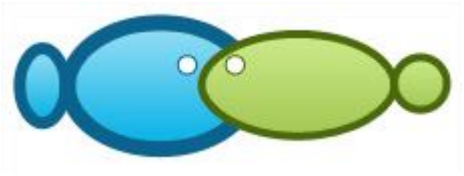

Policy on fishery extension in local marine conservation area Mayalibit Bay in Raja Ampat Regency, West Papua Province

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Abstract. Fishery extension must play a strategic role in making use of conservation area environment effectively as a system, which guarantees harmony between natural, humanistic ecosystem and system management. This research had an objective of formulating a policy on fishery extension in the environmental management of the local marine conservation area (KKLD) of Teluk Mayalabit in Raja Ampat Regency, West Papua Province. Data obtained were analyzed by index evaluation and Rap-FISFEXCOME sustainable status using a fishery Multi Dimensional Saling (MDS) method comprising funding sources and availability; educational program design; facilitator recruitment/placement; infrastructure and material development systematically and methodically.
Key Words: policy, fishery extension, Rap-FISHEXCOME, KKLD Mayalibit Bay.

Introduction. Efforts of conserving marine resources in Indonesia have been implemented in line with the country's national development, local community demand at the coastal area, as well as global-oriented conservation development. The local marine conservation area (KKLD) of Mayalibit Bay comprises 6 conservation areas: Area I - Ayau, Area II - Mayalibit Bay, Area III - Selat Dampier, Area IV - Misool, Area V - Kofiau, and Area VI - Kawe. They area integrated into Local Islets Park (TPPKD) of Raja Ampat. The Raja Ampat Local Islets Park is part of the marine protected area (MPA) network, which is considered tools for avoiding threats in water area of Bentang Laut Kepala Burung (BLKB) and provides contribution to the sustainable conservation of biodiversity and fishery (CTI 2009). KKLD Mayalibit Bay is located in Wego Island, a 53,100 hectare area attributed to the community commitment to protecting coastal and marine resource biodiversity as the major living sources for the local inhabitants. Conservation area is a fundamental instrument towards conservation of marine ecosystem human welfare (Green et al 2012; Halpern & Warner, 2002; Parnell et al 2005; Roberts et al 2005; Valdes & Hatcher 2010).

Marine conservation area possesses biological, ecological, economic, as well as social uses, in particular for enhancing fishery development by the emergence of adult and juvenile fish spillover to the fishing area (Alemany et al 2013; Goni et al 2008; McClanahan & Mangi 2000; Murawski et al 2005; Russ et al 2008). However, the KKL implementation has also resulted in social and economic impacts on the local community, such as fishermen who lost their fishing areas, diminishing fishing products, conflict between users, and higher cost dealing with the fishing area (Sanchirico et al 2002; Suuronen et al 2009; Mascia et al 2010; Stevenson & Tissot 2013; Geer et al 2013).

A solution is necessary for addressing the negative social and economic impacts of the KKLD Mayalibit Bay on the coastal communities, in particular fishermen, in order to make the KKLD Mayalibit Bay not only a technical problem-solving in protecting the coastal and marine area resources but also a step towards facilitating welfare to fishing dependent fishermen. Strategy for strengthening the management of KKLD Mayalibit Bay

can be implemented by optimizing fishery extension system to address concerned issues by creating strong and strong human resources with cognitive, psychomotoric, and affective knowledge. Such capacities are necessary for managing natural resources and improving welfare (Law of R.I. No. 5/1990; Law of R.I. No. 31/2004 Jo Law of R.I. No. 45/2009; Law of R.I. No. 27/2007 Jo Law of R.I. No. 31/2014 and Government of R.I. Act No. 60/2007). The Law of R.I. No. 16/2006 requires an extensional function, which helps analyze and solve problems as well as respond to opportunities and challenges faced by principle and business actors, so that they can manage their business and change the community behaviors. Extension is believed to contribute to the improving skills of the fishermen. Education is by which the fishermen acknowledge improvement, skills and attitudes towards environment and social condition of their localities (Amanah 2006; Indraningsih et al 2011; Jarrett 1985; Feder & Slade 1986).

This research had an objective of formulating a policy on fishery extension in the environmental management of the local marine conservation area (KKLD) of Mayalibit Bay in Raja Ampat Regency, West Papua Province.

Material and Method. Research took place in Yensner, Mumes, Warsambim, Lopinthol, Kalitoko, Kabilol, and Waifoy. Researcher selected these areas by a purposive sampling based on their zonal statuses: core, utility, and other zones in KKLD Mayalibit Bay (Figure 1).

