Conference Paper

Indonesian Small Pelagic Resource Accounting

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Abstract

Fish is one of natural resources, which is important for food security. Small pelagic fish is one of the sources of food, the most widely consumed by people of Indonesia, given the existence of a fairly abundant species, and are found in almost entire territorial waters of Indonesia, and also has a relatively affordable price. Management of pelagic fishery in the waters of Indonesia, thus becomes important, especially to maintain the sustainable industry. Optimal and sustainable fisheries industry can only be achieved with proper planning through the implementation of appropriate management instruments as well. Fisheries resources accounting is one of the planning instruments, which should be used as a main reference of Fisheries Management Plan. In general, fisheries accounting provide insights for policy makers on how the flow of the stocks of fish and its relation to changes in the dynamic of natural and economic activity of fishing. Small pelagic resource accounting is one of the mandates of agenda 21 UNCED recommendation, as formulated in the System of Integrated Environmental and Economic Accounting (SEEA). Besides, this is also a decree of Indonesian Law No. 32/2009 regarding the Management and Environmental protection. The paper discusses the fisheries account, both physical and monetary, for small pelagic fish. By using resource accounting, we can understand the dynamics of the availability of stocks of small pelagic fisheries in Indonesia for the sake of food security. The methods in use is the standard bio-economic modelling, using fox algorithm for parameter estimation, and resource accounting method of the System of National Accounts of FAO [1], adapted to the data existing condition. The results of the analysis, include measurement of standing stocks (physical assets account), fishable biomass, depletion, as well as monetary account. Paper also provides suggestion for management, as well as policy recommendation.

Keywords: Small pelagic, Resource Accounting, Physical assets account, monetary account, Fisheries Management Plan, Bio-economic modeling, Policy recommendation.

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1. Introduction

The extraction of fish resources for the purpose of food security, commercial, and economic growth of a country, has reached an extraordinary level. Massive use of technology has led to a very high catch rates. Although fish is a renewable resource, but the tendency of high capture rate and exceeding the ability of the fish's own resources to regenerate, causing degradation fish resources in some fishing grounds both at global and national levels. The phenomenon of overfishing, and also excessed capacity become very common due to the lack of understanding of the sustainable use.

As in other sectors, sustainable development is a prerequisite for the management and exploitation of fish resources in the fisheries sector. The decline in the quantity and quality of fish resources became a driving force for the implementation of sustainable development policy in the fisheries sector. Business continuity and supply Sustainability is the goal of sustainable development. Sustainable development implies the exploitation of fish that follow the rules of the optimal and efficient utilization. To achieve this, various instruments needed for proper management. Various instruments for the management of sustainable development goals in Indonesia today, in the form of instrument-based command and control management, such as Maximum sustainable yield (MSY), and prohibition of the use of not environmentally sound fishing gears, so far have not been able to solve the above problems.

Through the enactment of Law No. 32/2009, on Environmental Protection and Management, introduce the economic instruments for the management of natural resources and the environment. The economic insturments are expected to be complement to the instruments that have been there before, as the solution of various problems of utilization of natural resources and environment. Environmental economic instruments introduced in the law, consists of planning instruments and incentive-disincentive instruments. One of the environmental economic planning instruments mandated by the law is natural resource and environmental accounting. Natural resource and environmental accounting is an operational concept of sustainability, which is implemented by calculating the change in the flow of stock and production of natural resources, and also degradation that occurs as a result of the use of which is not in accordance with the principles of sustainable development. With the account of natural resources, we will obtain a more realistic picture of the "true cost" of the extraction of natural resources and the environment [2,3,4,5.6].

Law 32/2009 requires the calculation of the natural resources accounting in a variety of sectors, including fisheries. This study will calculate the Fisheries resource accounting, which would be very important information, as the basis for further development policies, regarding the Fishery Management Plan. Fisheries resources accounting gives an overview of the changing dynamics of the stock of both on the supply side and also the change either because of natural or human-extraction [1, 7–13]. Additionally Fisheries resources accounting can be contributed to the calculation of Green GDP at the macro scale which would also provide a more real feedback on the performance of natural resource-based economy in Indonesia.

