

Evaluation and Improvement of Production Technology in Uganda: Case Studies of Small-Holder Cage Culture in Watershed Reservoirs and as an Alternative Livelihood for Fishers

Production System Design and Best Management Alternatives/Study/09BMA01AU

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ABSTRACT

Aquaculture development commentary supports the formation of fish farmer associations or producer organizations as avenues for cultivating small- and medium-scale commercial farmers. However, little is known about the types of associations that facilitate commercialization. This research presents four qualitative case studies, based on semi-structured interviews, profiling existing associations of commercial fish farmers in Uganda. We conclude that the umbrella organizations under which local fish farmer associations vertically align themselves have important implications for fish farmer production. Aquaculture-specific umbrella organizations contribute to the success of local member associations more than general umbrella organizations do. Successful fish farmer associations accept government assistance only when it directly improves their fish farm operations. Other farmer groups seemed to wait for direct subsidization. Training fish farmers, providing quality information, cost sharing, and advocating for the aquaculture sector, not donor seeking, are the top priorities in productive fish farmer associations. Part I of this report summarizes the four case studies; Part II summarizes the results of the cage culture trials.

INTRODUCTION

Improving the livelihoods, nutrition, and opportunities of the rural poor is a central goal of development efforts, particularly the aquaculture sector. These efforts target smallholder farmers, who make up 70 percent of the African continent's population. Most rural farmers make their livelihoods from small-scale, mixed enterprises, producing first for home consumption and second for sale (Brummett et al. 2008:375). The prevailing approach to aquaculture development in Sub-Saharan aquaculture between the 1970s through the 1990s targeted the rural poor mainly by supporting tilapia and the African catfish as culture species. The FAO, the Peace Corps, and USAID largely centered their efforts on small-scale, limited input, integrated fish farming for improved household fish consumption and income with often disappointing or inconsistent results (Brummett et al. 2008:375, Moehl 2006:v). Currently, 90 percent of African fish farmers fall into this small-scale or artisanal category (Brummett et al. 2008:380).

Gains from small-scale, integrated fish farming systems generally are not captured in official statistics. Nevertheless, rural food security advances through increasing small farm production levels (Brummett et al. 2008:375). However, small-scale, integrated fish farming operations realize little cash gain due to the small quantities and low production intensity, that is, the weight of fish produce per unit area (Brummett et al. 2008:375). Increasing production intensity is a central goal in aquacultural development. Several factors work against the continued promotion of subsistence-level fish farms, including the expense of training and extension and the low expectations for economic returns from this diversified farming system (Brummett 2008:383).

Technical aquaculture experts have long understood that success in aquaculture hinges on human factors (Moehl 2006). Sociologists involved in aquaculture development find that personal commitment to fish farming is perhaps a more vital predictor of success than technical knowledge (Molnar et al. 1985). We have learned how commitment supports sustained attention to technical matters for individual farmers, but increasingly groups are used as mechanisms for extending technical knowledge, engendering mutual support, and sharing burdens such as surveillance to prevent theft and harvest of ponds. The purpose of this paper is to describe organizational and sociological factors that influence the success of commercial aquaculture in Uganda by examining four existing fish farmer associations. Each association relies on different coping strategies and mechanisms of affiliation to realize its fish farming objectives, albeit with different degrees of success.

PART I: CASE STUDIES OF SUBSISTENCE AQUACULTURE

Subsistence aquaculture is being re-evaluated and the commercialization of agriculture as a whole is the present focus of the Food and Agriculture Organization of the United Nations (FAO) in Sub-Saharan Africa and the Ugandan government's national policy as well. Several donor organizations and the FAO, are working to transform selected farmers from small-scale to commercial fish farm operators. The premise is that fish farmers who operate mainly for profit and can be the driving force behind aquaculture infrastructure development, including the production of quality fish fingerlings or "seed" and the use formulated feed in production (as opposed to reliance on pond fertilization and generally inadequate farm-produced feeds). The abiding characteristics of these profit-oriented farmers are yet to be realized, as there are currently only 200 such Ugandan fish farmers. A focus on commercial operators coincides coinciding with the Ugandan government's promotion of fish exports (Mwanja 2005).¹

Fish farmer associations are a key factor in establishing a viable commercial aquaculture sector in Sub-Saharan Africa (de Seligny 2006, Moehl 2006, Hecht 2005). A farmer association is defined as a conglomeration of individual farmers and/or fish farming groups joined for the purpose of more effective coordination of activities, and for established capacities to address several constraints and limitations faced by members. They are primarily social organizations and members of an association do not own joint fish ponds under the umbrella of the association (Moehl 2006). Some beneficial roles which fish farmer associations can play include influencing policy and regulations, providing technical services, facilitating market access, aiding in aquaculture research programs, providing extension services, developing and encouraging adherence to codes of conduct or better management practices, extending credit to member farmers, and facilitating knowledge-sharing (Hecht 2005, de Seligny 2006, Mosher 1966). In Africa, such entities are often the beginning points for developing a national industry.

Despite the long lists of roles for fish farmer associations to perform, no framework or set of guidelines exists for how effective associations can be created (Moehl 2006). In fact, many fish farmer associations are described as ineffective or short-lived, and links between donor funding and association creation are common, as promises of gifts often accompany injunctions to form farmer associations; in these cases,

¹ Aquaculture now is seen as a private-sector led enterprise that is technically sound, economically profitable, socially acceptable, and environmentally sustainable with the state playing a role as a facilitator and monitor (Brummett et al. 2008, de Seligny 2006). Commercialization of aquaculture need not exclude small holders; the distinction is more a reflection of motivation, goals, and business and management practices than scale (Brummett et al. 2008:375, Moehl 2006). In comparison to artisanal, integrated fish farmers, the small-to medium-scale commercial farmers typically build more ponds, use more technology, employ laborers, purchase fingerlings, use commercial feeds, and employ nonlocal business strategies. Commercial operators transport fish to urban markets where customers pay cash for fish (Brummet et al. 2008:380). Producers and consumers benefit from the commercialization of aquaculture.

associations commonly disintegrate after incentives disappear (Hecht 2005, Moehl 2006, Harrison 1996). There are few surviving instances of thriving fish farmer associations to cite as examples (Moehl 2006).

Nonetheless, government and donor interest in fish farmer associations remains strong because of the need to reach large numbers of adopters, using farmer field schools and other extension models to leverage the efforts of trainers and extension personnel (Moehl 2006). Larger numbers of beneficiaries participate in investments in pond construction, feed subsidies, and seed stock supply. A growing focus on commercialization necessitates that farmers have all available tool for success, as the financial stakes are higher than with previous subsistence efforts. Associations can provide some of the tools, in the form of knowledge, access to quality inputs, and relationships with aquaculture technicians, which individuals need to succeed as commercial fish farmers. Emerging commercial fish farmers, who have the desire to learn new techniques and improve production, are a target group for successful fish farmer association development (Hecht 2005). The case studies elucidate the way these efforts actually are realized in rural African communities.

PART II: CAGE CULTURE TRIALS

Cage culture is a new aquaculture technology in Uganda that involves the utilization of lakes, rivers and large water reservoirs. Most of these natural resources are over exploited due to the massive fishing pressure aimed at maximizing catches. As a result, many of the aquatic resources are being depleted. Therefore, cage culture can play the role of providing an alternative form of livelihood for fisher communities in order to practice aquaculture alongside sustainable fishing. Its advantages include ease with handling fish, high stocking densities, ease of controlling predators, utilizes less labor and higher turnover of profits. Some of the barriers of successful cage culture include: high investment costs combined with difficulties in access to credit and/ necessary materials, unavailability of cost effective high quality fish seed, theft of fish, problems concerning use of areas considered as public domain and challenges in marketing of cage reared products (FAO, 2004). None the less, cage culture is a venture that is attracting investment interest by a cross section of actors right from community based fisher groups to foreign commercial investors in Uganda. This is largely because it has the potential to produce large quantities of fish for domestic markets and for export.

USAID supported research as well as the fisheries section of National Agricultural Research organization conducted initial cage culture trials and demonstrations. Results of the research showed the possibility of small holder groups to engage in cage culture. In particular, fishers showed keen interest in engaging in cage culture mainly because many of them were losing employment due to reduced wild fish caged that were no longer viable. Towards the end of the FISH project, at least two groups of fishers had started the required formal process to enable them obtain permits for engaging in cage culture on L. Victoria. By the year 2007, the groups had obtained the permits. Permits for cage culture have to be obtained from the Ministry of Agriculture Animal industry and Fisheries (MAAIF), the National Environment Management Authority (NEMA) and the Directorate of Water Resource management of the Ministry of Water Lands and Environment.

