Model of investment reconstruction post moratorium of Cantrang fishing gear (case study: Makassar Strait Waters and Bone Bay in Indonesia)

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Abstract. Cantrang is active fishing gear. The workings of the Cantrang, drawn on the bottom of the water and the size of the small mesh, included in the category of fishing equipment damaging the environment and marine biota. In the PERMEN-KP/2/2015, Cantrang can no longer be used. For survival, fishermen must replace or reconstruct the investment used. The research objective is to analyze and obtain a model of investment reconstruction that can provide maximum income to fishermen in the Makassar Strait and Bone Bay waters after prohibiting the use of Cantrang in the Republic of Indonesia fisheries management area. The study used 6 treatments, namely; Scenario 1 without reconstructing, Scenario 2 reconstructing the net, Scenario 3 reconstructing the rope, Scenario 4 reconstructing the boat, Scenario 5 reconstructing the machine and Scenario 6 reconstructing the investment thoroughly. The study was conducted in August 2016 - July 2017 in 3 locations namely Takalar, Pangkep district, and Palopo City. The research location was determined intentionally by considering the existence of Cantrang and representativeness of the waters of Bone Bay and Makassar Strait. Sampling using census method. Research result; (1) Scenario 1. has a MtpI value equal to 0 (zero), which means that without reconstructing investment, income equals 0 (zero) (2) Scenarios 2 and 6 have a positive MtpI value which means that reconstructing investment causes an increase in income (3) Scenarios 3, 4 and 5 have a MtpI value equal to negative which means that reconstructing investment causes a decrease in income.

1. Introduction
Cantrang is an active fishing gear which is operated by pulling a net through the bottom surface of waters or through the water column for chasing fish schooling [1,2]. In general Cantrang boat has a capacity around 4GT to 30 GT and more than 100 GT. Cantrang is operated in shallow waters because the net has to reach the bottom of the water. Based on how Cantrang is operated, this fishing gear has been categorized as unfriendly due to the marine environment and organisms destruction during its operation [3]. Cantrang moratorium was implemented since 8 January 2015 in a document of PERMEN-KP/2/2015[4].

The cantrang moratorium law enforcement policy has reduced fishing life, and its enforcement made fishermen so scared to go fishing. Fishermen who are using cantrang in fishing stopped. Adapting to these conditions became difficult due to the fishermen limited skill and low level of education
Cantrang moratorium policy gave a multiplier effect to the socio-economy of the fishermen. The fishermen who lost their job due to this policy showed a social lost, such as physical and mental suffering and the other social problems. The abandonment of cantrang operation has caused fishermen their job. Cantrang moratorium created structural joblessness [5,6] found that unemployment was a scary problem for the community. Many problems will be created for the family and community in a jobless situation. Principally, joblessness means loss of output and the cause of human misery. A jobless fisherman has no income, and his welfare decreases due to limited financial capability in fulfilling the primary needs of his household. Pradana and Soeyono (2014) [7] stated that the fishermen’s daily income depends on catch production which is based on fishing activities. Suro et al. (2017) [8] discovered that cantrang fishermen do 24 trips per month. Cantrang moratorium reduces fishermen’s income accounting for 96%. One of the solutions in handling the problem caused by cantrang moratorium policy is to introduce a cantrang investment reconstruction. Cantrang investment reconstruction is reorganizing actions of cantrang investment based on the value and age of the cantrang that still remained due to cantrang could not be used since the moratorium.

Cantrang investment and reconstruction is a marginal cost investment. The fishermen required a lot of funds to add or to create a new investment plan. Investment is a more insecure component than the other components in business. Investment is the cost of buying capital goods, which are goods that could produce other goods. The effect of investment adding could increase income. The process of increasing and decreasing of income due to the effect of an investment adding is called multiplier effects [9]. It is important to analyze how the impact of cantrang investment reconstruction can create multiplier effects on fishermen’s income, post cantrang moratorium through analyzing six alternative models of cantrang investment reconstruction. Aims of the study were to develop and analyze an alternative model for cantrang investment reconstruction in giving a maximum income to fishermen at Makassar Strait and Bone Gulf post implemented of cantrang moratorium.

