Selecting livelihood model of community in North Tuppabiring District, Pangkep Regency

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Abstract. The study aimed to find out, the best alternative livelihoods in North Tuppabiring District, Pangkep Recency. The method used, the CFA analysis method, is the most dominant (best) livelihood model in the research location. The study uses four parameters, namely; desire, natural resources is measured by the number of raw materials available, human resources are measured by the amount of free time the fishermen and family members have, and market opportunities. The assessment uses a score of 1 to 5, namely 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, 1 = strongly disagree. The results of the study show that there are six alternative livelihoods, namely; preparation of dried fish, making Abon, making cakes, floating net cages, processing crabs and cultivating seaweed. Of the six alternative livelihoods (MPA), there are four MPAs that are feasible to develop, namely; making dried fish with a value of 0.586 MPA, making cakes 0.539 MPA, processing crab 0.720 MPA and cultivation of seaweed 0.507, while MPA which is not feasible to develop is the manufacture of Abon and floating net cages. The best MPA sequence is; the processing of crab crabs, making dried fish, baking and finally the cultivation of seaweed.

1. Introduction
The potential of fisheries resources is huge where the area of coral reef ecosystems reaches 50,875 square kilometers or 18% of the total area of the world's coral reefs [1] and hard corals of 590 species [2]. The mangrove ecosystem has an area of approximately 3,189,359 hectares that is the largest mangrove in the world and has 48 species [3]. While seagrass ecosystems are estimated at 30,000 square kilometers, where there are 30 of the 60 species that exist in the world [4].

Potential of such a large fishery, fishermen should be able to live well [5]. But in reality only a handful of fishermen who live well, the rest most of the others can be said not only has not affluent but still underdeveloped. This is due to the excessive fish exploitation, coral reefs only 5.3% classified as excellent, 27% good condition, 37.25%, and 30.45% of sufficient conditions poor condition [6]. In addition to weather conditions, the quality of the resource is declining, bad season, and the season's fish where the fish prices [7]. Besides, the profit-sharing system that does not favor the crew [8,9].
To improve the livelihood of fishermen of poverty need additional revenue by finding alternative livelihoods (MPA). There are many opportunities for fishermen and their families to add income because the fishermen's workflow in the medium season is 5.72 hours and the lean season is only 4.76 hours where productive working hours are 8 hours/day. As for the wife or wives of the fishermen outpouring most work in domestic activities, namely 82.36%, 5.18% social activities and productive activities is only 12.46% [10]. With many of the problems found at home stairs fishing and many opportunities to add the household income of fishermen, the study aims to determine the priority scale alternative livelihood best with the parameters of interest, human resources (HR), the potential of the area (SDA) and market opportunities.

2. Material and method
This study was conducted in South Sulawesi, namely the District Pangkajene Islands (Pangkep), this location was selected based on the consideration that the local fishermen center and has the largest islands. Pangkep Regency has 4 districts in the waters. North Tuppabiring District is a sub-district chosen as a research area with the consideration that the sub-district is close to the mainland. The sub-district consists of 7 (seven) the village has 19 islands of which 17 islands are inhabited and two uninhabited islands. Each village represents one island to the study site. So the number of research sites are 7 islands. Island study site is the capital village. For more details can be seen in figure 1 below:

![Figure 1. Map location research District of North Tuppabiring.](image)

2.1. Population and sample
The population is the fishing households that live in the North Tuppabiring sub-district, where the total population is 1,151 households. The research sample used is 15% of the population assuming the population is homogeneous. So that the number of samples is 173 households. Data collection tools in this study using questionnaires, focus group discussions and documentation.
2.2. Research stages
The stages of the research were carried out in 3 (three) stages, namely:
Phase I:
1) Survey to study area (see the potential and socio-economic conditions)
2) Record the number of each island population research
3) Determining respondents randomly (random)
4) Interviewed using questionnaires
5) Collecting the data contents of the questionnaire
6) Processing data

Phase II:
1) Documenting the potential of the region
2) Collect data by means of focus group respondents. FGD conducted to determine the wants and needs in determining the type of alternative livelihoods.
3) Collect FGD data
4) Processing data

Phase III:
1) Make inquiry
2) Interview respondents using a questionnaire
3) Tabulate poll results
4) Processing data
5) Compiling reports.

