Fisheries Rehabilitation in Post-Tsunami Aceh: Status and Needs from Participatory Appraisals

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Abstract

The widespread and long-term nature of the tsunami damage in Aceh province, Indonesia has threatened the continued use of coastal and fisheries resources. This article describes the application of the Rapid Appraisal of Fisheries Management System (RAFMS) methodology and presents key findings from the participatory appraisals in 15 study sites. The focus is on changes in the number and types of fishing boats and fishing effort, consumption and marketing flow patterns and community perspectives on livelihood options. The level of aid (for new boats), mainly from international organizations, has been unevenly distributed with the number of boats in 13 of 15 villages still being well below the pre-tsunami levels. A focus on supplying small vessels may put increased fishing pressure on the near-shore zone. Consumption data and marketing flows suggest that most fishing villages are supplying outside markets and adding considerably to the wider food security of the province. Despite the tsunami, marine fisheries-related livelihoods are still preferred, although there are indications for the potential expansion of livelihoods into the culture of new species. Alternative resource-based livelihoods need to be tested and refined to fit the needs of the current conditions in Aceh to provide viable options for eliminating hunger and reducing poverty.

Introduction

The December 26, 2004 tsunami and associated earthquake in March 2005 had a devastating effect on coastal fishing communities in Nanggroe Aceh Darussalam (NAD), Indonesia (also referred to subsequently as Aceh Province). In Aceh province, over 30 per cent of the population already lived in poverty and the tsunami is expected to increase this number by another 600 000 people. The tsunami, along with destroying housing and community facilities, killed an estimated 15-20 per cent of the fishers (10 000) and damaged or destroyed over 10 000 fishing boats, countless fishing gear and associated support infrastructure (MMAF 2006; CONSRN 2005; Stobutzki and Hall 2006). The current focus of short-term rehabilitation activities in these coastal communities is on replacing these critical fisheries associated assets as well as providing the community with options for other aquatic resource related livelihoods that provide real, tenable alternatives to eliminate hunger and reduce poverty (BRR 2005).

The Indonesian *Strategy and Program for Rehabilitation and Reconstruction of the Fishery Sector in Aceh and Nias: Post Earthquake and Tsunami Wave Disaster* (hereafter referred to in this collection of articles as the Indonesian *Strategy for Fisheries Rehabilitation and Reconstruction*) developed by the Ministry of Marine Affairs and Fisheries (MMAF), explicitly recognises the need for long-term sustainable livelihoods and fisheries management (MMAF 2005). The WorldFish Center, with funding support from the Australian Center for International Agricultural Research (ACIAR), initiated a project focused on fisheries rehabilitation from June 2005 to December 2006. The specific aims were to support the Indonesian *Strategy for Fisheries Rehabilitation and Reconstruction* to: (1) assess the fisheries sector and natural resources; (2) provide key inputs regarding community needs and sustainable livelihood strategies; and (3) strengthen the capacity of local researchers and fisheries officers in resource and livelihoods assessments, management and community engagement.

This paper presents the key results using the Rapid Appraisal of Fisheries Management System (RAFMS) methodology to assess the situation in tsunami-affected coastal fishing communities in Aceh, Indonesia. The participatory nature of the work was aimed at integrating local perspectives and contributing to an increased capacity of local organisations in follow-up rehabilitation activities, following the national decentralization process. This paper focuses on three key appraisal results, including

changes in the fishing fleet and associated potential fishing effort, fish consumption and marketing flow patterns, and community perspectives on livelihood options.

Rapid Appraisal Framework, Approach and Process

The devastating tsunami event created a real and pressing need for the application of an assessment methodology that could be undertaken rapidly on social, economic and resource issues at a relatively low cost. Hence, the RAFMS was selected to collect information and provide key management guidance. RAFMS focuses on the fisheries sector but takes into account the broader socioeconomic and institutional context in which the sector operates (Pido et al. 1996, 1997). In order to do this, the RAFMS largely uses a methodological framework known as institutional analysis and development (IAD) (Kiser and Ostrom 1982; Ostrom and Ostrom 1997; Ostrom 1986, 1990, 1992; Oakerson 1992) subsequently modified for use in fisheries management (ICLARM/IFM 1996; Pido et al. 1996) (Fig. 1). The focus on a participatory approach via community-based assessments was critical because the rehabilitation strategies need to be community driven in order to be effective.

