

Analysis of Sustainable Livelihood level and its Influence on Community Vulnerability of Surumana Village, Central Sulawesi

Ardiyanto Maksimilianus Gai¹, Fitriah Maghfirah¹, Titik Poerwati¹ & Monsar Marito Sir¹

¹Urban and Regional Planning Department, Institut Teknologi Nasional (ITN) Malang, Jalan Bendungan Sigura-gura Nomor 2, Malang 65111, Indonesia;

*Corresponding author. *e-mail*: ardiyantomax@gmail.com

(Received: April 11th, 2020; Accepted: September 22nd, 2020)

ABSTRACT

Sustainable livelihood is an activity that can help households in meeting their needs for survival. However, frequent flooding, increase in population growth each year, lack of facilities that support livelihoods such as education and health facilities, has made community's livelihoods decline. Frequent flood results in reduced agricultural production. As a result, resources available at the research site become unbalanced. Therefore, this study aims to formulate a village development concept based on sustainable livelihood. This research was conducted in Surumana Village, Donggala Regency, Central Sulawesi Province by using primary and secondary data with a sample of 82 households. Likert scale was employed to measure one's or group's attitudes, opinions, and perceptions regarding social events or symptoms experienced. Besides, the Delphi method was also employed and used to gather opinions from experts through questionnaires with feedback mechanism while maintaining the anonymity of experts' responses. The study result show that the maximum resource strength is found in social capital. Meanwhile, the vulnerability that affects resources in Surumana Village is flooding. In addition, the factors that support realization are institutions, education, health, transportation, reducing flooding, and increasing agricultural production.

Keywords: sustainable livelihood, village development, vulnerability

INTRODUCTION

Tjokrowinoto (1996) said that village development is a development activity that takes place in the rural area which covers all aspects of life from all community layers carried out in an integrated manner by developing community self-help. The government plays a significant role in developing the country's economy, especially the local economy for rural or village communities (Matridi, 2014). This rural development involves projects and policies that are coordinated and aimed at improving the life pattern of the rural communities provided from the lower to the higher level (Saleh, 2016).

The rural development intends to advance the welfare and life quality of the community through the development of facilities, infrastructure, economy, and existing resource sustainable use. According to Heal *in* Fauzi (2004), the concept of sustainable rural development contains at least two dimensions. First, the time dimension because sustainability is not related to what will happen in the future, and the second, the interaction dimension between economic systems and natural resources and environmental systems.

The community is the heart of a sustainable livelihood development approach. Saragih *et al.* (2007) said that the focus on community is just as important at higher levels

as well as at the micro or community level (in which this method has been widely used).

Chambers & Conway (1992) stated that sustainable livelihood includes abilities or skills, assets (savings, resources claims, as well as access) and activities needed to live. A livelihood is considered sustainable if it is able to overcome and improve itself from anxiety and disasters, preserve or build up skills and resource, and administer sustainable livelihoods for the next generation. In addition, it also has a long-term and short-term contribution to other livelihoods at the regional and universal standing. Department for International Development (2005) stated that sustainable livelihoods aim to increase access to high-quality education, IT, coaching, as well as good nutrition and health. Supportive and akin social surroundings, better management, and protected access to natural resources are also important. Finally, a better and safer path to basic facilities, infrastructure, and financial resources are considered as the objectives.

United Nation Development Program or UNDP (2007) developed the principle of sustainable livelihoods where humans are the main focus of development (people-centered). Besides, they also understood holistic livelihoods, responded to the dynamics of community livelihoods, and optimized community potential. Finally, they aligned macro and micro policies and realized life sustainability. The sustainable livelihood framework illustrates the relationship between livelihood components in which its application becomes the perspective and guide in understanding and planning for sustainable livelihoods.

Surumana Village is located in Donggala Regency, Central Sulawesi Province and is in the Border Area between Donggala Regency, Central Sulawesi Province, and North Mamuju Regency, West Sulawesi Province, where generally, border areas often grow more slowly compared to surrounding villages. For that reason, this research aims to formulate the concept of developing Surumana Village based on sustainable livelihoods by looking at five

aspects including natural resources, human resources, physical, social, and financial capital.

LITERATURE REVIEW

Based on Law No. 32 of 2009 concerning Environmental Protection and Management in Article 1 paragraph 3, sustainable development is a conscious and planned effort that integrates environment, society, and economy into a development strategy to assure environmental integrity and safety, capability, welfare, and life quality of present and future generations.

