

**TOPIC AREA:  
MARKETING, ECONOMIC RISK ASSESSMENT & TRADE**



**VALUE CHAIN ANALYSIS IN SOUTHERN MEXICO**

Marketing, Economic Risk Assessment & Trade/Activity/09MER08UA

**FINAL INVESTIGATION REPORT**

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**INTRODUCTION**

Tilapia have become one of the most popular food fishes in Mexico. They are frequently used to replace overharvested fish stocks from both freshwater and marine systems. Farm production is occurring in ponds, tanks and in raceway systems, with several domesticated strains. Farmed tilapias are currently sold in several different forms including live, frozen, and fresh on ice. They are also marketed in some value added forms including scaled and gutted, headed and gutted and as fresh and frozen fillets.

We have not been able to find any comprehensive study of the marketing system for tilapia and tilapia products in Mexico. As tilapia become a more important sector of the seafood industry across the country, an in-depth study will be valuable for stakeholders from producers, through harvesters, shippers, processors, wholesale and retail and the eventual consumers.

The value chain has been used as an analytical tool for the aquaculture industry. It will be used to describe the various steps in the pathway from farm to consumer and to determine the competitive advantages that certain stakeholders may have during these steps and processes. It may also identify where additional efficiencies may be gained in the production, processing, transportation and retailing aspects.

**OBJECTIVES**

The objectives of the activity were:

- (1) for the Arizona and Tabasco Principal investigators to participate in the AquaFish CRSP Tanzania workshop to be trained in value chain analysis;
- (2) to conduct a value chain analysis of tilapia, (*Oreochromis spp.*) in order to propose improved marketing and management solutions.

(3) to hold a workshop in Tabasco to bring together stakeholders to discuss the value chain model for tilapia in Tabasco and discuss the findings and additional aspects of where improvements in the model may yield the best returns on investment.

## METHODS AND MATERIALS

### Participation in the AquaFish CRSP Tanzania workshop in order to be trained in value chain analysis

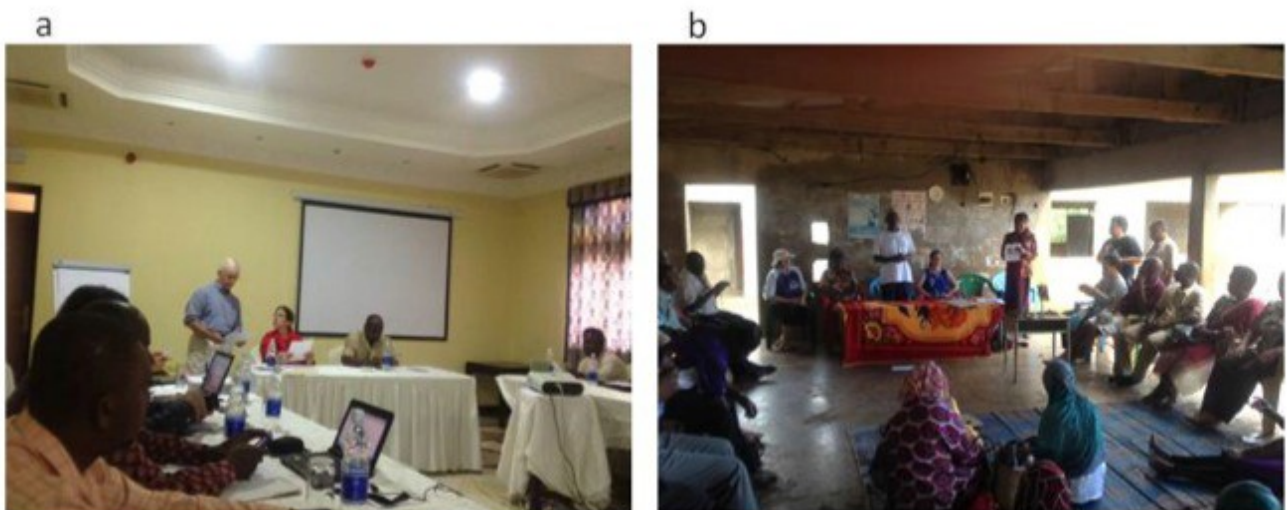
**Objective 1:** for the Arizona and Tabasco Principal investigators to participate in the AquaFish CRSP Tanzania workshop to be trained in value chain analysis

**General Activity Procedure.** Participation at the Aquafish CRSP Tanzania workshop of the US PI and HC Co-PI was performed from July 12 to 15 2012. Workshop aimed to train HC Co-PI in value chain analysis in order to develop the project in Tabasco. Subsequently, US PI and HC Co-PI participated in the IIFET 16th Biennial Conference (International Institute of Fisheries Economics & Trade) held in Dar es Salam, Tanzania from July 16 to 20, 2012 in order to get experience and acquire methodology from other researchers.

