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Abstract[*]

Honduran farmers are at a disadvantage when dealing with intermediaries because they lack timely information about market prices. This paper first analyzes which information and communications technology (ICT) would be most suitable for sending price information to producers scattered throughout the country at a reasonable cost and in a sustainable way. Negotiations by two groups of farmers were compared: one to which market prices were not sent (control) and one to which prices were sent (treatment). A simple uninterrupted time series research design was used, followed by linear regression analysis and univariant analyses to determine the cases in which the treatment had an impact on farmers' negotiations. Findings are reported, as well as recommendations and lessons learned.

JEL Classification: D24, O33, Q12, Q13
Keywords: Information and communications technology; Agriculture; Cell phones; SMS, Communication for development; Honduras; Central America

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1. Introduction

Honduras is a country with a vocation for agriculture and forestry. Agriculture accounts for 12.24 percent of GDP, and agriculture, forestry, fishing, and hunting account for 34.55 percent of the economically active population (Honduras in Figures, 2008).

The dynamics of the agriculture sector depend on the balance between supply and demand, which can change from week to week, as seen in the prices published weekly by the Information System for Agricultural Markets and Products of Honduras (SIMPAH) and the weekly price reports from EDA (Farmer Training and Development of the Millennium Challenge Account-MCA). The weekly prices for August through December 2009 are graphed in Annex 4.

There is high demand for agricultural products because they are staples of the Honduran diet. However, in recent years, the infrastructure for agricultural production has been gradually declining due to factors such as inadequate public policy, significant restrictions on financing for agriculture, adverse climate, the lack of technical assistance and training, and the lack of timely market information (Hernández, 2003).

The lack of capacity for market management by farmers is an advantage for wholesalers, marketplaces, and the agro-industrial sector, which normally have the logistics and technology necessary for obtaining timely information about price movements for agricultural products in local, regional, national, and international markets.

1.1 Analysis of Information and Communication Technologies as Government Policy

The World Bank study "Information and Communication for Development 2009" measures (on a scale of 1 to 10 with 10 being the highest) the use of information and communication technologies (ICTs) using three indicators: a) access to ICT services; b) availability of payment for ICT services; and c) adoption of ICTs for public and private sector use. According to these criteria, Honduras is in third place in Central America, with scores of 4, 4, and 6, respectively. It is ranked higher than Nicaragua, which has scores of 4, 3, and 5, respectively, but below Guatemala and El Salvador, whose scores are 5, 7, and 7, respectively. The leading countries in the world for these indicators are Canada, Switzerland, and Denmark, with a perfect score of 10 for each of the three criteria.

1.2 Analysis of the Horticulture Sector

Honduras has great potential for producing fresh vegetables for the domestic market and for export. The country has a geographic advantage because of its location in relation to other countries and to the world's largest market, the United States. It also has a variety of settings and climates for producing a wide variety of crops.

In 2002, imports of vegetables such as chopped tomatoes, cabbages, onions, carrots, potatoes, yucca (cassava), lettuce, and cauliflower increased sharply, representing 27.66 percent of the total value of agricultural imports (US$271.3 million), much higher than in 2000, when it was 6 percent. This increase was mainly due to the extraordinary importation of 18,119,000 kg of chopped tomatoes, for an estimated value of US$28,583,465 (*Mesa Agrícola Hondureña*, 2002).

Vegetables are cultivated on less than 5 percent of farms, on a total area of 24,000 hectares. Except for cantaloupe and watermelon (which contribute 5 percent of GDP), these crops are produced on a very small scale. The typical vegetable farmer cultivates less than 1 hectare (10,000 $m^{2)}$ and needs to improve his technology, although lately the companies that produce tomatoes, cucurbits, and East Asian vegetables have promoted the adoption of new technologies for medium-scale farmers (2 to 5 hectares) who are now using drip irrigation, plug transplanting, and hybrid seeds.

The horticulture sector is vital to the economy of several agricultural regions because of the participation of some 15,000 small production units that were important sources of employment and income during the year (Honduran Agricultural Forum, 2002). The majority are national vegetable farmers whose production is sold in the domestic market. They almost always farm without technical assistance, they have no access to credit services, they work individually, and generally they are not affiliated with any formal organization. In general, small and medium vegetable growers are the first link in the production chain, they pay the highest prices for inputs, and they are the first in the commercialization chain in which intermediaries obtain the highest profits in the shortest time.

According to the Honduran Agricultural Forum (*Mesa Agrícola Hondureña*) in 2002, the small scale of production was due to the fact that Honduras had no specific plan to develop its horticultural potential. Moreover, it does not have a strategy to develop small

farms dedicated to horticulture in general or to resolve the contradictions and deficiencies in the system for marketing vegetables. There are no agreements, market orders, or other instruments that would facilitate the ongoing provision of vegetables to national consumers and Central American markets. Commercialization margins should be adjusted to acceptable levels so that all stakeholders in the marketing chain receive fair compensation for their participation.

Consequently, the typical vegetable farmer faces the following limitations: low utilization of capital; lack of access to modern irrigation technologies (micro-aspersion, pressurized irrigation); uncertainty about price movements; little participation in first- and second-tier business organizations; low availability of technical assistance services specializing in the productive and commercial management of vegetables; and, no influence in the development of sectoral policies.

1.3 Analysis of Information and Communication Technologies in Honduran Agriculture

The Millennium Development Goals for the rural sector of developing countries do not necessarily correspond to unified criteria or a shared vision (Unwin, 2009). This observation is important for the application of ICTs in developing countries and, above all, in those with a largely rural and dispersed population like Honduras.

Most political analysts and government decision-makers do not include the use of ICTs as an integral part of their strategies or initiatives. Unwin found that the use of ICTs in combination with better management skills can play a fundamental role in creating, disseminating, and implementing a shared vision of rural development and in contributing to, among other things, a non-formal educational process that could place the rural producer virtually closer to the business centers or the most important local, regional, and national markets through the provision of information.

Among the most important efforts to reduce the gap between the producer and market information is the Information System for Agricultural Products Markets in Honduras (SIMPAH), which gathers, systematizes, and publicizes the prices of the main agricultural products in the national and international market (FHIA, 2009).

Experiences with market price information that began with a government initiative were found in other countries. In Honduras in 2008, the MCA and EDA—both funded with a donation from the United States government—began to publicize prices over the two radio stations with the greatest coverage in the country and continued to do so successfully for several months.

As noted by Monge and John (2004), there was major progress with the publicizing of prices in Costa Rica. “Along these lines, the central government, with support from international cooperation, has undertaken a number of projects and programs to strengthen market management capacity and promote access to information about the prices for the main agricultural products using information technologies, including Internet access, radio, television, and mobile telephones.”

1.4 Statement of the Problem

Historically, most Honduran farmers have lacked formal technical training. This has kept them at a disadvantage, with low yields and considerable post-harvest losses. The wholesale intermediaries continue to be the real beneficiaries of agricultural production, as they do not make the effort or take the risks that the farmers assume in the process. For years, technical assistance from private institutions has improved the techniques used in the countryside. This has had a positive impact on vegetable production in the country, leading to increased yields and improved quality. Nevertheless, so far very few (or in some cases none) have invested in reducing the gap between market information and the farmer, providing them with access to market price information, enabling them to improve their position for negotiating fairer prices from the wholesalers and thereby increasing their earnings as a reward for their efforts and the risks they take. (Dutch Development Service, 2005)

1.5 Justification

In recent years, ICTs have evolved rapidly, which has increased their presence in business, education, and labor and made important contributions to the efforts of developing countries to reduce social exclusion and poverty (Lanza, 2002). Increasingly, public and private institutions devoted to development have begun different applications of ICTs in

their formation/training, services, and production processes. Formation/training programs are oriented towards ICTs with a broad presence of micro-electronic means (radio, TV, videos) and communications and information processing technologies (networks, computers).

Distance learning and distance information have made excellent use of ICTs. There has been an evolution beginning with the use of media such as written correspondence, radio, and television to make the contents of learning accessible to populations in distant places and those who, because of their work, do not have time to be physically present at an information center. One example of a medium for formation/learning is Channel 10 of Honduran national television, which has educational programming. Several programs are now broadcast on how to operate and maintain ICT-based equipment using media such as satellite television and the Internet. With the advent of ICTs, unprecedented possibilities have arisen for reaching faraway populations and for making the conditions for access to new markets more flexible.

According to Allen L. Hammond: "Nothing has contributed so much as information and communication technology to giving an impetus to economic growth and the integration of markets during the last ten years all over the world. Much of the economic benefit stemming from ICTs and the rapid increase in Internet access has been seen so far in the developed world, where e-commerce is already transforming many industries and in which email, the mobile telephone, and instant messaging are omnipresent." C. K. Prahalad notes that poor communities are beginning to use digital technologies to create sustainable solutions to the problems they face (Lanza, 2002).

This study used one of the ICTs—selecting the most appropriate one—to help close the gap between the small, rural vegetable grower and up-to-date information on market prices for vegetables. A number of inputs were used to conduct the study. These included the experience of agencies working in Honduras such as Farmer Training and Development (EDA) with the support of the Millennium Challenge Account, field research, the knowledge and experience of the staff comprising the team and of outside advisors, and the results of different instruments, such as surveys and polls answered by stakeholders in the Honduran vegetable sector that use ICTs.

The study measured the capacity of short message service (SMS) to provide periodic information to farmers on market prices for nine vegetables and how farmers used this information to negotiate better terms and thereby increase their earnings. The results will assist public and private institutions in taking advantage of ICTs in order to provide information more efficiently to this population.

Around the world, one of the main problems with many attempts to use ICTs for development has been the tendency to concentrate first on the technology and later on analyzing the potential that ICTs can offer poor and marginal communities, generally the most excluded. Many initiatives that have been implemented in that context have tended to focus on supply rather than demand. As a result, the information that has been delivered has been insufficient. Delivery of ICTs has also been unsustainable once the initial funding and external support has ended (Unwin, 2009).

This study overcame these deficiencies of the preliminary work done. It first assessed the needs of rural vegetable growers. Subsequently, work was done to determine which ICTs could provide a solution to that situation. Beyond that, the study has also proposed a sustainable solution to the problem.

1.6 Limitations of the Research

The main approach for solving the problem of the lack of market price information for vegetable growers was technological. First, an analysis was done to determine which ICT had the most advantages to be used to send price information to producers. Dissemination through radio, the Internet, and SMS was analyzed. Then, once the SMS was chosen, the mobile service companies were analyzed to determine which one to use. The study determined whether sending text messages through CELTEL with its TIGO brand covered a large number of producers and whether the information empowered them to negotiate better prices for their produce.

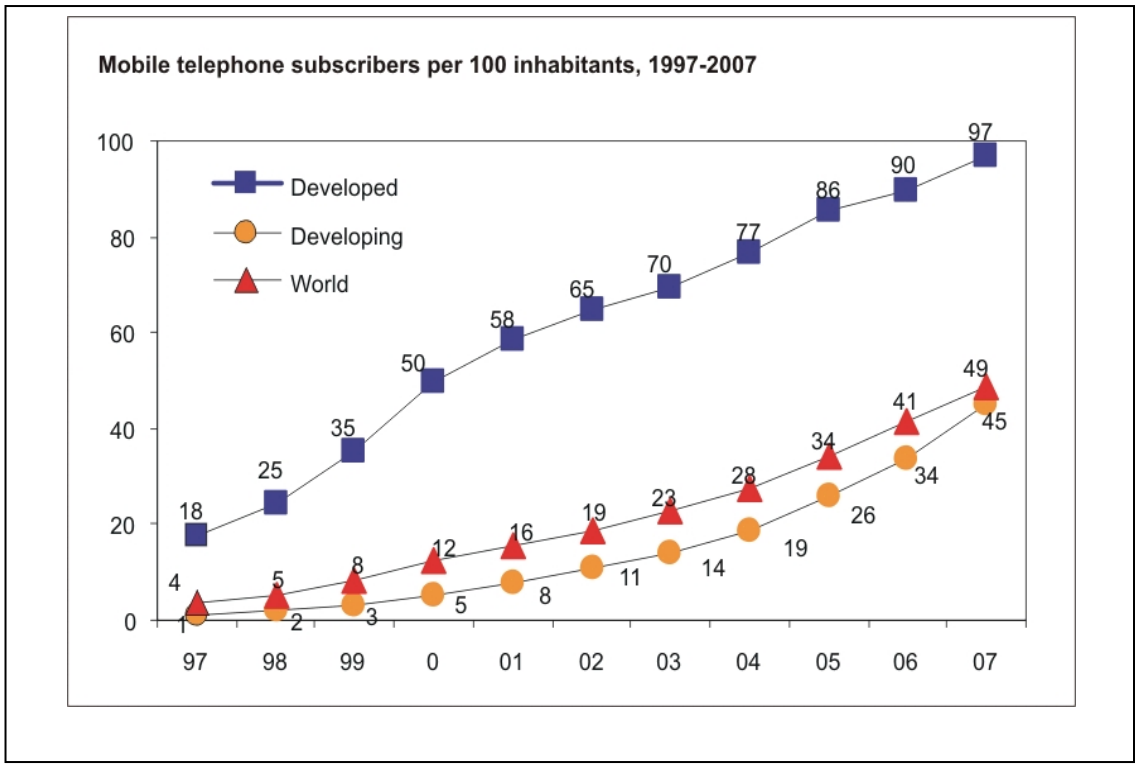
SMS, or Short Message Service, is a mobile data source that allows for alphanumeric messaging between mobile phones and other equipment, such as systems for voice messaging and email. SMS is a system for storage and sending. The messages are sent to a short messaging service center (SMSC) for different types of equipment, such as mobile telephones or email. The SMSC interacts with the mobile network to determine the

user's availability and location to receive a text message. Since SMS uses a control channel rather than a voice channel, one characteristic of SMS is that the user can receive a text message even if they are making a call. The telephone only needs to be on. If the telephone is off, the SMSC will wait until it is on in order to send the message. A "message received" is sent to the SMSC from the MSC when the mobile telephone message is delivered, allowing the SMSC to provide confirmation of receipt to the person sending it (La Voz al Mundo, 2008).

According to La Voz al Mundo 2008 (Voice of the World), the SMS Web has become a powerful tool for marketing and publicity. It enables companies to be in direct contact with their clients through the mobile phone. What professional does not at least have one mobile telephone?

The spread of cell phones has been accompanied by the spread of cell phone applications. Around 500 billion SMS were sent worldwide in 2004 (Unwin, 2009). According to the International Web as published in La Voz al Mundo, "The SMS Web is a perfect medium for sending messages, because it can both promote a product and be useful to the client. For example, we announce that we launched a new service in the company that can be of interest to him/her. Therefore, it is an excellent way to achieve customer loyalty and an effective way to get repeat sales."

Figure 1. Mobile Telephone Subscribers per 100 Inhabitants, 1997-2007



Source: http:// www.itu.int/ITU-D/ict/statistics/ict/graphs/mobile.jpg

Unwin (2002) observes that the mobile phone is the most widely researched ICT. It is a simple, two-way technology, and it can have an impact on the productivity of developing countries. The revolutionary spread of this technology is unprecedented.

Marketing via messages to mobile phones has the best cost-effectiveness ratio. Its speed and comfort win over traditional mail, while the immediacy of sending makes it win over email as well. An email may not be read for days, while an SMS is immediate, since most people are used to carrying their mobile telephone with them, especially in professional settings. In this way, messages to mobile phones are situated halfway between the telephone and email. They have the immediacy of a call to a mobile, but they send text and at a much lower cost. Web SMS saves a lot of time and money in comparison to calls to mobile telephones.

Why was the messaging service of TIGO or CELTEL chosen for conducting this study? According to Honduras' National Telecommunications Commission (CONATEL), the number of telephone service users in October 2009 was 8,516,528, of whom 812,056

are landline users and 7,704,472 are cell phone users. Among the latter, 4,719,270 use the TIGO service, which amounts to 61.25 percent of all mobile telephones. Since TIGO is the most widely used service, it was considered that it would represent most producers as well. In a random sample of farmers taken over a two-month period, 83.65 percent were found to be TIGO customers.

Table 1. Mobile Telephone Operators in Honduras and Number of Subscribers

Mobile telephone operators	Users August 2009	Percentage
CELTEL	4,719,270	61.25%
SERCOM	1,419,082	18.42%
DIGICEL	1,496,218	19.42%
HONDUTEL	69,902	0.91%
TOTAL USERS	**7,704,472**	**100.00%**

Source: Prepared with information from CONATEL, October 2009.
Note: The users of the mobile operator Hondutel are for June 2009. CONATEL did not have the figures for July and August.

The study also attempted to determine whether the information sent to the farmer was considered to be useful and whether they were willing to pay for it. The producers who received price information were asked the price they would be willing to pay for a SMS that provided price information on one type of crop.

2. Objectives

The overarching objective of the study was to determine the extent to which the use of ICTs empowered Honduran vegetable growers to be in a better position to negotiate the price of their produce and obtain higher returns.

This objective was achieved by directly sending SMS text messages with market prices for high-value vegetables in the markets of Tegucigalpa and San Pedro Sula and measuring the improvement in the negotiating conditions of the vegetable growers assisted by the EDA program in Honduras as a representation of Honduran vegetable producers. A statistical evaluation was made comparing the prices at which intermediaries purchased

from farmers who had access to the price information with those paid by intermediaries to others who did not have access to this information.

2.1. Specific Objectives

The specific objectives of the study were the following:

1. Assess the effectiveness of SMS text messaging for disseminating information about vegetable prices in Honduras, specifically for the horticulture sector.
2. Ascertain the popularity of mobile phones among vegetable producers in Honduras.
3. Make a socioeconomic assessment of a sub-sample of the horticulture producers studied.
4. Provide information to investors so that they can determine if collecting and disseminating market price information can be a profitable and sustainable activity that, at a reasonable cost, helps vegetable growers negotiate better prices for their produce.

3. Sources of Information

For this study, different sources were used to substantiate and validate the proposal for solution. Books, Internet consultations, and interviews with experts were used and are reflected throughout the document, along with surveys of producers.

3.1 Primary

The primary information was collected from interviews with the main actors. Market data were collected from the Marketing Department of the EDA Program, which has staff in the northern and central parts of the country. Information was also gathered on the results of sales of horticulture produce by the team in charge of the study, through cell phone calls and personal interviews with a selected sample of producers.

3.2 Secondary

Secondary sources were consulted on the following issues:

- ICTs and their impact on development projects
- ICTs and development
- ICTs as an instrument for development in Honduras
- Design of experiments
- Design of quasi-experimental investigations
- Statistics for investigation
- Statistics with SPSS
- Previous studies about disseminating market prices using ICTs in Honduras
- The use of cell telephones in Honduras

3.3 Techniques for Gathering Information

Various techniques were used to obtain in-depth knowledge about the factors affecting the appropriate management of information technologies. These were personal communication, telephone calls, and surveys of producers.

