

**NATIONAL FISHERIES RESOURCES RESEARCH
INSTITUTE (NaFIRRI)**

**Impact of Cage Fish Farms Operations on Socio-economic Activities of
Surrounding Communities in Buikwe district.**

Technical Report for Quarter four (April – June 2016)

By:

- 1. Robert Egessa**
- 2. Angela Nankabirwa**
- 3. Hikmah Nabukenya**

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EXECUTIVE SUMMARY

In Africa, subsistence-level pond-based system has been the focus since the 1950s, with cage aquaculture starting in the 1980s in sub-Saharan Africa. The benefits of cage fish farming include: poverty alleviation, employment, community development, reduction of exploitation of wild fish stocks, increase in fish supplies and export earnings for the country. However, cage operations also affect water environment and socio-economic activities of other resource users. NaFIRRI has been monitoring the water environment within and around cages but there is scarcity of information on impact of cages on socio-economic activities of surrounding communities. Since socio-economic elements are at the core of most developmental initiatives, a study was carried out in the communities (Bugungu, Busaana and Namusenyu-Buikwe district) close to established cage fish farms on Lake Victoria. The aim was to assess whether established cages are threatening fishing, navigation/transport, recreation, tourism, cultural services, or agricultural activities of the surrounding communities.

Therefore, a cross-sectional study was carried out on households at or near landing sites close to cage fish farms. Data was collected from: capture fishers, navigators, farmers, fish traders, retail business (restaurants, bars, shops and other small business), local leaders as well as fish farms managers. Of the total (n=178) respondents, 57.3% were fishers, 1.12% were involved in shipping, 10% in crop or livestock farming, 23.6% were fish traders while 6.8% were involved in retail business (restaurants, bars, shops and other small business) at the landing sites. Of the total respondents (n=178), 59.5% (n=106) reported negative impact of the farms on fishing. Among these (n=106) respondents, 50 (47%) were from Busaana, 36 (34%) were from Bugungu and the rest, 20 (19%) were residents of Namusenyu. Complaints such as: cages reduced fishing space and restriction of fishers and navigators from operating close to cages by farms were reported in all the communities studied, with the severity of these impacts varying according to the locality and fish farm operation. Other perceived negative impacts such as: dispersion of fish making it hard to catch due to the use of what they termed “noise equipment” was reported in Busaana; while dispersion of fish by light from fish farms was reported at Namusenyu. Respondents also indicated to have benefited from some cage fish farms through buying fish and gaining income through part time jobs. These results suggest that fishing was the most negatively affected of all the socio-economic activities. It is important that farm management put in place all considerations agreed upon during the initial stages of the project to create trust and ensure cooperation with the residents of communities the farm is located.

1.0 INTRODUCTION

Aquaculture contributes over 40% of world fish supplies and is one of the fastest growing food producing sectors (FAO, 2006). In Africa, subsistence-level pond-based system has been the focus since the 1950s. However, as momentum for aquaculture development grew and the need for aquaculture research received government recognition as part of national development plans, cage culture was introduced, starting as early as 1980s in sub-Saharan Africa (Blow and Leonard, 2007). The benefits of cage fish farming include: poverty alleviation, employment, community development, reduction of exploitation of wild fish stocks, increase in fish supplies and export earnings for the country. However, the practice of cage fish farming may also result in unintended and negative consequences on other socio-economic activities such as: capture fishing, tourism, recreation activities (e.g. diving, boating and swimming), navigation, cultural services (spiritual e.g. sacred/religious, inspirational) and agriculture especially in the riparian communities.

In Uganda, the establishment of cage fish farms on Lake Victoria requires that one acquires a license, and to ensure compliance to regulations, fish farms need to be monitored for damage on water environment and socio-economic activities of other resource users. Before establishment of cage fish farms, information on: physical, chemical, biological and socio-economic parameters is established as baseline for monitoring of cage culture operations. Monitoring of environmental impact of cages has been done by NaFIRRI at Masese in Jinja district, and Source of the Nile (SON) in Buikwe district through quarterly collection of data. However, cage operations also affect socio-economic activities of other resource users on water through competition for space (Whitmarsh and Palmieri, 2009) or even on land especially where other onshore facilities related to cages are established. Therefore, socio-economic elements cannot be excluded as they are at the core of most developmental initiatives. For instance, public acceptability and perception, stakeholder conflict (e.g. user groups such as fishers, navigators, environmental groups, etc.), and limited education and information exchange affect aquaculture development (Morake, 2011). This report presents results from a socio-economic study carried out in the communities of Bugungu, Busaana and Namusenyu, focussing on residents living and operating in the vicinity of established cage fish farms on Lake Victoria, Buikwe district. The aim was to assess whether established cages are threatening fishing, navigation/transport, recreation, tourism, cultural services, or agricultural activities of the surrounding communities.

2.0 METHODOLOGY

2.1 Study design

This was a cross sectional study carried out from 16th to 20th June 2016. Investigations centred on households at or near landing sites close to cage fish farms. Local leaders were consulted before any interviews were conducted in the area. The consultation with local leaders aimed at gathering information on an estimate of the number of people in a given community, number of households and range of socio-economic activities present in the area and operating close to aquaculture operations on water. In-depth individual interviews were also conducted with household heads or other available members. Discussions were also held with cage fish farm management to obtain information on cage fish farm operations.

2.2 Site selection for the study and description of the study area

Five sub-counties and 20 parishes in Buikwe district border Lake Victoria. From Mukono-Buikwe border and Owen falls dam, there are 52 fishing communities/landing sites giving an average of one fishing community for every three kilometres of shoreline (ICEIDA, 2013). Three landing sites: Bugungu, Busaana and Namusenyu were selected for this study because they contained well established cage fish farms in the vicinity.

2.2.1 Bugungu landing site

Bugungu landing site is located in Bugungu village, Njeru south parish, Njeru T/C, Buikwe district. The village had one established cage fish farm located at Bugungu landing site (Figure 1). The farm had both small and big cages placed in two sites: site 1, the initial cage site comprised of about 500 small cages while site 2 had 38 medium cages. Between the two sites was a fishing ground and a navigation route from Bugungu landing site to Jinja town across Napoleon Gulf.