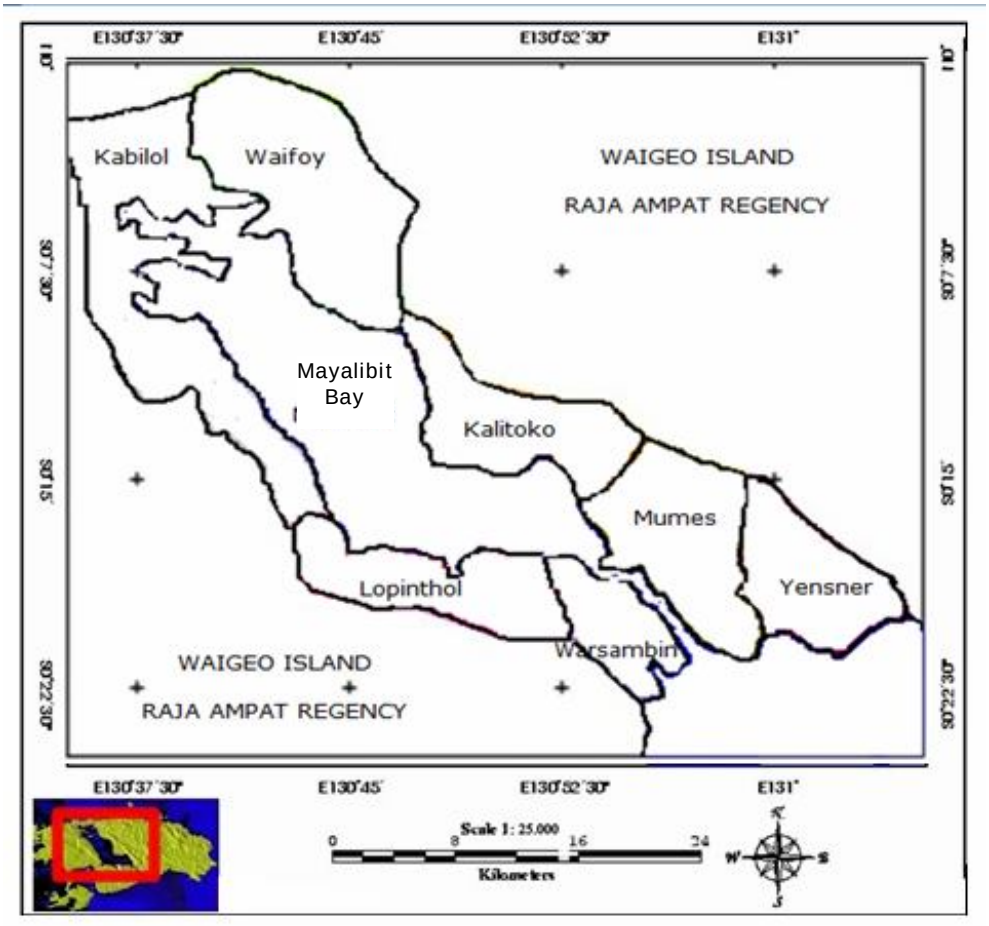

Figure 1. Map of the research location.

Respondents for this research were local fishermen, UPTD of the Local Marine Conservation Area (KKLD) of Mayalibit Bay, and fishery facilitators. This research applied two different sampling techniques. One was simple random sampling for the fishermen (resulting in 269 respondents) and the other was total sampling for both UPTD KKLD Mayalibit Bay and fishery facilitators.

The research used a multi dimensional scaling (MDS) for sustainable data analysis on fishery extension and KKLD Mayalibit Bay management and a Rap-FISHEXCOME data analysis as a Rap-Fish modification (Pitcher 1999; Kavanagh & Pitcher 2004; Pitcher & Preikshot 2001; Fauzi & Anna 2002). Rap-FISHEXCOME made use of seven dimensions: (1) fishery extension institutions, (2) fishery extension staff, (3) fishery extension facility and infrastructure and fund, (4) delivery of fishery extension, (5) social, economic and cultural dimensions of the fishermen, (6) fishermen personal characteristics, and (7) environmental ecology, with a total of 72 attributes.

Data analysis worked with several stages, including as follows: (1) attributes and criteria determination based on the dimension of fishery extension, (2) evaluation of each attribute at ordinal scale based on sustainability of each dimension, and (3) sustainable index value ordination analysis using the MDS. Parameters of each attribute used for sustainable index measured for their effects (either those supporting or hampering ones) by using sensitivity and leverage and Pareto analyses. The research went further with a Monte Carlo analysis in order to evaluate the effects of the current fishery extension activities based on results from hierarchical process analysis (AHP) to examine the policy on extension fishery to contribute to the management of KKLD Mayalibit Bay.

Results and Discussion. Mayalibit Bay is the longest bay in Raja Ampat, which almost divides Waigeo Island into two major parts. It is a 106,808 kilometer square area connected by coordinate points from 130^o 50.8" East to 00^o 25' 12.6" South, spanning through the coastline at high tide northeastward at the coordinates of 131^o 5' 45 East and 00^o 27' 06 South, and then southwestward at the coordinates of 130^o 54' 02" East and 00^o 27' 06" South towards the northwest direction to the starting point.

Coastal ecosystems in Mayalibit Bay are dominated by mangrove forest, which covers the bay from the outer to inner lines. Mangrove forest provides local people in Mayalibit Bay needs with its crabs and shrimps resources. Sargassum algae-dominated seagrasses were also found at the outer line of Mayalibit Bay. KKLD Mayalibit Bay is characterized by narrow bay, which has a high risk of destruction, either by waters or by surrounding impacts. The potential threats include area opening by converting forest cover nearby the bay, causing sedimentation, and fishing activities that tend to damage the environment. In particular season blooming algae have also contributed to death of many fish species (Khazali et al 2001). KKLD Mayalibit Bay has become one of favorite tourist spots, especially those who like diving. The diving points available in the bay are drift dive and muck dive.

The Rap-FISHECOME by MDS method resulted in dimension-based sustainability index values of fishery extension as follows: fishery extension institution 5331; fishery extension staff 55.08; fishery extension facility and infrastructure and funding 43.38; delivery of fishery extension 45.08; social, economic and cultural dimensions of the fishermen 53.57; fishermen personal characteristics 63.84 and environmental ecology 51.04. All of these dimensions were at the range of less sustainable and fairly sustainable (Figure 2).

