

• In-Situ Training for Lake Lanao Fish Farmers on Freshwater Aquaculture

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Abstract

This final report presents the accomplishments of the project covering the period from January 1997 to December 1997. Eight municipalities have become beneficiaries of the project. Of these municipalities, six were actually along the lakeshore while two were considered far from the lake, namely, Piagapo, which is around 20 kilometers northwest of Marawi City and Balo-i, a municipality in the province of Lanao del Norte and around 25 kilometers north of Marawi City.

The training which was conducted both in the College of Fisheries hatchery laboratory and in the field consisted of proper selection of carp breeders for induced-breeding, actual extraction of pituitary gland from donor fish and the proper preparation thereof prior to hypophysation, proper administration of hormone to the breeders and the proper care for the larvae and fry.

Around 30 local fish farmers were served by the project. Since each farmer had his own fishpond, actual field training on the proper fishpond layout and construction, pond and water management and proper feeding were given. Moreover, to get them started with their projects, initial stock of carp and tilapia breeders were given to the farmers. These farmers are already producing their own fish, either for family consumption or for business.

Around 500,000 carp and tilapia fingerlings were stocked into the lake by the project. The fish used for stocking was the product of the training conducted at the College.

I. Rationale

In 1990-91 the College of Fisheries, Mindanao State University, Marawi City conducted a study on the status of Lake Lanao fisheries. The result pointed to the fact that the number of most of the important fisheries in the lake have considerably declined in number when compared to their populations in the past years. For example, with regard to the common carp (*Cyprinus carpio* Linn.), one of the introduced species and is locally known as "bungkaong," the record shows that it ranked seventh in the lake's catch in 1976-77 (Escudero, 1980). In 1982-83, only 8.13% by weight of carp sold in the market came from Lake Lanao; the remaining 91.87% were imported from the provinces of Agusan and Surigao (Escudero, 19883). In 1990-91, the lake contributed only 0.5% of the total weight of carp brought to the market during the period. All the rest, i.e., 99.5%, were contributed by other provinces such as Agusan and Surigao (Escudero, 1994). It is expected that this downtrend would continue in to the future to the point of collapse of the carp fishery in the lake, if no remedial measures are taken.

The investigation also indicated the possible cause of the depletion of the carp population in the lake. Aside from the obvious non-observance of fishing regulations by the local fishermen, the present proliferation of an eleotrid (*Hypseleotris agilis* Herre), locally known as "katolong," has evidently contributed to the depletion of the carp population in Lake Lanao. The "katolong" is a voracious omnivorous fish that feeds on a variety of foods ranging from the small benthic invertebrates such as snails (locally called "susu"), shrimps (locally called "udang") and juveniles fishes, including its own kind. The fish is so omnivorous that in the absence of any of the aforementioned animal organisms, it actually grazes on the aquatic vegetation at the lake bottom.

Its own breeding habit has largely contributed to the carp's depletion in the lake. A phytophillic fish, the carp needs submerged aquatic vegetation to attach its eggs on during spawning. A careless breeder, it does not provide protection for its eggs and young. After spawning, the carp leaves its freshly laid eggs for the voracious "katolong" to feast on. Expectedly, the carp population in the lake declined in time.

In the light of the foregoing situation, the carp and other dwindling important fisheries in Lake Lanao have to be restored. This can be accomplished by breeding the fish in a hatchery where the eggs and fry are safe from the menacing effects of the eleotrid. At a predetermined size considered safe from predation, hatchery-reared fingerlings may be stocked into the lake. In time the fish population in this body of freshwater may be enhanced and the once flourishing fisheries in the lake may be restored.

Realizing the importance of addressing the foregoing problem and recognizing the fact that the task was too great for the University to undertake alone, the idea of involving the community in this undertaking was conceived. The project was envisioned to train local fish farmers on freshwater fish culture right in their locality. In return, they were expected to be able to produce their own fingerlings independently with little or no more assistance from the University. Part of their production (10%) were to be stocked into the lake and the remaining would be used for their own backyard fishponds or fishpens. In this manner the restoration process of the dwindling carp and tilapia fisheries in the lake would be hastened. More importantly, as independent fish producers

themselves, the fish farmers would be able to contribute significantly in minimizing the people's dependence on the lake as a source of freshwater food fish.

II. Objectives

The general objectives of the project was to enhance the capabilities of local residents in aquaculture technologies that would contribute to the restoration of the dwindling commercial fish species in Lake Lanao.