2.3. Data analysis
Analysis of the data used is the CFA (confirmatory factor analysis) analysis using GeSCA (Generalized structured component analysis) software. CFA analysis is the analysis used to determine the most priority livelihood. The latent variables are alternative livelihoods, variable dimensions, namely the manufacture of dried fish, Abon manufacture, baking, floating cages, processing crab and seaweed farming. While the indicator variable or item that is of interest, natural resources, human resources, and market opportunities. Modeling of alternative livelihoods obtained multidimensional construct, so the structural model using Reflective Order 1st, 2nd Order Reflective.

CFA 1st Order empirical modeling of alternative livelihood, namely:
- Variable dimensions as follows:
  \[ \text{Interests} = \lambda_{11} \text{variable dimensions} + \epsilon_{11} \]  \hspace{1cm} (1)
  \[ \text{HR} = \lambda_{12} \text{variable dimensions} + \epsilon_{12} \]  \hspace{1cm} (2)
  \[ \text{SDM} = \lambda_{13} \text{variable dimensions} + \epsilon_{13} \]  \hspace{1cm} (3)
  \[ \text{Market} = \lambda_{14} \text{variable dimensions} + \epsilon_{14} \]  \hspace{1cm} (4)

Empirical Modeling CFA 2nd Order is as follows:

Preparation of dried fish = \lambda_1 MPA + \epsilon_1 \hspace{1cm} (5)
Manufacture of Abon = \lambda_2 MPA + \epsilon_2 \hspace{1cm} (6)
Baking = \lambda_3 MPA + \epsilon_3 \hspace{1cm} (7)
Floating cages = \lambda_4 MPA + \epsilon_4 \hspace{1cm} (8)
Processing crab = \lambda_5 MPA + \epsilon_5 \hspace{1cm} (9)
Cultivation of seaweed = \lambda_6 MPA + \epsilon_6 \hspace{1cm} (10)
3. Result and discussion
The results of CFA analysis found alternative livelihood models which can be seen in figure 2 below:
Figure 2. Alternative livelihoods in the District of North Tuppabiring Of processed CFA obtain multidimensional construction that produces models of 1st Order 2nd Order Reflective Reflective. For the interpretation of the CFA produces 2 models of the measurement model and the structural model.

3.1. The measurement model obtained the following equation:

a. Model Making dried fish dimensional measurements are:

- Interest = 0.828 making dried fish ...................... (1)
- NR (Natural Resources) = 0.657 making dried fish .................. (2)
- HR (Human Resources) = 0.889 making dried fish ................. (3)
- Market opportunity = 0.822 making dried fish ..... (4)

b. Measurement Model for Abon Making Dimensions, viz

- Interest = 0.837 Abon making ...................... (5)
- NR = 0.768 Abon making ......................... (6)
- HR = 0.897 Abon making ....................... (7)
- Market opportunity = 0.823 Abon making ........ (8)

c. Dimensional Measurement Model Making Cakes namely:

- Interest = 0.853 cake making .................. (9)
- NR = 0.637 cake making ....................... (10)
- HR = 0.914 cake making ....................... (11)
- Market opportunity = 0.858 cake making ...... (12)

d. Dimensional Measurement Model Keramba cage, namely:

- Interest = 0.829 floating net cages ................... (13)
- NR = 0.608 floating net cages ...................... (14)
- HR = 0.893 floating net cages .................... (15)
- Market opportunity = 0.810 floating net cages ...... (16)

e. Dimensional Measurement Processing Model “small crab” namely:

- Interest = 0.847 “small crab” processing ............ (17)
- NR = 0.673 “small crab” processing ............. (18)
- HR = 0.892 “small crab” processing ............. (19)
- Market opportunity = 0.831 “small crab” processing... (20)

e. Dimensional Measurement Model seaweed cultivation, namely:

- Interest = 0.843 seaweed cultivation ................. (21)
- NR = 0.626 seaweed cultivation .................... (22)
- HR = 0.919 seaweed cultivation .................... (23)
- Market opportunity = 0.844 seaweed cultivation ........ (24)

