

**ESTABLISHMENT OF A LOCAL FISHERY CO-MANAGEMENT :
LESSONS GAINED FROM BALI ISLAND**

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ABSTRACT.

Deployment of the artificial reefs in Jemluk waters in Bali island paved the way to the local fishers to establish a fishery co-management. The process of establishing this local co-management was discussed in this paper. The performance of the local co-management was evaluated in term of the productivity and distribution criteria. It was found that the implementation of the co-management brought about positive impacts as fishers landed more fish and distribution of landings of individual fishers tended to be more equitable. The establishment and implementation of the co-management also provided opportunity to fishers to work in tourism by bringing tourists for snorkeling and diving in the artificial reef areas. Some lessons gained from this case study are presented. The implication of the study for developing of Indonesian inshore fishery co-management is discussed.

INTRODUCTION

Indonesia is now experiencing a quite radical change in development approach. For more than 30 years, under the so-called the new order regime led by the former President Soeharto, the approach of development was so centralized that local initiatives had no chance to live. To develop provinces, regencies, and villages, the government stipulated Law Number 5/1974 on provincial development and Law Number 5/1979 on village development. Following the laws, all provinces and villages in Indonesia had the same structure of government. The implementation of the laws might have been killed all regional differences and characteristics, including rural-based specific institutions that existed for long time and had responsibility in natural resource management. The examples of those institutions were *sasi* system in Ambon and *panglima laut* system in Aceh (Nikijuluw, 1995; Nikijuluw and Naamin, 1994).

Under current reformed government which started on May 1998, however, the development approach has been changed toward decentralization. To replace Laws Number 5/1974 and 5/1979 the government passed Law Number 22/1999 on regional development. According to this law, village governmental structure may differ depending on local characteristics and existing customary laws. The process of village development changed form top-down to bottom-up approaches by which planning is done at village level and villagers are responsible to implement development programs.

The Law Number 22/1999 also deals with the management and utilization of fishery resources. If before provinces had no authority over the marine environments and all fishing activities using greater than 30 GT fishing boats were based on licenses issued by the central government, now provincial government have full jurisdiction within 12 miles coastal waters and so provide licenses for all fishing boats as long as they operate within 12 miles. The law also states that of the 12 miles provincial waters, 4 miles from coastal onward is belonged to regencies and the remaining 8 miles is owned by provinces. While provincial and regencial government are responsible in managing the utilization of living and non-living resources in their respective waters, central government still have an authority on territorial waters beyond 12 miles and the economic exclusive zone.

The implementation of the Law Number 22/1999 provides a chance for local government to develop their own fishery resource management mechanism. Yet this task is not easy to do since provincial governments, represented by fishery services, have no enough capacity. More than 30 years, fishery services were just a subordination of the central government. Their main task was to implement centrally-planned programs and projects. Therefore they had no experiences, human resources, and facilities capable enough to carry out the new task.

Establishment of a fishery co-management between local government and fisher community may become an alternative of empowering fishery services and to build a sound fishery management. Fishery co-management may be based on local management practices

primarily undertaken by commercial fishers. It may be also developed on customary laws and rights. However, information on the existing local fishery management practices are limited. In the same time, local governments seem not to have initiatives and awareness on efficient and effective fishery management. Therefore, there should be an extra effort if a co-management approach wants to be realized. A bridge to fill the gap between government and fishers should be built so that they can have the same understanding and perspective on co-management .

This report describes people participation in coral reefs management in Jemluk village in Bali island of Indonesia. People participation refers to fishers' direct involvement in coral reef resource management. Artificial reefs deployed by local government latter are managed by fishers. Fishers are taking benefit from the installment of artificial reefs by generating income through fishery and tourism activities. This case study is an example of how a co-management at village level may be developed. The impact of this village level co-management is evaluated in this paper. Before elaborating the background of the fishery in the village, approach of this study is presented. The paper ends with an implication of this case study on the strategy to develop local fishery co-management mechanisms.

