International Journal of Sustainable Development and Planning
Vol. 18, No. 6, June, 2023, pp. 1901-1910
Journal homepage: http://iieta.org/journals/ijsdp

Coastal Village Model Based on Fishery Agribusiness in Donggala Regency, Indonesia

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https://doi.org/10.18280/ijsdp.180626

Received: 18 January 2023
Accepted: 13 April 2023

Keywords:
dynamic model, coastal village, sustainable fishery agribusiness

ABSTRACT

The high level of economic development activities in this coastal area should have a positive impact on the level of community welfare, but this development has not been felt evenly by all communities, especially those in coastal villages. This study aims to examine and develop the concept of developing a coastal village model based on sustainable fisheries agribusiness in Donggala Regency. The current phenomenon of rural development that is occurring in Donggala Regency is the large potential that is not followed by the development of its regional development, caused by not properly managing its development efforts by optimizing the existing potentialThis research is developmental research with a survey approach. The variables measured in this study are variables needed for the development of coastal villages which include technical feasibility and future development feasibility. To find out the two feasibilities, data are needed, including: 1) data on areas that have potential indications for development; 2) regional economic data; 3) social and population data; and 4) data on ecology, infrastructure, and institutions. The data obtained from research on the development of a coastal village model based on fisheries agribusiness in Donggala Regency were analyzed using a dynamic system analysis approach. Donggala Regency is an agricultural area so that agriculture has a dominant role in the economic structure. The contribution of the agricultural sector to Gross Regional Domestic Product (GRDP) was above 35.11 percent or 4,114,846.1 million rupiah in 2020. Overall, Donggala Regency's GRDP continues to increase from year to year. The fishery business carried out by fishermen is an individual business. Various capture fisheries businesses, from modern to small scale, operate along the waters of Donggala Regency. The conceptual model in developing coastal villages in Donggala Regency which is applied with an ethical management approach that is integrated into the fisheries agribusiness system will have implications for community protection, increase in income, and sustainable fisheries management.

1. INTRODUCTION

The Donggala Regency area, based on data in the 2011-2031 Regional Spatial Plan, has a fairly large natural resource potential including: the plantation sector, the industrial sector, the tourism sector, the fishery sector, the mining sector, and forest areas. The diversity of natural resources owned by Donggala Regency makes this area rich in natural resources, one of which is the coastal and marine areas, with a coastline of 414 km around which there are coastal villages totaling 79 of 167 villages in general [1].

The current issue of rural areas is that their potential is not followed by regional development due to the poor management of their development efforts through the optimization of the existing potential. In regional development efforts based on rural development (rural-based development), there are a number of challenges, including weak human resources (HR), limited basic facilities and infrastructure to increase production, weak economic and social institutions, and poor access to capital resources [2].

The high level of economic development activities in this coastal area should have a positive impact on the level of community welfare, but this development has not been felt evenly by all communities, especially those in coastal villages. This is due, among other things, to the suboptimal policies set and implemented by the local government in regulating the directions for the development of coastal villages. Thus, it is necessary to make efforts to overcome them, at least policies that direct coastal villages as one of the bases for regional development are required. Agricultural development must be implemented with an agribusiness approach and developed in a more integrated manner with rural development so that development will be more focused and limited resources can be utilized optimally. The development of the fishery agribusiness chain (upstream-downstream) in coastal villages will improve the community's economy as capital and indicator in the success of regional development (coastal villages) [3].

Considering the potential and various complexities of coastal village problems, the concept of development through the integration of various activities in coastal areas is needed to minimize ecosystem damage, reduce utilization conflicts and optimize the potential of coastal area resources in an integrated manner based on fisheries agribusiness. Based on the description above, this research is expected to formulate a coastal village model based on fisheries agribusiness in an effort to develop rural economies in Donggala Regency. The research focuses on formulating a development model for

coastal villages based on fisheries agribusiness. To achieve this goal, the study will explore two key questions: 1) identifying the economic development obstacles encountered by coastal village communities, and 2) examining the formulation of the coastal village model based on fisheries agribusiness in Donggala Regency.

Law Number 6 of 2014 states that traditional villages and villages that are called by other names, hereinafter referred to as villages, are legal community units that have territorial boundaries and authority to regulate and manage government and the interests of local communities based on community initiatives, origin rights, and/or traditional rights that are recognized and respected in the government system of the Unitary State of the Republic of Indonesia. Furthermore, Daldjoeni [4] stated that the characteristic of a village that distinguishes it from a city is that the village and its people are very close to nature because their activities are highly dependent on climate and weather with the majority of the population working in the agricultural sector [4]. Marwasta and Priyono [5] stated that in terms of geography/layout, coastal villages are villages that are located not far from the sea and are usually along the sea [5].

Ethical attributes reflect human behavior that is considered good or bad, or appropriate or inappropriate. It is realized that ethics does not only concern interactions or relationships between human beings, but is also very important in the management of natural resources. Ethics determines what behavior is considered good and what behavior is considered bad in a particular community or society. Ethics is a system of values and norms that control human behavior. However, with the outbreak of the environmental crisis or ecological crisis, ethical issues become an important topic in environmental management discourse. According to Keraf [6], the ecological crisis is not only a technical issue, but also a matter of morality and ethics. Ethics s viewed from two aspects, namely social ethics and environmental ethics [6]. With the existence of ethics which will be used in management, it has a lot of influence in the preparation of a coastal village development model.

A model is a representation of a system (both concrete and conceptual) using another system. This other system, which is called a model, is certainly simpler than the actual system so that its behavior is easier to understand. The model is a representation or formulation in a particular language of a real system [7]. The system referred to here is a dynamic system paradigm. Thinking systemically means studying the relationship between objects from observations and investigations in the real world. Thinking systemically has existed in the human thinking process in solving life's problems by finding out the reality it faces. In investigating and observing reality, humans always see the relationship between the factors they observe by sorting (analysis) and then assembling them (synthesis). In this way a comprehensive solution will be achieved.

