

People Empowerment in Livelihood Activities toward Sustainable Coastal Resource Management in Indonesia

Achmad Zamroni, Masahiro Yamao

Abstract—Coastal resource management, community empowerment and socio economic development are the cornerstones for uplifting the lives of coastal area inhabitants. This paper aims to identify the positive impacts of coastal management projects toward fishermen's economic well-being, to analyze the role of fishermen and their families in effecting economic change and to analyze the roles of stakeholders in managing coastal resources. Structured and semi-structured questionnaires were prepared to obtain qualitative data, and interviews were conducted with fishermen. Findings show that community empowerment and conservation of coastal resources through local and central government projects have exerted positive impact on the coastal community. Some activities involved women who are more active particularly in "off-fishing" season. Traditionally, local fishermen together with local stakeholders have set up a zoning system to minimize conflicts between fishermen. In addition, zoning is used to protect certain ecosystems that can provide benefits well into the future.

Keywords—Economic development, Off-fishing, Resource management, Stakeholders' participation, Women's participation

I. INTRODUCTION

FISHERIES resources provide one of the most important source of support for millions of coastal inhabitants in Indonesia. People in coastal area are still heavily dependent on coastal resources. However, productivity-based fisheries development has contributed to various problems of social, economic and environmental nature as well as poverty, over fishing, and mismanagement problems at the local level. This condition also leads to changes in the social structure and economic environment as a result of the community response to development in coastal areas.

To respond to the above condition, the economic empowerment of coastal communities has always been an integral part of coastal management projects implemented by the central government through various local governments.

Achmad Zamroni is from Graduate School of Biosphere Science, Laboratory of Food Production Management, Department of Bioresource Science, Hiroshima University, Hiroshima, Japan. 1-4-4 Kagamiyama, Higashi Hiroshima-City 739-8528. And Researcher at Research Center for Marine and Fisheries Socio Economics, Ministry for Marine Affairs and Fisheries, Jakarta, Indonesia. Jl. K.S. Tubun Petamburan VI Jakarta Indonesia 10260 (e-mail: azamroni-roni@hiroshima-u.ac.jp; roni_socio@yahoo.com).

Masahiro Yamao is Professor, Food and Resource Economic Division, Graduate School of Biosphere Science, Laboratory of Food Production Management, Department of Bioresource Science, Hiroshima University, Hiroshima, Japan. 1-4-4 Kagamiyama, Higashi Hiroshima-City (e-mail: yamao@hiroshima-u.ac.jp).

Coastal projects with a rehabilitation framework for the coastal and marine environment, such as COREMAP, MCRMP, PEMP, CO-FISH and SNRM include government intervention as part of economic improvement of coastal communities and the environment, and have become the focus of sustainable development. Implementation of decentralization concept absolutely requires community involvement that in turn increases the sense of belonging and responsibility for stakeholders in managing the resources [8].

Participation of women in economic activity may provide them a role in the exploitation of coastal resources and business diversification. Failed projects related to coastal resource management can be traced to the lack of attention on the development of local resource-based economy. In fact, economic pressure and damage to coastal resources have encouraged coastal communities to adopt pragmatic steps in coastal utilization and participation in government projects. As a result, most government projects have been implemented in a sustainable manner. This has contributed to a higher degree of socio economic development in recent years. Creating a delicate balance between economic development and coastal resource management becomes a real dilemma when they are applied together. Either they will succeed together, or one will succeed or both will fail.

Community involvement in alternative livelihood development in South Sulawesi, Indonesia provides an overview as to how important economic improvement is in the framework of coastal resource management in the local setting. Therefore, this study will identify the positive impact of projects on the economic status of fishermen; analyze the role of the fishermen's family in augmenting household income, and identify the role of stakeholders in coastal resource management.

II. METHODOLOGY

A. Study area

Takalar District is located on the south side of South Sulawesi Province. It has a land area of 566.51 km² and is located between 5°3' S and 5°38' S and from 119°22' E to 119°39' E. It is bounded by Gowa District on the north, Gowa District and Jeneponto District on the east, Flores Sea to the south and Makassar Strait to the west. It is about 42 km south of Makassar City. Interviews and data collection were conducted in Laikang Village, in Managarabombang Sub-district in Takalar District, 16 km from the central district and 63 km from Makassar City.