## RESULTS

**Objective 1:** Participation in the AquaFish CRSP Tanzania workshop in order to be trained in value chain analysis

According to plan, US PI and HC Co-PI traveled to Zanzibar in order to attend the AquaFish Value Chain workshop and to the IIFET 16th Biennial Conference. At AquaFish CRSP workshop, HC Co-PI presented his research objectives and goals in order to get feedback from other researchers. At A&F CRSP workshop, HC Co-PI improved his research scope in order to be more efficient for developing his research Fig. 1.



**Figure 1.** Workshop held in Zanzibar for training on value chain analysis. b. visit to rural farmers at village in Zanzibar (successful story).

## METHODS AND MATERIALS

### Value chain analysis of Tilapia

**Objective 2: to conduct a value chain analysis of tilapia, (*Oreochromis spp.*) in order to propose improved marketing and management solutions.**

The methodology employed in this study was based on PCARRD-DOST (2011) and Jamandre *et al* (2012) with modification according to actual regional conditions.

### Study areas and Data collection

The study was identified where there is more aquaculture activity. According to Gama Campillo *et al* (2012) these areas were the Centro and Cunduacan municipalities in Tabasco. In the case of Campeche, the municipality of Atasta was selected due to the development of the industry. Farmers were targeted based on openness to survey participation and farm size, with medium size farmers being the primary targets.

Questionnaires were designed and a survey conducted with the stakeholders in the Tabasco tilapia value chain:

- Tilapia farmers
- Custom harvesters – transporters
- Wholesalers and Retailers
- Consumers

The survey – questionnaires were completed in two parts. In one portion was a field survey conducted by faculty and/or students to reach stakeholders. The second portion was done to reconfirm data during a workshop from stakeholders also to discuss issues and concerns and to establish new links.

Data were gathered from targeted actors (medium farmers)- definition of size of actors, available in table 1. Selection of actors was based on actors' disposition of participation.

**Table 1.** Definition of size of actors based on working productive land

Definition of actor	Working land
Small size farmers	>500 m <sup>2</sup>
Medium size farmers	500-1500 m <sup>2</sup>
Large size farmers	>1500 m <sup>2</sup>

Laboratory/nursery operators were targeted according to previous answers of producers in order to track the value chain targeted. The same methodology was used for targeting aqua-agri shops and traders/retailers.

The value chain analysis consisted of the following: Firstly, at its most basic level, a value-chain analysis *systematically maps the economic agents* participating in the production, distribution, marketing, and sales of a particular product (or products). This mapping assesses the characteristics of economic agents, profit and cost structures, flows of goods throughout the chain, employment characteristics, and the destination and volumes of domestic and foreign sales. Such details can be gathered from a combination of primary survey work, focus groups, informal interviews, and secondary data.

Second, value-chain analysis plays a key role in *identifying the distribution of benefits of economic agents in the chain*. That is, through the analysis of margins and profits within the chain, one can determine who benefits from participation in the chain and which economic agents could benefit from increased support or organization. This is particularly important in the context of developing countries (and agriculture in particular), given concerns that the poor in particular are vulnerable to the process of globalization. One can supplement this analysis by determining the nature of participation within the chain to understand the characteristics of its participants.

Third, value-chain analyses are used to *examine the role of upgrading within the chain*. Upgrading can involve improvements in quality and product design that enable producers to gain higher-value or through diversification in the product lines served. An analysis of the upgrading process includes an assessment of the profitability of actors within the chain as well as information on constraints that are currently present. Governance issues play a key role in defining how such upgrading occurs. In addition, the structure of regulations, entry barriers, trade restrictions, and standards can further shape and influence the environment in which upgrading can take place.

