

学 位 論 文 の 要 旨

論文題目 Integrated Sustainable Livelihood Approach toward the Strengthening of Social Resilience: A Case Study on Recovery of Fisheries Livelihood after the Tsunami in Krueng Raya Bay, Aceh-Indonesia

(社会回復力の強化に向けた統合的かつ持続的な生計アプローチ：インドネシア・アチェ州、クルングラヤ湾における津波後の水産業復興に関する事例研究)

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Purpose and Objective

Integrated sustainable livelihood approach toward recovery of fisheries livelihood was implemented, in order to relief fishing communities and restore fish resource in tsunami-affected areas, Aceh-Indonesia. This approach gave a direction for the fishing communities how to make a balance between exploitation of fish resources and its conservation, on the recover process. This research purpose was to identify the strategies of integrated sustainable livelihood approach toward the strengthening social resilience in fisheries communities. It was conducted to focus on recovery process of the disaster in Krueng Raya Bay, Aceh Besar.

This research has five specifics objective: 1) to examine factors affecting on changes of fisheries livelihood pattern in fishing community; 2) to examine factors that cause decrease of anchovy resources and coastal ecosystems degradation; 3) to assess effectiveness of integrated and participatory sustainable livelihood approach by using indicative figures such as poverty and income, and by referring to fishing community's involvement in recovery activities; 4) to investigate the recovery process of fisheries livelihoods and roles of indigenous institution toward the strengthening of social resilience in fishing community; and 5) to provide recommendation for adaptive framework on recovery of fisheries livelihood.

Methodology

A series studies were carried out in Krueng Raya Bay-Aceh, Indonesia. Four villages; Ruyung, Meunasah Keudee, Meunasah Kulam, and Meunasah Mon; were selected as case study area. While referring to secondary data, survey, sampling, focus group discussion, and in-depth interview were conducted in March 2012 and September-October 2012 in Krueng Raya Bay, Aceh Besar-Indonesia. Semi structured

and open questionnaires were delivered to 120 respondents and key informant persons, with references to fishing communities, fisheries livelihood, fish resources, and social capital. The target respondents were fishermen, fish processing, financial trader, head of villages, sea commander, and local institutions. This research adopted the following analysis tools: (1) damage and loss analysis, (2) descriptive statistics analysis, (3) inferential statistics analysis, (4) stock classification analysis, (5) Social Vulnerability Index (SoVI) and Social Resilience Index (SRI), (6) Likert type scale analysis, (7) Aid Dependency Index (ADI), (8) stakeholders analysis, (9) comparative analysis, and (10) quantitative contents analysis. The most important analysis is inferential statistics analysis, followed by social vulnerability index, and stakeholders' analysis.

Factors Affecting Changes of Fisheries Livelihood

Fishing communities are exposed on unpredictable disasters. In 2004, the tsunami had directly affected on fisheries livelihood in Krueng Raya Bay. Definitely, it severely impacted on both tangible and intangible assets of fishing communities. The impact of the tsunami on fisheries livelihood asset could be measured using damage and loss analysis. As a result, USD 2.7 million fisheries livelihood assets was damage and loss. This amount approached 0.4% of total fisheries assets damaged and lost in Aceh Province. Moreover, the pattern of fisheries livelihood was changed by the tsunami struck. It led a number of fishermen increasing from 10.6% of total population in 2003 to 15% in 2011. It also caused a number of fishing boat decreasing sharply, and operational cost and re-investment of asset production increasing significantly. And the most interesting impact of the tsunami was to increase the percentage of fisheries household dependency on fisheries resources from 40% in 2003 to 60% in 2005. The changing of fisheries livelihood pattern might be led by direct and indirect factors. A declining of fish production in both volume and value could be identified as direct factor which shifted the income of fishing communities. An upward of food, fuel, wood, and equipment price; a change of workforce and livelihood; and an increasing immigration were contributed as indirect factor on change of fisheries livelihood. To sum up that the tsunami impact and the recovery process have become the opportunities and challenges on development of fisheries livelihood in sustainable way.

