



# PD/A CRSP NINETEENTH ANNUAL TECHNICAL REPORT

## PRODUCTION STRATEGIES CHARACTERIZING SMALL- AND MEDIUM-SCALE TILAPIA FARMS

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José A. Martínez Ayala  
Department of Agribusiness  
Escuela Agrícola Panamericana El Zamorano  
Zamorano, Honduras

Joseph J. Molnar  
Department of Agricultural Economics and Rural Sociology  
Auburn University, Alabama, USA

Freddy Arias  
Department of Agribusiness  
Escuela Agrícola Panamericana El Zamorano  
Zamorano, Honduras

Tom Popma  
Department of Fisheries and Allied Aquacultures  
Auburn University, Alabama, USA

### ABSTRACT

This report examines samples of farms from Honduras departments that have and do not have tilapia ponds as part of their farming systems. Data were obtained through personal interviews with 128 farmers, including 64 tilapia producers, in five departments: Olancho, Intibuca, El Paraíso, Francisco Morazán, and Santa Bárbara.

To obtain information about farms without tilapia, farmers were selected at random from within the same community as the identified tilapia producers. Interviews were conducted in communities where the small-scale farmers with production of tilapia were located. The data are intended to constitute a representative sample of the population of the Honduran small-scale aquaculture farmers in these departments. The analysis presents basic comparisons of landholding, farm, and personal characteristics of tilapia producers with the mirror sample of the farmers without tilapia. The analysis profiles basic differences between the two categories of farms, the operators, and their households. Younger farmers were more likely to become involved with tilapia farming. Those farmers more dedicated to their work inside their farm from which they obtain all their income, and whose principal occupation is farming, were more inclined to adopt farming of tilapia. Farmers who use their land more intensively and who dedicate themselves more to the farming of basic grains were more likely to adopt the farming of tilapia. Since Honduran small-scale farmers tend to be a depressed segment economically, they tend to satisfy first their subsistence necessities by maximizing the use of their resources. The financing for both tilapia growers and nongrowers tends to be a limiting factor because more than 80% of the population work without financing, a clear barrier to farm investments. Tilapia growers participated more in development projects.

### INTRODUCTION

Rural people in Honduras constitute almost 61% of the total population (Barham and Childress, 1992; Stonich, 1993). They have little access to basic development goods—food, shelter, potable water, sanitation systems, education, communications, roads, and markets (Rosero, 1997). Eighty percent of all rural people live in poverty. Sixty-six percent of farmers who produce basic grains, the country's staple food, have access to only eight percent of all cultivable land. This 66% operate, on average, slightly more than one hectare of land to secure a year's supply of basic grains to feed a family with approximately six children and to produce a surplus for the nation. Given the high levels of poverty in Honduras, it will be particularly important to attend to the problems that small- and medium-scale farmers have in realizing the cash potential of their tilapia crop (Green et al., 1992, 2000).

The farming of tilapia was introduced in Honduras during the 1970s. The production of tilapia at that period was primarily small-scale (Teichert-Coddington and Green, 1997; Arias et al., 1998). Originally it was groups of families that were the primary participants in tilapia farming in an extensive or semi-intensive form. It was done as a supplementary activity inside their processes of agricultural production. In 1995 it was estimated that a total of 113.6 ha belonging to small-scale family farmers were operational in Honduras. However, the exact number of small-scale producers is not known (Sarmiento and Nuñez, 1995). Export-oriented production of tilapia began in 1990 and has had rapid growth in Honduras since then (Teichert-Coddington and Green, 1997). In 1997 there were 15 commercial farms of tilapia with a total water surface of 185.3 ha, which were producing for export and national markets. The Honduran export of tilapia to the United States has grown consistently since 1992 (Ponce, 1986; Cerezo, 1993).

To illustrate the problems farmers face in rural Honduras, Centro Internacional de Agricultura Tropical (CIAT) researchers' account of Yoro, in Central Honduras, is helpful. The principal commercial distribution channel is the intermediary or coyote. Such persons generally do not live in the community but instead travel from San Pedro Sula, Morazán, El Progreso, El Negrito, Comayagua, Siguatepeque, or El Salvador. Sometimes the intermediary provides equipment services at high prices and finance at high interest rates. Although there are ponds and aquaculture activities in Yoro, this activity is not described in the CIAT account. The most important marketing problems facing rural producers center on price, followed by the availability of opportunities to sell their product on a regular basis (Abbot, 1993; Molnar et al., 1996). Rural producers in Honduras face particular difficulties due to setbacks from periodic hurricanes (UNDP, 1999), difficult terrain, poor road systems, and fragmentation in the rural sector (Arriaga, 1986; Engle, 1997).