Rap-FISHEXCOME analysis demonstrated that all attributes of the analysis were quite accurate at stress value of 0.14 with determination coefficient rate (R^2) of 0.94-0.95 and interval between MDS sustainability Monte Carlo was relatively small (Table 1).

Sensitivity (leverage) and Pareto analyses for each dimension of fishery extension were as follows. The leverage and pareto analysis of the fishery extension institution resulted in 4 (of 10) sensitive attributes, which affected the sustainable management of KKLD Mayalibit Bay, i.e., 1) specialized institution for fishery extension, 2) work burdens for fishery facilitators, 3) private/self-initiated institutions, and 4) coordination between stakeholders (Figure 3). Changes in these four attributes affected either increase or decrease of sustainable indices of the fishery extension institution.

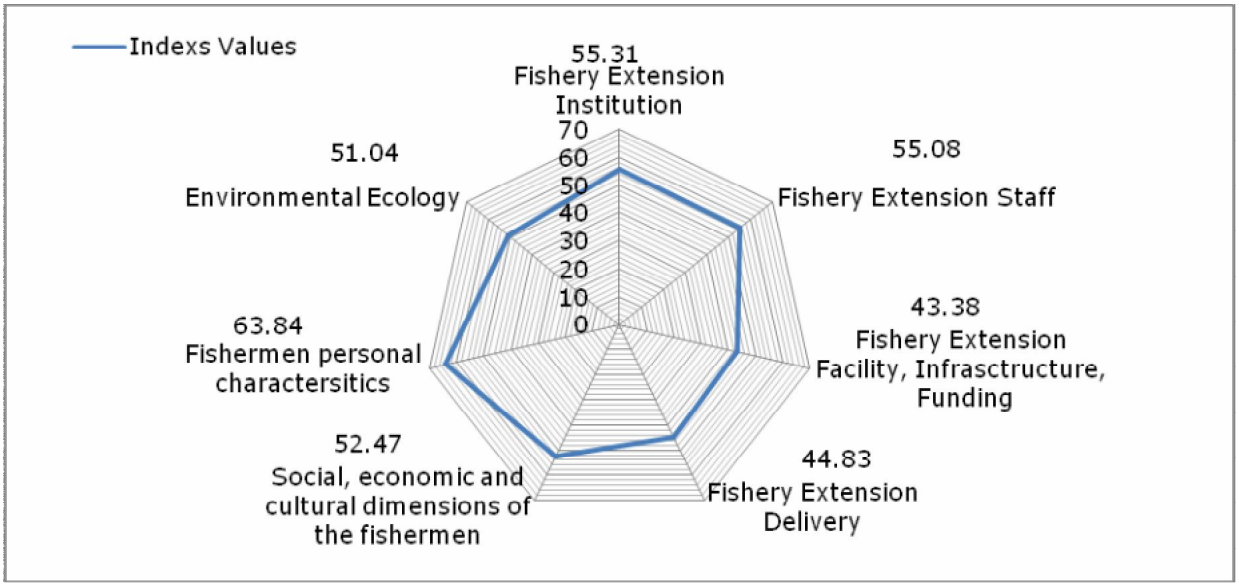

Figure 2. Kite Diagram of Rap-FISEXCOME for fishery extension management sustainability in KKLD Mayalibit Bay.

Table 1

MDS, Monte Carlo, Stress and R^2 rates of fishery extension dimensions in KKLD Mayalibit Bay, Raja Ampat Regency

Dimension	*MDS*	*Monte Carlo*	*Difference*	*Stress*	R^2
Fishery extension institution	53.31	52.96	0.35	0.1476	0,9425
Fishery extension staff	55.08	54.95	0.85	0.1401	0.9544
Fishery extension facility, infrastructure, funding	43.38	43.99	-0.61	0.1470	0.9466
Fishery extension delivery	45.08	44.93	0.15	0.1458	0.9503
Social, economic and cultural dimensions of the fishermen	53.57	53.78	-0.21	0.1455	0.9444
Fishermen personal characteristics	63.84	64.05	-0.21	0.1403	0.9432
Environmental ecology	51.04	50.97	0.07	0.1340	0.9533

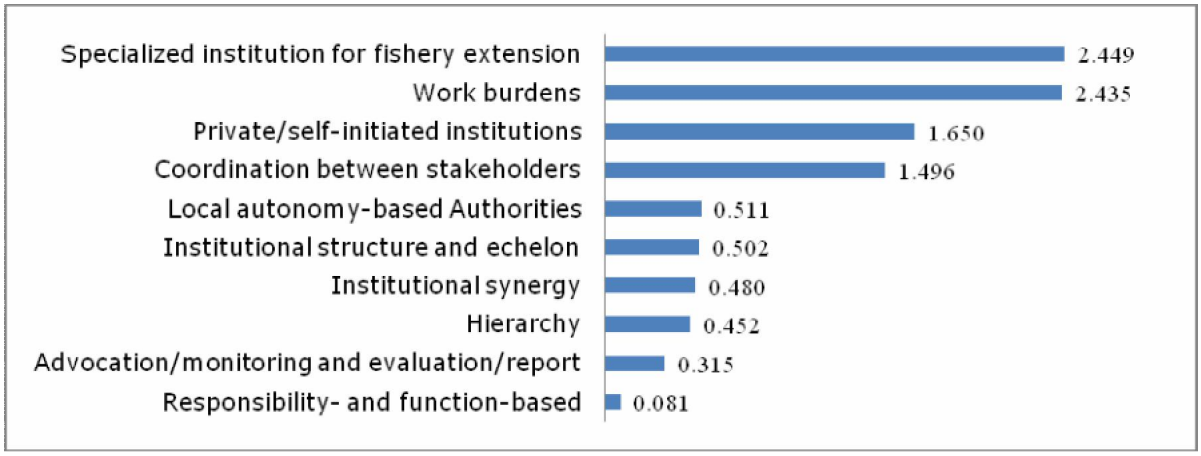

Figure 3. RMS rates for affecting attributes of fishery extension institution in KKLD Mayalibit Bay, Raja Ampat.