2. Material and methods.

2.1. Time and location research

The study was conducted in three locations, i.e. Location 1 (L1) in the North Galesong Takalar, Location 2 (L2) on the island of Pangkajene Podang Podang Sub-district Pangkep and location 3 (L3) in the Village of Ponjalae Tappong, South Wara District, City of Palopo. The choosing of the location was done purposively, with the consideration of the existence of cantrang and the inclusion of Makassar Straits for Mainland (location 1), the Makassar Straits to represent the islands (Location 2) and the Gulf of Bone (location 3). The samples in this study were the cantrang boat and the owner of the boat. The sampling used a census method. The number of the sample was the same as the population number accounting for 73 cantrang boats, in detail were: 44 units in L1, 22 units in L2 and 5 units in L3. The research was conducted from August 2016 to July 2017.

2.2. Sampling technique

The research consists of primary and secondary data. The primary data are those data that were obtained directly from the field through direct interviews and observation that were conducted using a questionnaire. The secondary data are data that were obtained from government-related institutions. In the parameters of research, there were six reconstruction models of cantrang namely: Scenario 1(S1) without reconstructing, Scenario 2 (S2) reconstructing the net, Scenario 3 (S3) reconstructing the rope, Scenario 4 (S4) reconstructing the boat, Scenario 5 (S5) reconstructing the machine and Scenario 6 (S6) reconstructing the investment thoroughly. Data were measured, including economic age of cantrang investment, reconstruction, economic age of cantrang benefit and lost economic age and reconstruction income.
2.3. Data analysis

Data were analyzed using descriptive, quantitative percentages. Data were used to analyze the effect of investment, reconstruction on fishermen’s income, namely: benefit value of investment reconstruction (NM), remaining value of investment reconstruction (NS2) and multiplier of investment reconstruction (MtpR), each formula for those parameters as detailed below:

a. The benefit value of the investment, reconstruction (NM)
   \[ NM = \frac{(NS_1 + NB)}{(US_1 + UP)} \times UT \]  
   or  \[ NM = \frac{NR}{UE} \times UT \]
   Where:
   - NM = Benefit Value of Investment
   - NR = Value of Investment Reconstruction
   - NS1 = Initial Remaining Value of Investment
   - NS2 = Remaining Value of Investment Reconstruction
   - NB = The New Value of Investment (Value of Investment Added)
   - UE = Economic aged Investment
   - UT = The Lowest age of Investment
   - US1 = Remaining Age of Investment
   - UP = Used Age for Investment

b. The remaining value of investment reconstruction (NS2)
   \[ NS_2 = (NS_1 + NB) - \frac{(NS_1 + NB)}{(US_1 + UP)} \times UT \]  
   or \[ NS_2 = NR - \frac{(NR}{UE} \times UT) \]  
   or \[ NS_2 = NR - NM \]
   Where:
   - NM = Benefit Value of Investment
   - NR = Value of Investment Reconstruction
   - NS1 = Initial Remaining Value of Investment
   - NS2 = Remaining Value of Investment Reconstruction
   - NB = The New Value of Investment (Value of Investment Added)
   - UE = Economic aged Investment
   - UT = The Lowest age of Investment
   - US1 = Remaining Age of Investment
   - UP = Used Age for Investment

MtpR value showed:

MtpR (-): The ratio of income comparison changing and expenditure changing for buying/reconstructing new investment gave a negative effect on income. Reconstruction causes a decrease in income.

MtpR (+): The ratio of income comparison changing and expenditure changing for buying/reconstructing new investment were positive to income. Reconstruction causes an increase in income.

