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Mapping of Resources and Potential Development for Food-Secure Region in East Seram, Maluku Province, Indonesia

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Abstract: ***In this study, we developed agro sector mapping of current condition, problems, threats, potentials, and strategic policies in rural area in East Seram, Maluku Province especially in Bula District. The aims of the agro mapping was to make food security planning in East Seram. The mapping process was conducted through literature study, observations, and data collecting through focus group discussion. The data were analyzed with descriptive analysis. We also collected the data based on 9 indicators of food security before and after 5 years of intervention in livestock program and capacity building. The data were calculated for their indicators and composite values, then analyzed to define food security improvement. Based on the data, livestock were still raised traditionally on pastures. To enhance food-security, the resilience should be built through: (1) the improvement of land productivity, including infrastructure, facilities for intensive livestock systems, and optimization of dry land's potential; (2) water management; and (3) capacity building for communities. After the intervention, the food security level of Bula District change from priority 2 (severely vulnerable) to priority 4 (moderately vulnerable). It means building human centered community based and local resources management become important in food security strategic in rural area especially in East Seram, Maluku, Indonesia.***

Index Terms: agro, food security, livestock, mapping.

I. INTRODUCTION

Food security exists when all people, at all times, have access to sufficient, safe, and nutritious food for an active and healthy life. The four main dimensions of food security according to Food and Agriculture Organization (FAO) are: 1) the availability of food including food production, stock levels and net trade, 2) economic and physical access to food, concern about insufficient food access that resulted in a greater policy, 3) food utilization, about food preparation, diversity of diet, and 4) stability of the other three dimensions over time [1]. When one of the four dimensions is not fulfilled, it leads to food insecurity. Food insecurity is defined as a situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development, and an active and healthy life [2]. Food insecurity is a global issue and becomes one of themain concerns today; it does not only occur in poor and developing countries but also in developed countries. According to Law No. 18/2012 [3], Food is anything that comes from biological sources of agricultural products, plantations, forestry, fisheries, livestock, and water, whether it is processed or not as food or beverage for human consumption, including food additives, raw materials of food, and other materials used in the process of preparing, processing, and/or making food or drink.

Indonesia is a large archipelagic country that has many agricultural, fishery, and marine resources, but unfortunately, food insecurity is still prevalent in Indonesia. It occurs when people are unable to meet their minimum food requirements over a sustained period of time. The strategic priorities prepared by the Government of Indonesia and World Food Program (WFP) are addressing food insecurity through monitoring, analysis, and mapping. Food vulnerability mapping of Indonesia had been conducted by WFP and DKP in 2012-2015. There were 398 areas with six priority levels of food vulnerability.Priority 1 and 2 of food vulnerability were in 53 districts such as in West Papua, Maluku, East Nusa Tenggara, Nias Islands, Mentawai Islands on the west side of North Sumatra Province, and West Sumatra [4].

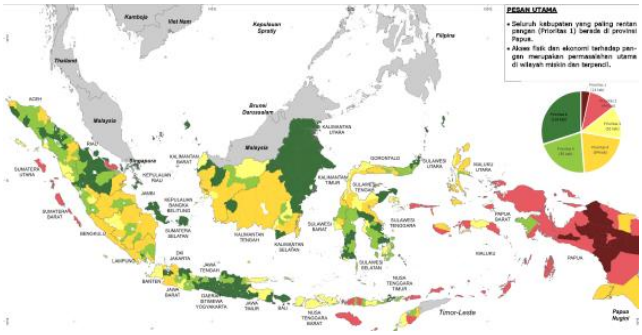

Fig. 1 Food vulnerability atlas of Indonesia (brown for priority 1 and red for priority 2) [4]

Based on the same map, East Seram in Maluku Province was vulnerable to food insecurity in second priority. Nine indicators were used to define East Seram priority level of food insecurity.

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The value of 9 indicators of food vulnerability in East Seram showed that these indicators: 1) stunting among children under 5 years of age; 2) normative consumption per capita to net cereal production; 3) people living below poverty line; 4) villages without adequate connecting access, were at priority level ranged from 1to 3. It means that the indicators in priority level 1, 2, and 3 should be handled to alleviate food insecurity.

Through a global agreement, one of the 17 Sustainable Development Goals (SGDs) related to food security is zero hunger. In Indonesia, the improvement of food security became the main national program since ten years ago. However, until today, many areas of Indonesia are still in food insecurity status,like in East Seram.