2.2.2 Busaana landing site

Busaana landing site is located in Busaana village, Tongolo parish, Nyenga Sub-County, Buikwe district. The village had one established cage fish farm located at Busaana landing site (Figure 1). The cage fish farm started in 2014 although actual production started in 2015. The farm had a total of 130 cages comprising of: 27 round big cages (26 cages with a diameter of 20m and one cage with a diameter of 10m), 52 small squared cages of dimension 2x2m, and 51 big squared cages of dimension 6x6m. At Busaana landing site, there was another fish farm

with seven cages in two groups owned by a group of residents, of which the chairperson local council one (LC1) was a member.

2.2.3 Namusenyu landing site

This is located in Busagazi East village, Busagazi parish, Najja Sub-County, Buikwe district. The village had one established cage fish farm located at Namusenyu landing site (Figure 1). The operation of the farm started in 2013 with about 8 cages and had expanded to 98 cages by the time this survey was conducted.

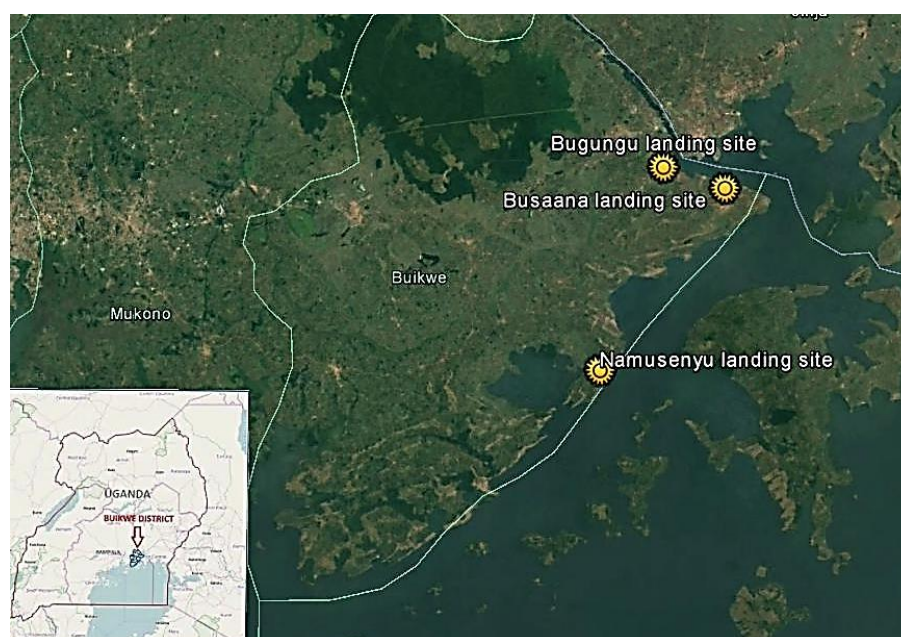


Figure 1. Study areas of Bugungu, Busaana and Namusenyu. Source: field survey (GPS locations) and ICEIDA 2015 (inserted map).

2.3 Research participants

The survey targeted residents whose activities were: fishing, navigation, agriculture close to fish farms, tourism, recreation (e.g. diving, boating) and cultural services (spiritual e.g. sacred, religious; inspirational e.g. art, aesthetic, etc.). In addition, key users: restaurant owners, fish traders and other business operators were identified as stakeholders because they are also directly affected especially during navigation on the lake or through fish supply from the cages. Each of these selected residents belonged to a different household and therefore each represented a household.

2.4 Research instrumentation

A questionnaire was used to collect data on experiences, perceptions, attitudes, and behaviours held by residents regarding the impact of cage fish farming on: fishing, shipping/navigation,

cultural services, recreation, tourism, and agriculture in the community. The questionnaire comprised of closed and open questions.

2.5 Sample size and data collection

Sample size was calculated following the formula by Yamane (1967) for categorical data, using demographic information on Buikwe district (ICEIDA, 2015; Uganda Bureau of Statistics, 2016). Data was collected using questionnaires to randomly selected respondents at landing sites and nearby households, each respondent from a different household. Data collection was conducted by 3 officials from NaFIRRI assisted by 3 community participants who helped in mobilisation of residents for the interview, over a period of four days in June 2016. The interviews were conducted individually. The survey questions were asked and an opportunity to seek clarity on the questions provided to the participants. This was to ensure that views of the participants with low literacy level are properly captured. Each interview session took 15-20 minutes.

Data was collected from: capture fishers, navigators, crop farmers, fish traders, retail business (restaurants, bars, shops and other small business), local leaders as well as fish farms managers. Socio-economic sectors that are non-fisheries (Tourism, recreation centres and cultural), were not in the proximity of the areas surveyed according to information from the local leaders and were therefore not considered. Data collected included: experiences and perceptions of residents about cage aquaculture operations in relation to their socio-economic activities, location settings using a Garmin GPS, photos where the leadership agreed to taking of the pictures of activities and landing site. Data captured was then entered in Statistical Package for Social Sciences (SPSS) software for analysis.

2.6 Data analysis

Data derived from the questionnaire was captured and analysed statistically using SPSS software. Descriptive statistics, frequencies tables and graphs were used to present the results. Further analysis was done on general comments of the respondents by summarising and categorising their responses. A profile of participants was compiled based on the questions that addressed personal information.