3.2. Structural models obtained table 1 below:

| Path Coefficients                      | Estimate | SE  | CR  |
|----------------------------------------|----------|-----|-----|
| MPA->Making dried fish                 | 0.586    | 0.095 | 6.14* |
| MPA->Making “abon”                     | 0.299    | 0.224 | 1.34 |
| MPA->Cake making                       | 0.539    | 0.157 | 3.43* |
| MPA->KJA                               | 0.364    | 0.233 | 1.56 |
| MPA->“Smal crab” processing            | 0.720    | 0.093 | 7.75* |
Based on table 1 is obtained as the following equation:

- Making dried fish = 0.586 MPA ...................................... (25)
- Cake making = 0.539 MPA ........................................... (26)
- "Small crab" processing = 0.720 MPA ............................. (27)
- Seaweed cultivation = 0.507 MPA ............................... (28)

3.3. Discussion

There are 6 (six) items of alternative livelihoods developed in the study area. Once the alternative livelihoods (MPA) were known, the questionnaires were distributed to determine public interest in alternative livelihoods, natural resources (materials provided), Human Resources (number of free time both fishermen and family members) and market opportunities. Then the results of questionnaires were processed using the CFA analysis. From the processed CFA we get a multidimensional construction that produces a model of 1\textsuperscript{st} Order Reflective 2\textsuperscript{nd} Order Reflective. For the interpretation of the CFA produces 2 models of the measurement model and the structural model was applied.

The measurement model is divided into four alternative livelihoods which are convergent validity, discriminant validity, discriminant reliability (AVE) and Cronbach's alpha. Livelihood measurement model provides indicators and dimensions. Where the indicator variable is interest, natural resources, human resources, and markets, while the variable dimensions are the manufacture of dried fish, Abon manufacture, baking, cages, processing crab and seaweed farming.

From the results of the study we found out that the value of the loading interest was 0.828, this means that the contribution of interest to make dried fish amounted to 82.8% (equation 1). NR value of 0.657 means contribution NR to make dry fish was by 65.7% (equation 2). HR value of 0.889 means that the contribution of HR to make dried fish amounted to 88.9% (Equation 3). Value market opportunity by 0.822 means that the contribution of market opportunities to make dried fish was 82.2% (equation 4). Overall we found that the largest or most dominant indicator was HR so that respondents do manufacture of dried fish with a loading factor of 0.889. This means that HR is the most dominant indicator so the respondent decided to make dried fish. Loading factor obtained was larger than 0.5 that is valid as a measure of the manufacture of dried fish. CR values obtained for all indicators get asterisks stated that the indicator of interest, NR, HR, and market opportunities are able to make dried fish.

Interest loading value of 0.837 this means that the contribution of interest to make Abon is 83.7% (equation 5). NR value of 0.769 means the contribution NR to make Abon was by 76.9% (equation 6). HR value of 0.897 means that the contribution of HR to make Abon is 89.7% (equation 7). Value market opportunity by 0.823 means that the contribution of market opportunities for making Abon was by 82.3% (equation 8). Overall we found that the largest or most dominant indicator was HR so that respondents do manufacture of dried fish with a loading factor of 0.889. This means that HR is the most dominant indicator so the respondent decided to make Abon. Loading factor obtained was larger than 0.5 that is valid as a measure of the manufacture of dried fish. CR values obtained for all indicators get asterisks stated that the indicator of interest, NR, HR, and market opportunities are able to make Abon.

The loading value of interest is 0.853 which means that the contribution of interest to make a cake is 85.3% (equation 9). NR value of 0.637 means that the contribution of NR to make cakes amounted to 63.7% (equation 10). HR value of 0.914 means the contribution of HR to make the cake is 91.4% (equation 11). Value market opportunity by 0.858 means that the contribution of market opportunities to make cakes is 85.8% (equation 12).
make the cake is 85.8% (equation 12). Overall we found that the largest and most dominant indicators were HR with a loading factor of 0.914. This means that HR is the most dominant indicators so the respondent decided to make cake. The loading factor obtained is greater than 0.5 so it is declared valid as a measurement of the cake making. CR values obtained for all indicators get asterisks stated that the indicator of interest, natural resources, human resources, and market opportunities otherwise be able to make a cake.