Community participation is very important in the village development process. According to Adisasmita (2013) in the book on rural development, the community is invited and encouraged by the government to participate considering their understanding about their problems, interests, and needs. They understand the social and economic environment.

According to WCED (World Commission on Environment and Development, 2008), sustainable development is oriented to meet present needs without compromising the capability of future generations. Sustainable development mandates that all basic needs are met.

Sustainable development can be defined as development that does not result in a reduction in the future economic productive capacity. The productive capacity of the future depends on the supply of natural resources, human resources, capital, and technology. Future generations inherit from the current generation. Entrepreneurs and academics may be able to compensate for lost income from forest resources but not for biodiversity and life quality because future generations' tastes and preferences may differ from the current generation. Therefore, the present generation has to preserve the same resources that we have and to use them today as a right to be obtained by future generations.

1. Village Development Factor

In essence, national development is carried out to realize: a). A just and prosperous society; b). Equitable distribution of material and spiritual well-being. Where this is all based on the state philosophy in the condition of independence, sovereignty, unity, and sovereignty of the people in an atmosphere of life that is harmless, tranquil, systematic, and lively as well as autonomous. (Lemhanas, 1997).

Community participation greatly influences the success of village development. The factors of village development include:

a) Community participation

Community participation, according to Adi (2007) is participation in the process of problems and potential identification that occur in the community, decision-making and selection about alternative solutions to deal with issues, efforts implementation in overcoming a problem and community involvement in the changes evaluation process.

Participation under Law No. 25 of 2004 concerning the National Development Planning system (as one of the objectives of SPPN Article 2 paragraph 4 letter d) means “community participation aims to accommodate community interests in the preparation process of development plans.” From the experts’ explanation above, community participation is community involvement in making decisions to deal with and overcome problems for their interests in the process of evaluating changes that occur.

b) Village Fund Allocation

c) Human Resources

d) Natural Factor (Natural Resources)

2. Village Development Concept

Haris *in* Fauzi (2004) said that the concept of sustainability consists of three aspects of understanding, namely: first, economic sustainability which is defined as development that can continuously produce goods and services aiming to maintain the continuity of government and avoid sectoral

imbalances that can destroy agricultural and industrial production. Second, environmental sustainability functions as environmental absorption capacity which is expected to maintain the stability of available resources to avoid any exploitation. Third, social sustainability is a system for achieving equality and the provision of social services consisting of health, education, gender, and political accountability.

The sustainable village development concept contains at least two dimensions. First, time dimension because sustainability is not related to what will happen in the future. Second, the interaction dimension between economic systems and natural resource systems and the environment (Heal *in* Fauzi, 2004).

According to Sugandhy (2007), the sustainable village development concept implies that boundaries are determined by the level of society and social organizations regarding natural resources and biosphere ability to absorb various impacts of human activities. The development process takes place continuously and is supported by existing natural resources with environmental and human qualities that are increasingly developing within the scope of carrying capacity.

3. Sustainable Livelihood

Sustainable livelihood approach is a mindset about the purposes, scope, and priority of human development (Maas, 2015).

Sustainable Livelihood consists of natural, economic, financial, human, and social capital (Bhaduri *et al.*, 2018). The same thing was stated by Faiz *et al.* (2012) that natural capital from flowing resources is useful for where livelihoods originate such as environmental resources. Social capital comes from social resources such as group or community along with its access where people are attractive in livelihood quest. Human capital consists of competence, education, and fitness which are important to go after livelihood strategies. Physical capital consists of transportation, shelter, energy, and communication as well as the facilities that help

people to obtain financial resources which leads them to different options.

DFID *in* Endang (2011) argues that the goal of sustainable livelihoods is to improve access to high-quality education, information technology and coaching, as well as good nutrition and health; social environment; safe access and better management of natural resources; better access to meet existing essential facilities and infrastructure and safer access to financial resources.

From various definitions of sustainable livelihood, the research indicators in determining sustainable livelihood aspects are:

a) Natural Resources

Natural resources are resources derived from nature (land, water, air) and environmental conditions (hydrological cycle, sinking pollution, etc.) (Scones, 1998). Natural capital can be referred to as natural resources. Natural supplies that produce carrying capacity and benefit for human life. It consists of natural resources and productions, biodiversity, and all things related to the environment. This capital represents the natural and biological resources that surround a community (DFID, 2001).