Assessment Factor Contributing on the Anchovy Fisheries Decline

Fish resources, in particular anchovy in Krueng Raya Bay faced a depletion state aftermath the tsunami. Some crucial factors contributing to the declining of anchovy which was identified as *Stolephorus commersonii* due to characteristics identification. According to the results of focus group discussion and fishermen interviewed, fish resources shown a downward trend and anchovy could be categorized into a depletion state aftermath the tsunami. Anchovy growth could be subjected to a negative allometric growth, meaning length growth is faster than weight growth. A downward trend of anchovy production could be revealed by less of catch during west monsoon season of 2012, amounted 7.8 tons or 52% of the total catch with the operation of 7-29 units of lift net boats. The result of surplus model calculation showed that maximum sustainable yield (MSY) of anchovy after the tsunami disaster was less than 20 times of MSY before the tsunami. Simple regression analysis resulted two different models of MSY either before or after the tsunami in 2004 which were shown as $y = 0.8696 -$

$0.00008x$ and $y=0.1138 - 0.00002x$, respectively. Model 1 recommended to reduce the number of lift net boat to 43 units for optimization of yield. On the other hand, Model 2 suggested that only 23 units could be operated for optimal effort each year. Average recent catch in MSY showed 53.9% (less abundant) before the tsunami and 5.5% of Average recent catch in MSY (depletion) after the tsunami. These conditions were led by increasing catch effort, destructive fishing gears, and degradation of coral reef and mangrove. Such a tragedy of resource depletion was accelerated by anthropogenic factors and compounded by the tsunami factor (natural environment). The tsunami's environmental impact on anchovy fishery depletion may be lesser than the combined effects of destructive fishing and anthropogenic factors.

Incorporate Sustainable Livelihood Strategy on Recovery of Fisheries Livelihood

Strategy on recovery of livelihood should be promoted by community participation and their shelf-lesson learnt. Poverty alleviation through increase of income is a main target of sustainable livelihood. Increase of poor population was caused by a drop of income, a depletion of fish resource, assets production damage, and ecosystem degradation. In Krueng Raya Bay, high dependency on fisheries resources, ranging between 0.61 and 0.81, brought poverty condition in fishing communities. It can be seen that 65.9% of total population was lived within coastal area and 69.2% (or 9 villages) of the 13 villages were coastal villages before the tsunami disaster (Statistics Indonesia Agency, 2005). The recovery program of fisheries livelihood successfully reduced a number of poverty population to 56.58% on 2009 from 97.70% in 2005. The strong internal characteristics of fishing community were regarded to cope fisheries livelihood recovery. But, their capacity of recovery process and financial capital were 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 community recommended to integrate alternative livelihood development and social-ecological approach into development of fisheries livelihood. These comprehensive strategies were supported by external institutions and their aids, which amounted to around USD 76.5 million.

Toward Strengthening Social Resilience through Fisheries Livelihood Recovery

Social resilience has role to govern the local community and coastal fisheries resources toward sustainable fisheries development in tsunami affected area. The tsunami was impacted on social capital through destructed social facilities (housing, fishermen meeting hall, etc.), erupted intangible of social capital (such as trust, network, relationship, indigenous institution, rule and norm), and increased shock and stress of fishing communities. The four villages selected, i.e. Ruyung, Meunasah Keudee, Meunasah Kulam, Ruyung, Meunasah Mon showed a highest SoVI, which were in range 0.7850 – 0.8460, because these villages are located nearby sea and flat area. Indigenous institution had a contribution and adaptable to rebound social resilience. The Panglima Laot Lhok (sea commander) had determined and adapted role on recovery of the fishing community, particularly facilitated aid delivery to fishermen, as shown in anchovy fisheries relief case in Krueng Raya Bay. Toke Bangku (financial trader) had stimulated for reinforcement of advance payment and market channel. The other institutions supported upon linking and bridging connectivity among stakeholders. Collaborative

governance can avoid conflict, reduce donor dependency and strengthen social resilience within fishing community. Toward the strengthening social resilience of fishing communities could be gain through: (1) revitalization of rule, norm, trust, network, and relationship using the social value and religious; (2) engagement of indigenous institution and local government unit on recovery process in designing program planning, decision making, monitoring and surveillance; (3) adoption of the sustainable livelihood approach by using fishing communities participation; (4) integration of management adaptive strategies for implementing fisheries livelihood program and activities; (5) collaboration action among the stakeholders and local institution capacity building in coping shock and crisis circumstance aftermath tsunami, (6) arranging exit strategies for fisheries and alternative livelihood development.

Conclusion and Recommendation

It is clear that anthropogenic factors contribute to depletion of fish resources and degradation of coastal ecosystem. The tsunami brings out fish resource and its ecosystems to the worse condition and resulted a huge negative affect on fisheries livelihood. It has caused a decreasing of income, increasing of poverty people, rising of social vulnerability, declining of social resilience within fishing communities. One of strategies that adopt and imply on recovery of fisheries livelihood is sustainable livelihood strategy toward the strengthening social resilience of fishing communities. Toward the strengthening social resilience of fishing communities, it is needed to integrate sustainable livelihood based on community's participation for achieving self-social resilient of fisheries communities and cope fish resources depletion and ecosystem degradation.