Specifically, the project aimed to train manpower in different technologies in freshwater fishpond and hatchery management; to promote awareness among the local residents, through the participants, of the importance of observing conservation and other practices in fisheries management as means to insure sustainable fisheries resources in Lake Lanao; and to promote backyard fishponds and other fish culture projects in Lake Lanao and nearby bodies of freshwater.

III. Methodology

This final report presents the accomplishments of the project covering the period from January 1997 to December 1997.

Even prior to the start of the project in January 1997, the College of Fisheries of Mindanao State University, Marawi City, had been attending to the needs of the local fish farmers in terms of providing free assistance on various techniques in freshwater aquaculture. Also, lake stocking had been undertaken. Such assistance and undertaking, however, were quite limited due to financial constraints, the very reason for which support from PCAMRD had been sought.

The project actually started in January 1997 with a group of local fish farmers trained on the induced-breeding technique of the common carp through hypophysation. Since then several barangays in various municipalities bordering the lake had become beneficiaries of this project.

Specifically, the local trainees were taught the proper selection, including the sexing, of carp breeders, pituitary gland extraction from tilapia and carp donor fish, preparation of hypophysis, and intraperitoneal administration of hormone to the breeders. Aware of the activity, neighboring barangays and municipalities around the lake were encouraged to put up their own individual aquaculture projects. Expectedly, initial inputs such as carp breeders and technical advice were provided to the local fish farmers by the college.

In addition to the in-situ training, some local fish farmers came to the college for technical assistance. In such cases, actual training on breeding technique and live feed culture was extended to them by the college. Fingerlings thereby produced are stocked into the lake.

Eight municipalities comprising of 30 local fish farmers had been served by the project during the period. Around 500,000 carp fingerlings had been stocked into the lake by the project. There had been no actual record of the number of carp and tilapia

fingerlings stocked into the lake from the produce of the local fish farmers as they do not usually keep records for this. Definitely, nonetheless, most of their produce were used for their own aquaculture projects.

There had been various problems encountered during the conduct of the project. The extension worker could not just go to any desired place about the lake any time without proper coordination with appropriate local leaders. This precondition caused much delay in the conduct of the project but was a much safer procedure made necessary by the otherwise hazardous neighborhood.

IV. Results

The results presented below include a brief description of the training sites and the type of services extended to the farmers.

Training Sites

Unlike other ethnic groups in the country, the Maranaos of Lanao del Sur are not easily convinced by what may seem to them newfangled ideas. They strongly subscribe to the saying, "To see is to believe." Once convinced, however, they mobilize all their resources to become successful in their venture.

In order for the training program to attain its objectives, the training of Maranao fish farmers was done right in their barangays and/or in their project sites. For practical purposes and so as to achieve a "domino effect," the selection of the training sites was crucial. The selection procedure must be such that the criteria used must not be biased so as to earn the ire of the local residents. For this purpose, the criteria used in the selection of the training sites included:

1. Interest of the trainees;
2. Actual operation of aquaculture project by the trainees;
3. Accessibility of the existing aquaculture projects;
4. Interest and support by the local government units.

Taking all these criteria into consideration, the training program management of the MSU College of Fisheries identified eight municipalities, strategically located around Lake Lanao and even in the hinterlands in and outside the province that requested to be in-situ training sites. These included Kaloocan, Marawi City; Molundo; Masiu; Ganassi; Wato; Poona Bayabao, and Piagapo, all in Lanao del Sur, and Balo-i, Lanao del Norte (Fig. 1).

Brief description of the training sites and the scope of training in these places are discussed below:

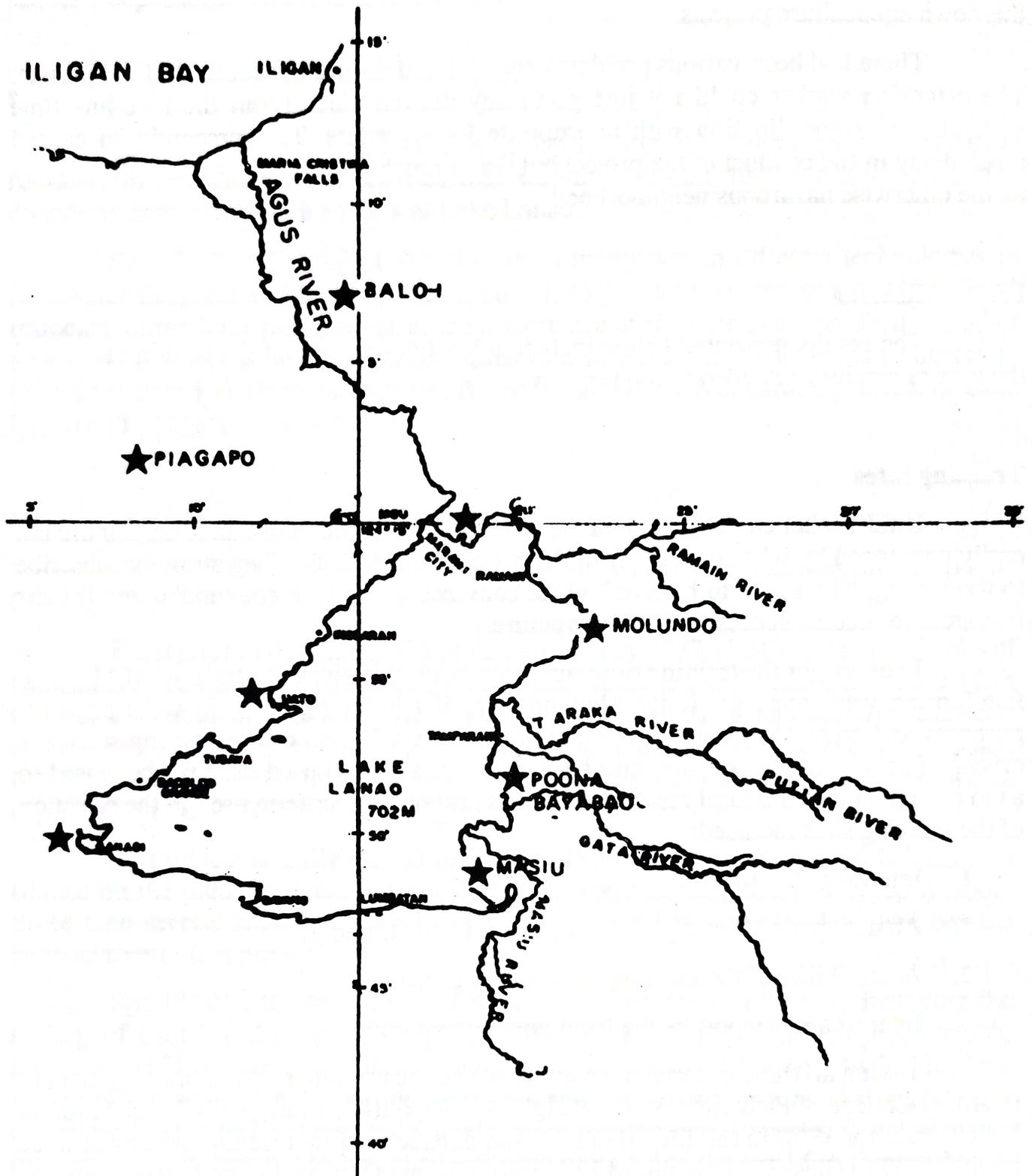


FIGURE 1. Map of Lake Lanao showing the eight municipalities by the project.

A. Kaloocan, Marawi City

Kaloocan is one of the barangays of Marawi City located in the lakeshore. It has a very beautiful cove with an estimated area of 15 hectares which makes it ideal for a fish pen or fish cage project: it is protected from the disastrous effects of strong waves, water current and winds. It is very accessible by both land and water means of transportation. The northwestern portion of the barangay is mountainous planted to a few hectares of corn. Bamboo grooves dominate in this area. The lowland portion of Kaloocan is quite limited in area. Very few hectares of land are devoted to rice.

Quite evident in Kaloocan is a vast expanse of water hyacinth and marshland which could be converted into productive fishponds. In fact, one of the enterprising residents has constructed some pond compartments for carp breeding (Fig. 2). The fishpond site was supplied with water from a nearby spring with a modestly estimated capacity of around 200 GPM.

The scopes of training conducted in Kaloocan included fishpond site selection, layout and construction as shown in Figure 4. Because of the suitability of the Kaloocan Cove, one of the local enterprising residents, the Latiph family, was encouraged and taught how to construct a fishpen.

With an initial stock of one hundred and fifty carp juveniles, the Latiph family was also trained in the culture of carp broodstock and breeding. After five months of culture, the broodstock was harvested and assessed for another scope of training on in-situ hypophysation. As a prelude to the actual administration of hormones on the carp breeders, the trainees were taught how to sex. Figures 3 to 4 show the trainees doing the sexing and segregation jobs. The selected gravid male and female carp breeders are shown in Figure 5.