The leverage and pareto analysis of sustainable fishery extension staff resulted 4 (of 7) sensitive attributes, which affected sustainable management of KKLD Mayalibit Bay, i.e., 1) recruitment/placement of fishery extension staff, 2) improvement of fishery facilitators

competency, 3) qualifications of fishery facilitators, and 4) working area of fishery facilitators (Figure 4). Changes in these four sensitive attributes affected either increase or decrease of sustainability indices of fishery extension staff.

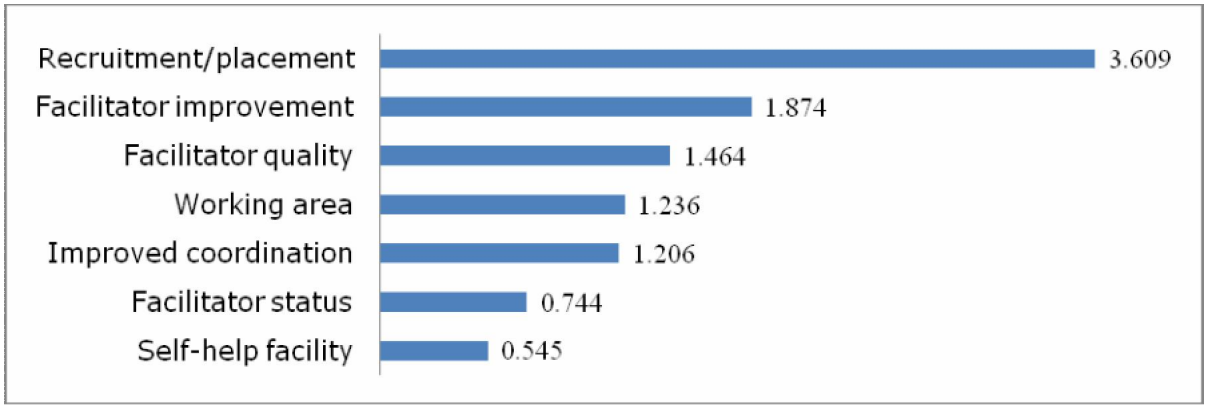

Figure 4. RMS rates for affecting attributes of fishery extension staff in KKLD Mayalibit Bay, Raja Ampat.

The leverage and pareto analysis of sustainable facility and infrastructure and funding of fishery extension resulted in 3 (of 6) sensitive attributes, which affected sustainable management of KKLD Mayalibit Bay, i. e., 1) source and availability of funding; 2) allocation and funding of capital strength; and 3) facility development (Figure 5). Changes in these three sensitive attributes affected either increase or decrease of sustainability indices of fishery extension.

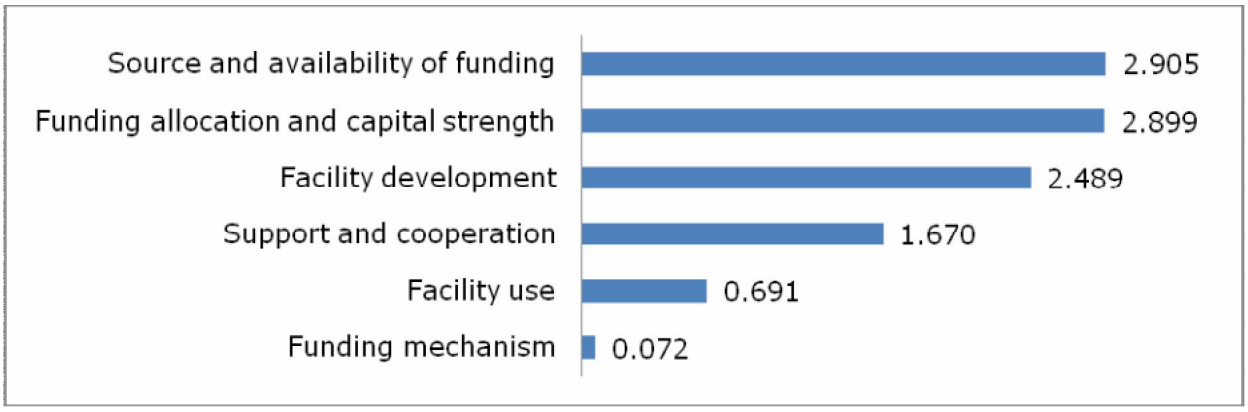

Figure 5. RMS rates for affecting attributes of facility and infrastructure and funding of fishery extension in KKLD Mayalibit Bay, Raja Ampat.

The leverage and pareto analyses of the delivery of fishery extension resulted 8 (of 16) attributes, which affected the sustainability management of KKLD Mayalibit Bay, i.e., 1) fishery extension programme, 2) program status, 3) systematically constructed materials, 4) program integration and synergy, 5) on target method of extension, 6) cooperation and participation, 7) extension materials for fishery management, 7) extension materials for environmental conservation, and 8) method compliance with target condition (Figure 6).