Although the project initially planned to work with four farmer groups in four different localities, only one group (Jinja United) was finally eliminated due to financial limitations. In addition, one group got into another arrangement with government while the other two faced problems of group cohesion and could not continue with the activities.

Following acquisition of the permits, the group members were ready to start but did not have enough money to cover the key cost i.e. cages. One group obtained financial support from government so AquaFish CRSP investigators opted to work with the other group that had raised some capital from their own savings. Discussions were held with group members and a Memorandum of Understanding was

drawn and signed by the two parties. It was agreed that the project would provide the cages and technical advice while the group members would provide some of the fingerlings at stocking and all the labor required in feeding, sampling and ensuring security. The Memorandum of Understanding (MoU) also spelled out details of responsibilities of the two parties and their expectations. With technical assistance by AquaFish CRSP investigators, a financial management plan and draft enterprise budget were developed with the group.

During the investigation and demonstration, emphasis was put on cash flow management. This was in order to demonstrate that the group can source capital and with good management be able to make profits from cage culture.

As a result of the increasing fishing pressure, aquatic resources are at a risk of depletion. Therefore, evidence that cage culture is a profitable venture is a key aspect in providing information that can transform fisher communities to practicing aquaculture as an alternative form of livelihood. The study aimed at providing evidence of cage culture as a profitable venture and information on some of the management aspects that should be emphasized.

The number of fishers on Lake Victoria has increased tremendously since 2000 and the increased pressure on the fishery has led to adoption of illegal and highly destructive fishing methods. Moving traditional fishers to farming has often been cited as near impossible. However, many of Uganda's fishers are newcomers to fishing because they were not able to subsist on agriculture. This group of people could more easily be moved into fish farming compared to groups who have been fishing for several generations.

METHOD

PART I: CASE STUDIES OF SUBSISTENCE AQUACULTURE

Case studies of four fish farmer organizations in diverse areas of Uganda were conducted during January and February 2010. Yin defines a case study as an "... empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (2008:13). Multiple case study analysis is a research method that looks carefully at persons and operations at several locations in order to understand a complex situation (Stake 2006). Evidence from multiple case studies is likely to be stronger than that of single case studies (Yin 2008:19).

Previous professional connections the associations had made with the Aquaculture Research and Development Centre, Kajjansi (KARDC), a branch of The National Fisheries Resources Research Institute (NaFIRRI). Recruiting focus group research participants from associations where potential participants seek services is one method for recruiting research participants (Hennink 2007:102). All three associations have donor project relationships. We intended to conduct focus group interviews with a sample of members from each aquaculture group. However, in the cases of "The Unaccountable Leaders" and "The Helping Hands," this was not possible, as the fish farmer association leaders were not cooperative in arranging focus group meetings. In these situations, data emanate from semi-structured interviews with the fish farmer association's leaders, extension officers, and other informants.

We identified "The Cooperative Society," an organization without direct development project ties or previous contact with the collaborating fishery officers. Contact with this organization came through a fish farmer organizer met at Uganda's Annual Fish Farmer Symposium and Trade Show. The case provides a contrasting comparison, as the other groups are representative of the type of fish farmer associations that maintain contact with government researchers, and "The Cooperative Society" does not. Events, meetings, and conferences are also useful venues for recruiting focus group research participants (Hennink 2007:101). The contact is the organizer and chairman of the Uganda Fish Farmers Cooperative Alliance. "The Cooperative Society" is one of the groups organized under the Uganda Fish Farmers

Cooperative Alliance umbrella. We examine each case in the context of the guiding issues of internal dynamics and relative success in the targeted technical activities.

PART II: CAGE CULTURE TRIALS

Initial work was to verify the appropriateness of the site allocated to the farmer group. GPS readings were taken and water quality parameters of Oxygen and temperature were also recorded. The site is close to Kirinya prisons, Jinja at the shore of Lake Victoria.

Table 1. Parameters of cage sites

Distance from shore line	Elevation	GPS readings	Temperature	Oxygen	Cloud cover
193M	1143	N0.41346 E033.23247	26 °C	3.5 Mg/l	80%

Cage installation. Two cages (2M by 2M by 2M) were installed on the selected site. Each cage was stocked with 2030 Sex reversed *Oreochromis niloticus* of average 4g that were obtained From Source of the Nile Fish farm. The initial plan to have the fry nursed in ponds was not performed because the farmers' ponds were not in good condition.

Management. Training in the management of cages was conducted a day before stocking the cages. The training was attended by Jinja United farmer group members (4 women and 6 men). The training was delivered by the AquaFish CRSP project team supplemented with technical assistance by a technician at SoN fish farm. The training covered the following topics:

- Feeding techniques
- Collecting and recording mortalities
- Record keeping (technical and financial)
- Group dynamics

The second training was conducted at the time of sampling fish at month three (March 2011). Besides Jinja United farmer group members, this training included some members of the Masese NAADS farmers group and some members from the surrounding community. Besides discussing sampling results, the issue of the need to use a stronger net cage was discussed since it had been realized that fish had escaped from one of the cages. Feed amounts were administered based on fish size and adjusted depending on fish response.

Data collection. Group discussion interviews were initially held with the farmer group member to obtain information about the history and organization of the group. This exercise was part of the field work carried out by Masters student from Auburn University. The next round of group discussions involved farmer group members (4 women and 6 men) and some members from the surrounding community.

Sampling of fish was carried out to monitor fish growth and to determine the right amount of feed to be administered during the subsequent month. Members of the farmer group kept records of cost of feed fed to the fish, feeding response and any fish mortalities encountered. Other records the group kept included members' cash contributions to the expenses and a roster of members' personal visits and activities carried out at the site.

RESULTS

Two associations are beginning to operate cage culture aquaculture systems, one is a fingerling producer, and the members of a fourth farm fish in ponds. In order to facilitate comparisons and analyses of factors that make fish farmer associations successful at improving their member farmers' fish production, the cases have been ordered from fish farmer associations with the lowest fish production to the entity whose members produce the most fish.

CASE STUDY ONE: "THE UNACCOUNTABLE LEADERS"

In western Uganda, bordering Queen Elizabeth National Park is a group of individuals who operate cages on the deep inland waters known as Uganda's crater lakes. They operate under a regional environmental conservation umbrella group. The environmental conservation umbrella group has 69 members and nine people in leadership positions, including a chairperson, vice chairperson, treasurer, secretary, project coordinator, and committee members.

The environmental conservation organization became involved in fish farming with cages through the project coordinator in 2008. As part of a five-year countrywide aquaculture development project, a subset of this association received some training, and project staff conducted water quality tests for 13 lakes, which demonstrated eight viable for fish farming based on indicators including dissolved oxygen and hydrogen sulfide levels. One lake was selected as an experiment and five cages were placed on the lake.

Cage culture. Of 70 people who came to learn about fish farming (some of whom maintain their own fish ponds), ten were selected to manage the cages on the selected lake. This operation was designated as a model farm. The group maintained the tilapia fish in the cages through two production cycles. But, due to a lack of feeds, the cages are currently empty.

In the view of the project coordinator, the first harvest was a success, though two of the five cages had problems just before harvest, which rendered them useless. One cage's top had not been latched correctly, so the fish escaped. Another's net was torn, possibly by otters. The other three cages were harvested and given to the people participating in the project in order to demonstrate the success of the venture as well as to establish that farmed fish tastes like wild-caught fish, as many people were skeptical of farmed fish.

The second harvest was also a success, though only two cages were in use. After harvest, the fish were salted and sun-dried, a low-cost preservation and value-addition method, and sold to traders from the Democratic Republic of the Congo. The project coordinator said, "We only had two cages because we had no feeds and the cages were getting old, and the feeds we were using were expired. Feeds are very expensive." The cages have since been repaired.

Resources necessary for production are currently the problem, as members cannot afford the investment. The chairman said, "People are willing to participate, but pooling resources is not affordable for the members, though a few members can."

Leadership. The honesty of the two leaders of the association was called into question during the discussion of the group's first harvest. It remains unclear why the fish from two of the five cages in the second production cycle disappeared. When asked if theft rather than an animal predator or unlatched lid could have led to the empty cages, the project coordinator said, "They don't steal from the cages because there is 24/7 monitoring." Theoretically, a full-time guard would have seen problems with an unlatched lid and an animal. Additionally, it became clear that the project coordinator never asked the members involved in fish culture to come to participate in interviews. A collaborating researcher conjectured that the project coordinator's actions reflect the members' distrust of him as a leader. Also, as the government research station plans to provide financial assistance to the fish farmers of this organization, the project

coordinator sought to prevent his members from meeting the actual source of the funding, perpetuating the illusion that the project coordinator himself is the supply line of assistance. The project coordinator spearheaded the fish farming efforts and is an aspiring politician, though currently not holding office.

