

# Social Status of the Fish-farmers of Floating-net-cages in Lake Maninjau, Indonesia

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## Abstract

The study surveyed the social status of fish-farming in Lake Maninjau of Indonesia. The structured interview using scheduled questionnaires were used in obtaining information from 240 fish farmers randomly selected from eight local sub-districts as the study areas. The eighth sub-districts were divided into three areas which involved the aquaculture zone of the lake. Data obtained were analyzed using descriptive statistics. The findings revealed that majority (39.16%) of the fish farmers were male with the age range of 31-40 years. It was about 55.41% of the fish farmer having household size 4-6 person, and 45.83% educational level was Senior High School graduates. The total annual income from sales of fish were IDR 10000000-IDR 20000000, 37.92% of fish farmers practiced the integrated fish-farming, and only 52.08% of the farmers practiced fish-production. 51.25% of the fish farmers got their information from their friends and fellow farmers. 73.33% of the fish farmers cultured Tilapia species, 77.91% of the fish farmers obtained their fingerlings from private hatchery, 96.66% of fish farmers stated that poor water quality as a major constraints to fish production. The results indicated that floating net-cages activities at the Lake Maninjau played essential role in the lives of fish-farmers for survival.

**Keywords:** Aquaculture; Fish farmers; Lake Maninjau; Indonesia

## Introduction

Food is the most basic necessity for every human being [1-3]. Food is not only necessary to support growth and human development through a series of physiological processes, is also often associated with socio-economic status [4,5]. Development of the world community in the 21st century has shown a propensity for changes in behavior and lifestyle and food consumption patterns to fishery products [6-8]. The sustainability of fish food production is highly dependent on the motivation and participation of fishermen and fish farmers [9,10], technology options are applied and enforced policies and should have a positive impact for their welfare [4,9,11].

Dealing with the social economic status of fish farmer in Lake Maninjau, Syandri examined the study on investment of floating net cages. He found that the investment was very beneficial economically [12]. He did not examine the social-economic status in perspective of age, education, marital status, income, household size, and number of floating net cages per household. While in Borgu, Niger State, Ahmed YB(2013) studied the socio-economic status focused on income of the society and social technology awareness [13]. According to him, the female earned 6000-10.000 ₦, while male did 11000-30000 ₦ with the technology awareness of fish-farming, V-bottom boat, solar-tent drier and trammel net. Syandri, et al., held research on water quality and tropic status in relation to mass fish-death with technology of floating net cages in Lake Maninjau [14]. The bad quality of water had caused fish to die in floating net cages. In addition, Pangemanan et al. studied the feasibility of the floating fish system-fish culture based on environmental and economic aspects in Lake Tondano, Indonesia, which resulted that all coastal areas were feasible for floating fish cage system-fish culture business except area of North Lake Tondano [15]. Study on the cost and return of fish-farming in Saki-East local government area of Oyo State, Nigeria resulted that the fish farming was profitable and expected to continue operating [16], while in Lake Abaya, Ethiopia, Sime SD found that majority of household (62.8%) gained their income from agriculture and fishing, where fishing was

important source of livelihood compared to agriculture [17]. Thus the previous studies did not include the social status of fish-farmers based on the aspects of age, education, marital status, income, household size, and number of floating net cages per household.

The paper examined the aspects in Lake Maninjau. Activity of fish-farming with floating net-cages in Lake Maninjau started in 1992 consisting of 16 units of cages with production of 96 tons [12]. In 2013, the cages increased to be 16,120 units which produced 12,090 tonnes of fish with value production of USD 2.1726 billion [14]. The farmed fish-species are Majalaya (*Cyprinus carpio*) and Tilapia (*Oreochromis niloticus*), but recently the Tilapia was more dominant species compared with Majalaya [18]. Fresh water aquaculture in Lake Maninjau was growing so very rapidly that it the society obtained income and jobs in the region [14,18]. According to FAO [19], the fishery sector was valuable and its importance was related to employment, livelihood support, poverty reduction, food security as well as foreign exchange. Moreover Singh stated that fisheries sector occupied an important place in the socio-economic development of the country [8].