3.0 RESULTS AND DISCUSSION

3.1 Profile of participants/respondents

3.1.1 Age, marital status, family size, tribe and education status

A total of 178 respondents were selected from Bugungu, Busaana and Namusenyu landing sites. Of the total respondents, 60 were from Bugungu, 62 from Busaana and 56 from Namusenyu. More than half (52%) of all the participants had lived their entire lives in these areas. Majority (84.2 %, n=150) of the respondents were married, with an average family size of 5.7 individuals, typical of traditional agriculture, where labour is the most significant resource especially during critical periods (Oluwemimo & Damilola, 2013). The largest proportion, 56% (n=100) of respondents, ended in primary, followed by ordinary level (32.6%, n=58) with the least proportion (1.1%, n=2) attending vocation school (Table 1). However, no significant difference ($p=0.722$) in education status of respondents was observed among the three communities. As shown in table 1, 74.2% (n = 132) of respondents were less than or just 40 years of age, with a mean of 34.6 years, which is the active age for production (Oluwemimo & Damilola, 2013). It is this young age of respondents which is reactionary and progressive, and given favourable conditions, should have the ability to take risks and adopt modern innovation when they perceive it to be capable of yielding higher incomes. However, given the low level of education of respondents, understanding the technical requirements of fish farming as well as make use of innovations and new techniques of fish management, besides comprehending policy measures put in place to ensure socio-economic and environmental sustainability of fish farming seems an obstacle.

Of the total respondents (n=178), 66.3% (n=118) were males and 33.7% (n=60) were females. The composition of respondents by tribe is represented in figure 2. A total of 14 tribes were recorded among the respondents. Baganda, Basoga, Bagisu, Bagwere and Banyoli respondents were common to all the three locations. Majority of the respondents were Basoga followed by Baganda (Figure 2).

Table 1 Age, marital status, family size and education status of participants

Characteristic of respondents	Frequency of respondents						Total	Mean value
	Bugungu		Busaana		Namusenyu			
	Male	Female	Male	Female	Male	Female		
Age								
≤ 20	0	0	2	0	0	0	2	34.6
21-30	18	10	14	6	22	2	70	
31-40	8	10	12	8	18	6	60	
41-50	0	6	10	4	4	2	26	
51 and above	4	4	4	2	2	0	16	
Marital status								
Single	4	4	2	4	8	0	22	5.7
Married	26	24	38	16	38	8	150	
Divorced	0	0	2	0	0	0	2	
Widowed	0	2	0	0	0	0	2	
Separated	0	0	0	0	0	2	2	
Family size								
1-5	20	14	24	10	22	4	94	5.7
6-10	10	12	10	10	22	6	70	
11-15	0	4	6	0	2	0	12	
Education status								
No education (illiterate)	0	4	2	2	4	2	14	5.7
Primary	22	12	24	14	24	4	100	
Ordinary level	6	14	14	4	16	4	58	
Advanced level	2	0	0	0	2	0	4	
Vocation school	0	0	2	0	0	0	2	

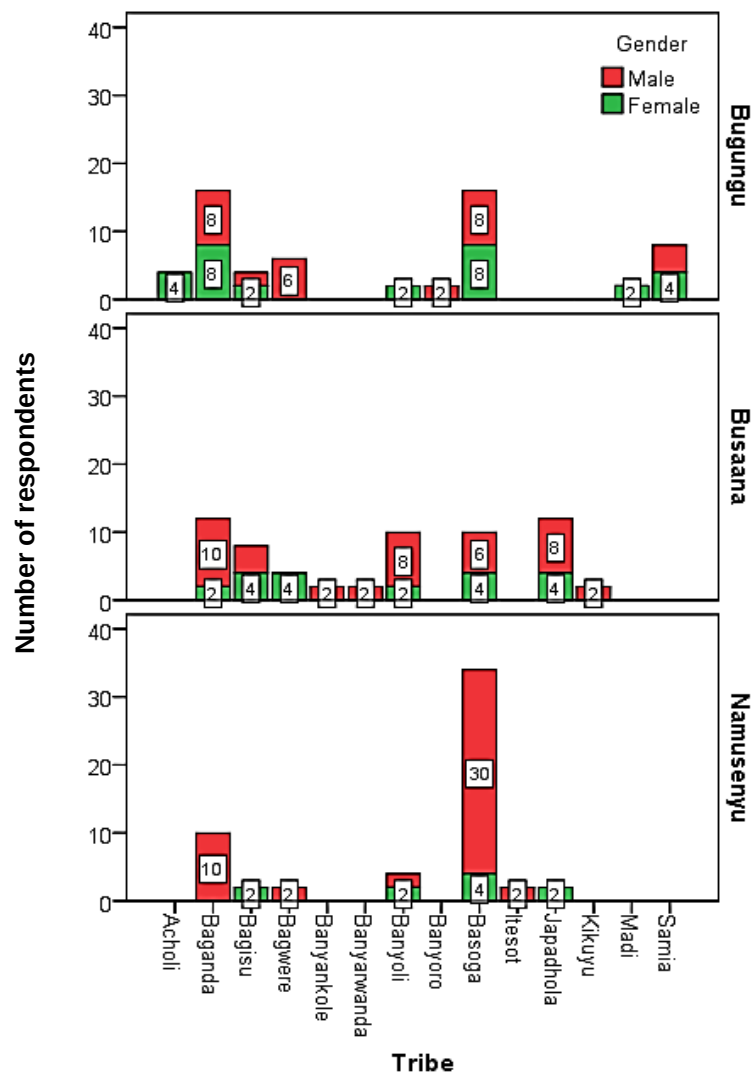


Figure 2 Number of respondents by gender and tribe in Bugungu, Busaana and Namusenyu.

3.1.2 Socio-economic activity and income of respondents

Of the total (n=178) respondents, 57.3% (n=102) were fishers, 1.12% (n=4) were involved in shipping, 10% (18) in crop or livestock farming, 23.6% (n=42) were fish traders while 6.8% (n=12) were involved in retail business (restaurants, bars, shops and other small business) at the landing sites (Table 2). According to the local leaders, majority of the people at or close to the landing sites were fishers. Although the negative impact of cage fish farm operations on fish traders and other retail business was largely through impact on fishers and therefore seen as indirect, they could also be directly affected especially when navigation routes were obstructed, preventing their easy access to other areas across the lake. Male respondents dominated in fishing activity whereas females dominated in fish trade, agriculture and retail business (Figure 3).