Study Areas

A total of 15 study sites (villages) were visited during the participatory appraisals (Fig. 2). The sites were selected on the following considerations: (1) damage inflicted by the tsunami; (2) importance of capture fisheries; (3) the aid process (e.g., boat gear distribution by government agencies, donors and NGOs); (4) presence of *Panglima laot* and active support of community and local leaders; and (5) security and accessibility. The study sites were distributed across seven districts in Aceh province and broadly clustered into three geographical locations (i.e., west coast, east coast and Aceh Besar) (Table 1). The appraisals were carried out between December 2005 and March 2006 (Rizal et al. 2006 - 15 Project Appraisal Reports).

Team Formation and Composition

Prior to conducting the rapid appraisals, and as part of the project, a 10-day training workshop[1] was conducted to: (1) introduce the RAFMS as a tool to strengthen the capacity of local research partners in the assessment of fisheries and livelihoods, and of local fisheries officers (*Dinas Perikanan*) in fisheries management and community engagement; and (2) design and field test the rapid appraisal guide (i.e., interview format) to be used by the research team for the field data gathering. A tripartite team

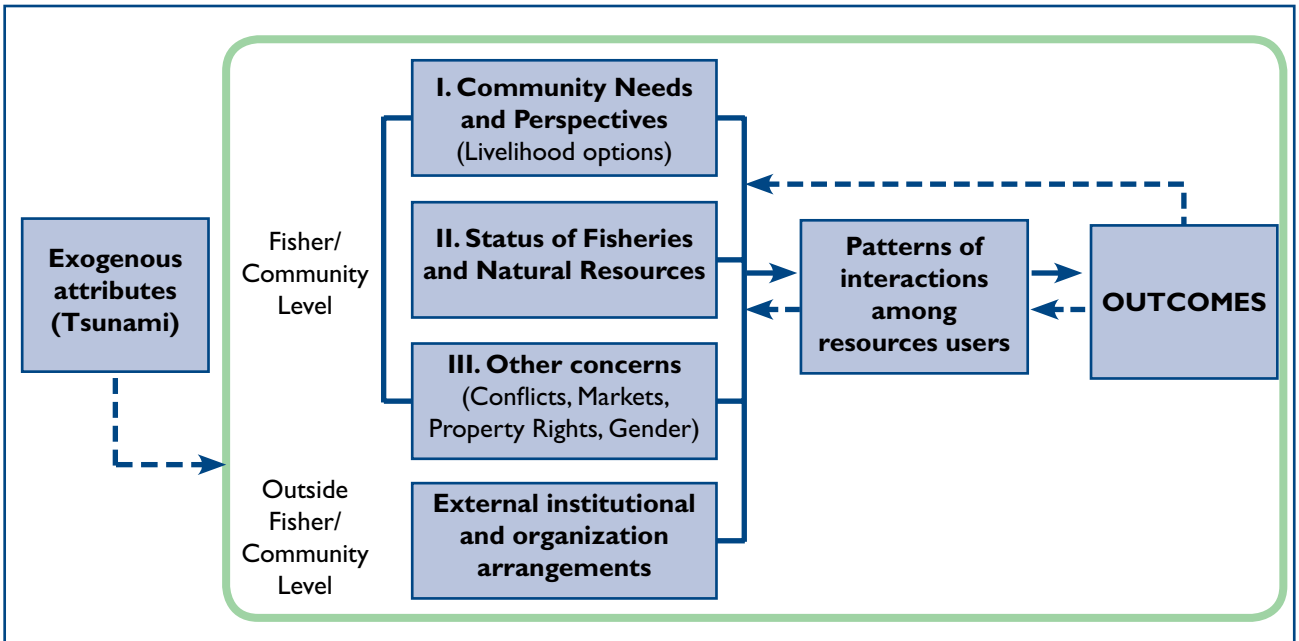

Figure 1. RAFMS modified research framework in the context of assessing tsunami-affected areas in the Aceh Province, Indonesia.

Source: Modified from Oakerson 1992 and Pido et al. 1996).

[1] Training Workshop on Participatory Appraisal for Community Needs Assessment and Resource Status, 30 November to 8 December 2006, Syiah Kuala University, Banda Aceh, Indonesia.

Figure 2. Location of the 15 study areas/sites in seven districts in Aceh province, Indonesia.

was organized to undertake the appraisals (Fig. 3). As suggested in the RAFMS methodology, the multi-disciplinary team consisted of at least one each of experts in the fields of socioeconomics, institution building and biophysics (Pido et al. 1996, 1997).

