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# The Development of Sustainable Livelihoods for Peasant-Fisher in Rote Island East Nusa Tenggara

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## Abstract

Sustainable development has now been widely adopted as main development paradigm since late 1980s, including the management of natural resources such as fisheries and livestock. This development paradigm must also be adopted by East Nusa Tenggara Province when managing its fisheries and livestock resources as well as other economic sectors. Within national development framework of economic development acceleration, known as MP3EI, East Nusa Tenggara, along with Bali and West Nusa Tenggara is part the fifth corridor of MP3EI which main priority of developing fisheries, husbandry and tourism sectors. This paper aims to provide a review of developing fisheries and husbandry sector in East Nusa Tenggara based on sustainable development principles. Base on this principle and MP3EI framework, this research aims to (1) determine the effect of the non-fisheries diversification for income of peasant-fisher in Rote, and (2) determine the productivity of each non fishing effort. This research was conducted using survey method by means of interviews and focus discussion group, experiments and participant observation. The results showed that diversification through non-fishery resources can increase the average income of the peasant-fisher, each fisheries effort (FE) 3,730,000 IDR; FE + weaving effort (WE) 6,780,000 IDR; FE + chicken livestock (CL) 4,774,375 IDR; FE + pig livestock (PL) 6,170,000 IDR; FE + WE + CL + PL 10,264,375 IDR. The measurement results on the productivity of non-fishery enterprises obtained the average production (IDR/ month) respectively weaving effort (WE) 3,050,000 IDR; chicken livestock (CL) 1,044,375 IDR and pig livestock (PL) 2,440,000 IDR. Based on the research results, it can be concluding that the development of non-fishery diversification can increase the income of the peasant-fisher. Therefore, it can be recommended that effort to increase income of peasant-fisher could be done through the development of non-fishery enterprises.

**Keywords:** peasant-fisher; sustainable livelihoods; MP3EI

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## INTRODUCTION

Located in southwest of the island of Timor, Rote is one of the districts in East Nusa Tenggara province that has enormous natural resources, yet has not been managed optimally. The majority of Rotenese are living as farmers and fisherman and poverty is still a major issue on this island. This is rather paradox given the richness if natural resource surroundings. There are several factors that contribute to the poverty of this coastal community. First, the prolonged illegal fishing in this area has contributed to the loss of earning that could have been earned by local fishermen (Fox and Sen, 2002). Secondly, the Timor Sea oil spill which occurred during the year 2009 might have significant ecological impact which could reduce the productivity of fishermen (Paulus, 2014). In addition, the transformation of economic activities of cultivated based activities into tourism has reduced the potential of seaweed cultivation, which is also the source of livelihood for coastal people in this island.

There are many ways to alleviate poverty in coastal community. Diversifying their source of income is one of them. Nevertheless, such an effort might be hindered by that fact that fishing communities are sometimes less aware that the condition of the aquatic ecosystem is

constantly changing from time to time, so it may affect the income of fishing communities. In addition, the low skills of fishing communities to diversify their fishing effort and their strong attachment to the operation of one type of fishing gear contributes to the onset of the poverty of fishing communities. Such a strong attachment to one type of fishing gear to catch certain type of fish, making it difficult to increase their catch, hence their income, when fishing is in low season. Therefore, diversification of fishing effort is needed to help fishing communities in addressing the problem of poverty.

Institution plays a greater role in diversifying coastal economic activities. Such an example is found in coastal fishing communities of Pandansimo, Bantul, Yogyakarta where the diversification of income among coastal communities could be used as a model in Rote case. In Pandansimo, in addition to fishing, fishing communities engage in livestock farming, so that when fishing is in low season, they are still able to earn income from other activities (Rakhmanda, 2014). Income diversification aims to increase overall family income of coastal communities. Hence, member of fishing family is likely to engage in economic activities. Women, in particular, are group of coastal communities who are actively support their husband in income diversification. Therefore, supporting women groups to engage productively in coastal economics activities could contribute greatly to the overall livelihood of fishing communities. Lesson learned from Pandansimo coastal economic diversification could be used to alleviate poverty of fishing communities in Rote Island. Optimization of business diversification based on local advantages, such as aquaculture, agriculture and animal husbandry in Rote Island needs to be done in order to increase the income of fishermen fishing communities so that people no longer need to look for fish to Australian waters so that cases of illegal fishing can be avoided as early as possible.

