Determining Costs of Conventional and Conservation Agricultural Practices

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Abstract

Farmers in the Chimbo watershed face problems with soil erosion as a result of the steep slopes and mountainous terrain. In order to help address these environmental concerns and increase farmer profitability and yields, an analysis was conducted to determine the costs of production under conventional and reduced tillage methods on fava beans, beans, maize, and potato. A specific questionnaire was created for both the Illangama and Alumbre watersheds and utilized in these areas. The information provided from research performed in the Chimbo watershed indicates that only conventional tillage bean and reduced tillage bean budgets experience positive net revenue. All other budgets were indicative of net losses for farmers. The data sets all contained considerable variation alluding to the fact that research yielding more accurate measurements is necessary in the future. Additionally, the variability in price at both the farm level and commercial markets make it difficult to accurately judge the cost of production at this time for the investigated crops. By identifying the actual costs of production, research agencies will be able to better understand the constraints faced by agricultural producers within the watershed. Addressing these limitations and practices will help researchers identify factors that affect crop yields, in an effort to improve farmer profits and soil health.

Introduction

The livelihood of agricultural producers in the Andean region of Ecuador is directly related to their natural resource base. Specifically, the Chimbo watershed, located in the central sierra, relies heavily on its fertile soils and water resources. Steep slopes and highly erodible soils combined with conventional production methods pose a threat to these important resources, and thus to the viability of neighboring agricultural communities.

In 2005, the Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program (SANREM CRSP) began a project in the Chimbo watershed in order to evaluate conventional farming practices and to introduce conservation agriculture practices. Funding for the project was renewed in 2009 with the beginning of Phase IV of SANREM, which focuses on the implementation of conservation agriculture productions systems. The objective of the SANREM CRSP is to support Sustainable Agriculture & Natural Resources Management decision makers in developing countries by improving access to appropriate data, knowledge, tools, and methods of analysis. By enhancing their capacity to make better decisions, SANREM researchers hope to improve livelihoods and the sustainability of natural resources.

Currently, data are insufficient regarding the variable cost of inputs for agricultural production using conventional and reduced tillage methods in the Chimbo watershed. According to INIAP, conventional tillage in the Illangama sub-watershed constitutes the use of a tractor, an oxen-team, or hand hoeing such that the soil is turned over during soil preparation prior to planting, while reduced tillage involves minimum hand-hoeing while planting along rows. Conventional tillage in the Alumbre sub-watershed is characterized through the use of either a tractor or an oxen-team for soil preparation, and reduced-tillage comprises manual soil preparation with a hoe or trellis pole. Qualitative and quantitative costs of current production methods, specifically inputs, must be understood in order to help address environmental concerns and increase farmer profitability.

This report presents the findings from interviews that were conducted in the Chimbo watershed. The main objective of the study was to understand how the implementation of conventional and reduced-tillage methods affects variable costs. Significant input costs that were accounted for include: labor, agro chemicals use, machinery use, tools, and seeds. Seven budgets were constructed using labor hour and input cost averages for each of four crops: potatoes, fava beans, corn, and beans (see appendices).

The findings of this research will be utilized by scientists within the SANREM project and by outside agencies. By identifying the actual costs of production, research agencies will be better able to understand the constraints faced by agricultural producers and inhabitants within the watershed. More comprehensive information about the relative costs associated with conventional and reduced tillage farming methods will help guide future research and outreach efforts.

Objectives

- Compare profitability of conventional and reduced tillage farming methods with conservation practices for a set of target crops
- Determine input costs and output prices of conventional and conservation practices
- Determine output yields of conventional and conservation practices
- Evaluate farmer awareness of conservation agriculture practices

Methods

Survey Development

In order to determine the costs of production under conventional and conservation practices, two surveys were designed. The first survey, for use in the Illangama (upper) watershed, focused on questions for potato and fava bean production, while a second survey for the Alumbre (lower) watershed concentrated on production of corn and bean varieties, specifically canario and bombolin (see appendices H&I). These surveys attempted to discern the costs of all production activities through estimations of time spent, labor required, material costs for each activity, as well as seasonal yield estimates.