Data Collection and Processing

The RAFMS methodology consisted of four sequential but overlapping steps: (1) literature review; (2) reconnaissance survey; (3) field data gathering; and (4) community validation (Fig.4). Detailed descriptions of the steps are presented in Pido et al. (1996) and Garces et al. (in prep). A semi-structured and previously tested interview format was used to obtain the desired data sets and information. The interview format consisted of three parts linked with the RAFMS framework (Fig. 1). The primary data were collected during the field data gathering phase through key informant (KIs) interviews. The key informants included a cross-section of coastal stakeholders: the local (sub-district) *Dinas Perikanan* (fisheries officers) representatives; village chief, elders, *Panglima laot* (fishers organization informal leaders); senior and new fishers, fish traders and distributors, *Toke banku* (local capitalists/creditors); women engaged in fisheries, and local youth. A total of 205 key informants participated in the primary appraisals (Table 1). In all 15 villages, the local leader (village chief and/or the *Panglima laot*) helped identify the KIs. *Panglima laot* is the local fisher's organization that has a long history in Aceh fisheries and is strongly embedded in the coastal communities (Nurhakim et al. 2006; Box 1).

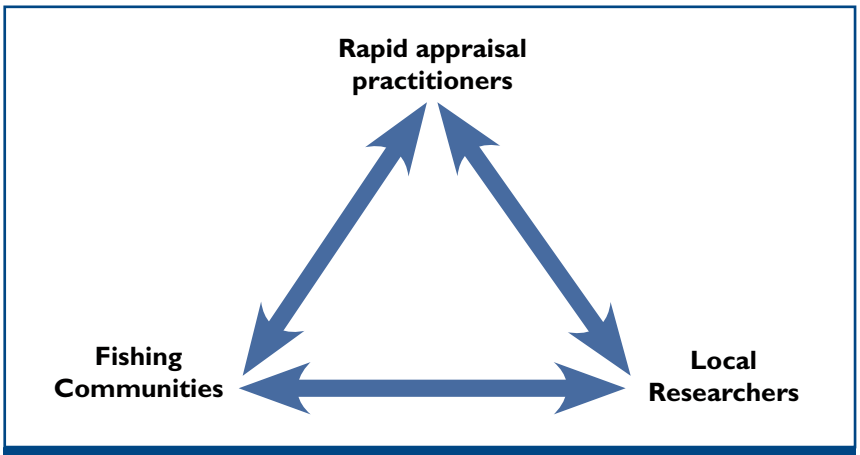

Figure 3. Tripartite partnership arrangements during the conduct of the appraisals using RAFMS in 15 villages in Aceh province, Indonesia.

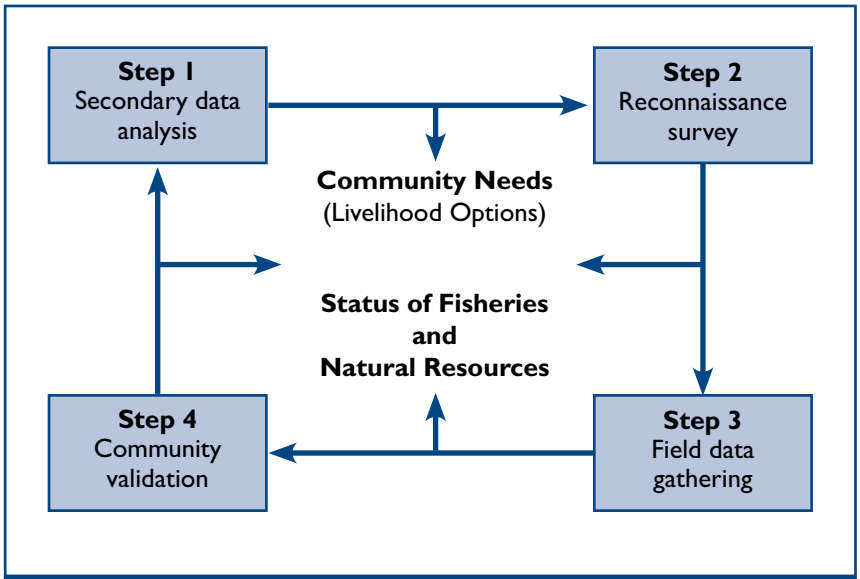

Figure 4. Description of the fisheries management system through the RAFMS process applied in the appraisals of 15 study sites in Aceh province, Indonesia.