Although tilapia can be a source of steady income, the enterprise is not likely to generate rapid or large profits. Producers holding exaggerated expectations tend to define normal results as disappointment or failure. Thus, some of the negative sentiment about tilapia in Honduras stems from unrealistic views of the rate of adoption and impacts of tilapia production (Molnar and Lovshin, 1995). Small- and medium-scale farmers may more profitably rely on strategies such as pond bank sales, partial harvesting for local delivery to restaurants or markets, or other niche arrangements that reflect situational opportunities.

At present there are in existence organizations and institutions that are working to support the development of the production of tilapia on a small scale in different zones of the country. The support is financed by international agencies and is oriented towards small-scale farmers. The support for medium-scale farmers also exists. These organizations have tried to improve the livelihoods of small-scale farmers by implementing and promoting tilapia enterprises in their farm systems, as well as providing a means to improve the diet of their family members.

In Honduras, many efforts to promote the farming of tilapia have been developed by various development agencies. In addition to the PD/A CRSP, the Christian Commission for Development, the Program of Rural Reconstruction, Proyecto Guayape, and El Instituto Nacional de Información Profesional are prompting the small-scale production of tilapia as an alternative system of production to improve the diet in the families of small-scale farmers. However, up to now there has been no detailed characterization of those small-scale farmers willing to adopt the farming of tilapia inside their production systems. In this sense, the efforts of promotion may have been less effective by not having good information about the target category of producers. The present work focuses on the investigation of socioeconomic conditions of small-scale farmers in Honduras as its initial step in the development of a more effective program of extension and production.

The objective of this study is to compare socioeconomic characteristics of small-scale farmers, with and without a tilapia production system, as one means for understanding the adoption of tilapia farming. The purpose of the research is to identify the social and economic conditions that distinguish small-scale farmers who have incorporated the production of tilapia inside their system of production from those who have not.

## METHODS AND MATERIALS

Given the lack of a national census of the producers of tilapia in Honduras, a partial census managed by specific developmental programs was used as a sampling frame for this study. The frame is incomplete and biased toward households and communities participating in NGO projects but is nonetheless representative of the total population. The projects that were considered were the following: Program of Rural Reconstruction, National Institute of Professional Development, Christian Commission for Development, Watershed Management Unit of the El Cajon Dam, and the Experimental Station of El Carao at Comayagua. Through these developmental agencies a list of tilapia producers was obtained. No other current list of producers, tilapia or otherwise, is available.

Data were obtained through personal interviews with 128 farmers, including 64 tilapia producers, in five departments: Olancho (Sta. María del Real and Juticalpa), Intibuca (Yamaraquila), El Paraíso (Danlí and El Paraíso), Francisco Morazán (Lizapa and Galeras), and Santa Bárbara (Las Vegas).

To obtain information about farms without tilapia, farmers were selected at random from within the same community as the identified tilapia producers. Interviews were conducted in communities where the small-scale farmers with production of tilapia were located (Casley and Kumar, 1988). The data are intended to constitute a representative sample of the population of the Honduran small-scale aquaculture farmers in these departments. The analysis presents basic comparisons of landholding, farm, and personal characteristics of tilapia producers with the mirror sample of the farmers without tilapia.

## RESULTS

Table 1 compares the characteristics of farm households with and without tilapia, presenting Chi-square statistics to suggest which differences are worth considering as significant. In some instances, an ANOVA F-test is reported in the text when an interval-level variable is considered.

### Age

Age was considered a factor that could have had influential effect on the adoption of the culturing of tilapia. In the case of farmers with tilapia, the average age was 39.5 years, significantly younger than the 43.6 years mean age for those without tilapia ( $F = 3.6, P < 0.057$ ). Although older farmers may have more capital, nutrition, and food security, younger tilapia farmers may be more amenable to new enterprises and perhaps more motivated to seek alternate uses of farm resources.

### Gender

Although 60% of the sample was male, there was no difference in the rate at which men and women participated in tilapia culture. About half the respondents of each gender in the sample were tilapia growers.