Specific questions were designed based on the targeted crop: for example, questions were included concerning the labor for hilling up of potatoes as well as the selection and degraining of corn. The surveys began with general questions about what crops were grown on each farm and how many parcels the farmer owned. With this information, a target crop was identified, and further questions were asked about each activity in the growing season: land preparation, planting and fertilizer application, weeding and hilling up, secondary fertilizer application, phytosanitary control application, and harvest.

Data Collection

Surveys were collected over a span of three weeks in both the Illangama and Alumbre watersheds. Three groups of students, accompanied by an INIAP employee, interviewed farmers from different communities each day, with each interview lasting about fifteen minutes. INIAP provided a database of farmers in each community to facilitate data collection. Once in the field, groups sought out potential interviewees and initiated conversation to explain the intentions of the survey. Selection of interviewees was random and based on availability (being at home or in a field accessible from the road) and there was no attempt to interview farmers who had cooperated with INIAP on production practices. In the few cases in which farmers were reluctant to participate, they were not interviewed. Each field was either measured or a size estimate was received from the farmer (if the field was inaccessible) as a reference for data comparison and standardization. A total of 45 observations were recorded in the Illangama watershed, and 43 observations in the Alumbre watershed.

In addition to conducting surveys in the field, the group collected input pricing data from local agro-chemical stores to ensure the accuracy of seed, chemical, and tool prices. The stores were chosen due to their proximity to the micro-watersheds. Two stores, one located in Guanujo, the other in Guaranda, were selected for the Illangama watershed, and a store in Chillanes was chosen for the

Alumbre watershed (See Appendix L). Dr. Carlos Monar, former extension specialist and current professor at the Universidad of Bolívar, provided market data for the crops.

Budget Construction

The template for a production budget was created prior to data collection based on the survey questions, with revisions made after the surveys were completed to reflect a lack of cost data for conservation practices. A total of seven budgets were constructed: potato and fava beans from the Illangama data, with conventional tillage corn, reduced-tillage corn, intercropped corn and beans, conventional tillage beans, and reduced-tillage beans from the Alumbre data. Any entry missing dimension information was dropped from the budgets because average per-hectare data could not be calculated. All reported data was analyzed to determine whether there were sufficient observations for all crops to be divided into a conventional budget and a conservation budget; intercropped corn and beans lacked enough observations under reduced tillage to construct a separate conservation budget. The conventional and conservation budgets were constructed using all observations for the crop regarding yield-related activities, including seed costs, planting labor, fertilizer costs, phytosanitary control costs and application labor, harvest labor, yield estimates, and market prices. These specific components were chosen to ensure robustness of yield data for each budget. Manual land preparation, herbicide input costs and application labor, weeding labor, hilling up labor, and post-planting fertilizer application labor were calculated using only the observations classified under each tillage system. With regards to soil preparation in the Alumbre watershed using a tractor or oxen-drawn plow, a single pay rate and average time/hectare were used across the corn, bean, and intercropped corn and beans budgets due to lack of observations when the data was divided.

Variable Costs

Variable costs in all the budgets included hours per hectare of labor spent for each activity as well as material costs per hectare. Manual labor hours for soil preparation, herbicide application, planting and fertilizing, weeding, hilling up and secondary fertilizer application, phytosanitary control application, and harvesting were calculated by first multiplying the reported number of laborers by the hours worked to give total man hours. Secondly, total man-hours were divided by the given field size, to give man-hours per hectare. Finally, the average of all man-hours per hectare was calculated and reported in the budget. In cases where an observation did not participate in a given activity, a zero was entered to represent that not all farmers incurred costs for every activity.

Material Costs

Material costs included seeds, fertilizer, phytosanitary controls, and herbicides. The standardized units for each consisted of quintals[2] for seed and for fertilizer, and liters for phyosanitary controls and

[2] One quintal equals 100 pounds

herbicides. To calculate the average material cost per hectare, the quantity used of each product was first multiplied by its unit cost, and then divided by the reported field dimension to give the cost per hectare. An average was taken of all costs per hectare and reported as "average cost per hectare" in the budget. The material costs were reported as a single number due to multiple varieties of seeds and chemical products, but a lack of observations for each variety or product. However, if a single variety or product was used in all observations for a crop and tillage system, then an average quantity per hectare was reported and multiplied by the given price within the budget. Glyphosate herbicide was the only reported product for corn and beans intercropped and beans, and therefore was the only reported price. Agricultural producers' reported costs were used when available in calculating material costs. When price paid data was not available, input price costs were determined from data gathered from the local agricultural supply stores as mentioned above (see Appendices J, K, and L-All Ag Store Prices).