Table 2 Main socio-economic activities of respondents.

Socio-economic activity		Crop or livestock farming				Retail businesses	Total
		Fishing	Shipping	Fishing	trading		
Village	Bugungu	24	2	12	16	6	60
	Busaana	40	2	0	18	2	62
	Namusenyu	38	0	6	8	4	56
Total		102	4	18	42	12	178

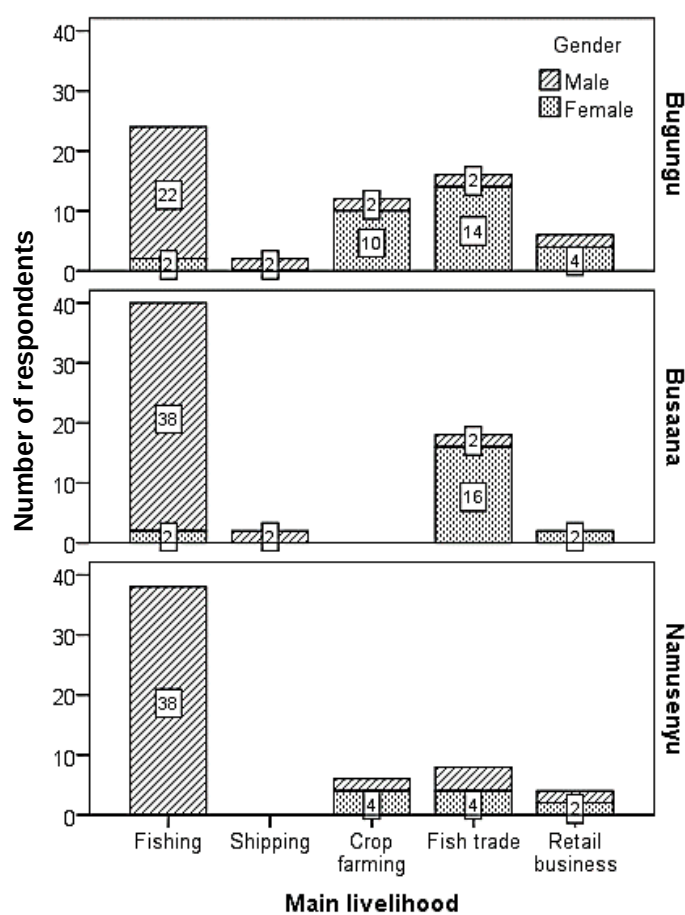


Figure 3 Socio-economic activities of respondents by gender.

The respondents were divided into six groups based on the level of their monthly income. Majority of the respondents earned below Ushs.100, 000 monthly. For instance, 50%, 54.8%, and 53.6% in Bugungu, Busaana and Namusenyu respectively, earned below Ushs.100, 000. As income level increased, the number of respondents decreased with about 3% (n=2) of the

respondents in each site stating they earned above Ushs.500, 000 (Figure 4). These few individuals were mainly fish traders especially in Bugungu and Namusenyu communities.

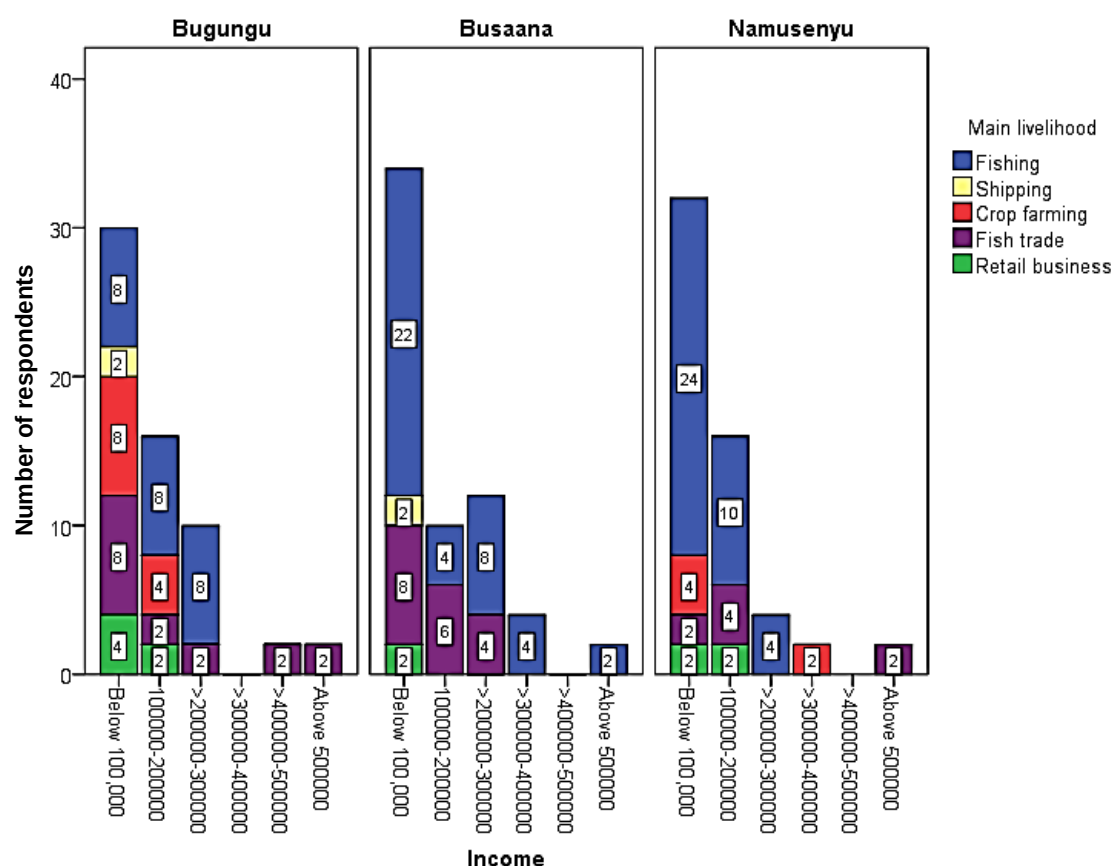


Figure 4 socio-economic activities of respondents and income level.