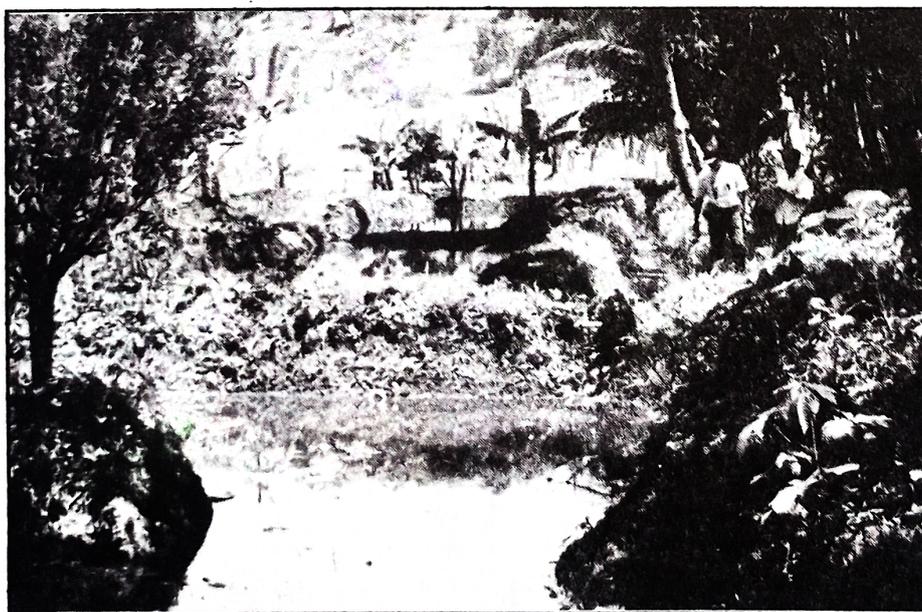


Figure 2. Staff members of the MSU College of Fisheries, Marawi City, assessing the pond area for correct stocking density while the owner looks on.

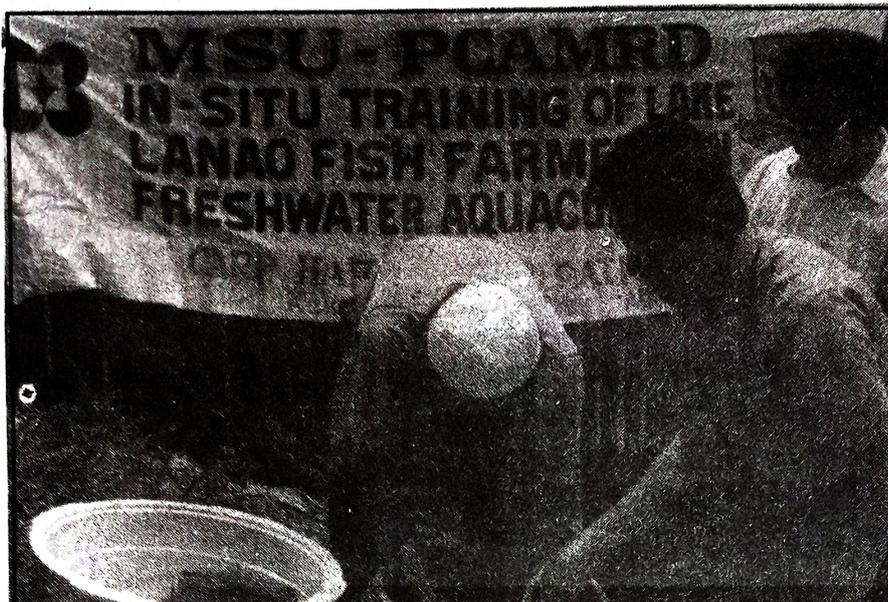


Figure 3. Fishpen owner Hadji Batu Iza, al hadj showing another trainee, Imam Khalid Dadayan, al hadj, how to sex a common carp breeder

Figure 4. A trainee, Imam Khalid Dadayan, al hadj sexing a female and a male common carp breeder in preparation for hypophysation.



Figure 5. Segregated common carp breeders made ready for in-situ hypophysation training exercise.

While the use of commercially prepared hormones for hypophysation (HCG and LHRH) are highly desirable due to their efficiency, their prohibitive price and local market availability has led to the more practical use of pituitary gland from carp and tilapia donors. In view of this situation, the trainees were also trained on the extraction of pituitary gland from the said donor species.

The actual administration of the right concentration of hormones into the carp breeders is very critical. Based on experience in the College of Fisheries, peritoneal injection is more effective; however, this requires proper training to avoid accidental



damage to the fish's vital organs, like the heart, which could cause instantaneous death to the breeders. After a series of demonstrations, the trainees were given the opportunity to administer the hormones intraperitoneally. (Figure 6 shows a male trainee doing his turn.)