Finally, value-chain analyses *highlight the role of governance* in the value-chain. Governance in a value-chain refers to the structure of relationships and coordination mechanisms that exist between economic agents in the value-chain. Governance is important from a policy perspective by identifying the institutional arrangements that may need to be targeted to improve capabilities in the value-chain, remedy distributional distortions, and increase value-added in the sector.

At the heart of the analysis is the mapping of sectors and key linkages. The value-added of the value-chain approach, however, comes from assessing these intra- and inter-actor linkages through the lens of issues of governance, upgrading, and distributional considerations. By systematically understanding these linkages within a network, one can better prescribe policy recommendations and, moreover, further understand their reverberations throughout the chain.

The methodology addressed the following issues, and began with understanding the nature of final markets, the industry, which are increasingly the driver in many value chains:

- The point of entry for value chain analysis
- Mapping value chains
- Product segments and Critical Success Factors in final markets
- How producers access final markets
- Benchmarking production efficiency
- Governance of value chains
- Upgrading in value chains
- Distributional issues

### **Data processing and analysis**

Data processing was performed according to Jamandre *et al* (2012) the methods of analysis were as follows: Flowchart analysis from downstream to upstream; Descriptive statistics and relevant performance metrics (qualitative)

## RESULTS

**Objective 2: to conduct a value chain analysis of tilapia, (*Oreochromis spp.*) in order to propose improved marketing and management solutions.**

Tilapia industry in Mexico is one of the most active and technological activities; this industry contributes 7.6% of the total aquaculture products in the fisheries national production. The Tilapia industry in Southeast Mexico has grown by a considerable increment in the last 10 years, almost all Tilapia production is sold within the region.

The supply chain in the region is relatively simple. It is based on inputs from providers of fingerlings, suppliers to grow-out producers, then to traders and retailers. Tilapia products are not subject to any fillet processing and in some cases the product is even sold fresh/live, not even gutted or headed. A small amount of the product is taken out of the region by traders, this condition occurred with the producers outside of cities or hot zone marketing areas, where they have sold their product to traders.

### **Key customers and product form**

We identified two value chains in the region, first based on production and marketing in the region and the second one production and processing is developed outside the region and just marketing is performed in this area. Key customers are classified in the two chains as; traders/retailers and end users for the first chain and institutional buyers (supermarkets) and fresh markets (mainly Mercado Pino Suarez in Villahermosa).

Product form for household customers are basically two; medium size Tilapia (350 – 500g) and large size Tilapia (>500), generally bought at the farm site or from retailers, it is the same size sold in supermarkets and fresh markets. As there is no processing in the region, large Tilapia is sold to end consumers. Small size Tilapia is regularly consumed by farmers or in some scarce occasions sold to traders, also we have seen in some small size restaurants that it is available. Small size Tilapia (<350g) are sold by kilogram (from 3 to 4 pieces per kg). Customers are indifferent to the color of skin Tilapia in the region as the principal Tilapia product is grey Tilapia. The common food recipes for Tilapia are charcoal grilled and fried. Most of these customers buy Tilapia direct at the farm, at fresh small markets and at mobile vendors.