STUDY APPROACH

Jemluk is a village situated in the northeast of Bali island. The length of coast line under the Jemluk territory is about 2 km. The waters within 400 meters from the beach are designated for the activities of the villagers. The designated waters are smaller than 4 miles (or about 7,200 meters) regencial jurisdiction waters according to the Law Number 22/1999. The water bottom consists of living coral, sandy coral, muddy coral, and black sand. The black sand is about 180,000 m². Oceanographic condition of the Jemluk ishore waters cannot be separated from that of open waters. Wasilun et al (1994) stated that during the month of August, relatively cooler and higher salinity water from Banda Sea passes by the Jemluk area to the Java Sea. In the month of February, mud from Jemluk river floods the sea waters. This is the reason for the existence of muddy coral and black sand on the bottom of the Jemluk waters. Nevertheless, the waters are still clear because of the circulation process by the tidal waves (Wasilun, et al. 1994).

This study focuses on the village-based co-management of coral fishery resource in the area of Jemluk. By co-management, it refers to a collaborative management arrangement between government and villagers to manage artificial reefs that were installed by government. The process of establishing co-management was scrutinized by interviewing fishers and government officers. The field data collection was performed in May and June 1995 and March 1996. A follow-up survey was done in February 1997 to find out information on the continuity and existence of villager's activities. A structured questionnaire interview was done for statistical analysis on 30 fishers who also engaged in tourism activities.

While it is true that productivity, equity, and sustainability criteria of co-management should be evaluated altogether, in this study, however, only productivity and equity criteria

were examined. Productivity and equity impacts of the co-management were analyzed by estimating the mean, coefficient of variation and Pearson Skewness Coefficient (Walpole, 1982) of fish landing, fish price, operational costs of fishing, and day spent fishing.

FISHERY OF JEMLUK.

Utilization of coral reef ecosystems in Bali island have a long history (Subani, 1982. Subani and Wahyono, 1987). About 30 years ago, the living resources of the reef ecosystem were only utilized by the local people for their daily consumption. In line with the international demand for spiny lobster and aquarium fish, the commercial capture and the collection of these organism increased (Subani, 1981; Nikijuluw, 1988). Moreover, as demand for building material increased, the ecosystem was also utilized to provide housing materials. At present, coral ecosystem in Bali island are regarded as an important asset to attract tourists, especially those from other countries.

Of the many tourist destinations in Bali island, the village of Jemluk is famed for its coastal waters which offers sport fishing, scuba diving, and snorkeling. Jemluk is a part of Abang District, the Regency of Karang Asem. Before becoming renowned as tourism spot, Jemluk was a modest fishing village whose coastal waters consists of coral reef ecosystem.

The total population of Jemluk in 1997 was 619 consisting of 307 male and 312 female. The total number of household was 120. Therefore, on the average, there were five persons in each household. This household size was relatively higher than the national figure of approximately four person per household. The exact figures on age distribution of the population were not available. However, it could be observed that the number of young people in the labor force was relatively higher than other groups.

About 93% of the households are engaged in fishing, 3.4% in agriculture, and the rest in trades and services. Based on the livelihood pattern, Jemluk might be categorized as a fishing village. There are four families who rely on agriculture. On part time basis, they also engage in fishing as boat crew. Other families depend on small-scale trading, home industry, and tourism services.

Fishing activities in the village, however, are confined to the near-shore waters. In other words, fishers just exploit the fisheries resources in the waters traditionally considered as their territory. Going farther for fishing is almost impossible as the boats owned by fishers are without engine or with small engine.

The types of fishing gears employed by Jemluk fishers are troll line (261 units), hand line (261 units), bottom gill net (3 units) and drift gill net (12 units). One household can have more than one gear. Almost all families possessed a troll and hand line. Troll line was operated in the day while hand line was used both in the day and night. Drift gill net is relatively new gear, being used for only three year. The hand line is employed to catch demersal fish, the gill net is directed to catch pelagic fish.