System dynamics is a method used to describe, model, and simulate a dynamic system (constantly changing from time to time). In dynamic systems, one is taught how to think systemically. This means that in solving a problem, a person does not see only one part, but plays all its effects on everything related to the problem. Forrester [8] defines system dynamics as a field for understanding how things change over time. This system is formed by differential equations. Differential equations are used for biophysical problems which are formulated as future states that depend on the present state [8].

This study aims to examine and develop the concept of developing a coastal village model based on sustainable fisheries agribusiness in Donggala Regency.

2. METHOD

2.1 Research methods

This research is a developmental research with a survey approach. Development research is a basic research activity that aims to obtain information for development. From the results of the development, it will be possible to assess the effectiveness of the topic or theme to be studied [5]. The variables measured in this study are variables needed for the development of coastal villages which include technical feasibility and future development feasibility. To find out the two feasibilities, data are needed, including: 1) data on areas that have potential indications for development; 2) regional economic data; 3) social and population data; and 4) data on ecology, infrastructure, and institutions.

Donggala Regency is a regency in the Central Sulawesi Province of Indonesia (Figure 1). This research was conducted in the coastal villages of Donggala Regency which were designated as research locations and were selected by multistage random sampling from 14 sub-districts, with the criteria;

1. Community activities are dominated by fishery business and the geographical location of villages and sub-districts is directly adjacent to the waters of the Makassar Strait.
2. The sub-district, based on the stipulation of the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia, is included in the *Minapolitan* area, both capture fisheries and aquaculture in Donggala Regency.
3. The sub-district is in synergy with the fisheries and marine development program launched by the Donggala Regency Government.

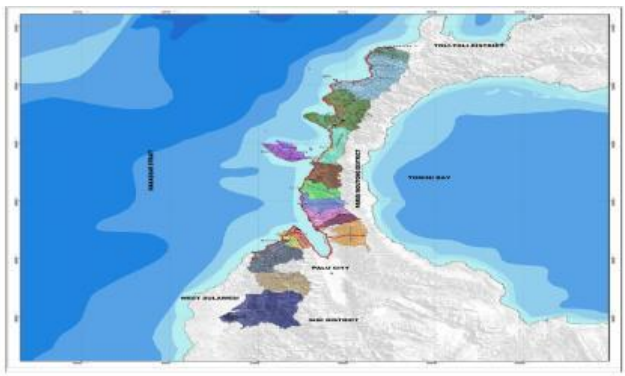

Figure 1. Research sites the coast of Donggala Regency

2.2 Types and sources of data

The data used in this study include primary data and secondary data. Secondary data was obtained through literature studies and documents from several related agencies (universities, private companies, marine and fisheries services, Bappeda, environmental services for Donggala Regency and Central Sulawesi Province), and the results of previous research studies. While primary data was obtained from the main actors, namely business actors who were widely used as

respondents, namely actors in fishery agribusiness activities in the coastal area of Donggala Regency, including actors in the procurement and distribution of fishery business production facilities (catching, aquaculture, processing, marine tourism and environmental services), primary production activities, processing activities, and marketing activities.

2.3 Data analysis

The data obtained from research on the development of a coastal village model based on fisheries agribusiness in Donggala Regency were analyzed using a dynamic system analysis approach. The system dynamics is a problem analysis method where time is an important factor and includes understanding how a system can be maintained from disturbances outside the system or made according to the objectives of the system modeling to be made [8]. Model development will be carried out using a dynamic system approach. This method can improve learning in complex systems [9]. To model dynamic system problems using iThink. iThink is the definitive modeling tool for creating professional simulations and presentations. iThink allows building beautiful, dynamic and attractive applications based on simulation models with the URL: https://www.iseesystems.com/store/products/ithink.aspx

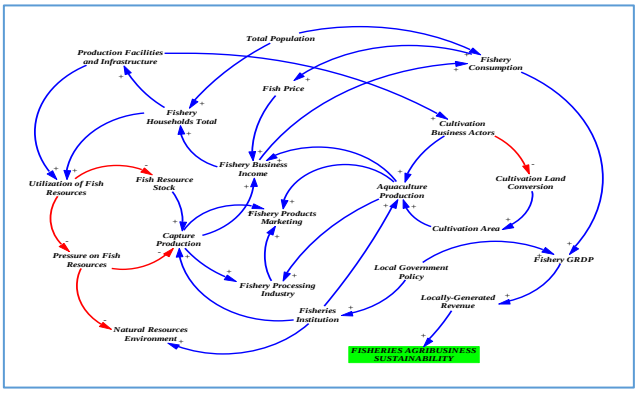

Figure 2. Causal loop diagram for the management of fisheries resources in the development of coastal villages based on fishery agribusiness

The development of the model starts from the conceptualization of the system which is carried out through the creation of a conceptual model which is described through a causal loop diagram (Figure 2). System conceptualization is used to describe in general the dynamic system simulation that will be carried out. Furthermore, the conceptual model is translated into a dynamic system model through stock and flow maps. Formulation of the model is done by understanding and testing whether the consistency of the model is in accordance with the objectives and constraints made. After the model is created, the next step is verification. At the verification stage, checks are made on the model made, whether the model is in accordance with what is desired, makes sense, and the formulation and units are consistent. Next, the system model is simulated. Then, validation of the model simulation results is carried out to ensure that the model created can truly represent the real condition of the system. Validation on this modeling is done by comparing the behavior of the model with the real system, namely the MAPE (Mean Absolute Percentage Error) test. MAPE is the average absolute difference between forecasted and actual values, expressed as a percentage of actual values. This test can be used to determine the suitability of the predicted data with the actual data with the equation [10]:

$$MAPE = \sum_{t=1}^{n} \left[\frac{yi - \hat{y}i}{\hat{y}i} \right] \times 100\%$$

n=period/number of data
y=score of actual result
ŷ=score of estimation result

3. RESULTS AND DISCUSSION

Administratively, Donggala Regency has 16 sub-districts and 167 villages/urban-villages with a total area of 5,275.69 Km^2, with the administrative boundaries of the Donggala Regency area according to the distribution per sub-district as an illustration in looking at the size of each sub-district. It should be noted that of the 16 sub-districts in Donggala Regency, 14 sub-districts are located in coastal areas, and 2 (two) other sub-districts, Rio Pakava and Pinembani, are in mountainous areas.