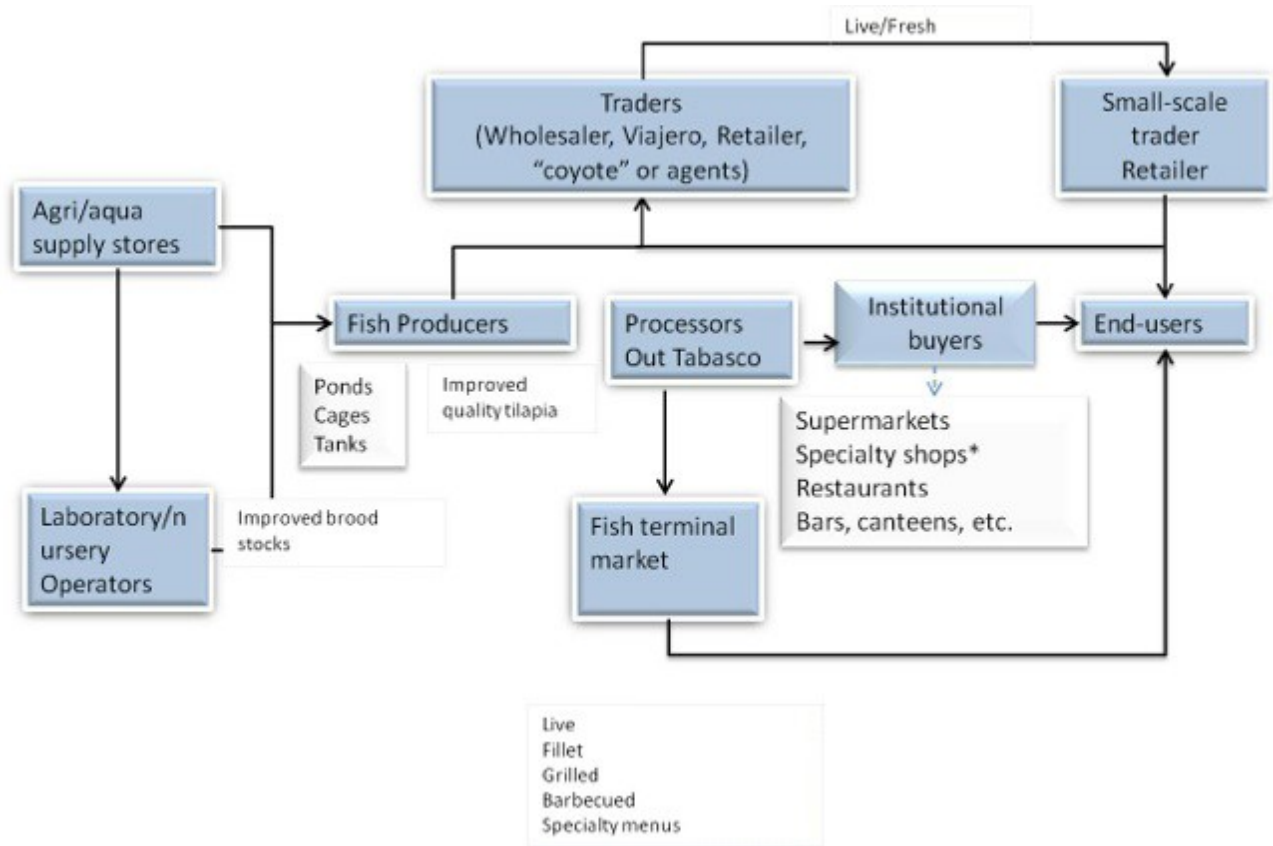
There are other Tilapia products (frozen fillets, fish fingers, nuggets) these are mainly sold in supermarkets and come from outside the region (produced and processed), it was impossible to trace those products as there are no reliable information. Also all those institutional buyers were not in the focus of this study.

### **Major players and their activities**

The major players and their activities are illustrated in Fig. 2. Agri/aqua supply stores offer products indispensable for aquaculture activities such as: feed (in different stages and brands) equipment (aerators; many forms and brands) materials (nets, liners, plastic bags) oxygen (for fish/fingerlings transportation).

Laboratory/ nursery operators provide sex-reversed fingerlings in two forms; for ponds/tanks production fry that could come in two ages; 30-35 days old (that required nursery in cages in the same pond or tank)

with an average price of 85 centavos and fingerlings of 45-60 days old that are more expensive with an average price of 1.20 pesos. And for cage production, the requirement of fingerlings is 45-60 days old. The Tilapia strain sold in these laboratory-nursery facilities are; Chitralada+ Gift, Tabasco line (breeding selected) and Chitralada. Some of these operators develop improved brood stocks and they presume of high sex reversed ratios (>97%) but unfortunately in some cases is not true.



**Figure 2.** Major players on Tilapia industry in Southeast Mexico

Fish producers are in two kinds; tanks and ponds users. The tanks producers work in plastic lined tanks (from 6 to 9m diameter tanks) with aeration and rely on feed as main source of protein. Pond users work in earthen ponds (from 200 – 500 m<sup>2</sup> ponds) in some cases they used aeration and unconsciously they use primary production as complement of protein source. All of the producers practice the size selection at mid-cycle in order to reach better and uniform sizes. Usually a normal cycle will take from 5 to 7 months to reach commercially desired sizes.

