the further the sustainability point moves away from 0, the greater the sustainability value. According to Fauzi and Anna (2002), flyover diagrams are often referred to as "radar" diagrams where the closer the analysis distance to the zero point, the more it shows low sustainability and vice versa. Based on the fly diagram, it can be seen that the sustainability index value for the technological dimension has the lowest value, followed by the economic dimension, environmental dimension, social dimension and the dimension with the highest value is the institutional dimension. The sustainability index value for each dimension based on the flyover

diagram is still not precise, meaning that each sustainability dimension is still not applied evenly and in a balanced manner.

The flyover diagram can illustrate the sustainability status of the millennial farmer extension model in West Java in an integrated manner between various sustainability dimensions consisting of economic dimensions, social dimensions, environmental dimensions, institutional dimensions and technological dimensions, the calculation results of which are shown in more detail in the following figure.

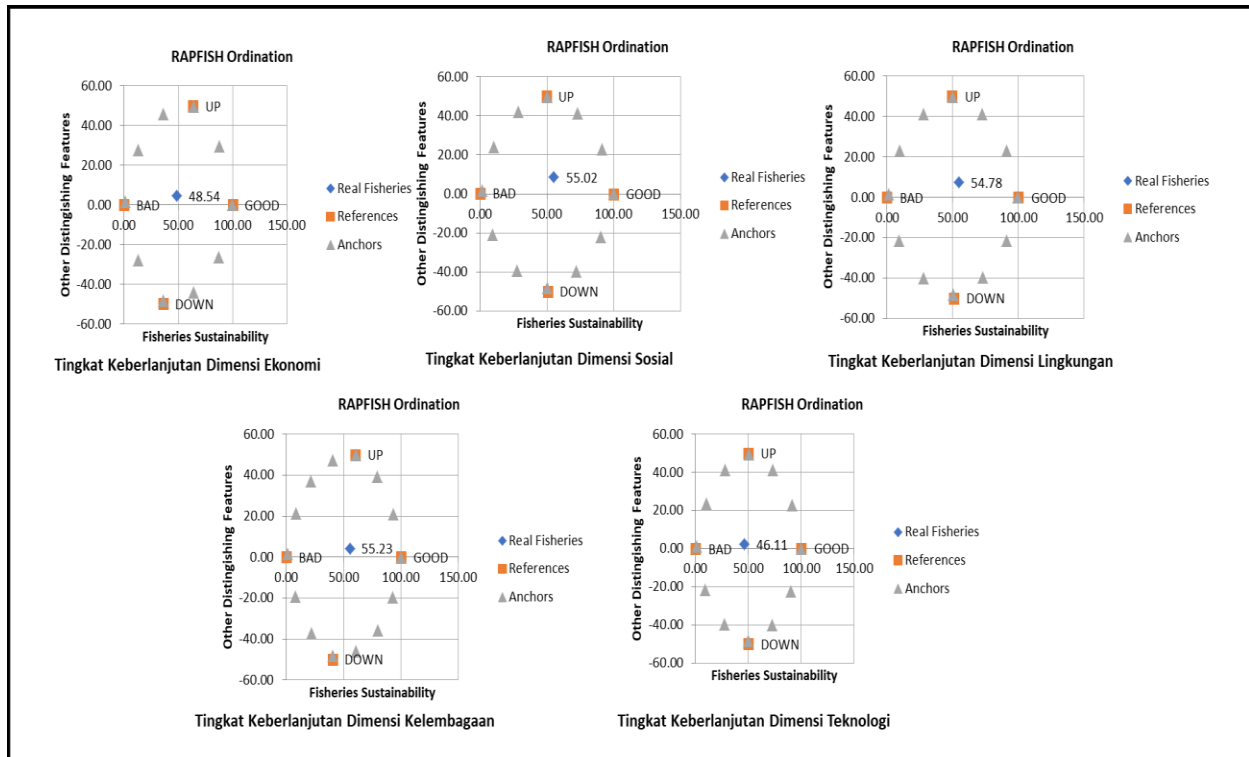


Figure 2. Level of Sustainability for each Dimension

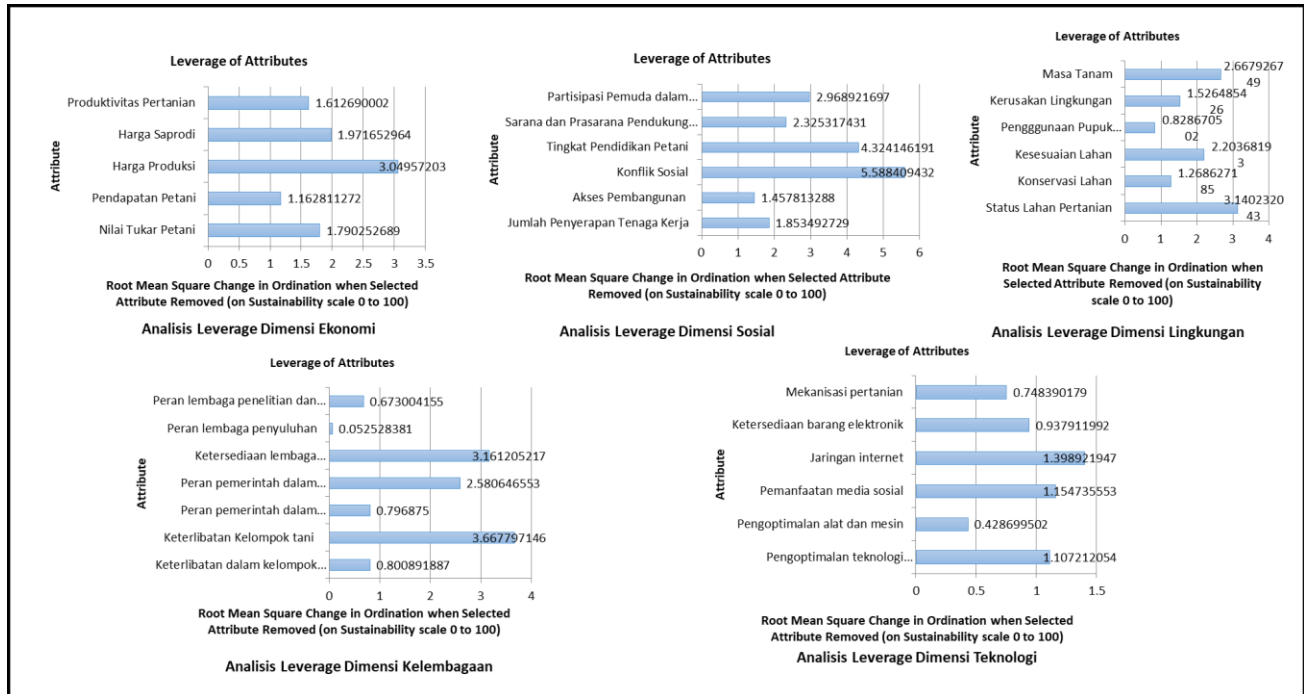


Figure 3. Leverage Value for each Dimension

DISCUSSION

Economic Dimension Sustainability Status

Covering economic aspects, sustainable development extension is closely related to economic growth and how to find ways to advance the economy in the long term and can improve the welfare of the current generation without reducing the ability of nature, society and the economy to increase the welfare of future generations. So, if the current generation can progress then the value of sustainable agricultural development will continue to advance and develop in the future (Sahban & Se, 2018) .

