



International Journal of Fisheries and Aquatic Studies

E-ISSN: 2347-5129

P-ISSN: 2394-0506

(ICV-Poland) Impact Value: 5.62

(GIF) Impact Factor: 0.549

IJFAS 2020; 8(2): 258-264

© 2020 IJFAS

www.fisheriesjournal.com

Received: 10-01-2020

Accepted: 12-02-2020

Aanyu, Margaret

National Fisheries Resources
Research Institute, Aquaculture
Research and Development
Center P. O. Box 530, Kampala,
Uganda

Opio Denis

National Fisheries Resources
Research Institute, Aquaculture
Research and Development
Center P. O. Box 530, Kampala,
Uganda

Aruho Cassius

National Fisheries Resources
Research Institute, Aquaculture
Research and Development
Center P. O. Box 530, Kampala,
Uganda

Atukunda Gertrude

National Fisheries Resources
Research Institute, Aquaculture
Research and Development
Center P. O. Box 530, Kampala,
Uganda

Corresponding Author:

Aanyu, Margaret

National Fisheries Resources
Research Institute, Aquaculture
Research and Development
Center P. O. Box 530, Kampala,
Uganda

Potential for enhancing and sustaining commercial aquaculture in Uganda: Producer organizations, contract farming schemes and public-private partnerships

Aanyu, Margaret, Opio Denis, Aruho Cassius and Atukunda Gertrude

Abstract

In 1990s, government of Uganda started promoting commercial aquaculture. Consequently, aquaculture production increased from about 2,300 tons in 2002 to 120,000 tons by 2018. As human population in Uganda is increasing at a rate of 3% per year, the annual demand for fish for human consumption and trade is projected to increase from the present 870,000 tons to 1,700,000 tons by 2025. The government therefore postulates aquaculture to supply 1,000,000 tons annually, with 700,000 tons obtained from capture fisheries. However, the aquaculture sector is not well organized to boost fish production and marketing unlike agricultural commodities like sunflower, rice and sugarcane whereby farmers are part of producer organizations, contract farming schemes and public-private partnerships which have improved crop productivity, profitability and market access. This review examines producer organizations, contract farming schemes and private-public partnerships in the agricultural sector in Uganda and their potential contribution in improving and sustaining commercial aquaculture.

Keywords: Aquaculture, producer organizations, contract farming, public-private partnerships

1. Introduction

Fish plays an important role as a source of food for at least 30% the people of Uganda ^[1]. People are also getting more aware that fish has lower cholesterol levels and higher levels of omega-3 fatty acids with less risk of causing heart-related diseases. Besides, fish is the second highest foreign exchange earner in Uganda with the fisheries sector employing over one million people ^[2]. Consequently, the government of Uganda considered fish as one of the priority commodities whose production, productivity and profitability need to be boosted to contribute towards improved food and nutritional security, income levels and livelihoods ^[3]. Presently, annual fish production is about 570,000 tons with 450,000 tons derived from capture fisheries and 120,000 tons from aquaculture. The annual per capita fish consumption is about 10 kg per person which is below the recommended level of 20 kg per person by the Food and Agricultural Organisation (FAO) of the United Nations ^[1, 4]. This implies that there is presently a fish deficit of about 300,000 tons annually. With growing human population in Uganda, at about 3% per annum, the demand for fish is projected to keep increasing. By 2025, the human population is projected to reach about 55 million and the fish demand for both human consumption and trade is projected to be 1,700,000 tons ^[3]. To address this, the government of Uganda has set a target to obtain 700,000 tons of fish from capture fisheries and 1,000,000 tons from aquaculture ^[1, 3]. This requires a shift to more efficient but sustainable fisheries exploitation measures and improved performance of the aquaculture value chain ^[1]. In Uganda, aquaculture started in 1941 with the aim of stocking fingerlings in the lakes in southwestern Uganda to combat malnutrition ^[5, 6]. Following the establishment of the Kajjansi fish farm in 1953, an extension programme was created resulting into the construction of 1,500 ponds by 1956 ^[7]. Aquaculture was promoted and largely supported by government through FAO as one of the rural development programmes though fish was largely produced at subsistence level ^[6]. Around 1990s, there was a decline in fish catches from wild fish stocks that led to increased appreciation of the potential of aquaculture to improve nutrition, food security, create employment and raise incomes.