Source: Modified from Pido et al. 1996, 1997).

Due to the limited availability of secondary information and the time for data collection, community validation was conducted in all the villages surveyed to ensure that the information collected by the appraisal team was realistic, acceptable and could provide a sound basis for future actions. In all 15 study sites, the village chief and/or authorized representative (mainly the *Panglima laot*) identified the 173 participants (Table 1) and called a community assembly to discuss the finding of the appraisals.

Key Appraisal Results

The appraisal process generated substantial information over a broad range of areas. However, we have highlighted three key results that pertain to: (1) the fishing fleet (number of boats and associated fishing effort), (2) fish consumption and marketing flow patterns, and (3) community perspectives on livelihood options. The knowledge garnered from these three areas contributes most directly to community needs and perspectives in terms of sustainable fisheries livelihoods

Table 1. Study sites for rapid/participatory appraisals in Aceh province.

Geographic location	District	Sub-district	Study area (village)*	Classification*	Distance from Banda Aceh	Affect of tsunami**	Survey date	KIs for survey	KIduring Validation
Aceh Besar	Aceh Besar	Lhoknga	1. Moniken	Urban	17	Heavily damaged	3-Dec-05	10	15
		Selimum	2. Leungah	Rural	47	Moderately damaged	3-Jan-06	9	9
		Mesjid raya	3. Meunasah Keudee	Rural	37	Heavily damaged	6-Dec-06	7	12
West Aceh	Aceh Barat	Samatiga	4. Suak Geudubang	Rural	169	Heavily damaged	21-Dec-05	13	11
		Johan pahlawan	5. Padang Seurahet	Rural	180	Heavily damaged	20-Mar-06	17	10
	Aceh Jaya	Krueng Sabee	6. Calang	Urban	113	Heavily damaged	20-Dec-05	11	10
		Setia Bakti	7. Rigaih	Rural	102	Heavily damaged	20-Dec-05	11	10
		Sampoinit	8. Lhok Kruet/Pulo Raya	Urban	85	Heavily damaged	20-Dec-05	10	7
	Nagan Raya	Kuala	9. Pulo	Rural	202	Heavily damaged	21-Dec-05	11	10
	Aceh Selatan	Tapak tuan	10. Batu Itam	Rural	360	Not damaged	24-Mar-06	25	17
		Labuhan Haji Tengah	11. Pasar Lama	Urban	310	Moderately damaged	2-Jan-05	18	13
East Aceh	Biruen	Jeunib	12. Blang Lancang	Rural	131	Moderately damaged	2-Jan-06	11	10
		Puedada	13. Paya	Rural	152	Not damaged	22-Mar-06	14	12
	Pidie	Batee	14. Geulhumpang Lhee	Rural	72	Moderately damaged	1-Jan-06	17	14
		Kembang Tanjung	15. Pasi Lhok	Rural	88	Heavily damaged	1-Jan-06	21	13

* The number corresponding to the study area (village) are also the same for Table 4 and 5. ** Central Bureau of Statistics (BRR).

Source: 15 appraisal reports of Rizal et al. (2006).

Box 1.

Panglima laot, "Father of the Community", has existed in the coastal areas of Aceh since the 4th century. Panglima laot is customary law that regulates fisheries and marine activities and is presided over by an elected leader from the fishing community. The Panglima laot operates in 16 districts/regencies and 73 villages in coastal areas in Aceh. The tasks of the Panglima laot are to control all customary sea law decisions, coordinate fishing ventures, resolve disputes and conflicts, administer all traditional sea ceremonies, attempt to improve the standard of living in the area, and, at the provincial level, act as a link between the fishing community and outsiders (other communities and government). After the tsunami, the Panglima laot undertook a number of activities, providing coordination, leadership and social support. They coordinated debris clean-up, gave living allowances to families, organized a province-wide prayer meeting, consulted and coordinated government and donor activities, and provided training for fishers in cooperation with a national NGO.

Source: ASEAN-SEAFDEC Regional Technical Consultation on Rights-based Fisheries and Co-management Systems for Small Scale Fisheries, Jakarta, Indonesia, 18-20 July 2005, Southeast Asian Fisheries Development Center, Bangkok in Pomeroy et al. 2006.

Table 2. Pattern of boat aid (% of pre-tsunami levels) by study site and by boat type.

