Incorporate Sustainable Livelihood Strategy on Recovery of Fisheries Livelihood in Krueng Raya Bay-Aceh, Indonesia

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ABSTRACT

Recovery of livelihood strategy should be promoted by community participation and their shelf-lesson learnt. This research assesses the integration of sustainable livelihood strategies into fisheries livelihood recovery using indicators (poverty and income), external aid role, and fishing community engagement in arranging fisheries livelihood recovery. It was conducted in Krueng Raya Bay-Aceh Province during September - October 2012. Survey, focus group discussion and interview were carried out to explore the state of income, poor, and the characteristics of fishing community. Poverty alleviation through increase of income was a main target of sustainable livelihood. It was indicate that a drop of income, a depletion of fish resource, assets production damage, and ecosystem degradation in fishing communities caused increase of poverty. Their high dependency on fisheries resources, ranging between 0.61 and 0.81, also influenced poverty hikes. Reduced a number of poverty to 56.6% in 2009 from 97.7% in 2005, was supported by the recovery program of fisheries livelihood and the strong internal characteristics of fishing community. But, their capacity on financial capital was insufficient to restore fisheries livelihood without any aid delivered from Government of Indonesia and other donor agencies. Lesson learnt from engagement in reconstruction process, people in fishing communities recommended to integrate alternative livelihood development and social-ecological approach into development of fisheries livelihood.

Keyword: Sustainable livelihood strategy, fisheries livelihood, poverty, and aid delivery

Introduction

Immediately after the Indian Ocean tsunami disaster in 2004, a quick response focused not only on the physical reconstruction, but also on livelihood recovery in Krueng Raya Bay, Indonesia. The integration of the sustainable livelihood approach (hereinafter called SLA) is an effective tool to restore fisheries livelihood. SLA is well known in development programs; not only for reducing poverty and vulnerability but also to recover livelihood post disaster in developing countries. SLA was established for protecting and rebuilding livelihoods and communities after disaster; and reducing vulnerability to future disasters (Cannon et al. 2003). SLA integrated into the Fisheries Livelihood Recovery Program (FLRP) by the United Nations Development Program (UNDP) in the period 2005-2007, effectively revitalized fishermen income and inspired them to develop alternative livelihoods in Krueng Raya Bay, Aceh Besar.

Krueng Raya Bay has had an important part for fishing communities prior to the tsunami. Pomeroy et al. (2006) described that the communities with high dependency on severely depleted natural resources base and badly degraded ecosystems, can be categorized into fragile communities. The impact of the 24 December 2004 tsunami on the coastal villages and fishing community in this area was disproportionately higher in comparison with other villages and groups of people in this region. Field Survey (2012) found 90% of the 13 villages were heavily affected by this huge disaster. This tragedy impacted upon human, social, natural, financial, and physical capital supporting fisheries livelihood. Total fishermen income lost was around USD 0.8 million for 6 months duration after the tsunami hit. We estimated 1,750 fishermen and aquaculture households lost their livelihood, and 44 fishermen were dead. Around 10,000 people were forced to live in temporary settlements (Field Survey 2012).

Facing the worst conditions, an enormous number of fishing communities was trapped in severe poverty. Recovered fisheries livelihood cannot solve the poverty problem immediately, and fishing communities still need to explore and develop any alternative livelihoods during the post recovery phase. However, their resources and capacity were limited to shift from their main livelihood and create
alternative livelihoods. Pomeroy et al. (2006) argued that only some of fishing communities can adopt and change to other livelihoods; but many of them fell into the worse situation.

This paper examined the strategies, which are selected by the fishing communities towards recovery of fisheries livelihood. In the present research we designed some specific objectives such as, to (1) identify tsunami impact on income and poverty of fishing community, and fisheries resources; (2) explore the characteristics of fisheries communities on coping crisis condition; and (3) investigate aid delivery factor as a source of financial capital on recovery process of fisheries livelihood.

**Methodology**

Krueng Raya Bay was selected as a research site. It is located on the edge of Malacca Strait and North Sea water, which has strategic position to extend production and marketing networks as anchovy fisheries center (figure 1). The survey was conducted during the period from September to October 2012 to collect primary and secondary data. Eighty-three respondents, who represent the fishing community, were selected and interviewed by using structured and semi-structured questionnaires. This research used Likert Scale Analysis to measure the respondent perception on aid delivery, local and external institutions’ role, fishing community’s strategy on recovery and development of fisheries livelihood. The data were analyzed by using descriptive statistics to calculate frequency, proportion, percentage, mean, standard deviation, range, and average for assessment of fisheries livelihood factors. Inferential statistics, such as chi-square and One Way ANOVA test, were used to examine the correlation among the factors or variable. SPSS version 20.0 and Excel 2013 were used to compute both descriptive and inferential statistics.