3.4 Information-Gathering Process

At the outset, the research team received a list of producers from the EDA Program that had harvested or were harvesting for four months in a row during the year. The list included telephone numbers and addresses of the farmers, the planting date and estimated harvest date, the crop planted, and the size of the parcel of land.

It was possible to communicate with most of the producers who had CELTEL cell phones. The subscribers were selected for economic reasons (sending text messages represents a fixed cost for the use of the platform of each cell phone company with a variable cost for each message sent) and because this company has a greater percentage of producers who are subscribers. Using this procedure, the information provided by EDA was verified: the cell phone number provided by them was in effect that of the producer, and they would harvest at least one of the vegetables of interest on the estimated dates.

The market prices gathered from August 2009 to the week of October 4-10, 2009 were also received from EDA. Calls were made to the farmers harvesting between August 15 and October 14, who did not have the market prices when they were harvesting, in order to conduct the survey in Annex 1.

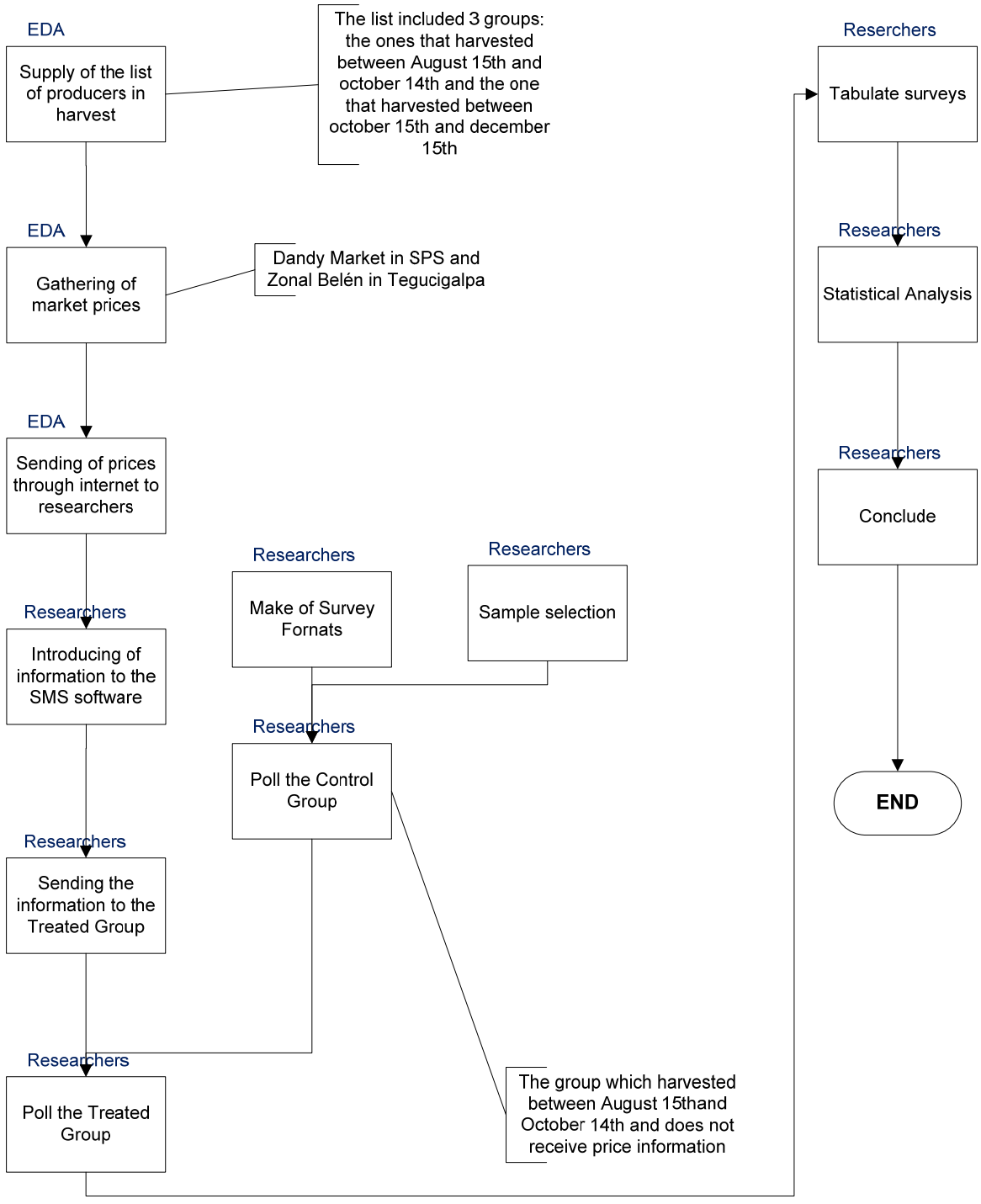
The EDA Marketing Department provided information weekly on the prices paid on these dates to farmers by Dandy market in San Pedro Sula and Zonal Belén in Tegucigalpa. The prices continued to be received weekly until December 15. The prices were for the nine vegetables considered to be the most profitable for the farmers, according to EDA. These were yellow onions, sweet peppers, carrots, cabbage, salad tomatoes and processing tomatoes, potatoes, cucumbers, plantain, and yucca/cassava.

A text message was sent with that information twice a week to the farmers over a period of two months. The SMS included the prices by size of the vegetable (large, medium, and small) since this information is very relevant to the buyer. This information came from the Dandy and Zonal Belén markets since they are the most important ones for wholesalers in San Pedro Sula and Tegucigalpa, respectively (Edgardo Varela of EDA). Each producer who had been surveyed by telephone was called when their harvest was over.

In order to consolidate the research and delve further into the use of ICTs, the research team analyzed the socioeconomic conditions of the farmers. A survey was designed to gather information about the availability of basic utilities, sources of income, participation of family members in the production process, and others. From the list of producers, 50 were randomly selected for an on-site socioeconomic assessment. The survey was tabulated and the results enabled some preliminary conclusions to be drawn about the relationship between the socioeconomic status of the farmer and the use of at least one ICT.

Figure 2 depicts a flow chart of the processes used in this study (not including the socioeconomic analysis), including the procedure used and the interactions with those involved.

Figure 2. Flow Chart of the ICT Study



Source: Authors' compilation.

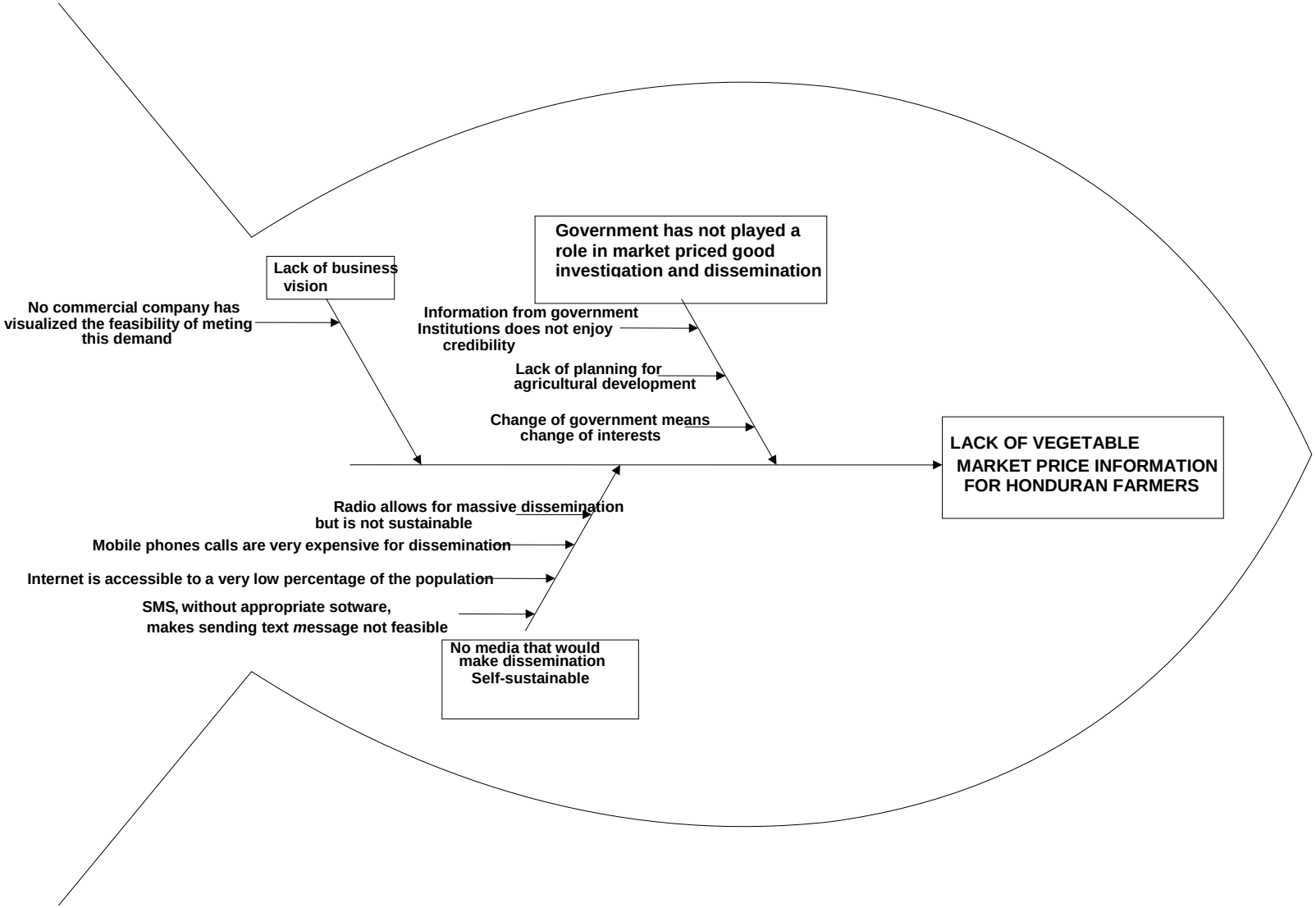
4. Methodology

In order to find a solution to the problem of lack of real and timely price information, the current situation was analyzed using the Ishikawa diagram, which enables an in-depth examination of the primary and secondary causes of the problem.

4.1 Cause-Effect Analysis

The cause-effect analysis, or diagram, shown in Figure 3, presents the factors contributing to the identified problem. One of the virtues of this diagram is that it promotes teamwork by having different groups affected by the problem participate, which increases the possibility that the causes of the problem will be identified and understood. The diagram contains all of the variables influencing the lack of real and timely vegetable market price information for vegetable growers.

Figure 3. Cause-Effect Diagram



Source: Authors' compilation.

The central government has lacked the capacity to create a system to publicize market prices for agricultural products massively and in a sustainable way. The most noteworthy effort was the creation of the SIMPAH, which was transferred to the FHIA to be managed. Unfortunately, since dissemination of market prices is done by email, it has had scant impact, as it does not reach farmers in isolated areas.

Radio broadcasts do not allow for sustainable provision of information, even though they have the advantage of being inexpensive. It was not until the advent of the Internet, together with dissemination via cell phone, that it has been possible to send messages en masse through SMS.

Despite the fact that this technology has been in operation in Honduras for about a decade, no private sector initiative had taken advantage of this business opportunity to meet the demand for price information at a reasonable cost while at the same time generating income from the service provided.

Once the SMS option was selected, using the methodology described above, the study looked at whether in effect the transmission of weekly prices via SMS would enable vegetable growers to negotiate a higher sales price of their produce with wholesalers.

4.2 Rationale for the Option Selected

Because SMS technology is a low-cost alternative for the recipient (i.e., the vegetable grower), it was considered together with the radio as a possible ICT for dissemination. In comparing the two low-cost alternatives, EDA determined that sustainability in the use of SMS was the most important factor. Radio broadcasting could have been used to demonstrate whether in effect there is a difference in income for vegetable farmers if they receive price information, comparing the sales price for the two groups: one that does not receive prices over a two-month period and the other that receives price information over the radio for two months. However, this would not have met objective 3 of this study, which is that the information generated induces a company or investor to take on the activity as a profitable venture that also meets the need of Honduran vegetable farmers for information.

4.3 SWOT Analysis

The SWOT is a tool that facilitates examination of the internal and external factors affecting programs and projects. The SWOT is represented in a double-entry matrix in which positive and negative factors are analyzed on the horizontal level and the internal factors (considered to be controllable by the project) and the external (uncontrollable) factors are analyzed with the vertical reading. In summary, the strengths must be used, the opportunities must be taken advantage of, the weaknesses must be eliminated, and the threats must be dealt with. Table 2 depicts a generic SWOT matrix.

Table 2. SWOT Matrix

INTERNAL FACTORS Controllable	EXTERNAL FACTORS Not Controllable
STRENGTHS **(+)**	**OPPORTUNITIES** **(+)**
WEAKNESSES **(-)**	**THREATS** **(-)**

Source: (http://www.infomipyme.com/Docs/GT/Offline/Empresarios/foda.htm).

In this study, the SWOT matrix enabled an analysis of some of the key factors that could contribute to the successful development of SMS, highlighting the strengths and the internal weaknesses by comparing them objectively and realistically with the alternatives and with the key opportunities and threats in the environment. Figure 4 depicts the SWOT matrix for this study.

Figure 4. SWOT Analysis of the ICT SMS

		OPPORTUNITIES	THREATS
		1. Massify price information for vegetable growers. 2. Higher bargaining power for producers. 3. Possible strategic alliances with Agricultural Houses for disseminating inputs prices. 4. Support from NGOs for increasing vegetable production.	1. The vegetable farmer is not willing to absorb the cost of the messaging. 2. Rate of participation of the SMS provider company is reduced. 3. High rivalry among competitors.
		STRATEGY SO	STRATEGY ST
STRENGTHS	1. Low cost. 2. High coverage of communications medium 3. Easy access to timely information. 4. Use of medium does not require more training. 5. Economic sustainability 6. High acceptance of medium.	1. Vegetable farmers manage and use price information in negotiations. 2. Marketing campaigns of low prices via SMS. 3. Technical assistance and training if needed.	1. Develop strategic alliances with national companies. 2. Manage promotions to maintain customer loyalty.
		STRATEGY WO	STRATEGY WT
WEAKNESSES	1. Contract a different SMS sending company for each mobile operator. 2. Less coverage than radio.	1. Constant communication and follow-up with vegetable growers. 2. Create a center with reliable information for vegetable farmers.	1. Awareness-raising campaign about importance of SMS for vegetable growers.

Source: Authors' compilation.

4.4 Analysis of the Options

The factors taken into consideration when evaluating the various options for disseminating prices through ICT were the following:

- Geographic coverage: greater coverage for a greater number of farmers can be achieved.
- Massification of use: the more vegetable growers who use the ICT, the more receivers of the price messages there will be.
- Unit cost for sending per recipient.
- Sustainability: even when a dissemination program can begin with financing from the government or some non-governmental entity, having the income from the activity cover the costs and generate a profit in the medium term must be considered.
- Efficacy of receipt of the message: the message must reach the farmer in a timely fashion. If the message is sent but not received by the recipient, it will not be useful.

Ways of disseminating market prices efficiently, effectively, and sustainably were analyzed. The first option analyzed was sending price information over the Internet. The second option was dissemination of market prices over the radio, using the radio stations with the greatest coverage in the country. The third option analyzed was disseminating prices by SMS text messages to a specific group of vegetable farmers.

The options for communication technologies that most Honduran producers have are radio and cellular telephones. The cost of radio dissemination per farmer receiving the price can be low. A 30-second radio spot broadcast twice a day for a month on one of the two radio stations with the greatest coverage in Honduras (Radio América or HRN) can cost $1,000 (Varela, E., personal communication, April 2009). The cost of sending a text message is $0.05 per recipient plus a fixed cost of $200 a month for use of the platform of a company that provides this service (Padilla, L., personal communication, October 2009).

Radio is the cheapest medium for dissemination because of the number of people listening to it, which makes it more efficient. However, if we consider effectiveness and

sustainability, SMS is more advantageous. When the message is broadcast, if the farmer is not there to hear it or one of his family members is not there to tell him later, the message is lost. The SMS, however, is stored in the mobile telephone even when there is no cell phone signal at the farmer's location during the day, and it will be received when the phone is in an area reached by the signal. This enables the farmer to read the SMS at any time of day and to save it after it is received.

In terms of sustainability, the radio spots could be funded by an entity such as the government of Honduras through the Secretariat for Agriculture and Ranching or through a non-governmental entity. Once funding is no longer available, dissemination ends. SMS is versatile since only those who receive the information pay for it. This payment not only sustains the sending of the information by this medium, but also represents a savings to the farmers, who can thus avoid having to go to the important purchasing centers or markets to check the sales price for their produce. This study concluded that the solution was to disseminate market prices for the most profitable or most widely consumed vegetables via SMS or text messages when the subscriber (vegetable grower) asks for it.

Table 3. Summary of Advantages and Disadvantages of the Options

Alternative for solution	Advantages	Disadvantages
Internet	- Low cost per recipient	- Little access in rural areas - Low number of users
Radio	- Massive dissemination in a large percentage of the national territory - Very low cost per recipient	- Cost of dissemination must be covered by some institution. - System can be unsustainable because of not finding donor institutions or sponsors. - If recipient is not present at time of broadcast, the message is lost.
SMS	- Widespread dissemination throughout the country. - Low cost per recipient. - Recipient of message pays for the information. - Can be incorporated into a publicity system in order to increase profitability. - The message is received when there is cell signal and is recorded in the cell phone.	- Less coverage than radio. - A different company must be contracted for sending SMS for each mobile operator with which one wants to work.

Source: Authors' compilation.

4.5 Hypothesis

The increase in income from their production for the farmers assisted by the EDA program has a statistically significant relationship to the empowerment that results from having access to up-to-date and reliable market prices for vegetables disseminated by information and communication technologies.

4.6 Research Design

According to Bernal (2006), a quasi-experimental design is one in which the researcher controls only one variable in two groups being compared. By definition, this design does not use random selection. This kind of design is frequently used in the social sciences in general when random selection is not always possible, and it is very useful when a control group cannot be identified. In this study, two groups selected at two given periods of time were compared: one which received market price information for vegetables and another that did not (so the only variable controlled is price information given to the treated group).

Among quasi-experimental designs are Interrupted Time Series Designs. An Interrupted Time Series Design is one of the most effective and powerful quasi-experimental designs, especially when complemented by other elements. An Interrupted Time Series Design refers to a long series of observations made of the same variable consecutively over time. The observations can be made of the same units or study subjects, as in studies of medical or psychiatric symptoms in an individual observed repeatedly. The observations can also be of different units or subjects for study (with common characteristics), as in the case of traffic deaths in a department or state of a country over many years, during which the population is constantly changing (Shadish, 2002).