As a result, from the year 2000, government of Uganda started promoting commercial-oriented aquaculture [6]. This enhanced aquaculture development, leading to an increase in the number of functional ponds from 11,000 by 1968 to about 20,000 in 2005 with a total of 1,500 tons of fish [5]. By 2010, the number of earthen ponds increased to 25,000 with at least 500 fish cages on Lake Victoria giving a national production of 100,000 tons of fish [6]. By 2017, there were over 25,000 functional fish ponds and over 1300 fish cages with an estimated fish production of 120,000 tons [6, 8, 9]. The National Agricultural Research Organisation (NARO) of Uganda through its Aquaculture Research and Development Center (ARDC) plays a crucial role in the growth of the aquaculture sector by undertaking, promoting and disseminating research-based technologies that enhance aquaculture production, productivity and profitability. Aquaculture research interventions include development of fast growing fish strains, cost effective feed, efficient production system designs and fish husbandry practices.

1.1 Farmed fish species and aquaculture productivity

Presently, the main farmed fish species in Uganda are Nile tilapia (*Oreochromis niloticus*) and African catfish (*Clarias gariepinus*) [10, 11, 12]. The main production systems used are earthen ponds followed by fish cages and lastly tanks [11]. Fish productivity is 0.05-1.5 kg. m⁻³ in earthen ponds; 25-80 kg. m⁻³ in cages and 5-20 kg. m⁻³ in tanks in a period of 8 months [12, 13].

About 60% of fish farmers are smallholders based in rural settings owning 1 to 4 fish ponds each of ≤ 500 m² or 1 to 3 small cages each of ≤ 10 m³ with a farm production of ≤ 300 kg annually and operating at subsistence level [13, 14]. Earthen ponds are the main production systems used by small-holder farmers [12, 13]. The households engaged in fish farming are mostly male headed, and rely on family labour [6, 14]. The women and youth normally carry out routine fish husbandry activities [12]. Aquaculture growth is vital for poverty reduction amongst small-holder farmers because poverty is concentrated in rural areas where over 60% of the total population live with at least 30% of children under 5 years being malnourished [13, 15, 16]. The commercial or emerging commercial fish farmers have over 5 ponds of an average size > 500 m² and over 5 fish cages of over 100 m³ with each farm producing more than 5 tons of fish annually [13]. Cage and tank fish culture are mainly undertaken by commercial farmers [6, 17]. Commercial farms use paid labour comprising 10 to 30 people [13]. Some cages and ponds are owned by emerging producer associations or farmer groups but they are deemed not active and often fail to fulfil their set objectives [9]. There is also a plan by government of Uganda through the Ministry of Agriculture Animal Industry and Fisheries (MAAIF) to pilot community-based aquaculture parks on Lake Victoria for cage fish farming and in Apac district for pond fish farming [18].

1.2 Aquaculture Inputs and their Supply

The main inputs required during the fish production cycle for enhancing aquaculture productivity and access to markets include quality seed and feed, market information, funding, extension services and favourable government policies and legislation [12, 13]. There is a government owned fish hatchery at the ARDC and about 35 privately owned hatcheries producing about 300 million fish fry/fingerlings annually [19]. Some farms produce their own fish fry. However, to produce

up to 1,000,000 tons of fish from aquaculture annually, Uganda, will need at least 2.5 billion fingerlings [1, 3, 19] and 1,500,000 tons of fish feed of good nutritional quality [3]. Presently, Uganda produces 50,000 to 100,000 tons of fish feed and imports 100,000 to 200,000 tons annually [1]. There is a deficit of about 1,200,000 tons of fish feed that could be produced locally to avoid the high costs associated with imported fish feed which affects the returns on investment [11, 12]. The distribution of commercial fish feeds is also limited to urban areas making it inaccessible to many farmers living in rural areas. In addition, most small-holder farmers cannot afford commercial fish feed and resort to making their own feed which is often of poor quality resulting in low fish yields and return on investment [20]. Feed producers therefore need to partner with NARO through Private-Public Partnerships to develop quality and cost-effective feed. Other aquaculture inputs are mostly imported and sometimes get out of stock for a long time while the high cost incurred while importing the items increases their market price. Besides, input suppliers are mainly based in central Uganda, implying that farmers from other parts of the country incur travel costs to purchase the items, and this limits rural farmers from accessing the equipment.