There is little evidence of meaningful interaction between the fish farming members of this association and its leaders. The general meeting scheduled to take place once a year did not occur last year or this year. Executive meetings attended by those in leadership positions occur as necessary. Technical meetings, which include the people involved in a specific project such as fish farming, took place once a week during production. During these technical meetings topics such as feed issues, the age and size of the fish, and problems that have arisen are discussed. Transparency with this core group of people involved in the fish farming is a challenge, especially as other members see the profits and become jealous. The inequality of benefit distribution is a source of members' jealousy. The project coordinator, who facilitated the donations of feed and equipment as well as invested some of his own money, explains the distribution of benefits. He says, "People who have put in big investments must have the lion's share."

It also seems that the leaders are intentionally unaccountable to the members. When asked if members pay dues, the chairman said, "They are doing voluntary work hoping to get a share of the proceeds. We have people who are ready to pay money to be members but we are not signing them up because we cannot take their money when there are no feeds because they will be asking 'What is happening with our money?' We have a very big number [who are interested] but we cannot accommodate [more members]." Thus, the members take no financial risk to purchase the necessary feeds and reap no reward. The project coordinator has a vested interest in limiting the risk that his members take: To have a failed harvest into which members invested their own resources would harm the project coordinator's reputation and potentially decrease his political support in future elections.

CASE STUDY TWO: "THE HELPING HANDS"

The umbrella regional poverty alleviation organization has a fish farmer association of 88 members. The group's formation was stimulated by the chairman's enthusiasm for fish farming. Additionally, the chairman expressed that he organized the group to meet members' needs and to access funding for projects. Some members own and maintain fish ponds, and others assist with a group pond. Several other charitable organizations have fish pond projects under the umbrella of the regional poverty alleviation organization. The fish farming members of "The Helping Hands" organization are preparing for a transition of emphasis from individually- and group-managed fish ponds to group management of a fish cage culture operation on Lake Victoria. The focus of our study was the structure of effort towards the potential transition to cage culture. Most of the interviewees were leaders of "The Helping Hands."

The fish farmer group typically holds meetings four times a year but gathers more frequently when preparing for a workshop or another unusual event. Currently, the fish farmer subset of "The Helping Hands" is not managing fish production collectively, but the chairman says they are ready to begin as soon as funds are available for that purpose. The chairman says, "As a management structure we have people in place but they are not functional (currently functioning). So the people are ready for when we have the money." The chairman appoints leaders and their responsibilities are based on the individual leaders' expertise. "Whoever has the ability of doing something does it voluntarily for the benefit of the group," states the chairman. This commitment to community service is shared among the group, though to some degree each executive member stands to benefit financially or politically through their involvement in the group's poverty alleviation projects.

Political connections. Under the umbrella of "The Helping Hands," and hence under its chairman, is a regional fish farmers association that encompasses local associations from four districts in eastern Uganda. The chairman unified them, saying, "These groups weren't capacitated (empowered) because

they were singular (working in isolation).” This integration followed a large fish farmer meeting with over 300 attendees organized by the chairman. At the meeting, the President’s assistant announced that the chairman would be the one to distribute information and assistance to the fish farmers in this region. Two aspects of this fish farmer meeting reflect the chairman’s political pull: the presence of the president of Uganda’s assistant and his pronouncement that the chairman of “The Helping Hands” will channel assistance to area fish farmers. Other examples further illustrate the chairman’s political power.

The goal of “The Helping Hands” cage culture operation on Lake Victoria is to be a demonstration or model farm, which is a political status, and an achievement for which the chairman will potentially be credited and financially rewarded. In addition, the local government provided the group funds to acquire the necessary permits for operating cages on the lake. The minister of fisheries wrote on “The Helping Hands” behalf to the executive director of NAADS. Each achievement reflects the chairman’s access to influential politicians, the essence of political power.

There are at least two perspectives on the political affiliation of the chairman and his fish farming aspirations. In a short-term view, political connections can lead to resources otherwise very difficult to procure, including permits, funding, and support for aquaculture activities. On the other hand, considering goals of sustainability, politicians’ goals are often incongruous with the goals of the development of commercial fish farmers.

Cages first. The management approach that “The Helping Hands” organization uses for fish farmer development is rooted in its origins as a collectivity. The chairman says, “After all, it is up to everyone to look after the structure. Management is organized by the group and owned by the group.” The group manages community fish ponds and hopes to operate cages with the expectation that profits from these operations will be used to purchase additional cages and inputs for individuals to own their own cages. The chairman says, “At the beginning we feel like we should work as a team. As we grow and begin realizing profits we should support individuals in owning cages. They will be then capable of owning and managing their own cages.”

The goal of “The Helping Hands” umbrella group is poverty alleviation and economic development. It appears that the activities and goals of the group are more charity-based than business-oriented. When the chairman was asked why he and his members wanted to be fish farmers, he said, “It is the farming that can help people of different abilities. Fish farming gives a chance to vulnerable groups including women who can’t go fishing by boat on the lake but can fish farm. It is an opportunity for the disabled, orphans, and the elderly. Also, fish farming can be done in teamwork. After all, it is up to everyone to look after the structure.”

When asked what would evidence the success of his cage culture operations on Lake Victoria, the chairman said, “Being that cage culture is new, we expect that people will realize that it is good. We want to show a demonstration project. In the process of time, people, after learning from us, will apply knowledge on an individual level. They will arrange for their own permits. Success will be proved by individuals owning their own permits and cages.” At no point did the chairman mention profits as a goal or of evidence of success. Also, fish farming is discussed as a project, not as a business or an enterprise. This organization does not yet have a definite business plan, though they anticipate creating one.

The chairman’s answers suggests that developing commercial fish farming enterprises is not a goal, but that his members are vulnerable people who want to add a fish farming project to their already long list of development projects. This attitude is reflected in the group members’ unwillingness to invest their own financial resources. The chairman says, “There have been no good examples of cage culture in lakes. So the members don’t want to invest their money.”

The piecemeal approach to aiding vulnerable people seems to manifest itself in members of “The Helping Hands” who are involved in multiple operations to varying degrees, gaining some benefit from each. It is an example of development thinker Robert Chambers’ (1997) explanation that, for the poorest of the poor, livelihoods are “local, complex, diverse, dynamic, uncontrollable, or unpredictable.” Being a specialized, capital and input intensive, risky, long-term enterprise, commercial cage culture does not fit productively into this type of livelihood strategy.

Uppers and lowers. Chambers’ (1997) discussion of “uppers” and “lowers” provides helpful terminology for describing and understanding the relationships of two types of members of “The Helping Hands.” “Uppers are people who in a context are dominant or superior to lowers. A person can be an upper in one context and a lower in another” (Chambers 1997 xvi). Conversely, “Lowers are people who in a context are subordinate or inferior. A person can be a lower in one context and an upper in another” (Chambers 1997 xv). There appears to be a strong dichotomy between “upper” and “lower” members of “The Helping Hands”. Having the opportunity to spend time with members of both types, evidence of the interactions and expectations of the two groups emerge.

There are members involved in “The Helping Hands” who can be termed “uppers;” they have more education (sometimes holding advanced degrees), their own fish farming operations, or have the resources to become fish farmers (including land, water, ponds, and money). We visited several of their fish farms, including one owned by a physician. These elite members see fish farming as an income-generating enterprise that they manage while hiring someone to provide the day-to-day management of ponds. They also see themselves as aiding members who are “lowers” in gaining income from fish culture. For these “uppers,” involvement in “The Helping Hands” organization introduced them to fish farming and provides access to training and some inputs for their fish farming enterprises as well as an opportunity to assist “lowers” in their community.

Several of these “uppers” see a fish farming operation as part of an income-generating farm to which they will retire. One woman, also a physician, stated, “I will do pond culture when I retire. This will be good because I can employ people at home.” Her statement demonstrates the dual goals of personal income generation and providing economic options for local “lowers.” It also illustrates a conception of fish farming as a sideline activity or a hobby for the wealthy (Moehl 2006).

“Uppers” in “The Helping Hands” are responsible for the management of the fish farms that the “lowers” operate on a day-to-day basis. In this way, “uppers” use their resources to aid “lowers” in the project work and potentially bring the “lowers” out of poverty. The avenues “uppers” use to aid “lowers” is in the procurement of funds for the group’s projects, the translation of technical information from English into Lusoga, the local language, and helping “lowers” procure and repay group-sourced credit. The chairman spoke to these relationships when responding to a question about the literacy levels of the members involved in fish farming, saying, “There are those (“uppers”) who are capable to help others, to explain in the language that they (“lowers”) understand. We are putting the literate at the forefront. A few should manage it (“uppers”). They do this on behalf of others (“lowers”).”