Major group	Boat type	Study Site/Village																											
		(1) Moniken		(2) Leungah		(3) Meunasah Keudee		(4) Suak Geudubang		(5) Padang Seurahet		(6) Calang		(7) Rigaih		(8) Lhok Kruet/ Pulo Raya		(9) Pulo		(10) Batu Itam		(11) Pasar Lama		(12) Blang Lancang		(13) Paya		(14) Geulhumpang Lhee		(15) Pasi Lhok	
		Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid	Boat (%)	Aid
Non motorized	Rowboat			0	-			3	-									0	-	100	-	0	-	59	+	12	-				
Motorized outboard, < 5GT	Motor Tempel	88	+					5	-			35	-	100	-	32	+											0	-		
Motorized inboard, < 5GT	Bak																													0	-
	Fiber Boat			*	+															100	-										
	Labi-labi			0	-			0	-	1300	+			11	-	17	-	0	-					200	+	25	-			0	-
	Pukat Langgar													0	-			36	+					80	-	29	-			17	-
	Robin			0	-					83	-					3	-			100	-	79	-					30	-	130	+
	Thep-thep	125	+	100	+	165	+			100	-	70	-			5	-			100	-			50	-	55	+			0	-
	Boat Pancing																					45	-								
	Boat Pukat																														
Motorized inboard, 5-10GT	Banteng/ Payang									23	-													70	-						
Bagan (liftnet)	Bagan					55	-									2	-					22	-			0	-				

- No aid; + Aid; * Not present before tsunami.
Refer to Table 1 for the actual/corresponding name of study area (village) as indicated by the number.
Source: 15 appraisal reports from Rizal et al. (2006).

strategies and an assessment of the status of the fisheries (in terms of fleets/boats).

Fishing fleet

More than 1200 boats of varying sizes were either lost or damaged in the 15 surveyed villages. The replacement of boats and gear has been gradual, largely through aid from international and non-governmental organizations (NGOs), with a small number from national and local governments. However, the distribution of this aid has varied greatly, with a few villages receiving the bulk of the aid while some villages have received none at all (Table 2). Thirteen villages still have a shortfall in boat numbers compared to pre-tsunami levels, ranging from 46 per cent to 100 per cent, an average deficit of 72 per cent of the fleet. The boats distributed through the aid process have been mainly smaller types of boats (mostly <12 m and <5 GT) with respect to the original fleet configuration. This may have consequences on the overall diversity of future fishing activities (e.g., gears used, species caught). As the tsunami has taken the lives of many senior fishers, there are now a number of new entrants to the fisheries. The ownership pattern has also changed. In the past, the boats and engines were largely owned by local creditors or *Toke banku*. Fishers now own their boats, which they have obtained largely as donations through aid. In areas where *Toke banku* are still operating, they now provide loans to cover the operational costs of fishing (e.g., fuel) rather than the capital to finance boats, engines and gear.

Fish consumption and marketing flows

The pattern of fish consumption and marketing flows, including profit sharing arrangements, vary among the 15 villages (Table 3). Three consumption typologies were noted


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from the appraisals by defining the per cent of fish landed that is locally consumed: Type I = <25 per cent; Type II = 25-50 per cent; and Type III = >50 per cent. The majority (73 per cent) of the villages export fish (Types I and II), with a major proportion of the total catch being transported (mainly via road transportation) to the urban centers of Banda Aceh or Medan. Only four villages consume the bulk (80 per cent or more) of the landed fish catch locally (Type III). Two basic types of sharing arrangements were observed. In both cases, the operating costs were first deducted and given back to the financier (e.g., *Toke banku*) before dividing the profit. The first type is where the owner and fishing crew divide the catch equally. In the second type, one-third goes to the boat owner and two-thirds of the catch goes to the fishing crew, including the boat captain. In some villages, the benefit pattern has changed significantly due to the change in ownership of the primary fishing assets (i.e., boats and gear) noted earlier. In most villages, the local credit system (*Toke bangku*) still plays a significant role in the selling and buying of fisheries products. In addition, women play an important role in the processing (mainly drying) of the fish prior to marketing. This is most evident in study sites where lift nets (using *bagan* boats) are employed to target small pelagic species such as anchovies (e.g., Meunasah Keudee in Aceh Besar).

Livelihood options

Livelihood activities are broadly classified into three types: fisheries resource based; non-fisheries resource based; and non-resource based, with some individuals engaged in several livelihood activities (Table 4). Some livelihoods were lost after the tsunami such as pond aquaculture,

Table 3. Fish consumption, marketing pattern and sharing of the total fish catch/landed at 15 coastal villages in Aceh Province, Indonesia.