2. Methods

Fisheries resource accounting consists of physical and monetary accounts. The calculation carried out for Pelagic and Demersal fish. The calculations based on following components:

- Standing stock (fishable biomass)
- Actual production (the number of fish catch in a given year)
- Natural growth, (the number of fish that grow naturally through reproduction or so-called natural production surplus).
- Depletion (changes in production or the difference between the conditions of sustainable production with actual production).
- IUU (Illegal, Unregulated and Unreported) Fishing. In this study it is assumed to be 10% from the catch.
- Other changes (changes to fish stocks caused by external and internal factors, not the result or IUU catches).
- The data and information, obtained from secondary [14-31],and primary sources as well as surveys in Indonesia's Fisheries Management Area (WPP-RI), collected includes (but not limited to):
- Data series of production per type of fish per fishing gear.
- Data series of trip and the number of labor in fisheries.
- Data report on illegal fishing.
- Data on economic, price and cost

The first step in data analysis is to present statistics descriptive analysis of primary and secondary data obtained. Descriptive analysis is required to determine the value of the mean, median and standard deviation of the distribution of the data obtained so far as possible the normal distribution.

The next stage is used econometric methods to determine biophysical parameters such as fish growth, carrying capacity and catch ability coefficients. Econometric analysis used both approaches through Ordinary Least Square (OLS) and Generalized Least Square (GLS), if the results of the OLS approach, does not qualify the goodness of fit.

General formula used to determine the biophysical parameters as following:

$$y = f(x_1, x_2, e) \quad (1)$$

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Where ”y” is an indicator of productivity ”x1” and ”x2” are input parameters (effort) and ”e” is the error (or error term). The commonly used model is the formula through Fox [32], where the biophysical parameters estimated by the general equation:

$$\frac{U_{t+1} - U_{t-1}}{2U_t} = rln\left(qK\right) - rln\left(U_t\right) - qln(E_t) \tag{2}$$

The next stage is using the above parameter estimation to determine the standing stock of initial conditions using a bio-economic approach by using the following equation:

$$\max\pi = \sum_{t=0}^{T}\sum_{i=1}^{n}\left(\int_{h_0}^{h_1} P\left(h\right)dh - c(h,x)\right)\left[\frac{1}{(1+\delta)^t}\right] \tag{3}$$

Subject to:

$$x_{t+1} - x_t = rx_t\left(1 - \frac{x_t}{K}\right) - h_t$$

$$0 \le x_t \le x_{max}; 0 \le h_t \le h_{max}$$

Where:

π_t = Economic rent at t period

ρ^t = Discount Factor

p = Price

h_{it} = Production at t period fleet i

c = Cost per trip

r = Natural growth rate

K = Carrying Capacity

δ = Discount rate

h_{jmax} = Maximum fleet capacity

The solution of the above equation is done by solving the Lagrangian, thus produced an equation called the Maximum Principle:

$$L = \sum_{t=0}^{T}\rho^t\left\{\pi\ \left(x_t, h_t\right) + \rho\lambda_{t+1}\left[x_t + f\ \left(x_t\right) - h_t - x_{t+1}\right]\right\} \tag{4}$$

$$\frac{\partial L}{\partial h_t} = \rho^t\left\{\frac{\partial\pi\left(x_t, h_t\right)}{\partial h_t} - \rho\lambda_{t+1}\right\} = 0$$

$$\frac{\partial L}{\partial x_t} = \rho^t\left\{\frac{\partial\pi\left(x_t, h_t\right)}{\partial h_t} - \rho\lambda_{t+1}\left[1 + \frac{\partial f(x_t)}{\partial x_t}\right]\right\} - \rho^t\lambda_t = 0$$

and

$$\frac{\partial L}{\partial(\rho\lambda_{t+1})} = \rho^t\left\{x_t + f(\ x_t) - h_t - x_{t+1}\right\} = 0$$

Table 1: Physical account calculation.