Whereas the government keeps building the capacity of extension staff to backstop farmers in aquaculture technologies, fish marketing and value addition, farmers still lack adequate knowledge on appropriate husbandry practices [12]. The extension staff are few with limited facilitation to promptly reach out to farmers requiring their services. Functional farmer groups would enable extension staff to reach out to a large number of farmers in one field visit [13, 21].

1.3 Marketing farmed fish

Smallholder fish farmers often grow small quantities of fish and hence do not have consistent supply of fish for the market [12]. The fish is sold on the farm to nearby communities, trading centres or middlemen who supply local outlets [12]. Some middlemen disappoint farmers by buying their fish cheaply. On the other hand, commercial farms have larger fish output and supply to traders who deliver fish to neighbouring countries [1]. The traders buy fish from big farms in order to quickly make up the quantities that they require [20]. A few fish farmers target niche markets by processing the fish [20, 22]. Most fish farmers however do not have access to information on fish markets, marketing strategies and value addition [12, 13]. Collaboration between actors along the value chain would avail different aquaculture products, ensure consistency fish supply, quality control and ultimately improve competitiveness of farmed fish [14]. Ensuring good fish quality is pertinent because in the local markets, fish is placed on stalls with inadequate shelter awaiting buyers yet, exposure to high temperatures lowers the shelf life of the fish [20]. Promoting well-organised marketing groups comprising registered members can improve fish marketing and increase returns to individuals and groups.

1.4 Access to credit

In aquaculture, credit access from financial institutions is minimal because most farmers lack collateral and banks deem fish farming as a high-risk enterprise [9, 13, 23, 24]. There is also need to support the different actors along the value chains through providing training on financial literacy and how to run aquaculture as a business [23].

2. Producer Organizations, Contract Farming Schemes and Public-Private Partnerships in the Agricultural Sector in Uganda

Producer organizations (POs), contract farming (CF) schemes and Public-Private Partnerships (PPPs) are some of the business models innovated to promote increased agricultural productivity, profitability and marketing of products [4, 21, 25, 26]. All these business models are operated under the government regulations [26, 27]. The POs are member-based and mostly have a positive effect on household income while CF is company-driven and benefits mostly production and value chain efficiency [25, 26, 28]. The PPPs are public-sector driven and involve one or more public agencies directly engaging non-state stakeholders in a collective decision-making process that is formal aiming at developing or implementing public policy or managing public programmes or assets [21]. The focus of PPPs is to add value to public services and allocate risks to those able to manage them [27]. A PPP has an agreement that states the responsibilities of each party and how the risks are allocated. Notably, POs, CF and PPPs are interlinked and operate together [21, 29].

2.1 Producer organizations in the agricultural sector

The POs help producers to achieve more than they could do individually hence making them better positioned to improve food security and income levels [26, 30]. They deliver services directly to their members, help in collective production, post-harvest handling and quality control; facilitate bulking products; access to markets and marketing products at premium prices; empower small farmers to engage in policy dialogue and business management [31]. Overall, POs promote inclusivity and sustainable rural transformation at local, national and international levels by facilitating bottom-up consultation between farmers' organizations, governments, NGOs and other partners [21]. POs can be in the form of cooperatives, producer associations, farmer/producer groups, communal land groups, unions, and federations [25, 30, 31, 32, 33, 34]. All POs have members with shared interests, activities or purpose. Cooperatives are autonomous associations of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly owned and democratically controlled enterprise [25]. While, farmer groups can be informal or registered and the membership rarely extends beyond the village. They are often promoted by NGOs and traders for training and extension service delivery and later perform input delivery and sales and develop into associations or cooperatives. An example of an informal group is the farmer field school, an approach developed by FAO to work in situations where more complex problems exist [35]. On the other hand, communal groups utilize state resources designated for community use and control [25]. The area allocated to each producer and that to be shared among members of the community are defined, while long-term user rights remain with the community [18, 36]. They enable widespread transfer of appropriate technology, technical support and financial loan facilities to many farmers situated in one location. Katerera Area Cooperative Enterprise in Rubirizi district in Uganda is one successful POs involved in production of maize, cotton and beans and has improved farmers' livelihoods and incomes [37]. It started in 2007 and has six registered rural producer organizations with about 4117 farmers.