## **METHODS**

### ***Location and Time Research***

This study was carried out in Nembrala Village, District of West Rote for 8 (eight) months from April to December 2015.

### ***Research methods***

Survey method based on interview and Focus Group Discussion (FGD) with coastal communities was used in this study. As many as thirty respondents were interviewed to collect information on their livelihood and fishing activities.

### ***Data analysis***

Data obtained from this study were tabulated and analyzed according to the objective of this study. An Analysis Hierarchy Process (AHP) is used to identify the development model of livelihood diversification. Simple benefit cost analysis is used to determine the productivity and revenue analysis of income, while analytical methods of comparison exponential (MPE) was used to determine the priority order of alternative types of business non-fisheries.

## **RESULTS**

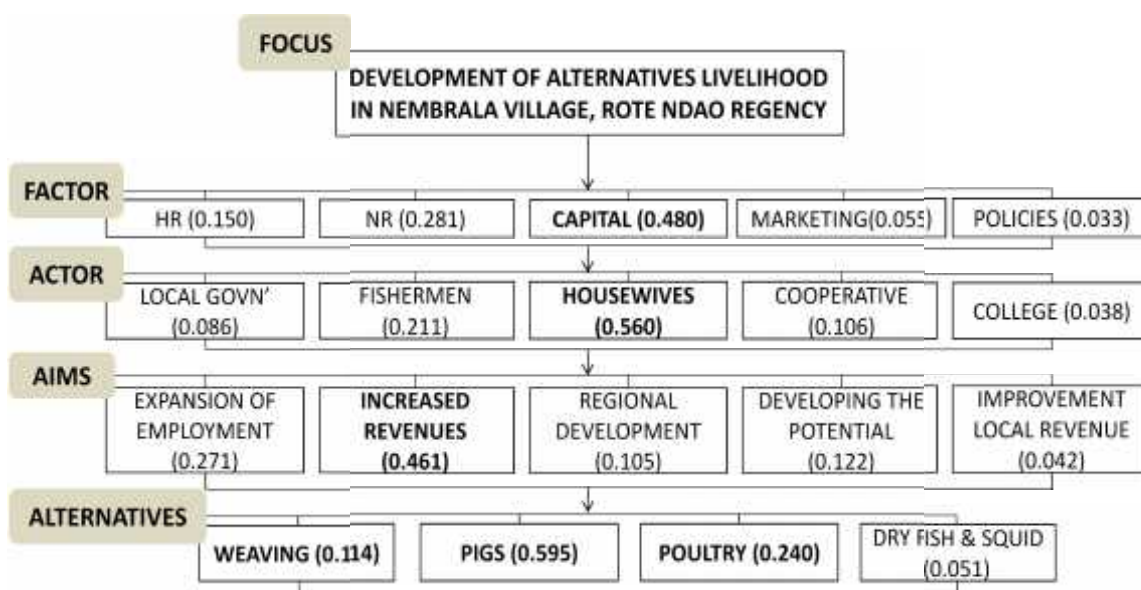
### **General Conditions of Respondents**

Respondents in this study are traditional fishermen with the main livelihood as fishing using simple equipment and additional economic activities as seaweed farmers. From interviews with respondents, it is found that fishing cannot be carried out throughout the year as a result of the change of seasons. There are certain months in a year that fishermen do not go fishing due to low season, and they engage in seaweed cultivation. Such as situation puts the level of livelihood of traditional fishermen remains low. In addition to seaweed farming, it is found that fishers also engage in other economic activities as complementary such as livestock (pig and chicken), and fish processing. Nevertheless, these activities are still carried out traditionally, especially for live stock of pork and chicken, so as not to contribute significantly to household income of fishermen.

**Identification of alternative livelihoods for fishermen in Nemberala Village**

To develop alternative livelihoods for Nembrala village, there are factors (elements) that affect both support and undermine efforts livelihood development. Determination of the key elements as an element of alternatives can be done using analysis tools namely Analytical Hierarchy Process (AHP). AHP is the result of expert opinion (expert judgment) to encompass a wide range of information from some of the elements that influence the settlement of an issue (Saaty, 1993).