A Simple Interrupted Time Series Design requires a treatment of one of the groups being compared and many observations (preferably more than 100, according to Shadish, 2002) before and after the treatment. A design with 10 observations can be diagrammed as follows:

$$O_1\ O_2\ O_3\ O_4\ O_5\ X\ O_6\ O_7\ O_8\ O_9\ O_{10}$$

In this study, it was the observation of farmers that grow nine types of vegetables (similar in this characteristic), but in two distinct groups: those who do not receive market prices and those who do.

As can be seen from the surveys in Annexes 1 and 2, other variables were studied that could have an influence on the price received: type of intermediary or final customer to which they sell (the number of probable final intermediaries is measured), the crop, the market to which they sell (local or main cities, with which the payment capacity of their market is measured), size of the parcel of land they have (to measure whether there is bargaining power because of volume), years of experience with the crop, and time of receiving technical assistance, among others. By measuring these variables, the effect of each factor on the farmer's bargaining power, and therefore the price received, was measured if there was any effect at all.

In designing the survey for systematizing it later, the book *Statistics for Research, with a Guide to SPSS* (Argyrous, 2005) was consulted. This reference also provides guidelines on how to enter the information from the survey into the SPSS program Version 15.

4.7 Description of the Variables

Department where production is located. The department of Honduras where the production occurred. The farmers of the EDA project are located in 16 of the 18 departments of the country, but the random sample only included 14 of them. A political map of Honduras is shown on Annex 6.

Years of technical assistance. The goal of technical assistance is to improve the quantity and quality of production using better production techniques. The technical assistance from the EDA project also includes seeking new markets for the farmers. The main goal of the marketing component is to establish more formal commercial relationships, according to Edgardo Varela.

Years of experience with the crop. This varies greatly in the sample, from one crop cycle (months) to several decades of experience.

Crop. There are nine crops (dividing tomatoes into salad and processing). There are no onion growers in the sample, though it is one of the crops for which prices were sent. Each crop has a different behavior. The price varies according to the crop itself (supply and demand) and the price can be very different from week to week with respect to the other crops.

Month of harvest. Since the investigation design is Interrupted Time Series, each group was divided into three months: August, September, and October (partial) for those treated and October (partial), November, and December for those not treated.

Area planted. The unit of measure is the *manzana* (mz), which is widely used in Honduras. One *manzana* has 7400 m^2. There is a broad range of areas (from 0.13 to more than 9 *manzanas*). A normal question for this variable is whether having a larger area of land gives farmers more bargaining power.

Total production. The unit of measure is the pound. Each crop has a different yield per area planted because of its particular biological characteristics. Like the previous variable, there is the question of whether there is more negotiating power with greater production. There are six ranges of production in multiples of 10,000 pounds to more than 50,000 pounds.

Market. Although the prices used in the study are from two main markets in the two main cities, there were 16 markets, among them the two main ones, but there is a considerable number of farmers who sold locally or to nearby small cities.

Type of client. This is type of client to which the farmer sells their produce. There are eight categories, among them supermarkets, intermediaries, market retailers, and industry.

Quality by category. Because of the different price ranges paid for different quality, this variable was added. Some vegetables have no range of categories and some have three.

Percentage difference of price. By having various crops, the principal dependent variable must be made uniform since the prices for each of the vegetables are different among

themselves in the same market from week to week. The following formula was introduced to obtain this variable:

$$\frac{\text{Price per pound from the most influential market} - \text{Price negotiated per pound}}{\text{Price per pound from the most influential market}}$$

With this, a percentage difference was obtained than can be compared between crops. The higher the price negotiated by the farmer, the closer to zero the value is or it becomes negative (when the price negotiated was higher than the ones offered to producers in the two main markets). Prices are expressed in *lempiras*, the Honduras national currency. During the time frame of this study, the exchange rate was US$1 = *lempiras* (L.) 18.89.

4.8 Possible Erroneous Predictions about the Behavior of the Dependent Variable Based on Changes in the Independent Variables

Before conducting research, two possible results were put forward when the hypothesis was posed. The variable of years of technical assistance will be used to illustrate.

One hypothesis for this variable was: a) The greater the number of years of technical assistance, the higher the price obtained by the farmer.

However, during the statistical investigation, the dependent variable was not the price negotiated, but the percentage difference between price from the most influential market and the real price negotiated. The study also focused on comparing the control group and the group that received the market prices.

Another hypothesis for this variable was: b) The greater the number of years of technical assistance, the lower the percentage difference between the price from the most influential market and the real price negotiated by receiving the market price by SMS.

It may be thought that these two hypotheses cannot be formulated at the same time or that they are relatively opposed, but the reality is different. According to Edgardo Varela of the EDA Marketing Department, one of the goals of the project is to have the farmer receive increasingly better prices, reducing the number of intermediaries as much as possible and entering into formal relationships with production programs for chains or supermarkets. The hope is that these relationships become increasingly closer. The farmers

who recently entered the program do not necessarily have close relationships with their buyers, because it takes time to build them. In the group of producers that received limited technical assistance, like one crop cycle or a few months, those who receive the market price information can reduce this differential by obtaining better prices. However, this same trend may not happen among the two groups of producers with more time of technical assistance, since their close relationships, which can even include pre-negotiations, are not affected by the farmers having market prices.

4.9 Statistical Analysis

With the information from the survey, a Univariant Analysis of Variance (ANOVA) was carried out, testing for the interaction of each variable with the treatment (sending of prices). For these analyses, all the variables in 4.4 were used, with the percentage difference of price as the dependent variable and the treatment as the independent variable, which interacted with the other independent variables. Bryman and Cramer (2005) suggest that the steps for the Univariant ANOVA include the Levene test of homogeneity of variants in order to determine the method for comparison of means to use.

A Linear Regression Analysis was used that included all the variables. Argyrous (2005) indicated that the variable Enter method is generally favored because it means that before the statistical analysis, we must think about what our hypothesis suggests about the nature of the relationships of interest to us. This method was used, including all the variables of interest which were forecasted to have an influence on the dependent variable.

As part of the analysis of the information, a specific study was made of the surveys of the treated group, in which the frequencies of the farmers saying they had benefited from price information and those who did not was measured. To corroborate the information, a calculation was made of the frequency of those who would be willing to pay for the information and the reasons stated for why they would or would not pay. There was also a calculation of the difference in price for which the treated producers sold versus what they think they would have sold for if they did not have the price information.

4.10 Socioeconomic Assessment

The socioeconomic assessment was made using the Poverty Score Card for Honduras developed and provided by the researcher Mark Schreiner. Visits were made to the homes of 46 of 50 randomly selected producers from the total sample of producers surveyed (control group and those treated). The tables from the National Poverty Line and the USAID Extreme Poverty Line were used to determine the probability that the producer's income was below the poverty line.

Aside from the valuable information provided by the survey used for the assessment, the following issues were found:

- The isolation of various agricultural production regions in the country.
- The difficulty in transporting harvests because of the condition of the country's secondary and tertiary roads.
- Difficulty of recharging cell phones daily due to the lack of electricity. Farmers cannot therefore leave them on all day, limiting communication.
- The value of technical assistance in the most isolated zones of the country where no government entity has regular access to provide it.

5. Results

The following tables depict the statistical results from the surveys on price information with the control group and the treated group.

Table 4. Linear Regression Analysis: Variables Entered/Removed (b)

Model	Variables Entered	Variables Removed	Method
1	Quality category, Treatment, Nearest main city price, Years technical assistance, Market, Years experience (a)	.	Enter

a All variables listed included
b Dependent: Price Percentage Difference

Table 5. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.452(a)	0.205	0.196	0.73455	0.205	23.282	6	543	0.000

a Predictors: (Constant), Quality category, Treatment, Nearest main city price, Years of technical assistance, Market, Years of experience

The model shows a low regression coefficient between the combination of independent variables included and the dependent variable. The level of significance of the coefficient is high. Despite the model explaining a low portion of the behavior of the independent variable, the probability that it happened by chance is very low.

Table 6. ANOVA(b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	75.372	6	12.562	23.282	.000(a)
	Residual	292.984	543	.540		
	Total	368.355	549			

a Predictors: (Constant), Quality category, Treatment, Nearest main city price, Years of technical assistance, Market, Years of experience
b Dependent: Price Percentage difference

Table 7. Coefficients (a)

Model		Un-stardardized Coefficients		Standar-dized Coeffici-ents			95% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	-2.033	.222		-9.148	.000	-2.469	-1.596		
	Treatment	.283	.075	.169	3.777	.000	.136	.431	.734	1.362
	Years technical assistance	.070	.021	.135	3.310	.001	.029	.112	.877	1.140
	Years experience	-.048	.017	-.124	-2.890	.004	-.081	-.016	.790	1.265
	Market	.037	.010	.158	3.734	.000	.018	.056	.820	1.219
	Nearest main city price	.204	.020	.419	10.024	.000	.164	.244	.839	1.192
	Quality category	.279	.051	.215	5.511	.000	.179	.378	.964	1.037

Included in the model are nominal variables such as Treatment, Crop, Market, and Quality Category. The regression analysis is usually done with variables measured in scales, intervals, or ratios, but they were included in the model given the possibility that these variables might have been determinant in forecasting the dependent variable. The disadvantage is that the regression coefficients cannot be used to make forecasts. However, that was not the purpose of this study.

Table 8. Collinearity Diagnostics (a)

				Proportions of variance						
Model	Dimen-sion	Auto-value	Condit-ion Index	Con-stant	Treat-ment	Years tech-nical assis-tance	Years experi-ence	Mark-et	Nearest main city price	Quality category
1	1	6.061	1.000	.00	.00	.00	.01	.00	.00	.00
	2	.286	4.606	.00	.00	.01	.73	.03	.01	.02
	3	.210	5.368	.00	.09	.32	.00	.05	.00	.17
	4	.178	5.842	.00	.03	.14	.08	.01	.63	.01
	5	.140	6.587	.00	.24	.00	.02	.01	.01	.60
	6	.111	7.393	.00	.00	.38	.11	.49	.12	.06
	7	.015	19.897	.99	.63	.14	.06	.41	.21	.14

a Dependent: Price Percentage difference

Leaving aside the independent term, we see that multi-collinearity affects the variable Treatment more than other independent variables, which is what has a greater proportion of variance associated with the index of condition. Variables like Area Planted and Client Type, which were not significant in preliminary tests, were not included in the model.

5.1 One-Way ANOVA Treatment by Crop

Table 9. ANOVA Treatment by Crop, Descriptive Statistics
Dependent Variable: Price Percentage Difference

Treatment	Crop	Mean	Std. Deviation	N
Control Group	Processing Tomato	.3371	.34118	87
	Salad Tomato	-.0513	.25441	8
	Potato	-.1436	.64150	100
	Green Pepper	-.7648	1.02586	27
	Cabbage	-.3841	1.78519	29
	Cucumber	.2914	.14018	22
	Plantain	-.1765	.27529	34
	Yucca/Cassava	-.4320	.71056	25
	Carrot	.3060	.02191	5
	Total	-.0774	.81086	337
Prices Received	Processing Tomato	-.6524	.71751	21
	Salad Tomato	.3608	.32360	12
	Potato	.2158	.23354	100
	Cabbage	-1.5372	1.95977	18
	Plantain	-.0333	.34551	52
	Yucca/Cassava	-.4820	.20993	5
	Carrot	-.3200	.64374	5
	Total	-.0995	.83376	213
Total	Processing Tomato	.1447	.58701	108
	Salad Tomato	.1960	.35689	20
	Potato	.0361	.51411	200
	Green Pepper	-.7648	1.02586	27
	Cabbage	-.8257	1.91840	47
	Cucumber	.2914	.14018	22
	Plantain	-.0899	.32559	86
	Yucca/Cassava	-.4403	.65137	30
	Carrot	-.0070	.54152	10
	Total	-.0860	.81912	550

Table 10. Levene's Test of Equality of Error Variances (a)
Dependent Variable: Price Percentage Difference

F	df1	df2	Sig
18.399	15	534	.000

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a Design: Intercept + Treatment + Crop + Treatment * Crop

The Levine Test of Homogeneity showed that there are significant differences between the variances of the groups. Because of this, the Tamhane Post Hoc Comparison of Measures Test suggested by Bryman (2005) was conducted. It was not possible to reduce the grossly unequal variances neither through transforming the data by taking the log or square root of the dependent variable.

Table 11. Test of Between-Subjects Effects
Dependent Variable: Price Percentage Difference

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	95.461(a)	15	6.364	12.453	.000
Intercept	12.084	1	12.084	23.645	.000
Treatment	3.400	1	3.400	6.653	.010
Crop	55.124	8	6.891	13.483	.000
Treatment * Crop	39.370	6	6.562	12.840	.000
Error	272.894	534	.511		
Total	372.421	550			
Total corrected	368.355	549			

a R squared = .259 (Adjusted R Squared = .238)

The results indicate there is a significant effect for the treatment factor ($p<0.010$) and a highly significant interaction effect for Treatment and Crop ($p<0.0001$) as well as for the Crop factor ($p<0.0001$).

5.2 Post Hoc Tests Multiple Comparisons

Table 12. Tamhane
Dependent Variable: Price Percentage Difference

(I) Crop	(J) Crop				95% Confidence Interval	
		Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Processing Tomato	Salad Tomato	-.0513	.09777	1.000	-.3858	.2832
	Potato	.1086	.06717	.983	-.1087	.3260
	Green Pepper	.9095(*)	.20535	.004	.1889	1.6302
	Cabbage	.9705(*)	.28547	.047	.0061	1.9349
	Cucumber	-.1466	.06390	.574	-.3551	.0618
	Plantain	.2346(*)	.06651	.019	.0190	.4502
	Yucca/Cassava	.5851(*)	.13166	.002	.1361	1.0340
	Carrot	.1517	.18032	1.000	-.6090	.9125
Salad Tomato	Processing Tomato	.0513	.09777	1.000	-.2832	.3858
	Potato	.1599	.08769	.949	-.1510	.4708
	Green Pepper	.9608(*)	.21295	.003	.2212	1.7004
	Cabbage	1.0217(*)	.29098	.033	.0421	2.0014
	Cucumber	-.0954	.08522	1.000	-.4020	.2113
	Plantain	.2859	.08719	.099	-.0241	.5959
	Yucca/Cassava	.6363(*)	.14322	.002	.1505	1.1221
	Carrot	.2030	.18893	1.000	-.5581	.9641
Potato	Processing Tomato	-.1086	.06717	.983	-.3260	.1087
	Salad Tomato	-.1599	.08769	.949	-.4708	.1510
	Green Pepper	.8009(*)	.20075	.016	.0899	1.5120
	Cabbage	.8618	.28218	.125	-.0941	1.8178
	Cucumber	-.2553(*)	.04706	.000	-.4095	-.1011
	Plantain	.1260	.05054	.383	-.0371	.2891
	Yucca/Cassava	.4764(*)	.12436	.018	.0453	.9076
	Carrot	.0431	.17506	1.000	-.7246	.8108
Green Pepper	Processing Tomato	-.9095(*)	.20535	.004	-1.6302	-.1889
	Salad Tomato	-.9608(*)	.21295	.003	-1.7004	-.2212
	Potato	-.8009(*)	.20075	.016	-1.5120	-.0899
	Cabbage	.0609	.34246	1.000	-1.0755	1.1974
	Cucumber	-1.0562(*)	.19968	.000	-1.7651	-.3472
	Plantain	-.6749	.20052	.078	-1.3855	.0357
	Yucca/Cassava	-.3245	.23048	.999	-1.1101	.4612
	Carrot	-.7578	.26135	.220	-1.6752	.1596

Table 12., continued

(I) Crop	(J) Crop				95% Confidence Interval	
		Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Cabbage	Processing Tomato	-.9705(*)	.28547	.047	-1.9349	-.0061
	Salad Tomato	-1.0217(*)	.29098	.033	-2.0014	-.0421
	Potato	-.8618	.28218	.125	-1.8178	.0941
	Green Pepper	-.0609	.34246	1.000	-1.1974	1.0755
	Cucumber	-1.1171(*)	.28142	.009	-2.0711	-.1631
	Plantain	-.7359	.28202	.355	-1.6914	.2197
	Yucca/Cassava	-.3854	.30405	1.000	-1.4016	.6308
	Carrot	-.8187	.32807	.438	-1.9260	.2885
Cucumber	Processing Tomato	.1466	.06390	.574	-.0618	.3551
	Salad Tomato	.0954	.08522	1.000	-.2113	.4020
	Potato	.2553(*)	.04706	.000	.1011	.4095
	Green Pepper	1.0562(*)	.19968	.000	.3472	1.7651
	Cabbage	1.1171(*)	.28142	.009	.1631	2.0711
	Plantain	.3812(*)	.04611	.000	.2289	.5336
	Yucca/Cassava	.7317(*)	.12262	.000	.3043	1.1591
	Carrot	.2984	.17383	.989	-.4717	1.0685
Plantain	Processing Tomato	-.2346(*)	.06651	.019	-.4502	-.0190
	Salad Tomato	-.2859	.08719	.099	-.5959	.0241
	Potato	-.1260	.05054	.383	-.2891	.0371
	Green Pepper	.6749	.20052	.078	-.0357	1.3855
	Cabbage	.7359	.28202	.355	-.2197	1.6914
	Cucumber	-.3812(*)	.04611	.000	-.5336	-.2289
	Yucca/Cassava	.3504	.12400	.246	-.0799	.7808
	Carrot	-.0829	.17481	1.000	-.8510	.6853
Yucca/Cassava	Processing Tomato	-.5851(*)	.13166	.002	-1.0340	-.1361
	Salad Tomato	-.6363(*)	.14322	.002	-1.1221	-.1505
	Potato	-.4764(*)	.12436	.018	-.9076	-.0453
	Green Pepper	.3245	.23048	.999	-.4612	1.1101
	Cabbage	.3854	.30405	1.000	-.6308	1.4016
	Cucumber	-.7317(*)	.12262	.000	-1.1591	-.3043
	Plantain	-.3504	.12400	.246	-.7808	.0799
	Carrot	-.4333	.20849	.853	-1.2146	.3479

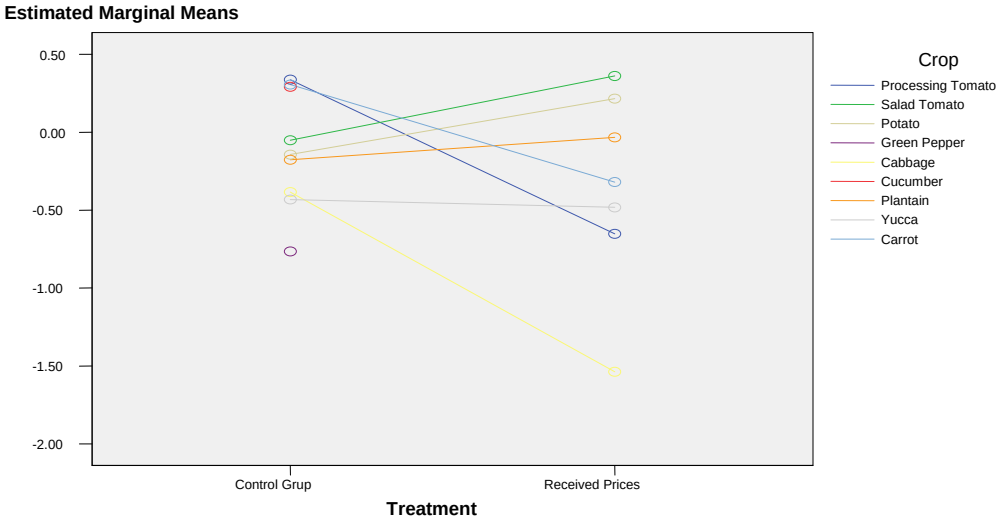
Table 12., continued

(I) Crop	(J) Crop	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Carrot	Processing Tomato	-.1517	.18032	1.000	-.9125	.6090
	Salad Tomato	-.2030	.18893	1.000	-.9641	.5581
	Potato	-.0431	.17506	1.000	-.8108	.7246
	Green Pepper	.7578	.26135	.220	-.1596	1.6752
	Cabbage	.8187	.32807	.438	-.2885	1.9260
	Cucumber	-.2984	.17383	.989	-1.0685	.4717
	Plantain	.0829	.17481	1.000	-.6853	.8510
	Yucca/Cassava	.4333	.20849	.853	-.3479	1.2146

Based on the means observed.
* The mean difference is significant at .05 level.

