



Commercialization and upgrading in the aquaculture value chain in Zambia

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ABSTRACT

After decades of government and donor-run programs that sustained extensive aquaculture systems, Zambia has experienced market-led capital investments that have facilitated significant growth in production. The emerging commercial sector is characterized by investments in intensive cage and pond-based aquaculture of mostly non-native tilapia species, which today makes up the bulk of annual production. To better understand this transformation we used a Global Value Chain (GVC) analysis to examine evidence of upgrading trajectories and various forms of coordination that govern the chain. A quantitative survey of smallholder farmers in Northern Province ($n = 223$) was designed to surface insights on the productivity of small-scale farmers and evaluate their position of strength within the chain. The survey reveals the extensive nature of rural, small-scale fish farming and suggests that farmers produce mostly for subsistence purposes and in isolation from the commercializing value chain. We also provide data from 22 key informant interviews with lead firms and stakeholders in the aquaculture sector to provide insights on upgrading and the forms of coordination between nodes and firms. Our findings show that upgrading in value chains is taking place in all its forms, i.e. through investments in high value products, improvements in operations that produce more efficiently, adopting upstream or downstream chain functions, and utilizing competencies from different chains into aquaculture-related operations. Much of this is possible because of increasing vertical integration of operations and tighter contractual relationships between firms and nodes. The value chain and markets in Zambia are thus dichotomized, where on one side there is an extensive smallholder sector, supported by government-run services, and little access to inputs and markets; and on the other side, a burgeoning commercial sector with a few pioneering lead firms who have shaped the commercial value chain and who dominate total production. Finally, we combined various government statistics to reveal the growing fish supply per capita rate between 2004 and 2014. We also provide data on fish imports to locate the Zambian aquaculture value chain in the larger global picture and present some insights into what many key informants in the industry feel is an increasing obstacle facing the sector. Analyzing upgrading and coordination trends is critical in understanding the emerging aquaculture value chains in sub-Saharan Africa.

1. Introduction

Aquaculture is the fastest growing food production system in the world (FAO, 2016), however, Africa has not kept up with the pace of growth achieved elsewhere (Beveridge et al., 2010; Brummett and Williams, 2000; Brummett et al., 2008; Hecht, 2006; Hishamunda, 2007; Moehl et al., 2006). At present, the whole of Africa contributes 2.3% to total global production volumes, of which two-thirds is produced in Egypt (FAO, 2016). Aquaculture in sub-Saharan Africa thus contributes less than 1% of the total global production. Projections for sub-Saharan Africa predict a decline in fish consumption per capita at an annual rate of 1% until 2030, resulting in an average of

5.6 kilograms (kg) of fish per capita per year (Kobayashi et al., 2015). Such projections do not take into account the role of aquaculture as part of the solution to overcome fish-supply deficits in many African countries, where the agro-ecological conditions are well suited for aquaculture development (Aguilar-Manjarrez and Nath, 1998; Kaspetsky, 1994).

Historically, government and donor-driven programs have set the pace and alignment of aquaculture development in Africa, mostly through targeting smallholder production to increase food and nutrition security at the household level (Brummett et al., 2008; Hishamunda, 2007; Jamu et al., 2012; Moehl et al., 2005). This has resulted in the establishment of extensive, small-scale farming systems under limited

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capital and low quality input regimes, which produce mostly for home consumption or to pay for immediate expenses (Brummett et al., 2008; Dey et al., 2006). Given the extensive nature of aquaculture systems in Africa, limited investments have been made by actors in the value chain, domestically or internationally, specifically into the quality of inputs and services required for upgrading (Beveridge et al., 2013; Brummett et al., 2008; Hecht, 2006).

Recently, some countries in Africa, including Zambia, Nigeria, Uganda, Kenya, and Ghana have experienced significant growth in aquaculture albeit from a low baseline, and there are examples of increasing intensification and commercialization in the value chain (Asiedu et al., 2015; Kassam and Dorward, 2017; Miller and Atanda, 2011). A favorable economic climate, the growing strength of domestic markets due to a rising demand for fish from a rapidly emergent middle class (Tschirley et al., 2015), and the increasing price of wild-caught fish are cited as factors that have enabled aquaculture development in Africa (FAO, 2016; Hecht, 2006). Commercial growth in the value chain occurs, in most cases, from market-led investments in large-scale, capital-intensive technologies, such as cage-culture in Ghana (Asiedu et al., 2015; Kassam and Dorward, 2017), and land-based rearing units in Nigeria (Miller and Atanda, 2011) but also from investments into research, such as in genetic improvements programs in Egypt (Rezk et al., 2009). Such upgrades in the value chain have tended to significantly impact the sector though they are rarely documented in Africa.