Interest loading value of 0.829 means that the contribution of interest for floating net cages is 82.9% (equation 13). NR value of 0.608 means that the contribution of natural resources to the floating net was by 60.8% (equation 14). HR value of 0.893 means that the contribution of HR to the floating net was by 89.3% (equation 15). The market opportunity value of 0.810 means that the contribution of market opportunities for floating net cages was 81% (equation 16). Overall we found that the largest and most dominant indicators were HR with a loading factor of 0.893. This means that HR is the most dominant indicators that perform in floating net cages. Loading obtained a larger factor of 0.5 that is valid as a measure of floating net cages. CR values obtained for all indicators get asterisks stated that the indicator of interest, natural resources, human resources, and market opportunities are able to perform floating net cages.

Interest loading value of 0.847 this means that the contribution of interest for processing small crab is 84.7% (equation 17). NR value of 0.673 means that the contribution of natural resources to small crab processing by 67.3% (equation 18). HR value of 0.892 means that the contribution of HR for small crab processing was by 89.2% (equation 19). Value market opportunity by 0.831 means that the contribution of market opportunities for small crab processing amounted to 83.1% (equation 20). From overall indicators, the most dominant that make respondents do small crab processing was HR with a loading factor of 0.892.

Interest loading value of 0.843 means that the contribution of interest for seaweed cultivation is 84.3% (equation 21). NR value of 0.626 means that the contribution of natural resources to seaweed cultivation at 62.6% (equation 22). HR value of 0.919 means that the contribution of HR for seaweed cultivation was 91.9% (equation 23). Value market opportunity by 0.844 means that the contribution of market opportunities for seaweed cultivation was 84.4% (equation 24). From overall indicators, the most dominant indicator that makes respondents do seaweed cultivation was HR with a loading factor of 0.919. This means that HR is the indicator that makes the respondent decide to do the cultivation of seaweed. Loading factor obtained was larger than 0.5 that is valid as a measure of seaweed cultivation. CR values obtained for all these indicators get asterisks stated that the indicator of interest, natural resources, human resources, and market opportunities are able to do the cultivation of seaweed.

Results Table 1 where the value of CR-making dried fish worth 6:14 asterisk), the value of CR for baking worth 3:43 (asterisk), the value of “small crab” processing CR 7.75 (asterisk) and CR cultivation of seaweed (asterisk). It states that an asterisk is significant. So the dimensions of making dried fish, baking, processing crab crabs and seaweed farming otherwise be able to measure the factors of alternative livelihoods. While the value of CR-making Abon and CR KJA not marked with an asterisk. It is stated that the manufacture of Abon and KJA indicator is not significant so that the indicator does not measure factors alternative livelihoods.

The model-dimensional structure has a coefficient value of making dried fish worth 0.586 (equation 25), it is stated that the diversity of alternative livelihoods can be explained by the dimensions of the manufacture of dried fish at 58.6%. In other words, the contribution of the dimension of making dried fish measure latent alternative livelihoods for 58.6%. Coefficient of baking valuable dimension 0.539 (equation 26), it states that the value of the diversity of alternative livelihoods can be explained by the dimensions of the baking of 54.9%. Coefficient of valuable crab processing dimension was 0.720 (equation 27), which means that the contribution of crab processing to measure the dimensions of
alternative livelihoods factor of 72%. And the coefficient of seaweed cultivation dimension of 0.507 (equation 28), which means that contributes seaweed cultivation at 50.7%.

Coefficient values that produce the highest value were processing “small crab” with 0.720 values. This suggests that the dominant “small crab” processing in measuring latency alternative livelihoods. Then the second largest coefficient value that is making dried fish by 0.586, the next one is making a cake that has a value of 0.539 and the last of seaweed cultivation by 0.507. It is stated that alternative livelihoods are the most excellent crab processing, and the manufacture of dried fish, and baking and the last is the cultivation of seaweed.

4. Conclusion
Alternative livelihoods that are most excellent in the district Tuppabiring Pangkajene Islands District starts from crab processing, and the manufacture of dried fish and baking and the latter is the cultivation of seaweed.

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