Not surprisingly, we had much more interview time with the “uppers” of the group. When conducting interviews with “lowers,” “uppers” were always present and sometimes even attempted to guide the “lowers” responses to questions. This occurred during interviews with the “lowers” who currently manage three very small lakeside ponds and potentially will manage cages on Lake Victoria. These group members live in a markedly poor lakeside community. When I asked why they want to be fish farmers and what they hope to gain from the fish farming enterprise, I received answers such as “The training interested me,” and “It is a business enterprise which will bring me money.” An “upper,” a physician, who will be assisting in managing the cage culture operation, interrupted the “lowers” and answered the question for them: “You get a cross section of people from the local community involved. They will be

able to send their children to school, address the problem of malnutrition, and sell the fish for money. They all show interest and everyone benefits. There are two purposes: to grow food and sell fish for money.” The physician attempted to broaden the “lowers” limited, though pragmatic, views of benefits from fish farming to a view reflecting community-development goals. In the process, she silenced them and reinforced her superior social position.

Patronage and paternalism. Further reinforcing the evidence of “uppers” and “lowers” embedded in this group’s dynamics is the distinct language of patronage that emerged in this case study alone. The first example is from the conversation between a fishery specialist and the chairman of “The Helping Hands”. After hearing that his project would be partially funded, he said, “I am so grateful that Madame (government specialist) has agreed to fund the project. I am grateful in this regard because we are becoming babies of Madame.” The uses of the supremely polite title “Madame” and the mother/children metaphor reflect a patronage relationship couched in deference, appreciation, and inferiority.

Later, I observed the chairman in the opposite relationship in a strikingly similar conversation. The chairman of “The Helping Hands” and the middle-aged female chairman of the Uganda Society of the Disabled were speaking together among a group. The Uganda Society of the Disabled is a group that “The Helping Hands” chairman has aided in establishing pond culture as an income-generating project. The chairman of the Uganda Society of the Disabled said, “I can only thank [the chairman] for his effort. He offered us training and seed stock. I thank him very much. He is a loving father and is caring for us very much.” The man previously expressing becoming a “baby” of his own patron, a government fisheries employee, becomes a “father” of the group of disabled people to whom he provides assistance.

Interestingly, in these patron relationships there is no discussion of or question as to the original source of the funds. To the one at the end of the assistance chain, it does not seem to matter if the money came from U.S. taxpayers, a private endowment, or a government agency. What emerges supreme is the deference to the individual immediately passing on financial assistance, reflecting the relational nature of assistance chains (Maranz 2001).

Besides expressing appreciation, applying maternal and paternal vocabulary to relationships of patronage can be understood as a diplomatic, desirous strategy on the part of “lowers,” who employ this language to access resources available through patron relationships with uppers (Chambers 1997).

CASE STUDY THREE: “THE FAMILY AFFAIR”

In northern Uganda near the town of Gulu, the center of longtime civil strife is a fish farmer organization that operates a hatchery, produces fingerlings, and maintains a few grow out ponds. This fish farmer association began in 2004, though the chairman has been farming fish on his land since 1973, beginning with a small pond and adding another large pond in 1984. The chairman is a patriarch and is known to his family and his fish farmer association as “Mzee,” the Swahili word for “old and wise man.”

In 2004, Mzee acted on the local fisheries officer’s suggestion to apply to a regional development fund to expand his ponds and build a hatchery. The assistance was specifically designated for farmer groups, not individual farmers. The original fish farmer association formed with 17 people, with 11 males and six females, significantly, all relatives of Mzee. Since then, the fish farmer association has grown to include more than 30 members, including non-relatives. In 2008, the president of Uganda visited the farm and gave money for the construction and management of grow-out ponds, where fingerlings are raised to a marketable size.

Currently, five members own and manage their own ponds in addition to operating “The Family Affair’s” farm. Twelve of the fish farmer association’s members are Mzee’s relatives. The executive members

include Mzee, who has been the chairman since the group's inception in 2004, Mzee's wife, who is the treasurer, a secretary, and five committee members. The group operates several bank accounts to safeguard and segregate money received from the fish farm's operation, donors and other enterprises. Other enterprises include operating an orphanage, beekeeping, and cattle production.

It is an understatement to say that the recent history of northern Uganda has resulted in a population with considerable needs. The challenge of developing commercial fish farmer associations is great. The fisheries value chain manager for an external aid project sums it up, saying, "In the north, people have been receiving handouts for 20 years. It is a difficult pattern to break." However, the linking of prospective producers to their home land can be a positive characteristic of fish farming over enterprises that are not place-based. The secretary of "The Family Affair" PO and an external aid project employee says about the members of the new fish POs, "They are constructing their own ponds so they feel as if they own them." Ownership and land improvement may facilitate these new fish farmers' success. Still, given the recent devastation of this entire region and the obvious physical and emotional needs of its inhabitants, our conversations about business plans, feed conversion ratios, and pond construction seemed surreal and totally irrelevant. The proposition of rebuilding a region that had little in the way of economic and infrastructure resources even before the decades-long reign of civil terror is a formidable one.

Orphan care. "The Family Affair" PO formed in 2004 when violence in the region was raging and many children were in need. Over half of the population of Uganda is under age 15, and only 2.1 percent of Ugandans are over the age of 65 (CIA World Factbook 2010). The chairman speaks of the challenges of that time, saying, "In that time we felt some difficulties to care for the young ones." Mzee's brothers died of HIV/AIDS, leaving him to care for their orphaned children. "Many houses in the community are left with orphans." Two systems simultaneously demand that the chairman cares for his orphaned nieces and nephews: one is a system of traditional responsibility, where the duty of caring for a deceased brother's children falls to brother, and one is an incentive system where receiving donor or government funds depends on performing the role of orphan-caretaker. Mzee says, "We chose to work with orphans because these government structures of assistance require that we reach cross-cutting issues. It is the first step to get the money."

Financial returns from the fish farm's operations are invested into the orphans who receive training in marketable skills, as well as contribute to the farm's operations. "We've paid (school) fees for the orphan children. Some of them are now doctors and teachers," says the chairman's wife. It is unclear whether the fish farm revenues or development assistance received paid the orphans' tuition. Job skills are another benefit the orphans receive. Mzee says, "One of our targets is to get some machines to employ orphans. We can build a workshop. We give them school fees and during the breaks we keep them busy making bricks and training them in that skill." Orphans are also employed to dig fish ponds, an activity that dovetails nicely with the WFP "food for work" approach. This approach requires that the community do the manual labor by digging the ponds, and the WFP supplies the inputs of seed and feeds.

Meetings and records. "The Family Affair's" executive committee meets monthly. The chairman says, "In these meetings we plan, distribute roles, plan for training of other farmers, see what work is done, and see difficulties in the communities within the two districts (Amuru and Gulu). During these meetings the executive committee makes decisions allocating their funds, giving money to the most urgent need, whether that is school fees, fish ponds, feeds, or another need." The entire group of over 30 meets two times per year. Several files are kept by the executive committee and the farm manager, including money received from donors and fish farming operations, fry sales, feeds, and a record of each meeting's events. The chairman comments on the records kept for pond management, saying, "For the feeds file, for example, we record amount of feeds bought, their cost, the source, and quantity daily given to the fish."

Development agencies. One large donor-funded project uses a Farmer Field School (FFS) approach to provide technical assistance. This extension mechanism is an interactive, on-farm learning experience designed to educate farmers, enhancing their ability to make informed decisions concerning their own farm's management (van den Berg 2004).

“The Family Affair” PO will conduct a FFS on every topic of fish production and sale, including value addition, with two members from each PO attending each training session. In addition to educational services that “The Family Affair” PO has been entrusted to provide the groups, the chairman describes the inputs that “The Family Affair” PO will supply to the other POs in kind; “We will help them with money for feed and fry, for every group. For each group we will want to have 3,000 square meters of ponds.” “The Family Affair” PO employs extension personnel to provide on-farm advising to the 22 POs.

It is clear that “The Family Affair” PO's activities in developing producer associations and using the farmer field school approach are dictated by donor project goals and requirements. A representative of an external donor project said, “We are trying to look at farmers as our entry point, but not individual farmers. If we worked with individual farmers it would take us 70 years to accomplish our goals. That is why we are looking at farmer groups – we call them producer organizations – of those who are commercially minded and commercially oriented.” Commenting on the farmer field school approach, he says, “We bring farmers together for the farmers to identify their own problems and identify solutions together and help link them to other farmers.” The “linking” of farmers through “The Family Affair” PO would not have occurred without direction from the donor agency. A Family Affair PO member and donor project technician says, “We are currently working with groups because it is easier for outreach and accessing government assistance.”