According to Baiquni (2007), natural capital more describes the ownership or joint control of natural resources such as climate, soil fertility, and water sources as production capital. This varies from region to region, both in terms of availability and characteristics, to shape community livelihood patterns. In natural capital, an important distinction is made between renewable and non-renewable natural resources. Natural resources that are around the community and useful for life, such as agricultural land, forests, groundwater quality, mining products, beaches and rivers, and other resources provided by nature.

b) Human Resources

Human capital is owned by the community by utilizing health status which can determine someone's capacity to work and

education which determines the return of the labor that is released.

The definition of human capital is all the capacity which help human to seek different livelihood strategies and achieve community goals (DFID, 2000).

According to Scone (1998), these resources are in the form of assets existing in humans, namely intelligence, capabilities, health, and physical abilities which can lead to achieve sustainable livelihoods.

Human resources consist of skills, knowledge, labor capability, and good health is essential to go after different livelihood strategies and achieve their goals (DFID, 2000; Scones, 1998). A household consists of qualitative and quantitative individual characteristics which helps them to have income. Human resource characteristics include age, education, sex, health status, household size, dependency, leadership potential, etc. (Bezemer & Lerman, 2003; Farrington *et al.*, 2002; Kollmair & Gamper, 2002).

c) Physical

This resource includes basic infrastructures such as roads and transportation, markets, irrigation buildings, housing, and so on. For agricultural areas, irrigation infrastructure is very important because it can improve their agricultural output. Physical capital is basic infrastructure and facilities that are built to uphold the community's livelihood process. The infrastructure comprises the improvement of the physical environment to make community have more productive life tasks. Infrastructure is generally a public facility that is used without being charged directly. Except for certain infrastructures such as housing, electricity, toll roads, and drinking water. Certain facilities such as buildings, vehicles, etc. can generally be used privately or in groups through a rental system (DFID, 2001).

Physical capital shows land tenure, land area, types of cultivated plants, and

building ownership such as houses, vehicles, furniture, and household equipment, factories, and production technology. In this context, physical capital is in the form of road infrastructure, irrigation, and public facilities (Baiquni, 2007).

Physical capital includes goods or objects that are useful to support one's livelihood. For example, vehicles, homes, tools, or work tasks (Solesbury (DFID), 2003).

Physical capital consists of infrastructure and producers of basic goods essential to uphold livelihoods (DFID, 1999). The infrastructure comprises environmental physical changes that help people meet their primary needs and become more productive. Some components of the infrastructure that are usually important as a sustainable livelihood are economical transportation; safe residences and buildings; sufficient water supply and sanitation; irrigation machines, clean energy; and access to information (communication) (CARE, 2001; Kollmair & Gamper, 2002; Bezemer & Lerman, 2003).

d) Social

Putnam *et al.* in Suharto (2007) stated that social capital is the emergence of social organizations such as trust, norms, and networks that can improve the community by facilitating coordination and cooperation for various benefits.

Fukuyama (1995) stated that social capital is an ability that occurs from community trust. Also stated that social capital is a series of human relations processes that enable efficient and effective coordination to be mutually beneficial.

e) Financial

Financial/economic resources in the form of basic resources (cash, credit or debt, savings, and other economic resources including infrastructure equipment, basic production, and technology) that are very important to pursue any livelihood strategy (Scones, 1998).

Financial/economic capital includes reserves or inventory, savings, deposits, or movable goods that are easily cashed to achieve community livelihood goals. Apart from private property, financial sources include funds provided by banks or credit institutions. A regular flow of funds; these funds include pensions, salaries, assistance from the state, remittances from relatives who migrate, etc. (DFID, 2001).

According to Ellis (2000), financial/economic capital refers to households that have access to sources of financial capital, especially savings and access to credit in the form of loans. Both savings and direct money loans are forms of productive capital that can be transferred into other forms of capital or may be directly consumed.

Financial capital represents the financial resources that people use to achieve their livelihood goals (DFID, 1999) and consists of the availability of cash or equivalent to something that allows people to adopt different livelihood strategies (Kollmair & Gamper, 2002). Financial capital includes household savings, loans, and remittances from family members who work outside (CARE, 2001; Benzemer & Lerman, 2003).