2.2. Contract Farming in the agricultural sector

Contract farming (CF) is a structured relationship involving a producer and actors down the value chain, such as agribusinesses, processors, traders, large-scale plantations, exporters or retailers [25, 38, 39]. The value chain actor is the lead agent in a CF scheme and serves as a contact for reaching the producer [21, 25, 39]. In Uganda, CF is often used in agribusiness companies whereby it can eliminate the need for the producer to acquire land and ensures quality control [25]. There is need for strong integration between production, nucleus farms, open markets, purchase agreements, management contracts and contracted farmers [21]. The head of the CF scheme owns land, which is contracted to farmers to cultivate a specific crop. Presently, the private sector manages most of the CF schemes with the government making binding agreements with the private sector on the shares to be owned by the state and the proportion of earnings to be paid to the government [27]. Farmers and processors benefit from the CF scheme through training to improve crop cultivation technology, post harvest management, access to finance and trade markets [40]. The main types of CF models include informal, intermediary, multipartite / centralized and nucleases [21, 25, 41].

2.2.1 Informal Contract Farming Model

This model is based on oral agreements and speculation with no contracts written and signed [27]. The farmers have no guarantee of quantities purchased or price and the processor may run the risk of not having adequate supply of the required product(s). In Uganda, GBK Company is one of the biggest milk buying, processing and packaging company in Mbarara District. It distributes and sells milk in different towns in Uganda thereby improving food and nutrition security. Dairy farmers sell milk to agents of GBK Company who have milk cooling facilities. About 70% of the milk collected is bought through informal marketing arrangement [42]. In the aquaculture sector in Uganda, Kati Farms (U) Ltd a fish agro-processing enterprise located in central region also operates an informal contract model [22]. Through informal contracts, the agribusiness company buys fish from farmers and makes fish sausages for sell.

2.2.2 Intermediary Contract Farming Model

The intermediary model has greater supply chain control than informal model [21]. The buyer may provide inputs to the producer on credit and specify how the inputs should be used, the husbandry techniques to be applied, technical assistance to be delivered by the buyers and benefits for the producer are agreed upon. The contracts range from informal oral agreements to signed and legally certified documents. The processor sub contracts an intermediary who formally or informally contracts farmers. A coffee marketing company in eastern Uganda operates a scheme where about 3500 farmers are guaranteed a market if their coffee meets the required standard but they have no obligation to sell to the company [43]. The farmers are only obliged to follow acceptable farming practices while the company is contractually bound to provide inputs and technical assistance. In addition, the capture fisheries sector in Uganda employs a form of intermediary CF system whereby fish processing factories sign contracts with middleman who buy fish from fishermen [44]. The fish is placed in a truck with ice so that they are delivered to the fish factory in good quality. Fish buyers might also provide ice to fishermen to prevent fish spoiling, provide a boat engine,

fishing nets or cover the cost of boat repairs.^[10] The fishermen are expected to pay back the credit in installments through fish sales. Sometimes, fish factories provide insulated vehicles to ensure that the fish delivered is of good quality. The fish maw (fish swim bladder) trade is also a business that operates through an intermediary model. Fish maws are mainly traded fresh, dried and frozen through formal and informal contracts involving fish buyers, fish factories, maw processors and exporters^[45]. Most fish maw is obtained by fish factories after filleting the fish and is processed and exported mainly by Chinese companies. Chinese companies offer working capital to fish traders to ensure continuous supply of fish maw.

