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Status quo of Fish farming in the Northern Province of Zambia a case for Mbala and Luwingu districts

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Abstract
It is not well understood to what extent poor and marginalized households in Mbala and Luwingu districts participate in aquaculture for food and nutritional security. The Integrated Research in Development for Livelihood Improvement project (IRDLP) therefore conducted a fish farming survey in October 2014 from the two districts. The survey captured five hundred and fifteen (515) households with Mbala recording 250 farmers; with 105 practicing, 4 abandoned and 141 potential farmers respectively. Luwingu on the other hand recorded 265 farmers with 67 practicing, 26 abandoned and 172 potential farmers respectively. Out of the recorded number of farmers for both Mbala and Luwingu 21 and 41 were female headed households respectively. The two districts surveyed have enormous fish culture potential but remain untapped due to several production challenges faced by smallholder farmers especially the non-availability of quality fish seed and feed. Engaging farmers in best aquaculture practices would therefore improve aquaculture production in the two study areas.

Keywords: Aquaculture, Survey, Nutritional security, Households

1. Introduction
Northern Province reflects the rural-urban dichotomy of recent Zambian economic growth. As a rural area dominated by agriculture, Northern Province saw overall poverty rates increase from 74% in 2004 to 78% in 2006, and at 0.781 the Province has one of the highest gender inequality indices in the country [1]. However, with extensive natural resources and proximity to international markets through Mpulungu Port on Lake Tanganyika– a major trade route to the Great Lakes Region – there is significant potential for Northern Province to substantially increase production and marketing of agricultural commodities including fish.
Mbala District in Northern Province covers a land area of 10,832 square kilometers and shares an international boundary with Tanzania. Classified in Zambia's agro-ecological region III, the district receives over 1,000 mm of rainfall annually and has leached, acidic soils and extensive wetlands. Of its population of 203, 129 [2]. 85% are engaged in farming as their main economic activity. Agricultural productivity is low, ranging from between 50-70% below standard/optimum production for maize, beans and finger millet, with identified constraints including delayed acquisition of inputs, low levels of mechanization and lack of certified seed.
Luwingu district on the other hand has a population of 122, 136 [3] and covers a land area of 8,892 square kilometers. The district has adequate rainfall and the District Situation Analysis highlights that the climate is ideal for crop growing, livestock and fisheries. 86% of households in the district are engaged in farming as their main economic activity. Luwingu has a high proportion of female-headed and youth (under 25) headed households at 26% and 32% respectively, whilst 16% of households have a head aged over 71 years [4].
Luwingu has abundant streams and wetlands and a 500m ^{2} area of Lake Bangweulu situated within its boundary. Over 70% of the farming surface area is used for cultivating cassava, beans, groundnuts, maize and finger millet[5]. There is significant potential for further production increases in maize and other crops in the district. Generally diversification in crop production in both districts is low; less than 25% of households are growing rice, soya beans, millet, sorghum, Irish potatoes and sweet potatoes. Household data indicates that there is also lack of integrated farming systems in these districts; in Mbala for example only about 15% of households keep cattle [5].
The presence of perennial water bodies and a strong agro-biodiversity in the two districts provides ideal condition for aquaculture development. However, despite the existing

aquaculture potential in the two districts, there is inadequate information on the participation by smallholder farmers in aquaculture and how aquaculture production translates into household food and nutritional security. The survey therefore aimed at generating information to characterize the status quo of aquaculture from the two districts of Mbala and Luwingu of Northern province of Zambia.

2. Materials and methods

2.1. Sampling procedure

Random Cluster sampling procedure was used to select target Livelihood Enhancement Groups (LEGs). Randomly selected Villages within LEGs were given numbers and visited accordingly. Selection of the sample included female-headed, husband and wife and child headed households. In order to ensure statistical significance for the various subgroups in the sample, the survey covered ≥ 200 respondents in each one of the two districts of Mbala and Luwingu.