Study site/village	% fish catch for local consumption (local vs. outside market)	Typology*	% share of fishers (fish catch/profit)
1. Moniken	40	II	67
2. Leungah	35	II	50
3. Meunasah Keudee	5	I	67
4. Suak Geudubang	5	I	67
5. Padang Seurahet	10	I	50
6. Calang	90	III	50
7. Rigaih	90	III	50
8. Lhok Kruet/Pulo Raya	30	II	50
9. Pulo	5	I	67
10. Batu Itam	5	I	50
11. Pasar Lama	8	I	50
12. Blang Lancang	80	III	50
13. Paya	80	III	50
14. Geulhumpang Lhee	7	I	50
15. Pasi Lhok	8	I	50

* Typology for % of fish catch for local consumption: I = < 25%; II = 25-50%; III = >50%.
Source: 15 appraisal reports of Rizal et al. (2006).

octopus collection, salt panning, and seaweed cultivation. Important livelihood options for the future include various forms of aquaculture or mariculture of new species, such as seabass, shellfish (e.g., shrimp) and seaweed. However, many respondents expressed a preference for future employment in boat building and repair, engine maintenance, and net making and repair. This may be in anticipation of the number of boats and/or gears that have been pledged by donor agencies. Hence, capture fisheries and related livelihoods will continue to be an important economic activity in the coastal communities. For non-fisheries resource based activities, agriculture is still expected to take a prominent role. This includes harvesting of crops (including coconuts) and raising of livestock, particularly poultry. Stone quarrying is no longer preferred as it may have contributed to coastal erosion that aggravated the impact of the tsunami. Of the non-resource based livelihood activities, carpentry is preferred and is closely associated with boat building as well as housing construction. The non-resource based activities also include the service (i.e., hotels, restaurants) and the building and construction sectors, with the former stimulated by the requirements of the 'aid community' and the latter based on the need to restore and rehabilitate the damaged physical infrastructure in both the transportation (i.e., roads, bridges) and fisheries (i.e., landing sites, ports, processing areas) sectors.


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Table 4. Relative importance of past, existing and preferred livelihood activities at 15 coastal villages in the NAD province, Indonesia.

Livelihood Activity	Past	Existing	Future
I. Resource Based (Fisheries)			
• Boat building/repair	10	8	13
• Fish processing	6	5	8
• Fishing/Fish trading	15	11	14
• Net making/repair	13	12	15
• Post larvae collection	10	1	7
• Shrimp nursery	9	2	7
II. Resource Based (Non-fisheries)			
• Agriculture (crop)	13	9	13
• Carpentry	8	10	12
• Cooking and selling food	15	13	14
• Handy craft	8	3	5
• Harvesting and selling coconut	8	5	6
• Poultry / livestock raising	14	12	13
III. Non-Resource Based			
• Builders / construction workers	11	11	13
• Coffee shop	7	7	7
• Dress making	8	5	7
• Employment (government)	15	15	15
• Mechanic	11	10	12
• Trading	15	11	14
• Transport	8	5	7

Note: Only the top six are presented in each of the sub-categories; numbers in each livelihood activity are actual responses per study site whereby the maximum is 15 (i.e., the livelihood activity was noted in all 15 study sites).
Source: 15 appraisal reports of Rizal et al (2006).

Management Implications and Recommendations

First, attention should be given to the appropriate replacement of the type of boats based on need and in accordance with resource sustainability. The fishing effort is seen to be on the increase with both national government and the international NGOs and aid agencies providing boats (including engines and gear). At the time of the appraisals (early 2006) the aggregate number of boats in the 15 villages had not even reached 50 per cent of the original fleet. The level of boat replacement in any particular village may be linked


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to the severity of damage and the relative distance from Banda Aceh (major staging area of the aid effort) and the associated damage to roads and bridges. As of September 2005, a total of 1578 boats (92 per cent <12 metres) were delivered to affected villages in Aceh province compared to more than 10 000 boats lost or damaged (CONSRN 2005; MMAF 2006). Such a level of response may have serious negative implications especially given the importance of fisheries as the primary source of food and income for many coastal communities. There are also many direct and indirect links from fish harvests to other livelihoods. Also, the focus on replacing or repairing of smaller vessel types and associated gear that are only capable of limited safe operations close to the coast, may put undue pressure on already overfished areas within the near shore zone. A well designed and managed rehabilitation of primary fisheries activities would provide much needed income while protecting the long-term sustainability of resources. These activities would naturally facilitate opportunities for revitalizing associated livelihoods and provide a buffer while developing alternative livelihoods to marine capture fisheries for some of the population.