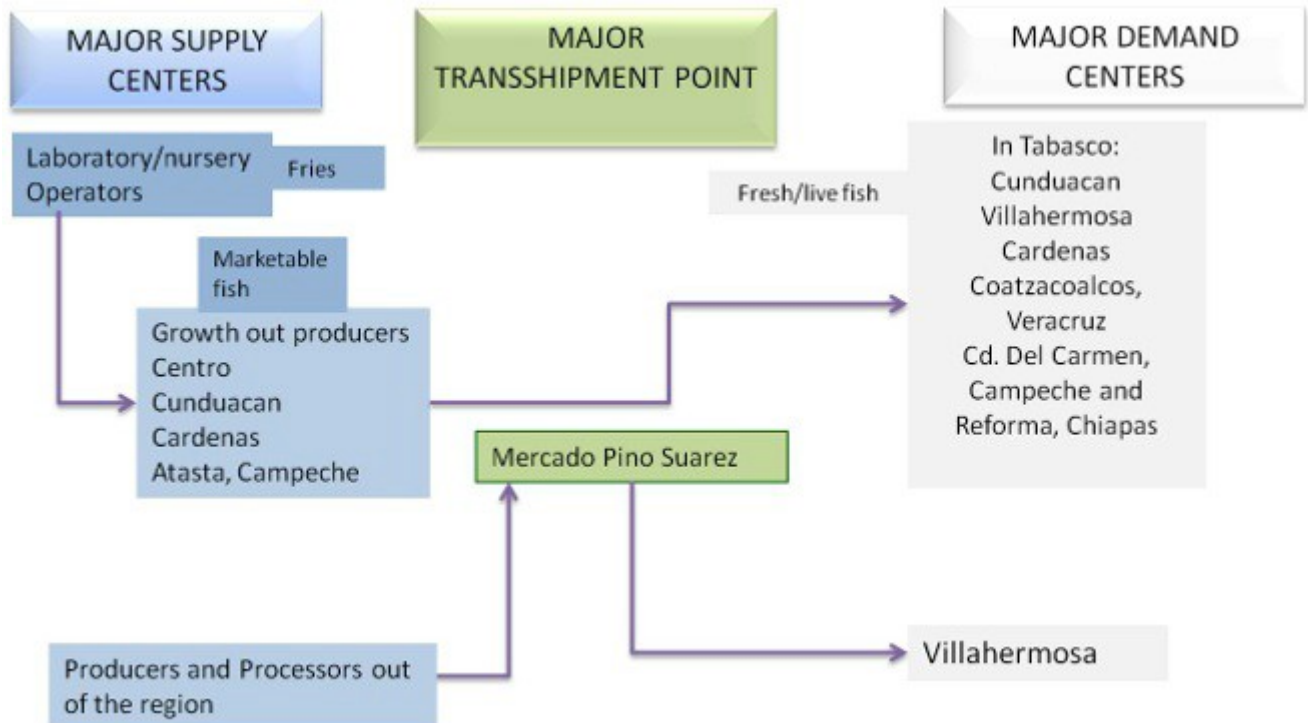
Traders are in two forms; traders/retailers that buy directly from producers and sell direct to end consumers with mobile shops that circulate in small towns and even residential areas outside Villahermosa. And traders who buy direct from producers and sell to small fresh markets and small retailers out of the region (Coatzacoalcos, Veracruz State).

For the outside of the region value chain, processors/retailers sold Tilapia (undefined source of Tilapia) to the State fresh Market (Mercado Pino Suarez) and they sold to end consumers. Institutional buyers like supermarkets buy from outside of the region processors and producers, many time they are part of a bigger chain that import their products (mainly China, Vietnam and Thailand).

**Major routes of products**

Fig. 3 shows the Tilapia supply chain’s major route in Southeast Mexico. For this chain the major transshipment point is in Villahermosa at the Mercado Pino Suarez. Although this transshipment point plays only a role in the second outside of Tabasco supply chain, we could not distinguish a transshipment point for the other regional chain as most of the Tilapia is sold either at mobile vendors, at farm site or small local fresh markets.