Figure 6. A Maranao trainee administering hormone intraperitoneally to a carp breeder.

B. Masiu, Lanao del Sur

After learning about the MSU College of Fisheries and PCAMRD of DOST's free conduct of in-situ training on freshwater aquaculture, Mayor Macacuna "Mike" Pangandaman of Masiu, Lanao del Sur, sent a representative in the person of Engr. Alongan Macalawi to the College to discuss the possibility of making his municipality one of the training sites. College Dean Pedro T. Escudero, together with some of the trainers and staff, led the visitor to the College's Hatchery Laboratory to show him the carp breeders conditioned in the concrete tanks for breeding purposes (shown in Figure 7).

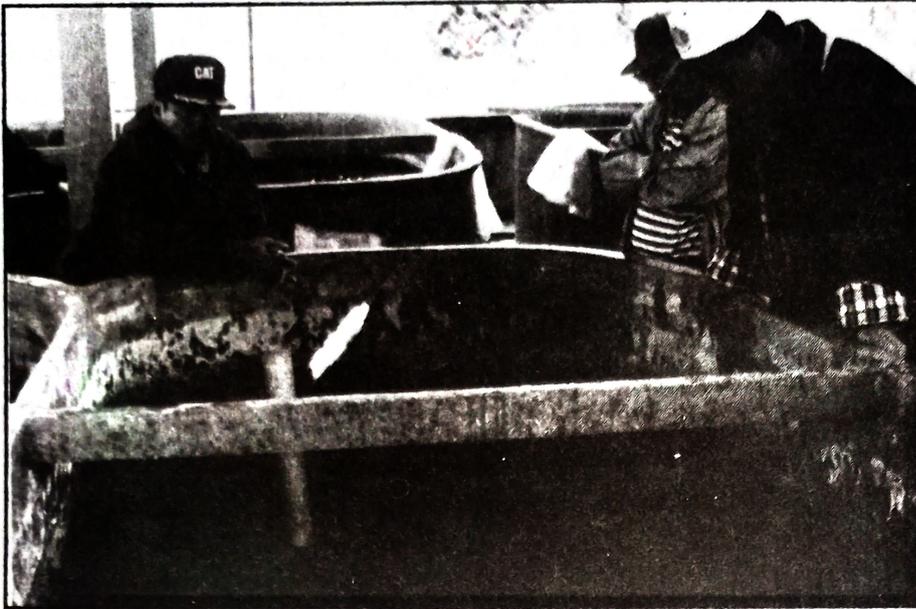


Figure 7. Engr. Alongan Macalawi (in jacket) of Masiu municipality being shown the carp breeders in the College of Fisheries Hatchery laboratory. He was sent by his mayor to arrange with the College for free training.

As part of the Training Management Protocol, an ocular survey of the existing project was conducted on February 15, 1997. Masiu is one of the fast developing municipalities in Lanao del Sur. It is located at the southeastern shore of Lake Lanao (see map). The terrain of the place is basically lowland, suitable for rice and fish production. The rice fields get their water supply from the Masiu River. Fronting the lakeshore is a wide tract of marshland dominantly populated with water hyacinth. Aside from rice, corn is planted in some areas which cannot be fully irrigated.

The inhabitants of Masiu are mostly farmers. The residents near the lakeshore are sustenance fisherfolk. Basically, the residents of Masiu depend on Lake Lanao for their fish supply.

The in-situ training on carp and tilapia cultivation in Masiu was conducted on July 10, 1997. The training conducted in Masiu was purely on the culture of the said species in fishponds. As such, the various participants were trained on the selection, layout and construction of freshwater fishponds and pond management, including water and feed management. The training culminated with the actual stocking of tilapia fingerlings in the reflecting ponds of the training venue.

C. Poona Bayabao, Lanao del Sur

The third municipality that signified its interest on the free training project was Poona Bayabao, Lanao del Sur. This is located at the eastern shore of Lake Lanao, about 10 kilometers north of Masiu town. The site was generally characterized by vast tract of level land subdivided into several owners along the lakeshore. Each subdivision ranged from 3-6 hectares in area. Most landowners devote their lands to rice production, while others, especially those adjacent to the lakeshore, to fishpond projects.

The training here was concentrated on fishpond layout and construction, pond and water management, and proper feeding. Initial stock of carp and tilapia breeders were given to the fishpond operators. Presently, these fishpond owners have become the source

of freshwater fish supply in the municipality, especially during the Muslim feast of Ramadhan (fasting).