Laikang Village is one of the 12 villages of Mangarabombang Sub-District. It has an area of 19.6 km², comprising about 19.57% of Mangarabombang Sub-District (±100.14 km²). The population is approximately 4,139, or 12% of the total population of the sub-district (35,526 people) with a population density of about 211 people/km². Most of the people work in fisheries, and some work in the agricultural sector. Laikang Village has rich natural resources in fisheries, agriculture and tourism sectors which largely contribute to the economic development of the village. However, fisheries infrastructure is still poor, undeveloped telecommunication and public transportation hampered a further the economic development of the village.

B. Respondent

Surveys were conducted in 2009 and 2010 in Takalar District in South Sulawesi Province and focused on fishermen who cultivate seaweed. Interviews were also conducted with other fishermen, women from 6 areas of Laikang village, and some village officials, informal leaders, fisheries officers of Takalar District. The respondents constitute people who exploit the resources of Laikang Bay and are involved in government coastal projects. Laikang is the most successful village in term of developing alternative livelihood using seaweed farming (Fig. 1).

C. Data collection

The data collected by using survey method was meant to document the activity of fishermen's wives, seaweed farmers and stakeholders. Stakeholders consist of people involved with the marine protected area management group and mangrove management group. Structured and semi-structured questionnaires were used to obtain information from fishermen's wives and seaweed farmers. Meanwhile, stakeholders' interview used semi-structured questionnaires in order to freely explore further information from respondents.

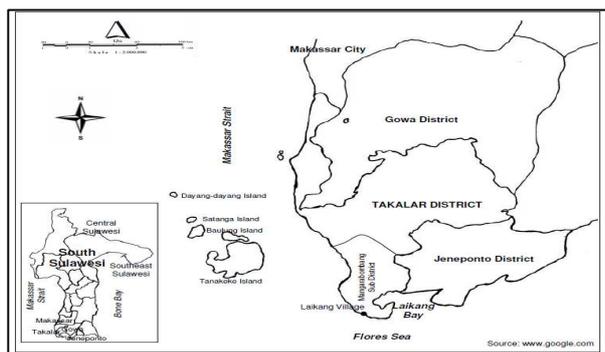


Fig. 1 Map of Laikang Village, Takalar District, South Sulawesi Province

D. Data Analysis

Data analysis was divided into 3 parts: first, descriptive analysis, the second, the benefit-cost (BC) analysis and the third, Likert-scale analysis. Descriptive analysis is used to describe the socio-economic conditions to determine the level of people participation and stakeholders involvement in coastal resources management. BC analysis is used to determine the economic value of some livelihood activities undertaken by the community.

Likert-scale analysis is used to identify the level of stakeholder participation in Laikang Bay coastal management

III. RESULTS AND DISCUSSION

A. Successful experience of livelihood project in improving fishermen's income

Villages in Laikang were selected as study sites because they have various potentials of coastal resources and fishing effort that can be further developed. The village has an 8 km coastline, which has the potential for the development of seaweed farming, fishing and the cultivation of crab and other fisheries. In addition, the implementation of Small-Scale Natural Resource Management (SNRM) projects in the Laikang, Mangarabombang Sub-District and Takalar District is considered successful in improving the household economy of fishermen. Efforts to improve fishing are done by providing soft loans that are packaged in a revolving fund to improve seaweed farming. Seaweed (*Eucheuma cottonii*) is one of the fishery commodities in the province of South Sulawesi deemed particularly important for increasing fish production and improving the economy of coastal communities since the last decade. This condition has changed the role of capture fisheries and other aquaculture business to contribute to household income of fishermen (Fig. 2).