3.2 Experiences and perceptions of respondents in relation to cage culture operations

3.2.1 Respondents' livelihood status before and after establishment of cages

Respondents were asked to compare the status of their livelihood before and after the cages were introduced in the area using three point Likert-type scale: better, same or worse. Of the total (n=178) respondents, 62.9% (n=112) perceived the situation as worse while 7.9% (n=14) perceived it as better (Figure 5). All respondents (100%, n=62) from Busaana perceived the status of their livelihood worse than that before the cages were established (Figure 6). However, majority of respondents at Bugungu (n=30, 50%) reported the status as better while at Namusenyu, majority (42.9%, n=24) reported that the status was the same (Figure 6).

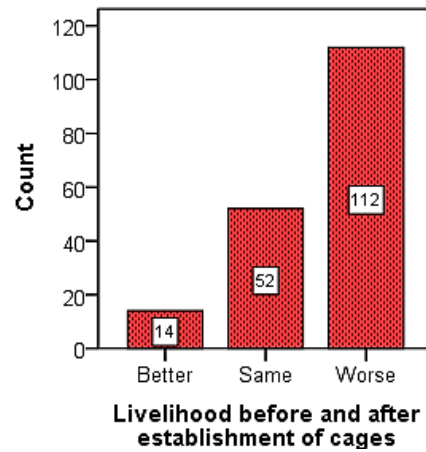


Figure 5 Status of respondents' livelihood before and after establishment of cages.

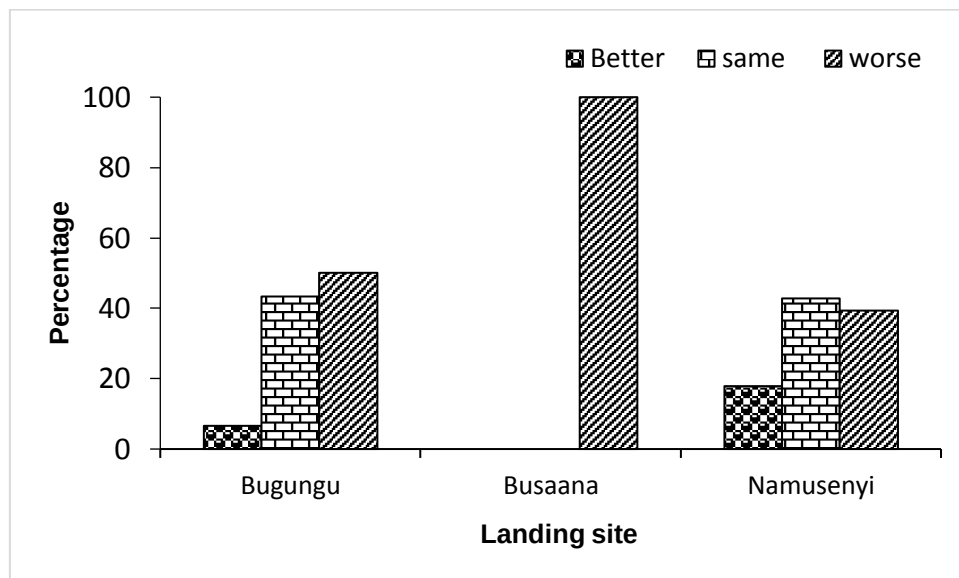


Figure 6 Status of livelihood before and after cages establishment by landing site.

3.2.2 Impact of cage fish farm operations on socio-economic activities

Of the total (n=178) number of respondents, 64.1% (n=114) indicated to have problems with cage culture operations. Of the 114 respondents, 50.9% (n=58) were from Busaana, 24.6% (n=28) from Bugungu and another 24.6% (n=28) from Namusenyu. Majority, 93.5% (n=58 of 62) of respondents from Busaana reported to have problems with cages and their activities were negatively affected by cage fish farms as well. However, this was different from respondents of Bugungu and Namusenyu where majority (>50%) indicated to have no problems with nearby cages and their activities were not negatively affected (Figure 7).

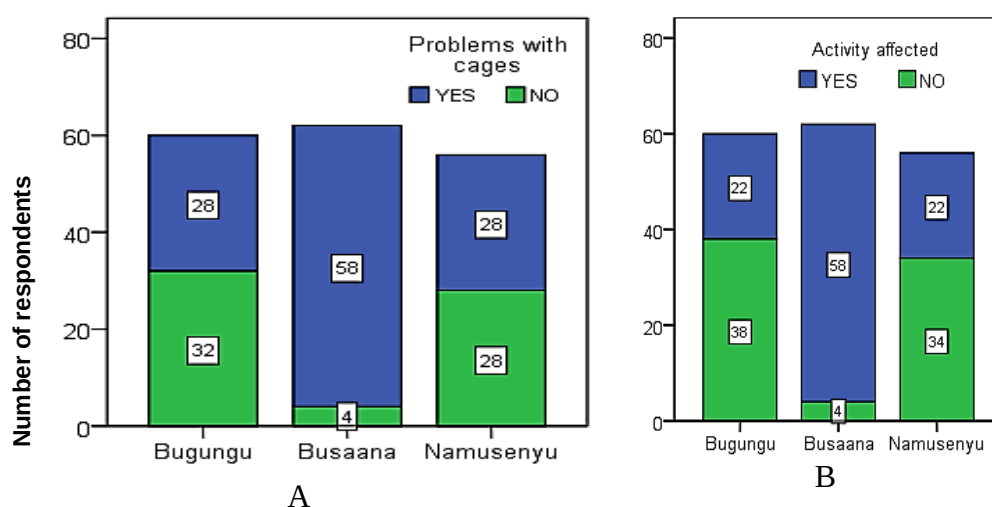


Figure 7 Number of respondents who: had problems with cages (A) with activities affected (B).