MtpR (0): The ratio of income comparison changing and expenditure changing for buying/reconstructing new investment has no effect on income.

3. Results and discussion

3.1. Economic aged investment

Investment is the capital that is spent when a business is started [12]. Investment is a capital that is
used as business assets for the future of the business. Suro et al. (2017) [8] found that investment is an initial investment for buying investment goods. Every investment has a productive age or an economic age. Economic age investment is a period of investment that could be used for the economic activities in the business gave a definition for economic age as a prediction of investment that could be used in the economic activities.

Economic age investment (UE), Usageaged4 investment (UP) and Remainingaged4 investment (US4) at study sites were a similar value. A moratorium of cantrang caused fishermen not to do any fishing activities; as a consequence, the initial remaining aged of investment became a lost investment for the fishermen. One of the efforts to make fishermen go fishing is through a reconstruction of cantrang fishing gear. Through reconstruction, the remaining age of investment has to be changed to fit with a new economic age of investment (reconstruction age of investment). The changing of age investment depends on the reconstruction scenario that has been chosen by fishermen.

Two out of 6 Scenario had an age benefit; they are S2 and S6. Aged benefit for the other scenario was equal to zero, it means that reconstruction of cantrang for rope, boat, and machine boat did not solve the problem of cantrang moratorium. All investment could not be used for fishing activities due to the moratorium policy. In detail, the reconstruction scenario could be explained below: S1 was a condition where fishermen did not make any changing at their cantrang fishing gear. The consequence of this S1, fishermen were lost by remaining age investment accounting for initial age investment. S2 was a condition where fishermen do a reconstruction of cantrang nets. This scenario caused a changing on aged cantrang net investment from 3 years to 6 years. For the other investment, namely rope, boat, and machine boat did not change. S3 was a condition where fishermen do a reconstruction of the salambar rope. This scenario caused a changing on rope investment from 3 years to 6 years. For the other investments, namely net, boat, and machine boat did not change. S4 was a condition where fishermen made a reconstruction for cantrang boats. This scenario caused a change in age boat cantrang investment from 8-11 years to 17 years. There are no changes for the other investments, namely; net, rope, and machine boat investments. S5 was a condition where fishermen made a reconstruction of a machine boat of cantrang. This scenario caused a change in age boat machine of cantrang investment from 2-3 years to 8 years. For the other investments, namely net, rope, and the boat did not change. S6 was a condition where fishermen did a whole reconstruction for their cantrang fishing gear including net, rope, boat, and machine boat reconstruction. This scenario caused a change to four investments, such as net, rope, boat and machine boat.

3.2. Value of investment

3.2.1. The initial remaining value of investment (NS1). Moratorium caused fishermen not to do any fishing activities using cantrang fishing gear. The consequence of the moratorium is that there were several investments for cantrang fishing gear that still have an economic value, but fishermen could have used this investment for their business. This remaining economic value is known as the Initial remaining value of an investment (NS1) (table 1).

| Loc | Net (IDR)      | Rope (IDR)   | Boat (IDR)   | Boat machine (IDR) | Total (IDR)   |
|-----|----------------|--------------|--------------|-------------------|---------------|
| L1  | 23,360,682     | 12,357,023   | 57,864,973   | 14,284,091        | 107,866,769   |
| L2  | 20,556,944     | 9,123,124    | 75,220,588   | 31,005,208        | 135,905,865   |
| L3  | 17,088,333     | 7,279,333    | 53,811,765   | 18,950,000        | 97,129,431    |

The highest NS1 value was found in boat investment and the lowest NS1 value was found in rope investment. The highest total NS1 value was found at L2 accounting for IDR 135,905,865 and the lowest total of NS1 value was found at L3 accounting for IDR 97,129,431.
3.2.2. New value of investment (NB). The new value of investments was a marginal investment, including the investment for price, cost, or price and cost investment that will be added to a reconstructed remaining investment. The amount of marginal cost varied and depend on the type of reconstructed investment and scenario model of investment that has been chosen. The added value per investment item and scenario model of reconstruction at three study sites were shown in Table 2.