Production Interest Rate

Within all the budgets, a production interest rate of 1% a month, or 11% for a full year was applied to the variable costs, and then multiplied by the fraction of the year the fields are dedicated to each crop. This interest rate was obtained from an interview with Maria Calera, a loan specialist at the Banco Nacional de Fomento in Guaranda. Yearly fixed costs were also uniformly applied to each budget based on the necessary tools for the crop. Common tools included backpack sprayers, hoes, and machetes. These costs were calculated from the unit prices obtained from the agro-chemical stores and then a depreciated value was used based on useful life estimates provided by INIAP.

Hourly pay rate

For the Illangama budgets, the common hourly pay rate was determined by dividing the stated daily wage rate by the hours worked in a day for all observations. An average was then taken for the hourly wage rate and reported in the budget. For the Alumbre budgets, the common pay rate was calculated from all the observations by first finding an average food cost per person from the observed data, adding the cost to each stated daily pay rate, and then dividing each by the given hours worked in a day. Similarly in the Illangama calculations, an average was taken and reported. Additionally, common hourly pay rates were calculated for soil preparation with a tractor and an oxen team for each watershed.

Sensitivity analysis

After all budgets were constructed, a sensitivity analysis was conducted in order to determine and disregard the influence of outliers. For each budget's data set, the highest value for each activity was dropped, and percent changes in costs calculated. Additionally, to show the output price sensitivity for each budget, a 25% price increase and decrease was calculated.

Results

General Observations

Table 1 shows the net revenues from each baseline budget. The only crop to demonstrate a profit on a per hectare basis was beans in the Alumbre watershed. The Illangama crops exhibit a $3,469 loss on average, which is 9.18 times larger than the net revenue loss reported in the Alumbre watershed ($378). Labor accounted for a large portion of the net costs in the entire watershed, with labor for soil preparation comprising of 31% of the total costs in the Illangama watershed, and harvest labor making up 55% of net costs in the Alumbre watershed.

Table 1: Net revenue summary

Crop	Net Revenue
Potato Conventional	-$3,134.66
Fava Beans Conventional	-$3,804.15
Corn Conventional	-$1,673.11
Corn Minimum	-$557.27
Beans Conventional	$252.83
Beans Minimum	$225.03
Intercropped Corn & Beans	-$278.41

Gender

In the Illangama watershed, out of the 45 people interviewed, 58% were female and 42% were male. However this was reversed in the Alumbre watershed: 33% of the people interviewed were women and 67% were men.

Table 2: Number of male and female interviewees

Watershed	# of Observations	Male	Female
Illangama	45	19	26
Alumbre	43	29	14
Total	88	48	40

As a general observation, women seemed more wary to be interviewed. A variety of reasons could have influenced the women, including lack of knowledge about the subject, directions from their spouse to not give away personal information to strangers, and comfort level with the interviewers.

Possible sources of error

Several assumptions were made when constructing the conventional and conservation budgets. After standardizing the data, it was clear that many of the yield responses seemed unrealistic when compared to input costs, field sizes, and market prices, likely due to the fact that farmers were often projecting into the future, whereas responses for the other production activities were based on the recent past. Farmers' replies also often mentioned the yearly variability due to environmental factors such as rainfall and diseases. This resulted in the usage of the same average yield estimates in both conventional and conservation budgets, and prevented further analysis of the profitability of the separate production methods.

Wage rate analysis

Analyses of the data from the Illangama watershed suggest that production of both potatoes and fava beans results in a net loss for farmers. Table 1 illustrates that potatoes experienced a loss of $3,134.66 per hectare and fava beans had a total loss of $3,804.15 per hectare. The most expensive input was labor for all activities with a wage rate of $1.02 per hour for the entire Illangama watershed. The wage rate of $1.02 was calculated from only 19 observations of the 45, due to a late emphasis on the importance of obtaining this information. The Alumbre wage rate is considered to be more accurate because of the greater presence of hired labor, as shown in Table 3.

