

**Appendix 3b: Policy brief**

**Project title: Sustainable Value-Chains: Aquaponics in Colombia**  
**Name of Responsible Institution: Technical University of Denmark**  
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In Colombia's Amazon region of Caquetá, the country's armed conflict fought between state and non-state armed actors combined with drug trafficking have hindered farmers from receiving basic services, having access to markets, and in general improving their quality of life. The 2016 peace agreement provided an opening in the political landscape to change farmers' living conditions for the better by reducing violence and diversifying income sources away from coca-related activities.

The linkage between farming production systems and development cooperation is a central feature of this project entitled "Sustainable Value-Chains: Aquaponics in Colombia". The project has as its main objective "to construct a sustainable water-optimizing model for small-scale fish farming that improves rural livelihoods." The project seeks to develop a so-called aquaponics system that combines fish and food production adapted to the local socio-economic conditions of the farmers in Caquetá.

The project included several data collection campaigns conducted in Caquetá. The fieldwork aimed at charting the regional part of the value-chain for fish in order to identify barriers, problems and possible synergies of the aquaponics system technology.

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Acuica has had a central role in articulating the production of fish in Caquetá through technology development and transfer to farmers. Acuica has followed a sequence of steps, financed through funds from the state and international cooperation organizations, in order to establish and expand fish production. To achieve this goal, the organization can be said to have employed recurrent strategies, with different degrees of success, of developing products, transferring the technology to farmers and growing a production base, in an effort to increase the value-added of products and overcoming production barriers.

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While some farmers fully engage with the market economy, others are simultaneously inside and outside capitalist relations. Combining observations, survey data on farmers' production and sales of all farming activities, and interviews concerning farmers' navigation through development initiatives, we find that farmers follow two logics of production that enjoy some degree of overlap: capitalist and petty commodity production. While capitalist farmers are somewhat risk prone and seem to adapt to new technologies, petty commodity producers are in no position to risk any capital that can potentially jeopardise their means of production. These latter farmers seem to resist and navigate through state policies and NGO initiatives that grant them different kinds of subsidies. Petty commodity producers are

in a precarious economic situation and slow payment of subsidies can compromise their production capacity.

Capitalist farmers strive to overlap production cycles in order to harvest sequentially or continuously. Farmers have an average of 16 ponds with at least one dedicated to raising fingerlings to juveniles. The ponds add up to an average of 2.4 ha per farmer. Farmers can afford to feed the fish uninterrupted, which makes fish gain weight rapidly. Due to their relatively high income-level and efficiency, this type of farmer is usually not included in development initiatives as such but primarily benefits from Acuica's technical support and expertise. These farmers plan for expansion, investing in more complex technologies and building more infrastructures for fish farming. Additionally, they tend to sell their harvest to traders and rarely to retailers.

Petty commodity producers are barely engaged with the capitalist economy. Farmers have an average of 4.1 ponds, which add up to an average of 0.4Ha in pond area. On average, farms produce 0.7 tons of fish per year. Farmers' access to the cash economy relies on their ability to monetize farm products. The production of these farms, including fish farming, is predominantly for subsistence. For example, most farmers produce less than 20L of milk per day (COP20,000—ca. US\$6.2). Other farmers sell crops in small quantities, such as plantain, cassava, sugarcane, and sown pasture to local retailers. For most of these farms, income ranges between the country's poverty line (COP257,433—ca. US\$80.3) and one minimum salary (COP781,242—ca. US\$244). These farmers can barely afford fish feed and their fish grow at a slower pace and risk perishing from disease or inadequate nutrition. These farmers are often invited to participate in development initiatives, however with poor results and many dropping out of the schemes. Most farmers primarily sell their harvest to neighbors and retailers, and some sell to traders.

In addition, we find a medium and small capitalist group of farmers that are in between the two logics of production. These farmers have an average of 5.5 ponds, that add up to an average of 0.7Ha of pond area. Average production per farm is 2.3 tons of fish per year. However, production is not at full capacity as farmers face various limitations. First, some farmers report not having sufficient capital to invest in fish feed or fingerlings in order to make their ponds produce at full capacity. Second, some farmers are either moving in or moving out from the business of producing fish. Hence, they are either learning how to farm fish, divesting, or dedicating time to other activities. Third, to a certain extent, the high production costs of aquaculture make farmers dependent on subsidies and development initiatives to be able to kick-start their production. Farmers usually have other incomes from dairy and agriculture, which allow them to cross-finance aquaculture. Farmers in this category tend to sell their harvest both to retailers and to traders.