3.1 Economic condition

Gross Regional Domestic Product (GRDP) is one of the important indicators to determine the economic condition of a region in measuring the success of development over a certain period of time. Donggala Regency is an agricultural area so that agriculture has a dominant role in the economic structure. The contribution of the agricultural sector to Gross Regional Domestic Product (GRDP) was above 35.11 percent or 4,114,846.1 million rupiah in 2020. Overall, Donggala Regency's GRDP continues to increase from year to year. It also shows that Donggala Regency has experienced a phase of regional development, namely the shift in the role of the primary sector which is replaced by the secondary and tertiary sectors.

3.2 Fisheries business condition

The potential of fish resources in the Makassar Strait, including the waters of Donggala Regency according to data presented by the Directorate of Research and Exploration of Biological Resources, Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia (2014) which is included in the category of Fisheries Management Area (WPP) 713 (Makassar Strait and Flores Sea) includes large pelagic fish, small pelagic fish, demersal fish, consumption reef fish, peneid shrimp, lobster, squid and ornamental fish [11].

The potential of marine fisheries in Donggala Regency is in the Districts of Banawa, South Banawa, Labuan, Tanantovea, Sindue, Sirenja, Balaesang, Balaesang Tanjung, Damsol, Sojol and North Sojol. While the potential for inland fisheries is evenly distributed in all sub-districts except for Pinembani and Rio Pakava sub-districts. Fishery production in 2020, including capture fisheries, aquaculture and public waters, has decreased significantly in Donggala Regency compared to 2019, which was 34,381 tons (Table 1).

The fishery business carried out by fishermen is an individual business. Various capture fisheries businesses, from modern to small scale, operate along the waters of Donggala Regency. The diversity of this type of business all depends on

the capital capabilities of the fishermen and the business opportunities that can benefit them. Owners of large capital will, of course, choose to develop their fishing business through the procurement of 20 GT purse seine vessels, bagan fishing gear, 1-5 GT long line tuna vessels, and floating net cages. Meanwhile, fishermen with small capital will choose to pursue a small-scale fishery business using fishing rods, gillnets, *sero* and traps.

Donggala Regency has 14 sub-districts located in the coastal area. Six sub-districts have the potential for aquaculture development, including South Banawa District which has the potential for seaweed and brackish cultivation, Balaesang District which has brackish water cultivation, Balaesang Tanjung District with Lake Rano covering an area of + 296.2 ha which has the potential for freshwater aquaculture, and Dampelas District with Lake Talaga with an area of + 542.6 ha which has the potential for freshwater aquaculture.

Table 1. Fishery production by sub-district and sub-sector in Donggala Regency (tonnes) in 2020

No	Sub-dictrict	Capture Fishery	Public Waters	Aquaculture	Total number
1	Rio Pakava	0	0	0	0
2	Pinembani	0	386	0	386
3	Banawa	5216,1	0	6,4	5222,5
4	Banawa Selatan	1862,3	0	0	1862,3
5	Banawa Tengah	1500,7	0	0	1500,7
6	Labuan	568,3	174	0	742,3
7	Tanantovea	452,3	0	0	452,3
8	Sindue	856,5	0	0	856,5
9	Sindue Tambosabora	641,3	0	0	641,3
10	Sindue Tobata	608,3	0	0	608,3
11	Sirenja	897,2	227	0	1124,2
12	Balaesang	1908,5	0	1,1	1909,6
13	Balaesang	1302	245	295,3	1842,3
14	Dampelas	1718,4	358	227,7	2304,1
15	Sojol	1294,6	0	5,4	1300
16	Sojol Utara	2509,8	0	437,3	2947,1
	Donggala	**21.336,3**	**1. 390**	**973,2**	**23 699,5**

Source: Department of marine affairs and fisheries of donggala regency, 2021 [12]

3.4 Fishery agribusiness-based coastal village model

The coastal village development model based on fisheries agribusiness in Donggala Regency used a dynamic system approach through the logic of the relationship between related components and their interactions. The systems approach is a method that can be used to solve complex, dynamic and uncertain problems. To obtain a comprehensive model of coastal village development based on fishery agribusiness, a dynamic system methodology was used based on consideration of its ability to present the relationship between the variables studied and simulate the behavior of the system when an intervention is made to the system.

3.5 System identification

System identification is a chain of relationships between the needs of each system actor and the problems that exist to meet these needs [13]. The relationship of each system actor is described in a causal relationship. Causal loop diagram describes the relationship between components in the system. In this section, the structure and behavior of the created model will be described together. To make it easier, the explanation will start from the structure of the model at a macro level and then each sub-model will be explained. The causal loop diagram of the coastal village development model based on fisheries agribusiness can be seen in Figure 2.

The system components involved in the utilization and management of fishery resources to support fishery agribusiness activities in the coastal area of Donggala Regency are the population (number of Fishery Households, per capita fishery consumption and market), fishery production processes (availability of fish resource stocks, area of cultivated land, fishing activities, and aquaculture), the fishing industry (processing), fishery institutions (improvement of human resources and environmental management, and sustainability of fishery business), and government policies (increasing Locally-Generated Revenue/LGR).