In the plot below, one can see the comparison of means for the different crops. Except for producers of potatoes, plantains, and salad tomatoes, the farmers that received market price information had a lower to negative price differential. This is seen with the positive slope of the lines connecting the measurements for both groups. Annex 3 shows the market price trends for the different vegetables analyzed. Prices for potatoes and plantains were the most stable during most of the period under study. According to Edgardo Varela of EDA, prices for these crops are the most stable throughout the year.

Figure 5. Estimated Marginal Mean Percentage Price Difference Treatment by Crop



The non measureable means are not represented

5.3 One-Way ANOVA Treatment by Years of Technical Assistance

Table 13. ANOVA Treatment by Years of Technical Assistance,-Descriptive Statistics
Dependent variable: Price Percentage Difference

Treatment	Years of Technical Assistance	Mean	Standard Deviation	N
Control Group	<0.5 years	.1989	.40789	37
	0.6-1.0 years	-.5494	.93975	67
	1.1-1.5 years	.1355	.39466	33
	1.6-2.0 years	.0164	.96085	132
	2.1-2.5	.2500	.00000	2
	>2.5 years	-.0573	.39345	66
	Total	-.0774	.81086	337
Prices Received	<0.5 years	-.1788	1.21595	40
	0.6-1.0 years	-.1959	1.03758	46
	1.1-1.5 years	-.1234	.64743	87
	1.6-2.0 years	.6700	.	1
	2.1-2.5	.1017	.28151	18
	>2.5 years	.1524	.15636	21
	Total	-.0995	.83376	213
Total	<0.5 years	.0027	.93467	77
	0.6-1.0 years	-.4055	.99166	113
	1.1-1.5 years	-.0523	.59857	120
	1.6-2.0 years	.0214	.95888	133
	2.1-2.5	.1165	.27017	20
	>2.5 years	-.0067	.36171	87
	Total	-.0860	.81912	550

Table 14. Levene Test of Equality of Error Variances (a)
Dependent Variable: Price Percentage Difference

F	gl1	gl2	Significance
3.794	11	538	.000

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a Design: Intersection + Treatment + Years technical assistance + Treatment * Years technical assistance

The Levene Test of Homogeneity is also significant for these two variables, which shows that there are significant differences between the variances for the groups. The Tamhane Post Hoc Test for Comparison of Measures was then used.

Table 15. Test of Between-Subjects Effects
Dependent Variable: Price Percentage Difference

Source	Type III sum of squares	gl	Mean Square	F	Significance
Corrected model	24.095(a)	11	2.190	3.423	.000
Intersection	.100	1	.100	.157	.692
Treatment	.106	1	.106	.166	.684
Years technical assistance	12.820	5	2.564	4.007	.001
Treatment * Years technical assistance	8.918	5	1.784	2.787	.017
Error	344.260	538	.640		
Total	372.421	550			
Total corrected	368.355	549			

a R squared = .065 (R squared corrected = .046)

The significance tests to determine the Type III sum of squares for each effect are shown in the table above. They indicate that there is no significant effect for the treatment ($p < 0.684$), while the effect of Years of Technical Assistance and the effect of the interaction for Treatment and Years of Assistance do have a significant effect ($p < 0.001$ and $p < 0.017$, respectively).

5.4 Post Hoc Test: Years Technical Assistance

Table 16. Multiple Comparisons
Dependent Variable: Price Percentage Difference
Tamhane

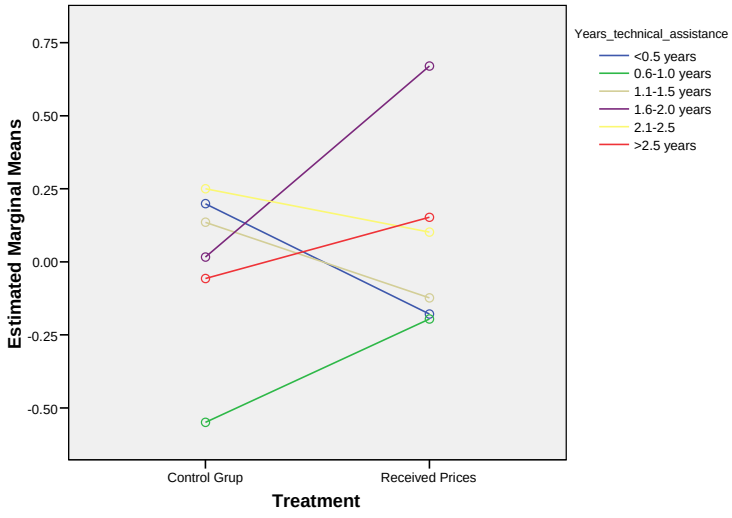
(I) Years technical assistance	(J) Years technical assistance	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Mean Difference (I-J)
<0.5 years	0.6-1.0 years	.4082	.14159	.065	-.0123	.8287
	1.1-1.5 years	.0550	.11971	1.000	-.3029	.4128
	1.6-2.0 years	-.0186	.13513	1.000	-.4202	.3829
	2.1-2.5	-.1138	.12245	.999	-.4817	.2541
	>2.5 years	.0094	.11336	1.000	-.3310	.3497
0.6-1.0 years	<0.5 years	-.4082	.14159	.065	-.8287	.0123
	1.1-1.5 years	-.3532(*)	.10811	.019	-.6740	-.0325
	1.6-2.0 years	-.4268(*)	.12496	.011	-.7965	-.0572
	2.1-2.5	-.5220(*)	.11114	.000	-.8546	-.1894
	>2.5 years	-.3988(*)	.10103	.002	-.6995	-.0982
1.1-1.5 years	<0.5 years	-.0550	.11971	1.000	-.4128	.3029
	0.6-1.0 years	.3532(*)	.10811	.019	.0325	.6740
	1.6-2.0 years	-.0736	.09949	1.000	-.3680	.2208
	2.1-2.5	-.1688	.08146	.482	-.4177	.0802
	>2.5 years	-.0456	.06700	1.000	-.2441	.1530
1.6-2.0 years	<0.5 years	.0186	.13513	1.000	-.3829	.4202
	0.6-1.0 years	.4268(*)	.12496	.011	.0572	.7965
	1.1-1.5 years	.0736	.09949	1.000	-.2208	.3680
	2.1-2.5	-.0951	.10278	.999	-.4031	.2128
	>2.5 years	.0280	.09174	1.000	-.2442	.3002

Table 16., continued

(I) Years technical assistance	(J) Years technical assistance	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Mean Difference (I-J)
2.1-2.5	<0.5 years	.1138	.12245	.999	-.2541	.4817
	0.6-1.0 years	.5220(*)	.11114	.000	.1894	.8546
	1.1-1.5 years	.1688	.08146	.482	-.0802	.4177
	1.6-2.0 years	.0951	.10278	.999	-.2128	.4031
	>2.5 years	.1232	.07179	.775	-.1017	.3480
>2.5 years	<0.5 years	-.0094	.11336	1.000	-.3497	.3310
	0.6-1.0 years	.3988(*)	.10103	.002	.0982	.6995
	1.1-1.5 years	.0456	.06700	1.000	-.1530	.2441
	1.6-2.0 years	-.0280	.09174	1.000	-.3002	.2442
	2.1-2.5	-.1232	.07179	.775	-.3480	.1017

Based on the means observed.
* The mean difference is sig at .05 level.

Figure 6. Estimated Marginal Means Percentage Price Difference Treatment by Years of Technical Assistance



By graphing the interaction, we see that farmers with only one production cycle that received market price information had a favorable differential price percentage. Those who received technical assistance for 1-1.5 years and 2-2.5 years also negotiated better. Producers with fewer years of technical assistance seem to negotiate better, empowered by price information. Most likely, producers who have received more technical assistance have developed stronger relationships with their buyers, and thus did not see a significant change in the price received by them once they received price information. During the study, some producers indicated that they had pre-negotiated the price of their production before the harvest.

5.5 One-Way ANOVA Treatment by Area Planted

Table 17. ANOVA Treatment by Area Planted -Descriptive Statistics
Dependent Variables: Price Percentage Difference

Treatment	Area planted	Mean	Std. Deviation	N
Control Group	<= 0.25 mz	.2429	.49141	73
	0.26-0.5 mz	.1877	.42372	52
	0.51-0.75 mz	-.6418	1.16043	17
	0.76-1.0 mz	-.0456	1.06802	93
	1.1-1.25 mz	.3060	.02191	5
	> 1.26-1.5 mz	-.6840	.85974	25
	> 1.5	-.3175	.52284	72
	Total	-.0774	.81086	337
Prices Received	<= 0.25 mz	-.3666	1.09055	62
	0.26-0.5 mz	.0816	.21085	43
	0.51-0.75 mz	-.2124	1.51604	21
	0.76-1.0 mz	.0741	.65065	29
	> 1.26-1.5 mz	.1486	.32147	29
	> 1.5	-.1372	.35063	29
	Total	-.0995	.83376	213
Total	<= 0.25 mz	-.0370	.87413	135
	0.26-0.5 mz	.1397	.34654	95
	0.51-0.75 mz	-.4045	1.36802	38
	0.76-1.0 mz	-.0171	.98380	122
	1.1-1.25 mz	.3060	.02191	5
	> 1.26-1.5 mz	-.2369	.75161	54
	> 1.5	-.2657	.48501	101
	Total	-.0860	.81912	550

Table 18. Levene's Test of Equality of Error Variances (a)
Dependent Variable: Price Percentage Difference

F	gl1	gl2	Significance
5.901	12	537	.000

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a Design: Intercept + Treatment + Area Planted + Treatment * Area planted

The Levene Homogeneity Test is significant for these two variables, showing that there are significant differences between the variance of the groups. Then, the Tamhane Post Hoc Comparison of Measures Test was conducted.

Table 19. Test of Between-Subjects Effects
Dependent Variable: Price Percentage Difference

Source	Type III sum of squares	Gl	Mean Square	F	Significance
Corrected model	39.603(a)	12	3.300	5.391	.000
Intersection	1.671	1	1.671	2.729	.099
Treatment	2.066	1	2.066	3.374	.067
Area planted	14.357	6	2.393	3.909	.001
Treatment * Area planted	24.733	5	4.947	8.080	.000
Error	328.753	537	.612		
Total	372.421	550			
Corrected total	368.355	549			

a R squared = .108 (R squared corrected = .088)

The significance tests to determine the Type III sum of squares for each effect is shown in the table above. They indicate that there is no significant effect for the treatment ($p < 0.067$). The effect for Area Planted and the effect of the interaction for Treatment and Area Planted is highly significant ($p< 0.001$ and $p<0.0001$, respectively).

5.6 Post hoc Tests: Area Planted

Table 20. Multiple Comparisons
Dependent Variable: Price Percentage Difference
Tamhane

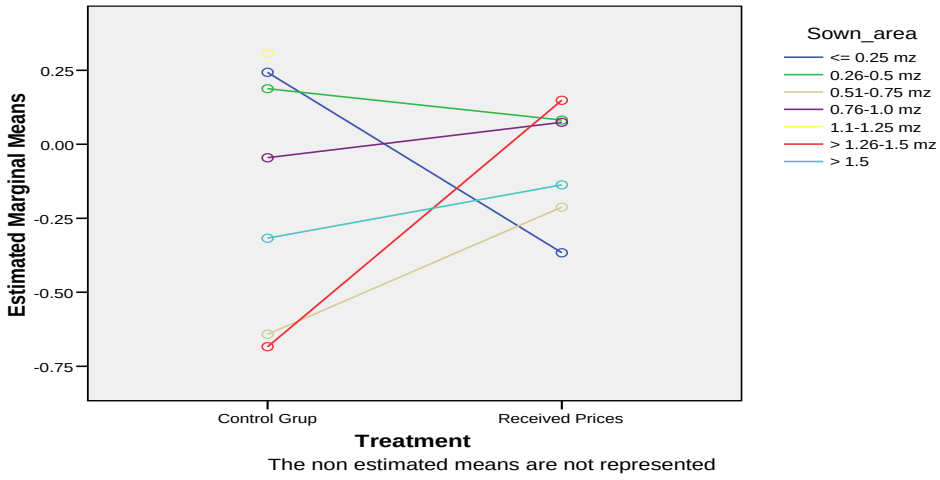
					95% Confidence Interval	
(I) Area planted	(J) Area planted	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Mean Difference (I-J)
<= 0.25 mz	0.26-0.5 mz	-.1767	.08321	.527	-.4324	.0789
	0.51-0.75 mz	.3674	.23433	.938	-.3843	1.1192
	0.76-1.0 mz	-.0199	.11659	1.000	-.3770	.3372
	1.1-1.25 mz	-.3430(*)	.07587	.000	-.5773	-.1088
	> 1.26-1.5 mz	.1998	.12697	.929	-.1939	.5935
	> 1.5	.2287	.08938	.210	-.0454	.5028
0.26-0.5 mz	<= 0.25 mz	.1767	.08321	.527	-.0789	.4324
	0.51-0.75 mz	.5442	.22475	.349	-.1844	1.2727
	0.76-1.0 mz	.1568	.09590	.900	-.1386	.4522
	1.1-1.25 mz	-.1663(*)	.03688	.000	-.2811	-.0515
	> 1.26-1.5 mz	.3765(*)	.10829	.019	.0352	.7178
	> 1.5	.4054(*)	.05994	.000	.2212	.5897
0.51-0.75 mz	<= 0.25 mz	-.3674	.23433	.938	-1.1192	.3843
	0.26-0.5 mz	-.5442	.22475	.349	-1.2727	.1844
	0.76-1.0 mz	-.3873	.23913	.917	-1.1512	.3765
	1.1-1.25 mz	-.7105	.22214	.058	-1.4329	.0120
	> 1.26-1.5 mz	-.1676	.24436	1.000	-.9456	.6104
	> 1.5	-.1387	.22711	1.000	-.8729	.5954
0.76-1.0 mz	<= 0.25 mz	.0199	.11659	1.000	-.3372	.3770
	0.26-0.5 mz	-.1568	.09590	.900	-.4522	.1386
	0.51-0.75 mz	.3873	.23913	.917	-.3765	1.1512
	1.1-1.25 mz	-.3231(*)	.08961	.009	-.6004	-.0458
	> 1.26-1.5 mz	.2197	.13563	.909	-.1995	.6389
	> 1.5	.2486	.10130	.273	-.0627	.5600
1.1-1.25 mz	<= 0.25 mz	.3430(*)	.07587	.000	.1088	.5773
	0.26-0.5 mz	.1663(*)	.03688	.000	.0515	.2811
	0.51-0.75 mz	.7105	.22214	.058	-.0120	1.4329
	0.76-1.0 mz	.3231(*)	.08961	.009	.0458	.6004
	> 1.26-1.5 mz	.5429(*)	.10275	.000	.2161	.8696
	> 1.5	.5717(*)	.04924	.000	.4188	.7247

Table 20., continued

					95% Confidence Interval	
(I) Area planted	(J) Area planted	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Mean Difference (I-J)
> 1.26-1.5 mz	<= 0.25 mz	-.1998	.12697	.929	-.5935	.1939
	0.26-0.5 mz	-.3765(*)	.10829	.019	-.7178	-.0352
	0.51-0.75 mz	.1676	.24436	1.000	-.6104	.9456
	0.76-1.0 mz	-.2197	.13563	.909	-.6389	.1995
	0.51-0.75 mz	.1387	.22711	1.000	-.5954	.8729
	0.76-1.0 mz	-.2486	.10130	.273	-.5600	.0627
	1.1-1.25 mz	-.5429(*)	.10275	.000	-.8696	-.2161
	> 1.5	.0289	.11310	1.000	-.3255	.3833
> 1.5	<= 0.25 mz	-.2287	.08938	.210	-.5028	.0454
	0.26-0.5 mz	-.4054(*)	.05994	.000	-.5897	-.2212
	1.1-1.25 mz	-.5717(*)	.04924	.000	-.7247	-.4188
	> 1.26-1.5 mz	-.0289	.11310	1.000	-.3833	.3255

Based on the means observed.
* The mean difference is significant at .05 level.

Figure 6. Estimated Marginal Means Percentage Price Difference Treatment by Area Planted



By plotting the interaction, we can see that farmers with areas planted of <0.25 mz and those with 0.26-0.50 mz who received market prices via SMS obtained a lower price differential (the negotiated price was closer to or above the market price) than those who did not receive prices using this technology. We can conclude that the producers who have less negotiating power (in this case because they have a smaller area planted) and received price information were empowered and received better prices (considering the weekly price in which they harvested) than those who did not have price information.