The objective of the study is to survey the social status of fish-farmers in Lake Maninjau in order to analyze the socio-economic characteristic of the fish farmers, the production level of fish farmers, fish-farming management, and the constraints to the fish farming in the study area.

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**Received** September 23, 2015; **Accepted** October 28, 2015; **Published** January 15, 2016

**Citation:** Syandri H, Elfiondri, Junaidi, Azrita (2015) Social Status of the Fish-farmers of Floating-net-cages in Lake Maninjau, Indonesia. J Aquac Res Development 6: 391. doi:10.4172/2155-9546.1000391

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## Methodology

### Area of study

This study was carried out in Lake Maninjau West Sumatera Province, Indonesia. The lake is a tecto-volcanic, on geographical position E: 00°12'26.63" S: 0°25'02.80" and E: 100°07'43.74" E: 100°16'22.48", located at altitude of 461.50 m above sea level with the surface area 9,737.50 ha. Based on the Schmidt-Ferguson climate classification, the lake has the characteristics of climate types A and annual rainfall 3,490 mm. The lake is a natural resource that has a very important role as a tourist destination, Hydroelectric Power Plants with a capacity of 64 MW, capture-fisheries and as the farming of floating net-cages [12]. The lake is located in the district of Tanjung Raya divided into 8 local government areas, namely Maninjau, Bayur, Duo Koto, Koto Kaciek, Koto Gadang VI Koto, Koto Malintang, Tanjung Sani, and Sungai Batang (Figure 1).

### Sampling technique, sample size and data analysis

Random sampling techniques were employed in the selection of the samples, in fisheries zones of fisheries development programme of Lake Maninjau. The zones consisted of three zones. Zone I involved Maninjau, Bayur, and Duo Koto. Koto Kaciek, Koto Gadang VI Koto and Koto Malintang were part of zone II. In Zone III, there were Tanjung Sani and Sungai Batang. In the 8 local government areas, 30 fish-farmers were randomly selected as the informants from each of the local governments that totally 240 fish-farmers were randomly selected informants of research. The research used data collected from primary and secondary sources. Primary data were collected by doing the scheduled and structured interview, while secondary sources were collected through library study on textbook and journal publication on Aquaculture. The interview was used to collect data from the fish farmers. The data were analyzed by using descriptive statistics [20].

## Result and Discussion

Socio-economic characteristics of fish farmers floating net-cages as indicated in Table 1, majority of the fish farmers (39.16%) were 31-40 years. While the rest, 20.83% were 20-30 years, 19.63% were 41-50 years, and 19.58% were above 50 years. The mean age (60%) showed that the farmers were relatively young. The young farmers were productive and innovative and brave to have investments. Such condition was in line with Silviyunan [21] who examined fish-farmers floating nets cages in Lake Laut Air Tawar. She reported that the age group of 35-44 years (39.36%) was the most productive farmers. In gender perspective, majority of the respondents (88.75%) were males, while 11.25% were females. The fish-farming was dominated by male in the study area. Generally in Indonesia, majority of fish-farmers in lakes and rivers were men [9] where men played important role in the farming. Unlike in Lake Kanji, Basin Nigeria, the men did not play significant role in the development of the fisheries resources of the lake, but the women played the role [22]. In river state Negeria majority of the fish farmers (34.4%) were male of the age, 41-50 years old [23]. In addition, marital status of the respondent showed that majority of the fish-farmers (79.16%) were married, while 16.25% were single, and 4.58% were widow. Compared with marital status of cat-fish (*Clarias gariepinus*) farmers in Ibadan Metropolis, majority of the fish farmers (85.6%) were married [24].