The causal loop diagram above illustrates the interrelationships between components in the agri-fishery sustainability system. The identification of the causal loop diagram system is then interpreted to build the black box concept of the input-output diagram. According to Sadelie et al. [14] there are three kinds of information found to compose a black box, namely: (1) input variables, (2) output variables, (3) parameters that limit the structure of the system. There are two kinds of input variables, namely those from outside the system (exogenous inputs) or environmental inputs, and overt inputs originating from within the system (endogenous inputs). Overt input consists of controlled and uncontrolled inputs, while the output variable consists of desired and unwanted outputs. The results of the analysis of the input-output diagram of the coastal village development model based on fisheries agribusiness in Donggala Regency can be seen in Figure 2.

In the input-output diagram (Figure 2) there are four important factors, namely uncontrollable inputs, controlled inputs, desired outputs and unwanted outputs. Controlled inputs are inputs that directly affect system performance. In addition to these four factors, there are two other influencing factors, namely environmental input and feedback. Inputs that directly affect the increase in fishery production and are controllable are fishery business institutions, additional production inputs, fishery production, improvement of human resources (Craftmaship and Skills), use of production inputs, and use of aquaculture and fishing technology which are controlled inputs.

The inputs needed to increase fishery production but cannot be controlled are high market demand, fishery prices,

cultivation land clearing, increasing capture fleets, exploitation of fisheries resources, and technological changes which are part of uncontrolled inputs. Environmental inputs are factors that indirectly influence the development of the fisheries agribusiness sector in achieving the objectives, namely natural and environmental resources, laws on fisheries, local government policies, socio-economic conditions, population, and geographical conditions of the region.

The three inputs will produce the desired output and unwanted output. The desired output is an increase in community welfare, an increase in fishery production, sustainability of fishery business, employment, an increase in Localy-Generated Revenue, the availability of industrial raw materials, and the availability of financial institutions. Meanwhile, the unwanted outputs are the lack of industrial raw materials, increasing poverty rates, decreasing production prices, environmental damage, and decreasing the amount of fishery production.

3.6 Model structure and simulation

System modeling is a group of modeling activities that will describe the system [15]. The model built is a deterministic symbolic model (mathematical model). The modeling of the coastal village development system based on fisheries agribusiness was carried out using *Ithink 6.0.1* software (Figure 3).

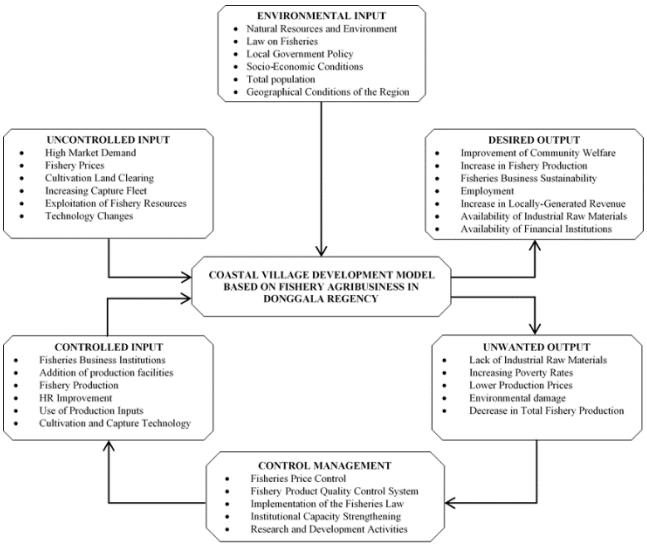

Figure 3. Diagram of the input-output model for the development of a coastal village based on a fishery agribusiness in Donggala Regency

The dynamic system modeling was carried out after the model identification stage. This step was done by changing the cause-and-effect diagram into a flow diagram that could be understood by the computer software to be used so that it could determine the dynamic behavior caused by the assumptions of the simulated model. The structure of the model shows the boundaries of the built system. The development of the dynamic system model aimed to determine the behavior of the fisheries agribusiness system during the coastal village development which is useful in improving community welfare. In this study, the structural characteristics of the coastal village development model based on fisheries agribusiness in Donggala Regency are described at a macro level and formed in 4 sub-models, namely: (1) a sub-model of increasing fishery production, (2) a socio-economic sub-model, (3) processing industry development sub-model, and (4) fishery product marketing sub-model.

3.7 Coastal village development model scenario simulation

The performance of the model described in the system structure describes the current condition. Over time, there will be changes in system performance according to the dynamics of time in the future. Based on this, various scenarios have been prepared for the model that has been built as a strategy for developing coastal villages in the future. The built scenarios are divided into three: (1) pessimistic scenario (2) moderate scenario, and (3) optimistic scenario.

The pessimistic scenario means that the variables that affect the performance of the system experience a setback, or there is a change in the existing state that leads to the achievement of progress but is small enough to affect the performance of the system, or there is a very rapid change in the situation that needs to be inhibited. The moderate scenario is defined as a change in several variables that affect system performance, and this change is better than the pessimistic scenario. Meanwhile, the optimistic scenario means that there is a change that is greater than the variables that affect system performance, and this change is better than the first and third scenarios. The key variables that greatly affect the performance of the system include population growth, input and output increase in production, and the level of community income. These variables will affect the increase in production, socio-economic, contribution to Locally-Generated Revenue (LGR) and Gross Regional Domestic Product (GRDP). This study estimates an increase in production of 4%, 8% and 12% in fisheries: capture fisheries production assuming an increase in the number of fishing fleets and an increase in the amount of effort, public water production assuming an increase in the amount of effort, and aquaculture production assuming an increase in land area.

