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## **IMPROVING PERFORMANCE OF FISHERIES SECTOR IN MALUKU PROVINCE: IMPULSE RESPONSE FACTOR (IRF) APPROACH**

Wellem Anselmus Teniwut<sup>1</sup> Eygner Gerald Talakua<sup>1</sup> Bruri Berel Tumiwa<sup>1</sup>

<sup>1</sup>Fisheries Agribusiness Study Program, Tual State Fisheries Polytechnic, Southeast Maluku, Indonesia

Correspondent Email: wateniwut@polikant.ac.id

### **ABSTRACT**

Fisheries sector is one of few major sources for revenue to Maluku Province, according to Indonesia Coordinating Investment Board in 2012 fishery sector which is include in agricultural sector had almost 30% of revenue of Maluku Province as total followed. Fisheries sector is the highest but isn't high enough consider amount of potential natural sea resources so it's crucial to figure out how to improving this sector. Purpose of this research is identified the priority factor for local government to increase performance of fisheries sector in Maluku province. This research uses interpolation data in order to deal with limitation of sum of data, with quarterly time series data from 2004-2013 and VAR (Vector Auto Regression) IRF approach. IRF is one of econometric analysis tool to determine the response of an endogenous variable to a shock given, which on this research is to analyze response of fisheries productivity to shock of its determine factors which are amount of catching ships/boats, number of catching fisheries households/company in Maluku Province and number of household aquaculture. Result of this research indicates that amount of catching ships/boats and number of catching fisheries households/company have significant and positive effect on fishery production also have permanent effect in long run but number of household aquaculture does not have significant effect but has positive permanent effect in long run. Means, local government can focused on developing catching fisheries since been reported by Indonesia ministry of marines and fisheries affair that approximately every year IDR 5 Trillion has been stolen from Maluku sea and huge potential that local government can utilize by adding more catching fish equipped with sufficient technology, good motor and size along with well-train crew.

Keywords: Fishery Productivity, Performance, Maluku, Impulse Response Factor

### **1. INTRODUCTION**

In 2013 share of fisheries sector in the country's Gross Domestic Products (GDP) has been growing rapidly (year on year comparison) especially in first to third quarter with an average rise was about 6.23%. This fact showed there was increasing in added value which meant there was actual increasing in revenue of Fisheries Company in average. Although, the positive growth on fisheries revenue and value in general relatively compare with other sector such as food and plant on overall Indonesian Gross Domestic Products (GDP) in 2012, yet still under performing, let alone to main sectors likes mining and gas, (Center Of Data, Statistic and Information, 2013). This is an irony, as the biggest archipelago country with large potential of marines and fisheries, Indonesia doesn't really have strong attention on this sector.

As an archipelago, Indonesia's geographical condition strongly supports the development of fishery activities. Indonesia has access to abundant fishery resources in both marine fishery and freshwater fishery, where 76 percent of Indonesia's surface area is sea-waters, in addition to the 5,500 rivers and lakes found throughout Indonesia (Indonesia Coordinating Investment Board, 2011). Maluku Province is known as a 'Thousand Island Province'. Surrounded mostly by water makes this province endowed by marine and fishery resources. The province whose waters cover 10 times the area of its land has 1.4 million populations, or constituting only 0.6% of the total Indonesian population. Fisheries sector is one of few major sources for revenue to Maluku Province, according to Indonesia Coordinating Investment Board in 2012 fishery sector which is including in agricultural sector had almost 30% of revenue of Maluku Province as total followed.

Fisheries sector is the highest but isn't high enough consider amount of potential natural sea resources so it's crucial to figure out how to improving this sector. Fisheries productivity determine by performance of catching fisheries and aquaculture. In catching fisheries number of boat with sufficient technologies play major role, in other hand number of households' aquaculture on aquaculture sub sector, number of Fisheries Company also can have huge effect on fisheries productivity. Hermansyah, *et al* (2013) indicated that catching ship/boat had significantly effect on productivity fishermen and in general fisheries sector of East Aceh regency. Same result showed by Salas and Charles (2007) whom indicated boat size, fisherman's experience and motor power had significant impact on fisheries productivity in Mexico. Purposed of this research was to formulate logical and plausible priority for

local government of this province to improve the productivity of fisheries sector though three determine factors from number of catching ships/boats, number of fisheries households/company and number of household aquaculture to fisheries production with impulse response function (IRF) approach. IRF is useful econometric tool to find out response of those three determines factors to fisheries production either in short and long run.