5.7 One-Way ANOVA Treatment per Market

Table 21. ANOVA Treatment by Market, Descriptive Statistics
Dependent variables: Price Percentage Difference

Treatment	Market	Mean	Std. Deviation	N
Control Group	La Ceiba	-2.2840	.66673	5
	Comayagua	.2900	.00000	7
	Copán	.1350	.20207	4
	Lempira	.1500	.03464	3
	La Paz	.4825	.21559	8
	Ocotepeque	.1405	.15375	19
	Olanchito	-.3640	.08488	10
	Santa Bárbara	.0229	.40406	14
	San Pedro Sula	-.5871	1.48270	56
	Tegucigalpa	.0776	.47126	199
	Yoro	-.4200	.10914	10
	Intibucá	.3650	.43134	2
	Total	-.0774	.81086	337
Received prices	La Ceiba	-.6700	.00000	3
	Copán	-4.6250	.88388	2
	Lempira	-.1047	.85471	92
	La Paz	-3.0000	.	1
	El Paraíso	.1550	.05196	4
	Olanchito	.1375	.07300	12
	San Pedro Sula	.0446	.40677	68
	Tegucigalpa	.2169	.26807	16
	Intibucá	-.7222	1.11377	9
	Choluteca	.0700	.00000	6
	Total	-.0995	.83376	213

Table 21., continued

Treatment	Market	Mean	Std. Deviation	N
Total	La Ceiba	-1.6788	.97559	8
	Comayagua	.2900	.00000	7
	Copán	-1.4517	2.49455	6
	Lempira	-.0966	.84217	95
	La Paz	.0956	1.17822	9
	El Paraíso	.1550	.05196	4
	Ocotepeque	.1405	.15375	19
	Olanchito	-.0905	.26684	22
	Santa Bárbara	.0229	.40406	14
	San Pedro Sula	-.2407	1.08295	124
	Tegucigalpa	.0880	.46028	215
	Yoro	-.4200	.10914	10
	Intibucá	-.5245	1.09746	11
	Choluteca	.0700	.00000	6
	Total	-.0860	.81912	550

Table 22. Levene's Test of Equality of Error Variances (a)
Dependent variable: Price percentage difference

F	gl1	gl2	Significance
6.092	21	528	.000

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a Design: Intercept + Treatment + Market + Treatment * Market

The Levene Homogeneity Test is significant for these two variables, which shows that there are significant differences between the variances of the groups. Because of this, the Tamhane Post Hoc Comparison of Measures Test, illustrated in Annex 4, was conducted.

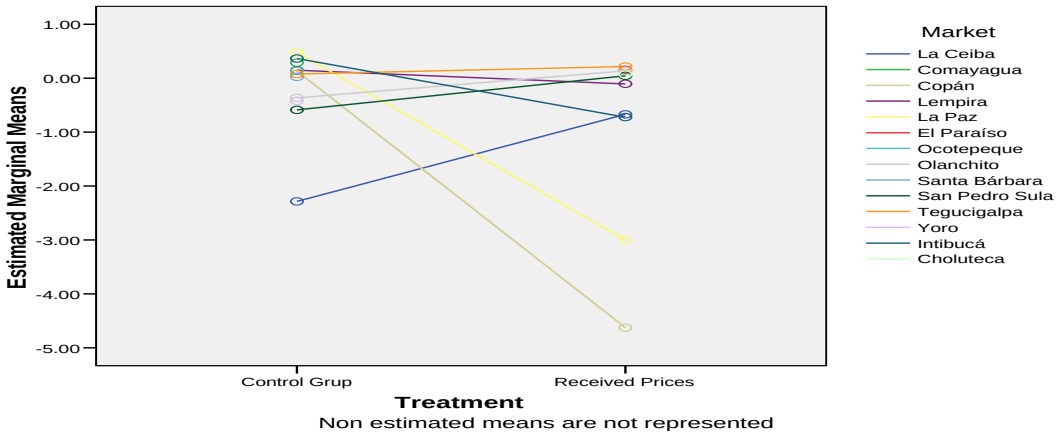
Table 23. Test of Between-Subjects Effects
Dependent Variable: Price percentage difference

Source	Type III sum of squares	gl	Mean Square	F	Significance
Corrected model	108.922(a)	21	5.187	10.556	.000
Intersection	22.549	1	22.549	45.892	.000
Treatment	12.301	1	12.301	25.035	.000
Market	52.217	13	4.017	8.175	.000
Treatment * Market	58.004	7	8.286	16.864	.000
Error	259.433	528	.491		
Total	372.421	550			
Corrected total	368.355	549			

a R squared = .296 (R squared corrected = .268)

The significance tests to determine the Type III sum of squares for each effect are shown in the table above. They indicate that there is a highly significant effect for the treatment ($p < 0.0001$), as there is for Area Planted and for the interaction of Treatment and Area Planted ($p< 0.0001$ and $p<0.0001$, respectively).

Figure 7. Estimated Marginal Means Percentage Price Difference Treatment by Market



The harvest is sold in many markets. The most interesting trends are found in the largest markets of Tegucigalpa, San Pedro Sula, and La Ceiba. In these three markets, the farmers who received price information obtained a larger price differential. It can also be observed in the graph depicting the other interactions that in various situations, the farmers who received price information had a larger price differential than those in the control group.

Does this mean that those who had the price information were poorer negotiators? To answer this question, other factors had to be studied in depth, such as the price trends for each vegetable during the period studied. Annex 4 contains graphs of price trends for each crop. Nearly all the crop prices showed a downward trend during the period studied. Only cabbage had a recovery peak at the end of the period under study.

This downward price trend causes a mathematical situation that can hide the empowerment effect on the producers who received market price information. An explanation will be given before proceeding to a mathematical explanation.

The research team interviewed informal agricultural intermediaries in several regions of Honduras, one of them in the department of Intibucá, to learn about the margins that the intermediaries look for when negotiating. According to this intermediary, the intermediaries set fixed margins on prices, not percentage margins. In the example that he put forward, he used a margin of L.1.50 per pound when the prices are “fair to good” and L.1.00 as a minimum when market prices are low. The example he used was broccoli. He explained that the one who “sacrifices” or is affected when prices are low is the farmer, because the intermediary “has to have a minimum L.1.00 margin of contribution.”

A hypothetical situation was presented with salad tomatoes, the price of which fell from L.7.00 per pound in September to L.4.00 per pound in November in the Tegucigalpa market. We assumed a farmer in the Control Group that receives L.5.50 per pound in September, assuming a margin of L.1.50 established by the intermediary interviewed (L.7.00 – L.1.50 = L.5.50).

If the Price Percentage Differential formula is applied, the following result is obtained:

$$\frac{\text{(Price per pound from most influential main market - Price negotiated per pound)}}{\text{Price per pound from most influential main market}} \times 100$$

$$\frac{\text{L.7.00} - \text{L.5.50}}{\text{L.7.00}} \times 100 = 21.4\%$$

Now we go to a farmer who received the intervention, who receives L.2.50 per pound (always with a L.1.50 margin) in November, when the market price had dropped (L.4.00 – L.1.50 = L.2.50).

$$\frac{\text{L.4.00} - \text{L.2.50}}{\text{L.4.00}} \times 100 = 37.5\%$$

Even though this farmer negotiated L.0.30 more per pound because of being empowered with knowledge of the prices in Tegucigalpa, the result would be this:

$\frac{\text{L.4.00} - \text{L.2.80}}{\text{L.4.00}} \times 100 =$ 30.0% ← This Percentage Differential is higher than the 21.4 percent received by the farmer who sold in September, even when the farmer managed to negotiate L.030 more per pound because of being empowered.

Thus, it would be expected that if the prices had remained stable throughout the study, the differences in prices obtained by the control group and the treated group would have been more favorable for the latter.

5.8 Analysis of Treated Group: Questions about the Benefit of Having Price Information

Table 24. Benefit of Having Price Information

Benefit from Information

N	Valid	42
	Lost	0

Table 25. Benefit from Having Information

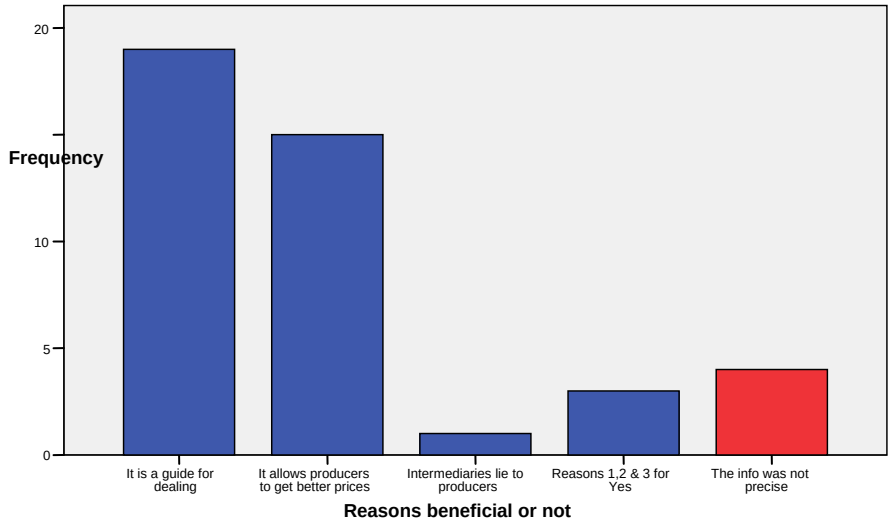
		Frequency	Percentage	Valid percentage	Accumulated percentage
Valid	Yes	38	90.5	90.5	90.5
	No	4	9.5	9.5	100.0
	Total	42	100.0	100.0	

More than 90 percent of the farmers surveyed answered "yes" to the question of whether they obtained some benefit from receiving the information**.**

Table 26. Reasons Information Was or Was Not Beneficial

		Frequency	Percentage	Valid percentage	Accumulated percentage
Valid	It is a guide for dealing	19	45.2	45.2	45.2
	It allows producers to get better prices	15	35.7	35.7	81.0
	Intermediaries lie to producers	1	2.4	2.4	83.3
	All the above	3	7.1	7.1	90.5
	The info was not precise	4	9.5	9.5	100.0
	Total	42	100.0	100.0	

Figure 8. Reasons Why Farmers Did or Did Not View Price Information as Beneficial

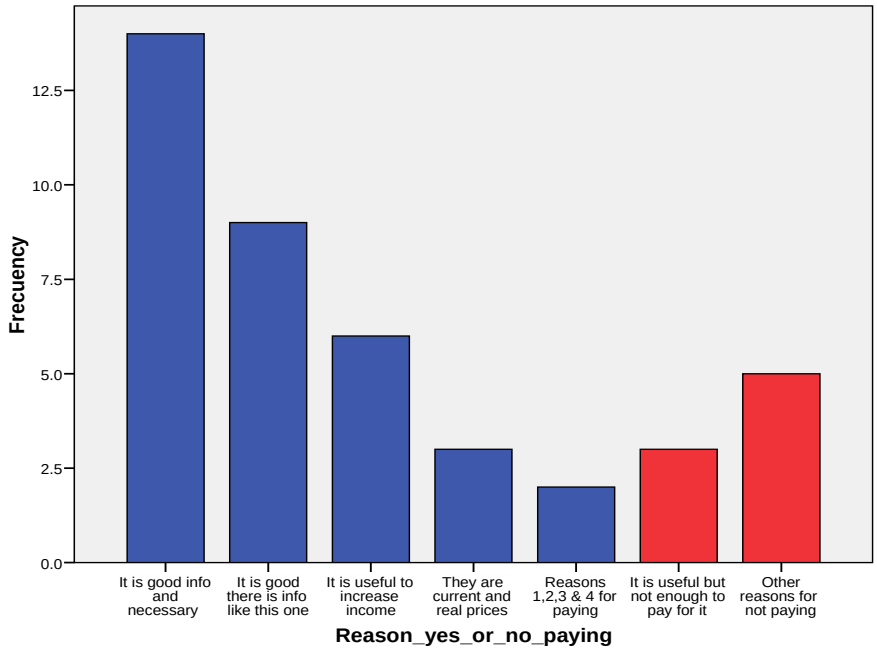


Most of those surveyed said that the information was a useful guide for negotiating the price of their produce. The second most frequent response was that the information enabled them to obtain better prices. Of those surveyed, 9.5 percent said that the information was incorrect. When asked for more specifics, the four farmers who responded said that the real prices were actually higher than those sent by SMS.

Table 27. Frequency of Reasons Why the Treated Producers Would or Would Not Pay for Market Price Information

		Frequency	Percentage	Valid percentage	Accumulated percentage
Valid	It is good, necessary information	14	33.3	33.3	33.3
	It is good there is info like this	9	21.4	21.4	54.8
	It is useful to increase income	6	14.3	14.3	69.0
	They are current and real prices	3	7.1	7.1	76.2
	All of the above for paying	2	4.8	4.8	81.0
	It is useful but not enough to pay for it	3	7.1	7.1	88.1
	Other reasons for not paying	5	11.9	11.9	100.0
	Total	42	100.0	100.0	

Figure 9. Reasons why the Treated Producers Would or Would Not Pay for Market Price Information



Eighty-one percent of producers surveyed responded that they would be willing to pay for the price information through SMS. Among the reasons why producers responded that they would not be willing to pay was: "The government should pay for this service."

Table 28. Frequencies of Percentage Price Differences, Received by the Treated Producers
(Price Percentage Difference Expressed)

N	Valid	160
	Lost	73
Median		12.556
Typical deviation		7.9554
Minimum		.0
Maximum		40.0

Table 29. Price Percentage Differences

		Frequency	Percentage	Valid percentage	Accumulated percentage
Valid	0.00%	20	8.6	12.5	12.5
	0.01-5.00%	4	1.7	2.5	15.0
	5.01-10.00%	43	18.5	26.9	41.9
	10.01-15.00%	39	16.7	24.4	66.3
	15.01-20.00%	44	18.9	27.5	93.8
	>20.00%	10	4.3	6.3	100.0
	Total	160	68.7	100.0	
Lost	99.00	73	31.3		
Total		233	100.0		

Although a high percentage of farmers consulted answered that they did not know what price they would have obtained if they had not had the prices sent by SMS (result in 73 of 233 weekly negotiations), of those who did respond (representing 160 negotiations), 87.5 percent reported obtaining a positive price differential. The median result was a 12.5 percent higher price negotiated. This price differential makes it possible to pay for the information during the harvest period if we considered a price for the SMS of L.18.00 suggested by Luis Padilla, owner of SOTEICA, a company whose business is sending SMS for marketing and related purposes.

5.9 Results of the Socioeconomic Assessment

Below are graphs showing the results from randomly selected producers for each of the 10 questions on the Poverty Score Card for Honduras.

Figure 10. Frequencies of Responses to the Poverty Score Card Questionnaire for the Socioeconomic Assessment