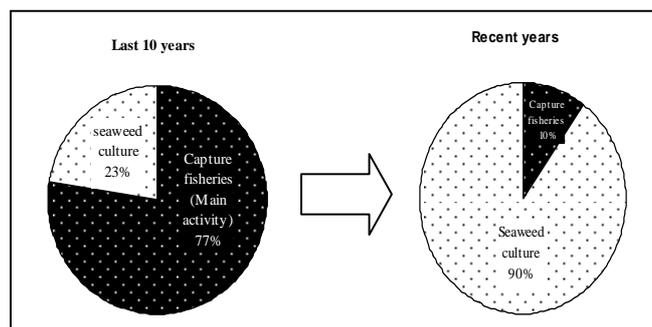


Fig. 2 Change of main income source during the last decade
 Source: Field survey 2011

Since the production of seaweed (*Eucheuma cottonii*) cultivated with long line floating method, fishermen income has increased 50%, especially after or during the implementation of the SNRM project (Fig. 3). Analysis of costs and benefits for the cultivation *Eucheuma cottonii* can be seen in Table I.

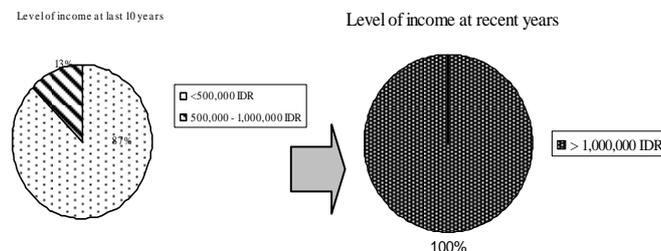


Fig. 3 Changes of fishermen's income in recent years
 1 USD = 9,240 IDR
 Source: Primary data analyzed, 2011

TABLE I
 BENEFIT-COST ANALYSIS OF SEAWEED FARMING BY USING FLOATING METHOD

No	Components	Total Cost (IDR)
A.1	Initial investment	9,796,667
A.2	Labor cost	810,000
B.1	Wet seaweed (revenue)	4,800,000
B.2	Dried seaweed (revenue)	18,000,000
C.1	B1-A2-A1 (income)	-5,806,667
C.2	B2-A2-A3 (income)	7,393,333

Source: Primary data analyzed, 2011

Up to the present, seaweed farming remains the main option of most coastal people Takalar District, and surrounding districts such as Jeneponto District, and Bulukumba District. Changes in the main livelihood of fishermen do not necessarily abandon fishing activities that have been done for many decades. They still catch fish and crabs every day using gillnet, push net, cast net and palisade trap. They conduct fishing around the coast and around seaweed farms.

B. Involvement of woman as a tool in coastal management

Women participate in activities in food processing by using raw material from seaweed materials as well as fish and participate in some parts of seaweed farming activity. The role of women in the cultivation of seaweed includes 1) preparing the rope used to tie the seed as well as in construction, 2) tying seaweed seeds for re-planting, 3) drying the seaweed, and 4) clean up the rope (construction) after harvesting for re-planting preparation. Since the development of seaweed farming, coastal women were more productive in farming activities as well as in income generating activities. Seaweed farming is easily done by women of all age levels (children to adults) (Table 2). Additional income from the women's activities has pushed down the number of fishermen who have to go to urban areas to work outside the fisheries sector during off-fishing season.

TABLE II
 TYPE OF WORK, AGE GROUP AND DIVISION OF THE BURDEN OF WOMEN'S ACTIVITIES IN SEAWEED FARMING ACTIVITIES

Activity	Age	Burden sharing
Prepare the main lines	Adults	40% woman (men cut the big rope and women prepare for "ring line")
Set up the frame line	10 years old - adults	90% women
Tie the seaweed seed	7 years old - adults	100% women
Carrying seed to boat	Adults	Women together with men
Transport seaweed from the boat drying rack	Adults	Women together with men
Drying	10 years old - adults	75% women
Transport dried seaweed from the drying rack to storage	Adults	40% women
Cleaning the ropes	10 years old - adults	75% women
Separation and re-streamlining the rope	7 years old - adults	75% women

Source: Field survey 2011

C. Coastal Zone system based on local knowledge

Activities in the coastal area of Laikang Village are varied, namely seaweed farming, fishpond, capture fisheries, marine transportation, marine tourism, research and conservation. Some activities have generated income to the village as service charges. Most income came from seaweed farmers, crab collectors, fish farmers, and fish traders. Remuneration from seaweeds only applied to the collector because of some considerations. First, it could protect the actual seaweed farmers engaged in production. Second, it was assumed that the seaweed collector get more economic benefits from selling the dried seaweed. The calculation of remuneration is based on the frequency or purchasing volume. In this study, integrated coastal management regulations were included in the village rules with the cooperation and concurrence among existing stakeholders such as groups of fisheries and other marine producers, non-governmental organizations in Laikang village, donors or partners, community groups and small-scale business people. Meanwhile, retributions are imposed upon people who commit violations. Punishments include warnings, expulsion from Laikang Village, fines, revocation of business license, confiscation of fishing gear and litigation.