4. Vulnerability

The vulnerability can be defined as the tendency to cause harm which has the potential to change natural hazards in a disaster (Formetta, 2019). According to some researchers, the vulnerability has several dimensions, namely: social, economic, environmental, institutional, physical, functional, and so on (Michellier, 2020).

Vulnerability includes two interrelated aspects. The external aspect includes shocks, season, and critical trends; and the internal aspect includes self-defense due to the inability to deal with trauma and stress (Tamangb, 2019).

Vulnerability will affect human systems and ecology at several levels including people, institutions, and places which in turn affect

human welfare and livelihoods (Mekonnen, 2019). It also impacts farming production, farmers' decisions, and farming sub-systems in developing countries (Greene, 2018).

Vulnerability context refers to a latent situation which at any time can affect people's lives. The vulnerability context is important to recognize various vulnerabilities and build a shared awareness that is very influential for the livelihood sustainability (DFID, 2001).

METHOD

This research was conducted in Surumana Village, Central Sulawesi using the Slovin sampling formula. This research consisted of 82 households across three hamlets. The total population in this study was 1,707 people and 429 households so that the percentage of allowance used was 10%. To find out the respondent samples, here are the calculations:

$$n = \frac{429}{1 + 429(0.1)^2} = 81.09 \approx 82 \text{ KK}$$

Table 2. Sustainable livelihood variable

Variable	Measured Data	Data Sources and Data Collection Methods	Analysis
Human Capital	Education, health, experience, knowledge, skills/expertise, workforce, self-character/motivation/innovation, and physical abilities	Structured Interview using a questionnaire;	Quantitative and qualitative descriptive The analysis includes the number of assets owned and can be accessed
Natural Capital	Tenure of land, land productivity, water sources, and environmental services	In-depth interview;	
Social Capital	Community organization, participation, mutual cooperation, kinship, social network	Field observation	
Financial Capital	Income, expenses, savings, debts and payables, support	Secondary Data	
Physical Capital	Facilities and infrastructure, work/production equipment, accessibility		

Source: Wijayanti, 2018

Furthermore, the analysis of the impact of the vulnerability context on the condition of sustainable livelihood by adopting the Hahn calculation was carried out (*in* Villagrán, 2006) namely by rating and weighting the 5 observation variables that affect (Harpe, 2015).

The data at the interval level shows the same range for two consecutive values, while

Based on the calculation above, the respondents were 82 households while determining the number of samples in each hamlet can be seen proportionally in Table 1 as follows:

Table 1. Number of samples taken

No.	Hamlet	The number of Households	Sample
1	Hamlet 1	162	35
2	Hamlet 2	151	30
3	Hamlet 3	116	17
Total		429	82

The following are some of the analyzes used in achieving the research objectives.

1. Sustainable Livelihood Analysis in Surumana Village

The research was initiated by identifying the level of sustainable livelihood for the community using a scoring analysis which is then depicted in a pentagon asset diagram.

The following table explains the research objectives, data, data sources, and analysis used in more detail in the study.

the feelings measured by the Likert Scale have different intervals range between the two levels. (Vonglao, 2017)

Thus, the range for the percentage of scale obtained from 100/highest value of 5 (five) = 20 (twenty) is:

Very bad : 0 – 20%
 Bad : 21 – 40%

- Sufficient : 41 – 60%
- Good : 61 – 80%
- Very good : 81 – 100%

2. Vulnerability Analysis to Sustainable Livelihood in Surumana Village

To achieve this, the Delphi method is used to establish the weight of each factor that has an influence on sustainable livelihoods to the vulnerability of society. The Delphi method is a forecasting technique, which entails the collection and compilation of knowledge from a selected group of experts. It fosters the

exploration of complex problems, especially in cases where historical data are lacking, there is insufficient knowledge, or a lack of agreement within the studied field (Brunnhofner, 2020). The DELPHI method is based on the analysis of the ideas of a group of experts who are specialized in a field of knowledge in search of a consensus (Núñez, 2014). Clearly, the steps of the Delphi method can be seen in the image below:

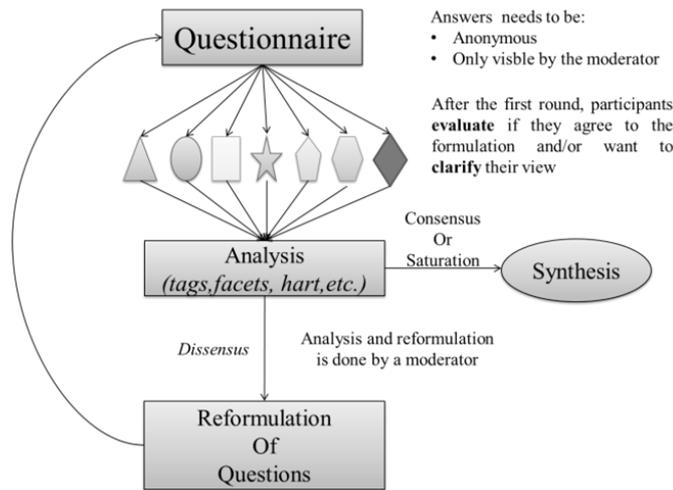


Figure 1. Delphi analysis process

RESULTS AND DISCUSSION

1. Sustainable Livelihood Level in Surumana Village

The data were collected using a questionnaire with a Likert scale where the alternative answers positive values from 5 to 1. The questionnaire consists of 20 items and distributed to 82 families as respondents. The researcher analyzed the response based on the list of questions raised in the questionnaire. In this Likert scale assessment, 5 classifications are determined, namely very good (5), good (4), sufficient/neutral (3), bad (2), and very bad (1). In the Likert scale rule according to Sugiyono (2014), the highest value of 5 with a very good classification. According to the rules of the Likert scale method, to find out the highest

value, the highest value is multiplied by the number of respondents which means the highest point is $5 \times 82=410$, and the lowest value is 82 which is obtained from the lowest point (1) with the classification of very bad.

Research result from the questionnaire is the main data in this research in addition to data from the literature study. The discussion is a calculation and analysis of data obtained from the research site. The data collected are primary data because they were obtained through from the first hand through research instruments or questionnaires. To find out the sustainable livelihood level of natural resources, human resources, physical capital, social capital, and financial capital using a Likert scale analysis, it can be seen in Table 3.

Table 3. Sustainable livelihood level in Surumana Village

No.	Variable	Σ	Percentage	Remarks
1	Land	230	56.1%	GOOD
2	Trees	273	66.6%	
3	Water	273	66.6%	
4	Land Products	233	56.9%	
5	Water Products	228	55.7%	
Means			60.38%	
6	Health	283	69%	FAIR
7	Education	178	43.4%	
8	Livelihood	217	52.9%	
9	Age	249	60.7%	
Means			56.5%	
10	Roads	209	51%	GOOD
11	House	208	50.7%	
12	Irrigation	234	57.1%	
13	Clean Water	357	87.1%	
14	Vehicle/transportation	214	52.2%	
15	Electricity	256	62.4%	
Means			60.08%	
16	Organization	255	62.2%	GOOD
17	Trust	335	81.7%	
18	Network	214	52.2%	
Means			65.37%	
19	Saving	160	39%	FAIR
20	Loan	177	43.2%	
Means			41.1%	

From the results obtained from the results of the questionnaire analyzed using the formula: $T \times P_n$, where (T) is the number of respondents and (P_n) is the choice of Likert score. Then, to

calculate the percentage, formula $Index\% = \frac{\text{Total score}}{Y \times 100}$ is used. Where Y is obtained from the highest score of Likert multiplied by the number of respondents.

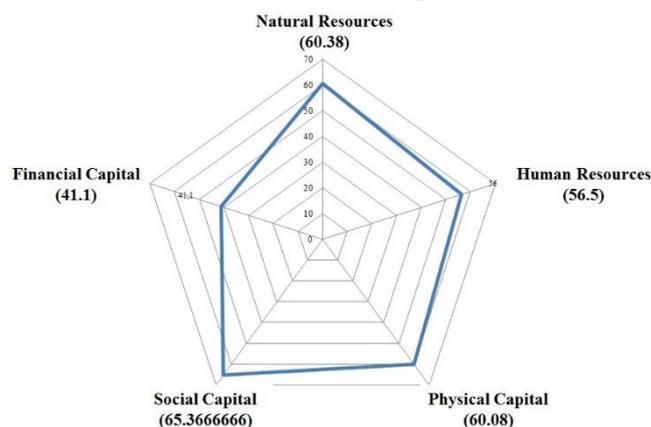


Figure 2. Pentagon assets graphic achievements sustainable Livelihood in Suruma Village

The pentagon assets graph shows that as a whole, the community of Surumana Village is able to access social capital with a percentage of 65.37%, and the lowest is community financial capital with a percentage value of 41.1%. The strength of social capital which reaches 65% is considered not maximal,

especially with other sustainable livelihood capitals whose figures are below 60%.