Most of the respondents' house hold size were 4-6 persons (55.41%), while 24.58% of them had 1-3 persons. The house hold average was 6 persons, it was large family size. It implied that more

unproductive people were dependent on the productive ones. In education, most of the respondents (45.83%) were senior high school graduates, 27.08% were junior high school graduates, and 6.66% were university graduates. The finding was that most of the fish-farmers in the study area were educated people who could easily adopt innovations. This was supported by Pontoh [25], who analyzed fishery business on floating net cages in the village of Tandengan, Minahasa, North Sulawesi, Indonesia. He found that most of respondents were also Junior High School graduates. Silviyunan also found the same finding on majority of floating-net-cages farmers in Lake Laut Air Tawar, Banda Aceh, Indonesia [21]. Furthermore, in Punjab India education levels of aqua-farmers was university graduate (26%), senior high school graduates (38%), and junior high school graduates (22%) [8]. The main occupation of respondents in the study area was full-time fish farmers in majority (71.66%), and 10.41% of them were the retired civil servant-farmers. The rest of them worked as businessmen and farmers (11.25%) and as civil servants and farmers (6.67%). This implied that most of fish farmers devoted their time as fish-farmers.

The farmers had different experience in length. Most of them (37.08%) had 6-10 year-experience in fish-farming, 25.57% of them had 11-15 year-experience, and 21.25% of them had been experienced as the fish farmers for 16-20 years. Thus, most of the fish farmers in the study area were so experienced that they were potential to develop innovation for the increase of production. According to Pontoh O, human resources in the development of aquaculture were very important [25,26]. He stated that in the rural areas the human resources played very important role for the implementation of aquaculture operations.

Dealing with the fund of the farming, majority (50.41%) of the respondents had a personal funding, while 25.41% of them got funding from juragan, 13.75% from family, and 9.58% from Bank allowance. Personal funding could only have 8 units of floating net-cages maximally. Farmers who had funding from juragan and Bank could have more than 8 units of floating net-cages. Majority (61.66%) of land for farming in the study area belonged to the farmers themselves (their own lands), the rest 24.17% were rented, and 14.16% were the crop-sharing-rented lands. The annual income of the fish farmers was that majority (32.08%) of the farmers earned from IDR 10,000,000 to IDR 20,000,000, 25.42% earned from IDR 21,000,000 to 30,000,000, while 22.5% earned above IDR 40,000,000. As claimed by Tunde et al. the fish farming was profitable for the people who worked as the fish farmers. It was a profitably additional job for the people living the study area [16].

The result of the study revealed that majority (52.08%) of the farmers were fish farmers having business focused on fish-farming activity only, while others were the fish farmers with the integrated fish-farming activities: 20.41% practiced fish and rice farming, 20% practiced fish and cocoa farming, and 7.5% of them practiced fish and cattle farming (Table 2). The integrated fish-farming in a region was highly dependent on the location, topography, rainfall, growing-season, and technology owned by the farmers [11,27,28].

Regarding with the information on the fish farming, majority (51.25%) of the respondents got the information from their friends and fellow farmers, 29.16% from mass media, 8.75% from agents and juragan, while 2.08% of the farmers got the information from internet (Table 3). Compared with that of River State Nigeria, majority (58.9%) got information from friends and fellow farmers, and 3.3% from internet [29]. Table 4 indicated that majority (73.33%) of fish farmers cultured Tilapia species as their fingerlings, 17.91% cultured Common carp, and 8.75% cultured tilapia and Common carp respectively. Furthermore, majority (77.91%) of the fish farmers obtained their