In principle AHP work to simplify a complex issue that is not structured, strategic and dynamic into parts that can be arranged in a hierarchy. In AHP the order of priority for each element is presented in the form of numerical values or percentage. An AHP analysis for livelihood development in the Nembrala village was conducted in five specified level. Level 1 focus on the analysis of development alternative livelihoods; level 2 describes the factors that influence the development of alternative livelihoods. These are human resources (HR), natural resources (NR), capital, marketing, and government policies; Level 3 describes actors and their role on development. These are local government, fishermen, housewives, cooperative, and universities; Level 4 is the purpose of the development of alternative livelihoods, which include expanding employment, increasing public revenues, regional development, the development of superior potency, and increased local revenues. Level 5 presents alternative development of alternative livelihoods which includes business development of pigs, chickens, weaving, and fish salted/dried squid. Selection of four alternative livelihood is based on the analysis of the potential that has been done on the test site and also an alternative business that never existed and was developing in the Nembrala Village, Rote. Selection of alternative livelihoods to fishing activities based on AHP analysis is presented in Figure 1.



**Fig. 1:** Results of Analysis Hierarchy Process Alternative Livelihood Development

Based on Fig. 1 above, it shows that the factors that influence the development of alternative livelihoods of fishermen in the Nembrala Village - Rote is capital value with highest index of 0.480, followed by a factor of natural resources 0.281, the factor of human resources 0.150, marketing factor 0.055, and the lowest factor of 0.033 policies. This suggests that the development of alternative fishing livelihoods in the Nembrala Village - Rote need to fix the capital aspect fishermen through the expansion of access of fishermen to obtain a business model, but it is also necessary to reform towards optimizing the utilization of natural resources that can be accessed by fishermen as a basis for developing alternative livelihoods and improvement of the human resource factor that focuses on increasing fishing capacity in accessing various information and technology related to the development of alternative livelihood of fishermen.

In terms of actor or component which plays a greater role in encouraging the development of alternative livelihoods of fishermen, it is found that the actor who has the highest index value is housewives at 0.560, followed by fishermen 0.211, cooperative 0.106, local governments 0.086, and the lowest is the college with the score of 0.038. Based on the results of the analysis, the development of livelihood alternative to fishing is largely determined by the involvement of housewives because they have plenty of time to develop alternative livelihoods such as business weaving and livestock business. Nevertheless, fisherman have also potential to develop their alternative livelihoods, especially in periods where they cannot go fishing and seaweed cultivation cannot be carried out. The presence of the fishing cooperatives is also important to encourage the development of alternative livelihoods, especially in efforts to raise funds together that can be used for the development of non-fishing businesses.

Based on the analysis of the purpose of the development of alternative livelihoods for fishermen, this study shows that the goal to increase revenues give the highest index of 0.461, followed by goals for the expansion of employment 0.271, the goal of developing the potential winning 0.122, the goal of regional development 0.105, and the lowest for the purpose of improvement local revenue. This suggests that efforts to increase household income of fishermen could be done through diversification, especially in the field of non fisheries such as weaving and livestock business. In addition, further development of household activities of fishermen for alternative livelihoods could be done by expanding employment opportunities, especially housewives fishermen and children.

### Simulation of Fishery and Non-Fishery Efforts

The simulation of non-fishing businesses is divided into three types of businesses namely: Business of Weaving (UT), Poultry (UTA), and Pigs Livestock (UTB). The result of the simulation is presented in *Table 1*.

**Table 1:** Mean dan Deviation Standards of Business Type

VARIABLES	Types of Businesses (IDR/Year)					
	Fishery Efforts (UP)	Business of Weaving (UT)	Poultry (UTA)		Pigs Livestock (UTB)	
			Control	Technology	Control	Technology
Mean	3,730,000	3,050,000	555,937	1,044,375	1,431,785	2,440,000
SDEV	376,600	476,445	65,069	133,775	124,412	188,414

As can be seen from *Table 1*, the highest income earned from fishing is 3,730,000±376,600 IDR, followed by weaving (3,050,000±476,445 IDR), pig breeding business with technology (188,414±2,440,000 IDR), pig breeding business without technology (control) of 124,412±1,431,785 IDR, chicken farming technology with 1,044,375±133,775 IDR, and the lowest is chicken farming without the technology of 124,412±1,431,785 IDR. High average income from fishing is due to the fact that fishing and seaweed farming are the main business, while the business weaving is a skill passed down culturally with its economic value depends on market share of foreign tourists. In the meantime, local farming businesses such as pigs and chickens are complementary business performed particularly by fishermen in anticipation for loss of income due to low seasons. The results show that although the cattle business has economic potential as a source of income for fishermen, but it is still managed traditionally or without the application of technology.