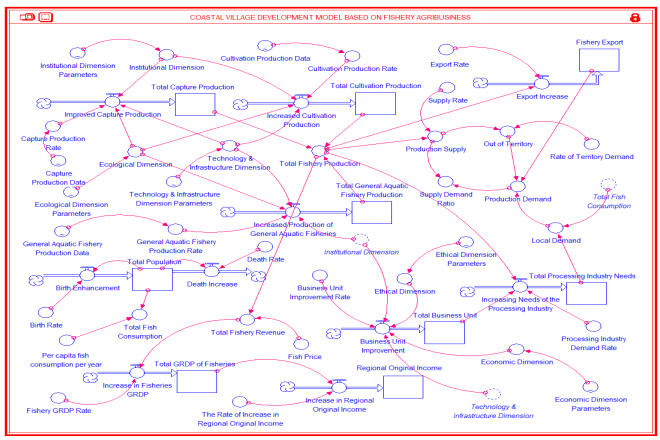

Figure 4. Dynamic model structure of coastal village development based on fisheries agribusiness in Donggala Regency

The scenario for increasing fishery production in the coastal village area of Donggala Regency is shown in Figure 4. In the early stages, the pessimistic, moderate and optimistic scenarios show the same production of 23,699.50 tons in the simulation year of 2020, which then increases at a different rate with an increase in production by 4% (pessimistic), 8% (moderate) and 12% (optimistic) per year. The simulation

results show that until 2027 the simulation of fishery production only reaches 63,734.50 tons in the pessimistic scenario, 88,172.16 tons in the moderate scenario, and 105,497.06 tons in the optimistic scenario. This production level then increases until the final year of the simulation, which is 2034. In 2034, fish production increases to 103,769.51 tons in the pessimistic scenario, 152,644.82 tons in the moderate scenario and 187,294.63 tons in the optimistic scenario.

The difference in the increase in fishery production shows a sharper curve in the optimistic scenario than those in the moderate and pessimistic scenarios. The higher fishery production in the third scenario (optimistic) than the other scenarios is caused by the increase in production inputs in primary activities of the main actors, in addition to other factors affecting the increase in production.

This increase in production will affect the income of the main actors in the coastal villages. The higher the fishery production generated by their business activities, the greater their chances of obtaining profits and income. However, this income is not only influenced by the amount of production, but also by the price of fishery commodities. By making efforts to increase production through the addition of inputs to production facilities, a scenario model of income from fishery businesses (including capture, cultivation and processing) can be made.

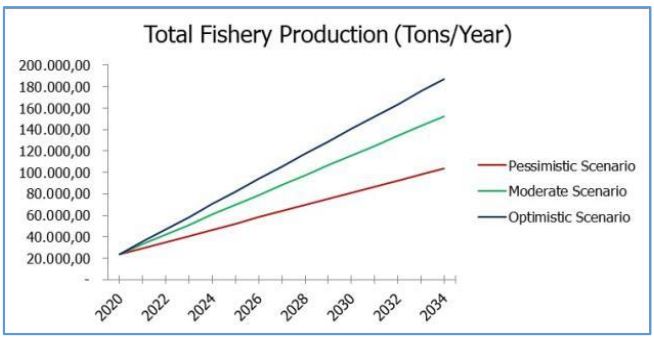

Figure 5. Scenario simulation of changes in fishery production increase in the coastal village area of Donggala Regency

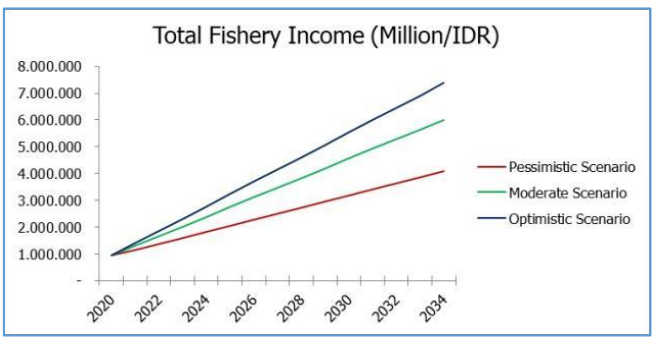

Figure 6. Scenario simulation of fishery business income in the coastal village area of Donggala Regency

The difference in the growth of the revenue/income curve in the pessimistic, moderate and optimistic scenarios, with the curve in the optimistic scenario being higher than the curve in the moderate and pessimistic scenario, is shown in Figure 5. The difference is partly due to differences in the prices of fishery commodities being traded. As it is known that the fishery commodity that is built in this model is a fish commodity with the assumption that the current (existing) price is Rp. 37,029 per kilogram. In the moderate scenario, the main actors earn Rp. 933,049 million in 2020, which continues to rise to Rp. 6,009,627 in 2034. In the pessimistic scenario, the income earned is Rp. 4,085,406 million in 2034, while in the optimistic scenario it is 933,049 million in 2020, which increases to Rp. 7,373,790 million in 2034 (Figure 6).

The increase in fishery production will also affect the increase in Gross Domestic Product (GDP) (Figure 7). The development of the increase in GRDP originating from the contribution of the fisheries sector in this model is made into a scenario model. Commodities for which scenarios are made to see their contribution to GRDP include leading fishery commodities (fish, shrimp, lobster, and others).

The simulation results of each component making up the sub-model show a tendency to form a positive growth curve that follows the exponential curve until 2034. However, several components of the sub-model, such as increased fishery production and marketing of fishery products, are always balanced by the availability of technology and support for facilities and infrastructure of fisheries agribusiness so that in this model there is a positive feedback relationship through the reinforcing process. The form of the model being built follows the basic pattern of "Limit to Growth" in a dynamic system. To improve the performance of the model, the scenario that needs to be carried out is the optimistic scenario, namely by conducting a larger intervention on one or more variables that affect the model.