D. Molundo, Lanao del Sur

The fourth in-situ training site was Molundo, Lanao del Sur. This is another municipality located at the eastern shore of Lake Lanao (see map). The site is also of lowland and flat terrain. Like Masiu, the inhabitants are mostly rice and corn farmers and fisherfolks. Fronting the lake is a vast expanse of water hyacinths extending up to 0.5 – 0.8 meters water depth.

The training conducted in Molundo was concentrated more on pond management that included pond stocking and feed management. The participants were all fishpond operators with ownerships ranging from 0.5 – 2 hectares each. It is interesting to note that pond construction involves simply the removal of water hyacinths and depositing them at the pond sides, thus, forming the dikes. Since water seepage is not a problem due to the constant pond water depth (being part of the lake water), partition dikes are not necessary. The trainees were taught to use nets instead, as partition for a desirable pond size.

Figure 8 shows the existing and newly expanded fishponds of the participants. The fishponds were mostly seeded with both tilapia and carp fingerlings. During the training, the participants were encouraged to form a cooperative which would put up its own carp hatchery to produce seedstock for its own use and for lake stocking. The suggestion was warmly accepted. Once the cooperative would undertake hatchery construction and management that would include hypophysation, fry and fingerlings rearing, it would become the next training module in Molundo.

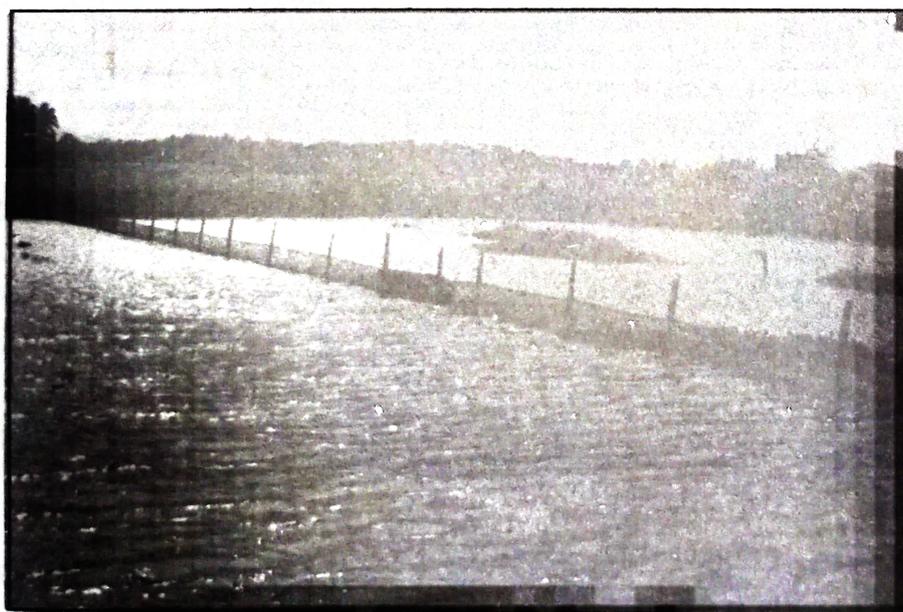


Figure 8. A carp/tilapia fishpond in Molundo, Lanao del Sur. Note the fine-mesh nylon net marking the boundary between two co-owners.

E. Wato, Lanao del Sur

Wato, Lanao del Sur, was the fifth training site. The training was conducted right at the project site. The main interest of the College of Fisheries training

management was to develop the area into an integrated agro-forestry and fisheries project that would serve as a showcase in the province. The training site has existing agro-forestry projects and small backyard fishponds with sufficient water supply and clayish soil.

The project owner, a former top-ranking MNLF commander now integrated into the AFP, Lt. Dixon Mogawan, was trained on pond layout and construction and pond management that include water management.

F. Ganassi, Lanao del Sur

The sixth training site around Lake Lanao was Ganassi, Lanao del Sur. The place is located at the southwestern portion of the lake. Generally, the place is surrounded with rugged terrain and rolling hills. The lakeshore has varied coves and cliffs.

The residents in the place also have varied occupations. Most of them are sustenance fisherfolks and rice and corn farmers. Being far away from the seacoast, the residents are primarily dependent on Lake Lanao for their fish supply.

As in Molundo, the training was made in response to the request of the Diangka family. The family owns a modest freshwater fishpond of roughly 0.5-0.75 hectares, not counting the potential areas for development that may be expanded up to more or less than 15 hectares. The project site could be supplied with a tremendous amount of water coming from a nearby river (shown in Figure 9).