2.2.3 Multipartite/Centralized Contract Farming Model

The multipartite or centralized model entails the organization of farmers into cooperative and engages a financial institution, governmental statutory bodies and private companies^[21, 46]. There is control over the value chain from pre-planting to harvesting and quality control. A production-management contract could cover quality standards, production quotas, cultivation practices, crop delivery arrangements, pricing, quantity, timing, payment procedures and insurance^[27]. This is an incentive to the farmers since their produce has a guaranteed market at a predetermined price that conform to an agreed upon standard. Conversely, preset prices might cause a breach of contract by farmers when the price set in advance is below the price of the product in the market. Once there are several potential buyers offering better prices, farmers sometimes make side sales leaving the CF scheme leader with insufficient amount of produce^[27]. In addition, farmers might divert inputs, fail to supply timely and become highly dependant on input supplies. Conversely, if the preset price is below the present market price, processors might change the quality standards so as to refuse the produce from contracted farmers. Therefore, trust between producers, buyers and processors is vital for ensuring sustainability of CF schemes^[21]. The epuripur sorghum contract scheme in Uganda follows a multipartite model involving Nile Breweries Limited, Government of Uganda, the NAADS, NARO and about 8,000 farmers^[29]. It was started by Nile Breweries Limited (NBL) in 2002 to obtain 6000 metric tons of epuripur annually locally for making affordable non-malt beer for the Uganda market. This substantially reduced the production costs resulting into a lower price of the beer for the consumers. Another example is Mukwano Industries Ltd, a private company engaged in sunflower oil production in Uganda^[27, 47]. In 2002, the company started a sunflower growing scheme in northern Uganda, operating under a multipartite model CF scheme involving Mukwano Industries Ltd, NAADS and NARO, international aid agencies, and about 32,000 smallholder farmers^[27]. The main objective was to obtain assured supply of sunflower for the production of edible oil through the introduction of a high yielding sunflower variety known as PAN 7351. Mukwano required 100,000 metric tones of sunflower seed to meet its oil mill annual production capacity, hence, contracted farmers to grow sunflower. The company's goal was to improve farmers' livelihoods by guaranteeing them market after production so that farmers realize more income. All interested farmers sign a CF agreement and the company gives subsidized inputs (seeds, fertilizers), training and guaranteed price at harvest. Farmers are obliged to buy seed (hybrid 7351) from Mukwano Industries Ltd, the Uganda Oilseed Producers'

Association (UOSPA) or other seed companies and sell to Mukwano Industries Ltd exclusively as raw inputs for edible oil and seedcake processing. Mukwano Industries Ltd increased women's income by at least 30% from 2005-2008 contributing to reducing extreme poverty and hunger^[27]. Furthermore, the Cotton Development Organization (CDO) in Uganda operates a multipartite model where CDO controls distribution of cotton seed by direct distribution to private companies and cooperative structures^[48]. The harvested cotton is sorted into clean or stained cotton that is bought either from the farm by CDO agents, or delivered to cooperatives, ginneries or buying centers.

2.2.4 Nucleus Estate Contract Farming Model

The nucleus estate model is lucrative when there are economies of scale in producing and processing agricultural commodities at low cost^[21, 27, 40]. The processor must buy land/estate or pay for a lease so that when the supply of the required product from farmers is unreliable, the processor has a certain output from the estate. The processor can satisfy all conditions for export, e.g. food safety, traceability, working conditions of labour and environmental sustainability that would need expensive monitoring and enforcement on contracted farms^[21]. Tilda Uganda Limited is a rice scheme in Eastern Uganda that follows a nucleus estate model^[27]. It began in 2004 to increase its production to meet the rising market demand for rice. Tilda had 650 hectares of arable land capable of producing about 4,000 metric tons of rice per year. It supplemented its production with output from about 600 contracted out-growers who produced about 3000 metric tons of rice annually. Another CF was initiated at an island in Kalangala district whereby government of Uganda obtained land for oil palm Uganda limited (OPUL) to grow and process oil palm as an alternative to imported oil^[21, 27]. A growers association was established as an intermediary between farmers and the processor. Through a PPP, a fully integrated oil palm value chain was established from input provision, financing, production, processing and marketing with forward and backward linkages. The PPP is based on a tripartite agreement between the government of Uganda, OPUL and Kalangala oil palm growers trust. There is an oil palm mill and a nucleus estate of 6225 ha with farmers' farms covering 3864 ha. Presently, about 3 million kgs are harvested annually by 700 farmers worth 1.5 billion Uganda Shillings. The standard of living for about 1,800 participating households has improved. People can now afford to build permanent houses, buy cars and send their children better schools and hospitals on the mainland which was not the case when fishing was the only activity at the Island. The project has also created employment to about 1400 youth. The OPUL has built Schools, constructed a Hospital with free consultation and rehabilitated Feeder Roads. Transport between Masaka and Kalangala districts has been eased using 2 ferries. Local private investors providing accommodation services and establishing beaches have also emerged thus developing Eco-tourism. The Kakira Sugar Works, is also a nucleus estate formed in 1985 in Eastern Uganda as a joint venture between the Madhvani Group and the Government of Uganda^[27, 39]. It operates at a crushing capacity of 4,000 - 6000 tons cane per day. Sugarcane is cultivated on the company's 9,700 ha estate to supplement cane from about 4,500 out grower farmers utilizing 17,000 ha. The Kakira sugar works factory produces over 100,000 tons of sugar, maintaining its position of Uganda's largest sugar producer. It provides a means of

livelihood to over 75,000 people through direct employment as outgrower farmers, cane transporters, ancillary and support industries.