Most of the fishers who use hand line and drift gill net fish for their subsistence needs. Commercial fishing and marketing is not the main orientation for these fishers. On the other hand, fishers who employ troll line and bottom gill net always sell their catch. The types of fish caught are mackerel, little tuna, snapper, and grouper. All these fish are highly valued in the village market. There is no special fish auction market in the village, meaning that fishers are free to sell their marketable catch anywhere. The surplus of landings are brought to the village market which is visited by local consumers and middlemen from other places.

Of about 100 current fishers in Jemluk, 40% are engaged in the tourism sector by providing their fishing boats as excursion boats. The number boat and frequency of trips in tourism has steadily increased. In 1992, there were 324 excursion boat trips, increased about ten times to about 3200 trips in 1997. Not all fishing boats can serve as tourist boats. This is due to the fact that only motorized boat are demanded by tourist.

DEPLOYMENT OF ARTIFICIAL REEFS

The regency of Karangasem once was renowned as an area whose waters were covered by living corals. People used coral for various purposes. Of the total 400 coral mining enterprises in Bali island operating in 1981, 125 were located in Karangasem, 208 concentrated around Denpasar, and the rest scattered in other parts of the island. It was reported that materials for coral mining in Denpasar were supplied from Karangasem regency (Subani, 1982).

Coral were also used as brick and road materials. Subani (1982) reported that although there was a Provincial Decree Number 02/PD/DPRD/1973 to ban the collection of corals as building materials, the rule was ineffective as there were violations of the rule. The efforts to implement the rule was hindered by the fact that many villagers built their livelihood on this activity. It was reported that 2,880 people worked in coral mining in 1981. When the study was done, no coral mining was found.

The destruction of the coral ecosystem in Bali island, especially in Karangasem regency was also caused by the development of the ornamental fish industry. Villagers in Jemluk caught ornamental fish. Fishers from Sumber Kima and Tejakula in North Bali also came to catch aquarium fish in Jemluk waters. The development of the ornamental fish industry was accelerated by the fact that access to international markets was easy as there were flight services from Denpasar to various international cities.

Most of the ornamental fish are coral residents. Other species like snapper and grouper temporarily stay in coral reefs, particularly when they are young. The habitat of coral reefs provides food and protection for all these fish. Unlike consumption fish, to catch ornamental fish is more difficult as the fish can hide in the holes of corals and they must be alive. Fishers in Jemluk and other parts of Bali used cyanide to catch ornamental fish (Nikijuluw, et al.

1988). Nevertheless, fish can still run to hide inside the coral reefs even though they have been sprayed with cyanide. To get the fish, the coral is broken.

As a consequence of such coral reef exploitation, coral fish resources were degraded. Subani (1982) asserted that both production and number of species of sea weed, mollusk, and crustacean, especially spiny lobster, decreased. The poor state of fish resources was exacerbated by the fact that fishers fish primarily in near shore waters and do not go farther offshore.

To regain the previous state of fish resources in the area, artificial reefs were introduced and installed by the provincial government through the Local Fisheries Service. This artificial reef project was sponsored by the Directorate General of Fisheries (DGF) and Research Institute for Marine Fisheries (RIMF) in Jakarta. In 1991, 3 units of pyramid modules made of open concrete cubes were installed. After being evaluated and found that the installment of the reefs brought about positive impact to fish availability (Wasilun, et al. 1993), another 4 units of artificial reefs were placed in 1992. In addition, the Local Fisheries Service assembled 11 units of pyramid modules made of old tires and concrete. Hence in total there were 18 modules of artificial reefs installed in Jemluk waters covering an area of about 217 cubic meters.

Deployment of artificial reefs in Jemluk waters was a part of the Coastal Waters Development Project. The main objective of the artificial reef deployment in Jemluk was to provide substitute for destroyed coral reefs. The secondary objective was to have habitat or shelter for fish and other marine organism. The objectives, however, do not cover the whole ranges of the ecological and socioeconomic features of artificial reefs (Munro and Balgos 1995).