The survey design intended to have sample distribution of approximately with 50% of respondents being practicing farmers, 25% former and 25% potential. Self Help Africa (SHA) and Ministry of Agriculture and Livestock camp officers helped identify potential farmers who then were selected randomly for interviews. In each village visited the three categories of farmers (Practicing, and/or abandoned farmers and potential candidate farmers) were interviewed using a structured questionnaire form. The survey team also tracked down "absentee" farmers to avoid introducing considerable bias in replies.

Pond facilities were also visited in cases of where practicing and former farmers were interviewed to verify specifications recorded about ponds. For potential farmers efforts were made to contact village headmen, to establish: (i) whether suitable land/water was available on grounds not allocated to any particular household and (ii) if any informal group (or individual) has expressed interest in using it for aquaculture purposes. Where that was the case, then, the enumerators traced the individual/groups to be interviewed as potential farmers.

2.2 Survey team

The composition of the interview team naturally influences the result. The survey team (enumerators) composed two male and three female interviewers. These enumerators were drawn from the Ministry of Agriculture and Livestock under the departments of Fisheries and Agriculture and were led by the author, an Aquaculture Scientist from the World Fish; Kasama office. The questionnaire was designed to generate both Yes/NO answers and narrative responses. All enumerators chosen were extension agents, who were initially taken through orientation training by the team leader to acquaint with the survey questionnaire and protocol. The team was equally competent and understood the purposes of the survey and therefore was better prepared to conduct the survey. An expression of local dialect by the enumerators proved helpful for purposes of interpreting the questionnaire.

3. Results

The surveillance team captured data on 515 fish farmers from both Mbala and Luwingu Districts (See Figure 1). The number of ponds per farmer ranges from 2 to 10 with a mean size of 100–150m^2. The majority of the ponds are poorly constructed (shallow, small steep dikes, etc.) and managed. Most ponds are excavated in dambo areas with reliance on underground water supply. A few ponds were supplied by a farrow with water abstracted from a stream. Seepage is generally high and is compensated by permanent water supply. Also some ponds are used as a flow-through system and are stocked with predominately *Tilapia coptodon* (*rendalli*) and to some extent with *Oreochromis macrochir*. Feeding is low, most often comprising of household leftovers and green manure. Agricultural by-products are seldom used. Productivity is generally low (i.e. 10–15Kg per 100m^2) and the observed fish were on average small (10–50g), a probable scenario for stunting.

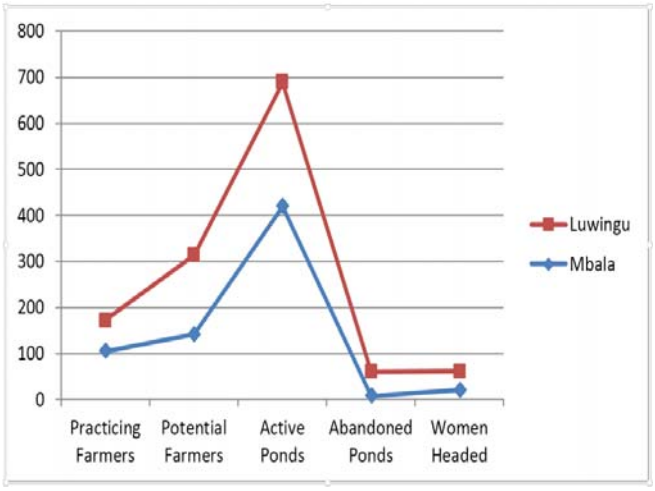

Fig 1: Survey data between Luwingu and Mbala

Nearly all the visited farmers acknowledged practicing an intermittent harvest followed by an incomplete batch harvest, once a year. Fish were cropped using gill nets and mostly fish traps.

More than half (60%) of farmers said they get, when harvesting, the quantity they expected at the time of stocking. Those who do not, blame animals and poor management. Just under half of those interviewed reported that they did not know the quantities harvested. Amongst those who reported, (20%), the maximum quantity mentioned is 30 kg. All respondents affirmed that they have the right to all fish produced. The majority, (136/172 or) 80%, reported that people come to purchase fish at pond side. If they do not come it is possibly because they are unaware or there are no neighbors around. It does not seem to be a custom to sell grown fish to traders. The main reason (60%) seems to be that there is not enough fish left to excite a trader. Those who sell at pond side frequently (70%) sell more than half their harvest.