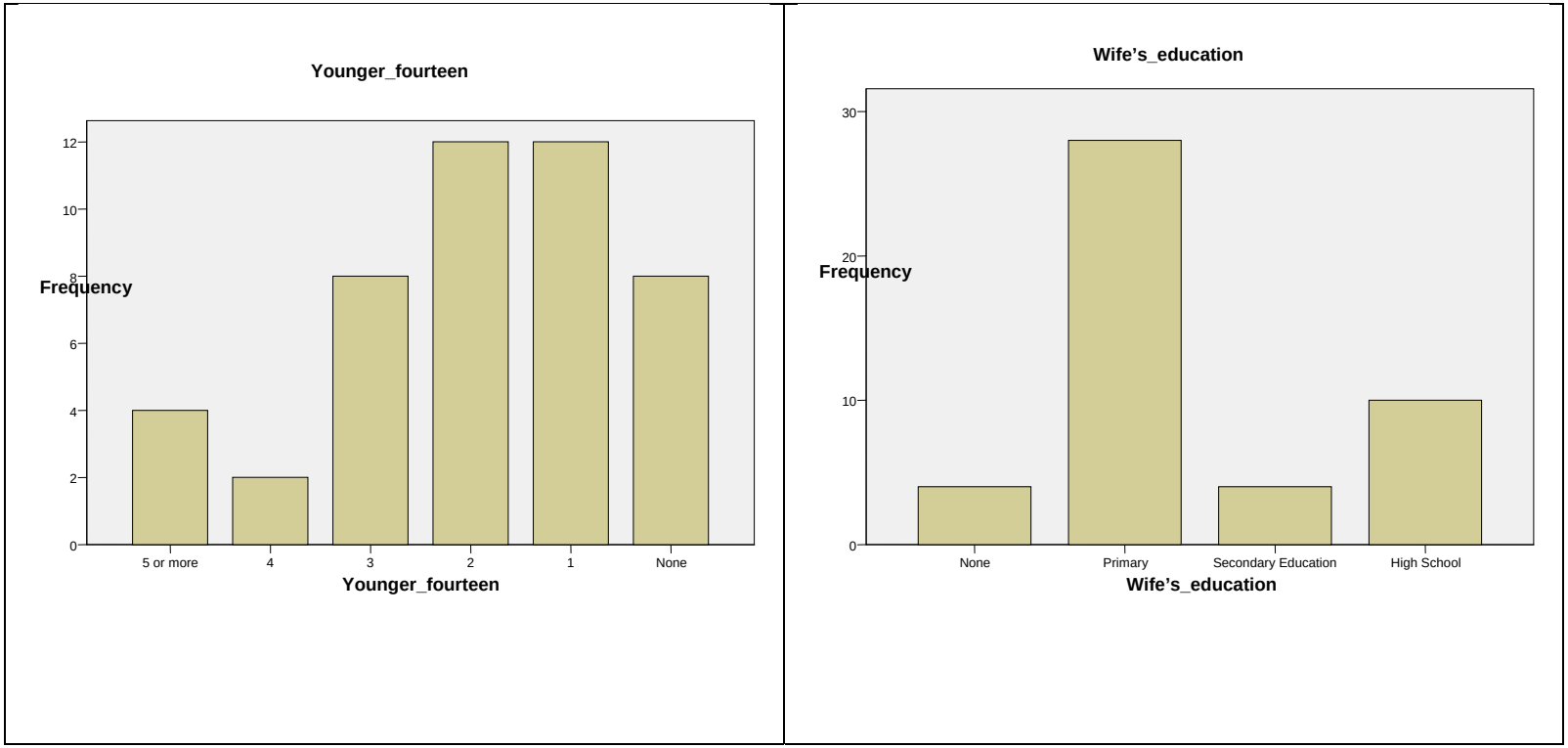


Figure 10., continued

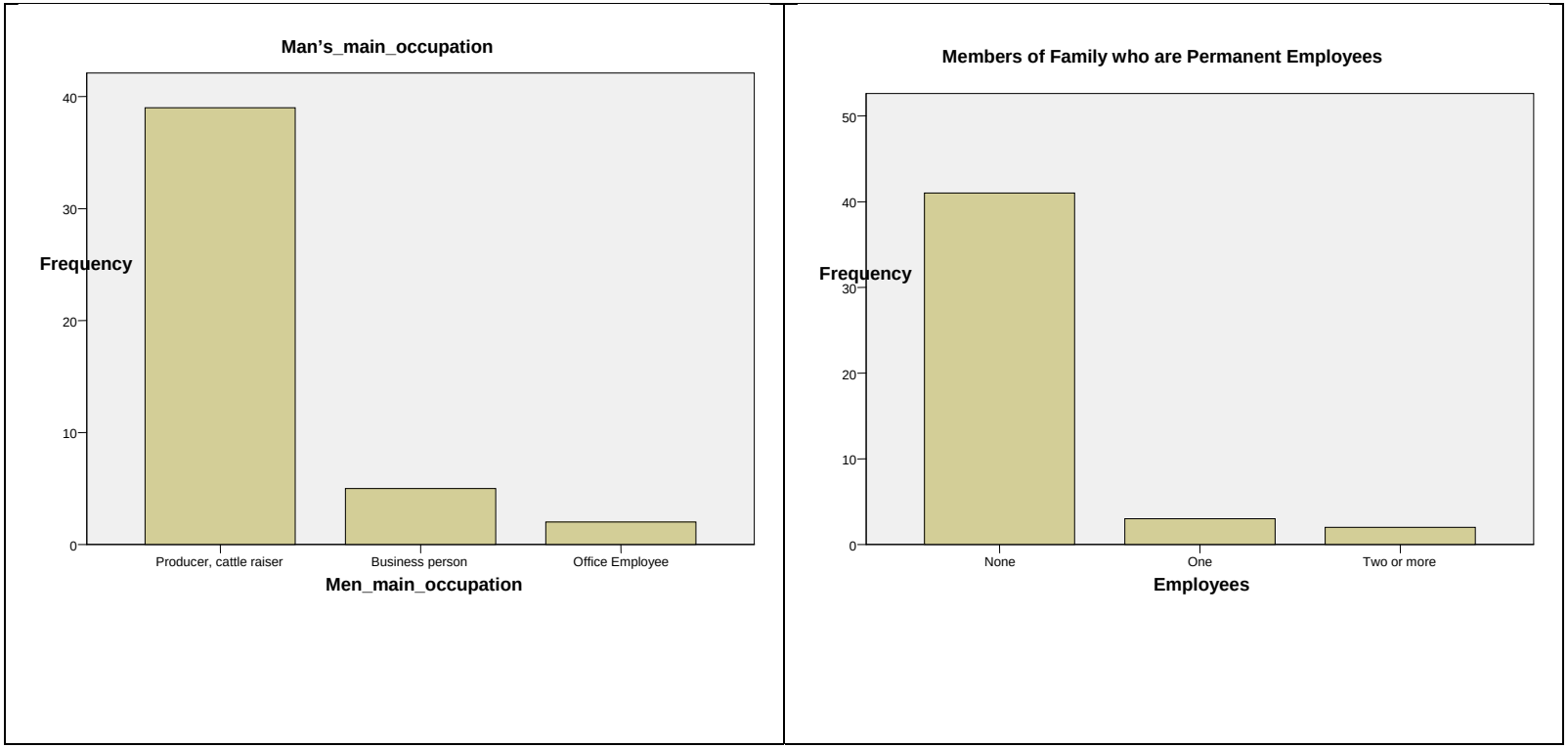


Figure 10., continued

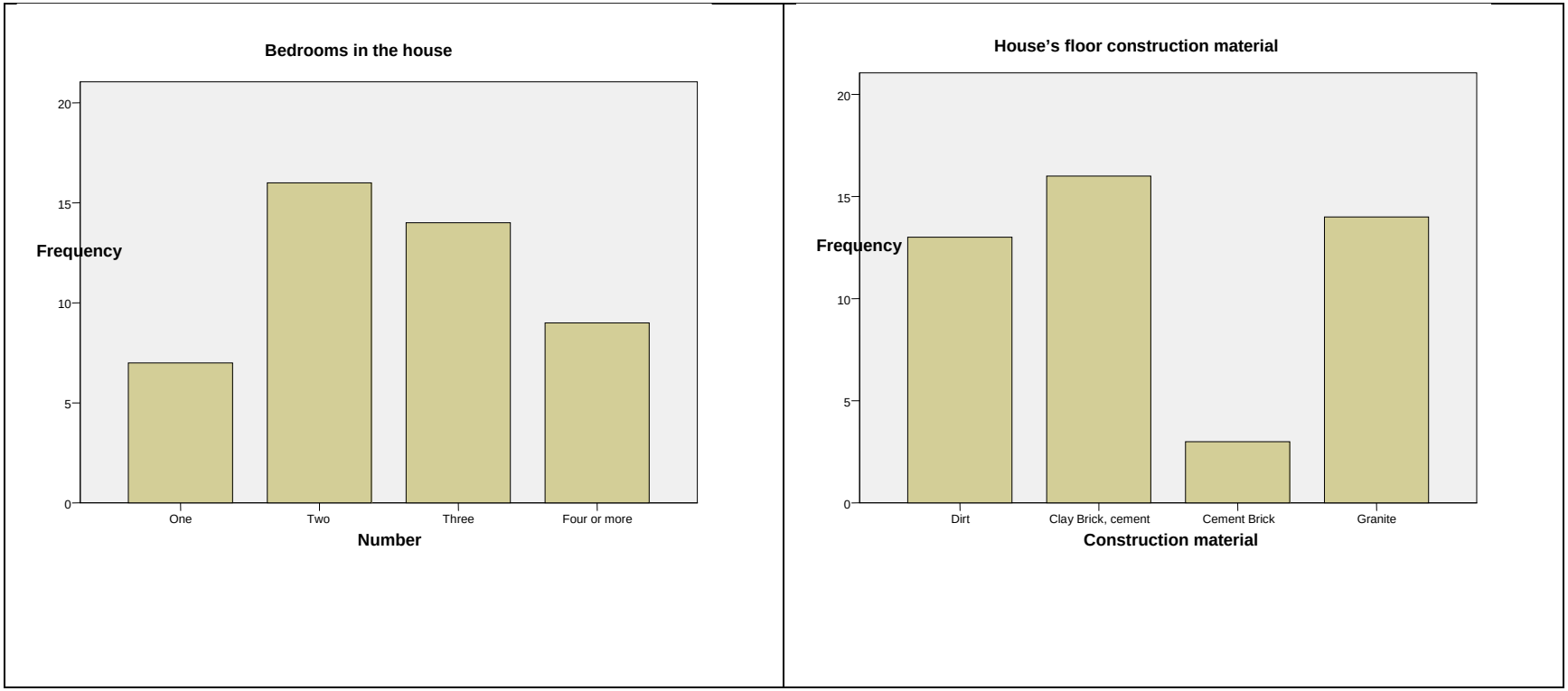


Figure 10., continued

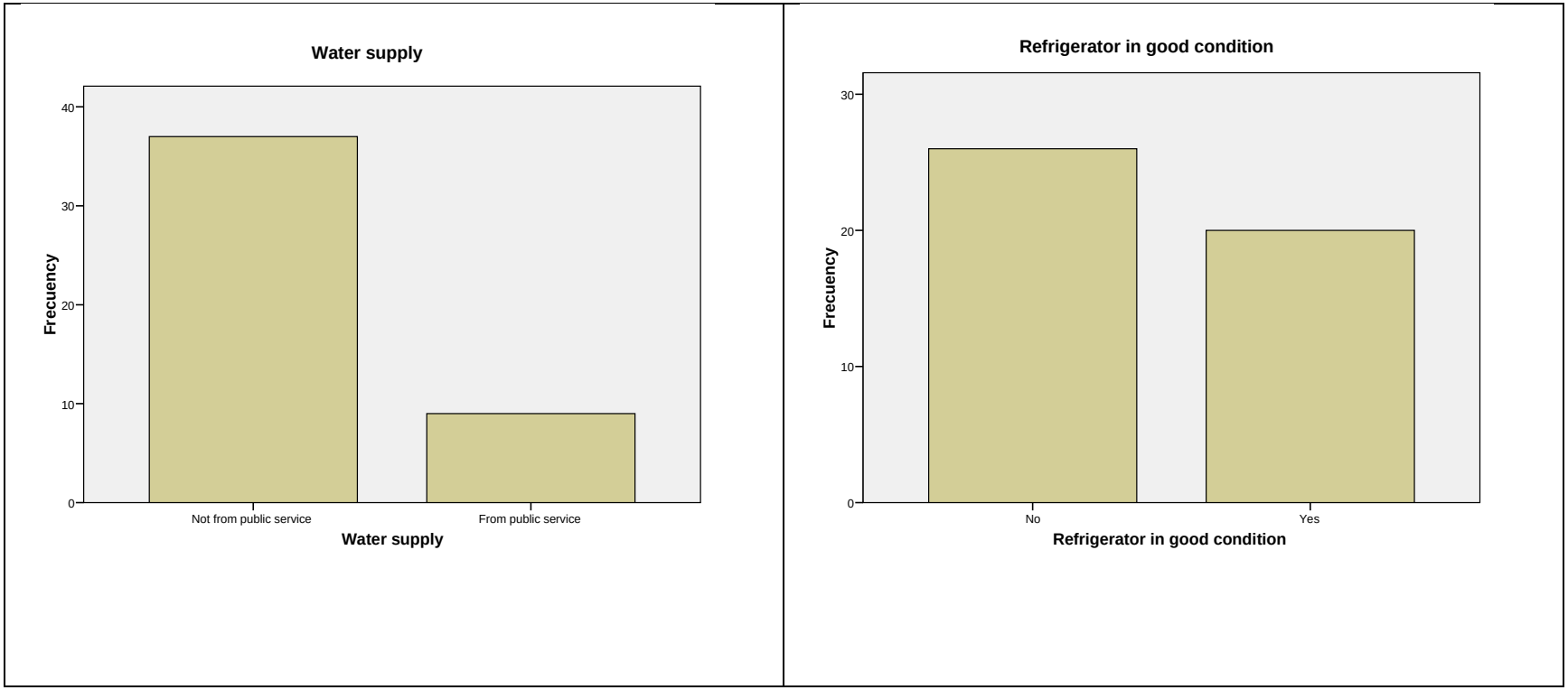


Figure 10., continued

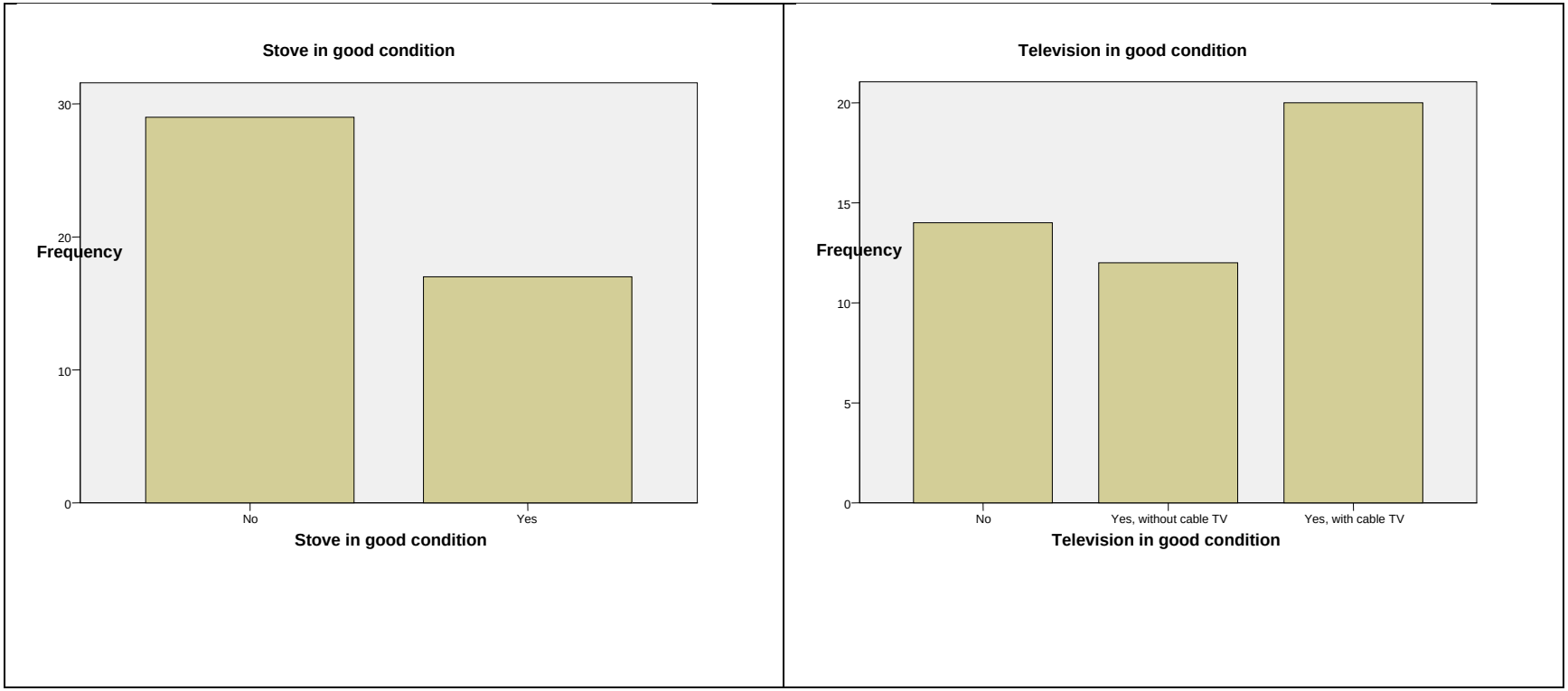
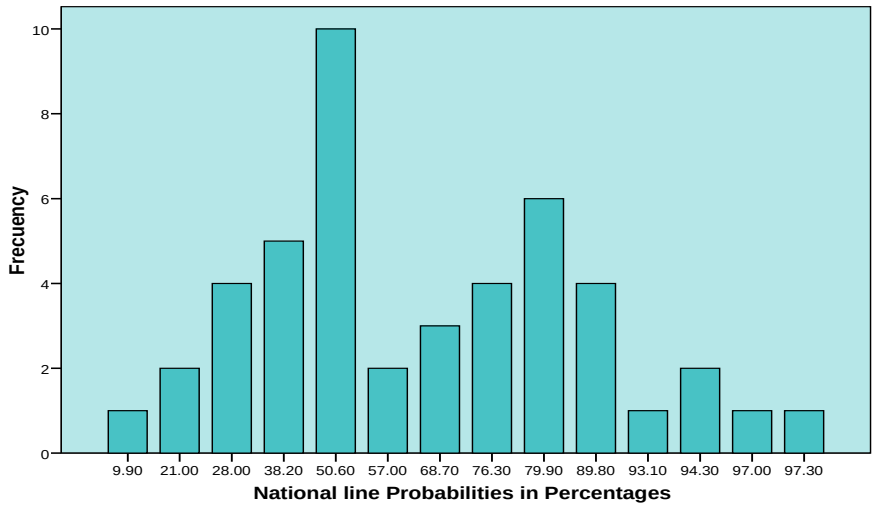


Table 29. Frequency of Probability (%) that Farmers Are Below the Poverty Line, according to the National Poverty Line

		Frequency	Percentage	Valid percentage	Accumulated percentage
Valid	9.90	1	2.0	2.2	2.2
	21.00	2	4.0	4.3	6.5
	28.00	4	8.0	8.7	15.2
	38.20	5	10.0	10.9	26.1
	50.60	10	20.0	21.7	47.8
	57.00	2	4.0	4.3	52.2
	68.70	3	6.0	6.5	58.7
	76.30	4	8.0	8.7	67.4
	79.90	6	12.0	13.0	80.4
	89.80	4	8.0	8.7	89.1
	93.10	1	2.0	2.2	91.3
	94.30	2	4.0	4.3	95.7
	97.00	1	2.0	2.2	97.8
	97.30	1	2.0	2.2	100.0
	Total	46	92.0	100.0	
Lost	.00	4	8.0		
Total		50	100.0		

Figure 11. Distribution of Probabilities in Percentages for Being below the Poverty Line, according to the National Poverty Line

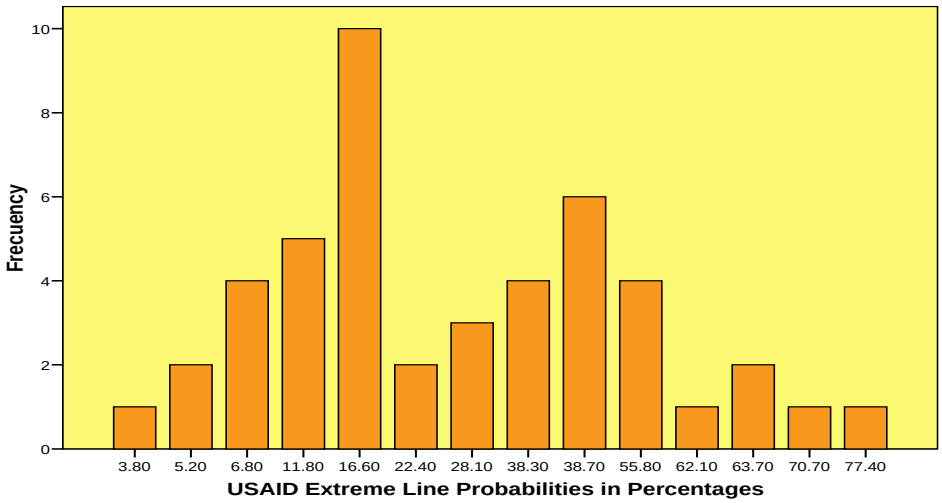


The probability of falling below the poverty line with a greater number of producers with this value is 50.60 percent.

Table 30. Distribution of Probabilities in Percentages for Being below the Poverty Line, According to the USAID Extreme Poverty Line

		Frequency	Percentage	Valid percentage	Accumulated percentage
Valid	3.80	1	2.0	2.2	2.2
	5.20	2	4.0	4.3	6.5
	6.80	4	8.0	8.7	15.2
	11.80	5	10.0	10.9	26.1
	16.60	10	20.0	21.7	47.8
	22.40	2	4.0	4.3	52.2
	28.10	3	6.0	6.5	58.7
	38.30	4	8.0	8.7	67.4
	38.70	6	12.0	13.0	80.4
	55.80	4	8.0	8.7	89.1
	62.10	1	2.0	2.2	91.3
	63.70	2	4.0	4.3	95.7
	70.70	1	2.0	2.2	97.8
	77.40	1	2.0	2.2	100.0
	Total	46	92.0	100.0	
Lost	.00	4	8.0		
Total		50	100.0		

Figure 12. Distribution of Probabilities in Percentages for Being below the Poverty Line, According to the USAID Extreme Poverty Line



The trends are the same, but compared to the values for the national poverty line, the probability of having a greater number of producers fall under it is 16.60 percent, less than a third of the probability of falling below the national poverty line. For a "poverty line" reference, we have a table of probabilities in percentages of USAID poverty equivalents with income of US$1.24/day, and the USAID extreme poverty line has higher values. In other words, their probabilities are greater given the same scores in the survey, as shown with the example of 16.6 percent versus 50.6 percent.