Figure 9. A creek supplying a series of fishponds owned by Capt. Sangbaan Acmad Diangka (PNP) at Ganassi, Lanao del Sur. Other fishpond owners, Mr. Borac Marohombsar (in jacket and white t-shirt) and Mr. Tomee Paramata (in striped t-shirt) serve as guide.

The training conducted in Ganassi was mostly concentrated on fishpond layout and construction and pond management. Considering the availability of clean and sufficient water supply, the family was encouraged to put up their modest common carp and tilapia hatchery to supply their needs and the adjacent areas and for lake stocking. Once the family is ready, hatchery operation and management becomes the next training concern in the area.

G. Piagapo, Lanao del Sur

Unlike the other training sites in the province of Lanao del Sur, Piagapo is far from the lake. Again, the training activity was made possible upon the request of the municipal mayor, Mayor Mauyag Aco-on, who learned about the free training program.

Piagapo has gained the reputation as one of the dreaded places in the province. Information had been unkindly circulated that most kidnapped victims are brought to this place for ransom. The place is a forested area with rugged terrain. In fact, the training site, about fifteen kilometers from the nearest highway, could be reached only by foot after about three-hour hike. While hiking to the training site, the mayor refuted the bad image labeled his municipality by saying that Piagapo is basically a peaceful town. Its constituents are mostly upland rice farmers and corn planters. Some hilly portions were planted with falcata and mahogany trees.

The training site had a deep depression forming a lake with a total area of more or less than 1.5 hectares and an average depth of 2.5 meters. Adjacent to the lake on the northeastern side were small pond compartments averaging around 0.25 hectares due to a terraced terrain. Both the small lake and fishponds were supplied with natural springs below the surrounding bamboo grooves.

Considering the conditions obtaining in the area, the training module in Piagapo was concentrated on lake stocking and management. Additional lectures were given on fishpond layout and construction and pond management. Figures 10 and 11 show the mayor discussing matters with the College of Fisheries trainers at the training site.



Figure 10. Mayor Mauyag Aco-on (in white Hadji cap) of Piagapo, Lanao del Sur listens as MSU technicians explain the importance of proper feeding and controlled fishing in this small lake.

Figure 11. Mayor Aco-on explaining his plans to develop this mini lake located at Barangay Paridi, Piagapo, Lanao del Sur into a communal fishpond.



H. Balo-i, Lanao del Norte

Balo-i, Lanao del Norte, was the only training site located outside of Lanao del Sur province. While it is true that the municipality is not within the political jurisdiction of Lanao del Sur, the Maranao inhabitants of the place, as demanded by their culture, had always been dependent on Lake Lanao for their freshwater fish supply.

The training in Balo-i was conducted upon the request of Atty. Kunug Pumbaya who owned a wide tract of ricefield in the area. The interest of the trainors was to transfer the technology on rice and fish farming integrated with duck raising. The idea was to maximize the production of the project per unit time and area. As envisioned, the integrated project would serve also as a show window for livestock and rice and fish farming in the province.

The training included rice paddies and pond preparation, fish stocking and pond harvest.

MSU Hatchery Laboratory

As embodied in the training program, training on carp fry and tilapia fry rearing was conducted at the MSU College of Fisheries hatchery laboratory. The training included hypophysation, fry rearing in concrete tanks and fingerling production in earthen ponds.

The trainees included men and women of varied age groups and occupations. Some were government employees and others were plain housewives. All trainees had small possessions of backyard fishponds in their homes. Figure 12 shows the participants posing with the trainors.



Figure 12. Trainees coming from various municipalities in the province of Lanao del Sur pose with their trainers in the hatchery laboratory of the MSU College of fisheries.

J. Lake Lanao Stocking

Considering the restoration of the dwindling species of Lake Lanao as the general objective of the program, the MSU College of Fisheries had regularly stocked the lake within the duration of the training program. The species stocked into the lake were common carp and tilapia fingerlings produced from the hatchery training efforts.

Figure 13 shows the actual fish stocking in the lake by the College faculty, staff, students and local residents in Tugaya, Lanao del Sur.



Figure 13. Technicians and students of the MSU College of Fisheries in a lake stocking activity in Tugaya, Lanao del Sur.

Table 1 shows the list of farmers from the eight municipalities served by the project.

Table 1. List of clients with their corresponding types of aquaculture practice and location.