Variabel	Year 1	Year 2	Year 3	Year 4	Year 5
Opening Stock	x_1	x_2	x_3		
Catch					
Natural Growth					
Depletion					
Illegal fishing					
Other changes					
Final stock	x_2	x_3	x_4		

Solving the above equation will produce a standing stock that would be the initial stock for the calculation of the fisheries resource accounting.

$$x^* = \frac{K}{4}\left[\left(\frac{c}{pqK} + 1 - \frac{\delta}{r}\right) + \sqrt{\left(\frac{c}{pqK} + 1 - \frac{\delta}{r}\right)^2 + \frac{8c\delta}{pqKr}}\right] \tag{5}$$

Once known the value of standing stock, then the next step is to perform the calculation of the balance sheet using recursive model, as illustrated by the following table.

Monetary account analysis is done by converting the physical balance of the rent calculation unit, i.e. the ratio of rents and production per year. Rents derived from the difference between total revenue and total cost with other variables such as the formula above. To obtain the total revenue and total cost, the average price should be determined beforehand, which is obtained from the price per year, which is considered to be constant from baseline data in 2011, the results of the field survey and secondary data for each type of fish. From the consumer price index of Indonesian agriculture adjustment, annual price series obtained from 1988 to 2012.

The cost of the data obtained from the average cost per trip and per usage of fishing gear, which has been standardized on any ship with a variety GT. These costs as well as the price is assumed to be constant with the consumer price index adjustment and done through each year of data from the database that has complete data (WPP-RI conditions at each of these data vary). These data from all WPP-RI is then aggregated and averaged. From data rates, costs, production and trip, can be obtained the value of Indonesian fish resource rents per year. The ratio of rents to the total production per year is a unit rent per year of each type of fish resources. Unit rent obtained for each type of fish from the average unit value of the annual rent.

Once the unit rent is generated, then the value of depletion calculated using the method of Repetto et al. [32], by the following formula:

$$VD = RR(D_t) \tag{6}$$

Where VD_t is the value of depletion in t period. RR is resource rent, and D_t is depletion in "t" period. For illegal fishing data, based on the few years data provided, can be

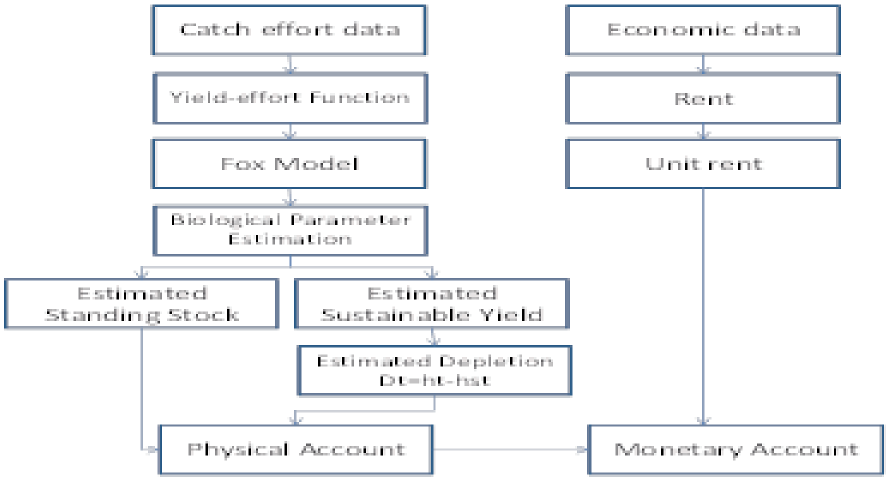

Figure 1: Flowchart Fisheries Resource Accounting.

Table 2: Biology and Economics Parameters of small Pelagic Fishery in Indonesia.