Mangrove rehabilitation is also included among the regulations of the village because the mangrove ecosystem is important for its ecological functions and environmental protection. The mangrove ecosystem is vulnerable to land conversion. The regulation specified that the mangrove ecosystem could only be used for capture fisheries and aquaculture without cutting the mangrove trees. If there is a conversion of the function of the mangrove ecosystem to other purposes, then it should be under the control of the village leader and mangrove management group (MMG) in Laikang Village.

Mangrove rehabilitation is determined on levels of vulnerability of the area that is determined by the MMG and replanted together with the help of the coastal community. Planting of mangroves with community involvement is emphasized, because the community also has the responsibility to maintain ecosystem. Destructive practices have included logging, destructive fishing practices, harvesting of mangroves and other trees for commercial purposes.

Zoning of the coastal area has been created through the SNRM project.

Zoning in Laikang Village coastal area consists of: 1] erosion area conservation, 2] mangrove forest conservation, 3] sea grass conservation, 4] coral reef conservation, 5] fish cage, 6] tourism, 7] seaweed, 8] fish pond and 9] boat track. Zoning the coastal land could serve 1) to protect the coastal environment from human activities that may damage the ecosystem, 2) to prevent conflicts of interest from various parties that utilize the coastal area, 3) to educate coastal communities about the coastal areas that open or restricted for human activity (Fig. 4). Economic pressure can be lead to coastal communities to unregulated exploitation to gain greater economic advantage, even if it would destroy the environment.

Institutional strengthening is more emphasized towards capacity building of the human resource in coastal environment and community development.

This is particularly necessary because there is limitation of general knowledge among coastal communities about environmental management and organizational management among them is still weak, while their capabilities are indispensable in managing the natural resources. Institutional strengthening under the SNRM in Laikang Village is to set up management groups such as MMG and fish cage management group (FCMG), financial institutions for lending funds and village regulations group.

D. Stakeholders' involvement in coastal management

The stakeholders consists of 11 different groups who come from governmental sectors, non-government organizations (NGOs), academe, small business groups, fishermen group and research centers. About 90.9% of the stakeholders performed roles and responsibilities to support fishermen to develop alternative livelihoods. Findings showed that 45.5% perceived the current management scheme as prone to horizontal conflict with 54.5% perceiving otherwise. In addition, 63.6% of stakeholders stated that there is no integrated management concept formulated by the two districts for arranging the seaweed farm in Laikang Bay, while 27.3% said neutral because they are not sure if there is any or not (Table 3).

Some stakeholders (36.3%) perceived continuing illegal fishing practice fishermen, but 45.5% stated there are no illegal fishing practices. Therefore, they set up an informal agreement among all seaweed stakeholders including fishermen who are also seaweed farmers and full-time seaweed farmers. This agreement aims to prevent conflicts, to control coastal utilization around the beach, and to optimize the yield from farming and fishing. Perceptions showed that 63.6% of respondents stated that fishermen can communicate well with other stakeholders, 27.3% perceiving otherwise with 9.1% neutral. Therefore, almost all stakeholders (90.1%) want to encourage more productive and effective communication among existing stakeholders.

TABLE III
 PARTICIPATION OF MULTI-STAKEHOLDERS AT LOCAL LEVEL

Statement	The response of respondent (%)		
	Agree	Neutral	Disagree
Management prone to horizontal conflict in the current farming area	45.5	0	54.5
Respondents can communicate with other stakeholders	63.6	9.1	27.3
Some fishermen still doing illegal fishing practice	36.3	18.2	45.5
Stakeholders do their responsibility	90.9	0	9.1
Stakeholders need communication among themselves	90.9	9.1	0
No integrated management concept in the two districts	63.6	27.3	9.1

Source: Primary data analyzed, 2011

E. Discussions

Poverty is a common and persistent problem that occurs in many coastal areas of tropical regions. Scientists have long identified that the main cause of poverty in the coastal area to be unequal economic benefit derived from marine resources when fishery resources were meant to be open access and common property ownership.