The economic dimension is one of the most important criteria in measuring the sustainability of the millennial farmer extension model. The economic dimension is also one of the responsibilities in the concept of sustainable development stated by Styaningrum (2021) , namely economic success which means the wise use of financial resources for the welfare of society. There are five measurement attributes in the economic dimension that are analyzed using the *Rap-Farmer Extension analysis* , including: a) Farmer's exchange rate, b) Farmer's income, c) Production price, d) Production price and e) Productivity.

Sustainability analysis results The economic dimension of the millennial farmer extension model for all attributes shows that the sustainability index value for the economic dimension is 48.54 and is included in the less sustainable category, according to the value range of 25 – 50 (Wibowo et al , 2015). Coordination analysis in the economic dimension produces an R² value = 0.93 and an *S-Stress value* of 0.17 or 17%. Analysis of the economic dimension in this research shows that *the goodness of fit condition* is in the fair category . According to Kavanagh and Pitcher (2004), analysis in *Multi Dimensional Scaling* (MDS) is said to be good and acceptable if the *S-Stress value* is <25% or (<0.25) and the R² value is close to 1 or 100%. This shows that the attributes tested in the economic dimension can explain or approach 100% of the original model.

leverage analysis method in the *RAPFISH software* shows that of the five attributes tested, it is known that there are two sensitive attributes that most influence the sustainability of the millennial farmer extension model in West Java, namely the production price with an RMS value of 3.05 and the input price attribute with RMS value 1.97. According to Mamat et al (2019), the greater the *leverage analysis value* , the more sensitive the attribute is in

influencing sustainability. The previous description shows that in an effort to improve sustainability status from the economic dimension, it is necessary to pay attention to and consider these two attributes.