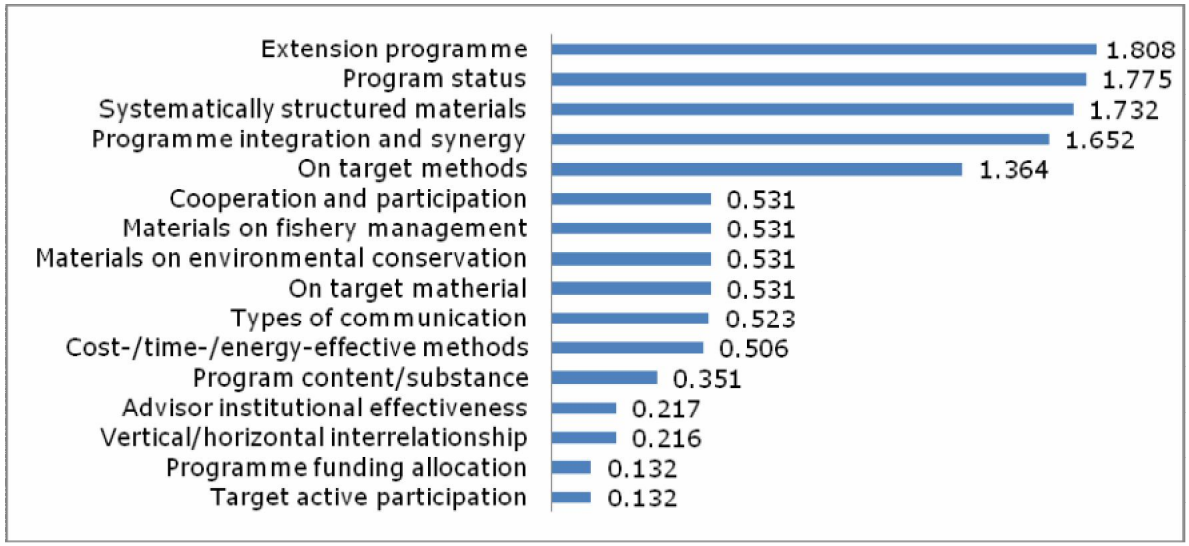

Figure 6. RMS rates for affecting attributes of delivery of fishery extension in KKLD Mayalibit Bay, Raja Ampat.

The leverage and pareto analyses of the social, economic, and cultural dimensions of the fishermen resulted in 6 (of 10) sensitive attributes, which affected the sustainable management of KKLD Mayalibit Bay, i.e., 1) educational level 2.601, 2) access to fossil fuel/market 1.887, 3) access to the media 1.831, 4) diversification of fishery products 1.818; 5) respect to local wisdom 1.247; and 6) fishermen income 1.017 (Figure 7). Changes in these six leverage factors would immediately affect either increase or decrease of sustainable indices of the social, economic, and cultural dimensions of the fishermen.

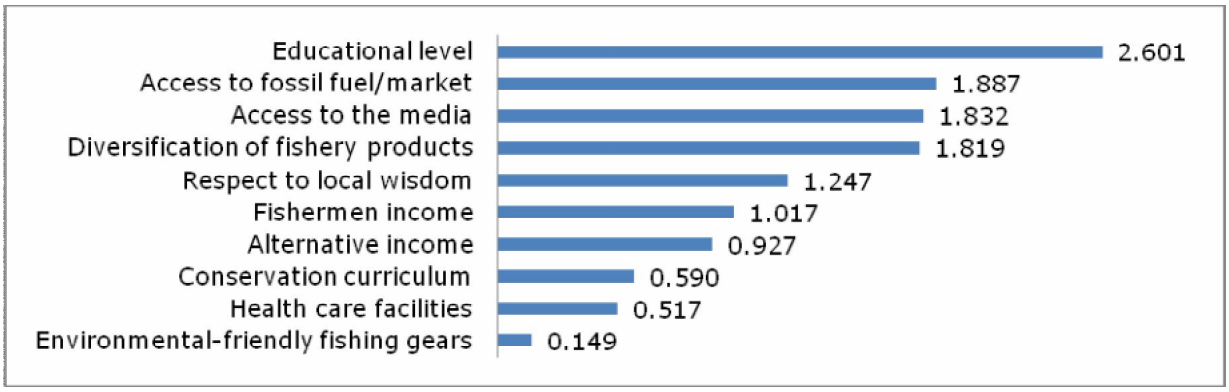

Figure 7. RMS rates for affecting attributes of social, economic, and cultural dimensions of fishermen in KKLD Mayalibit Bay, Raja Ampat.

The leverage and pareto analyses resulted in 8 (of 14) sensitive attributes, which affected the sustainable management of KKLD Mayalibit Bay, i.e., 1) fishermen perceptions of the extension methods in use 2.800; 2) fishermen perceptions of the extension materials 2.522; 3) fishermen participation in activities 2.031; 4) attitudes toward fishery extension 1.885; 5) fishermen expectation toward KKLD; 6) fishermen expectation toward extension activities 0.955; 7) motivation for self-development 0.885; and 8) attitudes toward environmental conservation 0.821 (Figure 8). Changes in these eight attributes would immediately affect either increase or decrease of sustainable indices of the fishermen personal characteristics.