There was no biological base line study purposely conducted before the deployment of the artificial reefs. However, monitoring on the kind of abundance of fish was conducted after reefs had been deployed. Two months after the first installation, 28 families consisting of 114 species of fish were found in the artificial reefs (Wasilun, et al. 1993). The abundance of fish in the artificial reefs also increased. In October 1991, it was found that the abundance of fish was 5 pieces per meter cubic, It increased to 61 pieces in August 1992. Based on the abundance of fish, it can be said that the artificial reefs have functioned as fish habitat.

ESTABLISHMENT OF FISHERY CO-MANAGEMENT

From the beginning, villagers of Jemluk were involved in construction and placement of the artificial reefs. Extension services to the villagers on the function of the artificial reefs before and right after their deployment were carried out by the Provincial Fisheries Service and RIMF. The impact of the extension services is that community awareness to manage coral reef resources improved. As villagers are involved, they considered the reefs as their own and hence they patrolled on the reef areas.

When the artificial reefs were installed, management of the coral reefs and their fish resources officially was under government responsibility. Nevertheless, government was getting difficulty to properly implement artificial reef management simply because they did not have facilities and apparatus in the field. Later, management of the reefs was handed over to villagers and village government. The involvement of villagers was in line with the Provincial Code No. 3/1985 about Fishery Resource Conservation stating that every person is responsible to maintain and conserve fish habitat. The law also states that fishers are disallowed to catch fish by using explosive, poison, electric current, and other equipment which can damage fish resource. The monitoring of the biological impact of the artificial reefs undertaken by RIMF also involved some fishers

As the tasks of the management are given to villagers and village government, the villagers of Jemluk developed their own management mechanism. Under the supervision of the Provincial Fisheries Service, Tourism Department, and the Local Police Station, villagers together with villager government established co-management mechanism for coastal waters. A fisher association named the *Tunas Mekar Fisher Association* (TMFA) whose members consist of fishers who also work in tourism was established. The objective of TMFA is to manage Jemluk waters as a source of people livelihood. In addition to fishing, TMFA members are bringing tourist for snorkeling and diving in coral and artificial reefs. The TMFA has an executive board consisting of one coordinator, one secretary, and one treasurer.

After the installment of the artificial reefs, tourists were attracted to visit the area for snorkeling and scuba diving. While Jemluk had been visited by tourists since 1982, the visitation rate rose after the construction of the artificial reefs. The coming of tourists to the village meant that other economic opportunity was created. Fishers who formerly relied on only fishing could diversify their livelihoods by offering their boats to bring tourists for snorkeling and diving. The formation of TMFA could avoid competition among fishers to offer their services to tourists because services were done according to their agreed schedule.

The membership of the TMFA is restricted to those having motorized boats and commitment to provide better service. Furthermore, each member pays Rp 150,000 as a membership fee. Due to the motorized boat requirement, only about 40% of fishing households have the ability to join the TMFA. Although only around 40% of fishing households joined the TMFA, the other fishers and residents of Jemluk paid respect to managing the area as a tourist destination.

For those who did not join the TMFA, benefit could still be derived from fishing in the artificial reef areas especially when they could not go farther offshore for fishing due to bad weather. In addition, since members of the TMFA were not fishing because of being scheduled for tourism, the remaining fishers have a greater chance to catch fish. In technical words, it implied that the establishment of the TMFA and the installment of the artificial reefs have brought about a positive impact to fishers in the form of less fishing effort.

Under those coastal waters management measures, pressure on the resources seemed to be reduced. In fact, construction of the artificial reefs made the resource more productive.

The pristine condition of beaches was gradually regained. In sum, it might be said that the new approach to resource management, based on villagers participation, has been effective. The artificial reefs which were developed to replace destroyed coral reefs and provide alternative fish habitat have also functioned as fishing ground for small-scale fishers, eco-tourism and recreational areas, and an entry point for co-management.

CO-MANAGEMENT RULES

Table 1 provides basic rules or regulations initiated by the villagers for the purpose of the management of Jemluk waters. The rules are applied to both members and non-members of the TMFA. The rules dealing only with the activities of the TMFA members are written in the TMFA constitution and presented in Table 2.