Parameters	Small Pelagic
Intrinsic growth (r)	0.87
Catch ability coefficient (q)	0.000000008
Carrying capacity (K) Ton	5,848,070.24
Price (p) Rp Million/Ton	8.45
Cost per trip (c) Rp Million/Trip	0.12

assumed that the value is about 10% from the reported catch. To calculate the next five years (5 years of recent data year 2012) forward account, a model of CGR (compound growth rate) linear and quadratic is used. Of the two methods, were chosen the value with smallest MSE (Mean Square Error).

3. Result and Discussion

Results of biological and economic parameters for pelagic and Demersal fisheries, as shown in Table 2. From the table below, it appears that Demersal fish in Indonesian's water, has a carrying capacity which quite high compared to other types of fisheries, with a value of about 7.3 million tons. Large pelagic fish has a value of carrying capacity of 6.2 million tons, a small pelagic fish of 5.9 million tons Compared to MSY listed on ministerial decree Indonesian Fisheries and Maritime Affairs, No. 45 of 2011 on Indonesian fish resource potential which approximately 6.5 million tons, the results of this study, demonstrate the value of the carrying capacity of a much larger (about 18 million tons for the three types of fish) than it should be, if the potential MSY considered only 6.5 million tons (value carrying capacity should double MSY). This calculation is based only on input and output values reported.

Table 3: Small Pelagic Resource Accounting.

Year	Opening Stock	Production	Growth	Depletion	IUU	Other Change	Closing Stock
1988	3.552.729,13	914.589	1.709.834,21	(906.965,94)	91458,90	(744.097,57)	4.419.383,82
1989	4.419.383,82	985.215	1.323.863,80	(555.522,51)	98521,50	(1.345.894,61)	3.869.139,02
1990	3.869.139,02	1.028.460	1.605.423,83	(862.999,77)	102846,00	(471.454,42)	4.734.802,19
1991	4.734.802,19	1.146.383	1.105.213,68	(549.125,97)	114638,30	(597.552,23)	4.530.568,32
1992	4.530.568,32	1.171.272	1.251.551,17	(659.370,39)	117127,20	(733.556,26)	4.419.534,42
1993	4.419.534,42	1.203.199	1.323.769,36	(863.684,50)	120319,90	(481.880,29)	4.680.307,31
1994	4.680.307,31	1.293.752	1.145.971,25	(376.750,75)	129375,20	(647.335,75)	4.443.039,41
1995	4.443.039,41	1.346.339	1.308.912,72	(1.073.657,64)	134633,90	342.070,71	5.646.777,67
1996	5.476.734,44	1.340.780	426.415,68	(402.717,30)	134078,80	(438.648,40)	4.366.394,47
1997	4.366.394,47	1.501.655	1.356.503,18	(1.393.262,84)	150165,50	502.042,87	5.646.777,67
1998	5.646.777,67	1.526.024	238.326,92	(1.312.186,88)	152602,40	(775.110,92)	3.834.084,57
1999	3.834.084,57	1.415.268	1.619.059,22	(1.741.246,30)	141526,80	(1.351.964,10)	3.937.647,73
2000	3.937.647,73	1.422.214	1.577.287,85	(834.742,20)	142221,40	(1.629.404,92)	3.633.282,13
2001	3.633.282,13	1.508.233	1.687.236,55	(1.601.041,79)	150823,30	(558.554,24)	4.844.154,44
2002	4.844.154,44	1.579.904	1.019.670,70	(2.223.215,52)	157990,40	(1.148.553,11)	3.812.119,83
2003	3.812.119,83	1.540.155	1.627.340,41	(2.327.791,56)	154015,50	(2.071.347,13)	3.274.984,40
2004	3.274.984,40	1.520.758	1.766.884,58	(2.549.855,45)	152075,80	(2.333.846,22)	3.258.404,47
2005	3.258.404,47	1.557.618	1.769.267,01	(2.501.781,24)	155761,80	(2.292.097,93)	3.349.985,32
2006	3.349.985,32	1.724.520	1.754.667,25	(3.063.620,52)	172452,00	(2.280.463,49)	3.477.072,53
2007	3.477.072,53	1.798.214	1.728.580,28	(1.208.833,47)	179821,40	(2.578.774,86)	3.150.623,79
2008	3.150.623,79	1.786.749	1.781.943,99	(2.982.326,68)	178674,90	(1.345.254,60)	4.685.509,79
2009	4.685.509,79	1.855.989	1.142.134,00	(2.631.718,10)	185598,90	(1.664.278,64)	3.330.610,73
2010	3.330.610,73	1.897.538	1.758.049,26	(2.982.326,68)	189753,80	(2.438.676,98)	3.545.017,90
2011	3.545.017,90	1.913.044	1.711.854,74	(2.631.718,10)	191304,42	(2.262.085,78)	3.522.156,36
2012	3.522.156,36	1.952.664	1.717.698,48	(2.755.336,78)	195266,44	(2.955.028,22)	2.892.232,53