The aqua/agri shops, laboratory/nursery operators and grow-out farms are located in Cunduacan, Cardenas and Centro municipalities of Tabasco and Atasta in Campeche State. The major demand centers are Cunduacan, Villahermosa Cardenas, Tabasco and Coatzacoalcos, Veracruz, Ciudad del Carmen and Reforma, Chiapas.



**Figure 3.** Major routes identified in the value chain

Fig. 4 describes the route of products. In the first regional supply chain laboratory/nursery operators in Centro and Cunduacan, Tabasco and Plan de Ayala, Campeche provide sex reversed fingerlings to the farms (tanks and ponds) in Centro, Cunduacan, Cardenas in Tabasco and Atasta in Campeche. Producers after 5 to 7 months provide mainly two Tilapia (live/fresh) sizes to traders that are then sold in Villahermosa, Cunduacan, Cardenas, Tabasco, Reforma, Chiapas and Ciudad del Carmen in Campeche. Also some of these traders sold frozen Tilapia to retailers in Coatzacoalcos, Veracruz. And finally Tilapia producers sold live/fresh Tilapia to end consumers at farm site.

For out of region supply chain, grow-out/ processors sold Tilapia to traders that sold frozen Tilapia to retailers at Mercado Pino Suarez in Villahermosa, Tabasco. Institutional buyers buy from processors out of the region (unidentified supply chain).

