System identification for small scale fisheries development in Riau Province waters

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Abstract. System identification for small scale fisheries development was designed using System Methodology. This system identification consisted of construction related Causal Loop Diagram and Input-Output Diagram. It was found that system approach was an effective tool in identifying an complicated system. It could provide a set of holistic information necessary for solving such intricate problem systematically. The study conclude that beside favorable incentives created by the Government, accurate information along with a synergetic network among the actors involved were the key elements to develop small scale fisheries. Accurate information were needed on business for small scale fisheries and industrial capacity on the effectiveness of suitable fisheries and also for the processing technology, on the quality and quantity of accessible raw materials could be on the proper product prices and finally on the appropriateness of labor wages. The system development should also explore a control subsystem to repress trade monopoly practices, diminution in product quality, excessive payment transaction and damage of the environment.
Keywords: system identification, small scale fisheries, accurate information

Introduction

RiauProvince is one of theregions inIndonesiawhichhas thepotential forsubstantialfish resourcesandlocated betweenthe twomainmarinewaters of theSouth China Sea andthe Malacca Straits. Potentia lfisheries in the South China Sea at 602,384 tonnes/year and the sustainable potential of 361,430 tons which utilization nrate of 216,960.3 tonnes, while for the Malacca Straits by 141,546tonnes/yearby the sustainable potential of 84,928 tons and autilization rate of 96513.1 tonnes (DPK Riau Province, 2009). The problem of marine fisheries development in Riau Province, among others, is that fishing capture is dominated by small scale fisheries. In 2009, small scale fishermen was about 82% of total fishermen inthis provice (Riau dalamAngka,2010). They are characterized with low input of technology which results to low productivity, and finally low income of the fishermen. Small-scale fisheries requires a comprehensive fisheries management in orderto be sustainable. Fishing activities thatdotake placearound thebeach with arange offishing groundsarestill limited.

Fundamental issues relating to the development of fisheries is there's no a comprehensive perspective of all stakeholders on the state of fisheries as a system. This system involves a state issue fisherman, catching productivity, income levels, availability of fish resources and fisheries management activities. These problems can be grouped into five major aspects, namely aspects of the market, technical, economic, social and environmental friendly (Dahuri, 2004). The existence of conflicts in Riau waters requires a more serious effort in the development of fisheries areas as an effort to increase productivity and incomes in a sustainable fishing.Development ofsmall-scale fisheriesis one ofthe 1945 Constitutionin theprovision of employment andimprovedliving standardsfor the peopleespeciallyfishermen andpeoplesaround thefishing village. The visionof thedevelopmentis supposed to support the potential of fishing communities to increase participation, productivity and efficiency of existing resources. Thus, it will strengthen the small-scale fisheries and other small-scale fisheries grow by strengthening technology in the field of marine fisheries.

Materials and Methods

A systems approachis very appropriate to be used to solvec omplex subject, dynamic and probabilistic. The complex nature of the interactions can be observed that factor srelated to veryc omplicated. The hall mark of a dynamic problem, namely the factors that change according to the time and w as followed by a process of conjecture the future. Probabilistic

characterized by uncertain ythrough the use offunctionopportunitiesin reaching conclusions and providerecommendations.The method starts with doing system equirements analysis, system identification, system modeling, verification, implementation andending with periodice valuation of the decision-making models to be developed (Eriyatno, 2002). The system is a group of elements that are interconnected and organized to achieve the goal. Thus the suitability and equivalence relations become important in the identification of a system where there is no element left. Characteristics goal oriented systems approach of holistic and effective. While such a system has a finite group of the group of elements, so that these restrictions can be described clearly.

Needs Analysis

The parties involved in the effort to increase the income of small scale fisheries are fishermen, traders and middlemen, the fish processing industry, supporting industries, consumers, the Ministry of Maritime Affairs and Fisheries, Cooperation, local governments, and financial institutions. Needs of each party can be seen in Table 1.

Systems identification

Diagrams are used for system identification is the circumference of a causal diagram and diagram input output. Causal diagram illustrates the relationship between the componentsin the systemsmall scale fisheries development (Figure 1). The diagramillustratesinputandcontroloutputof this model(Figure 2).