Clients	Type of Aquaculture	Location
1. Batu Iza	Fishpond/Fishpen	Kaloocan, Marawi
2. Yusoph Latip	-do-	-do-
3. Khalid Dadayan	-do-	-do-
4. Ringgo Dimakuta	Fishpen	Wato
5. Dixon Mogawan	Fishpond	Wato
6. Acmad Diangka	Fishpond	Ganassi
7. Borac Marohombsar	-do-	-do-
8. Tomee Paramata	-do-	-do-
9. Omar Sarip	-do-	-do-
10. Anton Mala	-do-	Poona Bayabao
11. Aliuden Mla	-do-	-do-
12. Hadji Nasser Ali	-do-	Molundo
13. Mayor Macacuna Pangandaman	-do-	Masiu
	-do-	Molundo
14. Labi Riwarung	Rice-fish	Balo-I, Lanao Norte
15. Kunug Pumbaya	Fishpond	Dilimbayan, Balo-I
16. Sabdullah Abubakar	-do-	-do-
17. Hadji Mohammad Cabib	-do-	-do-
18. Macalangca Milion	-do-	-do-
19. Ditangcap Biruar	-do-	-do-
20. Salic Abdul	-do-	-do-
21. Maulana Bagumbaran	-do-	-do-
22. Banteres Arumpac	-do-	-do-
23. Edris Maminta	-do-	-do-
24. Hadji Rakma Polo	-do-	-do-
25. Hadji Omar Arumpac	-do-	Tuca, Marawi City
26. Macacuna Moslem	-do-	Raya, Wato
27. Sultan Roy Ramos	-do-	Limbo, Wato

28. Hadji Saiben Radiatoa	-do-	Wato
29. Hadji Mikunug Berana	-do-	Paridi, Piagapo
30. Hadji Mauyag Aco-on	-do-	Masiu
31. Alongan Macalawi		

CONCLUSION AND RECOMMENDATIONS

The Maranaos have long been practicing aquaculture since the time of their forefathers. Owing to their geographical location (being far away from the coastal areas), they show preference for freshwater fishes, which they consider a delicacy more than the marine ones. Although some still adhere to their primitive methods of fish culture, others have already improved their techniques. Not too long ago, it was not uncommon to find fishponds with dikes laden with rocks, logs or anything that could fill up the dikes quickly, which are all considered taboo in fishpond construction. Some did not have even an inlet or outlet in their fishponds thereby making water management practically difficult, if not impossible.

Perhaps it is the presence of the College of Fisheries in the area which trains young people on the proper techniques in freshwater aquaculture that contributed to the improvement of the techniques of the Maranao farmers. The project funded by PCAMRD has definitely contributed significantly in enhancing the capabilities of the fish farmers to produce fish in their backyard fishponds. During the various visits to the different training sites, the College was delighted to note that its services were really needed by the farmers. Their errors were immediately corrected in the field and other forms of assistance were provided. In short, the project was timely and useful.

Now that this PCAMRD-funded project had finally ended, the College of Fisheries will continue to follow up the progress of the different trainees in their respective localities. It is highly desirable that frequent contact with the fish farmers to monitor their individual projects be made. This will be made possible through the Extension Services department of the College of Fisheries of Mindanao State University, Marawi City.

PROJECT COMPONENT AND TEAM COMPOSITION

I. Component I: Hypophysation

Team Leader: Ruben B. Silang
Members: Venerando Moldez
Zacaria Marohomsalic
Nasser Taurac

II. Component II: Fishpond Layout, Construction & Management

Team Leader: Roman P. Rosagaron
Members: Alejandro Gonzaga, Sr.
Oscar Gripaldo
Leopoldo Nicolas
Diosdado Dandoy
Cosain Rinabor

III. Component III: Lake Stocking

Team Leader: Letecia C. Escudero
Members: Amor Abrenica
Roman P. Rosagaron
Taib Tomiara
Cannie Cali

Project Management

Pedro T. Escudero
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Roman P. Rosagaron
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ACKNOWLEDGMENT

The College of Fisheries of Mindanao State University, Marawi City would like to express its sincere thanks and gratitude to the Philippine Council for Aquatic and Marine Research and Development of the Department of Science and Technology (PCAMRD-DOST) for the financial support extended to the project. Likewise, its gratitude also goes to all of the municipal mayors and barangay captains who had been instrumental in the success of the training sessions in their respective areas of jurisdiction. Without their invaluable assistance, this undertaking would have not been possible. Finally, to the officials of the university who have extended support and to all those who in one way or another have made this undertaking possible, our boundless thanks.

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