| Location | S1 (IDR) | S2 (IDR) | S3 (IDR) | S4 (IDR) | S5 (IDR) | S6 (IDR) |
|----------|----------|----------|----------|----------|----------|----------|
| L1       | 0        | 42,845,000 | 24,531,818 | 89,931,818 | 43,636,364 | 200,945,000 |
| L2       | 0        | 48,550,835 | 22,580,832 | 133,375,004 | 87,208,338 | 291,715,002 |
| L3       | 0        | 47,995,000 | 21,993,333 | 101,000,000 | 56,166,667 | 227,155,000 |

S1 did not have an added value of the investment (Table 2), due to this scenario model without any reconstruction that was being made. Furthermore, for the other five scenario models of reconstruction, the added value of investments was varied. The highest cost for reconstruction was for a scenario model 6.

3.2.3. Value of investment reconstruction (NR). The value of investment reconstruction (NR) was added NS1, dan NB or remaining investment value that was not being used due to moratorium policy, but still has an economical age plus marginal investment reconstruction. The value of investment reconstruction per scenario reconstruction was shown in Table 3.

| Location | S1 (IDR) | S2 (IDR) | S3 (IDR) | S4 (IDR) | S5 (IDR) | S6 (IDR) |
|----------|----------|----------|----------|----------|----------|----------|
| L1       | 23,360,682 | 66,205,682 | 36,888,841 | 147,796,791 | 57,920,455 | 308,811,769 |
| L2       | 20,556,944 | 69,107,779 | 31,703,956 | 208,595,592 | 118,213,546 | 427,620,867 |
| L3       | 17,088,333 | 65,083,333 | 29,272,666 | 154,811,765 | 75,116,667 | 324,284,431 |

S1 value was the remaining investment value (NS1). S2 value was NS1 plus NB. S3 value was NS1 rope salambar plus tali salambar NB rope salambar. S4 value was NS1 boat plus NB boat. S5 value was NS1 machine plus NB machine. S6 value was added of NS1 net + NS1 rope + NS1 boat + NS1 machine + NB net, NB rope, NB boat, and NB machine.

3.2.4. The benefit value of investment (NM). The benefit value of the investment is the value of the investment reconstruction subtracted from the age economic reconstruction, multiplied by the standard age or lowest age benefit from all investments. The benefit value of the investment (NM) at three study sites is shown in Table 4.

| Location | S1(IDR) | S2(IDR) | S3(IDR) | S4(IDR) | S5(IDR) | S6(IDR) |
|----------|---------|---------|---------|---------|---------|---------|
| L1       | 0       | 33,102,841 | 0       | 0       | 0       | 198,698,438 |
| L2       | 0       | 23,035,926 | 0       | 0       | 0       | 263,093,868 |
| L3       | 0       | 21,694,444 | 0       | 0       | 0       | 205,332,946 |

Moratorium caused benefit value of an investment for S1, S3, S4 and S5 which was equal to zero or they did not have benefit value anymore. From 6 reconstruction scenario, only 2 scenarios reconstruction still have benefit value of the investment, namely, S2 and S6. Net reconstruction (S2) and reconstruction all components of cantrang(S6) were fitted with moratorium policy, furthermore, age economic of cantrang was longer and investment could still be used by fishermen. However, for each
investment has a different value of age investment, re-investment of cantrang was only used based on the lowest age of other components of investments.