Based on the results of bio-economic analysis of each type of fish as shown in the table above, do the calculation of stock accounting or physical accounting, with the results as described below. The results of the analysis of the small pelagic resource accounting in the year of 1988-2012 can be seen in the Table 3.

The resource accounting indicates that small pelagic fish resource stocks are relatively in stable conditions in the range between 3.1 million tons to 5.6 million tons. Standing stocks fluctuate in value, while the annual production showed an increasing trend from year to year. This is not only due to the input that is increased throughout the year, but also because there is still room for fishable biomass to be fished. The natural growth fluctuated, depending on the amount of standing stock, because small pelagic fish is a type of self-regulating stock, it means that the growth depends on the amount of the initial population and not much influenced by environmental conditions, due to its cruising ability. The lowest growth occurs when standing stock in

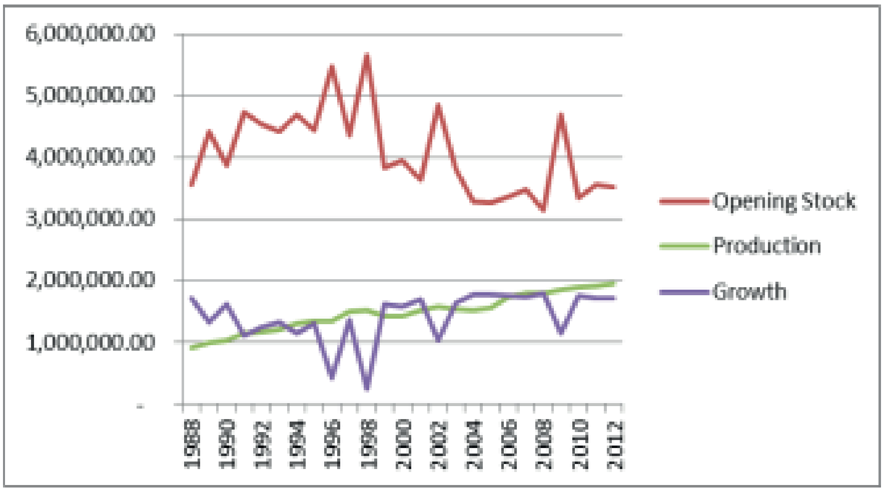

Figure 2: The fluctuation of stock, production and growth of small pelagic fishery.

the range of 5.6 million tons, which is when they are close to the carrying capacity of the environment, resulting in a decrease in the growth rate to only 238 thousand tons. Depletion values are generally negative, which means precisely, fisheries have a surplus. Small pelagic fish stocks close at the end of 2012 to around 2.9 million tons. From the graphics, the condition of the stock tends to fluctuate, while production has an increasing trend, and the relative growth also increased from year to year. The position of the standing stock of which is the value of the stock on the area of the growth curve is still in the range away from the actual catching. It shows that the small pelagic fishery Indonesia is relatively safe. Figure 2 is the dynamic of stock, production and growth of Indonesian's small pelagic fishery.