Secondly, a better understanding of local fish consumption, fish marketing flows, and supply and demand trends is required. The consumption patterns and marketing channels and flows suggest that most of the fishing villages are supplying fish to outside areas. The bulk of the fisheries production is transported to the urban centers within Aceh province, such as Banda Aceh and Medan. Therefore, these villages are not only self-sufficient in their protein requirements but also supply fish that is crucial for wider food security, employment and the economy of the province and possibly beyond. As a component of marketing, the local credit system (*Toke bangku*) appears to be as important as before. In the past, the marketing options of individual fishers may have been limited by the presence of credit ties to local fish buyers who provided investment and operational loans to fishers as a means of insuring a constant supply for their own marketing activities (Bailey and Marahudin 1987). In some study areas, the *Toke banku* now only provide credit for operational costs where the fishers own the boat or gear they received from the aid agencies. The sharing arrangement for the catch is now also different in some areas due to the change in ownership of the fishing assets (boats and engines). In the past, the boats and engines were largely owned by the local investors (i.e., *Toke bangku*). Now, the boats (largely as donations) are owned by the local fishers themselves. There is a need, therefore, to undertake research on the current dynamics of fish marketing (patterns, sharing of profits, etc.) in relation to the factors of fish catch and production, including demand and supply for fish.

Thirdly, the rehabilitation of livelihoods should be based on community needs and reasonable opportunities. Prior to the tsunami, marine fisheries and land-based


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agriculture were the predominant economic activities. Coastal fisheries resources and habitats were the most negatively impacted. Large areas of mangroves have been severely damaged as a consequence of the tsunami (Kanagaratham et al., this volume). Terrestrial-based resources, such as coconuts and pine trees, were also largely destroyed. However, the preference for fisheries-related livelihoods remains strong. There are indications of expansion of non-marine capture fisheries, such as the culture of new species. The general principles for rehabilitating livelihoods as proposed by Pomeroy et al (2006) must be considered. Moreover, feasibility studies may be needed before facilitating new livelihoods. The community members have identified a variety of livelihood options, including alternatives that are outside the fisheries sector. It seems that they prefer to either intensify their existing livelihoods, or undertake supplementary activities that are fisheries and/or natural resource based. Therefore, appropriate training and/or capacity building measures must be instituted. The livelihood options must be commensurate with the skills of the community members, should not endanger the sustainability of the natural resources over the long-term and should not move people into sectors for which skills and opportunities are lacking. A stakeholder consultation workshop[2] was organized as part of the WorldFish Project on Fisheries Rehabilitation in Tsunami-Affected Indonesia: Community Needs Assessment and Resources Status funded by ACIAR and the FAO project A Rapid Assessment of the Status of the Fisheries in Tsunami affected Areas of Indonesia. A similar workshop was also conducted in Sri Lanka with support from the Government and people of Lao PDR. The issues, problems and recommendations covering the research and management options included resource status, livelihoods, governance and conflict resolution, capacity building and understanding the new dynamics resulting from the tsunami event. The recommendations from this workshop are expected to guide and support rehabilitation activities in Aceh province.

Conclusions

The application of a rapid and inexpensive appraisal methodology (RAFMS) has yielded critical information in support of fisheries rehabilitation in Aceh. This is in light of the widespread and long-term nature of the damage cause by the tsunami that threatens the continued use of fisheries resources by coastal communities. Specifically, the donation of boats through aid has varied greatly, with many villages still having a considerable shortfall in the number of boats compared to pre-tsunami levels. The focus on the donation of small vessels may, in fact, put undue pressure on already overfished near shore areas. Both points illustrate that the rebuilding of the fleet is a complex and sensitive issue requiring a well coordinated effort to be effective and sustainable. Also, data on fish consumption and marketing flows suggest that most fishing villages are supplying outside markets, further adding to the importance of re-establishing fish production for wider food security. Finally, alternative, resource based livelihood activities, including aquaculture, may add significantly to the prospects for improving fisheries related food security and incomes and, hence, a reduction in hunger, poverty and the pressure on marine fisheries resources.

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