3.2.5. Remaining value of investment reconstruction ($NS_2$). The remaining value of investment reconstruction ($NS_2$) was a lost value of the investment. $NS_2$ was $NS_1 + NB - NM$ (Table 5).

| Location | S1 (IDR) | S2 (IDR) | S3 (IDR) | S4 (IDR) | S5 (IDR) | S6 (IDR) |
|----------|----------|----------|----------|----------|----------|----------|
| L1       | 23,360,682 | 33,102,841 | 36,888,841 | 147,796,791 | 57,920,455 | 110,113,331 |
| L2       | 20,556,944 | 46,071,853 | 31,703,956 | 208,595,592 | 118,213,546 | 164,527,005 |
| L3       | 17,088,333 | 43,388,889 | 29,272,666 | 154,811,765 | 75,116,667 | 118,951,485 |

Table 5 showed that a scenario model of cantrang reconstruction that was given the lowest lost value of the investment is namely: L1 was S1, S2, S3, S5, S6, and S4. L2 was S1, S3, S2, S5, S6, and S4. L3 was S1, S3, S2, S5, S6, and S4.

3.2.6. Disposable Income of Reconstruction (YdR). Disposable Income of Reconstruction (YdR) was the last income of fishermen before cantrang moratorium was implemented and multiplied by the current year of reconstruction income (year-N) (Table 6).

| Model | L1 (IDR) | L2 (IDR) | L3 (IDR) |
|-------|----------|----------|----------|
| S1    | 1,178,248,449 | 597,077,201 | 945,533,527 |
| S2    | 1,178,248,449 | 597,077,201 | 945,533,527 |
| S3    | 1,178,248,449 | 597,077,201 | 945,533,527 |
| S4    | 1,178,248,449 | 597,077,201 | 945,533,527 |
| S5    | 1,178,248,449 | 597,077,201 | 945,533,527 |
| S6    | 2,970,217,058 | 2,431,003,555 | 3,849,745,663 |

Table 6 showed that only two model alternatives that have given a positive disposable income of reconstruction, namely S2 and S6. For both models, S6 was given the highest disposable income of reconstruction. The other models (S1, S3, S4, and S5) had a negative value of disposable income of reconstruction. These four models could not give an income for fishermen, but gave a loss to fishermen even further.

3.3. A multiplier of Investment Reconstruction (MtpR)

A multiplier of Investment Reconstruction (MtpR) is a ratio number of comparisons between marginal investment expenditure and income changing due to investment reconstruction. The amount of MtpR was calculated by marginal investment divided by 1. Marginal investment was a value that is obtained from investment changing value ($\Delta I$) divided by reconstruction income (YdR). The percentage of investment income changing, propensity to investment (MPI) and the multiplier of investment reconstruction (MtpR) were shown in figure 1.
Figure 1. Percentage of marginal investment value (%ΔI) Multiplier of Investment Reconstruction (MtpR) and Marginal Propensity To investment (MPI) per type models of reconstruction

Percentage of marginal investment value (PMI), Marginal Propensity To investment (MPI) and Multiplier of Investment Reconstruction (MtpR) in figure 1 shown as follows:

a. Model S1 without reconstruction, PMI, MPI and MtpR values at L1, L2 dan L3 was zero.

b. Model S2 net reconstruction, PMI value at L1, L2 dan L3 were accounting for 64.7 %, 70.3%, 73.7 %, respectively, that caused the value of MPI and Mtp Rat three sites were positive, while the value of MPI was 0.04, 0.08 and 0.05, respectively and the value of MtpR was 27.5, 12.3, 19.7 for L1, L2, and L3, respectively.

c. Model S3 rope reconstruction, PMI value at L1, L2 dan L3 were accounting for 66.5 %, 71.2 %, 75.1 %, respectively, that caused the value of MPI and Mtp Rat three sites were negative, while the value of MPI was 0.02, -0.04, -0.02, respectively and the value of MtpR was -48.0, -26.4, -43.0 for L1, L2 and L3, respectively.

d. Model S4 boat reconstruction, PMI value at L1, L2 dan L3 were accounting for 60.8 %, 63.9 %, 65.2 %, respectively, that caused the value of MPI and Mtp Rat three sites to be negative, while the value of MPI was -0.08, -0.22, -0.11 respectively and the value of MtpR was -13.1, -4.5, -9.4 for L1, L2 and L3, respectively.