Fauzi [9] argued that there are four key strategies that can be used in Indonesia to reduce poverty in coastal areas. First is re-assessment of fisheries resources for economic valuation purposes. Second, rationalize an economy based on market mechanisms by strengthening local institutions. Third, design the appropriate strategy in the fisheries economic cycle based on the characteristics of fisheries resources. Fourth, apply the subsidy strategy.

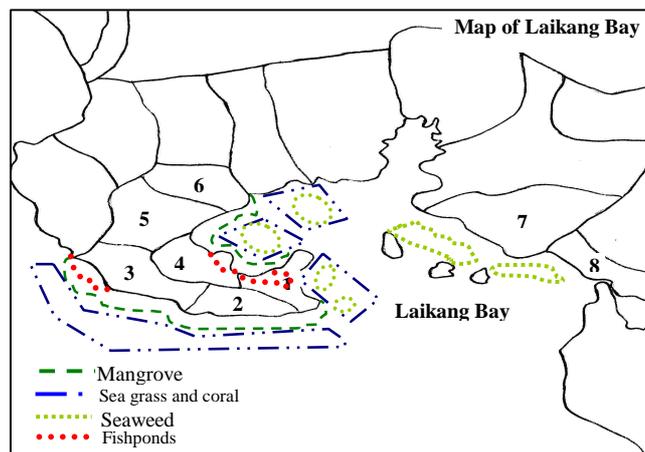


Fig. 4 Coastal zones of Laikang Bay

Remarks: 1: Puntondo Sub-Village (*dusun*) 2: Bodia Sub-Village 3: Laikang Sub-Village 4: Turikale Sub-Village 5: Pandala Sub-Village 6: Ongkoa Sub-Village 7: Garassikang Sub-Village 8: Pantai Bahari Sub-Village

For small-scale fishermen, investment in fisheries carries an expensive cost. In fact, they still rely on the providers of financial capital such as fish traders and brokers/middlemen. The relationship between fishermen and the capitalists occur due to two considerations: for marketing and capital access purposes. These conditions have led to heavy dependency on the financial capital provider. The limited financial capability of the fishermen has made it difficult for government to improve the lives of fishermen. Economic activities of coastal communities rely on the existing natural resource. Their awareness of the economic value of fishery resources has caused many threats to the sustainability of the resource availability over the last decade. Community empowerment programs to improve the economy of coastal communities have been conducted both by Non-Government Organizations (NGOs) as well as central and local governments in the region with programs such as Community Recovery Program-UNDP (1999-2003), Sea Partnership (2003-2006), and Small-Scale Natural Resource Management Project-SNRM (2006-2007).

The rising global price of dried seaweed also helps provide a positive motivation for seaweed farmers. Cultivated seaweed has the following advantages relatively low production costs, short planting time, i.e. 40-45 days under normal conditions, good market opportunity are still available. Sievanen et al., [13] and Pollnac et al., [12] state that increasing the size of farms for seaweed usually gives a positive impact on the quality of fishermen life. The additional income is also sometimes used to repair fishing house or buy fishing equipment.

Fishermen tried to diversify their household income by engaging in an alternative fishery activity. Allison and Ellis [1] stated that diversification is used to reduce losses due to failure of livelihoods or alleviating lack of income by doing more than one livelihood activities. At present, fishermen engaged in two fisheries activities do so without much conflict in schedule.

Fishermen catch fishes with fishing equipment and at the time when they do not do so they do perform activities related to seaweed farming such as harvesting, cultivation and maintenance. The fishes caught are then sold to collectors, to neighbors or held household consumption depending on the situation at that time. Proceeds are used for daily food, buy cigarettes and other foodstuffs.

Coastal resource management requires participation of all stakeholders at all levels whether individual, group or institution. Functional relationship between them would contribute to sustainable development.