The overall results of the sustainable livelihood analysis in the asset pentagon in Surumana Village can be seen in Figure 1. Overall, the people of Surumana Village have a great influence on natural resources, human resources, physical capital, social capital, and

economic capital. The maximum strength of access to resource ownership is in social capital. Then, natural resources, physical capital, human resources, and the smallest financial is capital.

Furthermore, the vulnerability analysis of the Surumana Village community is carried out based on the achievement of the sustainable livelihood level with the influence of the vulnerability variable. In grouping respondents to determine the effect of the vulnerability context, they must be sorted according to their weighting hierarchy and then included in the Software Expert Choice.

2. Influence of Vulnerability to Sustainable Livelihood in Surumana Village

In grouping respondents to determine the effect of the vulnerability context, they must be sorted according to their weighting hierarchy and then included in the Software Expert Choice. According to the analysis results, it is found that the highest hierarchy in determining vulnerability is flooding and the lowest is land-use change. Therefore, the results of hierarchical determination can be seen in the figure as follows:

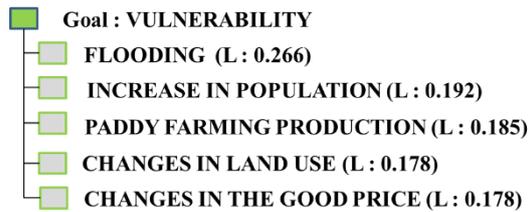


Figure 3. Results of the Expert Choice the effect of susceptibility on sustainable livelihood

a) Criteria Weighting

After compiling the hierarchy and identifying respondents, a weighting was carried out for each criterion aiming to determine which variables would be prioritized in knowing the effect of the vulnerability context on sustainable livelihood in Surumana Village. In weighting, researchers distribute questionnaires to respondents to get responses related to variables and indicators that are prioritized. Based on the

questionnaire results, the first order of importance was flooding.

Table 4. Conclusion of questionnaire results from 82 respondents

Variable	Order of Importance
Flooding	1
Increase in population	2
Paddy farming production	3
Changes in land use	4
Changes in the goods price	5

With the questionnaire results obtained, the priority weighting for the influence of the vulnerability context can be seen in the Table 5.

Table 5. Hierarchy of weighting of vulnerability context from 82 respondents

Variable	Weight
Flooding	0.266
Increase in population	0.192
Paddy farming production	0.185
Changes in land use	0.178
Changes in the goods price	0.178

The priority weighting of 82 respondents can be seen in Figure 4 below:

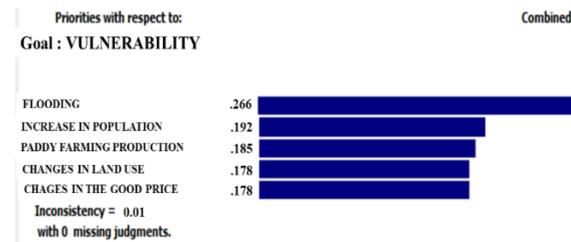


Figure 4. Priority weighting of 82 respondents

b) Decision Making

Based on the weighting in the previous stage to find out the variables that will be prioritized in the vulnerability context, the conclusions are as follow:

Table 6. Conclusion of priority weighting in the vulnerability context

Variable	Order of Importance	Weight	Inconsistency
Flooding	1	0.266	0.01
Increase in population	2	0.192	
Paddy farming production	3	0.185	
Changes in land use	4	0.178	
Changes in the goods price	5	0.178	

Table 6. Continued

Variable	Order of Importance	Weight	Inconsistency
Changes in land use	4	0.178	
Changes in the goods price	5	0.178	

From the analysis results using Expert Choice, the community tends to be more vulnerable to flooding. The relationship between the results of sustainable livelihoods analysis and the vulnerability level of flooding, it can be seen that the household access of Surumana Village to financial capital varies based on the type of need and opportunities to use it. For business or daily capital needs, the Surumawa community prefers to use banks as a source of capital. The results showed that the majority of respondents did not have savings. Saving ownership and community participation to save are very low. This makes it difficult for financial management if there is flooding that affects agricultural land and decreases productivity.