2.3 Lessons drawn for success of POs, PPPs and CF schemes in Aquaculture

2.3.1 Starting POs, PPPs and CF schemes

Producer organizations, PPPs and CF schemes have to be constituted following guidelines and legislation set out by the government to facilitate them to be effectively formed, registered, engage in business and run sustainably. The members should have shared interest and objectives with mutually agreed upon roles, responsibilities, obligations and binding agreements to guide their operations. The members should be trust worthy, reliable and credible.

2.3.2 Good governance

There is need for political stability, effective and efficient government policies. The projects need to ensure good leadership values, on accountability, transparency, inclusivity, consultations/dialogue with members and enforcement of agreed upon agreements.

2.3.3. Provision of inputs and services to farmers

Given that most smallholder fish farmers particularly women and youth, do not own land and have no direct control over fish harvests, community-based groups or Nucleus Estate CF have potential to offer them employment opportunity, contributing to improved household livelihoods and self reliance. POs and CF schemes also have potential to facilitate fish farmers to access quality seed, technical guidance on husbandry practices, post harvest loss reduction services and credit facilities hence boosting their production. Since fish is highly perishable, they can also enable farmers' to access fish preservation and processing facilities for quality control thereby fetching better market prices. Whereas individual smallholder farmers cannot produce large quantities of fish to sustain market demands, POs would facilitate farmers to bulk fish, enabling collective marketing to sustain markets and collectively bargain for better market prices.

2.3.4 Sustainability of Projects

Ensure sustainability of POs, PPPs and CF schemes in terms of financial viability, environmental and social safeguards, institutional strengthening, effective partnerships, community acceptance, gender diversity, inclusivity and dissemination of improved technologies that are user-friendly.

2.3.5. Credibility of farmers under CF schemes

CF schemes may collapse when farmers practice side-selling, input diversion, unreliable deliveries of harvests or avoid paying back loans. CF schemes could avoid this by making contracts informative, well understood and enforced effectively and efficiently with penalties. Credibility of individual farmers should be established in order to blacklist potential defaulters.

2.3.6 Reliability of processors/agri-business companies

Contracts should clearly state the cost of inputs given to farmers in terms of loans, quality standards and units of measurement of the produce. The inputs provided by the agriprocessor should also be of good quality and delivered timely so that farmers get good quality and quantity of fish. Government authorities should be involved in routine

monitoring of the operations of CF schemes to protect the farmers and ensure sustained economic growth.

3. Conclusion

The search for innovative approaches to improving agricultural productivity, market access, profits, food safety and quality control is gaining grounds in recent years. POs, CF schemes and PPPs represent some of the alternatives to improving agricultural productivity, market access, food safety and quality control. However, their application in the aquaculture sub-sector of Uganda has been limited largely due to inadequate knowledge on how to apply them along the aquaculture value chain. This review has identified potential areas in which these business models might be applied in the aquaculture sector. Lessons emerging from the business models discussed show that applying the models in aquaculture can lead to improved aquaculture productivity, profits, market access, product traceability, quality control and assurance.

4. Acknowledgements

We thank officials at the ARDC and Directorate of Fisheries Resources, Ministry of Agriculture Animal Industries and Fisheries who availed information used for writing this publication.

5. References

1. MAAIF. National Fisheries and Aquaculture Policy "Optimizing benefits from Fisheries and Aquaculture Resources for Socio-Economic Transformation". Ministry of Agriculture Animal Industry and Fisheries (MAAIF), Uganda, 2017, 1-51.
2. MAFAP. Review of food and agricultural policies in Uganda. MAFAP Country Report Series, Food and Agriculture Organization (FAO) of the United Nations, Rome, Italy, 2013, 1-214.
3. MAAIF. Agriculture Sector Strategic Plan 2015/16-2019/20. Ministry of Agriculture Animal Industry and Fisheries (MAAIF), Uganda, 2016, 1-78.
4. FAO. The state of the world fisheries and aquaculture. FAO Report, 2018, 1-202.
5. Hyuha TS, Ekere W, Egna H, Molnar JJ. Social and economic performance of tilapia farming in Uganda. In: Cai J, Quagrainie KK, Hishamunda N. Social and economic performance of tilapia farming in Africa. FAO Fisheries and Aquaculture Circular 1130, Rome, Italy, 2017, 127-144.
6. FAO. Uganda National Aquaculture Sector Overview. FAO Country Report, 2019, 1-8.
7. Ssebisubi M, Ögmundur K, Helgi G. The value chain of farmed African catfish in Uganda. IIFET Tanzania Conference Proceedings, 2012, 1-12.
8. FMP III. Fisheries Management Plan III for Lake Victoria Fisheries, 2016-2020, 1-43.
9. Stutzman E, Molnar J, Atukunda G, Walakira J. Understanding the Role of Fish Farmer Associations as Intermediaries for the Commercialization of Aquaculture in Uganda. Fisheries and Aquaculture Journal. 2017; 8(3):214.
10. Atukunda G, Ahmed M. Analysis of incentives and disincentives for fish in Uganda. Technical notes series, MAFAP, FAO, Rome, 2012, 1-31.
11. Namatovu S, Atukunda G, Obeti L, Walozi R. Profitability and Viability Analysis of Aquaculture