Table 1. Basic Co-management Rules on Utilization of Jemluk Coastal Areas.

Objective of the Rules	To manage Jemluk waters as a source of people livelihood.
Rules	<ul style="list-style-type: none"> • Unlawful to dump garbage at sea. • Prohibition to take coral heads and catch ornamental fish • Abolishment of using cyanide, other poisons, dynamite, bomb, and destructive fishing gears and methods. • Area under the co-management is the waters from coast line until 35 meter depth.
Process of the Rules establishment	<ul style="list-style-type: none"> • The rules are stipulated by community convention under the supervision of the Fisheries Service, Tourism Department, and the Local Police Station. • Monitoring of the rules and patrol are performed by villagers. • Enforcement of the rules is under the auspices of the Local Police.

Source: Primary Data.

Every villagers is strictly prohibited from dumping garbage in the sea and litter on the beach. Cleanliness, neatness, and tidiness of the environment are intensively promoted by the provincial government in a bid to attract more tourists. To maintain the cleanliness of the beach, members of the TMFA are obliged to clean the beach once a month. If that is not possible, the member should inform the association beforehand and pay Rp 250 as a penalty. The penalty of Rp 250 per violation is so low that every member may be able to pay it. Nevertheless, this penalty is not a reason to make members of the TMFA abandon their obligation. In other words, members of the TMFA do not have the intention to break the rule although they can undoubtedly afford the penalty payment.

It is also prohibited to take coral for any purpose and catch ornamental fish for commercial use. The rules are apparently well-respected by villagers, as taking coral for building materials and catching fish in reef areas were common practices in the past. The villagers are also prohibited from using destructive fishing practices such as poison, cyanide,

dynamite, and spear. The area under this co-management arrangement are the waters facing the village, about 2 km along the beach up to 35 meters depth offshore.

It is showed in Table 2 that member of the TMFA are forbidden to fish in artificial reef areas. The non-members, in contrast, can fish in the artificial reef areas as long as they use permitted fishing gears and when there are no tourism activities around the reefs. The capture of ornamental fish were strictly prohibited in the artificial reef areas. Tourists generally do not wish for waters around the artificial reefs to be used as fishing ground, so that when fishers area encountered operating in the waters around the artificial reefs, they are normally driven away.

Table 2. Rules and Regulations of the TMFA in Jemluk.

VARIABLES	DESCRIPTION
Name of Institution	Tunas Mekar Fisher Association (TMFA)
Objective of the Institution	<ul style="list-style-type: none"> • Conserve and manage coral reefs for tourism activities. • Increase income of the members
Rules / Regulations	<ul style="list-style-type: none"> • Obligation to cleanse the beach once a month. • Prohibition to catch fish in the waters and artificial reef areas destined for snorkeling and scuba diving. • Unlawful to go fishing for the fishers who have been scheduled to bring tourists.
Behavior	<ul style="list-style-type: none"> • The rules and regulations are enacted in the TMFA constitution. • Monitoring and patrol are undertaken by the TMFA members. • Implementation of the rules and regulations are under responsibility of the executive board.

Source: Primary Data.

There is tendency of growing number of tourists to visit to Jemluk. It happened without real effort of the villagers to promote their area. The promotion of tourism in Jemluk may be executed by the Tourism Department in Denpasar. However, it is also possible that the information about diving and snorkeling in Jemluk waters are passed on by tourists themselves. The larger number of tourists, the less number of boats go out fishing.

Monitoring, control, and surveillance of the aforementioned rules and regulations are undertaken by villagers themselves. Fishers, both member and non-member of the TMFA do patrol by themselves. Village government and local police are responsible for backing up the villagers so that they follow the rules. It appears that the rules are effective since there are no reported cases of rule-breaking. Provided that there is a rule-breaking in the TMFA, the executive board is responsible for imposing penalties. The types of penalties range from reprimand to fine. As mentioned earlier, members of the TMFA will be fined if they are absent from community work to clean the beach.