### Marital Status

Marital status was related to whether or not farmers grew tilapia ( $\chi^2 = 9.8, P < 0.01$ ). The married farmers were more likely to grow tilapia. It can be said that those legally married

families present more stable socioeconomic conditions, which made it easier for them to adopt a technology that would affect their system of production. This is why projects of development should focus their work on promoting the production of tilapia to those families with family stability.

## Income

Tilapia farmers reported higher average annual incomes than non-tilapia growers (18,918 Lempiras vs. 17,811 Lempiras).

Table 1. Association between tilapia growing and selected personal, family, and household characteristics, Honduran farmers, 2001.

Characteristic	Number	%	
		Tilapia	No Tilapia
GENDER		$(\chi^2 = 0.533, P < 0.465, df = 1)$	
Male	80	53	48
Female	48	46	54
MARITAL STATUS		$(\chi^2 = 9.8, P < 0.01, df = 4)$	
Single	7	71	29
Married	94	48	52
Common-law Union	21	67	33
Widow	4	0	100
Single Mother	2	0	100
PRINCIPAL INCOME SOURCE		$(\chi^2 = 23.7, P < 0.001, df = 3)$	
Agriculture	84	60	40
Food Shop	10	10	90
Day Laborer	16	6	94
Others	18	67	33
HOLD LAND TITLE		$(\chi^2 = 0.533, P < 0.465, df = 1)$	
Titled	77	53	48
No Title	54	46	54
USE OF LAND		$(\chi^2 = 11.1, P < 0.01, df = 2)$	
Annual Crops	94	47	53
Perennial Crops	24	42	58
Combination	10	100	0
PRINCIPAL OCCUPATION		$(\chi^2 = 3.0, P < 0.25, df = 2)$	
Farmer	30	63	37
Housewife	41	49	51
Farmer/Day Laborer	57	44	56
SOURCE OF FARM LABOR		$(\chi^2 = 1.0, P < 1.0, df = 1)$	
Family Only	106	50	50
Family and Hired	22	50	50
SOURCE OF FARM FINANCE		$(\chi^2 = 1.0, P < 1.0, df = 1)$	
ONG	4	50	50
Bank	8	62	38
Cooperative	7	43	57
Self	106	49	51
Other	3	66	34
PRINCIPAL ENTERPRISE		$(\chi^2 = 5.5, P < 0.1, df = 2)$	
Grains	88	49	51
Coffee	16	75	25
Others	24	38	63
PARTICIPATION IN PROJECTS		$(\chi^2 = 28.3, P < 0.001, df = 1)$	
Yes	81	68	32
No	47	19	81

However, this difference was not statistically significant ( $F = 0.127, P < 0.7$ ).

## Principal Source of Income

Farmers were asked about their principal source of income: agriculture, day labor, and small food store business. Apart from this, other sources of income such as the sale of items sent from abroad, among others, were considered. The Chi-square test showed significantly more farmers with tilapia obtain their income principally from agriculture ( $\chi^2 = 23.7, P < 0.001$ ). Those without tilapia have more income coming from working as day laborers, and others depend on income from profits made from a small food store or tavern.

Agriculture is commonly the main source of income for farmers in Central and South America; they depend on it for their subsistence. A study carried out in Guatemala about small-scale farmers showed that the principal source of income is agriculture (Castillo et al., 1992). Meanwhile, the production of tilapia should be promoted to those whose principal income is from agriculture. In this study farmers with tilapia have less land, which is why they have more intensive management of their farm. At the same time, they are more productive and prefer to work their lands instead of going out looking for work, as is more often the case of farmers without tilapia.

## Size of Farm

The amount of land available showed significant difference between tilapia-growing and non-tilapia-growing farms; consequently, the size of the farm could be a factor of influence in the adoption of the farming of tilapia. Farmers without tilapia had more land in comparison to those with tilapia; on average farmers with tilapia had 2.45 ha, and those without tilapia had an average of almost 3.5 ha ( $F = 4.8, P < 0.03$ ). Those with tilapia had smaller farms. Apparently, the intensity of the use of the land is greater as the size of the farm diminishes. In this case, it is true that those farmers with small farms have a tendency to diversify their operations. Similarly, Castillo et al. (1992) found that Guatemalan farmers with less than 2 ha of land were more likely to farm tilapia.

## Type of Crop

Tilapia farmers differed depending on the type of crop they planted. The majority of farmers with tilapia showed a combination of annual and perennial crops. This could be because they have less availability of land than the traditional farmer does, and they utilize it better for greater productivity for their survival. This type of combination observed in farms is one in which farmers plant corn and beans and have part of their land in coffee as a perennial crop.