Table 1. Indicator of food insecurity in East Seram [4]

No.	Indicator	Priority	Scope of Priority	Percentage/ Ratio	Rate
1	Stunting among children under five years of age	1	> 40%	40,57%	very high prevalence
2	Normative consumption per capita to net production of cereals	1	>1,50	1,72%	high deficit
3	People living below poverty line	3	25-35%	24,49%	large number of people living in poverty
4	Access to roads and waterways in rural districts	1	>30 %	47,50%	large number of villages without access
5	Households without access to clean water	4	40-50%	44,66%	good
6	Households without access to electricity	4	30 – 40 %	34,93%	Good
7	Life expectancy at birth	4	64-67	66,35	Good
8	Villages located more than 5 km away from health facilities	6	≤ 20%	14,38%	large number of villages already had access
9	Illiteracy of female over 15 years of age	6	≤ 5 %	4,20%	very good

Food insecurity is related to the quality of human resources. Thus neglecting food insecurity means neglecting the quality of human resources. The effort needed to be done is to develop an integrated and sustainable collaborative planning involving many parties to cover many sectors, in order to be consistent in solving the problems of food insecurity. Planning is the first step before making an action or a policy that will be implemented in a massive condition and in particular location. Efforts in collaborative, integrated, and sustainable planning require a conceptual idea to be able to touch the overall planning objectives. The collaborative, integrative, and sustainable planning must accommodate food insecurity indicators and touch food supply sectors such as agriculture and livestock (agro-sectors) to avoid partial planning. The concept of ideas included in the planning should be technical and in accordance with the criteria.

II. METHODOLOGY

This study used a qualitative approach based on descriptive data of written or spoken words by people observed in the field based on literature [5] and focus group discussion with people and local governance. The study was conducted in the situation experienced in two villages, Jembatan Basah and Rukun Jaya, in Bulu District, East Seram. This study used descriptive-analytical methods for the description of the phenomenon to study the aspects of who, what, when, and how of a topic [6]. We collected the data based on 9 indicators of food security before and after 5 years of intervention in livestock program and capacity building. The data were calculated for their indicators and composite values, then analyzed to define food security improvement according to DKP and WFP's method [4].

III. RESULT

A. Characteristic of food insecurity

East Seram is one of the districts in Maluku Province. The total area of East Seram is approximately 5.779.123 km^2 (Figure 2).

Fig. 2 East Seram in Maluku Island

Food Security Agency (DKP) and WFP [4] have divided the indicators of food insecurity into two groups. The first group includes the indicators of food insecurity and chronic nutrition, namely the ratio of food consumption to cereal production, infrastructure and electricity, access to drinking water and health facilities, life expectancy, female illiteracy, and stunting rate among children while the second group includes the indicators of food and nutrition insecurity related to climatic factors, including data on natural disaster events that have impacts on food security, estimation of the loss of rice production caused by floods and drought, deforestation rate, and the impact of el nino/Southern Oscillation (ENSO) resulting in rainfall variability. Based on the DKP and WFP data in 2009, East Seram was categorized as priority 2 (food insecure area).

Based on the priority scale (Table 4), food security in East Seram required some efforts to be food secure area. In many countries, achieving food security is usually a guarantee against hunger and malnutrition that lower the rate of economic development. Davies [7] stated that poverty and food insecurity are related. There are many reasons why people may not have access to food. The most fundamental is not having enough income to buy and provide the food they need. Therefore, poverty reduction is critical to achieve food security. Mekonnen and Gerber [2] argued that despite several years of improvement, the problem of poverty and food insecurity remains a challenge. Moreover, when people in developing countries have no capacity to adapt to climate change, it will make a bigger challenge.