CONCLUSION AND RECOMENDATION

1. Conclusion

The conclusions from the results are as follows:

- From the sustainable livelihood level in Surumana Village in the pentagon assets, the community of Surumana Village has a great influence on natural and human resources, as well as physical, social, and economic capital. The maximum access to resource ownership is social capital.
- From the scaling and weighting analysis results, the flood is the most vulnerable variable that occurs in Surumana Village with the highest weighting result of 0.266. While the lowest variable is the changes in land use and goods price with a weighting of 0.178.
- In the Delphi analysis, the consensus results showed that in supporting the realization of sustainable livelihood, the

existence of institutions, the availability of health service facilities, education, transportation, reducing flood, and increasing agricultural production can be a supporting factor in the Surumana Village development. From the results of disagreement, the factors that support the realization of sustainable livelihood are known that the consensus value for the supporting factors is 100%.

2. Recommendations

Recommendations from the results are as follows:

- The level of sustainable livelihood in the pentagon assets will be balanced if the community is able to improve welfare by utilizing existing resources in Surumana Village and supported by the government's role in creating a balance in 5 (five) resources.
- There is a need for counseling from the department that handles disasters to reduce the frequency of flood by dredging mud and dirt in the river area.
- There needs to be an increase in technology and skills so that production is more efficient and optimal. This is because community members who work as farmers and fishermen still use traditional tools as work aids.
- The government needs to go directly to Surumana Village to improve village infrastructure, especially roads, electricity, building supporting facilities, and provide quality human resource socialization.
- Government institutions should prepare themselves with a variety of activity schemes that lead to resource product development in the Surumana Village.

REFERENCES

- Adi, I. R. (2007). *Perencanaan Partisiporis Berbasis Aset Komunitas. Dari Pemikiran Menuju Penerapan*. PT Raja Grafindo Persada.

- Adisasmita, R. (2013). *Teori-teori Pembangunan Ekonomi*. Graha Ilmu.
- Baiquni, M. (2007). *Strategi Penghidupan di Masa Krisis*. Ideas Media.
- Bezemer, D. J. & Lerman, Z. (2002). Rural Livelihoods in Armenia: The Centre for Agricultural Economic Research, the Department of Agricultural Economics and Management Discussion Paper No. 4.03
- Bhaduri, S., Sinha, K. M. & Knorrington, P. (2018). Frugality and cross-sectoral policymaking for food security. *NJAS - Wageningen Journal of Life Sciences*, 84, 72–79.
- Brunnhofner, M. (2020). The biorefinery transition in the European pulp and paper industry – A three-phase Delphi study including a SWOT-AHP analysis. *Forest Policy and Economics*, 110.
- Chambers, R. & G. Conway. (1992). Sustainable rural livelihoods: Practical Concepts for The 21st Century. IDS Discussion Paper 296. Brighton: IDS. (pp.7-8). 33.
- DFID. (1999a, 2000d, 2001). Sustainable livelihoods guidance sheets. Retrieved from www.livelihoods.org
- DFID. (2001). Sustainable Livelihoods Guidance Sheets. Eldis Document Store.
- DFID. (2003). *Achieving Sustainability: Poverty Elimination and the Environment, Strategies for Achieving the International Development Targets*. Department for International Development.
- DFID. (2005). *Sustainable Livelihoods Guidance Sheets. Department for International Development (UK)*. London. diakses di: http://www.livelihoods.org/info/info_guidancesheets.html tanggal 2 April 2012
- Endang, S. S. (2011). *Kertas Pedoman Penghidupan Berkelanjutan*. Program Studi Kependudukan Pascasarjana UGM. 92.
- Ellis, F. (2000). *Rural Livelihoods and Diversity in Developing Countries*. Oxford University Press
- Faiz, A., Faiz, Aysha., Wang, W. & Bennett, C. (2012). Sustainable rural roads for livelihoods and livability. *Procedia-Social and Behavioral Sciences*, 53, 1–8.
- Fauzi A. (2004). *Ekonomi Sumberdaya Alam dan Lingkungan: Teori dan Aplikasi*. Gramedia.
- Farrington, J., T. Ramasut, J. Walker, (2002). *Sustainable Livelihoods Approaches in Urban Areas: General Lessons, with Illustrations from Indian Cases*. ODI.
- Formetta, G. & Feyen, L. (2019). Empirical evidence of declining global vulnerability to climate-related hazards. *Global Environmental Change*, 57.
- Fukuyama, F. (1995). *Trust: Social Virtues and the Creation of Prosperity*. Free Press.
- Greene, C. (2018). Broadening understandings of drought–The climate vulnerability of farmworkers and rural communities in California (USA). *Environmental Science & Policy*, 89, 283–291.
- Harpe, S. E. (2015). How to analyze Likert and other rating scale data. *Currents in Pharmacy Teaching and Learning*, 7 (6), 836–850.
- Kollmair & Gamper (2002). Input paper for the Integrated Training Course of NCCR North-South Aeschiried, Swifter land (9-20, Sep, 2002)
- Lemhannas. (1997). *Ketahanan Nasional*. PT. Balai Pustaka.
- Maas, L. T., Sirojuzilam, E., & Badaruddin. (2015). The Effect of Social Capital on Governance and Sustainable Livelihood of Coastal City Community Medan. *Procedia-Social and Behavioral Sciences*, 211, 718 – 722.
- Matridi, R. A., Zuraidi, D., Setyadiharja, R., Sanopaka, E., Effendi, D. & Utari, D. S. (2014). An Evaluation of P3DK (An Acceleration of Development Village Program): A Reviewing on Failure toward Revolving Loan Fund System in Kepulauan Riau Province, Indonesia. *Procedia-Social and Behavioral Sciences*, 169, 189–197.