In this paper we aim to contribute to the literature on emerging and transforming aquaculture value chains in Africa by examining recent developments in the aquaculture sector in Zambia. The overall objective was to map the current value chain, describe the actors and stakeholders and understand the dynamics that have led to transformation in the value chain. We use a Global Value Chain (GVC) analysis and focus in particular on evidence of upgrading trajectories that have enabled commercial growth. The analysis further focuses on forms of coordination between lead firms (and external actors) that govern these trends and interactions. It is hoped the analysis provides greater insights into some of the emerging value chain trends in aquaculture in Africa.

2. Upgrading and coordination in Global Value Chain analysis

Value chains are usually defined as the full range of processes that are required to bring a product from its conception to its end use (Kaplinsky and Morris, 2001). GVC analysis is a tool that has been increasingly applied to commodity value chains, in particular to analyze international trade and ways in which actors in developing countries can upgrade and strengthen their position in the chain, in this case in the global aquaculture sector (e.g. Barrett, 2002; Bush and Duijf, 2011; Jespersen et al., 2014; Ponte et al., 2014). GVC focuses on analyzing actors, structures and dynamics of value chains, focusing particularly on the typologies of various actors and the activities, linkages and relations between them (Bolwig et al., 2010). To date, such studies have centered on areas with more developed aquaculture value chains and a long history of aquaculture production. GVC analyses are lacking in areas that are not considered major aquaculture producers (Lim, 2016).

GVC literature focuses around two critical issues, namely how and what type of upgrading takes place and what forms of coordination govern such developments. Upgrading is used as a concept to identify ways in which an actor can strengthen their position in a value chain by improving their horizontal and vertical relations, improving their activities and functions and bettering their overall performance and position of strength in the chain. Four categories of upgrading are commonly recognized: product, process, functional and inter-chain upgrading (Humphrey and Schmitz, 2002). These relate to producing more valuable products, producing more efficiently, acquiring new functions with higher skill levels, and applying competences from one chain and using them in another (Ponte et al., 2014).

Coordination in a value chain is defined as the efforts or measures that players make in a market system to act in a complementary way

towards a common goal (Poulton et al., 2004). This especially focuses on the types of relationships between actors (e.g. between buyers and suppliers). Distinguishing between these relationships requires an analysis of value chain governance, i.e. by analyzing the exchanges, flow of materials, resources, and information within the chain. Such exchanges and relationships are often governed by ‘lead firms’, which organize at particular positions in the chain and are able to shape (coordinate) the chain, e.g. in terms of standard setting, pricing, and role specification, among other things (Bolwig et al., 2010).

This paper focuses specifically on two forms of coordination by which lead firms exercise their position and power in a value chain, namely, (i) *hierarchy* (vertical integration where an actor performs several functions), and (ii) *contractualization* (various horizontal and vertical contracts between nodes and specific actors – see Kelling et al., 2013). For a more common classification of coordination used in more established value chains, see Gereffi et al. (2005).¹ The two forms used in this analysis are more appropriate to infant industries where there are few actors and a relatively short value chain.

Lead firms that perform upgrading and coordination activities in a value chain form part of a larger institutional framework, which includes government departments or ‘external actors’ such as development organizations. The institutional framework and enabling environment forms the backdrop in which firms perform upgrading and coordination activities and is thus a critical component of value chain governance. We therefore distinguish between overall forms of governance (analyzing the institutional framework) and forms of coordination (analyzing lead firms and relations between various actors within the chain) but only focus on the latter in this paper. An analysis of the former would require an institutional and/or stakeholder analysis, which this study was not able to conduct. We recognize the urgent need for such an analysis, especially in Zambia where aquaculture is emerging. It will be critical in the future to assess the institutional arrangements and enabling factors that lead to certain upgrading trajectories in aquaculture on the sub-Saharan African continent.

3. Materials and methods

The key processes in the Zambian aquaculture value chain, including the production of fish, value addition, trading, and marketing of the final product to consumers, as well as the inputs, services, and institutional enablers that are required for these processes (De Silva, 2011), were assessed where possible. Using primary and secondary data we analyzed the value chain in reference to instances of upgrading and forms of coordination recognized in the GVC literature.

3.1. Secondary data

Data from several government sources was collected in an attempt to better understand how the increasing production from aquaculture contributes to annual fish supply per capita. The government sources used in the analysis were as follows: (1) capture fisheries and aquaculture production data from the Department of Fisheries (DoF) of Zambia (1995–2014)²; (2) population data from the Central Statistics Office (CSO) of Zambia (2004–2014); (3) trade data from the Zambian Revenue Authority (ZRA) on imports and exports of fish (including farmed fish) from (2004–2014).³ We combined this data to calculate the fish supply per capita rate and the market share of aquaculture compared to capture

¹ According to the classification of value chain governance in Gereffi et al. (2005), *contractualization* would fall somewhere between *market* and *hierarchy*. However, in areas where lead firms operate in an infant industry, *relational* value chains may also be evident.

² This data is published in various government reports and the authors (including a high ranking aquaculture research officer) compiled the data over several months.

³ This dataset is not published in any form and has been compiled over years by the ZRA. This paper is the first to publish data on fish imports in Zambia.

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