This service that “The Family Affair” PO provides to the regional POs will prospectively perpetuate “The Family Affair” PO's business model. The secretary said, “We hope to train 600 fish farmers, create demand for our seed, our feeds, and our factory that we hope to build... We need all those we train to become commercial fish farmers so they will come in by themselves and continue to buy feed and fry from us.” When the secretary was asked for his assessment of the POs that “The Family Affair” PO is developing, he said, “We believe they will stand on their own after (the large donor-funded project). According to our vision, all the groups will still continue getting fingerlings from us.”

The secretary of “The Family Affair” PO is also the project manager employed by a donor project, and he provided insight on previous problems encountered with working with fish farmer groups. “(Pond) management is not done well. There is variation in feeding because many people are feeding.” He also speaks of the challenges associated with people transitioning from Internally Displaced Persons (IDP) camps back to their homes, where they attempt to establish farming enterprises, saying, “One of the problems was that some of the groups were formed in the camps where people are together but not necessarily from the same area. So when they leave the camps they are living in distant places. This was a problem in 2007 with the NAADS groups.” NAADS, Uganda's National Agricultural Advisory Service, provides financial assistance and training to a spectrum of agricultural producer groups. Also, he sees problems with individuals joining groups without a commitment to fish farming: “All of them should have an interest in fish farming, not just the project.”

Goals. When asked about the goals of their producer organization, all executive members interviewed listed construction or infrastructure-based goals that they aim to achieve if donor funding is ascertained. The treasurer, Mzee's wife, cited their need for a water heater for the hatchery, as the solar heater does not supply heat at night. When asked when he hopes to build more ponds, Mzee replied, “You will tell me when you say if you support me.” Currently, the hatchery built in 2004 is being renovated through assistance from the external donor project. The chairman stated their three year goal, which is to build a feed mill, and a five year goal, which is to build a fish processing factory for exporting fish to Sudan.

They also anticipate building dormitories and a guest house for those who come to be trained, as well as a structure to house a formulated feed outlet. They would like to build a workshop where the orphans can learn job skills, as well as construct a swimming pool for recreation. Construction of ponds is currently undertaken in anticipation of future donor funds, both for ponds currently under construction and a reservoir. The chairman says, “For us, we keep on making ponds. We are still looking for phase two of NUSAF.” NUSAF stands for Northern Uganda Social Action Fund, the regional funding agency that first encouraged “The Family Affair” to form a group.

“The Family Affair” PO’s fingerling sales goals are secondary to their infrastructure development goals. This is partially a result of a decreased fingerling market and partially a result of a distorted incentive system inherent in development assistance. Aid programs favor construction projects rather than profitability of enterprises in natural markets.

Fingerling sales. “Between 2004 and 2006 fish farming in northern Uganda had gone down and is now beginning to increase,” says a Family Affair PO member and a LEAD-employed fish farming technician. In 2009, “The Family Affair” PO produced 40,000 fingerlings, 30,000 of which were purchased by organizations, including the Food and Agriculture Organization of the United Nations (FAO), AT Uganda Ltd, a national NGO, and the African Development Bank (ADB). Only one producer organization purchased fingerlings from “The Family Affair” PO in 2009.

Since 2004 “The Family Affair’s” business structure has been built on accessing donor funds. This requires that “The Family Affair” align their producer organization’s goals to the donor’s goals. Even the sales of the fingerlings they produce demonstrate the donor saturation in this region of Uganda: 75 percent of “The Family Affair’s” fingerlings are sold to aid organizations. Natural markets are not at work here, but given the social and recent-historical context of this region, it may be some time before natural markets emerge as driving economic forces.

CASE STUDY FOUR: “THE COOPERATIVE SOCIETY”

“The Cooperative Society”, located in western Uganda, began in 2004 when several members were invited by the minister of fisheries for training at the Fisheries Training Institute (FTI) in Entebbe. The commissioner told them to form groups “in order to be heard and known by government and NGOs.” Ten members went for training and upon returning spoke with interested friends and neighbors and began organizing. First, the group registered as an association but changed their registration to a cooperative society at a minister’s recommendation. The group is currently registered at all levels, from the local council one, or village level, up to national level, with the Uganda Cooperative Alliance (UCA). This cooperative society is overseen by the head of the Uganda Fish Farmers Cooperative Union and receives technical assistance from the county fisheries officer, who attends gatherings, answers farmers’ questions, addresses fish farming problems, and makes farm visits. “The Cooperative Society” also receives some assistance from Uganda Cooperative Alliance and the Ugandan government in the form of fingerlings and training.

“The Cooperative Society’s” 90 members include men, women, and youth, with members coming from four sub-counties within the district. Leadership offices are elected positions, and include chairman, vice chairman, treasurer, general secretary, publicist secretary, advisors, and committee members.

Differences between the leaders and members. Two focus group interviews, one with the positional leaders and one with a subset of the members, indicate that there are differences between the members and leaders concerning benefits received from their cooperative society activities and involvement in other types of farming groups and cooperative societies. For example, when asked what other agricultural producer groups they were involved in, the leaders listed beekeeping, dairy production, banana wine processing, organic pineapple, coffee production, poultry production, tree planting, and animal husbandry

as the principle activities of other groups of which they are a part. The members listed poultry production, beekeeping, and banana production, which are agricultural activities that require less up-front capital and with less value-addition components than the leaders' activities.

There are also differences between the leaders and the members of "The Cooperative Society" concerning sources of motivation for joining the group, level of satisfaction with their fish farming enterprises, and extent to which their expectations of the group, the government, and NGOs have been realized. Leaders showed higher levels of satisfaction with their fish farming operations, which is probably related to the fact that leaders had been fish farming longer and had larger fish farming operations than the members, on average. Throughout the discussion leaders' and members' often disparate attitudes are noted. Importantly, leaders were significantly older individuals than the members.

Benefits of membership. One of the primary goals of fish farmer associations is to meet member farmers' technical shortcomings. Therefore, an assessment of farmers' perceived deficiencies in fish culture practice and how these are addressed by fish farmer organizations is a good measure of the viability of a producer organization, especially as it pertains to long-term farmer involvement and growth. Farmers in "The Cooperative Society" identified deficiencies in several areas crucial to their fish farming operations.

First, farmers acknowledged lack of inputs, specifically feed and fingerlings. "The Cooperative Society," through connections with the government and Uganda Cooperative Alliance (UCA), are sometimes given fingerlings for distribution to members. However, these have been given in insufficient quantities or are of low quality and promises of fingerlings are often not met. When farmers purchase their own fingerlings, "The Cooperative Society" also plays a beneficial role by decreasing each farmer's cost through bulk purchase of fingerlings and sharing transportation costs.

Farmers also require fingerlings of high quality, which refers to each fingerling's size, viability after stocking, and subsequent growth rate. In terms of procuring fingerlings of high quality, the collective knowledge, experience, and social capital of the individuals in the producer organization gives farmers access to better fingerling producers and excludes others who peddle poor quality fingerlings. In the same way, the member-farmers who purchase formulated feeds share transportation costs and collectively negotiate for bulk prices. In the future, "The Cooperative Society" aims to serve as a large poultry company's feed vendor for the western regions, which will provide income and further reduce feed costs for members. Member-farmers who are not yet at a scale of operation to purchase formulated feeds receive instruction in making feeds from locally-available ingredients.

Financial shortcomings were at the forefront of member-farmers' stated deficiencies. Many farmers have yet to realize profits from their fish farming operations, though all of them have harvested fish for household consumption. All fish farmers expect profits, and most members who have operated for two production cycles reported generating profits. In addition to teaching productive pond management, the producer organization aids farmer-members in achieving profits through collectively marketing farmers' fish, reducing the time the farmer must spend searching for buyers, as well as reaching the best possible price. Farmers also receive advice on marketing and pricing their fish.

Farmers with a desire to expand their fish farming operations find access to capital to be a problem, especially in terms of credit and land; lack of capital is often an inhibiting factor in improving their fish farm's productivity. The producer organization, while not currently aiding farmers in accessing credit, hopes to increase resources to the point of providing production-cycle loans to member farmers.

One way that "The Cooperative Society" acts as a financial safety net is through an emergency fund that it maintains for its members. Farmers annually pay into this revolving fund and are able to access small

loans to pay unexpected bills unrelated to fish farm operations, such as a death in the family or hospital bills. In this way, “The Cooperative Society” also functions as a burial society, one of many such societies to which farmer-members may belong. Burial societies serve an important function in terms of civil society and financial security (Makumbe 2002). Thus the cooperative provides broader social and economic benefits to its members beyond inputs and guidance for fish farming.

In fish farming training, farmers were eager to learn environmental improvement techniques that they integrated into their fish farming operations. They mentioned water harvesting and decreasing erosion through pond side tree planting as conservation efforts they employ. Leaders in “The Cooperative Society” identified human capital-enhancing skills they developed while occupying elected positions. These included skills in business, leadership, communication, English, marketing, learning from one another in the group, hearing new ideas from outsiders, and growing in personal confidence.