The first attribute that most influences the sustainability of the millennial farmer extension model in West Java in the economic dimension is the total production price. Agricultural production in West Java fluctuates because it is seasonal, where the potential for price increases occurs during the rainy season, the month of Ramadan, before the New Year or other major and religious holidays. According to Windhy & Jamil (2021). The increase in agricultural prices in certain seasons is significant enough to influence the level of inflation in society. Domestic agricultural money prices continue to increase and become increasingly volatile, resulting in a shift in the timing of Indonesia's highest prices which are much higher than prices on the international market, resulting in Indonesia's lower competitiveness compared to other countries.

The next attribute that most influences the sustainability of the millennial farmer extension model in West Java in the economic dimension is the price of inputs. Based on current field conditions, the government limits the amount of subsidized fertilizer, both in quantity and on certain commodities, so that millennial farmers have to pay higher production costs. Some farmers also think that currently there is a shortage of chemical fertilizers, which is affecting production levels which directly impacts farmers' welfare.

Social Dimension Sustainability Status

The social aspect is an important criterion in realizing the sustainability of the millennial farmer extension model. Social aspects are one of the reference pillars of sustainable development which can contribute to rural development and reduce poverty (Iskandar, 2020). Nasdian (2014) is of the view that social aspects are part of the three main perceptions of sustainability, namely the social definition aimed at the continuous fulfillment of basic needs for security, justice, freedom, education, work and recreation.

In this research, there are six attributes used to analyze the sustainability of the millennial farmer extension model in West Java in the social dimension, namely a) number of labor absorption, b) access to development in rural locations c) social conflict, d) level of farmer education, e) facilities and supporting infrastructure, and f) youth participation in farmer groups (Puspita et al, 2023; Saleh & Riyadi, 2023; Bisht et al, 2020). Based on the results of the *Rap-Farmer Extension* analysis with the six attributes in the social dimension, the sustainability index value in the social dimension is at 55.02, including in the value range 51 - 75, so the social dimension category is quite sustainable (Alamsyah, 2023). Coordination analysis shows that *the goodness of fit condition* is in the fair category *with* a determination value of $R^2 = 0.94$ and an *S-Stress value* of 0.16 or 16%. These results fulfill the statistical rules in *Multidimensional Scaling* (MDS) analysis.

Sensitivity analysis (*leverage*) was carried out to determine the most sensitive attributes influencing the sustainability of millennial farmer extension in West Java on the social dimension. The greater the change in the RMS value, the more sensitive the role of this attribute is to increasing sustainability status. Based on the results of sensitivity analysis (*leverage*) carried out on six attributes of the social dimension, it is known that there are two attributes that have the highest leverage value that influence the sustainability status of the social dimension, namely social conflict with an RMS value of 5.59 and the attribute of farmer education level with an RMS value of 4.32.

In fact, conflict occurs not only because of the presence of something new (innovation factors, inventions, etc.) and is responded to with pros and cons, but conflict can also occur because of certain social conditions that have shackled society for too long (Hamzana & Romadi, 2017). In this context, the alleged emergence of conflict in question is conflict that occurs in society in relation to program implementation. Conflicts that occur can be between the group implementing the program and the target group receiving the program, between village elite groups and marginalized groups, between individuals in one group and there are many other types of conflicts between groups, so there is a need for clearer education and measurable so that the public understands the presence of this extension program as a good innovation to develop.

The education level attribute is the educational condition of farmers in rural areas. Currently, it cannot be denied that the educational condition of farmers is still quite low so efforts that can be made are increasing formal

education, internships, training from both government and private agencies. It is hoped that the presence of counseling for millennial farmers can be a solution to improve this condition so that the majority of the community can gain an understanding of how agricultural businesses are being developed (Sukmawati and Maryanti, 2022).