## Use of Land

The association between tilapia-growing and the use of the land was not significant ( $\chi^2 = 11.1, P < 0.1$ ). Nonetheless, tilapia farming development programs should focus on the farmers who have a combination of annual and perennial crops, since they are the majority of those who have adopted the system of tilapia. The previous result signifies that those farmers with a more stable and diversified system of production would be more willing to adopt new technology.

## Principal Occupation

Dependence on farming as a principal economic activity is important in determining the likelihood of adoption of tilapia farming because farmers with more or less continued presence on their operation may have more time and inclination to attend to a farm pond. This variable was significantly related to tilapia growing ( $\chi^2 = 11.1, P < 0.1$ ). Farmers with shops or labor employment were less likely to be involved in tilapia culture.

## Principal Farm Enterprise

The nature of the main farm enterprise was not associated with tilapia growing ( $\chi^2 = 5.5, P < 0.1$ ). Although more respondents who grew tilapia reported coffee as the principal activity of their farm, the differences were not significant. Perhaps not detected in these data, some link may exist between the conditions that are favorable for coffee production and those for fish culture; soil quality and rainfall sufficiency in particular may also be more conducive to fish culture. Generally coffee areas have at least somewhat fertile soils and sufficient rainfall to replenish ponds and the watersheds that supply ponds.

## Project Participation

Development agencies such as missionaries, NGOs, and units of the Honduran government often conduct training programs and provide technical assistance intended to improve and diversify the livelihoods of rural producers. Often these activities feature fish culture among the array of alternatives that are supported. The data suggest that these efforts bear greatly on whether small-scale farmers become involved in the promoted technology. There was a strong association ( $\chi^2 = 28.3, P < 0.001$ ) between culture of tilapia and participation in NGO projects.

Organized programs of technical and organizational assistance may influence the adoption of tilapia farming. For one, such endeavors may provide technical assistance for fish culture. Others may provide low interest loans or access to pond construction services that might not otherwise be available in a locale. Such projects are often a central audience for PD/A CRSP research results and technical assistance efforts. The training programs they organize and the regular contacts that NGO technicians have with fish farmers are important conduits of information about fish farming. PD/A CRSP scientist participation in technician and farmer training are central mechanisms for propagating research results.

## DISCUSSION

Development agencies should take into consideration the findings of this study in their programs of extension and research, in the promotion of tilapia, and in planning for rural people. One central insight of the study is the need to consider the role of financing to small-scale farmers. Small loans can help producers acquire technology and infrastructure that can make a long-term contribution toward developing their well-being. The results show that the majority of farmers work with their own finances, and this is a limitation for them.

Honduras is a diverse country, but the several different sites chosen for investigation augment the durability or robustness

of the findings. Nonetheless, it remains necessary to investigate the possibilities for tilapia production in other zones of the country in relation to the socioeconomic characteristics of small-scale farmers and the production strategies appropriate to their conditions.

## ANTICIPATED BENEFITS

The results of this study provide additional guidance to the technology development and outreach efforts of the PD/A CRSP research program in Honduras. There is growing recognition of the need to focus and target outreach efforts that encourage farmers to undertake tilapia culture. Understanding how tilapia farmers differ from the general population of producers in terms of their personal and household characteristics, coupled with knowledge about appropriate soils and water-holding capacity, can lead to a more effective presentation and use of PD/A CRSP research results. Enhanced understanding of production barriers, distribution difficulties, and disincentives to participation in tilapia culture are important ingredients in efforts to assist farmers in selecting tilapia as a farm activity and in increasing their production. The project must understand and anticipate those factors that give farmers reservations about the benefits they will receive from new or reactivated fish ponds.

Fish culture has a future in Honduras. The government can help best by doing a few things well and otherwise staying out of the way where it does not have the resources or commitment to act effectively. The donor community can share information with each other and the farmers, paying particular attention to the small-scale sector. Our project can help the nongovernmental community to train its technicians and to develop its capabilities for the day when PD/A CRSP will not be in Honduras. Tilapia is something Hondurans will eat and something an identifiable segment of operators is capable of growing. The market will work if a broad array of public institutions, NGOs, and large-scale farms are enlisted to improve the distribution of information about opportunities to grow and sell tilapia in Honduras.

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