IMPACT OF CO-MANAGEMENT

Fishers in Jemluk derived benefits from the establishment and implementation of co-management in their area. The derived benefits are as follow:

1. There was an opportunity for fishers to catch coral (demersal) fish in waters of deployed artificial reefs by using hand line;
2. Fish production increased;
3. Villagers diversified their livelihood by working in tourism-related activities;
4. Income increased; and
5. Increase fish production and income had a tendency to bring equity.

The opportunity to catch coral and demersal fish has been regained by fishers because the use of destructive and illegal fishing methods on coral reefs has been stopped. Since the co-management has been practiced, following the installation of artificial reefs, the abundance of coral fish has increased. This was traced to the increases of fishing landings. Some fishers who previously did not catch coral fish now have a chance to do it.

Fishery production figures before and after co-management are presented in Table 3. The figures for before co-management are illustrated by the recalled information of fishers back to 1990. The figures for after co-management are presented by information for the years 1995/1996. Based on the figures in table 4, it can be concluded that the co-management resulted in a positive productivity impact as shown by an increase in demersal fish production from 3.9 kg per trip to 13.3 kg per trip. The pelagic fish productions, on the other hand, tended to be the same as depicted by their mean. However, based on the median of the pelagic fish production, it can be inferred that more fishers caught above the average production. Hence it may also be inferred that production of pelagic fish was slightly improved.

The use of gill nets by fishers in Jemluk may be regarded as another effect of the co-management. Beforehand, fishers only employed troll line and hand line using hand-paddled boats. After the installation of the artificial reefs, bigger and motorized fishing boat were used. Investment in motorized boats also might be considered as a tourism-driven demand. Operating bigger and motorized boats, fishers can reach farther fishing grounds and use drift gill net to catch pelagic fish. Since offshore fishing grounds can be reached, the fishing period for pelagic fish can be extended from six months to nine months a year.

Efficiency impact of the co-management may also be evaluated on the basis of the changes in fish price received by fishers. In Table 3, it can be seen that the nominal price of demersal fish increased four times from Rp 500/kg to Rp 2,000/kg. The price of pelagic fish also increased from Rp 710/kg to Rp 416/kg.

The five year price data comparison should not be done without being deflated by a price index. In other words, in such a comparison the general price change or inflation should be taken into consideration. Say that inflation rate is 10% a year, after five years prices should have increased by 50%. Since demersal and pelagic fish prices increased by 400% and 240%, respectively, it may be inferred that there was still a net increase in price. The increase of the fish price may be also attributed to the tourism development in the area which raised the producer prices. From the increase in the amount of average fish landing and the fish prices, the gross revenues of fishers increased. This increase is another proof that the current system of coastal waters management brought about positive impact to the fishers.

Table 3. State of Fisheries in Jemluk Before and After Co-management.

Variable	Before Co-management	After Co-management
Demersal fish production:		
Mean	3.9 kg	13.3 kg
Standard of deviation	2.4 kg	5.6 kg
Median	5.0 kg	15.0 kg
Coefficient of variation	61.5%	42.1%
Skewness coefficient	1.4	0.9
Pelagic fish production:		
Mean	36.0 kg	35.0 kg
Standard of deviation	22.3 kg	14.4 kg
Median	30.0 kg	32.5 kg
Coefficient of variation	61.9%	41.1%
Skewness Coefficient	0.8	0.2
Mean of demersal fish price	Rp 500 per trip	Rp 2,000 per trip
Mean of pelagic fish price	Rp 170 per trip	Rp 2,250 per trip
Mean of operational costs	Not	Rp 2,250 per trip
Fishing gears used:	Troll line, hand line	Troll line, hand line, gill net

Source: Primary data.

Remarks: Production figures are landings per trip. Labor cost is excluded from the operational costs.

Under the co-management, fishers spend about Rp 2,250 per boat every time they go fishing for gasoline. Before the co-management, fishers did not use an engine and therefore there was no expenditure for oil and gas. Therefore, implementation of the co-management did not only change the technology used but also the pattern of inputs used and fishing expense.