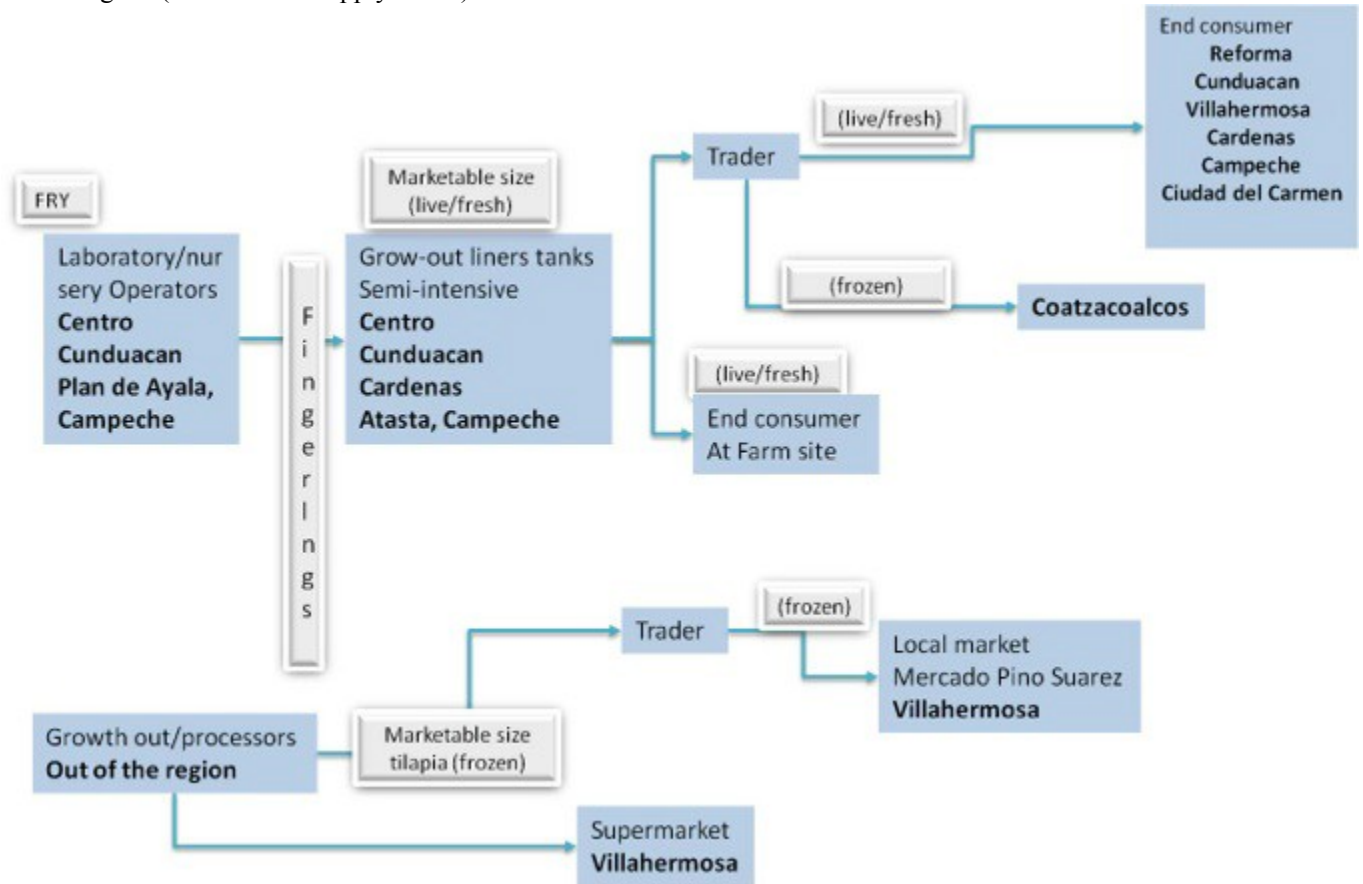
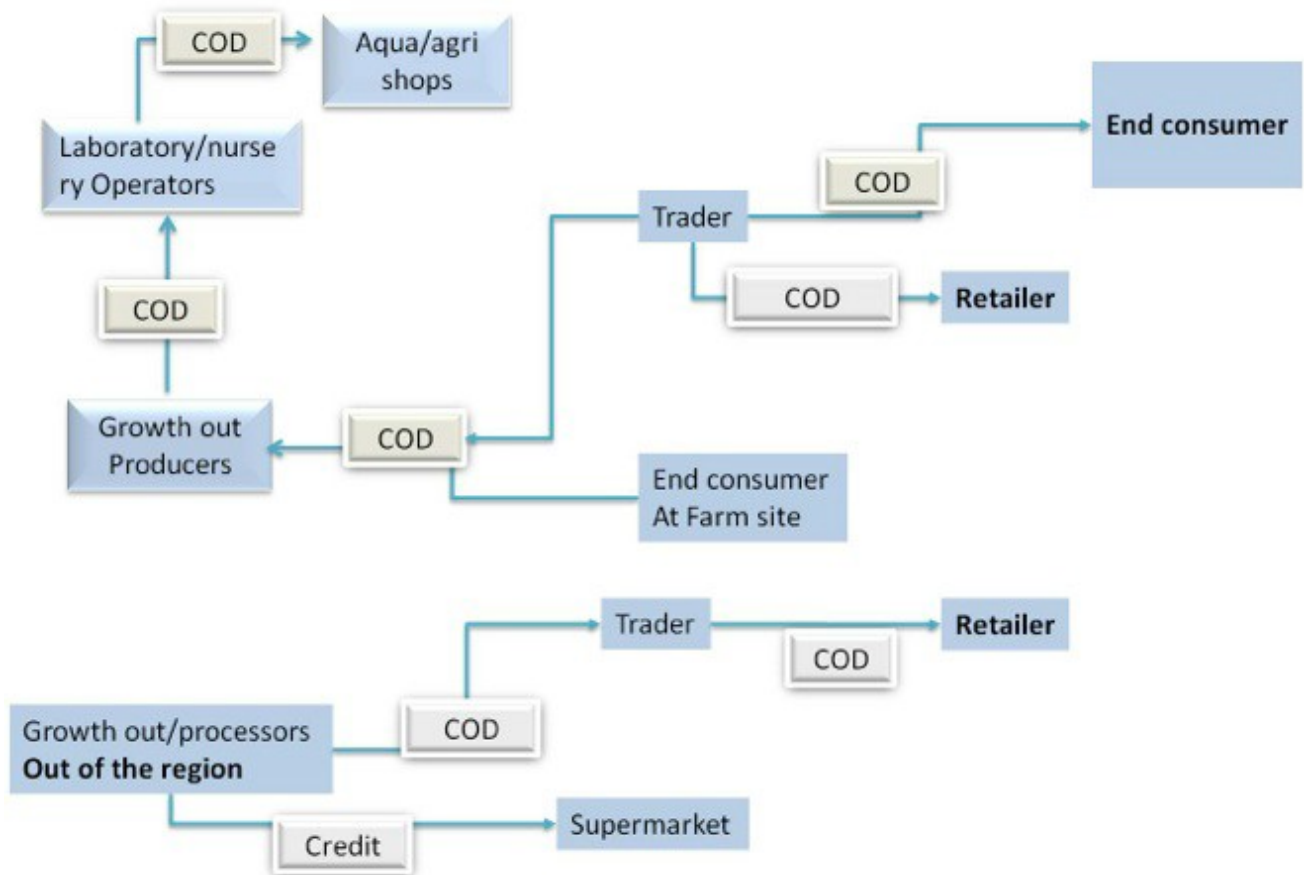