e. Model S5 machine boat reconstruction, PMI value at L1, L2 and L3 were accounting for 75.3 %, 73.8 %, 74.8 %, respectively, the value of MPI and Mtp Rat three sites to be negative, while the value of MPI was -0.04, -0.15, -0.06 respectively and the value of MtpR was -27.0, -6.8, -16.8 for L1, L2 and L3, respectively.

f. Model S6 reconstruction for all Cantrang components (net, rope, boat, and machine), PMI value at L1, L2 dan L3 were accounting for 65.1 %, 65.1 %, 76.0 %, respectively, that caused the value of MPI and Mtp Rat three sites to be positive, while the value of MPI was 0.07, 0.12, 0.06 respectively and the value of MtpR was 14.8, 8.3, 16.9, for L1, L2, and L3, respectively.

3.4. Discussion
The socio-cultural characteristic of fishermen resulted in them not being able to change job, though, they could easily find an alternative job [13]. Cahaya [14] mentioned that fishermen could survive in every limited condition. In our case, the post-moratorium of cantrang fishermen could do their fishing activities by adaptation to the present situation. Fishermen have chosen, replaced or reconstructed their cantrang resulting in a multiplier effect. Multiplier effects of investment relied on reconstruction scenario that has been chosen based on the available fund or capital. Based on the theory of Richard Kahn (1931); John Maynard Keynes (1936; 1973) in Pantina & Borodulina [15] multiplier effect is an
investment result that showed in an increasing income that is higher than investment.[16] mentioned that the difference in policy or decision making could create a different effect on work.

At three locations of our study sites, the fishermen have no capital to reconstruct their cantrang, they have chosen a scenario 1, which is a model without reconstruction. Scenario 1 model caused an investment expenditure direction at three locations with no change, as a consequent; there was no change in investment effect for their income. It means that without any change in investment, income change is zero. On the other hand, fishermen with capital choose investment reconstruction of cantrang. [17] mentioned that capital contributed to fishermen resistant in coping with changing conditions. Reconstruction of fishing gear required a marginal cost investment; however, not all reconstruction could obtain an optimal income. For this reason, fishermen have to have a good consideration when they decide to invest. [18] stated that there is a risk to lose in investing. They also mentioned that investment is a risk premium for investment capital. [19] mentioned that fishermen income could dramatically vary.

At three locations of our study sites (L1, L2, and L3), fishers with no capital have chosen S2, S3, S4, S5, and S6 models. For S2 model at L1, when fishermen did a net reconstruction, they could add an investment accounting for 46.7%. This resulted in a positive change in investment account with 0.04 points The ratio of change in expenditure, investment and income were 27.5 points. It means that for obtaining 27.5 points of income, it requires 0.04 points of investment. At L2, when fishermen did a net reconstruction, they could add an investment accounting for 70.3%. This caused a positive in changing of investment account for 0.08 points. The ratio of changing in expenditure, investment and income were 12.3 points. It means that for obtaining 12.3 points, it requires 0.08 points of investment. At L3, when fishermen did a net reconstruction, they could add an investment accounting for 73.7%. This caused a positive in changing of investment account for 0.05 points. The ratio of changing in expenditure, investment and income were 19.7 points. It means that for obtaining 19.7 points, it requires 0.05 point of investment.

For S3 model at L1, when fishermen did a rope salambar reconstruction, they could add an investment accounting for 66.5%. This caused a negative in changing of investment account for -0.02 point. The ratio of changing in expenditure, investment and income was -48.0 point. This result showed that 0.02 points of investment caused the decreasing in income accounting for 48.0 points. At L2, when fishermen did a rope salambar reconstruction, they could add an investment accounting for 71.2%. This caused a negative in changing of investment account for -0.04 points. The ratio of changing in expenditure, investment and income were -26.4 points. This result showed that 0.04 points of investment caused the decreasing in income accounting for 26.4 points. At L3, when fishermen did a rope salambar reconstruction, they could add an investment accounting for 75.1%. This caused a negative in changing of investment account for -0.02 point. The ratio of changing in expenditure, investment and income was -43.0 point. This results showed that 0.02 point of investment caused the decreasing of income accounting for 43.0 points.