Table 2. Food insecurity atlas of East Seram [4]

NCPR (%)	Prov (%)	Road (%)	Elec (%)	Water (%)	Life (%)	Stu (%)	Flit (%)	Health (%)
1.72	24.49	47.50	34.9	44.66	66.3	-	4.20	14.38

NCPR	: ratio of per capita normative consumption to net production of cereals	Life	: life expectancy at birth
Pov	: people living below poverty line	Stu	: stunting among children under five
Road	: villages without transport connections	Flit	: female illiteracy
Elec	: households without access to electricity	Health	: villages more than 5 km from health facilities
Water	: households without access to clean water		

B. Population Potentials for Food Security

Food security consists of four main sub-systems namely food availability, food access, food utilization, and stability. In this study, food utilization is defined as safe and nutritious food which meets the dietary needs, so nutritional status has effect on food security [2]. Food access and utilization can be achieved if community has the capacity to carry out productive activities to increase their income to access safe and nutritious food. However, it is not only about income, but also about how people can manage local resources and prepare themselves to face challenges in food security. In this study, Jembatan Basah Village, one of the areas in East Seram,consisted of 154 households with working age population of 352 people or 57.42% from total population, while non-productive population (those who cannot work yet and cannot work anymore) consisted of 261 people or 42,57% from total population. As many as 302 people in the village of Jembatan Basah were farmers, and the rest worked in other fields such as traders, construction workers, and wood-workers. The other village in this study, Rukun Jaya Village,consistedof 117 heads of families with a population of 407 people. Most of the productive people in Jembatan Basah and Rukun Jaya Village were farmers. This fact showed that the labor available in Jembatan Basah and Rukun Jaya could fill job opportunities that were mostly in agriculture, including livestock and trading.

The average income per month per family in Jembatan Basah and Rukun Jaya Village is still uncertain,depending on the type of the works. The average income per month of working families in agriculture can reach 2-3 million if the harvest is good. However, the harvest is often disrupted because of the drought. When bad harvestis coming, farmers usually only get 1 million rupiah per month. To meet their daily needs, the farmers usually borrow money from the bank for business capital. The life expenses per month of the families include the cost for food, transportation, and electricity. The cost of meals can reach 500 -700 thousand rupiah per month, 100 thousand rupiah for electricity, and 200 thousand rupiah for transportation. In daily life, the most expensive cost spent by the average population in both villages is the household expenses.

IV. DISCUSSION

A. Program of Food Security Improvement

The inhibiting factor in food security is the inability of community to manage potential local resources. Furthermore, policies related to food security areimportant. Boratynska and Raqif [8] mentioned that there are two approaches to analyze the concepts related to food security policy: direct and indirect policy. The direct policy involves structural changes in relative prices and targeted food subsidies. The indirect policy includes the improving of agricultural infrastructure and general economic environment, and the facilitating of farmers with new agricultural technology that can increase food crop production.

Indonesia's central government makes indirect policy to improve food security through village funding for all villages in Indonesia. Rukun Jaya and Jembatan Basah Villages were also given the investment funding from central government through village funding to improve local economic and food security in these villages. The largest expenditure of the budget was for physical infrastructure like entrance gates and roads inside the village. The physical infrastructure becomes one of many programs in food security improvement. One of the indicators of food insecurity is the lack of access to the village entrance, so if the construction of the roads is completed, it is expected to lower the level of food insecurity of the village. The rest of village funding both in Rukun Jaya and Jembatan Basah were used for developing the capacity of human resources, for example by doing socialization on how to use agricultural technology and learn microeconomic approach. Hall [9] and Spielman [5] said that the use of agricultural technology becomes a potential suggestion for increasing crop production, improving food security and ultimately increasing farmer income while Boratynska and Raqif [8] reported that using simple microeconomic approaches to promote food security program can accelerate and optimize the realization of food security improvement. In this case, Jembatan Basah and Rukun Jaya have potential in livestock sector. However, the livestock were still raised traditionally on natural pastures. Both villages also need to build infrastructure through (1) improvement of land productivity (infrastructure of roads and bridge, dry land potential, intensive livestock system); (2) water management; and (3) capacity building for community.

B. Analysis of The Intervention to Food Insecurity Indicator

Dumasari [10] stated that the potential alternative program to overcome food insecurity in poor peasant households is through the reinforcement and development of food-shed institutions that must be provided by the village independently.

The institution of food-shed is almost invisible today in the farming community. Therefore, the empowerment of farmers to explore, manage and reuse local social potentials, especially in livestock sector,to increase the security of nutritional food should be strengthened. Based on the identification of potentials in East Seram,a calculation of projection was produced to decrease the level of food insecurity (Table 3). The calculation showed that the projected achievement of the implementation of intervention program in food security,especially in livestock sector and capacity building for 5 years, was able to reduce food insecurity priority of East Seram from priority 2 (prone) with composite score of 113,34 to priority 4 with composite score of 72,98.