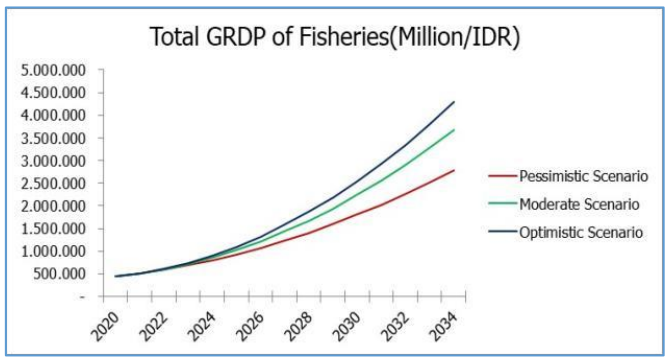

Figure 7. Scenario simulation of GRDP contribution in the coastal village of Donggala Regency

3.8 Model validation test

Model testing was done using statistical methods such as MAPE (Mean Absolute Percentage Error). MAPE or the mean absolute percentage error is one of the parameters that can be used to determine the suitability of the estimated data and the actual data. The model validation test was carried out on 4 (four) main sub-models, namely: (1) fishery production sub-model, (2) socio-economic sub-model (population, Fisheries GRDP and LGR), (3), sub-model of development of fishery product processing industry, and (4) marketing sub-models (fishery exports and demand for fishery production outside the region assuming 50% of total production). The results of the validation test for each sub-model are shown in the following Table 2.

Analysis of the model validation test was also carried out on the sub-model of the needs of the fisheries processing industry. The MAPE test value of the sub-model is 40% so that the sub-model can be categorized as 'fair' because it meets the criteria that the MAPE test is in the range of 20-50%. Meanwhile, the

MAPE test value of the marketing sub-model is 16%, and therefore it is categorized as good because the MAPE test results are in the range of 10-20%.

Table 2. Validation test results

No	Description	MAPE test results	Range
1.	Increase in Fishery Production	12%	10-20%
2.	Socio-Economic (Total population, GRDP & LGR)	2%, 10% 24%	0-10% 10-20% 20-50%
3.	Processing Industry Development	40%	20-50%
4.	Fishery Product Marketing	16%	10-20%

3.9 A conceptual model of coastal village management based on agribusiness sustainable fisheries

The results of the study show that the coastal area of Donggala Regency is very potential for the development of the fisheries sector, especially capture fisheries and aquaculture. However, its development is limited by technological factors and the availability of facilities and infrastructure to support fishing and aquaculture, including the level of awareness (ethics), in the management of fishery resources.

Considering the potential of the coastal area of Donggala Regency, development policies in this region are directed at development in the fisheries sector through agribusiness development supported by adequate facilities and infrastructure, both public facilities and infrastructure and agribusiness development facilities and infrastructure. One of the concepts of balanced area development that can be applied in this area is the development of coastal village areas or fishing village areas (*minapolitan*). This concept is in line with the program of the central government and the Donggala district government regarding the concept of the *minapolitan* area in 2011 to develop coastal villages through the development of fishing towns. However, based on the results of the analysis, the existing condition of the coastal village areas is largely undeveloped, so it is necessary to make efforts to improve the coastal village area by completing the required facilities and infrastructure.

The main obstacle faced in the development of coastal villages in Donggala district is the limited infrastructure/facilities and the quality of human resources in utilizing technology. The infrastructure in question includes the availability of an ice factory, Fish Auction Place (TPI), workshops, provision of refueling stations for ships, and provision of fishery tools and materials (catching/cultivating). Besides that, the coaching and training activities carried out by the relevant agencies are still lacking because there are not enough skilled workers placed in the village area. Capital factors, financing systems, technology, human resources, facilities and infrastructure as well as market access are key variables [16]. Therefore, to overcome this, it is necessary to provide adequate infrastructure and increase skilled human resources. In this case, the role of the government, both the Central Government and the Donggala Regency Government as direct implementers in the field, is very important, especially in making policies for teh development of coastal village areas. On the other hand, the potential for social conflict between communities is also a serious threat that can occur at any time. Social conflicts are generally caused by issues of marginality and a sense of injustice and inequality in economic and socio-cultural aspects. The integration of fisheries into coastal area management is carried out because the coastal area is a very fragile area due to various overlapping interests that tend to trigger conflict [17]. The development of village areas with the concept of agribusiness is a Bottom-Up Planning approach, therefore, the active participation and involvement of all stakeholders in the coastal village area (main actors/fishery businesses, investors and local governments) is crucial.

The waters along the coastal villages as places for fishery business activities and suppliers of fishery commodities will certainly be seen from several components of the problem and improvement efforts as follows:

1. The main actors (fishermen and fish cultivators) as the beneficiaries of the existing fishery resources in the waters will certainly try to get as many fish commodities as possible with the equipment they have to increase their income. With the availability of equipment and good water conditions, their enthusiasm and work ethic will have a positive impact. On the other hand, if the equipment is damaged/unavailable, technological capabilities are low and the waters are not good, then they will be reluctant to do activities to get fish commodities (becoming lazy).
2. Efforts to conserve aquatic ecosystems (coral reefs, seagrass beds, mangroves) and fish resources will ensure the current and future needs of fish commodities. On the other hand, if the environmental quality of the aquatic ecosystem is damaged by irresponsible people and efforts to obtain commodities are carried out in a destructive manner such as bombing or destroying wood, then this will have an adverse impact on the growth and sustainability of fish resources. As a result, the main actors will not get the expected results.
3. The availability of supporting facilities and infrastructure is important for every village, considering that facilities and infrastructure such as Fish Auction Place (TPI), markets, financial institutions, raw material shops, ice factories and others are needed. The availability of these facilities will affect the activities of the main actors in efforts to repair equipment, market products, and meet fishing needs.
4. Management of fishery resources. The management referred to here is concerned with the behavior of the main business actors in the utilization of fishery resources. Awareness of the importance of ethics among the main actors in utilizing fishery resources is important considering that if fish resources are not managed properly, it will have an impact on future generations. Therefore, it is necessary to maintain the quality of the waters by carrying out conservation efforts and making collective agreements in formulating rules in the management of fishery resources.