Environmental Dimension Sustainability Status

According to Ulum & Ngindana (2017) environmentally sustainable, extension does not have a negative effect on the local ecosystem. Apart from that, conservation is a necessity that must be pursued to protect natural resources and the environment from the negative effects of agricultural business activities. One of the requirements for sustainable natural resource (SDA) processing is to maintain the previous function of natural resources. Apart from that, it must have *Eco-Efficiency criteria* which means being efficient both economically and environmentally. Attributes in the environmental dimension were chosen to reflect how the use of natural resources and the environment impacts sustainability (Mamat et al, 2019).

Measuring the sustainability of the millennial farmer extension model in West Java in the environmental dimension uses six measurement attributes which are analyzed using *Rap-Farmer Extension analysis*, including: a) Agricultural land status, b) land conservation, c) land suitability, d) use of chemical fertilizers, e) environmental damage, and f) planting period (Fajar et al, 2023; Maukar & Runtuk, 2023; Akpoti et al, 2019). Based on the results of the *Rap-Farmer Extension analysis*, the sustainability index value of the millennial farmer extension model in the environmental dimension is 54.78 and is in the quite sustainable category. Coordination analysis on environmental sustainability dimensions produces an R2 value = 0.94 and an *S-Stress value* of 0.16 or 16%. Thus, the analysis of sustainability in the environmental dimension shows that *the goodness of fit condition* is in the less category.

Leverage analysis is the next stage after carrying out the *Rap-Farmer Extension analysis*. This analysis functions to see the attributes that most sensitively influence sustainability in the environmental dimension. The results of the *leverage analysis* state that the two most sensitive attributes in influencing the sustainability of the millennial farmer extension model in West Java in the environmental dimension are land status with an RMS value of 3.14 and planting period attributes with an RMS value of 2.67.

The first attribute that influences the sustainability of millennial farmer extension in West Java on the environmental dimension is the status of agricultural land. According to Syahza (2019), the current condition of farmers in rural areas requires that they cultivate only a limited area of land, which affects the sustainability of their farming business. Millennial farmers in West Java mostly rely on land inherited from their families so that there is no significant development of the farming businesses that are being developed. The next attribute influencing the sustainability of the millennial farmer extension model in West Java in the environmental dimension is the planting period. Currently, most farmers feel the uncertainty of the planting season because the conditions of the rainy season and dry season cannot be predicted, so farmers really consider the commodities they cultivate.

Sustainability Status of Institutional Dimensions

Institutions that have *authority*, responsibility and role in supporting the implementation of extension activities. Internal extension institutions Law No.16 of the Year 2006 concerning Agriculture, Fisheries and Extension Systems Forestry implies the importance of education regarding sustainable agriculture. In this law Extension is defined as a learning process for the main actors and business actors so that they are willing and able to help and organize themselves in access market information, technology, capital, and other resources, in an effort to improve productivity, business effectiveness, income and welfare, as well as increasing awareness in preserving environmental functions.

Measuring the sustainability of the millennial farmer extension model in West Java on the institutional dimension uses seven measurement attributes, namely a) involvement in farmer youth groups, b) involvement of farmer groups, c) the government's role in determining production prices, d) the government's role in determining input prices, e) availability of financing institutions, f) role of extension institutions and g) role of research and training institutions (Ittaqillah et al, 2020; Ssebunya et al, 2017; Mutmainah, 2014).

Rap-Farmer Extension analysis on the institutional dimension, it is known that the sustainability index value of the millennial farmer extension model in West Java on the institutional dimension is 55.23, which is in the quite sustainable category. These results conclude that the institutional dimension still needs improvement and improvement in the future. *Rap-Farmer Extension* analysis in the institutional dimension was carried out to produce $R^2 = 0.94$ and the *S-Stress value* was 0.16 or 16%. So the *goodness of fit value* in the sustainability analysis of the institutional dimension of sustainable extension is in fair condition and has met the requirements for a good MDS analysis. Sensitivity analysis was carried out to see the most sensitive attributes in influencing the sustainability of the millennial farmer extension model in the institutional dimension. Based on *leverage* analysis, it is known that there are two attributes that most sensitively influence the sustainability of the institutional dimension, namely the involvement of farmer groups and the availability of financing institutions.