In this study the role of women in fisheries activities have positive contribution to household and economic improvement and fisheries resources management. In fisheries, Bennett [5] also states that women play various roles, particularly in pre and post-harvest, processing and marketing. This means, women have double roles in daily life: first, the role in taking care of the family (domestic role) and the role in productive or income-generating activity. Coastal management in Laikang Village includes various aspects of social, economic, environmental and institutional strengthening. These four aspects have been implemented in an integrated manner. Nevertheless, coastal management in Laikang Village is more focused on the socio-economic aspects and institutional strengthening.

Economic improvement of coastal communities in Laikang Village remains a central issue in coastal management. It is not free from the economic pressures faced by coastal communities since the national economic crisis in Indonesia. Close collaboration between social and natural scientists and practitioners will contribute to the advancement of integrated coastal management [6].

Table 2 shows that women in different age groups have an important support role in seaweed farming activity. Although men are also involved in seaweed farming (seedling to sales), women have more workload compared to men. Some young women also occasionally participate in tying the seeds (seedling). Women also do the work of men such as bringing the seaweed seedlings from the seedling storage to the boat then brought to the farm; carry the seaweed from the boat to the drying rack. Aldon [2] found that the smooth relationships of women with the outside community make them a stronger social and economic network than their husbands.

As an ecological system, the coastal zone is very difficult to monitor because of the interactions of many kinds of inputs such as land, rivers and streams [6]. People in coastal areas are highly vulnerable to the changing of natural resources exploitation patterns and environmental changes. Limited ability of the people in managing natural resources and the dynamics of environmental changes is still the main obstacle for them. Most significant form of degradation of habitat is the destruction of mangrove forests and coral reefs.

Mangrove forest damage was caused by the conversion of mangrove areas into fishponds and large waves due to extreme weather. Meanwhile, damage of coral reefs can be due to destructive fishing practices such as dynamites and poisons used to catch the fishes. These problems occur because of economic and political pressure that led to policies that are more concerned with production and less with sustainable resource management [4].

Some fishermen are interested to help protect resources that they have depended on for their livelihoods [2].

Small-scale Natural Resource Management (SNRM) Project (2006-2007) is one of the projects implemented in the Takalar District (Laikang Village). This project came from the central government whose main purpose was to restore the coastal environment that provides economic capacity building program in fisheries. Coastal management under the SNRM is limited to the aspects of coastal environmental improvements which evaluate the rules (non-formal) at the local level as a reference in managing coastal areas at the village level (village regulations). This regulation was made to minimize conflicts of interest in the exploitation of coastal areas or bay area (Laikang Bay) by setting the rules in the use of the bay area with control on users, fishery activities, retribution and punishment. All users are obliged to obey the regulations both as a group or an individual.

The increased attention and awareness are partly a product of the emphasis made on participatory and democratic governance and civil society participation within international institutions since the early 1980's [15]. There are many failed experiences of livelihood projects in coastal areas of Indonesia. The failures were caused by lack of internal coordination, cooperation and communication between participants, local and central government, local government and the peoples, etc. Cooperation with all stakeholders is needed. This condition was also emphasized by Mangi [10] that complex marine ecosystems should have a simple system of sharing for all stakeholders, as well as representatives of many interested bodies of stakeholders [11]. Cooperation from local stakeholders should provide greater role and real actions towards developing coastal areas. Central government will play a role as a partner of local governments in developing any livelihood activities. Local government is expected to gradually reduce its dependence on the central government particularly in funding sources.

Participation should be understood as a process which not only includes the opportunity given to different sectors (resource users, stakeholders) to have something to say (share information), but also the opportunity to be listened to and considered in the decision making process (empowerment) in order to achieve a consensus that leads to effective resource management [3]. It is true that communication and collaboration between communities are important factors to drive integrated management [14].

IV. CONCLUSIONS

In case of Village Laikang, revolving fund stimulus given to fishermen through government projects was effective in increasing economic capacity of fishermen.

The funds are primarily to support the development of fishermen activities and livelihood diversification. Seaweed farming (*Eucheuma cottonii*) as a product measure of diversification efforts has improved the economic situation of fishermen in recent years. The success of fishermen in livelihood diversification has not only given a positive impact on the fishermen themselves, but also provided benefits to his wife and other family members. The fishermen's wives involved in production activity, tend to be more active than their husbands in dealing with the cultivation of seaweed. People in coastal area of Laikang Bay together with other stakeholders set up informal coastal zones in the bay area. Although still tentative and formal legal status is still weak, stakeholders in the village level set up the zoning policy of temporary nature.