Table 1. Actors Needs Analysis

| No.	Actors	Needs
1.	Fishermen	• adequate income for fishermen and families • improvement of fishing capture and post-harvest technology • stable and reasonable prices
2.	Traders and retailers	• gain maximum sales • ease of obtaining fish and fishery products • quality assurance and continuity of supply • a good trading system and secure
3.	Fish processing industry	• maximum benefits and investment incentives • accessibility of financial resources and technology • ease licensing procedures investment,taxation, export and import of auxiliary
4.	Supporting industries	• Maximum selling price • Repayments and services • Ease of export and import licensing procedure
5.	Consumer	• stable and reasonable prices • quality assurance, safety, and halal products • the availability of products at any time
6.	Ministry of Maritime Affairs and Fisheries	• fish production to meet market demand • sustainable fish stocks
7.	Cooperation	• ease of obtaining price information, products favored by consumers, technology and financial resources • an efficient trading system
8.	Local Government	• expansion of employment • increased revenue • minimal environmental pollution
9.	Financial institutions	• current loan repayment • high interest rates • the number of customers increased
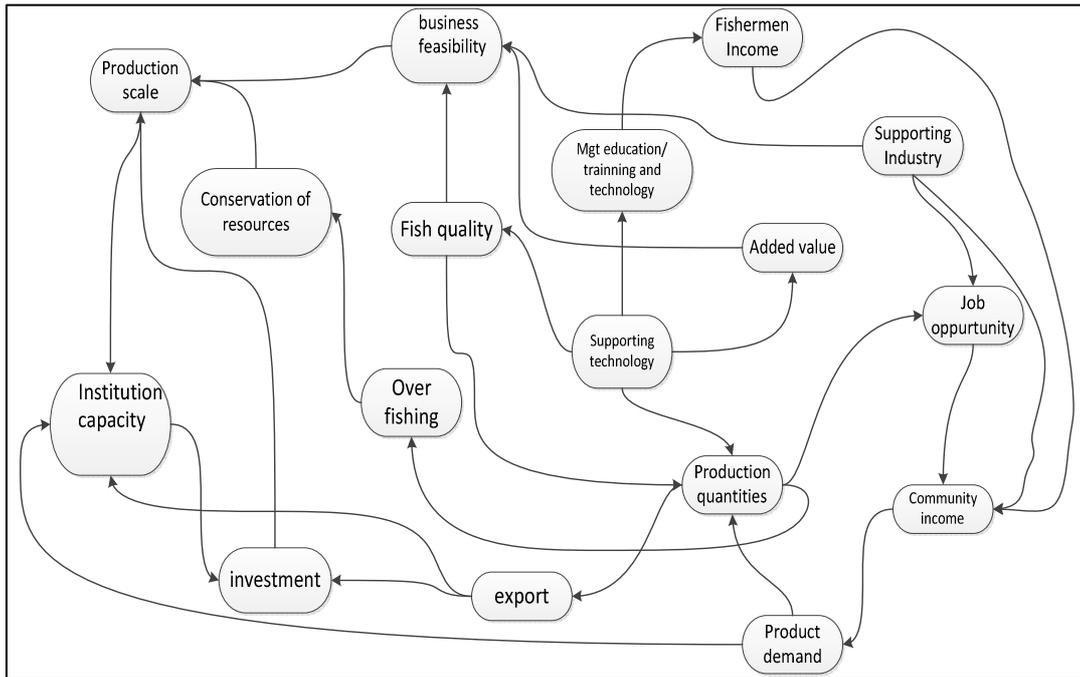
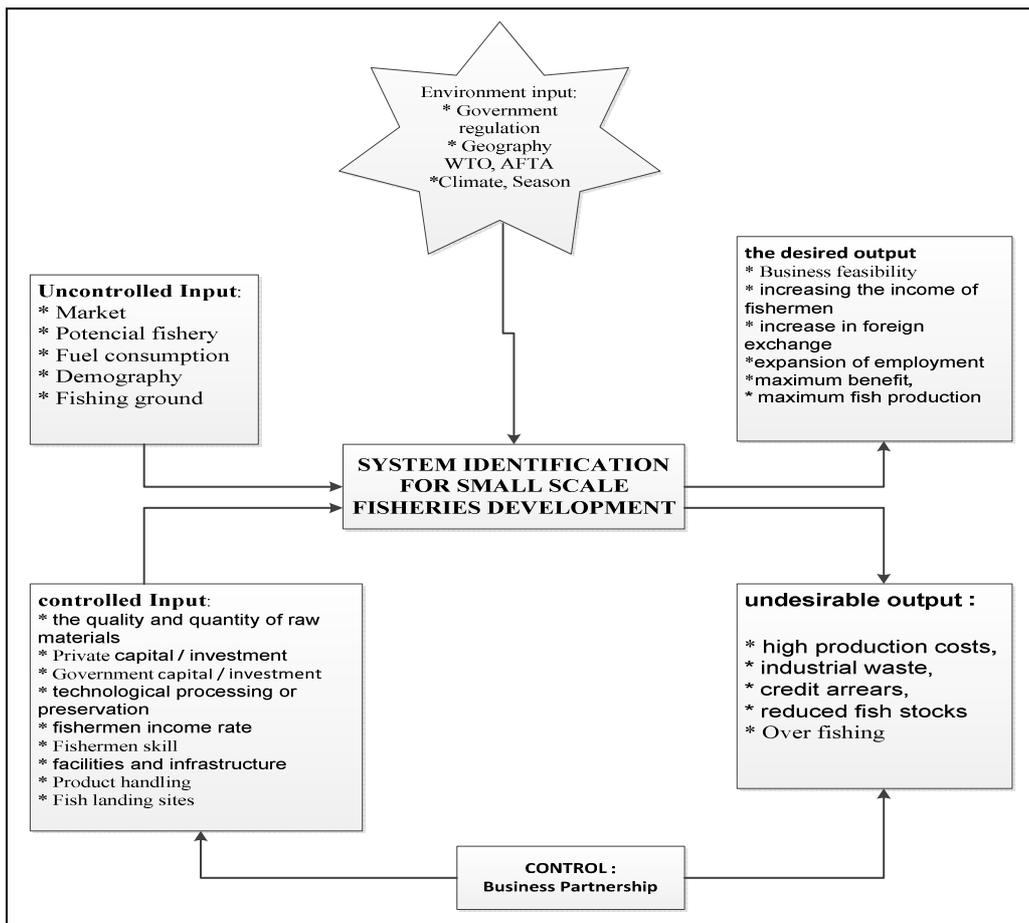Figure 1. Causal Diagram of System Development of Small Scale Fisheries