In all locations, respondents who practised fishing were the mostly affected. For instance, at Busaana, 95% (n=38 of 40) of respondents who practised fishing reported to have problems with cages and their activities were affected. Besides that, all participants also indicated more knowledge about impact of cages on fishing than any other activity. With the exception of fishermen who indicated impact of cages on their activity, other participants, notably those who belonged to other activities could not state impact on their activities but rather stated impact on fishing clearly indicating that fishing was the most affected.

A similar trend applied to fish trading at Busaana with 88.9% (n=16 of 18) of fish traders indicating they had problems with cages and their activities were affected as well. However, at Bugungu and Namusenyu, majority of the respondents who were not fishers indicated no problems with cages and their activities were not affected by the nearby farm (Figure 8).

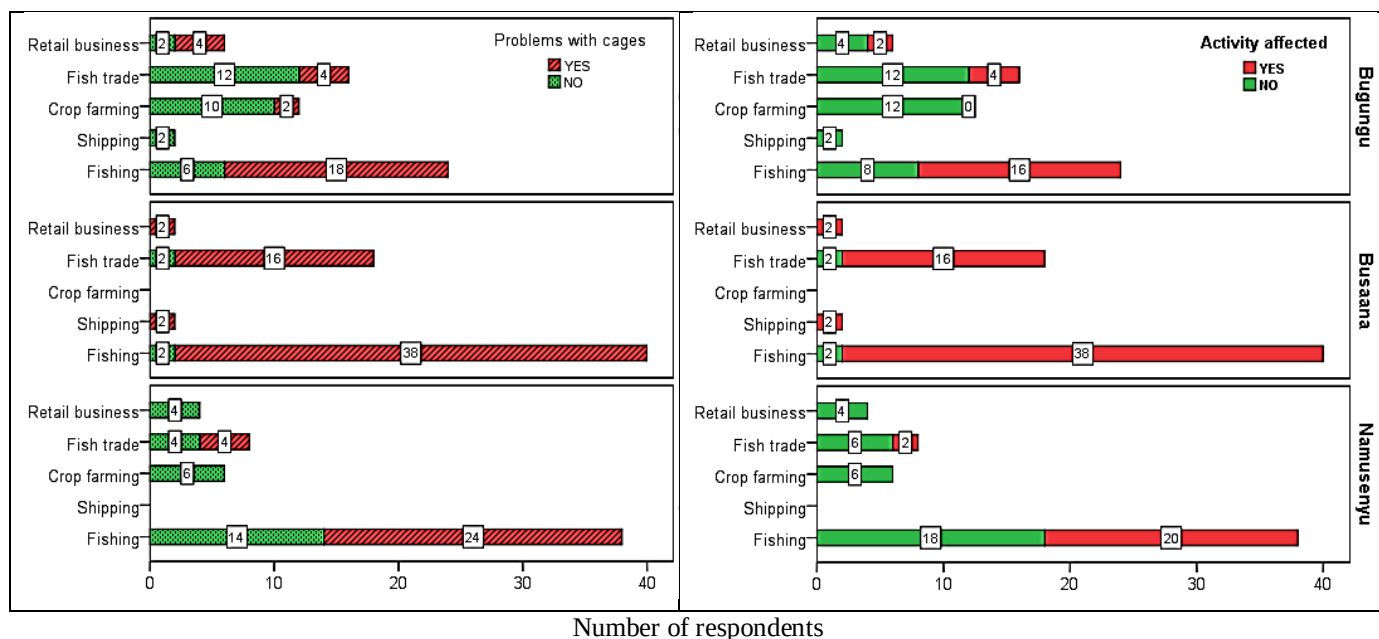


Figure 8 Number of respondents by socio-economic activity who had problems with cages with activities affected

3.2.2.1 Impact on fishing

A total of 106 (59.5%) of respondents indicated negative impact of the farms on fishing. Of the 106 respondents, 50 (47%) were from Busaana, 36 (34%) were from Bugungu and the rest, 20 (19%) were residents of Namusenyu. Table 3 shows the responses that were generated by the participants/respondents regarding the impact of nearby fish farms on fishing.

Table 3 List of impacts perceived by respondents and the number of times response was mentioned.

No.	Responses of participants/respondents	Number of times mentioned			Total
		Bugungu (n=60)	Busaana (n=62)	Namusenyu (n=56)	
1	Not allowed to fish near cages	20	20	2	42
2	Space for fishing reduced	18	6	14	38
3	Installed “noise equipment” that scares away the wild fish	-	6	-	6
4	Fish aggregates at the cages	2	2	-	4
5	Light from the cages disperses fish at night	-	-	8	8

Complaints on restriction of fishing near cages were more at Bugungu and Busaana compared to Namusenyu while reduction of space for fishing was noted most at Bugungu followed by Namusenyu and least at Busaana (Table 3). According to the respondents (n=38, Table 3), fishers get low fish catch because the establishment of cages reduced space for fishing.

Respondents (n=42, Table 3) also indicated that the space was further reduced when cage operators restricted fishermen from fishing near the cages. Many fishers now compete for the small space for fishing to the extent that some miss fishing on particular days or have to travel long distances in search of available fishing ground.

Aquaculture structures are considered hazards and barriers by fishermen and lake navigators (Araullo, 2001). Most of the conflicts between capture fishers and aquaculture operations arise when space becomes limiting, creating competition for the resource. In the event, fishers seek to fish close to the cages, which according to fish farm management is impossible for reasons related to theft. According to the management of the fish farm at Bugungu, fishers were restricted to fish within a distance of about 100m off the cages for security reasons. Farm operators feared that fishers when allowed could interfere with their activities. However, at Namusenyu, fishers were allowed to fish as close as 10m from the cages which could have attributed to a lesser number of respondents indicating that the farm had restricted fishing near cages compared to the fish farms at Bugungu and Busaana (Table 3). In terms of available open water space close to the landing sites, Busaana had a large expanse of water compared to Bugungu and Namusenyu. However, due to the large available open water space, only 6 of the 62 respondents at Busaana indicated reduction in fishing space (Table 3). Therefore, any installation of cages in an already small area of water close to the landing site creates a perception of reduction in fishing space.