![Figure 1.](image)

**Result and Discussion**

**Decreasing income and increasing poverty of fisheries household**

The 2004 tsunami directly impacted on fisheries household income in the study area. Before the tsunami, fisheries household that earned more than IDR 1,000,000 per month accounted for 57.83% of the total, followed by those with income in the range IDR 500,000-1,000,000 (18.7%) and those with less than IDR 500,000 (10.8%). However, after 2004, the fisheries households with income of more than IDR 1 million declined 7.23% and their income in range IDR 500,000-1,000,000 increased 22.8%.
The decline of fisheries household income was caused by several factors such as asset production damage, declining value of fish production, and change of fishing boat composition. Naturally, production, processing and marketing assets were damaged and lost. Before the tsunami, the numbers of lift net, hand line, beach seine, gill net, mini purse seine boat, and fish processor unit were 89, 18, 64, 6, 6, and 58 units, respectively (Imran and Yamao 2014). Only 8 units of lift net boat remained and redeployed three months after this huge disaster (FGD 2012). On the recovery process, as of 2012, 29 units of lift net, 5 units of beach seine, 2 units of gill net, 1 unit of mini purse seine, and 18 units of fish processing were put into operation.

There is no national standard about fisheries household’s income sufficiency in Indonesia after the tsunami. However, fishing communities got additional income from the cash for work project, Government of Indonesia’s rice aid, and international donor agencies’ food aid to meet their living cost until 2006. During the recovery process, the fisheries communities could save their income and buy luxury goods such as refrigerator, television and motorbike because their daily primary goods had already been supplied by GOI and international donor agencies until 2007 (Field Survey 2012). Fishermen said that their income was insufficient after the aid delivery terminated and they just obtained income from fisheries livelihood since 2007. It is clear that poverty increased, thereby becoming a greater threat to sustainable use of fish resources.

Another impact of the tsunami was a rapid increase of poverty in the affected area. The proportion of the poor sharply increased immediately after the tsunami (table 2). In 2003, 45.3% of households in the four villages had faced the poverty condition (Statistics Indonesia Agency 2006). After the tsunami, almost all households (97.7%) were regarded as poor. However, along with the economic recovery during the period 2006-2009, their economic condition showed improvement and income of households continued to increase. As a result, the poor accounted for 56.58% in 2009.

Before the tsunami, 61% of the households had been under the poverty line in Ruyung village, and Meunasah Keudee showed 38% only. In Meunasah Mon Village, the poor reduced its portion in 2009. However, the figure of the poor in four villages shows a higher percentage than that in Aceh Besar District, both before and after the tsunami disaster. FH income can be classified into a lower income group in Krueng Raya Bay. The poverty condition of FH would naturally influence the fishing communities. After the tsunami, the percentage of the poor might not only been contributed by FHs but also by other households such as traders, farmers, and local government officer; because the tsunami disaster affected all people living in Krueng Raya Bay. Generally speaking, fisheries communities have higher vulnerability to natural disasters. There were several factor that contributed increasing poverty in Kruang Raya Baya, such as: (1) Dependent on fisheries livelihood. FHs dependency ratio was 40.1%, increased to 54.3% and gradually went up to 62% in period 2005-2009 (Imran and Yamao, 2014); (2) Extremely increased unemployment. The research figure out 4.15 % (2003), 100% (shortly after the tsunami, 2005), and 33.38% (2012) of jobless people; and (3) Damaged production assets compounded the condition of the poor population in the fishing communities as an aftermath of the tsunami. Many scholars agreed that high poverty level is one of the fishing communities’ characteristics. They are among the poorest communities and the rate of poverty is increasing over time in developing countries (Salagrama 2006).

Declining fish resources and ecosystem damage

In general, fish resources have shown a declining trend in Krueng Raya Bay; however, this research focused only on anchovy. According to data analysis, anchovy resource also indicated a downward trend both before and after the tsunami. Imran and Yamao (2014) revealed a decline of anchovy resources by examining production trend and Maximum Sustainable Yield (MSY). Changing process of anchovy production was divided into three distinct periods. During the period 1999-2004, anchovy production showed a decreasing trend. Anchovy catch fell down to 1,050.1 tons in 2004 and it sharply declined to 171.1 tons in 2005 after the tsunami. As shown in figure 3, it continued to show a fluctuation between 126.57-279.07 tons during the period 2006-2012. It also points out that actual production was less than the production of Schaefer Model recommendation in the period 1999-2002 and 2007-2012.