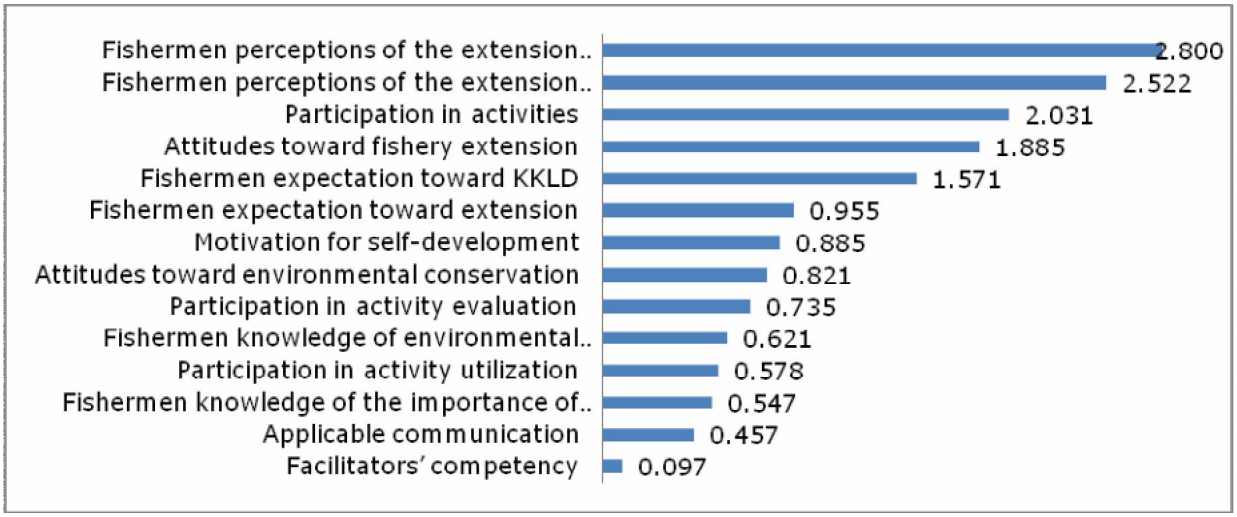

Figure 8. RMS rates for affecting attributes of fishermen personal characteristics in KKLD Mayalibit Bay, Raja Ampat.

The leverage and pareto analyses of the environmental ecology resulted in 3 (of 6) sensitive attributes, which affected the sustainable management of KKLD Mayalibit Bay, i.e., 1) water quality 10.806; 2) coral reef ecosystem closure 10.241; and 3) exploitative fishing 4.362 (Figure 9). Changes in these three attributes affected either increase or decrease of sustainable indices of the environmental ecology.

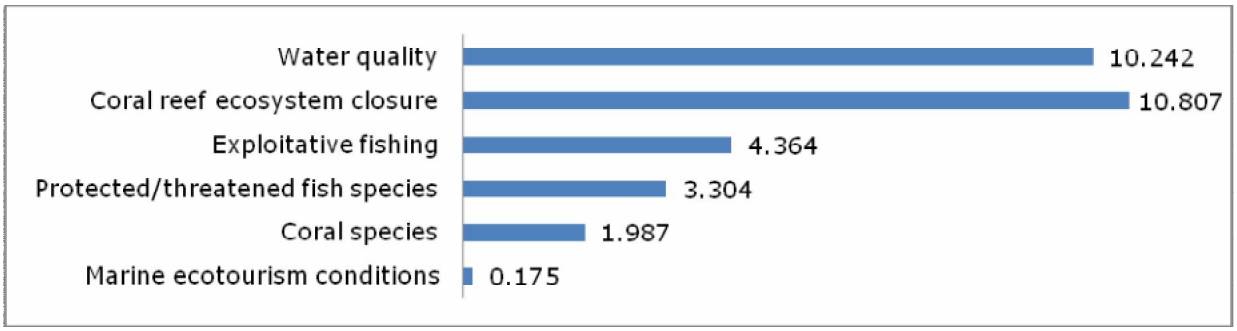

Figure 9. RMS rates for affecting attributes of environmental ecology in KKLD Mayalibit Bay, Raja Ampat.

The sensitive attributes of the five dimensions based on Rap-FISHECOME dealt with problems that hinder an optimal management of KKLD Mayalibit Bay. All attributes were necessary to improve and to maintain their management performances in order to increase sustainability index rates. Such condition needed an intervention policy on the attributes as key factors. The policy formulation consisted of efforts to be made in delivering the fishery extension in KKLD Mayalibit Bay in a sustainable manner to meet the requirements of all principles of conservation activities (social equality, sustainable environmental and economic growth). For testing alternatives of the policy, this research applied an Analytical Hierarchy Process (AHP), a process by which information about policy-making process is made available.

The AHP showed that dimensions of fishery extension that became priorities of the management of KKLD Mayalibit Bay differed in priority rates: delivery of fishery extension 0.235; facility and infrastructure and funding of fishery extension 0.225; fishery extension staff 0.205; fishery extension institution 0.123; social, economic, and cultural dimensions 0.084; individual characteristics of fishermen 0.069; and ecological environment 0.59. Furthermore, the AHP also reported differences in priority scales of policy by attribute: source and availability of funding 0.115; fishery facilitator 0.102; recruitment/placement of facilitators 0.094; development of facility and infrastructure 0.058; systematically structured materials 0.055; and on target method 0.054.

Source and availability of funding was the main priority for the policy on fishery extension and environmental management of KKLD Mayalibit in Raja Ampat Regency. Funding for extension was still primarily sourced from central government through Special Allocation Funding (DAK) and Extension Operational Cost (BOP). Funding from Local Budget was typically still limited to support the delivery of the educational program without additional source from private sectors. This relatively limited funding had become a serious problem that hindered development of fishery extension in Raja Ampat Regency, despite the fishery's significant role in leveraging local development of the regency, which is mostly composed of islets and where most people are making for living by becoming fishermen.