The first attribute that most sensitively influences the sustainability of the millennial farmer extension model in West Java in the institutional dimension with an RMS value of 3.67 is the involvement of farmer groups. Farmer institutions are strategic institutions in assisting the government in developing the nation towards a more prosperous society. Farmer groups as farmer institutions in society at the lowest level certainly have a very important role in helping farmers. The role of farmer institutions is to be able to develop farmer groups as effective models in the application of science and technology for farmers so that farmers become empowered and develop their farming activities (Djelau et al., 2014; Nona et al., 2018; Nona & Juniasih, 2020). Thus, the role of farmer groups is very necessary in realizing the ideals of village development and society in general.

The second most sensitive attribute influencing the sustainability of the institutional dimension is the availability of financing institutions. Agricultural financing is an important component in efforts to develop the agricultural sector. On the other hand, banking attention to the agricultural sector is very low. Banks tend to pay more attention to the non-agricultural sector, this is partly because businesses in the agricultural sector have high risks and slow turnover.

Collector traders are an informal source of financing that is mostly used by farmers. However, informal credit providers, namely product traders, provide credit loans with the aim of not only gaining economic profits, but also to bind farmers so that farmers will indirectly sell their crops to them, making farmers unable to determine the sales results from traders who want to buy at a certain price. higher. This shows that the availability of capital (credit) from both formal and informal institutions is an important component for the continuity of farming businesses. Several research results show that the accessibility of most farmers to formal credit sources is still very limited (Anggraeni, 2009; Nurmanaf et al. 2006; Weber and Musshoff, 2012; Yehuala, 2008). It can be said that the importance of credit availability for farmers is not yet fully supported by the existence of financing sources, especially from formal institutions.

Technology Dimension Sustainability Status

According to Wibowo (2020), the technological dimension of sustainability is the use and adoption of technology in extension to make it easier to access and obtain agricultural information. One of the important components in extension activities is the application, website and media used to provide education to millennial farmers. Measuring the sustainability of the millennial farmer extension model in West Java in the technological dimension uses six measurement attributes, namely a) optimization of cultivation technology, b) optimization of tools and machines, c) use of social media, d) internet network, e) availability of electronic goods and f) agricultural mechanization (Saragih et al, 2020; Nababan et al, 2017; Herdiana, 2019).

Rap-Farmer Extension analysis of the sustainability of the millennial farmer extension model in West Java in the technological dimension produced a sustainability index for the technological dimension of 46.11 and was included in the less sustainable category. This shows that the implementation of the technological dimension is still not optimal. The *Rap-Farmer Extension* analysis on the technological dimension was carried out with 2 (two) iterations resulting in an R^2 value = 0.93 and an *S-Stress value* of 0.17 or 17%. Thus, the technology dimension analysis in this research shows the *goodness of fit* condition in the less category.

Leverage analysis was carried out to determine the key attributes or attributes that are most sensitive in influencing the sustainability of the millennial farmer extension model in West Java in the technological

dimension. Based on the six attributes analyzed, two attributes were most sensitive to influencing the sustainability of the technological dimension, namely the internet network with an RMS value of 1.39 and the attribute of social media utilization. This shows that in an effort to improve the sustainability status of the technological dimension, it is necessary to pay attention and consider these attributes.

A sensitive attribute that influences the sustainability of the millennial farmer extension model in West Java in the technological dimension is the internet network. Internet conditions in rural areas sometimes still require quite intense improvement because millennial farmers prefer online learning systems so they require adequate internet network facilities and can be done anywhere (McHaney, 2023). The next most sensitive attribute is the use of social media. The current digital era makes it easier for farmers to optimize social media in promoting agricultural products so as to obtain more and more efficient selling value (Purwani, 2021).

CONCLUSION

The level of sustainability of the millennial farmer extension model in West Java is quite sustainable which is viewed from the economic dimension, social dimension, environmental dimension, institutional dimension and technological dimension. Of these five dimensions, the most sensitive main attributes that can influence sustainability include production prices, input prices, social conflict, farmers' education level, land status, planting period, involvement of farmer groups, availability of financing institutions, internet networks and use of social media. The suggestion from the research is that it is necessary to plan the development of the extension model for millennial farmers in an integrated and collaborative manner as a process towards integrated planning both hierarchically (province, district, city) and sectorally (various institutions/ministries) and synergy between stakeholders (academics, entrepreneurs, society, government and media).

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