Based on the results of pilot project with the technology for pigs and chickens, it shows that the application of technologies such as improved feeding and health management could increase income of fishermen compared with traditional methods of rising the same cattle. Income derived from business of pigs with the application of technology provides an average

income as high as 2,440,000±188,414 IDR compared without technology of 1,431,785±124,412 IDR. Similarly, poultry with the application of technology could earn 1,044,370±133,775 IDR compared with no technology 555.937±65,069 IDR. When analyzing the total household income of fishermen, the results show that fishing has the highest value of 3,730,000 IDR, followed by fisheries and weaving 6,780,000 IDR, fisheries and traditional pig breeding business and technological treatment of 5,161,785 IDR and 6,170,000 IDR, fisheries and chicken farming of traditional and technological treatment of 4,285,937 IDR and 4,774,375 IDR, fisheries combined with weaving and pig livestock and poultry is traditionally 8,767,722 IDR and fishing effort combined with weaving and pig livestock and poultry in the input technology of 10,264,375 IDR.

The results showed that the total household income of fishermen much lower is they rely on fishing effort only. This number is much lower than that obtained Asih and Laapo (2009) who found that the total earning of fishers' household in the district of Ampanan amounted to 8.192 million USD per fisherman per year. The business diversification obtained in this study differs as much as 8,767,722 IDR with that Asih and Laapo (2009).

### Priority Efforts

In order to determine the priority efforts, an MPE calculation (Marimin, 2004) was conducted using the following steps.

1. Determining the alternative of expert opinion questionnaire, namely: UP + UT, UP + UTA, UP + UTB and UP + UT + UTB.
2. Determine the criteria and weighting the criteria of expert opinions, namely: Market Demand (Weight Criteria = 4), Selling Price Product (Weight Criteria = 4), HR (Weight Criteria = 3), Access to Raw Materials (Weight Criteria = 3) and Power Adaptation effort Against External Factors (Weight Criteria = 4).
3. Create a calculation table to calculate the MPE value and sequence or highest rank, as in *Table 2*.
4. Taking the results of two best/highest priority extra effort.

**Table 2:** MPE Calculation results for Type of Priority Business in Nemberala Village

ALTERNATIVES	CRITERIA					MPE VALUE	PRIORITY BUSINESS
	Market Demand	Selling Price Products	Human Resource	Access To Raw Materials	Power Adaptation Effort Against External Factors		
UP+UT	4	4	3	3	4	822	2
UP+UTA	2	3	4	2	3	250	4
UP+UTB	4	3	4	4	4	721	3
UP+ UT+UTB	4	4	4	4	4	896	1
<b>WEIGHT</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>4</b>		

Based on the results of the calculation of MPE, it is found that the priority for developing fisheries and non-fisheries business is a combination of fishing effort, weaving effort and pig livestock with a value of MPE at 896, followed by a combination of fishing effort and weaving effort with a value of MPE at 822, and the pig livestock with MPE value for 721. The choice of priority development of both combinations fisheries and non-fisheries (weave and pig livestock) is due to unique characteristics of the Nembrala weaving effort and pig livestock

whereby the market demand is relatively high or high economic value. In addition, human resources in fishing community of the Nembrala Village are knowable about the process of production of weaving and pigs. They have also easy access to raw materials for weaving and pigs, and high adaptability of businesses weaving and pigs.

## CONCLUSIONS

Based on the results and the discussion above, it can be concluded that:

- 1) The development of non-fishery diversification can increase income of the traditional fishermen in the order of priority I weaving effort (UT), priority II pigs livestock (UTB), and the third priority poultry business.
- 2) The application of technology in the business of pig livestock and poultry through improved feed and health management can increase income of fishermen compared with pigs and chickens livestock by means of traditional pattern.
- 3) The highest household income could be earned from combination of fishing effort (UP), weaving effort (UT), and the pig livestock (UTB).
- 4) The calculation of MPE showed that the highest value obtained is a combination of fishing effort (UP) + weaving effort (UT) + pig livestock (UTB) of 896, followed by a combination of fishing effort (UP) + weaving effort (UT) for 822, a combination of fishing effort (UP) + pig livestock (UTB) amounted to 721, and the lowest on the combination of fishing effort (UP) + chicken livestock (UTA) of 250.

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