## 2. METHODOLOGY

### Variables and Data Selection

This study used secondary quarterly time series data with 10 years of the period observation from 2004-2013, which collected from center of statistical board, Indonesia. This research was conducted from January to May 2015, with Maluku Province as its research object, variables on this research divided into two categories, first, independent variables which are variables that have determination on fisheries productivity; number of catching ship, number of fishery household/company and number of household aquaculture. Second, dependent variable which being measure by total production of fisheries sector Maluku Province. Analysis method of this research is VAR (vector auto regression), with Impulse Response Function (IRF) as one of tools of VAR to examine the trend from response on each shocks of those independent variable in short and long run to dependent variable.

### VAR (Vector Auto Regression)

The VAR model has proven to be especially useful for describing the dynamic behavior of economic and financial time series and for forecasting. It often provides superior forecasts to those from univariate time series models and elaborate theory-based simultaneous equations models. Forecasts from VAR models are quite flexible because they can be made conditional on the potential future paths of specified variables in the model (Enders, 2004).

VAR model will be used when stationary data of the study are at the level; if the data are not stationary at the level but not co-integrated, then the VAR model of first difference will be used. Another option is to use VECM model if the data used in this study are not stationary at the level and co-integrated when Rank cointegration ( $r > 0$ ). VECM model ordo  $p$  and rank  $r$  cointegration be written as follow (Fuss, 2008, Canova and Ciccarelli, 2013):

$$\Delta y_t = A_0 + \pi y_{t-1} + \sum_{i=1}^{p-1} \phi_i^* \Delta y_{t-1} + \varepsilon_t \quad (1)$$

Where:

$$\begin{aligned} \pi &= \alpha\beta \\ \beta &= \text{Vector cointegration } r \times 1 \\ \alpha &= \text{Vector } r \text{ adjusted } r \times 1 \\ \phi_i^* &= - \sum_{j=i+1}^p A_j \end{aligned}$$

### Impulse Response Factor (IRF)

IRF measures the effect of a shock at a certain time to the endogenous variable innovation at that time and in the future, IRF described in Canova and Ciccarelli (2009), researchers using VARs with static and dynamic interdependencies and, possibly, time variation in the coefficients may be interested in computing the responses of the endogenous variables to shocks in the variables or to shocks to the coefficients (via shocks to the common  $\lambda_t$  or shocks to the factors  $\theta_t$ ) and in describing their evolution over time. In this situation, responses can be obtained as the difference between two conditional forecasts: one where a particular variable (coefficient) is shocked and one where the disturbance is set to zero.

## 3. RESULTS

Based on the data stationary test, data set for the fisheries performance model is not stationary at the level, but stationary at the first difference. Based on the optimum lag test, the three optimum models are at the first lag. Based on the stability test, at the optimum lag of the first lag, the models are already stable. Based on Johansen Co-integration Test, all three models have co-integration. So for this study, the suitable model to be used on the model of this research is Vector Error Correction Model (VECM),

instead of VAR (Vector Auto Regression). Impulse responses uses to view the response of current and future values of each of the variables to a one-unit increase in the current value of one of the standard deviation. It is a one-period shock, which reverts to zero immediately.