For S4 model at L1, when fishermen did a boat reconstruction, they could add an investment accounting for 60.8%. This caused a negative in changing of investment account for -0.08 point. The ratio of changing in expenditure, investment and income was -13.1 point. This result showed that 0.08 point of investment caused the decreasing in income accounting for 13.1 points. At L2, when fishermen did a boat reconstruction, they could add an investment accounting for 63.9%. This caused a negative in changing of investment account for -0.22 point. The ratio of changing in expenditure, investment and income was -4.5 point. This result showed that 0.22 points of investment caused the decreasing in income accounting for 4.5 points. At L3, when fishermen did a boat reconstruction, they could add an investment accounting for 65.2%. This caused a negative in changing of investment account for -0.11 point. The ratio of changing in expenditure, investment and income was -9.4 point. This result showed that 0.11 points of investment caused the decreasing in income accounting for 9.4 points.

For S5 model at L1, when fishermen did a boat machine reconstruction, they could add an investment accounting for 75.3%. This caused a negative in changing of investment account for -0.04
points. The ratio of changing in expenditure, investment and income was -27.0 point. This result showed that 0.04 points of investment caused the decreasing in income accounting for 27.0 points. At L2, when fishermen did a boat machine reconstruction, they could add an investment accounting for 73.8%. This caused a negative in changing of investment account for -0.15 points. The ratio of changing in expenditure, investment and income were -6.8 points. This result showed that 0.15 points of investment caused the decreasing in income accounting for 6.8 points. At L3, when fishermen did a boat machine reconstruction, they could add an investment accounting for 74.8%. This caused a negative in changing of investment account for -0.06 points. The ratio of changing in expenditure, investment and income were -16.8 points. This result showed that 0.06 point of investment caused the decreasing in income accounting for 16.8 points.

For S6 model at L1, when fishermen did all fishing gear component reconstruction, they could add an investment accounting for 65.1%. This caused a positive in changing of investment account for 0.07 points. The ratio of changing in expenditure, investment and income were 14.8 points. It means that for obtaining 14.8 points of income, it requires 0.07 point of investment. At L2, when fishermen did all fishing gear component reconstruction, they could add an investment accounting for 65.1%. This caused a positive in changing of investment account for 0.12 points. The ratio of changing in expenditure, investment and income were 8.3 points. It means that for obtaining 8.3 points of income, it requires 0.12 point of investment. At L3, when fishermen did all fishing gear component reconstruction, they could add an investment accounting for 76.0%. This caused a positive in changing of investment account for 0.06 points. The ratio of changing in expenditure, investment and income were 16.9 points. It means that for obtaining 16.9 points of income, it requires 0.06 point of investment.

From all reconstruction models, S2 and S6 models were the chosen models, due to the fact that these models could solve the problem of fishermen relating to cantrang moratorium. Those models could minimize the loss of investment for fishermen. However, S3, S4, and S5 models are no solution to moratorium problem.

4. Conclusions
Cantrang moratorium caused fishermen to lose their investment. Lost investment value was affected by investment age that could still be used. The reconstruction option could create a multiplier effect. From 6 reconstruction models, one model had zero points, three model shad negative points, and two model shad positive points. The multiplier is zero when the adding of investment did not affect their come of fishermen. The multiplier is a negative point when adding investment caused a decreasing in income. On the other hand, the multiplier is a positive point when the adding of investment could increase an income of fishermen. Overall, cantrang reconstruction significantly impacted fishermen income.

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