How Does Mariculture Affect Local Communities? A Study from the Philippines

Mariculture is the managed cultivation or production of fish and other marine organisms in brackish and saline water. The Philippine government started to promote the concept of mariculture parks in the early 2000s as a way to reduce poverty in coastal communities. However, take-up has been slow, and local people have not been involved to the degree that was hoped when the initiative was first launched.

Now, a new EEPSEA study has examined the way local people engage in mariculture park operations. The study, which is the work of a team led by Dr. Alice Joan Ferrer from the University of the Philippines Visayas, found that mariculture is providing some employment to local people, but that levels of local involvement are relatively low. The study also found that mariculture is producing a range of local problems, including pollution, that are affecting local livelihoods. The study proposes a number of policies that might help local people to set up their own mariculture projects and to boost the number of local people employed in the sector.

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A summary of EEPSEA Research Report No. 2017-RR8: "How Mariculture Operations Affect Local Communities: Insights from Seven Mariculture Areas in the Philippines," by Alice Joan G. Ferrer, Herminia A. Francisco, Canesio Predo, Benedict Mark Carmelita, and Jinky C. Hopanda. Comments should be sent to: Dr. Alice Joan G. Ferrer, Division of Social Sciences, University of the Philippines Visayas, 5023 Miagao, Iloilo, Philippines. Tel: +63-33-5137012. Email: agferrer@upv.edu.ph

Strengthening local capacity in the economic analysis of environmental issues

The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries (i.e., Cambodia, China, Indonesia, Lao PDR, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, and Vietnam.) It aims to strengthen local capacity for the economic analysis of environmental issues so that researchers can provide sound advice to policy makers.

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The mariculture challenge

Mariculture parks are implemented by local government units (LGUs), with technical assistance from the Bureau of Fisheries and Aquatic Resources (BFAR). To set up a mariculture park operation, the BFAR first zones at least 100 ha of coastal municipal water as a reserve. To attract investors, the BFAR also provides financial support for the implementation of mariculture parks by subsidizing operators. In 2009, the BFAR began implementing a cage-for-rent project to address the problem of low participation by small-scale fishing households.

These initiatives have not been particularly successful. In 2010, almost a decade since the BFAR introduced the mariculture park program, only 62 mariculture parks have been set up. Despite government support, the low participation of the local people remains a problem. For example, out of the 300 mariculture cages in Panabo City Mariculture Park, only 20 are operated by local fisherfolk families. In Sual mariculture park, no local fisherfolk owned any of the 750 cages.

How local people engage with mariculture projects

To provide policy makers with information about how local people engage in and are affected by mariculture projects, the study looked at mariculture sites in seven municipalities. These seven mariculture sites were: Balingasag, Misamis Oriental and Lopez Jaena, Misamis Occidental in Region 10 (Northern Mindanao); Calape and Talibon, Bohol in Region 7 (Central Visayas); Sto. Tomas, La Union, and Bolinao and Sual, Pangasinan in Region 1 (Ilocos Region).

Caretakers transport feeds to the fish cages in Balingasag, Misamis Oriental
Photo by Benedict Mark Carmelita

In each of these areas, the study team assessed the fishing, gleaning, and leisure activities of local community members, both before and after the establishment of mariculture production. The study also looked at the impact of mariculture on food security, local employment, *barangay* (village) income, and pollution. In addition, the income generated by LGUs from mariculture operations was estimated for each of these seven sites.

The data used in the study were collected through key informant interviews, focus group discussions (FGDs), and a survey. The survey was carried out among 785 randomly selected fishing and non-fishing households in the period January–August 2015.

Low take-up characterizes mariculture program

Overall, there has been a low uptake of mariculture in the study area, and this does not seem to be changing. For example, in Calape, Talibon, and Sto. Tomas, the number of operations have already stopped increasing because of the high cost of operations or because mariculture operations have been damaged by bad weather.

On the average, only 24% of household members in each study area were either employed in mariculture operations, or had been employed in mariculture at some point in their working lives. Most of those employed in mariculture were men. Given that mariculture had been established in all of the study areas for more than five years (for more than 20 years in the case of Sual and Bolinao), it was expected that the participation of households in mariculture would be higher than this.

Mariculture provides significant income

For those households who were gainfully employed in mariculture operations, income from mariculture represented a significant part of their overall income. For example, mariculture income made up 45% percent of all household income of those from Sual

Table 1. Income derived from mariculture employment relative to total household income, 2015

Sites	Households with Current Participation in Mariculture Operation	Households with Participation in Mariculture Operation (Previous and Current)	Annual HH income (PHP, mean)	Annual Income from Involvement in Mariculture (PHP, mean)	% of Annual Income from Involvement in Mariculture to Annual Household Income
Balingasag	19	31	149,692.90	58,832.53	39.30
Lopez Jaena*	–	5	–	–	–
Sual	25	40	102,803.40	46,550.56	45.28
Bolinao	7	32	160,916.00	55,580.00	34.54
Calape*	–	14	–	–	–
Talibon	1	46	309,020.00	56,000.00	18.12
Sto. Tomas	6	19	138,943.30	38,733.33	27.88
Total	58 (31.02%)	187			
% to total number of households surveyed (N=785)	7.39				

Note: * No households with current involvement in mariculture operation were covered by the survey.

and made up about 35% of all income for households in Bolinao.