According to the national poverty line, 34 farmers have more than a 50 percent probability of being below the poverty line, while only 9 have the same probability using the USAID extreme poverty line.

A statistical analysis was made of the variable for Number of Family Members (not taken into account among the 10 Score Card questions) and both the national poverty line and the USAID extreme poverty line values, with the regression value being significant ($p<0.12$) although in both, the R squared corrected is low because only this factor was tested and not the others for the evaluation. Below are the results using the USAID extreme poverty line.

Table 31. Linear Regression Analysis between Number of Family Members and Percent Probability of Being Below the Poverty Line

Variables Introduced or Eliminated (b)

Model	Variables introduced	Variables eliminated	Method
1	Family members (a)	.	Introduced

a All requested variables introduced
b Dependent variable: USAID Extreme Poverty Line

Table 32. Summary of the Model

Model	R	R squared	R squared corrected	Typical error of estimation
1	.367(a)	.135	.115	18.92197

a Predictor variables: (Constant), Family members

Table 33. ANOVA (b)

Model		Sum of squares	Gl	Median squared	F	Sig.
1	Regression	2459.247	1	2459.247	6.869	.012(a)
	Residual	15753.794	44	358.041		
	Total	18213.041	45			

a Predictor variables: (Constant), Family members
b Dependent variable: USAID Extreme Poverty Line

Table 34. Coefficients (a)

Model		Non-standardized coefficients		Standardized coefficients	t	Sig.
		B	Typical error	Beta	B	Typical error
1	(Constant	10.913	7.503		1.454	.153
	Family members	3.332	1.271	.367	2.621	.012

a Dependent variable: USAID Extreme Poverty Line

The model obtained for making projections is the following:

Percent probability of being
below the poverty line = 10.913 + 3.332 (Number of members of the household)

6. Conclusions

1. The SMS or text message is a low-cost mechanism for disseminating price information that can reach a significant portion of the Honduran population (50 municipalities out of 298 are represented by 208 farmers with cellular telephone coverage). This represents a little more than 15 percent coverage of the national territory.
2. Dissemination of prices over the radio meets the requirements for being a medium for mass dissemination, with broad coverage of the entire country at a low cost. However, an evaluation of the way the information is received shows that its efficiency depends on whether the person receiving the message is present during the broadcast; otherwise, the message is lost.
3. Of the ICTs evaluated, the SMS is the one with the versatility to be sustainable for commercial firms that could provide the service, thereby meeting the demand for market prices from Honduran vegetable farmers. The one using the service would be willing to pay a reasonable amount for accessing the sales prices from the country's main markets.
4. As of October 2009, the month when the information was received from CONATEL, CELTEL was the company with the most subscribers. 61.25 percent of all mobile telephone users in Honduras have CELTEL service, while in a selected sub-sample of 208 vegetable growers, 83.65 percent had service from that company.
5. The linear regression analysis shows that the variables of Treatment, Quality Category, Price from the Closest City, Years of Technical Assistance, Market, and Years of Experience with the Crop are significant for explaining the dependent variable Percentage Difference between Market Price and Negotiated Price. The R^2 adjusted is low at 0.196, but the model is highly significant at <0.0001.
6. The ANOVA univariant analysis used to measure the interactions between Treatment by Area Planted and Treatment by Years of

7. Of the nine vegetable crops assisted by the EDA Program, with the exception of plantain, potatoes, and salad tomatoes, the ICTs became a tool that provided timely reference prices that were used by the farmer to maximize profits and minimize the profit margin of the intermediary. In other words, it can be generally concluded that the technology reduced the gap between the farmer and their participation in a free and diverse market.
8. As stated by 91 percent of the farmers surveyed that received market prices, the price information was useful to them. Of these farmers, when asked what the price would have been if they had not received this information, 87 percent said that they obtained a higher price, averaging 12.5 percent more.
9. According to the socioeconomic assessment made with a sub-sample of the vegetable farmers studied and the USAID extreme poverty line, 9 of the 46 farmers visited and surveyed had a more than 50 percent probability of falling below the poverty line. According to the national poverty line, another way to assess poverty according to the results of the Poverty Score Card for Honduras, 34 of the 46 farmers have more than a 50 percent probability of falling below the poverty line.
10. In analyzing the socioeconomic conditions of the farmers surveyed in this study, the sample indicates a certain homogeneity in terms of living conditions: a subsistence production family unit that normally does not have the capacity to efficiently negotiate the sale of its harvest because of isolation or exclusion from various elements that interact in a market, chief among them “reference price information.”

11. The socioeconomic analysis revealed the real reason why more farmers did not respond to the first attempts to communicate with them and why some could not be contacted at all. At the start of the study, this was attributed to errors in the database of farmers used or to problems with the mobile telephone signal. A large number of farmers do not have access to electricity, cannot recharge their cell phones, and can only turn them on when they need them. Thus, communication did not occur.

7. Recommendations

1. The study centered on the dissemination of market prices from the main markets in Tegucigalpa and San Pedro Sula because of limits in the budget and staff devoted to collecting prices. However, if dissemination is to be undertaken for commercial purposes, it is necessary to consider disseminating prices from markets like Santa Rosa de Copán and San Salvador (El Salvador), which are very important markets for vegetable farmers in the west, from markets in La Ceiba, which is the most important market on the Atlantic seaboard, and others that have considerable commercial importance.
2. The veracity of the price information is extremely important for dissemination in a commercial form. Information should always be obtained from reliable sources by staff who are keenly aware of its importance.

8. Lessons Learned

1. One of the main reasons for the lack of price information is not the absence of information itself but the government's inability to provide electricity to an important part of the population. This makes it difficult to watch television, listen to the radio, or recharge mobile phones. Even when a producer has bought a mobile phone and has access to a mobile phone company signal, communication can be limited because of the difficulty of recharging mobile devices.

2. During the period under study, several companies showed interest in starting price information delivery through a mobile service, according to Edgardo Varela from EDA Project. However, not one company had solid information about the demand for this service. It was only a preconceived notion that it might be both useful to producers and a profitable activity.
3. Small producers responded positively to their participation in the activity of “prices through text messages” However, later in the study, when asked about their willingness to pay for the information, the response was not so positive. This confirms the general perception that the normal behavior of Honduran small and medium farmers is as producers and not as entrepreneurs. For years, development projects implemented by private companies or NGOs have been working to change that limited vision, but there is still a long way to go.

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Annex 1. Survey of Farmers to Whom Prices Were Not Sent

Encuesta para productores EDA posterior a cosecha

No tratados

I. Datos Generales

1.1 Nombre del productor: _____

1.2 Comunidad: _____

1.3 Municipio: _____

1.4 Departamento: _____

1.5 Año en que inicio a recibir asistencia técnica de parte de EDA-MCA: _____

II. Informacion de Precios

Saludo: Buenas tardes Sr(a)_____, le estamos hablando del proyecto EDA, para corroborar algunos datos

¿Nos permite realizarle una corta encuesta?

2.1 ¿En que mes(es) cosechó su producto?

Jul Sem 1	☐	AgoSem 1	☐	Sep Sem 1	☐	Oct Sem 1	☐	Nov Sem 1	☐
Jul Sem 2	☐	Ago Sem 2	☐	Sep Sem 2	☐	Oct Sem 2	☐	Nov Sem 2	☐
Jul Sem 3	☐	Ago Sem 3	☐	Sep Sem 3	☐	Oct Sem 3	☐	Nov Sem 3	☐
Jul Sem 4	☐	Ago Sem 4	☐	Sep} Sem 4	☐	Oct Sem 4	☐	Nov Sem 4	☐

III. Producción

3.1 ¿Cuáles son los productos que cultivó, área cosechada y producción obtenida?

Producto	Área Sembrada	Producción*

*Libras, kilogramos, gavetas, cajas, sacos, cargas, quintales

Si es una unidad que no especifique peso(ej. Saco) consulte al productor a cuántas libras equivale

*Cultivos estudiados

Tomate Pera	**Papa**
Tomate Manzano	**Pepino**
Chile Dulce	**Plátano**
Repollo	**Yuca**
Cebolla amarilla	

3.2 ¿Cuántos años de experiencia tiene en este cultivo?

Cultivo	Años

IV. Mercado

4.1 ¿Cuál es el Mercado de destino de su producto?

Producto	Mercado Destino

ej. San Pedro Sula, Tegucigalpa, Ceiba, etc…

4.2 ¿A quién vendió su producto?

Producto	Comprador

ej. Intermediario, Industria, Puesto en el mercado Supermercado, autoconsumo para procesamiento, autoconsumo para venta al detalle

4.3 ¿A qué precio por unidad negoció su producto?

Cosecha (1era, 2nda, 3era, 4ta)		Precio
	Cultivo 1	
	Cultivo 2	

Cosecha (1era, 2nda, 3era, 4ta)		Precio
	Cultivo 3	

4.6 ¿Cuál es la distancia hacia el mercado al que vende su producto?

En kilómetros u horas y minutos en carro o en bestia.

_____

4.7 ¿En qué medio de transporte traslada su producto?

Medio	
Camión	☐
Carro pickup	☐
Carro refrigerado	☐
Bestia	☐
Otro	☐

4.8 ¿Cómo transporta su producción?

Forma	
En cesta	☐
En saco	☐
En bines	☐
A granel	☐

Despedida: Gracias Sr(a) por el tiempo proporcionado.

Annex 2. Survey of Farmers to Whom Prices Were Sent

2.4 ¿Obtuvo beneficios al recibir la información de precios del Programa EDA a través de mensajitos?

Si ☐ ¿Porque?
- Orienta para negociar ☐
- Permite obtener mejor precio ☐
- Los interemediarios le mienten al productor ☐
- Otros* ☐

* Explicar

No ☐ ¿Porque?
- Se obtuvo lo que el intermediario ofreció ☐
- Aún con la información no se puede negociar mejor ☐
- La información no fue precisa ☐
- Se tiene negociado un precio fijo con comprador ☐
- Consume su propio producto para proceso ☐
- Consume su propio producto para venta al detalle ☐

*Si la respuesta es afirmativa pasar a la pregunta **2.5**, si es negativa pasar a la **2.9.**

2.5 ¿Cuando el proyecto EDA haya terminado usted estaría dispuesto a pagar para obtener la información de precios?

Si ☐ ¿Por que? La información:
- Es buena, valiosa y necesaria. ☐
- Es excelente que haya una información de este orden. ☐
- La información es buena, sirve para mejorar nuestros ingresos en las ventas. ☐
- Interesa porque son los precios oficiales, actuales y reales. ☐
- Cubre todos los productos y mercados más influyentes. ☐
- La difusión es muy buena, nos llega a tiempo. ☐
- Otro* ☐

*Explicar

No ☐ ¿Por qué? La información:
- Debería ser enviada por el estado ☐
- No sirve tanto ☐
- Sirve, pero no para pagar por ella ☐
- Otro* ☐

*Explicar

2.6 ¿Cuánto estaría dispuesto a pagar por un mensajito del precio del día?

*Dejar que el productor conteste abiertamente, si no lo hace, proponer las siguientes alternativas:

Rango de precio	
L.10.00-L12.00	☐
L.12.01-L14.00	☐
L.14.01-L16.00	☐
>L.16.00	☐

2.7 ¿A qué precio por unidad negoció su producto?

Cosecha (1era, 2nda, 3era, 4ta)		Precio
	Cultivo 1	
	Cultivo 2	

2.8 ¿Qué precio hubiera obtenido si no hubiera conocido los precios de mercado?

Cosecha (1era, 2nda, 3era, 4ta)		Precio (L.)	Diferencia en centavos / Unidad*
	Cultivo 1		
	Cultivo 2		

*** A calcular posterior a la encuesta**

2.6 ¿Cuánto estaría dispuesto a pagar por un mensajito del precio del día?

*Dejar que el productor conteste abiertamente, si no lo hace, proponer las siguientes alternativas:

Rango de precio	
L.10.00-L12.00	☐
L.12.01-L14.00	☐
L.14.01-L16.00	☐
>L.16.00	☐

2.7 ¿A qué precio por unidad negoció su producto?

Cosecha (1era, 2nda, 3era, 4ta)		Precio
	Cultivo 1	
	Cultivo 2	

2.8 ¿Qué precio hubiera obtenido si no hubiera conocido los precios de mercado?

Cosecha (1era, 2nda, 3era, 4ta)		Precio (L.)	Diferencia en centavos / Unidad*
	Cultivo 1		
	Cultivo 2		

*** A calcular posterior a la encuesta**

2.9 Si la respuesta fue negativa: ¿cómo cree que hubiera sido mejor la información?

Si hubiera sido enviada más frecuentemente	☐	
Si se hubieran transmitido los precios de otros mercados*	☐	¿Cuáles mercados?*
Si se hubiera enviado el precio de más productos**	☐	
Si se hubiera enviado el precio en otras presentaciones	☐	
Si se hubieran transmitido los precios por la radio	☐	¿Cuáles productos?**

III. Producción

3.1 Enumere los productos que cultiva, área cosechada y producción obtenida

Producto	Área Sembrada	Producción*

*Libras, kilogramos, gavetas, cajas, sacos, cargas, quintales

Si es una unidad que no especifique peso(ej. Saco) consulte al productor a cuántas libras equivale

3.2 ¿Cuántos años de experiencia tiene en este cultivo?

Cultivo	Años

IV. Mercado

4.1 Cuál es el Mercado de destino de su producto

Producto	Mercado Destino	ej. San Pedro Sula, Tegucigalpa, Ceiba, etc…

4.3 ¿Cuál es la distancia hacia el mercado al que vende su producto?

En kilómetros u horas y minutos en carro o en bestia.

_____

4.4 ¿En qué medio de transporte traslada su producto?

Medio	
Camión	☐
Carro pickup	☐
Carro refrigerado	☐
Bestia	☐

4.5 ¿Cómo transporta su producción

Forma	
En cesta	☐
En saco	☐
En bines	☐
A granel	☐

Despedida: Gracias Sr(a) por el tiempo proporcionado.

Annex 3

Guide to Interpretation of Scorecard Indicators

The following information comes from the Honduran National Institute of Statistics, *Manual de Encuestador, XXXV Encuesta Permanente de Hogares de Propósitos Múltiples*, Tegucigalpa, 2007.

1. How many household members are 14 years old or younger?

According to page 13 of the manual, "household members are those who have eaten and slept in the residence for the past six months; eaten and slept in the residence for less than six months, but who currently live in the residence and plan to continue; and those who, because of work, only spend weekends at the residence."

2. What is the highest educational level that the female head/spouse has reached?

According to page 18 of the manual, the response options are defined as follows:

None: The person has never gone to school or attended a literacy program

Literacy program: Programs to help adults learn basic reading and writing

Preschool: Pre-primary school, also known as pre-kindergarten and kindergarten. The classes teach children social habits and psycho-motor skills

Primary: The first six grades of formal schooling. It includes "basic education"

educational institutions that offer nine grades

Common cycle: A three-year course of studies called the "basic plan" or the "common cycle of general culture". The prerequisite is having passed sixth grade

Diversified: A four-year course of studies whose prerequisite is having passed the common cycle or ninth grade. It includes the specialties of salesperson, public accountant, primary teacher, artist, secretary, computer technician, business administration, etc.

Higher than diversified includes the following:

Technical school: Two-year college programs for mid-level professionals. The prerequisite is having passed diversified. Majors include sales, education, etc.

Non-college post-secondary: This covers students and graduates of the National

Agricultural School in Catacamas, the National School of Forestry Science in Siguatepeque, the Panamerican Agricultural College (Zamorano), military and police academies, Our Lady of Suyapa Seminary, the Center of Construction and Architectural Design, etc. It also includes graduates of the former Francisco Morazán College.
College: Public and private universities that train professionals
Graduate school: Courses of study completed after having obtained an initial college degree. The courses of study last from one to five years.

3. What is the main occupation of the male head/ spouse?
According to page 33 in the manual, an occupation "is the type of work that the person does . . . the main occupation is the one that the respondent considers to be the main one." Specific definitions follow the third revision of the CIUO.

4. How many household members receive a salary in their main occupation?
According to pages 33–34 of the manual, this includes "blue- or white-collar public employees, blue- or white-collar private employees, and domestic servants"
A blue- or white-collar public employee is "someone who works for the government and whose salary is paid by the State, including people in the armed forces"
A blue- or white-collar private employee is "someone who works in a privately owned business"
A domestic servant "does housework for monthly remuneration. Examples are maids, cooks, washerpeople, nannies, gardeners, and chauffeurs".

5. How many rooms does the household use as bedrooms?
According to pages 10–11 of the manual, this includes "all rooms used for sleeping, regardless of whether they are used for some other purpose during the day."
A room is a "space demarcated by walls that reach from the floor to the roof. Folding screens or thin partitions do not count as walls."

6. What is the main construction material of the floors of the residence?
According to page 6 of the manual, “If the residence has different types of floors, record the main type.”

7. What is the household’s source of water?
According to page 7 in the manual, the relevant source is that which “provides the majority of water used by the household.” Public network covers water supplied by “SANAA and the municipal governments”.
Not public network covers piped water provided privately, bucket-drawn wells, pump wells, rivers, creeks, springs, water-tank trucks, pickups with barrels/drums of water, public/community spigots, or others (including getting water from a neighbor).

8. Does any household member have a working refrigerator?
The manual does not provide any additional information about this indicator.

9. Does any household member have a working stove with four burners?
The manual does not provide any additional information about this indicator.

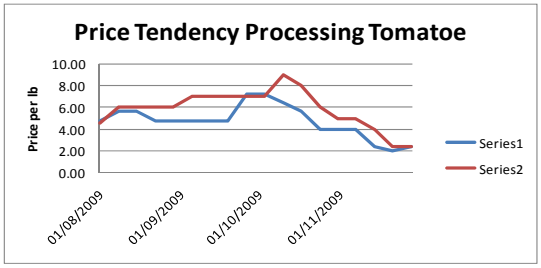
10. Does any household member have a working television with or without cable?
The manual does not provide any additional information about this indicator.

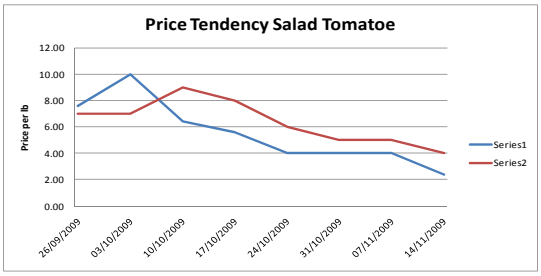
Annex 4.