Table 4 is the monetary account of Small Pelagic Fishery which is simply is the value of physical account multiplied by the unit rent. As can be seen from the table the value of the stock in monetary, it appears that the initial stock yearly shows fluctuate. As shown in the table below, the stock in early 1988 shows the value of 13 trillion Rupiahs. The highest value of initial stock in 1996 at a range of 20 trillion dollars, and in 1998 amounted to 21 trillion Rupiahs. These years are the toughest in the Indonesian economy, so economic inputs in the fishery also slowed down. This increased the value of small pelagic fish stock. Monetary value of Indonesian small pelagic fish stocks closed at a value of about 12 trillion Rupiahs in 2012 . When referring to the monetary value of small Pelagic fish growth, in line with the physical balance, showed fluctuating in values from the lowest value of about 891 billion dollars to 6.6 trillion Rupiahs. Monetary value of Small Pelagic stocks closed in late 2012 into 10.8 trillion Rupiahs.

Furthermore, for the analysis of future trends for small Pelagic fish can be seen from the results of Minitab below. Using quadratic model, the tendency forward, which performed for five years up to 2017, shows that the of Small Pelagic production will increase steadily.

Table 4: Monetary account Indonesian's Small Pelagic Fishery.

Year	Opening Stock Value	Production	Growth	Depletion	IUU	Other Change	Closing Stock
1988	13.282.984,00	3.419.476	6.392.747,93	(3.390.974,77)	342947,59	(2.782.040,59)	16.523.243,36
1989	16.523.243,36	3.683.533	4.949.677,32	(2.076.933,98)	368353,32	(5.032.046,33)	14.465.981,75
1990	14.465.981,75	3.845.218	6.002.377,19	(3.226.593,54)	384521,82	(1.762.679,26)	17.702.533,25
1991	17.702.533,25	4.286.110	4.132.185,71	(2.053.078,55)	428611,00	(2.234.135,21)	16.938.941,27
1992	16.938.941,27	4.379.165	4.679.314,00	(2.465.261,65)	437916,53	(2.742.628,63)	16.523.806,45
1993	16.523.806,45	4.498.534	4.949.324,20	(2.775.703,89)	449853,43	(1.801.659,60)	17.498.787,16
1994	17.498.787,16	4.837.095	4.284.580,58	(2.569.400,28)	483709,50	(2.420.266,39)	16.611.687,18
1995	16.611.687,18	5.033.708	4.893.778,03	(3.229.153,59)	503370,78	1.278.937,94	20.476.478,13
1996	20.476.478,00	5.012.924	1.594.287,89	(1.408.600,07)	501292,38	(1.640.023,73)	16.325.126,20
1997	16.325.126,20	5.614.405	5.071.709,79	(4.041.203,61)	561440,51	1.877.043,70	21.112.237,70
1998	2.112.237,70	5.705.516	891.059,46	(1.505.684,10)	570551,62	(2.897.993,66)	14.334.919,78
1999	14.334.919,78	5.291.420	6.053.357,34	(5.209.147,22)	529142,04	(5.054.739,03)	14.722.122,90
2000	14.722.122,90	5.317.390	5.897.182,06	(4.906.019,51)	531739,02	(6.092.037,99)	13.584.157,30
2001	13.584.157,30	5.638.999	6.308.259,55	(6.510.191,81)	563899,90	(2.088.329,06)	18.111.380,70
2002	18.111.380,70	5.906.963	3.182.356,60	(3.120.943,78)	590696,34	(4.294.223,64)	14.252.797,74
2003	14.252.797,74	5.758.349	6.084.319,16	(5.985.993,56)	575834,93	(7.744.376,61)	12.244.549,58
2004	12.244.549,58	5.685.828	6.606.048,51	(8.312.183,91)	568582,76	(8.725.811,26)	12.182.560,37
2005	12.182.560,37	5.823.640	6.614.955,96	(8.703.174,04)	582364,02	(8.569.722,26)	12.524.963,89
2006	12.524.963,89	6.447.655	6.560.370,24	(9.533.429,08)	644765,53	(8.526.223,31)	13.000.119,03
2007	13.000.119,03	6.723.183	6.462.835,96	(9.353.688,67)	672318,33	(9.641.553,30)	11.779.588,70
2008	11.779.588,70	6.680.318	6.662.352,82	(11.454.299,85)	668031,78	(5.029.653,49)	17.518.238,26
2009	17.518.238,26	6.939.193	4.270.223,84	(4.519.600,55)	693919,32	(6.222.424,23)	12.452.525,94
2010	12.452.525,94	7.094.537	6.573.014,94	(11.150.357,53)	709453,70	(9.117.753,72)	13.254.153,95
2011	13.254.153,95	7.152.512	6.400.302,33	(9.839.498,10)	715251,17	(8.457.512,49)	13.168.678,97
2012	13.168.678,97	7.300.644	6.422.150,97	(10.301.685,03)	730064,44	(11.067.986,56)	10.793.819,60