Fish farming as status symbol. A common benefit cited both the leaders and members of “The Cooperative Society” derived from their fish farming enterprises as well as through leadership positions they held in “The Cooperative Society” the status in the community. Farmers take great pride in their fish farming enterprises. This pride is reflected in the physical care and management of ponds, evidenced by the well-kept grass, as well as the ways the farmers use their fish. The act of a farmer serving fish he or she had raised at a special event, such as a child returning home from boarding school, or to important people, like visitors, is both a demonstration of achievement and status and a source of farmer pride.

A special meal is usually served to children returning from boarding school and fish farmers who are able to serve fish are offering their children a treat: “Fish is something they never would have eaten at school.” Also, fish farmers discussed how their fish ponds improved the appearance of their homes. Ponds demonstrate the ability to develop their resources and this physical evidence increases their neighbors’ perception of the farmers’ success. One fish farmer said, “A neat and well-organized home is a symbol of status.”

The ability for fish farming households to feed fish to their families is also a source of pride as they actively provide nutritious, high-value foods for their children. Farmers who were receiving income from their ponds spoke of the increased prestige that their improved incomes brought as well as the ways they invested this income into land and education. One farmer mentioned expanding his land holdings as a result of fish-based income. Several spoke of the pride they felt from sending their children to boarding school with income from their ponds. Finally, farmers were proud to be able to share fish harvests with their disadvantaged neighbors, knowing that they had a nutritious, valuable food to offer. While farmers cited compassion and empathy as reasons for gifts of food to poor neighbors, sharing fish is also an important demonstration of agency and wealth.

Leadership. Discussions with the leaders revealed the status conferred on elected cooperative society leaders. Being elected to a position in a society is public recognition of status and affords opportunities to further improve status. Fish farmers holding leadership positions in “The Cooperative Society” talked about the business and communication skills they had gained through their roles. One man who had limited schooling was able to improve his English through interchanges with more educated peers. Also, leaders are often nominated to go to training and bring back the information they received to share with the members. The opportunity of learning information first and presenting it to members at a meeting reinforces the leaders’ status.

Several leaders are retired. In Uganda, government employees are required to retire at age 60. After retirement, their community involvement and status usually decreases. Involvement in “The Cooperative Society” is a means of maintaining their community-serving and active lifestyle. One woman, a retired teacher and committee member who proudly pointed out her former students among the members, shared

the confidence and influence she maintains post-retirement through her involvement in this organization. She holds a leadership position and therefore a responsibility to be busy and engaged. She says, “I am able to pick up my nice dress, put it on, and I forget my old age.”

Leaders articulated several key areas where networking and advocating for the fish farming sector are important responsibilities of their producer organization. Consistent with the society’s goal of addressing farmer deficiencies, the leaders seek to “Work together to solve the challenges of fish farmers with one voice.” In order to unite the fish farmers’ voices the leaders have sought out relationships with fish farmers outside their producer organization and thus built social capital. The president boasted, “Now we know all the fish farmers in the entire county.”

The leaders interact with individuals and groups who have resources that their member famers need. These resources include fingerlings and training and are sought through relationships with government officials, foreign donors, and the UCA. With an understanding of the linkages between fish farming and other development arenas, the leaders have aligned their fish farming goals with goals such as poverty alleviation, environmental preservation, and malnutrition, especially as it is experienced by HIV/AIDS victims. Advocating for the fish farming sector includes recruiting new fish farmers, and “... spreading the message that households with land and water can earn good incomes through fish farming.” Thus the logic and objectives of the donor shape the direction of the cooperative.

The Cooperative Society leaders actively plan to expand its presence as a locus of fish farming specialization. They state that the society’s success is built on the member-farmers’ success, which explains why their first goal is to increase all members’ fish production and thus, household income. For some, increases in income from fish farming have already lead to sums sufficient to purchase more land to expand fish farming operations and pay children’s school fees. Plans to rent an office space, sell formulated feeds, and offer production-cycle loans to members are all part of their vision to increase member-farmers,’ and therefore “The Cooperative Society’s,” success. Leaders also articulated several community-development goals, such as creating opportunities for local youth with little education to earn incomes from pond construction and a fish consumption goal for the community to which they belong. One leader cited the FAO nutritional recommendation that individuals eat fifteen kilograms of fish per year, and her vision is for the fish farmers in “The Cooperative Society” to supply that amount of fish for local consumption.

PART II: CAGE CULTURE TRIALS

Following group member meetings and training on stocking and management of the cages discussed above, the group was set out to grow their first lot of fish. The results presented below are based on the data collected up to day 84 following stocking of the cages. This is the last time sampling was carried out. The results thereafter are a projection based on the previous sampling.

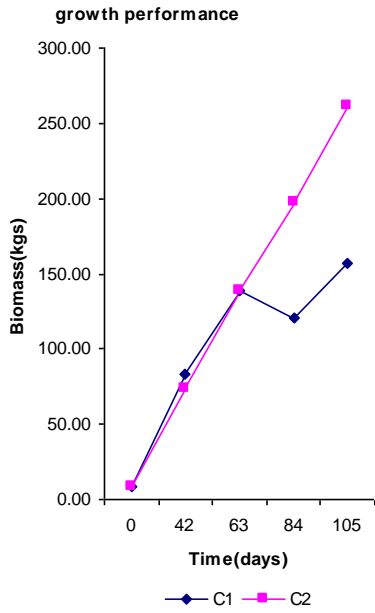


Figure 1. Growth performance

The graph shows growth performance of cage 1 (C1) and Cage 2 (C2). The biomass of cage 1 and 2 increased exponentially for the first 2 weeks but later the biomass of cage 1 decreased on day 84 and eventually increased on day 105.

The significant drop of biomass in cage 2 was due to fish that escaped through holes that were discovered on the net bag. However, the biomass of cage 2 increased at a relatively constant rate reflecting a steady fast growth up to day 105. This was an indication of normal growth.

Biomass and carrying capacity of cage 1

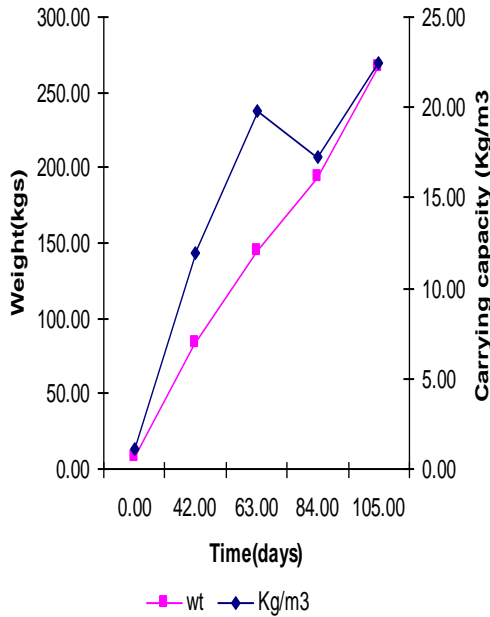


Figure 2.

Biomass and carrying capacity of cage 2

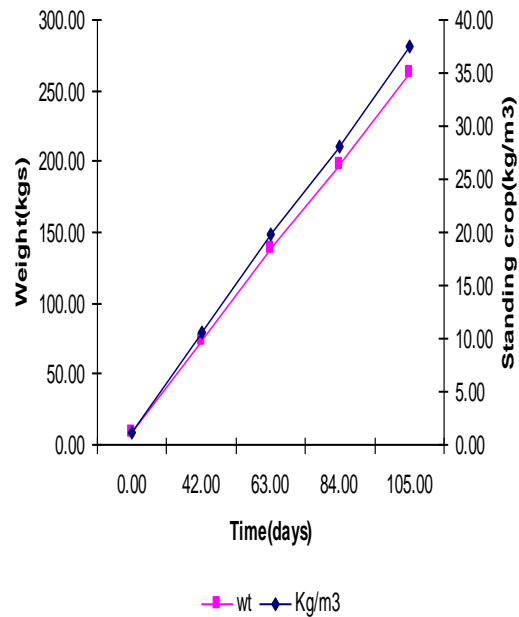


Figure 3.

The figures above compare the biomass of cages 1&2. Figure 2 shows an exponential increase in the biomass of cage1 together with its carrying capacity. However the biomass on day 84 decreased as well as its carrying capacity. This was because when fish escaped there was a reduction in numbers, total weight and the carrying capacity per m³.

Figure 4 shows biomass and carrying capacity of cage 2 increasing at almost the same rate for a period 105 days. This was because this cage experienced low mortalities and no fish escaped hence maintaining a favorable stocking density.