All households interviewed reported they eat fish. A few (10%) report that none of the fish they eat is cultured fish. However, for 40%, cultured fish represents more than half of total consumption.

It was noted that, those who culture fish also produce and sell between 3 and 4 agricultural crops and/or types of livestock, and most households (78%) have some other source of cash as well. A good share of the practicing fish farmers (40%) report that they obtain no cash from the sale of fish. Very few of the farmers had ever completely drained their pond nor had holding ponds for fingerling restocking. Fingerlings were out sourced from Misamfu research station which is located about 200 km away from most farmers.

From the 515 respondents interviewed (practicing, former and potential fish farmers) about 7% were females (62). Fish are

reared both for home consumption and sale. 87% of all respondents earn cash incomes by selling crops but no information was collected on the amount of land under cultivation or how land and labour are allocated between crops -factors likely to influence the practice of intermittent harvesting. 91% of respondents implied that they did practice intermittent harvesting, primarily for household consumption, and particularly because most ponds never drain.

Almost all the respondents purchased fish for household consumption, so fish farming can be viewed as a way to reduce or divert household expenditures to other items. The surveys revealed that fish, at any size, can be sold easily even in remote areas, as demand is high.

3.1 Basic data on respondents

The survey covered 2 districts of Mbala and Luwingu. On the average 20 interviews were carried out per village per day. A total of 515 individuals were interviewed, with 250 and 265 farmers captured from Mbala and Luwingu respectively. They grouped into 172 practising, 30 former (or abandoned) and 313 potential fish farmers. Sixty two (62) of the respondents were women, the rest men. The average age of respondents at the time of the survey was 40 years; the youngest reported 20 years and the oldest 73. There was a small number of young heads of households, 20/515 or 4% between 20 and 30 years of age. Also there were a few elderly, 50/515 or 10% between 54 and 73 years of age.

Those who have Bemba as a mother tongue were the overwhelming majority, and account for 280/515 or 54%. Lungu was the second most important language; 150/515 or 30% reported that language as mother tongue. The remainder of the respondents was split amongst: Mambwe and Nyika. English was sparingly spoken by the community members.

3.2 Economic situation of respondents

Almost all respondents occupy traditional land which has been allocated to them and have control over their pieces of land. Permanent buildings structures have been put up although have no mechanized farm equipment. Very few (80/515) report that they own farm animals. Most respondents obtain cash mainly through sale of crops, (500/515 or) 97% although other income generating activities exist such as brewing and sale of local beer.

3.3 Social situation of respondents

The majority of those interviewed consider that they take decisions concerning fish culture on behalf of their household, (412/515 or) 80%. Half the respondents, (257/515 or) 50% consider that they manage the ponds.

A minority, (20/515 or) 4%, reported that they participated in political roles at the lowest levels (branch) of governance.

3.4 Ponds and water supply

The pond water area of individual farms in use varies from a minimum of 100m^2 to a maximum of 2,400m^2. Out of the one hundred and seventy two (172) practicing farmers captured in the survey, the majority of the ponds (80%) are placed in damboo areas where complete drainage is not attainable. Streams are a common (60%) source of water, springs and seepage also provide water, each, to one quarter of the surveyed ponds. Most farmers, (155/172 or) 90%, have water throughout the year in quantities adequate for fish culture. Very few respondents (10/172) however, reported that ponds dry up in October and November because of insufficient water and high seepage.

3.5 Activities during the current production period

All of the 172 farmers had sufficient water in their ponds to culture fish at the time of the survey (October) but only (86/172 or) 50% had tilapia in their ponds which was obtained from Misamfu research station. This implied that half the number of practicing farmers had adequate ponds with water but no fish under culture.

Few, (35/172 or) 20%, knew, or had an idea of the amount of fish stocked at the beginning of the culture period. All respondents indicated practicing “mixed tilapia culture”. Only (18/172 or) 10% reported that they never practiced intermittent harvesting. Amongst those who reported this practice (intermittent harvest) informed that it was done purely for home consumption. Only 8, or (8/86 or) 9%, reported that they knew the date for the next major harvest. As a result, few had a firm idea on the length of the production cycle. Only some, (26/86 or) 30%, of those interviewed replied to the question of how a major harvest will be carried out. None of those interviewed provided a figure for how much fish the next major harvest will give.