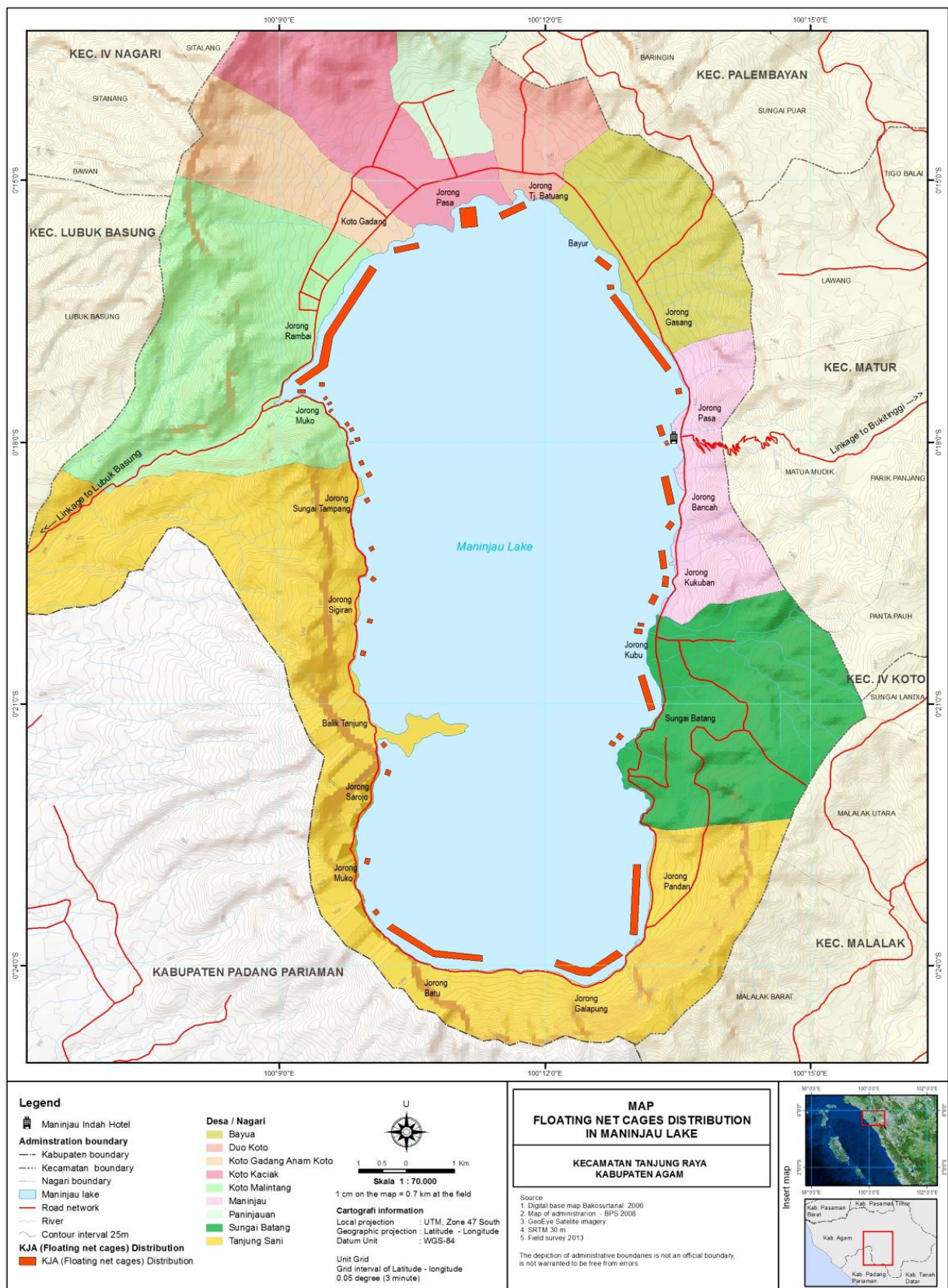


Figure 1: Map of Lake Maninjau of Agam Regency-Indonesia showing the study area.

Parameters	Frequency	Percentase	Mean
<b>Age of respondents</b>			
Less than 19	0	0	40,5
20-30	50	20.83	
31-40	94	39.16	
41-50	49	20.41	
More than 50	47	19.58	
Total	240	100	
<b>Sex of respondents</b>			
Male	213	88.75	
Female	27	11.25	
Total	240	100	
<b>Marital status of respondents</b>			
Single	39	16.25	
Married	190	79.16	
Widowed	11	4.58	
Total	240	100	
<b>Household size (person)</b>			
1-3	59	24.58	5
4-6	133	55.41	
7-10	48	20	
Total	240	100	
<b>Educational level</b>			
Primary and below	49	20.41	
Junior High School	65	27.08	
Senior High School	110	45.83	
Graduate and above	16	6.66	
Total	240	100	
<b>Primary occupation of respondents</b>			
Fulltime farming	172	71.66	
Farmings and business	27	11.25	
Farming and civil servant	16	6.67	
Retired civil servant and farmers	25	10.41	
Total	240	100	
<b>Farming experience (years)</b>			
1-5	23	9.58	
6-10	89	37.08	
11-15	77	32.08	
16-20	51	21.25	
Total	240	100	
<b>Source of venture funding</b>			
Personal funding	121	50.41	
Family funding	33	13.75	
Juragan funding	61	25.41	
Bank funding	23	9.58	
Total	240	100	
<b>Number of floating net cages/ household (units)</b>			
Less than 4	56	23.33	
5-8	71	29.58	
9-20	48	20.0	
More than 20	65	27.08	
Total	240	100	
<b>Land Ownership</b>			
Inherited	148	61.66	
Leased-rent	58	24.17	
Share cropping	34	14.16	
Purchased	0	0	