- Production in Central Uganda: A Case of Urban and Peri-Urban Areas. *Asian Journal of Agricultural Extension, Economics and Sociology*. 2018; 22(4):1-11.
12. Atukunda G, State AE, Molnar J, Atekyereza P. Aquaculture Development and Uganda's Agricultural Extension System: The Case of Fish Farmers in Central and Northern Regions. *Journal of Fisheries and Aquaculture Development*. 2018; (JFAD-137) 1-8.
 13. Bolman B, Pieter van Duijn A, Rutaisire J. Review and analysis of small-scale aquaculture production in East Africa. Wageningen Centre for Development Innovation, 2018, 1-58.
 14. Ssebisubi M. Analysis of small-scale fisheries' value-chains in Uganda. Aquaculture Management Consultants Ltd, 2011, 1-29.
 15. USAID Report. Uganda: Nutrition Profile, 2018, 1-6.
 16. World Bank Report. Uganda Poverty Assessment, Fact Sheet, 2016, 1-1.
 17. Mbowa S, Odokonyero T, Munyaho AT. Harnessing floating cage technology to increase fish production in Uganda. Towards sustainable development towards, 2017, 1-29.
 18. Mugabira M, Borel P, Mwanja W, Rutaisire J, Balirwa J, Wadanya J *et al.* National Investment Policy for Aquaculture Parks in Uganda. ICBE Policy Brief, 2013, 1-5.
 19. Mwanja M, Rutaisire J, Ondhoro C, Ddungu R, Aruho C. Current fish hatchery practices in Uganda: The potential for future investment. *International Journal of Fisheries and Aquatic Studies*. 2015; 2(4):224-232.
 20. Dalsgaard JPT, Dickson M, Jagwe J, Longley C. Uganda aquaculture value chains: Strategic planning mission summary report. Penang, Malaysia, World Fish, 2012, 1-16.
 21. Murekezi P, Menezes A, Ridler N. Contract farming and public-private partnerships in aquaculture. Lessons learned from East African countries. FAO Fisheries and Aquaculture Technical Paper No. 623, Rome, Italy, 2018, 1-70.
 22. Cadilhon JJ, Kobusingye L. Adding Value to Aquaculture Products: Kati Farms (Uganda) Ltd. *International Food and Agribusiness Management Review*. 2014; 17(B):131-135.
 23. Munyambona E, Nampewo D, Adong A, Mayanja M. Access and Use of Credit in Uganda: Unlocking the Dilemma of Financing Small Holder Farmers. Economic Policy Research Institute (EPRC) Policy Brief. 2012; 25:1-36.
 24. Hyuha ST, Bukenya OJ, Twinamasiko J, Molnar J. Profitability Analysis of Small Scale Aquaculture Enterprises in Central Uganda. *International Journal of Fisheries and Aquaculture*. 2011; 2(15):271-278.
 25. Molenaar JW, Beekmans A, Pelders P. Producer groups models and certification: An exploration of various producer group models in the agricultural and forestry sectors, 2011, 1-59.
 26. Gersch I. Producer organizations and contract farming: A comparative study of smallholders' market strategies in south India. De Gruyter Z. *Wirtsch*, 2017, 1-16.
 27. Elepu G, Nalukenge I. Contract Farming, Smallholders and Commercialization of Agriculture in Uganda: The Case of Sorghum, Sunflower, and Rice Contract Farming Schemes. CEGA Working Paper Series No. AfD-0907. Center of Evaluation for Global Action. University of California, Berkeley, 2009, 1-32.
 28. Ton G, Desiere S, Vellema W, Weituschat S, D'Haese M. The effectiveness of contract farming in improving smallholder income and food security in low-and middle-income countries: A mixed-method systematic review. *3ie. Systematic Review 38*. London: International Initiative for Impact Evaluation, 2017, 1-114.
 29. Akullo D, Maat H, Wals AEJ. An institutional diagnostics of agricultural innovation; public-private partnerships and smallholder production in Uganda. *NJAS – Wageningen. Journal of Life Sciences*. 2018; (84):6-12.
 30. Latynskiy E, Berger T. Networks of rural producer organisations in Uganda: What can be done to make them work better? *World Development*. 2016; (78):572-586.