Based on the foregoing, in an effort to create effective fisheries management, it is necessary to have management ethics and the integration of systems and policies. This integration is built on the basis of connectivity and system synergy formed from fishery activities which include fishery resources, fishery actors, fishery infrastructure, and fishery infrastructure providers in coastal village areas. This is in line with the opinion of Kusuma and Ma'rif [18] that in order to increase the development of rural areas for the community, economy, and regional development, intensive efforts to develop local potential are needed [18].

Regarding management ethics in the agribusiness system in primary activities specifically for capture fisheries and aquaculture in each coastal village, the main actors (fishermen

and fish cultivators) need to behave well and be aware of managing fish resources as a commodity from fishing targets and supporting economic activities. In addition, the main actors also have very high connectivity to infrastructure, especially fishing gear, fishing fleets, and the technology used which is the main capital in catching fish. The ethics of fisheries management with a connectivity approach to the primary activity system (production) is intended to increase and control interactions, both between resources and fishery actors, especially fishermen, as well as between fishery actors and the government, universities, and the private sector that play a role in monitoring and controlling them so as not to commit violations in carrying out their business activities.

Government control and guidance is emphasized on the use of environmentally friendly fishing gear and the types and sizes of fishing gear so that fishery resources and their habitats can be sustainable. The integration of fisheries management and agribusiness systems approach is regulated in a policy that must be mutually agreed upon, such as the use of environmentally friendly fishing gear and technology, government intervention on uniformity of market prices in coastal village areas, and justice for all main actors, both members and non-members in the utilization of BUMDes/Cooperative. Another integration that must be implemented is the integration between the government, the private sector, cooperatives and the main actors/business actors in the management of fishery activities. The government carries out its role as a supervisor for fisheries actors in order to realize sustainable fisheries, and universities provide guidance and introduce technology from research results to increase productivity and production.

The conceptual model framework for the management of capture fisheries agribusiness in coastal village areas in a sustainable manner must be applied, which means that fishery actors make the best use of fishery resources, supported by management ethics in good agribusiness and infrastructure systems under the supervision of the government as the infrastructure provider. The conceptual model framework for fisheries and aquaculture agribusiness management in the coastal village area is shown in Figures 8 and 9.

Figures 8 and 9 show that the concept of integration is based on connectivity and aquaculture systems which have components such as aquaculture actors, in this case fish farmers/cultivators; managed fishery resources such as cultivated land (both in sea and in brackish water including fresh water); and cultivated commodities such as milkfish, shrimp, seaweed and others. Besides that, the availability of cultivation infrastructure such as aquaculture storage warehouses, production markets including ice factories, suppliers or infrastructure providers from both the government and the private sector (shops/providers of tools and materials), and guidance from relevant agencies in providing information such as aquaculture technology (traditional, semi-intensive and intensive) that cultivators need to know and master, will have a positive impact on the increase in land productivity which in turn can increase production.

In order to achieve an integrated and sustainable management of the submodels that have been prepared previously, where there is connectivity and interaction between systems, it is necessary to make efforts to manage the submodels that are integrated with a systems approach and policy integration. Connectivity that occurs both internally and externally in each village or between villages is caused by interdependence factors, especially the availability of infrastructure that supports both social and ecological interactions. A village that has external connectivity in interactions between the main actors is generally caused by the unavailability of supporting facilities for community activities in these interactions, such as markets and other supporting infrastructure. Villages with these conditions will generally depend on other villages. Appropriate spatial planning in the study area requires the integration of policies and integration of infrastructure use. Each village that does not have infrastructure will look for another village that has it. This is in line with spatial planning theory that humans will look for a more adequate place both biologically and physically to carry out the life cycle [19]. The component attributes of each village must be identified first to find out the absence (eg infrastructure) in the village. Then the government or related stakeholders conduct a connectivity study to find out how much each village tends to depend on all the existing components.

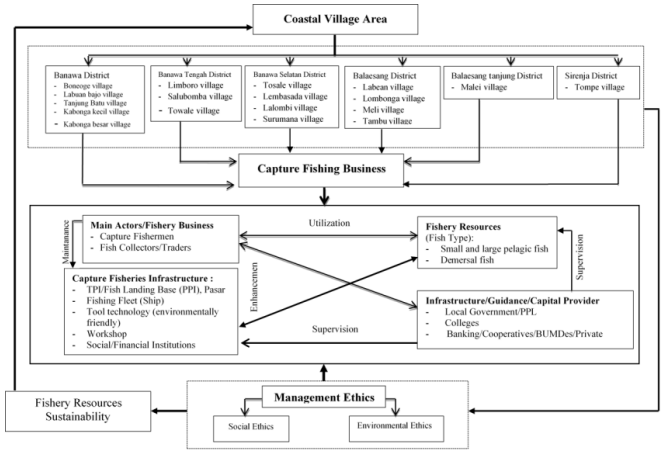

Figure 8. Conceptual model of management of coastal village areas based on fishery agribusiness (sustainable capture fisheries) in Donggala Regency