The equity impact of the co-management might be judged by virtue of the coefficient of variation. In Table 3, it can be seen that after co-management, the production of demersal and pelagic fish bore smaller coefficients of variation, meaning that fish production become more equal among individual fishers. The Pearson skewness coefficient tended to be closer

to zero, implying that production per individual fishers did not vary so much with the implementation of the co-management. Hence, it could be said that implementation of the co-management in Jemluk brought about improved equity to the members of the TMFA.

The variation of landings may be explained as follow. Before the deployment of the artificial reefs, fishers only caught fish in the waters around destroyed coral reefs. Operating hand line and troll line, they competed with one another for limited fish resources available in inshore waters. Under such circumstance, catch depended very much on the skill of fishers. It was also a situation that who came first to the fishing ground had better chances to fish than those coming later. Therefore, landings of individual fishers would vary. After the deployment of the artificial reefs, fishers operated bigger and motorized boats and used gill net as a fishing gear. They had the ability to enter offshore fishing ground which offer more fish. Competition was not so tight and as a consequence landings of individual fishers was not so different.

IMPLICATION OF THE STUDY

Findings of the study

Based on productivity and equity criteria, it can be said the establishment of co-management in Jemluk brought about positive impact to villagers. Major beneficiaries, however, seem to be members of the TMFA because they had a bigger proportion of economic activities. Other villagers received benefits from fishing as they now catch demersal fish by employing hand line. However they could not generate income from tourism because of limited assets. The implication of this is that if motorized boats could be provided to the non-members of the TMFA, they could join the organization and consequently enjoy the benefit of tourism.

Technology-led co-management

Co-management in Jemluk was established following the deployment of artificial reefs. Although the deployment of artificial reefs did not aim at creating a fishery co-management, the installment of this technology latter provide the way for people to be organized, aware on sustainable resource utilization and create a fishery co-management. Learning from this experience, it may be said that a fishery co-management can be more successful if its establishment is undertaken altogether with introduction of new production technology or method.

Involve local people from the beginning

The people of Jemluk were involved in the construction, placement, and biological impact monitoring of artificial reefs. Likewise, they were introduced with the purposes and functions of artificial reefs by series of extensions done before and right after the deployment of the reefs. By these approaches of participation, people were more aware on the importance of sustainable coastal fishery management. As a result when central and provincial government

could not undertake their responsibility in management of local fishery, that responsibility was taken by the local people. Transfer of the responsibility had been successfully done because local community were involved from the beginning.

Giving up responsibility

The central and provincial government finally realized that they did not have enough capacity to manage fishery locally. The responsibility to manage local fishery was eventually handed over from central and provincial government to villagers and village government. However provincial government still involved in the process of building local fishery co-management mechanism. The willingness of central and provincial government to give their responsibility in fact was seriously responded by local people and it become a solid ground for the establishment of local fishery co-management.

Managing Indonesian inshore Fisheries

This case study was indeed cover a small village and therefore might not have a big impact to the very broad area Indonesia. However this study revealed some lessons that can be used to develop management mechanism for the Indonesian inshore fishery. As the development of the fishery is now partly performed by local government, the local government should build up their capacity so that sound fishery management can be formulated and implemented. Problems and difficulties, however, may be faced by the local government because they do not have capable human resources as fishery managers. In addition, the fishery greatly differs from one to another area, employing different type of fishing gears to catch multi-species fish, that eventually makes fishery management as a difficult task. Lack of facilities and budgets are other problems faced by the government that seems not to be easily solved. To cope with all these problems and difficulties, local co-management as established in Jemluk may be developed.

The development of local co-management essentially is not at odd with formal laws. The Law Number 22/1999 on regional development states that every local government should utilize their natural resources for the benefits of the people. The Law also protects local characteristics, traditional customs and practices used in natural resource management. Based on the law, local specific co-management may be developed for each region. Since information on local fishery practices are not better available, studies should be conducted to provide those data. On the basis of the data, fishery managers may intervene local people with initiatives of developing specific fishery co-management.

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