Extensional funding is very important for improving educational capacity, which depends on vary educational activities and cooperations and partnerships as well as for integrating public-private institutions (Sulaiman & Van den Ban 2003). However, funding allocation for extension delivery had not been the main priority because of lacking political commitment to and beliefs in the importance of fishery for local development (Djari 2009; Quizon et al 2001; Anderson & Feder 2004). Funding is such an important aspect that it must be well-planned in an activity program. Annabi et al (2011) explains that funding availability in a particular activity program, including extension, can increase the rate of human capital accumulation and decrease negative impacts of low growth of employment. Public funding has been likely deciders and measured factors for the effectiveness of extension (Fabrino et al 2014), and optimized funding may help improve extension (Jung & Thorbecke 2013).

Fishery facilitator is a written plan composed in a systematical manner for giving direction and guidance of controlling and achieving fishery extension goals. A regular program formulation in working area of KKLD Mayalibit Bay is very important for enhancing a successful fishery extension. In order to be productive, effective, and efficient, the delivery of fishery extension must begin with identification of resources and development programs in the working area, either those implemented by government, private sectors or communities. This is an expected condition, under which comprehensive plans for delivering fishery extension to be effective by integrating all available resources. The delivery of fishery extension at any governmental administrative level must agree with local conditions and needs. Hence, there must be adequate information about conditions, purposes, problems, and their solutions for main actors. Cropper (1998) contends that a good facilitator is developed by considering planning, organizing, staffing, and controlling. Planning in extension becomes the basis for any other functions, by which time can be spent efficiently.

Program development according to necessary phase helps achieve effectiveness of extension delivery (Herianto et al 2010). Educational program development can be done by join planning or participatory planning, in which top-down central government interest (i.e., policy) joins bottom-up facilitator needs (Indraningsih et al 2011). Therefore, cooperation between development actors and facilitators should be interrelated and interdependent (Vitalaya & Aida 1992).

Recruitment/placement of fishery facilitators in the working area of KKLD Mayalibit Bay, which consisted of Mayalibit Bay, Tiplol Mayalibit, and Wigeo Timur districts, were urgently necessary. Numbers of facilitators in working area of Raja Ampat Regency were still inadequate due to lacking recruitment formation of civil servants at Badan Kepegawaian Daerah Kabupaten Raja Ampat. In addition, many of the current facilitators had moved to structural positions, leaving many villages and districts without any facilitator. The education system should have been supported by appropriate human resources, those with good teaching skills.

The number of facilitators according to the Minister of Marine and Fishery of R. I. Decree No. 38/2013 must be at least three civil servants for each district with fishery potentials and they must promote one self-initiated fishery facilitator for each main actors by optimizing the role of fishery facilitators as well as empowering private facilitators. Lacking personnel for facilitators, as Belay & Abebaw (2004) mentions, has become a big obstacle for a particular area to adopt technologies. It is therefore new recruitment for fishery facilitators was deemed necessary. The recruitment process must

give priority to candidates who are willing to dedicate themselves in education. Fishery facilitators need specific skills with minimal academic degree requirements of D3 in fisheries (Poernomo 2004). Similarly, Padmanagara states that to become an facilitator, one can not only be a civil servant; he or she must be dedicated and self-motivated to work with him or herself and other people; he or she must be able of coping with life principles of local farmers (Ekstensia 2005).

Extension activity in our time and in the future encounters with bigger challenges in the shape of democracy and globalization. Soedijanto (2003) writes that duties of facilitators must not "change how to become a farmer", but "change farmer itself". Recruitment and placement of human resource in an appropriate manner will improve performance and competitiveness of organization. Atalay (2015) and Kucharčíková et al (2015) explain that to obtain organizational goals, it is important for one to measure human capital efficient because human capital management is the most valuable strategic and planned approach to an organizing social development and economic welfare. Institutional and human capitals are considered deciding factors of competitiveness and economic growth (Čadila et al 2014; Liepe & Sakalas 2014; Dias & Tebaldi 2012).

Institutional capacity development for fishery extension needs adequate facility and infrastructure in order that this activity to be effective and efficient. Raja Ampat Regency as a proliferated region from Sorong Regency had yet to have adequate facility and infrastructure, thus, affecting performance of facilitators and independence of its local people. Facilities such as communication devices (audio-visual) and other devices for disseminating information were absent. To make worse, the regency also lacked of regular sea transportation facilities, either for transporting passengers or for fishing activities (people only had longboats for their daily activities). Most of local people believed that education was not a significant activity contributed to the poor performance of the facility and infrastructure in Raja Ampat. Such belief had put education outside the prime priority.

According to Anderson & Feder (2004), education effectiveness is crucial when investment in infrastructure is inadequate at the expense of knowledge and educational systems at national scale. Dercon et al (2009), who studied the similar issue to this research in Ethiopia, concluded that good infrastructure, i.e., road quality improvement, helped improve access to extension, which, in turn, contributed to acceleration of economic growth and eradication of poverty in Ethiopia.

Extension materials are, in essence, all sort of messages to be communicated by a facilitator to target participants or messages delivered in a developmental communication (Mardikanto 2009). Implementation of education materials delivery in KKLD Mayalibit Bay was still policy-oriented in a top-down manner. Such policy usually did not allow participative approaches to disseminating information and determining priorities as well as putting away decision-making process from the practical outset, resulting in sub-optimal decisions (Belay & Abebaw 2004; Fleischer et al 2002; Syahyuti et al 1995). In addition, Djari (2009) and Roger (2003) write that education materials to be developed must comply with socio-cultural values and ideas that have been previously introduced and/or with local needs.