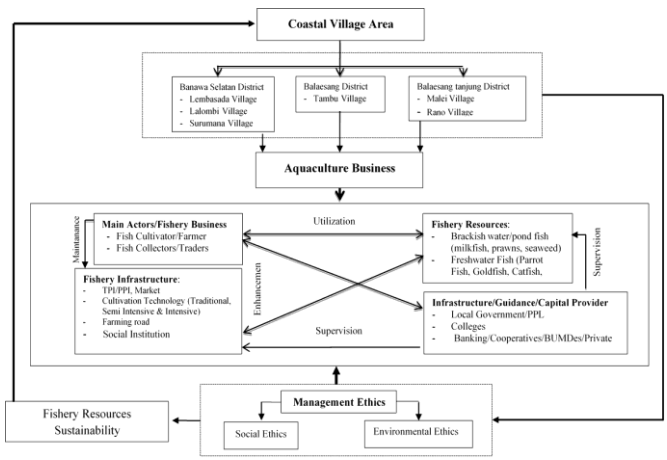

Figure 9. Conceptual model of management of coastal village areas based on fishery agribusiness (sustainable aquaculture) in Donggala Regency

The existence of the concept of a sustainable fishery agribusiness management model in coastal villages with the support of the Regional Regulation of Donggala Regency is expected to increase their ability to adapt and develop in the Donggala Regency area, so as to increase community income and sustainable fisheries management.

In supporting the development of coastal villages in the Donggala Regency area, it is necessary to develop several formulations of operational policy directions, including: 1) Designate the coastal villages located in the sub-district capital as a Growth Center Village (DPP) and other surrounding villages as hinterland areas. This is related to the level of development of the villages in the sub-district capital which are more advanced than the other villages. These results are supported by research which shows that the regency government and province do not have clear and concrete policies to resolve firmly and thoroughly the economic problems of fishermen living in the coastal areas [20]; 2) Build agribusiness facilities and infrastructure needed both in DPP areas and in hinterland areas supported by adequate public facilities and infrastructure, especially markets, transportation and telecommunications in all coastal villages. This is intended to increase fishery business productivity and facilitate access between regions in the procurement of fishery production facilities and marketing of fishery products. Well-functioning and efficient infrastructure promote inclusiveness by expanding access to vital services and improving economic opportunities for all and this, in turn, reduces poverty [21]; 3) Develop economic institutions for coastal communities from, by, and for the benefit of the coastal communities themselves and not for institutions formed for the benefit of the supervisory agency. The coastal communities require guidance from the relevant agencies/institutions because in general the main actors are working individually with minimal skills and capital. Steps that can be taken are to provide encouragement and guidance so that they are able to work together in groups and form a combined group or association. Other research shows that the economic development of coastal communities has a significant effect on coastal economic growth, that is at community empowerment 12.5%, welfare 17.2%, development 6.8% [22]; 4) Improve coordination and establish good partnerships with all relevant stakeholders. In this case, coordination and partnership between the government, coastal communities and the business world are very important in the development of coastal village areas in accordance with their respective authorities. The government is expected to be able to provide strategic public facilities and infrastructure and fishery research activities. The role of the business world is important in terms of providing fishery inputs and in processing fishery products, while the community as the main actor contributes to the utilization of facilities and infrastructure that have been prepared by the government and the business world to increase their income. Coastal areas can be managed by traditional villages and coastal management arrangements that can contribute to the local economy and environmental conservation actions of coastal areas [23]; 5) Increase the level of awareness in environmental management of fishery resources with a behavioral (ethical) approach, both social ethics and environmental ethics, so that resource sustainability is maintained for the future; 6) Increase the capacity of coastal communities by providing formal and informal education such as trainings, courses, and workshops. This is important considering that the community is expected to be able to take the initiative independently and creatively to seek steps that must be taken in their business activities, including the processing and marketing of fishery products. Non-formal education plays a major role in improving community development related to education (school) and equality and providing skills to improve the economy of the people in the Pati Regency [24].

Other research results show that the coastal rural development planning based on fishery food management is strongly dependent on the relationship among the agricultural environment, alleviating rural poverty and fishery food management [25]. The priority parameter for the agricultural environment is that the role of the private sector and handling skyrocketing food prices. whereas, the priority solution for rural poverty is that of supplying access to education and health as well as supplying growth opportunities for job creation [25].

Constraints and problems in the economic development of communities in coastal villages include: 1) The level of participation of the main actors (fishermen and fish cultivators) as the beneficiaries of the existing fishery resources in the waters is influenced by the lack of equipment availability and low ability to adopt technology; 2) Damage to the quality of the aquatic environment is the result of the large number of main actors carrying out activities that damage the environment, such as bombing, harvesting mangrove wood and others; 3) Supporting facilities and infrastructure/infrastructure are very limited even though their existence is very much needed by every village, for example TPI, markets, financial institutions, raw material shops, ice factories and others; 4) The behavior of the main actors and business actors in the utilization of fishery resources is low. Awareness of the importance of ethics is important among the main actors in utilizing fishery resources, considering that if fish resources are not managed properly, it will have an impact on future generations; 5) Guidance and training activities are still lacking because there are not enough extension workers placed in rural areas.

4. CONCLUSIONS

Community economic development in coastal villages has various constraints and problems, including limited equipment and technological capabilities, environmental damage due to human activities that damage the environment, limited facilities and infrastructure needed by each village, low behavior in utilizing fishery resources, and lack of training and guidance. This conclusion suggests that there needs to be more serious and planned efforts to address these issues so that community economic development in coastal villages can run well and sustainably.

The conceptual model in developing coastal villages in Donggala Regency which is applied with an ethical management approach that is integrated into the fisheries agribusiness system will have implications for community protection, increase in income and sustainable fisheries management.

The limitation of this research is that it does not include the components of fishery resource management, both cultivation and fishing, including marketing of the produce. It is hoped that further research will be needed.

ACKNOWLEDGMENT

We are especially grateful to Fisheries Service and coastal communities of Donggala Regency, and the head of Alkhairaat University for supporting the Research Grant.

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