#### **Fisheries Performance on Production Response to Shock on Sum of Catching Ships/Boats**

Result showed that fisheries performance on production response to shock on sum of catching ships/boats own by every fishermen on this province that been tracked and registered and it indicates that shock on number of catching ships/boats would definitely increase fisheries production performance in this province and gave permanent effect in long run. Result really implied actual condition on this province, there are many catching boats run their operation around Maluku sea, but the number of catching ships/boats own by local fishermen of this province compare with catching ships/boats that own by fishermen from other province not to mention number illegal-fishing and illegal operation or non-license operation are still out of number. In the meantime fleets from local fishermen still haven't much on the use on latest and sufficient technology, with an effective technology its possible to tackle lack on number of fleets in term of productivity. Its an ideal situation when increased in the number of catching fleets equipped with latest and efficient technology and well-trained human resources would certainly increase the productivity of fisheries sector of this province in long run. Salas and Charles, (2007) and Hermansyah (2013) also supported result of this findings that catching fisheries fleet has significant effect in fisheries productivity, Bandara, 2014 also supported this finding that catching vessel design, construction and operation have huge role in enhancing productivity of fisheries.

#### **Fisheries performance on production response to shock on number of Fisheries Company**

Fisheries performance on production response to shock on number of fisheries company that been registered and it indicated that shock on number of number of fisheries household/company in this region will certainly increase fisheries production performance in this province and gives permanent effect in long run. More people to run business on fisheries sector will have positively effect on productivity, which also means increasing revenue from fisheries sector through tax and more importantly greater the number of multiplier effect since most fisheries company in this province are still more in labor-oriented that capital-oriented so will rely much on man power which can help to decrease number of unemployment on region.

#### **Fisheries performance on production response to shock on number of households' aquaculture**

Fisheries performance on production response to shock on number of households aquaculture that been registered and showed that shock on number of households aquaculture in this region had not have an effect on fisheries production performance on this province would have positive and permanent effect in long run. There are research related to how aquaculture for freshwater, brackish water and seawater have grown rapidly around the world, Waite, *et al* (2014) reiterated that aquaculture could boost income and employment, particularly in developing countries where most aquaculture growth will occur though aquaculture needs enough supply on inputs from land, freshwater, feed, and energy. That enough supply may have been the main problem why aquaculture in this province hasn't have significantly effect on total fisheries production, there are many factors that have to be in line and ready which require capabilities of capital and well-trained human resources to make it worked, though since 2004 to 2013 aquaculture in Maluku have risen rapidly.

### **4. CONCLUSIONS**

Result of this research indicated that amount of catching ships/boats and number of catching fisheries households/company had significant and positive effect on fishery production also have permanent effect in long run but number of household aquaculture did not have significant effect but would have positive permanent effect in long run. Implication of these findings were in few years to come government had to focus on developing catching fishery sector to increase total revenue of fishery sector, because according to Indonesian Ministry of Marines Affairs and Fisheries, that potentially more than IDR 5 Trillion have been stolen from Maluku Sea every year. Therefore local government could take several approach which were, enhancing the intensity of sea patrol to prevent illegal fishing, gives positive incentive to catching Fisheries Company such as tax allowance and price protection and also gives subsidy on fuel. Local government can also increase research funding to create more effective technology of fish catching which can strengthen triangle networking between local government as

regulator, fishermen (households/company) as core business and education institution as innovation agent, together side by side to make fisheries sector become real economic backbone of this province. More approach that local government could get through in order to enhance fisheries productivity in particularly catching fisheries was to get involve in open up an accessibility for capital sources to local businessmen, by launch a bank that only focus on funding fisheries sector include giving loan because access to capital become one of classical problem for almost every fisheries sector around the world especially in third world country or developing country so to speak. Another important factor which is related to post production from price to (potential) market of fisheries product, local government can help to keep price of fisheries product from local businessman in competitive level against its competitor's business sector in particularly from outside region by added more taxes only to fisheries companies that own by non-local businessmen.

Yet, this study has some limitation likes more non-technical related variable related to fisheries sector such as access to capital or in this case rate of loan given by commercial bank to SMEs fisheries includes individual and traditional fisheries because various studies showed that access to capital was one of the major constrain for fisheries sector to grow. In Addition, intangible factors such as strategic plan by governors to majors from every region in this province related to what's their plan to increase fisheries sector. Another intangible factor that should be consider is bureaucracy related to time elapse of administrative works. Future research can include those factors to enrich scope of the research also be more thorough on analysis regarding readiness of catching fisheries in particular on how is the condition and how far are catching fisheries include catching ships/boats and fisheries company using sufficient technology by local fishermen to run their business.

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