 31. Millns J, Juhasz J. Promoting farmer entrepreneurship through producer organisations in Central and Eastern Europe. Food and Agricultural Organisation of the United Nations, 2006, 1-66.
 32. GFRAS. Producer organisations in rural advisory services: Evidence and experiences. Position Paper. Lindau: Global Forum for Rural Advisory Services (GFRAS), 2015, 1-19.
 33. UNDP. Reengineering Cooperatives into Enablers of Agricultural Transformation in Uganda. United Nations Development Programme (UNDP) Report, 2016, 1-64.
 34. Mwesigwa D. Using farmer groups to empower smallholder rural farmers in Hoima District, Mid Western Uganda. *International Journal of Development Sustainability*. 2018; 7(3):917-933.
 35. FAO. Farmer Field School Guidance Document, Planning for quality programmes, Food and Agricultural Organisation (FAO) of the United Nations. 2016, 1-112.
 36. White P, Cappell R, Isyagi N. Feasibility study to design, cost and operationalise model commercial Aquaculture Parks in Uganda. Beneficiary Framework Contract EA/127054/C/SER/multi Lot 1: Rural Development. European Union, 2013, 1-195.
 37. Kadama R, Muzaki S, Nampiiima I, van Schie M. Farming as a Business in Uganda Experiences, Models and Good Practices. Agri-ProFocus Uganda Report Dissemination and Expert Meeting, 2011, 1-58.
 38. FAO. Contract farming for inclusive market access, Food and Agriculture Organisation (FAO) of the United Nation, Rome, Italy, 2013, 1-227.
 39. Martiniello G. Bitter sugarification: agro-extractivism, outgrowers schemes and social differentiation in Busoga, Uganda. The 5th International Conference of the BRICS Initiative for Critical Agrarian Studies held in Moscow, Russia. Conference. 2017; 55:1-22.
 40. Ekepu D, Tirivanhu P, Nampala P. Assessing farmer involvement in collective action for enhancing the sorghum value chain in Soroti, Uganda. *South African Journal of Agricultural Extension*. 2017; 45(1):118-130.
 41. Oya C. Contract farming in sub-Saharan Africa: a survey of approaches, debates and issues. *Journal of Agrarian Change*. 2012; 12(1):1-33.
 42. NAADS. Final report on market studies and value chain analysis of five (5) selected enterprises under the ATAAS project in Uganda, National Agricultural Advisory Services. 2013, 1-95.
 43. Hansen K, Rosenthal B. Impacts of Smallholder Contract Farming in the Republic of Uganda: Evidence from the "Improve" Coffee Scheme. MSc thesis. Stockholm

- School of Economics. Stockholm, Sweden, 2014, 1-19.
44. FAO. Report of the expert consultation on international fish trade and food security. Food and Agricultural Organization (FAO) of the United Nations, Fisheries Report 2003; 708:1-31.
 45. Bagumire A, Muyanja CK, Kiboneka FW. The Value Chain Analysis of Nile perch Maw Trade in East Africa. The Responsible Fisheries Business Chains Project of Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) under Contract No. 83285575, 2018, 1-52.
 46. Bolwig S. Poverty and Gender Effects of Smallholder Organic Contract Farming in Uganda. International Food Policy Research Institute. USSP Working 2012; 8:1-26.
 47. Ogwal E. The contribution of Mukwano sunflower scheme to contracted smallholder farmers' household food availability. A case study of farmers in Ogur sub county, Lira District, Uganda. A research project. Van Hall Larenstein University of Applied Sciences, 2013, 1-52.
 48. Locke R, Byrne KG. Cotton value chain case study for northern Uganda. Guided case studies in value chain development for conflict-affected environments. United States Agency for International Development, 2008, 1-42.