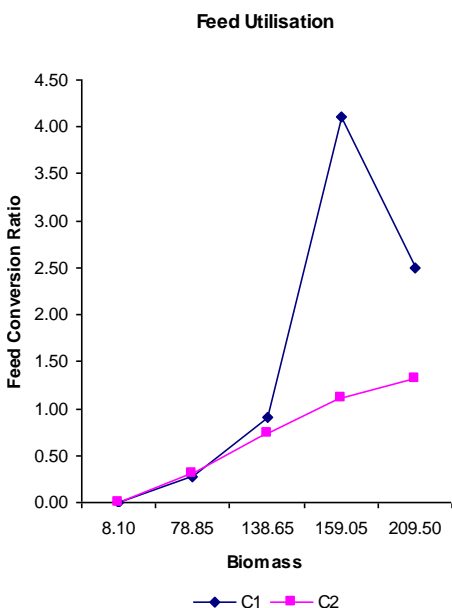


Figure 4. Feed utilization: The graph shows utilization of feed by cage 1 & 2 with increasing average biomass. At average biomass 78.85 the FCR of cage 1 & 2 is less than 0.5 because the fish supplement their diet with natural food which is mostly phytoplankton.

Cage 2 showed a steady increase in FCR together with increasing biomass from 78.85 to 209.5 kg. This indicated that almost all feed eaten by the fish was converted into body weight. This rendered them more efficient at digestion and utilization of feed as compared to cage 1.

However, cage 1 shows a sharp increase in FCR with increasing biomass from 78.85 to 159.05 kg. This could have been due to fish escape to the wild. As a result, most of the feed administered during this period was in excess and wasted to the lake as uneaten feed.

These graphs emphasize the importance of sampling as a key aspect in monitoring current fish biomass. This enhances determination of right quantities of feed that should be administered hence minimizing losses due to applying excess feed.

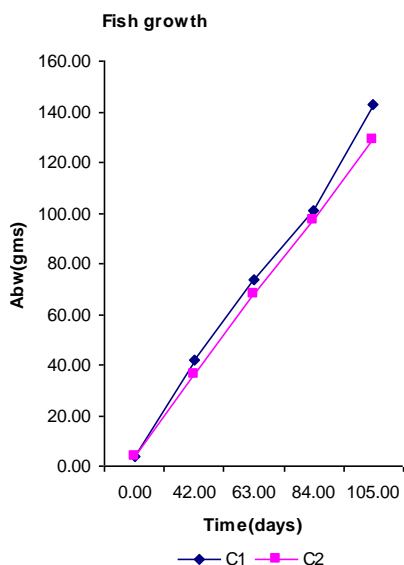


Figure 5. Average body weight with time: The graph above compares size of fish in cage 1 & 2. Initially the growth of these two cages is almost the same. However, day 84 shows cage 2 with a faster growth than 1. The faster growth was due to lower stocking density in cage 1 due to fish escapes. This resulted in less competition for available resources like food. As a result growth was accelerated in cage 1 than 2.

The average weight attained in both cages within 84 days is about 100g. This size is more than most of the undersize capture fish sold at an informal landing site at Kirinya, an illegal fish business between fishers and wives of prison warders².

Small holder farmer group organization. Jinja United Group Initiative for Poverty Alleviation and Economic Development (JUGIPAED) secured most of the key requirements (water quality parameters, permit, site, market information), to start a project on cage fish farming on Lake Victoria. Later, the group entered into partnership with the Aquaculture Research and Development Centre, Kajjansi with funding from AquaFish CRSP to carry out cage fish farming at Kirinya. The partnership is on a cost sharing basis and it is intended to provide a kick start to implementation of cage culture project agreed upon by the group members while at the same time carrying out research in cage culture. The rationale for this approach is demonstration of fish farming as a business, hence the need for the group to contribute to the costs of the enterprise and learn how to manage their cash flow.

Stutzman (2010) observes that aquaculture development commentary supports the formation of fish farmer associations or producer organizations as avenues for cultivating small- and medium-scale commercial farmers. Umbrella organizations under which local fish farmer associations vertically align themselves have important implications for fish farmer production. Formation of small holder farmer group organizations has been encouraged by government of Uganda in order to ease provision of various services particularly technical advice and inputs such as seed. Some of these farmer organizations have initiated self-help activities carried out as a group most notably savings and credit. When JUGIPAED decided to engage in cage culture, the members used their collective savings in the group's account to cover their share of items that were agreed upon as per the MoU. These items included feed, labor, and any other expenses such as communication and transport costs to the site.

However, as earlier noted by Stutzman (2010), group cohesion and participation by all group members seem to be a challenge. This stems from the fact that groups tend to front numbers in order to attract support from government or donors, hence actual group activates are often engaged in by just a few members and not all listed in the group's register. However on the other hand, group managed activities are in themselves a challenge especially if there are uncertainties on issues such as the potential risks involved and benefit sharing. Consequently only a few members keep the work moving.

Cash flow management. A draft enterprise budget to guide the trial was drawn by the project team and discussed with the group members. During the discussions, inputs to be contributed by either party were agreed upon and included in the MoU. During the trial, the chairman and treasurer of the group kept all the records pertaining to cash flow. The records showed sources of funds which are mainly members' contributions. The project team also availed group members with information on cost of items contributed by the project. Discussions were held with group members on the variable costs incurred for cage operations up to day 84.

² The business emerged shortly after the cages had been stocked.

Table 2. Operating costs of managing the cages for 3 months

Input description	Unit cost (UGX)	Total cost (UGX)
2030 fry	80	162,400
132 kg of feed	2167	286000
Labor for feeding per month	50,000	150,000
Transport by members	8,000	60,000
Total		658,400

Basing on UGX400 which is the average price of the 80-100g tilapia fish sold at Kirinya, we estimated that the anticipated revenue from the 209.5kg from cage 2 to have been UGX 836,000 culminating in a profit of UGX177,600. However, if the fish were to be sold by a kilo at UGX 3,500, the revenue would have been UGX731,500 making a profit of UGX73,100. This indicates that it is profitable to sell fish at the smallest market size as long as positive returns above variable costs can be attained.

CONCLUSION

Across cases, several similarities emerge. Each fish farmer association operates in an area of high potential for aquaculture in Uganda. Fish farmer associations are place-based, with members from a defined geographical region. Each operates in an umbrella group structure. That is, each fish farmer association has other farmer associations “under” it or has an organizational structure “over” it. Also, no full-time fish farmers emerged from the groups examined; all group members and leaders stated that they are involved in other agricultural producer groups, with many individuals involved in three or more agricultural producer groups. For only one fish farmer association, “The Family Affair”, is fish farming the primary economic enterprise for executive members, and even this fish farmer association is involved in other agricultural activities.

The thread of misdirected development assistance runs through each of the following categories of discussion. It should go without saying that the primary goal of a fish-productive aquaculture producer organization cannot be orchestrating its activities to qualify for the most donor assistance possible. Nonetheless, there are multiple aspects at play in the relationships between each of the fish farmer associations examined and funding agencies (both governmental and NGO). These relationships are considered in light of the ways the structures they produce aid or inhibit fish farmer associations in strengthening profitable, commercial member farmers.

Specifically, across cases, the catalyst for group formation influenced each producer organization’s goals and priorities, as well as members’ expectations. Members’ expectations are shaped by the promises of the government official encouraging the individuals to form a fish farmer association. Also, catalysts for group formation and subsequent priorities and goals are directly related to members’ fish production. Fish farmer association goals and priorities determine whether or not the member farmers and leaders view their activities and enterprises as successful. In instances where the goal of engaging in fish culture is to receive money rather than generate income, success is not measured in fish production, but in the amount of money received (Grivetti 1982).

Across cases, every producer organization formed based on the advice or encouragement of government officials and group formation was related to receiving funding for the producer organization’s activities. Though no case besides “The Family Affair” kept concrete production records for their organization, based on farmers’ assessments of production and profitability, some conclusions can be drawn about the connection between donor support and fish production or fish farm profitability.

“The Unaccountable Leaders” worked through an existing community based organization (CBO), an association dedicated to environmental conservation, in order to receive government support for their fish farming activities. However, there is no system or mechanism for equitable distribution of benefits among members of this group-managed fish farm, even though much of the funding comes from government agencies or donors. The fish farming project coordinator says, “People who have put in big investments must take the lion’s share,” implying that the project coordinator himself, who arranged for the funding, was the “lion.”

“The Helping Hands” producer organization was made up of a subset of members of a regional organization focused on poverty alleviation. When the chairman was asked why this organization was formed, he replied, “The idea was to serve the needs of the members of the group and to get creditors.” This group works with cross-cutting issues, in response to donor goals; in order to receive funding from NAADS, the group must provide HIV/AIDS education to its members. This producer organization has received or sought funds from donor-funded projects, as well as local government agencies. Because this organization has not begun cage farming no assessments can be made about fish production.