Total	240	100	
<b>Annual income from sales of fish</b>			
IDR 10000000- IDR 20000000	77	32.08	
IDR 21000000 – IDR 30000000	61	25.42	
IDR 31000000- IDR 40000000	48	20	
Above IDR 40000000	54	22.5	
Total	240	100	

Source: Primary survey data, 2015-08.

**Table 1:** Demographic chararacteristic of fish-farmers (n=240).

Integrated fish farming activities	Frequency	Percentase
Fisheries and rice agriculture	49	20.41
Fisheries and cattle farm	18	7.50
Fisheries and cocoa agriculture-plants nutmeg	48	20.00
Fisheries only	125	52.08
Total	240	100.00

Source: Primary survey data, 2015-08.

**Table 2:** Integrated fish farming activities (n=240).

Sources of information for fish farmers	Frequency	Percentase
Extension agents	21	8.75
Friends/fellow farmers	123	51.25
Mass media	70	29.16
Juragan	21	8.75
Literature	5	2.08
Internet	0	0
Total	240	100

Source: Primary survey data, 2015-08.

**Table 3:** Sources of information for fish farmers (n=240).

Types /species of fingerlings used	frequency	Percentage
Tilapia	176	73.33
Common carp	43	17.91
Tilapia and Commoncarp	21	8.75
Total	240	100.00
Source of fingerlings		
Personal hatchery	48	20.00
Government hatchery	0	0.00
Private hatchery	187	77.91
Wild	5	2.08
Total	240	100.00

Source: Primary survey data, 2015-08.

**Table 4:** Types species and source of fingerlings (n=240).

Constraints	Percentage
Inadequate infrastructure	68.33
Inadequate supplay of fish feeds	15.83
Irregular electricity supplay	17.50
Poor finance	50.41
Poor hatchery facilities	20.00
High cost of feeds	83.33
Hight price of input/production	88.33
Diseases	71.66
Poor water quality	96.66
Poor services	65.00
High cost of management	42.50
Poor marketing	30.41

Source: Primary survey data, 2015-08.

**Table 5:** Constraints to fish farming in the study area (n=240).

fingerlings from private hatchery, 20% of the fish farmers got their fingerlings from personal hatchery. This implies that most of the fish farmers did not have hatchery in their farms.

Table 5 revealed that majority (96.66%) of the farmers stated that poor water quality was a major constraint to fish production in the study area. Other factors which were constraints to fish-farming in the study area were: high price of input (88.33%), high cost of feeds (83.33%), diseases (71.66%), and inadequate infrastructure (68.33%). The constraints factors reduced fish-production and social income in the study area.

## Conclusion

The research resulted in that the aquaculture of the floating-net cages played an important role to increase fish production and fish farmer's income. Majority of the fish farmers obtained annual income which could support the daily need. In farming, a few farmers practiced the integrated fish-farming, and most of them practiced fish-production farming. The farmers were dominated by men with the age range of 31-40 years. They had 4-6 person-household in average, and educationally majority of them were Senior High School graduates. Information on the farming was gained from their friends and fellow farmers. No information they got from internet due to being busy with their farming. Poor water quality of Lake Maninjau led most of farmers to culture Tilapia species of which the fingerlings derived from private-farmed hatchery. The poor water quality was a major constraint to fish production.

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