The result of this estimation is used to predict production changes, from the initial stock in 2013 which is a stock late in 2012. Results of trend analysis, shows the condition of stocks, which tend to be relatively decreased from the level of 3.5 million tons in 2012, to 2.37 million tons in 2017, while the production tends to increase, although not too significant (Table 5). Growth tends to stable at a level of 1.7 million tons. Fish stocks will be closed in 2017 on the position of 2 million tons.

4. Conclusions and Recommendations

The study of the fish resources accounting in Indonesia is still relatively new. This study is a the second study, after the first prototype made in 2011 and tested in the Java Sea [34]. The following are some of the conclusions that can be drawn from the

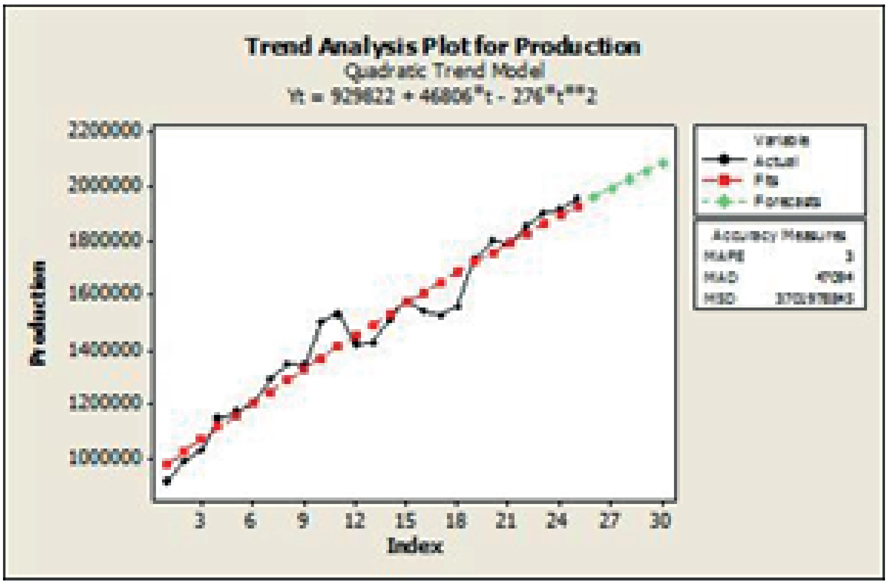

Figure 3: Trend analysis Plot Production of Small Pelagic Fishery.

Table 5: Small pelagic accounting trend analysis for the next 5 years.