“The Family Affair” was a functioning fish farm for 30 years, from 1973-2004, and operated by an individual and his family, until a district fisheries officer advised the farmer to organize as a group in order to be eligible for regional, government-sourced funding. Still, many members of this producer organization are the chairman’s family. Besides accessing funding based on having a group structure, the name of the association includes the word “orphan,” which expands the chairman’s entitlement to donor funds. The chairman’s brothers died of AIDS, leaving him with the responsibility of providing for his nieces and nephews. When asked about the organization’s connection to orphans, the chairman said, “We choose to work with orphans because these government structures of assistance require that we reach cross-cutting issues. It is the first step to get the money.” This producer organization has received funds from a regional funding agency, WFP, and USAID.

“The Cooperative Society” began as an association, but the leaders changed their organization’s registration after the minister of fisheries advised them to form a cooperative society. This registration change allowed them to receive assistance (or, the promise of assistance, as many promises have not been fulfilled) from the Uganda Cooperative Alliance (UCA).

Each producer organization operated within a larger umbrella structure, where fish farmer associations are affiliated with a larger organization: “The Unaccountable Leaders” producer organization is under a regional association dedicated to conserving environmental resources; “The Helping Hands” is a sub-set of members of a poverty alleviation organization who share the goal of cage culture, as well as a regional administration and funding structure of fish farmer groups throughout the region; “The Family Affair”, at the mandate and expense of external donors, is overseeing the development of 22 other fish producer organizations; and “The Cooperative Society” is a regional producer organization under the umbrella of the Uganda Fish Farmers Cooperative Union, and also registered with the Uganda Cooperative Alliance. The impacts of these “groups within groups” structures require further study, though some important elements emerge from our research.

From the four cases examined, the most significant impact of the umbrella structures was that the goals of the “umbrella” organization color the goals of the groups they “cover.” When this “cover” is tied to financial support, the goals become mandates. Often, the goals of the funding agency do not include developing commercial fish farmers, though this may be a primary goal of the producer organization.

Funding agencies’ directions can potentially distract producer organizations from their objective of developing productive fish farmers or promote strategies that are ineffective in practice. Part of the reason for this promotion is that fish farming is touted by government officials as a profitable farming enterprise

that anyone can do. The perception is: men and women, able-bodied and disabled, wealthy and poor, widows and orphans, everyone can earn money from fish farming. While most successful fish farmers and technical experts seriously question the validity of that perception, government officials still design and fund projects to organize fish farming projects connected with reaching unrelated goals. Examples of funding agency goals unrelated to productive fish farmer development include reaching cross-cutting issues such as providing HIV/AIDS education and reaching vulnerable populations (i.e. women, orphans, and disabled people). An example demonstrates the ineffective strategies of one of these efforts: a fish farmer group made up of disabled people operating under “The Helping Hands” producer organization cited problems with physical mobility as one of their major constraints to operating a profitable fish pond. Their mobility-related disabilities prevented this group from efficiently managing their ponds. According to their production records, the group of disabled people found fish farming financially unsustainable and plans to abandon production.

However, fish farmers’ ability to improve the lives of the poor is not only accomplished through training vulnerable people as fish farmers, and may not require funding agency dictates. The producer organization with the least donor support, “The Cooperative Society”, addressed cross-cutting issues quite differently than “The Helping Hands” or “The Family Affair”, the two most donor-involved producer organizations. “The Cooperative Society” members aided vulnerable people as individual farmers, not as a collectivity, by providing poor neighbors with on-farm employment opportunities and sharing nutritious, farm-raised fish.

In the cases examined the umbrella structures that specialize in fish farming yield member fish farmer associations with higher production than umbrella structures that oversee a spectrum of projects. “The Cooperative Society,” under the umbrella of the Uganda Fish Farmers Cooperative Alliance, and “The Family Affair,” are the two highest-producing fish farmer associations examined.

Fish production-based umbrella structures are better able to develop productive fish farmers partially because of the social capital these associations develop: bonding social capital, which unites the members of a producer organization and bridging social capital, which connects people and institutions. A host of relationships set these specialists associations apart, as they have long-term working connections with technical experts, government research stations, universities, international experts, fingerling producers, feed distributors, and development professionals. Through these relationships, fish production-based umbrella structures are better poised to advocate for the fish farming sector, broaden member farmers’ resources, and develop productive fish farmers.

Additionally, umbrella structures which specialize in fish producer organization development are less likely to seek funding for non-aquaculture related development projects, efforts which distract diversified umbrella associations from focusing on improving fish farmers’ successes.

Several incentive systems designed to encourage the development of a profitable and commercial fish farming sector in Uganda have been distorted to the point that they inhibit the economic and human-capital growth they were conceived to foster. What were designed to be incentives to productive fish farm development have evolved into ends in themselves. When leaders profit from distorted incentive systems, members’ trust is seriously compromised and member attrition results.

Two leaders of producer associations expressed that they wanted to operate model farms. The leaders of both “The Unaccountable Leaders” and “The Helping Hands” expressed this interest. Also, these two men are most politically ambitious and donor-seeking PO leaders. In Uganda, a model farm is a political distinction. Rather than recognizing farmers who have built up productive and economically successful farm enterprises through the farmer’s own long-term investment and expertise, model farms can be designated before one complete production cycle. In this context, a model farm is one that has been

recognized by the president and designated as a demonstration farm for farmer field school education. With model farm distinction comes an inflow of government assistance. This system is well suited to limited funds and staff members but, as previously mentioned, ordinary farmers may perceive model farmers as a privileged group they are unable to mirror (Mangheni 2007). This understanding limits the application of information received during farmer field schools held on model farms. Both of the producer organization leaders interested in achieving model farm status are envisioning the rewards, in terms of money and influence, which are unrelated to fish farm profitability. Yet the rewards from donor money are often more tangible and immediate than proceeds from fish culture. Model farm distinction is a financial end in itself; it is tangentially related to farm commercialization.

The reality of producer associations maintaining multiple bank accounts for categories of donor assistance offers an insight into a pattern of assistance-seeking. Related to the treadmill of development assistance, many producer organization leaders pursue a piecemeal approach to funding sources.

This approach is borne out of the development paradigm of cost sharing, where assistance-receivers invest a percentage of their own financial resources into a project. The purpose of cost sharing is to encourage participant ownership of the project and thus, incentive to manage the project well, as to provide returns on the participant's investment. Since a producer organization leader realizes that development agencies expect cost sharing, he pursues multiple donors. For example, if one donor will finance 80 percent of a project, and the group members are expected to contribute 20 percent of their own financial resources, the producer organization leader may not ask his members for the 20 percent but finds another donor, unbeknownst to the first, to finance the 20 percent that is the members' responsibility.

If the leader is also a local politician, or has political aspirations, this piecemeal approach becomes even more important, as the leader will lose popular support if his or her participants invest their own resources into a project that fails. With membership dues or participant investment come expectations of leaders' accountability and financial returns. In the words of the project coordinator of "The Unaccountable Leaders" producer organization, "We have people who are ready to pay money to be members but we are not signing them up because we can't take their money when there are no feeds because then they will be asking, 'What is happening with our money?'"

To clarify, this is not a greedy or underhanded approach to conducting business but a practical one. This approach was created (and is sustained) by the revolving door of donors and government programs designed to assist the poor farmers of Uganda. A half-century's history has proven that in time, another donor will come; therefore investing personal financial resources is unwarranted, if not wasteful. However, the piecemeal approach to funding sources has a detrimental impact on the aquaculture development of Uganda as it perpetuates the idea that fish farming is only profitable if a donor pays for the fingerlings and feed.

Though patterns of distorted incentive systems and piecemeal donor seeking were established by donor behavior, the effects damage the viability of fish farmer associations and undermine their ability to accomplish the goal of becoming profitable commercial fish farmers. As previously mentioned, with each donor comes that donor's own aims, which may or may not align with the producer organization's goals. In fact, government or donor goals may serve to hinder member fish farmers from focusing on production, profitability, and long-term organizational viability. Donor and governments' requirements certainly threaten fish producer organization leadership development, as this pattern of goal displacement and distortion obstructs leaders from defining, working towards, and achieving goals and forming an organizational identity.

In the current method of operations, leaders of donor-driven fish producer associations simply follow the dictates of donor organizations, dictates which change with the creation and completion of an endless

stream of short-term projects conducted by an alphabet soup of donor organizations. Additionally, fish producer organizations model the donor's short term project orientation. For fish producer organizations in Uganda to support a market-driven, thriving aquaculture sector sustained over time, producer organization leaders must recognize that current government and donor financial incentives are not serving their interests as commercializing fish farmers, and avoid them while demanding that these structures be reformed to serve the intended purposes of governments, donors, and fish farmers.

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