- Mekonnen, Z., Woldeamanuel, T. & Kassa, H. (2019). Socio-ecological vulnerability to climate change/variability in central rift valley, Ethiopia. *Advances in Climate Change Research*, 10 (1), 9–20.
- Michellier, C., Kervyn, M., Barette, F., Syavulisembo, A. M., Kimanuka, C., Mataboro, S. K., Hage, F., Wolff, E. & Kervyn, F. (2020). Evaluating population vulnerability to volcanic risk in a data scarcity context: The case of Goma city, Virunga volcanic province (DR Congo). *International Journal of Disaster Risk Reduction*, 45.
- Núñez, S. (2014). Application of a Model based on the Use of DELPHI Methodology and Multicriteria Analysis for the Assessment of the Quality of the Spanish Dry Ports Location. *Procedia-Social and Behavioral Sciences*, 162, 42–50.
- Saragih, S., Lassa, J. & Ramli, A. (2007). Kerangka Penghidupan Berkelanjutan. https://www.zef.de/fileadmin/user_upload/2390_SL-Chapter1.pdf (18/02/2012)
- Saleh, A. (2016). Concept of Village Regrouping as an Alternative Strategy for Sustainable Micro Regional Development. *Procedia-Social and Behavioral Sciences*, 216, 933 – 937.
- Scoones, I. (1998) ‘Sustainable Rural Livelihoods: A Framework for Analysis’, Working Paper 72, Brighton, UK: Institute for Development Studies.
- Sugandhy, A. & Hakim, R. (2007). *Prinsip Dasar Kebijakan Pembangunan Berkelanjutan Berwawasan Lingkungan*. Bumi Aksara.
- Suharto. E. (2007). *Kebijakan Sosial Sebagai Kebijakan Publik*. Alfabeta.
- Tamangb, Dorje, D., Udasa, P. B., Unnic, A., Hamala, M., Shresthad, K., & Pandite, A. (2019). Basin level gendered vulnerabilities and adaptation: A case of Gandaki River Basin. *Environmental Development*, 31, 43–54.
- Tjokrowinoto. (1996). *Pembangunan Untuk Rakyat*. PT. Pustaka Cidesindo.
- UNDP. (2007). *Modul Pembelajaran Pendekatan Penghidupan Berkelanjutan Bagi Perencana dan Pegiat Pembangunan Daerah*. UNDP. 176.
- Villágran, D. L. J. C. (2006). *Vulnerability A Conceptual and Methodological Review - Studies of the University: Research Counsel Education UNU-EHS*. Institute for Environment and Human Security No. 4/2006.
- Vonglao, P. (2017). Application of fuzzy logic to improve the Likert scale to measure latent variables. *Kasetsart Journal of Social Sciences*, 38, 337–344.
- WCED. (2008), *Our Common Future*. World Commission on Environment and Development. Oxford University Press.
- Wijayanti, R. (2018). Strategi Penghidupan Berkelanjutan Masyarakat Berbasis Aset di Sub DAS Puser, DAS Bengawan Solo. *Jurnal Wilayah Dan Lingkungan*, 4 (2), 133–152.