Therefore, the local government under the local autonomy framework should provide legal assistance to encourage the implementation of zoning regulations in the Laikang Bay for all parties to obey. In addition, local governments should support a favorable business environment for fishermen, so that fishermen retain an active role in the seaweed business in the Takalar District particularly and ensure that the fishermen will always gain the benefit from their business.

ACKNOWLEDGMENT

The authors would like to express the deepest thanks and appreciation Dr. Lawrence Liao, associate professor of the Graduate School of Biosphere Science, Hiroshima University for his academic suggestions.

REFERENCES

- [1] Allison E.H. and F. Ellis, "The livelihoods approach and management of small-scale fisheries," *Marine Policy* Vol. 25, No. 5, 2001, pp. 377-388.
- [2] Aldon, Ma. E.T., A.C. Fermin and R.F. Agbayani, "Socio-cultural context of fishers' participation in coastal resources management in Anini-y, Antique in west central Philippines," *Fisheries research* Vol. 107, No. 1-3, 2011, pp. 112-121.
- [3] Alpizar M.A.Q. "Participation and fisheries management in Costa Rica: from theory to practice," *Marine Policy* Vol. 30, 2006, pp. 641-650.
- [4] Bailey, C., "The Political Economy of Marine Fisheries Development in Indonesia," *Indonesia* Vol. 46, pp. 25-38. 1988. Available at: <http://cip.cornell.edu/seap.indo/1107010938> accessed on July 5th, 2011.
- [5] Bennett, E., "Gender, fisheries and development," *Marine policy* Vol. 29, No. 5, 2005, pp. 451-459.
- [6] Cheong, S., "Controlling the coast," *Ocean and Coastal Management* Vol. 51, No. 5, 2008, pp. 391-396.
- [7] Cheong, S., "A new direction in coastal management," *Marine policy* Vol. 32, No. 6, 2008, pp. 1090-1093.
- [8] Dept. of Agri. and Dept. of Inter. and Loc. Gov., "Philippine Coastal Management Handbook No: 4 Involving Communities in Coastal Management," Coastal Resource Management Project of the Dept. of Environment and Natural Resources, Cebu City, Philippines, 2001, p. 84.
- [9] Fauzi, A., "Kebijakan Perikanan dan Kelautan: issue, sintesis, dan gagasan." PT. Gramedia Pustaka Utama. Jakarta. 2005, p.185.
- [10] Mangi, S.C. and M.C. Austen, "Perception of stakeholders towards objectives and zoning of marine-protected areas in southern Europe," *Journal for Nature Conservation* Vol. 16, No. 4, 2008, pp. 271-280.
- [11] Pita, C., G.J. Pierce and I. Theodossiou, "Stakeholders' participation in the fisheries management decision-making process: Fishers' perceptions of participation," *Marine policy* Vol. 34, No. 5, 2010, pp. 1093-1102.
- [12] Pollnac RB, Crawford BR, Sukmara A., "Community-based coastal resources management: an interim assessment of early implementation Actions in Bentenan and Tumbak, North Sulawesi, Indonesia," (with) Technical report TE-00/04-E. University of Rhode Island Coastal Resources Center, Narragansett, Rhode Island. 2001.
- [13] Sievanen, L., B. Crawford, R. Pollnac and C. Lowe, "Weeding through assumptions of livelihood approaches in ICM: Seaweed farming in the Philippines and Indonesia," *Ocean and Coastal Management* Vol. 48, 2005, pp. 297 – 313.
- [14] Wiber, M., A. Charles, J. Kearney and F. Berkes, "Enhancing community empowerment through participatory fisheries research," *Marine policy* Vol. 33, No. 1, 2009, pp. 172-179.
- [15] Wilson, D.C., "The community development tradition and fisheries co-management," In: "The Fisheries Co-management Experience. Accomplishments, Challenges and Prospects." Eds: Douglas C. Wilson, Jesper Raakjær Nielsen and Poul Degnbol. Kluwer Academic Publishers, Dordrecht. 2003.