



Foresight analysis of tilapia supply chains (*Sistema Producto*) in four states in Mexico: Scenarios and strategies for 2018

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ABSTRACT

In order to increase competitiveness among individual producers and to encourage their integration, the federal government of Mexico has pursued the establishment, at both the state and national levels, of supply chains, or *Sistema Producto* (SP). For fisheries and aquaculture, 33 SPs exist at the state level and 7 at the national level, 1 of them for tilapia. The objective of this study is to carry out a foresight analysis (FA) of 4 tilapia SPs in Mexico—for the States of Colima, Sonora, Tabasco and Yucatán—analyzing their 2018 vision for the development of the tilapia chain. FA provides an integral vision of both the internal and external environments, identifying the key factors for each SP and helping to develop the best strategies in order to compete successfully. Sonora, Tabasco and Yucatán identify marketing aspects as key elements for their 10-year future: adding value to the product by means of new processing technologies, developing their own brand, and identifying and differentiating their product based on sanitary issues. Colima focuses its industry future success on efficiency improvements. Finally, the main technological disruptions identified by the 4 states are the incremental use of information technology, product and process certification, new hatcheries with genetically-improved fry, and new processing methodologies developed and/or applied.

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1. Introduction

In recent years, countries worldwide have faced an increasingly demanding global economic dynamics that proposes a competition scenario among complex sectors and not between individual companies. Currently, a process of redesign of production systems exists, which has as its main attribute the search for a scheme of production and marketing integration [1]. This constant evolution has led each nation to raise different development strategies that enable them to compete and meet new challenges and opportunities in the present environment [2].

As is the case with most Latin American countries, one of the central policies for industrial economic development of Mexico focuses on the impulse of micro-, small- and medium-size enterprises, considered as generators of development and capital and as propellers of the economy themselves [3]. To improve these enterprises' competitiveness, the development of supply and production chains is a main objective [4].

The focus of this paper is to carry out a foresight analysis (FA) of 4 tilapia supply chains, or *Sistema Producto* (SP), in the Mexican States of Colima, Sonora, Tabasco and Yucatán, analyzing their 2018 vision for the development of the tilapia industry. The objective of this study is double: first, to explore the possible future of the 4 tilapia SP in Mexico, and second, to support strategic stakeholders' decision-making processes.

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1.1. A brief overview of Mexico's industrial policy

In the past, the Mexican government focused on the politics of promotion instead of attending to individual productive units. Today it is focused on an integrative approach, the SP. The SP is defined as “the set of actors who participate in the supply chain, from the supplying of inputs and services, the production process itself, and the storing, transformation, distribution, commercialization and consumption of the product” [5¹]. The Law of Sustainable Rural Development (*Ley de Desarrollo Rural Sustentable*, or LDRS) provides the legal framework to support this policy. In order to facilitate the management of the SP, System-Product Committees (SPC) have been established at both national and state levels, based on the premise that achieving an increased productivity and competitiveness in all productive sectors of the country is one of the development strategies to pursue. Members of the SPC are state and federal government agents, non-governmental representatives, and elements of the corresponding supply chains [5].

Currently 35 SPs have been established for agriculture, 9 for livestock and 7 for fisheries and aquaculture [4]. Supply chains as a subject of study is recent in Latin America; thus, only a few works can be found in the literature, including studies from Colombia [6], Chile [7] and Peru [8].

Everyday change in the business environment requires these organizations constantly to adapt to new realities, new products and new technologies. The identification of future trends and the anticipation of market changes have become determinant to the competitiveness of these organizations. Actually, the capacity of the firms to deal with uncertainty and to adapt quickly to major changes has become a crucial factor for success and a major challenge for managers [9].

1.2. Foresight analysis (FA) and Delphi as techniques for development

The scenario analysis method has been used since the 1960s to understand future developments in many areas, such as energy [10], the TV industry [11] and the agri-foodstuff sector [12]. In the 1970s, Godet and other authors gave a new impulse to the development of FA², which presented a philosophical and literary shape, turning it into an investigative technique of the future that is still applicable to real cases. Prospective analysis has thus been formalized through a variety of quantitative methods (structural analysis, mactor analysis, morphological analysis, etc.), which together make up a toolbox for the implementation of this analytical method, based on the construction of scenarios [13–18]. Thanks to the development of such tools, FA is now a widely used technique in a variety of sectors and industries.

FA presents rich and complex portraits of possible futures scenarios, then allows an organization to determine these possible futures and to evaluate them both qualitatively and quantitatively. In those cases where the most likely future includes unfavorable elements, the role of FA is to determine which strategies will eliminate or minimize these unfavorable elements [13].

By contrast, the Delphi method, belonging to the subjective and intuitive methods of foresight, is perhaps the best known prospective research method in use today [19]. During the last decade, this method has been broadly used in science, technology and educational contexts. Developed in the 1950s in the U.S. for the RAND Corporation, the Delphi procedure is based on questionnaires structured to elicit available intuitive information with participants who are mainly experts in their field [20]. Hence, the Delphi method has both quantitative and qualitative dimensions. It is not one single method, but all agree that a Delphi study requires an expert survey in at least two or more rounds. Starting from the second round, feedback is given about the results of previous rounds: The same experts assess the same matters once more, influenced by the opinions of the other experts [21]. In summary, the study aims to collect and distill knowledge from a group of experts by means of a series of questionnaires based on a structured process with controlled opinion feedback [22].

The first experiment using a Delphi-style technique was carried out in 1948 in order to predict the winners of horse races and, thus, to optimize betting [19]. In the last two decades, the Delphi method has found a wide range of applications in planning, evaluation, forecasting and issue exploration in a variety of areas, such as the TV industry [11], agriculture [23], and bioenergy production [24].

The Delphi method can be used to define and structure issue exploration as well as to forecast and assess technology trends [22]. The methodology facilitates a relatively strongly structured group communication process, revealing conflicting as well as consensus areas. Delphi-based foresight exercises, therefore, have been used repeatedly and increasingly in the context of policymaking, building on their capacity to facilitate an alignment of actors' expectations through interactions [21].

1.3. Importance and brief overview of the aquaculture and tilapia industries

The Food and Agriculture Organization (FAO) states that aquaculture, the farming of marine organisms including fish, contributes to food security in many parts of the world. The extreme importance of aquaculture to both food security and nutrition may be illustrated by assessments of the situation in Africa. The FAO estimates that fish provide 22% of the protein intake in sub-Saharan Africa. This share, however, can exceed 50% in the poorest countries, especially where other sources of animal protein are scarce or expensive. The contribution of aquaculture is also important to the daily dietary energy supply [25]. Global aquaculture³

¹ See third article, fraction XXXI and article 149 [5].

² The English term “foresight” is perhaps the closest translation of *la prospective*, yet the idea of proactivity is less present [12]. Recently Godet suggested that, considering how he applies it, the term *la prospective* is best translated “strategic scenario building” (SSB) [13].

³ The farming of aquatic organisms in both inland and coastal areas, involving intervention in the rearing process to enhance production and the individual or corporate ownership of the stock being cultivated [26].

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