Eutrophication, the attraction and aggregation of fish near cages, changes in fish diets associated with the culture environment, changes in the benthic community and the dispersal of non-native species, are some of the socio-environmental problems associated with cage fish operations (Demétrio et al., 2012; Uglem et al., 2014). Four respondents, two from Bugungu and another two from Busaana indicated that fish aggregated at the cage sites due to food availability and this resulted into low fish catch. As part of the monitoring process, NaFIRRI has been monitoring the impact of the fish farm at Bugungu on environmental and fisheries parameters since 2011. Results suggest no clear trend in fish abundance, species richness, and evenness near and away from the cages.

A total of six respondents at Busaana attributed low fish catches due to the use of what they referred to as a “noise equipment” by the fish farm. According to the respondents, this scares away wild fish. However, we could not verify from the farm whether the noise equipment respondents referred to was an acoustic deterrent device or not and whether the farm was using

it or not. Such equipment have been used in marine aquaculture to prevent damage to caged fish by aquatic mammals and birds (Bevan et al., 2002).

Eight respondents at Namusenyu reported that the farm uses strong lights which they attributed to be dispersing fish making them hard to catch. On the other hand, this would be seen as an advantage to disperse aggregating fish away from the cages for exploitation by fishermen (Arechavala-Lopez et al., 2010). The low fish catch cannot be attributed to the cages alone as it is widely known that fish abundance in the lake has dwindled (Balirwa et al., 2003; Ogutu-Ohwayo, 1990).

3.2.2.2 Impact on Navigation

There was no response on negative impact of the cages on navigation route from all the respondents (n=60) at Bugungu. However, two respondents indicated that initially there was conflict over the navigation route when the farm wanted to expand the business to areas covered by other users which was resolved through dialogue. According to the respondents, if this plan had continued, the navigation route would have been blocked.

At Busaana, there were two cage fish farms, a small farm owned by residents and a large farm owned by a foreign investor. Respondents (n=22, 35.5%) indicated that the large farm blocked the navigation route and restricted navigation near cages. According to the respondents, the shortest navigation route to Nansu, Lingita and Namugongo was blocked and now navigators use more fuel and take long time to reach these destinations. Respondents also indicated that the blocked route used to be an escape route from the lake to the land during bad weather. However, information from management of the large farm indicated that only navigators using boats with oars and not engines are allowed to navigate close to the cages as shown in Figure 9. The fact that 36.7% (n=22 of 62) of respondents at Busaana indicated that the navigation route was blocked by the fish farm suggests that the farm blocked a major navigation route. All respondents (n=62, 100%) at Busaana also indicated that the small locally owned cage fish farm did not block the navigation route and lake users including fishers are not restricted from operating close to the cages (Figure 10).

At Namusenyu, two (3.6%) respondents indicated that they were not allowed to navigate near cages as well as indicating that a shortcut navigation route was blocked by the farm. However, majority (n=54, 96.4%) responded that the farm did not block any major route and are not restricted from navigating close to the cages. According to management of the farm at Namusenyu, lake users are only allowed to operate at a distance of $\geq 10\text{m}$ off the cages.



Figure 9 Navigators using oars in a canoe move past cages of the large farm at Busaana. Source: field survey.



Figure 10 A small cage fish farm at Busaana: P and Q are cage groups, A and B show boats moving freely near cages. Source: field survey.

3.2.2.3 Impact on agriculture

Aquaculture developments do not only end on water but also extend onshore through construction of other facilities such as buildings for staff and stores for feeds which can displace people leading to social disruption. Respondents were asked whether cage fish farm operations were negatively impacting nearby agricultural activities on land next to aquaculture operation. Of the total (n=178) respondents who participated in the survey, none reported negative impact of the farms on existing nearby agricultural activities. However, 12.4% (n=22) reported that the large fish farm displaced residents on land leading to loss of agricultural farms next to the fish cages. Of the 22 respondents who reported displacement of residents, 20 were from Busaana and two from Namusenyu. Respondents reported that residents who never wanted to sell their land were forced to sell after being surrounded by land bought by farm owners to set up onshore developments related to aquaculture (Figure 11). Information from the large fish farm at Busaana showed that the farm owned a piece of land measuring 36.422ha (90 acres)

stretching from the shore. Some residents were seen within the fence and these claimed not to have been compensated. One of the residents was observed exchanging bitter words with employees at the farm.



Figure 11 An established onshore facility belonging to the large farm at Busaana. Source: field survey

3.2.2.4 Impact on fish trade and retail business (Bars, restaurants, shops, other small businesses)

A total of 54 (42 fish traders and 12 retail business, Table 2) respondents participated in the survey and these comprised 30.3% of the total (n=178) respondents. Of the 54 respondents, 44.4% (n=24) indicated were negatively impacted by cage fish farms. The rest (n=30) indicated were not negatively affected by the cages instead they derived some benefits through buying fish or part time jobs during fish harvesting especially at Bugungu, and Namusenyu fish farms. Respondents who reported were affected, explained that when fishers are affected, they too become affected because they mainly buy fish from capture fishers. All the respondents from Busaana indicated they had only benefited from the small fish farm owned by residents.

Aquaculture operations can impact fish traders and other retail business especially restaurants positively and negatively. Positively, they benefit through buying fish from the cage farms. Such a positive impact from aquaculture would be hoped to result into reduction in fish prices and increase fish consumption in the communities. In absence of fish supply from cage farms, capture fishers remain the source of fish sold in the community. Therefore, any negative impact on capture fishers is perceived to affect those dependent on them as well. However, this had not been the case with the large farm at Busaana where all (n=62) the respondents reported that the farm was not selling fish to the locals. Information from the farm management also indicated that the farm targeted foreign market where prices were higher. Fish traders have

therefore continued to rely on capture fishers for fish supply and any negative impact of fish farms on fishers creates negative perception and behaviour by the residents. Besides that, all respondents at Busaana also reported that the locally owned fish farm had benefited them because the farm sells fish during harvesting period to the locals. However, given its small size and low production, most of the perception was biased to the large farm.