Overexploitation and depletion of anchovy resource can be caused by several factors. Firstly, the number of lift net boat definitely increased to 91 units in the 2004 from 2 units in the
1990s. Secondly, equipment and materials used for fishing became rapidly sophisticated, which brought a sharp rise of productivity. Thirdly, the mesh size of the lift net fishing gear became too small. In the survey area, fishermen used the mesh size 0.95 cm on the bottom side, 1.27 cm in the middle side, and 2.54 cm on the top side to construct a set of lift net fishing gear with a width of 18 m X 18 m and a depth of around 15 - 20 m. And finally, The worst state of anchovy resources can be also explained by coastal ecosystem degradation and the tsunami impact. Long et al. (2006) reported that average living cover of the coral reef ecosystem was 10%; however, Ocean Diving Club (2011) found that the live cover of hard coral was 36.9 %.

Both reports remarked that the coral reef ecosystem was in poor condition based on the classification developed by McAllister (1988). We estimated that 62-90% of this ecosystem was in degraded condition. Coral reef devastation was compounded by the tsunami physical impact. The tsunami also affected the mangrove ecosystems. The percentage of mangrove trees area had remained at around 5% and it can be classified within damaged category according to the Ministry of Environment (2004).

Characteristics of fishing communities on supporting livelihood recovery

In this paper, the term of fishing communities’ characteristics is related to internal communities’ capability on recovery of fisheries livelihood. As regards the attitude of fishermen, 54.22% of the respondents did not feel mental trauma after the earthquake and tsunami struck, while 45.78% of them felt very traumatic. As of 2012, some of those affected people suffered from the trauma. Indeed, the majority of respondents expressed that they have very high trust on the informal leader (85.54%) and learning from past failures and successes (93.98%) to recover their livelihood.

There are some factors contributions on building fishing communities’ characters. The most interesting factors as follow: (1) The majority of Aceh’s people including fishing communities had face armed conflicts for 32 years before a peace agreement was established in 2005; (2) Social and religious values have a role in building the fishing communities’ mentality, such as family, relatives’ and religious role; (3) Many fishermen kept their trust on the sea commanders because they still needed the leader to manage social interaction, capture fisheries activities, conflict solver, and communication with the government and other stakeholders. If trust is still established for personal resources, many people may believe in cooperating in the same action from which they can receive mutual benefit (Cacioppo et al. 2011); (4) Lessons learnt from past failure and successful experiences guided the fishermen to struggle with their lives. In this case, technology improvement on fishing gear of lift net boat can be taken as a good example; (5) Fishermen’s wives were involved mainly in fish processing (FP) and fish trading activities. It was reported that 250 women had seasonal jobs in 58 FP before the tsunami, at least 25 fishermen’s wives were engaged fish processing and fish trader in Meunasah Keudee Village before the tsunami (Miftachhuddin, 2003). Houghton (2006) stated that that women participation needed to be encouraged for the recovery process because they were very vulnerable to disasters according to their socio-economic status and their lack of access to resources; (6) Work experience in fisheries activities can support the donor agencies in recovery fisheries livelihood and it was very useful in the planning and implementation of lift net boat activities.

Aid delivery factor as a source of financial capital

The fishing communities expressed diverse responses on their capacity and external aid for the recovery of fisheries livelihood. Many respondents strongly disagreed and disagreed on capacity of fishing communities on recovery of fisheries livelihood (F4) are 49.4%and 31.3% respectively. However, 16.9% of respondents were undecided (neutral) that they could restore their livelihood by themselves. In other words, almost all agreed that the recovery of fisheries livelihood would have never been achieved without any external aid.
High dependency of fishing communities on external aid was understandable. We found that almost 99% of respondents’ fisheries livelihood assets and other assets were damaged and lost. The majority of respondents also lived in temporary shelters for two years while waiting for re-building their house. The only one expectation on recovery of fisheries livelihood was definitely the access to external aid. To assess dependency on aid, this research formulated an aid dependency index (ADI). This describes how the fishing community is dependent on external aid because of less themselves capacity on recovery of fisheries livelihood in Krueng Raya Bay. All villages in Krueng Raya Bay indicated a high of ADI, ranging between 0.61 and 0.81. There was correlation between productive asset damaged and ADI by using crosstab analysis; the result revealed that \( \chi^2 \) Value (67.4) > \( \chi^2 \) table (8:0.05) (15.5) and P value (0.00) < 0.05.