Table 3.Composite value calculation of food prone indicators in East Seram

No	Indicator	Quality	Value and Quality			
			Ind. value	Quality x Value	Ind. value	Quality x Value
1	Stuntinga mong children under 5 years of age	0.40	40,57	16,23	30,57	12,23
2	Normative consumption per capita to net production of cereals	0.54	11,72	6,33	0,71	0,38
3	People living below poverty line	0.74	30	22,2	15,94	11,79
4	Villages with inadequate transport connections	0.42	24,49	10,28	14,49	6,08
5	Households without access to clean water	0.23	37,65	8,66	37,65	8,66
6	Households without access to electricity	0.46	25,52	11,74	25,52	11,74
7	Life expectancy at birth	0.22	67,62	14,88	68,54	15,08
8	Villages located more than 5 km from health facilities	0.40	50,91	20,36	10,91	4,36
9	Female illiteracy	0.31	8,57	2,66	8,57	2,66
COMPOSITE SCORE				**113,34**		**72,98**

Table 4. Composite value of priorities in food security and vulnerability atlas [4]

Priority	Composite value
Priority 1	>= 140
Priority 2	114 - < 140
Priority 3	91 - < 113
Priority 4	68 - < 91
Priority 5	47 - < 68
Priority 6	0 - < 47

V. CONCLUSION

East Seram requires some efforts to be secure food area because East Seram was included in priority 2 level in food insecurity. Based on observation, interview and focus group discussion, East Seram, especialy in Jembatan Basah and Rukun Jaya Village have many resources potential, mostly in agriculture sector. From this study, we concluded that the ideal strategy to improve food insecurity in these areas is to build a human-centered community based on a well-targeted and sustainable insight of local resource management.The identification of potential should be the basis in planning the implementation policies that focus more on problem solving based on the problem identification. The analysis showed that it was able to decrease food insecurity level from priority 2 with composite score of 113,34 to priority 4 with composite score of 72,98.

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Ambar Pertiwiningrum was born in Ambarawa, September 2, 1966. Her educational background is doctoral program in Gifu University, Japan, especially in microbiological science.

In renewable energy, she was/is involved in community empowerment programs. She was/is also involved in training or workshop were: Technical Guidance Biogas in Kulon Progo Yogyakarta Special Region (2014), Technical Guidance Biogas in Palu (2014) and Utilization of Livestock Waste to Biogas and organic fertilizer delivered on Livestock Waste Management Technical Assistance Training (2014). Today, she is a senior lecturer in Faculty of Animal Science, Universitas Gadjah Mada, Yogyakarta, Indonesia. She concerned in livestock waste management. She has published publication are: Isolation, Identification and Dehairing Activity of Indonesian Native Keratinolytic Bacteria Exiguobacterium (2015), A commentary on occupational infectious diseases due to agricultural practices in Sub-Saharan Africa (Science Direct, 2014) and so on.

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Supriadi is a researcher that also works as Director of Directorate General of Development of Food Insecurity Areas, Ministry of Village, Development of Disadvantaged Regions, and Transmigration, Indonesia. He was graduated doctoral program in Universitas Gadjah Mada. He is active in research about development of rural areas and food security in underdeveloped areas in Indonesia. He is also active in doing project in development of transmigration areas in Indonesia collaborating with Universitas Gadjah Mada's researchers. Today, he is doing some research about development of new cities in transmigration areas in Indonesia especially local economic development based on agriculture and livestock.

Margaretha A. Wuri was born in Surakarta, March 21, 1992. She graduated master program from Department of Technology for Sustainable Development, Environmental Science, Universitas Gadjah Mada, Indonesia. Before she graduated from Department of Chemistry in Sebelas Maret University, Indonesia.

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Teguh Ari Wibowo has graduated from master program from Animal Science especially about livestock production in Bogor Agriculture Institute, Indonesia. Before working as researcher in Pusat Studi Ekonomi Kerakyatan Universitas Gadjah Mada, he worked at Ministry of Village, Development of Disadvantaged Regions, and Transmigration, Indonesia. Today, he also works a researcher in Faculty of Animal Science, Universitas Gadjah Mada, He focused in livestock reproduction and local economic development program in some rural areas especially in livestock sector. He also accompanies rural area in Pacitan to develop innovation product from cow dairy livestock. He also works as lecturer in Magelang City.