3.2.3 Relations of respondents with cage fish farm owners or those who come to work at the cage farms

Respondents were asked whether they had and would continue having good relations with the owners of cage fish farms or people who might come for working purposes at the cage fish farms. Majority (57.3%, n=102) of the participants indicated good relationship followed by those (27%, n=48) indicating would not want them while 15.7% (n=28) indicated that it would depend on the circumstance. Namusenyu had the highest number (n=50, 89.3%) of respondents reporting good relationship and the lowest number (n=2, 3.6%) reporting bad relationship as well, followed by Bugungu landing site (Figure 12). Such relations indicate ability and willingness of communities to cope with cage culture. It has been noted that in providing practical approaches to fishery development and fish productivity, the ability of the fishing communities to cope with introduction of an innovation is very important to the diffusion of any new fishery technology (Amu-mensah et al., 2014). The bad attitude towards the large fish farm at Busaana seemed to arise from the way the farm management had treated residents especially denying fishers to fish near cages and obstruction of navigation route, a scenario which was not observed at Namusenyu.

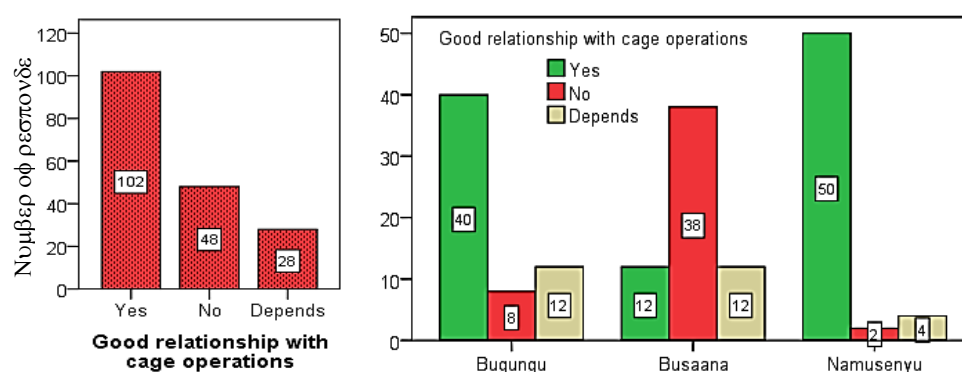


Figure 12 respondents' relationship with cage owners and employees at cage farms, overall and by landing site.

3.3 Managing conflicts between cage fish farms and other resource users

Respondents were asked to suggest ways to resolve conflicts related to cages. The following responses (Table 4) were suggested by respondents:

Table 4 Respondents' suggestions regarding management of conflicts between cage culture operations and other lake users.

No.	Response of participants/respondents	Number of times mentioned			Total
		Bugungu (n=60)	Busaana (n=62)	Namusenyu (n=56)	
1	Government intervention needed	4	10	6	20
2	Farms should follow guidelines from locals	2	2	-	4
3	Dialogue between farms and fishers	16	14	10	40
4	BMUs should handle conflicts on water and LCs to handle those on land	-	2	-	4
5	Farms should employ locals	6	8	10	24
6	Farms should build better relationship with community not leaders only	2	-	2	4
7	Fishers be allowed enough space	4	-	-	4
8	Locals should be supported and given first priority to start cage culture	2	-	2	4
9	Allow fishers fish near cages after all farmed fish is in cages	2	-	-	2
10	Allow navigation near cages	-	8	-	8
11	Cage farms should reduce or remove lights at night	-	-	4	4
12	Farms should sell fish to the locals	-	8	-	8
13	We see no way since government is involved	-	4	-	4

Majority of the respondents reported that conflicts over use of common resource should be resolved through dialogue (Table 4). According to the management of cage fish farms visited, conflicts related to space and the need to fish close to the cages have been resolved through dialogue with resource users, involving the local leadership. As suggested in table 4, some respondents insisted that the specific cause of the conflict be tackled. Respondents also reported that cage farm owners make promises to the locals such as providing employment and development of infrastructure which are not fulfilled. Locals also felt should be supported to start cage fish farming, a venture which they indicated to be expensive. An initiative of this kind was observed at Namusenyu, where the fish farm offered one cage to members of one of

the local associations at the landing site and was willing to provide support in supply of feeds, in an attempt to help them start cage farming. This created better relationship between the farm and locals. However, the business had not started by the time of the study.

According to the local leadership at Namusenyu, it is one thing to reach an agreement and another thing to completely change attitude. The leaders reported that majority of the households in the village have land and agriculture can be an alternative away from capture fishing. This would help to reduce the number of people engaged in fishing as a main activity hence reducing tension between capture and culture fishers. However, they require support through provision of seeds.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

In all communities surveyed, participants indicated more knowledge about the impact of cages on fishing than any other activity suggesting capture fishers were the mostly affected. Complaints such as: cages reduced fishing space, restriction of fishers and navigators from operating close to cages by farms were common to the communities surveyed, with the severity of these impacts varying according to the locality and fish farm operation. The greater the restrictions imposed by farms on other resource users from operating close to their business the greater the farms were negatively perceived by residents. Other perceived negative impacts such as dispersion of fish making it hard to catch due to the use of “noise equipment” and light by cage fish farms, and blockage of major navigation routes were limited to particular farms. Respondents also indicated to have benefited from some cage fish farms through buying fish and gaining income through part time jobs especially during harvesting period.

4.2 Recommendations

It is recommended that:

- There should be a minimum set distance from the cages at which navigators and fishers can operate such that it is known to all the parties.
- To minimise the negative perception of farm operations by residents, farms should consider residents as first priority for employment at farms as well as supply fish to the communities they are located in.
- Environmental monitoring of cages to investigate type, stage, abundance and diversity of fish near and away from cages to aid in conservation and management of the lake.
- Management of established large cage farms should not engage in acquisition of land next to the cages as this would result into resistance from locals, affecting growth of the industry.

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