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Farmers sell their fish harvest to traders, retailers, and sometimes directly to consumers. Virtually all economic transactions are in cash, and around half of the farmers give credit to buyers. It is common practice among farmers selling their harvest to retailers located in the closest town. Farmers have to bring the fish to the retailers by their own means. Traders are located in Florencia. They are highly mobile and just a few farmers sell directly to them. In contrast to retailers, traders buy the harvest at the farm site and participate in the fishing, degutting, and cleaning of the fish, ensuring the quality of the product. Retailers pay a higher price per kilogram of fish; however, they can only buy a limited amount. Traders on the other hand, pay less per kilogram, yet they buy the entire harvest at once.

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### *Challenges*

Most farmers perceive fish farming as a profitable activity but a number of issues are currently hampering productivity. Some difficulties have been addressed in several development projects, nevertheless, others are persistent and will have to be targeted in future initiatives. The main challenges that farmers encounter during fish production are the following:

- 1) Deficient infrastructure both in terms of ponds as well as in terms of road access. Farmers struggle with planning correctly their ponds, constructing them adequately, and having roads to access markets.
- 2) Technical know-how for controlling production variables. While an open pond system is not a complex technology, farmers struggle controlling system variables, that in turn affect production.
- 3) Labour-related issues. Aquaculture is not a labour-intensive activity when it comes to harvesting small batches or production in general. However, farmers' aging population and the introduction of species of great weight like Pirarucu, may start affecting production in the short-term. In addition, hired labour is usually needed during harvest, yet employees are hired informally without the proper social security or labour conditions.
- 4) Access to markets. Farmers struggle reaching markets due to poor road infrastructure and by not having a network that provides them with buyers that pay well and buy the entire harvest on the spot.
- 5) There is a general lack of financial planning among small farmers, which hinders their capacity to calculate profits and losses. Further research is needed to understand if this is having a negative effect on market prices across the region.
- 6) Coping with changing weather patterns has been difficult for farmers. Unusual cold temperatures have hindered production.
- 7) Farmers expressed some security concerns regarding robbery as well as the presence of FARC dissidences a few kilometers away. If the security situation were to deteriorate, farmers will struggle with their production and livelihoods in general.

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### *Recommendation*

We recommend that further development initiatives have differential treatment to address the different challenges for each of the three groups of farmers we identified: Capitalist farmer, medium and small capitalist, and petty commodity producers. Specifically, we suggest that farmers' production logics be taken into consideration, so that petty commodity producer farmers retain their autonomy over their means of production and are able to fulfil their own goals. On the other hand, initiatives targeting medium and small capitalist farmers need to ponder their financial planning capacity, so that the projects' goals can be achieved without compromising farmers' livelihoods. Finally, the development and transfer of technology should take into consideration production logics. Farmers need to be differentiated so that the technological complexity and level of risk meets their needs.

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### *Future research*

Future research can focus on finding ways to coordinate production and sales among the different nodes in the value-chain. In addition, as there are no real barriers to entry beyond pond construction, research can focus on product differentiation based on quality through labelling and eco-labelling schemes. Finally, as the experience so far with development initiatives has had mixed results, research is needed so that initiatives target not only the different needs of farmers but also the different kinds of farmers found in Caquetá. Future research can also focus on assessing the practices in the implementation of an aquaponics system at a local farm and study the new commercial relations that have arisen because of its use. In particular, research needs to focus on the different conditions that farmers encounter in their endeavors to market the hydroponic products, including an examination of whether specialization or diversification is the most advisable strategy to pursue.



Images, from top left: Commercial pond for cachama at ACUICA experimental facility; construction of aquaponics system at farm; project meeting with Danish partners and representative from Royal Danish Embassy Bogota; formulation of experimental diets with different lipid levels for pirarucu; finished aquaponics system with vegetable production; digestibility and growth trials with cachama at DTU Aqua