In addition, in four of the seven sites (Balingasag, Sual, Bolinao, and Talibon), a significant proportion of the survey participants thought that mariculture had provided new local employment. The results of the FGDs supported this perception, with participants citing employment opportunities as the main reason why they liked having mariculture in their localities.

Mariculture operations also provide additional income to LGUs, but this revenue make up only a small percentage (0.01% to 2.63%) of the LGUs' internal revenue allotments. It is thought that the potential to exploit income from mariculture is not fully realized because of some LGUs have failed to pass regulations that would enable them to collect more taxes.

Mariculture causing livelihood problems

The low participation rates of local residents in mariculture can be attributed to a number of factors. First, only those with good financial resources can be operators, as even one small bamboo cage can cost about PHP 120,000. Moreover, feeds are very costly, making operational costs high. These high costs mean that the rent-to-own schemes of the BFAR in Balingasag and Lopez Jaena (where fisherfolk were provided with cage materials and their initial seed requirements) have had few participants. The high cost of mariculture operations means that the largest share of mariculture benefits accrue to investors from other areas, who are mostly traders or financiers from cities or influential people such as local officials.

Another factor that has limited the local people's involvement in mariculture is the fact that in small-scale mariculture operations, operators can perform several roles (such as caretaker, watcher and maintenance worker). This means that operators only need hired help during harvests or when they have to change nets.

A significant number of community members believed that mariculture has led to a reduction in livelihood activities, such as gleaning and fishing. They thought that mariculture had either displaced them from their fishing grounds or that it had polluted the waters from where they fished or gleaned. It was also reported that fish cages act as fish-aggregating devices, and therefore reduce the fish available to local fishing households. The greatest decline in fishing was observed in Sual (where fishing had declined by 20%).

Wide variety in the type and size of mariculture operations

Mariculture management operations in the study sites involved the private sector, local government, and the BFAR. Many of the mariculture operators, particularly medium and large operators, were from outside the municipality where their mariculture operations were located.

The study found a wide variety in the size of operators. In Balingasag, for instance, there were 63 operators. Of these, 28 were small-size operations, 24 were of medium size, and 11 were large-scale operators. There was also a wide variety of technologies being used. For example, mariculture cages

and pens were either square or round, fixed or floating, and made of either bamboo, GI pipes, rope-framed cages, or high density polyethylene (HDPE) material.

HDPE was mainly used by large-scale operators. Cages made of this material can last between 10 and 15 years, but they are very expensive, with one cage worth about PHP 1 million. Bamboo cages, which can last up to three years and which have smaller capacity than HDPE cages, are used by small- and medium-sized operators.

Milkfish was the main species farmed in all sites. A small number of operators raised other species such as pompano, siganid, and grouper. Grouper was popular in the mariculture sites located in Sto. Tomas.

Mariculture causing pollution problems for local communities

There was a general perception that mariculture causes pollution. Indeed, more than half of the survey participants in Balingasag, Sual, and Bolinao, and a third in Talibon, thought that mariculture had increased water pollution. This perception was underlined by reported reductions in leisure activities, such as swimming and strolling by the beach. These findings are understandable as fish cages can generate a wide range of aquatic waste, including uneaten food, fish feces, scales, and mucus.

The reported decline in leisure activities was largely due to the fact that mariculture water pollution causes problems such as foul odor, murky water, and itchy skin (when body comes in contact with the contaminated water). As a result of these problems, tourists have not been attracted to mariculture sites, and the hoped-for tourism gains have not been achieved.

Despite these problems, results of the FGDs revealed that the local residents have a generally positive attitude toward mariculture, largely on account of the perceived local employment that mariculture provides.

What should be done to boost the benefits that mariculture provides?

To increase local employment and reduce poverty in mariculture areas, local residents, particularly fishing households, must be given support to start up small-scale mariculture operations, to hire labor, and to market farmed fishes. Local legislations should be passed to make this happen. In particular, the BFAR's livelihood program should be expanded to provide the feeds required for one full season of operation. This would provide small-scale operators with the experience and funds they need to continue their operations. Technical assistance should also be strengthened and extended to include financial management. The BFAR should also give more support to fisher organizations or cooperatives.

If more mariculture operators are local residents, then it is likely that more residents will be hired to work on their operations. Non-local mariculture operators should be encouraged to prioritize local hiring.

To keep local fish prices down, a certain percentage of all mariculture harvests should be sold directly to local traders, particularly to retailers and to local small processors. Currently, processing is not present in many mariculture areas. However, if mariculture operations are linked to processing, then they will contribute more to local employment. Moves should therefore be made to make this connection.

Lastly, LGUs should maximize their power to generate revenues from mariculture, as provided by the Local Government Code of 1991. LGUs with mariculture should learn from each other about the optimal fees, taxes, or other requirements that they can impose on mariculture operation. For instance, at the time of the study, a one-time fixed environmental fee was being imposed by some LGUs, but not by others.

EEPSEA, SEARCA Building,
College, Los Baños,
Laguna 4031
Tel/Fax: +63 49 501 3953

Email: admin@eepsea.net

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