Figure 2. Diagram Input Output System Development of Small Scale Fisheries

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Results and Discussion

Preparation ofa causalflow chartsystemdevelopment of small scale fisheriesshould consider allthe factorsthat canaffect the system. These factorsmayhave a positive impactora negative impact onthe system. Factors thatpositively impactgivenpositive sign, while thenegative impactwillbenegativemarks(Figure 1). Formulationdevelopment modelshould consider theactorsinvolvedand associatedin the system. Thorough analysisof the needsof eachoffender mustbe done first. The next stageisto considerthe componentscontained in theinput outputdiagram(Figure 2). Goals to be achievedin a boxcomposedof the desiredoutput, while thenegative impacts thatmay arisearranged in a gridundesirableoutputthat can becontrolled througheffective managementand business partnerships. Input that can not be controlled is the market price of fuel and demographic areas should not be overlookedin the preparation ofthe development model. Inpu tthe environment should also be considered and carefully anticipated as law enforcement, climate, and theprocedures andrule

Fish processing is a process that is expected to provide added value. This is because processing can enhance economic value through improving the quality and value of the product. The problem, which is controlled by the processing technology is simple fishermen so that the resulting product has no added value as expected. In order to encourage the improvement of the quality of the products, the government should develop technologies that can be applied directly and have been controlled by the fishermen. The efficiency of the application of these technologies can be seen from the added value of the products produced. Small business development is complex and complicated, due to the nature of small businesses in this state between the state of chaotic (chaos) to the all-state basis (Eriyatno, 2002).

Government assistance can be provided to the private sector (small businesses) and to the cooperative. Forms of government intervention may include production credit with low interest rates without collateral, the import duty exemption processing equipment components and fishing units, VAT exemption role in domestic sales, the development of appropriate processing technology, setting UMR fisheries and licensing facilities investment. The increase in the income of fishermen measured by the wage rate minimum wage. Niga governance efficiency gains measured from each trade costs (the price of fresh fish, freight cost, retribution TPI) and profit middlemen. The effectiveness of the export can be seen from the number and value of exports of fishery products and the contribution of export fishery products to the national GDP. Expansion of employment can be measured by the percentage of the labor force is absorbed. The increase in foreign exchange can be measured by the percentage increase in the contribution of foreign exchange from exports of fishery products. Policy parameters based on the achievement of all of the desired output as optimal as possible and avoid the appearance of undesirable outputs.

Conclusions

Marine and fisheries sector should be able to provide welfare for the actors who were in it. Also expected to contribute to the national economy through employment and value added.Efforts to increase the income for small scale fisheries must be supported by the government, because most fishermen are still weak in terms of technology and information. Thus, government interference is still dominant, but this does not make over protection against excessive fishing. Firmness in carrying out law enforcement will reopen investment opportunities from a number of countries in the fishing industry. Formulation of the model of development should consider the actors involved and associated in the system and the components contained in the input-output diagram. Unwanted output can be controlled through effective management system. The success of analysis for the system development

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can be done by tracing the paths starting from the procurement of investment decisions, operational phase until the output is produced.

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