All the farmers with fish in their ponds reported that they fed their fish with kitchen wastes. Less than half (30/86) reported that they also apply organic manures. Integrated fish- cum animals is uncommon.

3.6 Reason for engaging in fish farming

The majority, (136/172 or) 80%, see fish farming as an activity which will provide fish both for food and business. A minority (20%) sees it as an activity which only will provide fish to eat for the members of the household. and less than 10% consider it as mainly an opportunity to trade.

3.7 Reasons for abandoning fish farming

Almost everyone (28/30 or) 93% of those who have abandoned fish farming gave the reason of non-availability of inputs. The remainder, (2/30 or) 6%, reported too low production or better alternative use for inputs. Those who lacked inputs, indicated lack of fingerlings and sufficient water.

4. Discussion

The study generated useful information as entry points for various aquaculture interventions. Reasons of engaging in fish farming were given by the farmers; to obtain fish to eat and to sell. Aquaculture interventions must therefore be best practices, and farmer directed in order to stimulate sustainable and increased farm productivity.

Most farmers also suggested the need to introduce farmer exchange visits as another way of obtaining the required know-how. Exchange visits especially to show case of success story in smallholder aquaculture are an excellent tool in motivating the farmers’ interest in the venture and must be encouraged. For most potential fish farmers (280/313) water will be obtained from underground seepage in damboo areas while the rest will abstract water from a river or a stream. It was evident that the two districts being in a high rainfall belt are best suited for aquaculture activities. This potential needs to be capitalized on to translate the districts into aquaculture economic zones.

It was noted during the survey that aquaculture challenges include non-availability of quality fingerlings, inadequate organic fertilizer and feed. All postulated aquaculture interventions for the two districts must therefore seek to address these bottlenecks failure to which performance of

aquaculture will continue to lag behind the agriculture sector. Farmers also indicated limitation to extension services, the problem being compounded by skewed ratio of farmer to extension worker. Deliberate attempts by the Department of Fisheries must be made to increase the number of fisheries extension officers at district level and also government must broker partnerships with private institutions that offer extension services to strengthen public-private collaborations. It was evident from the survey that record keeping by the farmers especially from stocking time to harvests was inconsistent and poorly done. Worse still, incomplete harvests distort production figures. Fish farmers would need to be taken through the rudiments of fish farming and importance of record keeping in order to improve on their pond management practices.

The rural communities of Mbala and Luwingu districts are very passionate about fish farming, a practice they are already familiar with. Farmers admit that engaging in best aquaculture practices would help them provide much needed animal protein for improved nutrition and income for their communities.

5. Conclusion

Although the aquaculture sector is small in comparison with the rest of the national economy in Zambia, fisheries and aquaculture constitute a significant component of the agriculture sector and the country cannot achieve its food and nutrition security goals without considering fisheries. Mbala and Luwingu districts fall in agro-ecological zone III of Zambia which receives above normal rainfall and therefore has enormous potential for fish farming. It turned out that more than half the sampled fish farmers were potential and very keen candidates to venture into fish farming. However, fish farming in the two districts is still fragmented and therefore has not made significant contribution towards the food and nutrition security of the people in the survey area. Some eminent bottlenecks cannot be overlooked; lack of quality fish seed and feed remain the greatest challenges to aquaculture development in the two districts. These bottlenecks can be mitigated through decentralized production of both fish seed and feed. Selection of satellite farmers for on farm production trials would prove beneficial. The fish seed in current circulation appears to have outlived its usefulness and therefore prone to stunting due to inbreeding. Recruitment of fresh parent fish stocks would facilitate production of quality fish seed. Current crop diversification program by Shelf Help Africa on soya beans, Vitamin A orange maize and sorghum will broaden the horizon upon which fish feed raw materials can be generated.

This enormous potential for blue revolution in the two districts of Mbala and Luwingu therefore cannot be over emphasised.

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