Year	Opening Stock	Production	Growth	Closing Stock
2012	3.522.156,36	1.952.664,43	171.698,48	3.287.190,41
2013	3.287.190,41	1.959.948,35	1.765.056,98	3.092.299,04
2014	3.092.299,04	1.992.106,37	1.786.772,72	2.886.965,39
2015	2.886.965,39	2.023.711,63	1.792.421,04	2.655.674,79
2016	2.655.674,79	2.054.764,14	1.777.609,01	2.378.519,67
2017	2.378.519,67	2.085.263,88	1.730.312,87	2.023.568,65

results of the balance study of small pelagic fish resources in Indonesia, as well as suggestions that can be implemented for the development of Indonesian fisheries. Some conclusions can be derived from the analysis of the balance of the fish resources are, among others:

1. Small pelagic Fish Resources accounting in Indonesia provides a detailed picture of the condition of the stock and fishery flows, which is an aggregate of all Regional Fisheries Management in Indonesia. Stocks and flows which can be determined quantitatively from Indonesia's fish resources accounting is the beginning of standing stock and its revisions throughout the year including the production, growth, depletion, externalities due to Illegal, Unreported and Unregulated Fishing (IUU), other changes, as well as the standing stock at the end of the year.

2. From the analysis of the small pelagic fish resources accounting of Indonesia, it is known that the overall condition of the stock of fish resources is still in surplus condition.

3. Nevertheless, the annual trend of the stocks conditions vary. By using recursive models, found that a standing stocks of small Pelagic, fluctuates. Nevertheless, the annual trend stocks condition varies. By using recursive models, found that stocks of small Pelagic fluctuates. Standing stocks throughout the year (1988 until 2012) of Small Pelagic fish, were in the range of 3 million tons to 5 million tons. Monetary value of the standing stock of the same model for small pelagic fish, were in the range of 12 trillion to 21 trillion dollars per year.

4. The natural growth of small pelagic fish tends to be on average positive, with the value of fish fluctuating. By recursive models, the value obtained for the growth of Small Pelagic is in the range of 400 up to 1.8 million tons.

5. Both variables Depletion, or IUU, on balance of recursive models, basically only affects other changes, and the entire standing stock estimation derived from bio-economic dynamics of fish from time series data input and output, which also did not include these variables in the model.

6. Indonesian small pelagic fish resource accounting with the recursive model, has the initial monetary account opened on the value of 13 trillion dollars in 1988, and closed at a value of about 12 trillion dollars in 2012.

7. On the estimated future, the trends of Indonesian small pelagic fish resources physical account, data analysis of the relative trend of stock conditions tends to decrease from the level of 3.3 million to 1.6 million, while production tends to increase. Small Pelagic fish stocks closed in 2017 in the position of 965 thousand tons.

From these results, some several policy implications that are necessary for the sustainability of Indonesian fisheries can be suggested as follows:

1. The results of the analysis of the balance of Indonesia's fish resources can be used as a basis for planning sustainable management of fisheries through fish stock portfolio.

2. Although the results of the analysis of the balance of Indonesian small pelagic fish resources indicate the condition of the standing stock still a surplus, does not mean that these conditions will be safe forever. Management to stabilize the stock to remain in a state of surplus, still required, either in the form of licensed restrictions that are tailored with the standing stock of existing conditions, using an agreed management regime.

3. Related to the above two points, because basically stock portfolios would affect the fisheries license, it would require fundamental changes associated with the

licensing unit of measurement used, whether to use gross tonnage or composite measurements that must be agreed by all parties.

4. Management using MSY regime should be converted into economically efficient management, which is based on MEY (Maximum Economic Yield), which is capable to obtain a more efficient input with the maximum output, as well as yielding more conservative stocks of fish resources.

5. In the state of fish resources that still surpluses, there is still room for the utilization development of fish resources of Indonesia for small Pelagic, especially for domestic investors.

6. Development of these uses should be strictly regulated in the form of calculations of the exact scale input, which is calculated from the amount of effort that still enables the conditions of existing stock by transforming effort to the number of boats and fishing gear according to its capacity.

7. Thus, the results of Indonesian fish resources accounting study must be linked to the results of a study on capacity utilization, to acquire number of fleets that still can be added in the utilization of fish resources in Indonesia.

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