Figure 4. Product flow in the Tilapia value chain



## Payment flow

In general payments are made on spot cash or cash on delivery (COD) depending on different situations between laboratory/nursery producers, grow-out producers, traders/retailers and end consumers, in some occasions it is known that some producers give credit to large traders (this information could not be identified). For the out of the region supply chain, the payment flow could not be identified although some producers argued that institutional buyers required credit for long periods (usually institutional buyers pay in 1 to 3 months) Fig. 5.



*Figure 5. Payment flow in the Tilapia value chain*

## External influence/ concerns

1. Program support from the government in some cases results in sub-optimal product quality. There is no direct influence from technology development arising to production areas through government programs. There is a gap between university/institutions, technology developers and government extension programs.
2. Certification with providers. Commercially available sex reversed fry are not quality tested as advertised from providers. Equipment and material are very often high priced and not high quality. Feed inputs are high priced due to manufacturers being far away from the region. There is also a big concern with the electricity fare, as there is no special electricity fare to farmers.

3. Excess of bureaucracy. Most of the permits, certifications or regulations are too many and too energy/ time demanding that in some cases become impossible for many of the actors in the supply chain.

4. Lack of training/ technical assistance. There are a critical number of active Tilapia farms. Only the 35% of the total official Farms in the State of Tabasco are active or working. Lack of training and technical assistance is the most frequent cause for this issue together with natural disaster.

### **Recommendations**

The following are some recommendations to address the various concerns of chain players;

1. Encourage the establishment of high quality reliable hatchery-nursery facilities that can provide different sizes or establish separate hatcheries and nurseries in order to offer bigger size fingerlings and thus shorten grow-out cycle.

2. Conduct market promotion activities highlighting the various niche opportunities of tilapia among growers and consumers (added value, market small sizes in new niches, specialty shops).

3. Motivate the participation of small farmers in supply chains by setting up an incentive scheme through a mix of patronage refund and profit sharing.

4. Provide capital windows to improve facilities and reduce logistics and transaction costs in the entire supply chain of Tilapia.

## **METHODS AND MATERIALS**

### **Workshop with major players from the supply chain**

**Objective 3. Hold a workshop in Tabasco to bring together stakeholders to discuss the value chain model for tilapia in Tabasco and discuss the findings and additional aspects of where improvements in the model may yield the best returns on investment**

We organized a workshop with major players of our traced supply chain. We were also assisted by interested students, professors and technicians. The workshop was held at the Laboratorio de Acuicultura Tropical. We had the participation of Dr. Wilfred Jamandre to assist in the workshop. The program of the workshop was: presentation of advantages of supply chain, basics, experience in Philippines and a round table with participants.

## **RESULTS**

**Objective 3. Hold a workshop in Tabasco to bring together stakeholders to discuss the value chain model for tilapia in Tabasco and discuss the findings and additional aspects of where improvements in the model may yield the best returns on investment**

We organized a workshop after the interviews in order to reaffirm data gathered and discuss concerns and issues in an open way. The workshop was held at the Laboratorio de Acuicultura Tropical from Division Academica de Ciencias Biologicas, Universidad Juarez Autonoma de Tabasco. We had 23 participants (table 2) including producers, fingerling suppliers, feed suppliers, traders, students, professors and technicians.

The most important highlights of the workshop were the open participation of players, where they confirmed the data gathered before. They presented their concerns and issues that were pretty similar to

all players in the supply chain. Among impacts of the workshop there was the beginning of new collaboration among actors where they decided to acquire the new system presented at Dr. Jamandre's talk.

The workshop held at UJAT was an eye opener of supply chain players, where they for first time could understand that there should not be a confrontation between actors, but rather there should be a efficient, dynamic supply chain where all can make profits.



*Figure 6. Workshop held at UJAT.*

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