KKLD Mayalibit Bay has become one of tourist destinations in Raja Empat Regency. In addition to the need for conservation materials and environmental-friendly, sustainable fishing activities, local people also need to be given education materials concerning coastal area tourism management and business development. Such materials may help them manage the potentials of natural resources to leverage their traditional living as fishermen. These education materials have to be delivered in interactive and communicative manners, allowing local participants to adopt easily and have to be supported by good educational systems in order to achieve an effective material dissemination and technological transfer (Jan et al 2008). Education materials must be constructed as such that they offer choices/alternatives and strategies of problem-solving, facilitate decision-making, technology adaptation and technical problem-solving (Garforth & Lawrence 1997). However, Black (2000) contends that no model or strategy

of approach, either top-down or bottom-up, that tends to be successful if implemented separately.

One of main responsibilities of facilitators is to communicate innovations in order to change community behaviors, which are recipients/targets of the importance, to understand, be willing, and be able to apply any innovation to improve their life quality. However, recipients/targets with different conditions (i.e., individual characteristics, physical and social environments, needs, motivations, and purposes) need different methods to deal with. The problem is whether a particular method is the most appropriate to be applied in particular situations (Mardikanto 2009). The excessive use of trawls, bombs, and toxic substances, and mangrove deforestation still occurred in KKLD Mayalibit Bay so that a change in strategy for improving fishermen's life quality was ultimately necessary. Extension strategy can be implemented by several approaches, such as mass, group, and personal methods.

This research applied a group method approach to disseminating information in KKLD Mayalibit Bay, by means of group discussion and meeting, in particular with those receiving grants from government. Group method, or group approach, is an effective way to guide and direct individual to work in group and do activities more productively in a mutual manner (Kartasaputra 1994). Group method is more beneficial because it allows feedback between target communities and facilitators as well as group interaction, by which experiences of both facilitators and participants are shared (Suhardiyono 1990; Van den Ban 1999).

This research also applied mass approach. Information concerning knowledge about coastal ecosystem (protection and conservation) was disseminated by environmental campaigned broadcast on RRI Sorong, local newspapers, posters, and banners. Mass method was applicable for larger audiences, including tourists and visiting fishermen who also fished in KKLD Mayalibit Bay waters using damaging fishing gears. This kind of approach was proven effective for different fishing times between fishermen.

Difficulties in collecting fishermen at the same time due to different fishing schedules had motivated the facilitators to apply a personal approach. Following Kartasaputra (1994), personal approach is a very effective tool because it directly deals with individuals, in particular those who need for special guidance. A face-to-face situation is an interpersonal communication. Should the participant do not understand the materials, the facilitator can immediately give explanation. The face-to-face communication helps both parties share information and messages.

Personal approach allowed educational activities on location where fishermen were situated when they did not do fishing activities. Facilitators could immediately identify problems on the field. Informal discussion and dialogue were done within an interpersonal communication (Hybels & Weaver 1992). Dialogue is the right technique for extension and personal approach, by means of consultation, asking question, information dissemination, and problem solving. In addition to these three approaches, facilitators also developed and strengthened social capital available in the local communities, such as coastal women, in particular fishermen's wives. Costal women in Raja Ampat played a significant role, either in economic or in social aspects. They got involved in fishing, post-harvest activities, marketing of fishing products (by opening small-scale kiosks), and social organizations (PKK, a family welfare advisory; "dasa wisma", a neighbourhood community consisting of ten households). Women also helped disseminate information about conservation of coastal resources, in addition to taking part into mangrove rehabilitation, from breeding to cultivation (Coremap 2008). The General Secretary of People's Coalition for Fishery Justice (KIARA) reported that women had been relatively productive and playing a significant role in small-scale activities from pre-production to production to processing to marketing (www.gresnews.com 2015).

Women presence as one of potentials for development has been urgently required because at the moment Indonesia is within a very crucial momentum to develop (Handuni, 1994). Coastal women's role and position are important for fishing industries. They contribute to determining socio-economic outsets of the coastal area. They play dominant role on land, as do their counterparts – men – on the sea (Kusnadi 2007; Zhao et al 2012).

Conclusions. The conditions of fishery extension, which consisted of fishery extension institution (53.31) and fishery extension staff (55.08), were considered "fairly sustainable", whereas facility, infrastructure and funding of fishery extension (43.38) were considered "less sustainable". Priorities of policy on fishery extension in KKLD Mayalibit Bay management according to priority scale were as follows: the need for source and availability of fishery extension funding; program development for fishery extension in working area of KKLD Mayalibit Bay; recruitment/placement of fishery facilitators in working area of KKLD Mayalibit Bay; development of facility and systematically structured materials, in particular those dealing with environmental conservation, environmental-friendly fishing gears, diversification of fishing business, fishing product marketing, environmental-friendly fishing culture, and marine tourism. Educational strategy to diminish environmental threats and issues in KKLD Mayalibit Bay needed active involvement of local fishermen, visiting fishermen and tourists towards the increasing income and integrating approach methods (mass, group, and personal). All dimensions of fishery extension are necessary to be strengthened, in particular facility, infrastructure, funding, and delivery of fishery extension, which was still considered less sustainable. In addition, coordination between stakeholders and institutions, either horizontally or vertically, in Raja Ampat Regency and central government, was also in need of improvement.

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