**Optional Strategies of Fisheries Communities toward Sustainable Fisheries Livelihood Development**

Fishing communities set up several strategies for the recovery of fisheries livelihood. They have selected two main strategies toward the development of sustainable fisheries livelihood according to their lesson learnt during the recovery process. Table 1 shows that S9 and S7 were ranked at the 1st and 2nd respectively, considering mean result and proportion of favorable respondent answer on neutral, agree, and very disagree. For example, respondents were very confident about the improvement of their livelihood in the future. “Agree” and “very agree” responses were accounted for 30.1% and 67.47%, respectively, while only 2.4% of respondents had full of doubt.

<table>
<thead>
<tr>
<th>Optional Strategies</th>
<th>Proportion (%)</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fisheries communities involvement on management (S1)</td>
<td>0.00 3.61 13.25 26.51 56.63</td>
<td>4.36</td>
<td>0.85</td>
<td>5</td>
</tr>
<tr>
<td>Collaborative action (S2)</td>
<td>1.20 0.00 4.82 31.33 62.65</td>
<td>4.54</td>
<td>0.70</td>
<td>3</td>
</tr>
<tr>
<td>Strengthening bonding indigenous institution and LGU (S3)</td>
<td>0.00 0.00 15.66 34.94 49.40</td>
<td>4.34</td>
<td>0.74</td>
<td>6</td>
</tr>
<tr>
<td>Increasing capacity building of indigenous institution (S4)</td>
<td>0.00 0.00 22.89 34.94 42.17</td>
<td>4.19</td>
<td>0.79</td>
<td>7</td>
</tr>
<tr>
<td>Provided technical assistance for fisheries communities (S5)</td>
<td>6.02 2.41 27.71 42.17 21.69</td>
<td>3.71</td>
<td>1.03</td>
<td>9</td>
</tr>
<tr>
<td>Integrated social, finance, human, physical and nature capital building (S6)</td>
<td>0.00 0.00 4.82 37.35 57.83</td>
<td>4.53</td>
<td>0.59</td>
<td>4</td>
</tr>
<tr>
<td>Adopted social ecological system approach (S7)</td>
<td>1.20 0.00 3.61 26.51 68.67</td>
<td>4.61</td>
<td>0.68</td>
<td>2</td>
</tr>
<tr>
<td>Engaged women in fisheries livelihood (S8)</td>
<td>1.20 0.00 36.14 45.78 16.87</td>
<td>3.77</td>
<td>0.77</td>
<td>8</td>
</tr>
<tr>
<td>Developed alternative livelihood (S9)</td>
<td>0.00 0.00 2.41 30.12 67.47</td>
<td>4.65</td>
<td>0.53</td>
<td>1</td>
</tr>
</tbody>
</table>

Fishing community selected S9 as the first priority toward the development of sustainable fisheries livelihood and could be explained by several factors, such as existing source of income, land ownership, fishing experiences, and dependency on fisheries resources in fishing communities. Meanwhile, fishing communities selected the S7, adoption of social ecological system approach, as the second priority.
Conclusion and Recommendation

Changes in fisheries household income and poverty levels were greatly affected by the tsunami strike. This natural disaster shifted the structure of fisheries household income from > IDR 1 million to IDR 0.5-1 Million. Destruction of physical, fish resource, and financial capital were the main factors that caused a decrease of fishing community income. Many fishermen substituted their fishing boats from lift net boat to hand line boat in order to cope the decrease of income. On the other hand, the number of poor people increased almost to double because of the tsunami disaster. After reconstruction program (2005-2009), the number of poor people in fishing communities could be decreased to 50% of their original number as an aftermath of the tsunami (2005).

The characteristics of fishing communities could be the key factors for the recovery of fisheries livelihood. The strong characteristics of the fishing community can help cope with their shock and stress after the tsunami hit. However, they cannot restore fisheries livelihood without aids delivered by external institutions. As a consequence, the aid dependency index of fishing community became very high at the end of the recovery process. Setting up a good criteria for aid delivery has to be defined first in order to avoid overlapping and conflicts among the beneficiaries in the beginning of recovery process.

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