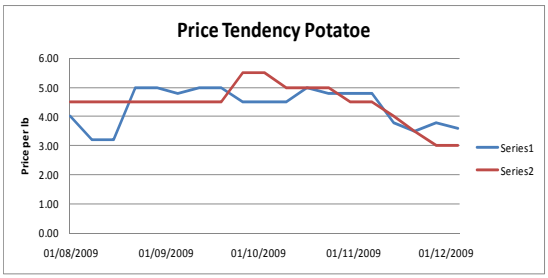
Price Trends of Nine Crops Studied

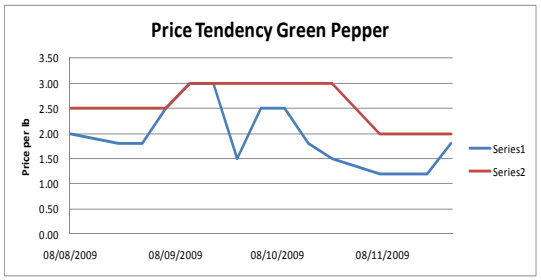
Red lines represent Tegucigalpa's prices

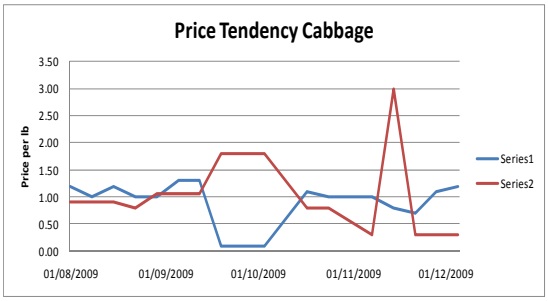
Blue lines represent San Pedro Sula's prices

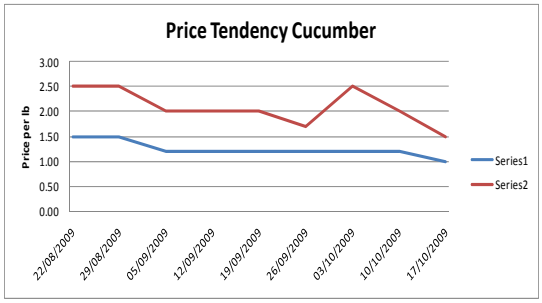


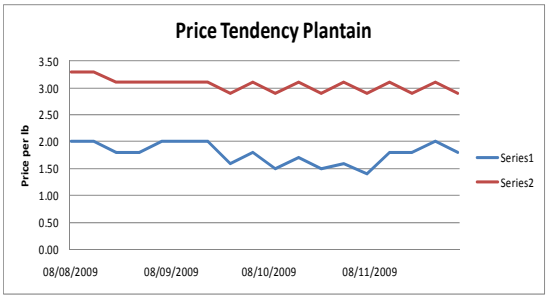


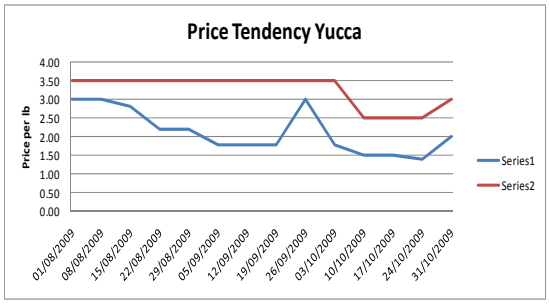


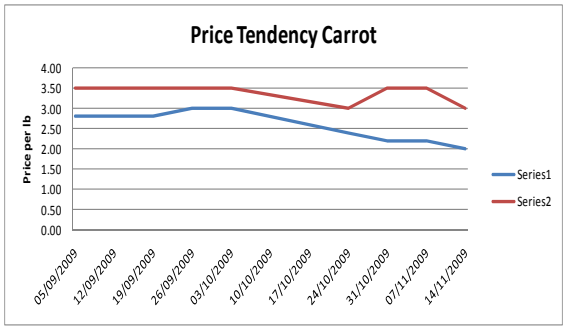











Price Tendency Carrot
Price per lb
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
05/09/2009
12/09/2009
19/09/2009
26/09/2009
03/10/2009
10/10/2009
17/10/2009
24/10/2009
31/10/2009
07/11/2009
14/11/2009
Series1
Series2

Annex 5. Post Hoc Tests

Market

Multiple Comparisons

Dependent Variable: Price Percentage difference

Tamhane

(I) Market	(J) Market				95% Confidence Interval	
		Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Mean Difference (I-J)
La Ceiba	Comayagua	-1.9688	.34492	.064	-4.0250	.0875
	Copán	-.2271	1.07522	1.000	-7.2292	6.7750
	Lempira	-1.5821	.35558	.182	-3.5561	.3919
	La Paz	-1.7743	.52270	.307	-4.0539	.5053
	El Paraíso	-1.8338	.34590	.094	-3.8814	.2139
	Ocotepeque	-1.8193	.34672	.096	-3.8597	.2211
	Olanchito	-1.5883	.34958	.190	-3.6053	.4287
	Santa Bárbara	-1.7016	.36143	.115	-3.6456	.2423
	San Pedro Sula	-1.4380	.35837	.288	-3.3947	.5186
	Tegucigalpa	-1.7668	.34635	.114	-3.8103	.2768
	Yoro	-1.2588	.34665	.523	-3.2998	.7823
	Intibucá	-1.1542	.47798	.924	-3.1982	.8897
	Choluteca	-1.7488	.34492	.123	-3.8050	.3075
Comayagua	La Ceiba	1.9688	.34492	.064	-.0875	4.0250
	Copán	1.7417	1.01840	1.000	-6.1758	9.6591
	Lempira	.3866(*)	.08640	.002	.0781	.6951
	La Paz	.1944	.39274	1.000	-1.9716	2.3605
	El Paraíso	.1350	.02598	.719	-.2724	.5424
	Ocotepeque	.1495(*)	.03527	.044	.0021	.2969
	Olanchito	.3805(*)	.05689	.000	.1495	.6114
	Santa Bárbara	.2671	.10799	.924	-.2223	.7565
	San Pedro Sula	.5307(*)	.09725	.000	.1863	.8751
	Tegucigalpa	.2020(*)	.03139	.000	.0921	.3119
	Yoro	.7100(*)	.03451	.000	.5305	.8895
	Intibucá	.8145	.33090	.955	-.8293	2.4584
	Choluteca	.2200	.00000	.	.2200	.2200

(I) Market	(J) Market				95% Confidence Interval	
		Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Mean Difference (I-J)
Copán	La Ceiba	.2271	1.07522	1.000	-6.7750	7.2292
	Comayagua	-1.7417	1.01840	1.000	-9.6591	6.1758
	Lempira	-1.3550	1.02205	1.000	-9.1920	6.4820
	La Paz	-1.5472	1.09150	1.000	-8.3763	5.2818
	El Paraíso	-1.6067	1.01873	1.000	-9.5167	6.3034
	Ocotepeque	-1.5922	1.01901	1.000	-9.4960	6.3116
	Olanchito	-1.3612	1.01998	1.000	-9.2434	6.5210
	Santa Bárbara	-1.4745	1.02411	1.000	-9.2681	6.3191
	San Pedro Sula	-1.2109	1.02303	1.000	-9.0271	6.6052
	Tegucigalpa	-1.5397	1.01888	1.000	-9.4463	6.3670
	Yoro	-1.0317	1.01898	1.000	-8.9361	6.8727
	Intibucá	-.9271	1.07080	1.000	-7.9671	6.1128
	Choluteca	-1.5217	1.01840	1.000	-9.4391	6.3958
Lempira	La Ceiba	1.5821	.35558	.182	-.3919	3.5561
	Comayagua	-.3866(*)	.08640	.002	-.6951	-.0781
	Copán	1.3550	1.02205	1.000	-6.4820	9.1920
	La Paz	-.1922	.40213	1.000	-2.3068	1.9224
	El Paraíso	-.2516	.09023	.446	-.5744	.0712
	Ocotepeque	-.2372	.09333	.679	-.5685	.0942
	Olanchito	-.0062	.10345	1.000	-.3742	.3619
	Santa Bárbara	-.1195	.13830	1.000	-.6473	.4083
	San Pedro Sula	.1441	.13009	1.000	-.3113	.5995
	Tegucigalpa	-.1846	.09193	.987	-.5104	.1412
	Yoro	.3234	.09304	.067	-.0082	.6549
	Intibucá	.4279	.34199	1.000	-1.1889	2.0447
	Choluteca	-.1666	.08640	.995	-.4751	.1419

(I) Market	(J) Market				95% Confidence Interval	
		Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Mean Difference (I-J)
La Paz	La Ceiba	1.7743	.52270	.307	-.5053	4.0539
	Comayagua	-.1944	.39274	1.000	-2.3605	1.9716
	Copán	1.5472	1.09150	1.000	-5.2818	8.3763
	Lempira	.1922	.40213	1.000	-1.9224	2.3068
	El Paraíso	-.0594	.39360	1.000	-2.2202	2.1013
	Ocotepeque	-.0450	.39432	1.000	-2.2013	2.1114
	Olanchito	.1860	.39684	1.000	-1.9559	2.3279
	Santa Bárbara	.0727	.40732	1.000	-2.0221	2.1675
	San Pedro Sula	.3363	.40460	1.000	-1.7670	2.4395
	Tegucigalpa	.0076	.39399	1.000	-2.1508	2.1659
	Yoro	.5156	.39425	1.000	-1.6412	2.6724
	Intibucá	.6201	.51355	1.000	-1.5619	2.8021
	Choluteca	.0256	.39274	1.000	-2.1405	2.1916
El Paraíso	La Ceiba	1.8338	.34590	.094	-.2139	3.8814
	Comayagua	-.1350	.02598	.719	-.5424	.2724
	Copán	1.6067	1.01873	1.000	-6.3034	9.5167
	Lempira	.2516	.09023	.446	-.0712	.5744
	La Paz	.0594	.39360	1.000	-2.1013	2.2202
	Ocotepeque	.0145	.04381	1.000	-.1749	.2038
	Olanchito	.2455	.06254	.058	-.0038	.4947
	Santa Bárbara	.1321	.11107	1.000	-.3575	.6218
	San Pedro Sula	.3957(*)	.10066	.013	.0388	.7527
	Tegucigalpa	.0670	.04075	1.000	-.1040	.2380
	Yoro	.5750(*)	.04320	.000	.3698	.7802
	Intibucá	.6795	.33192	.998	-.9612	2.3203
	Choluteca	.0850	.02598	.987	-.3224	.4924
Ocotepeque	La Ceiba	1.8193	.34672	.096	-.2211	3.8597
	Comayagua	-.1495(*)	.03527	.044	-.2969	-.0021
	Copán	1.5922	1.01901	1.000	-6.3116	9.4960
	Lempira	.2372	.09333	.679	-.0942	.5685
	La Paz	.0450	.39432	1.000	-2.1114	2.2013
	El Paraíso	-.0145	.04381	1.000	-.2038	.1749
	Olanchito	.2310	.06694	.128	-.0235	.4855
	Santa Bárbara	.1177	.11361	1.000	-.3711	.6064
	San Pedro Sula	.3813(*)	.10345	.029	.0162	.7463
	Tegucigalpa	.0525	.04722	1.000	-.1204	.2254

(I) Market	(J) Market				95% Confidence Interval	
		Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Mean Difference (I-J)
Ocoteque (continued)	Yoro	.5605(*)	.04935	.000	.3649	.7562
	Intibucá	.6651	.33277	.999	-.9732	2.3033
	Choluteca	.0705	.03527	.997	-.0769	.2179
Olanchito	La Ceiba	1.5883	.34958	.190	-.4287	3.6053
	Comayagua	-.3805(*)	.05689	.000	-.6114	-.1495
	Copán	1.3612	1.01998	1.000	-6.5210	9.2434
	Lempira	.0062	.10345	1.000	-.3619	.3742
	La Paz	-.1860	.39684	1.000	-2.3279	1.9559
	El Paraíso	-.2455	.06254	.058	-.4947	.0038
	Ocotepeque	-.2310	.06694	.128	-.4855	.0235
	Santa Bárbara	-.1133	.12206	1.000	-.6120	.3854
	San Pedro Sula	.1503	.11267	1.000	-.2480	.5486
	Tegucigalpa	-.1785	.06498	.577	-.4247	.0678
	Yoro	.3295(*)	.06654	.002	.0727	.5864
	Intibucá	.4341	.33575	1.000	-1.1963	2.0645
	Choluteca	-.1605	.05689	.608	-.3914	.0705
Santa Bárbara	La Ceiba	1.7016	.36143	.115	-.2423	3.6456
	Comayagua	-.2671	.10799	.924	-.7565	.2223
	Copán	1.4745	1.02411	1.000	-6.3191	9.2681
	Lempira	.1195	.13830	1.000	-.4083	.6473
	La Paz	-.0727	.40732	1.000	-2.1675	2.0221
	El Paraíso	-.1321	.11107	1.000	-.6218	.3575
	Ocotepeque	-.1177	.11361	1.000	-.6064	.3711
	Olanchito	.1133	.12206	1.000	-.3854	.6120
	San Pedro Sula	.2636	.14533	.999	-.2812	.8084
	Tegucigalpa	-.0651	.11246	1.000	-.5528	.4226
	Yoro	.4429	.11337	.113	-.0467	.9324
	Intibucá	.5474	.34807	1.000	-1.0640	2.1588
	Choluteca	-.0471	.10799	1.000	-.5365	.4423
San Pedro Sula	La Ceiba	1.4380	.35837	.288	-.5186	3.3947
	Comayagua	-.5307(*)	.09725	.000	-.8751	-.1863
	Copán	1.2109	1.02303	1.000	-6.6052	9.0271
	Lempira	-.1441	.13009	1.000	-.5995	.3113
	La Paz	-.3363	.40460	1.000	-2.4395	1.7670
	El Paraíso	-.3957(*)	.10066	.013	-.7527	-.0388
	Ocotepeque	-.3813(*)	.10345	.029	-.7463	-.0162
	Olanchito	-.1503	.11267	1.000	-.5486	.2480

(I) Market	(J) Market				95% Confidence Interval	
		Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Mean Difference (I-J)
San Pedro Sula (continued)	Santa Bárbara	-.2636	.14533	.999	-.8084	.2812
	Tegucigalpa	-.3287	.10219	.135	-.6889	.0315
	Yoro	.1793	.10319	1.000	-.1858	.5443
	Intibucá	.2838	.34489	1.000	-1.3280	1.8957
	Choluteca	-.3107	.09725	.149	-.6551	.0337
Tegucigalpa	La Ceiba	1.7668	.34635	.114	-.2768	3.8103
	Comayagua	-.2020(*)	.03139	.000	-.3119	-.0921
	Copán	1.5397	1.01888	1.000	-6.3670	9.4463
	Lempira	.1846	.09193	.987	-.1412	.5104
	La Paz	-.0076	.39399	1.000	-2.1659	2.1508
	El Paraíso	-.0670	.04075	1.000	-.2380	.1040
	Ocotepeque	-.0525	.04722	1.000	-.2254	.1204
	Olanchito	.1785	.06498	.577	-.0678	.4247
	Santa Bárbara	.0651	.11246	1.000	-.4226	.5528
	San Pedro Sula	.3287	.10219	.135	-.0315	.6889
	Yoro	.5080(*)	.04665	.000	.3274	.6886
	Intibucá	.6125	.33238	1.000	-1.0268	2.2519
	Choluteca	.0180	.03139	1.000	-.0919	.1279
Yoro	La Ceiba	1.2588	.34665	.523	-.7823	3.2998
	Comayagua	-.7100(*)	.03451	.000	-.8895	-.5305
	Copán	1.0317	1.01898	1.000	-6.8727	8.9361
	Lempira	-.3234	.09304	.067	-.6549	.0082
	La Paz	-.5156	.39425	1.000	-2.6724	1.6412
	El Paraíso	-.5750(*)	.04320	.000	-.7802	-.3698
	Ocotepeque	-.5605(*)	.04935	.000	-.7562	-.3649
	Olanchito	-.3295(*)	.06654	.002	-.5864	-.0727
	Santa Bárbara	-.4429	.11337	.113	-.9324	.0467
	San Pedro Sula	-.1793	.10319	1.000	-.5443	.1858
	Tegucigalpa	-.5080(*)	.04665	.000	-.6886	-.3274
	Intibucá	.1045	.33269	1.000	-1.5340	1.7430
	Choluteca	-.4900(*)	.03451	.000	-.6695	-.3105

(I) Market	(J) Market				95% Confidence Interval	
		Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Mean Difference (I-J)
Intibucá	La Ceiba	1.1542	.47798	.924	-.8897	3.1982
	Comayagua	-.8145	.33090	.955	-2.4584	.8293
	Copán	.9271	1.07080	1.000	-6.1128	7.9671
	Lempira	-.4279	.34199	1.000	-2.0447	1.1889
	La Paz	-.6201	.51355	1.000	-2.8021	1.5619
	El Paraíso	-.6795	.33192	.998	-2.3203	.9612
	Ocotepeque	-.6651	.33277	.999	-2.3033	.9732
	Olanchito	-.4341	.33575	1.000	-2.0645	1.1963
	Santa Bárbara	-.5474	.34807	1.000	-2.1588	1.0640
	San Pedro Sula	-.2838	.34489	1.000	-1.8957	1.3280
	Tegucigalpa	-.6125	.33238	1.000	-2.2519	1.0268
	Yoro	-.1045	.33269	1.000	-1.7430	1.5340
	Choluteca	-.5945	.33090	1.000	-2.2384	1.0493
Choluteca	La Ceiba	1.7488	.34492	.123	-.3075	3.8050
	Comayagua	-.2200	.00000	.	-.2200	-.2200
	Copán	1.5217	1.01840	1.000	-6.3958	9.4391
	Lempira	.1666	.08640	.995	-.1419	.4751
	La Paz	-.0256	.39274	1.000	-2.1916	2.1405
	El Paraíso	-.0850	.02598	.987	-.4924	.3224
	Ocotepeque	-.0705	.03527	.997	-.2179	.0769
	Olanchito	.1605	.05689	.608	-.0705	.3914
	Santa Bárbara	.0471	.10799	1.000	-.4423	.5365
	San Pedro Sula	.3107	.09725	.149	-.0337	.6551
	Tegucigalpa	-.0180	.03139	1.000	-.1279	.0919
	Yoro	.4900(*)	.03451	.000	.3105	.6695
	Intibucá	.5945	.33090	1.000	-1.0493	2.2384

Based on the means observed.
* The mean difference is sig. at 0.05 level.

Annex 6. Political Map of Honduras