Since most of the farmers participated in community interchange of farm labor, they were only able to estimate the wage rate within their specific community. Man-hours of work are believed to be inflated due to interviewee error and lack of specificity in questions. Farmers gave broad responses suggesting a single activity lasted half a day, a day, or several days; seldom was an answer given in hours per activity. This estimation of man-hours coupled with the fact that some activities such as soil preparation occurred several months before the interview resulted in large labor costs.

The aggregation of the wage rate for the entire Illangama watershed ignores the variability in wage rate between the communities. Some communities' wage rate was as low as $.61 per hour, while other communities' had wage rate as high as $1.23 per hour. Applying the same wage rate to all communities could exacerbate labor costs for certain communities. Farming work in the Illangama watershed is generally shared within the family; few households sought outside help unless they interchanged work with neighbors or participated in a *minga*[3]. With children playing an important role in farm activities, quantifying the opportunity costs of all family members can be misleading and an attempt was made to avoid this miscalculation. However, in many cases it was unclear as to which family members participated and which did not in a given activity. The lack of hired work implies the poverty of the area and it is unclear if the wage rate illustrates the correct value of other opportunities available to the famers.

Labor costs

Responses from the Illangama watershed reported higher net revenue losses than the Alumbre watershed (Table 1). As mentioned above, this could be the result of inflated hours recorded. The average field in the Alumbre watershed was five times greater than the average field size in the Illangama watershed, as seen in Table 3. With larger fields there was a higher presence of paid workers, especially in the harvest process. Reported man-hours show that it took one fourth of the time to harvest a hectare in the Alumbre watershed than in the Illangama watershed. By assuming that all of the workers present were paid the full wage rate, this inflated the cost of labor in the Illangama watershed. The increased productivity in the Alumbre watershed could also be a result of the fact that the workers were being paid per hour in addition to receiving two meals. It is possible the interchange of work does not provide the same incentive to work efficiently, especially in the Illangama communities, as a set wage rate may have in the Alumbre watershed.

Table 3: Characteristics of harvest labor

Watershed	Average Field Size in Hectares	Average Workers Per Activity	Average Man Hours Per Hectare	Observations of Paying for Work
Illangama	0.19	5.88	943.34	3/45
Alumbre	0.98	8.47	255.55	19/43

[3] Community work force

Budget Analyses

Potato Results

Potatoes exhibited the highest cost of production for all crops in the Chimbo watershed. All labor costs accounted for 62% of total production costs. The largest individual cost in production was labor for harvest, constituting 26% of the total costs; followed by fertilizer costs (14%), labor for weeding (10%), with all other inputs making up the remainder (50%).

Thirty-one observations of potatoes were analyzed, though information regarding each production practice was not available from all observations, and calculations were made only from observations including field dimensions. Average reported harvest values ranged from 571.43 quintales/hectare to 9.96 quintales/hectare (23 observations). After removing the highest values in each category (the cost for herbicide activities were left the same), there was a 16% reduction in the cost of production. After increasing the price by 25%, there was a 13% increase in revenue. A change in price demonstrated little increase in profit estimates, due to the high costs associated with production.

Corn Results

While both baseline budgets for corn indicated negative net revenues from production, the net revenue for reduced tillage corn was 63% higher than conventional tillage corn, demonstrating that reduced tillage techniques are potentially more profitable than conventional techniques. Land preparation time and costs under conventional practices far outweighed reduced practices; an average of 14.53 hours for tractor preparation, 1.12 hours for oxen team preparation in addition to 141.601 hours of manual preparation gives an average of 184.6 total hours of land preparation per hectare under conventional tillage, in comparison to only 140.38 hours of land preparation under reduced tillage. The most expensive activity under conventional corn production was weeding, with 704 man-hours per hectare, while the most expensive activity under reduced tillage was harvesting, with 281.34 man-hours per hectare. However, with sensitivity analysis, weeding hours under conventional practices decreased by 326% to 165.12 man hours/hectare, within the 165-306 man hour range for the other labor-intensive activities, including soil preparation, hilling, and harvesting. Labor hours per hectare under reduced tillage had a slightly narrower range, between 140 and 281 for the most intensive activities. Seed costs were calculated as an average per hectare given that two varieties of seed were common; moracho and blanco. A cost of $64.63 per quintal was assigned to moracho and $20 per quintal to blanco based on reported prices, to give an average seed cost of $23.06/hectare.

Sensitivity analysis showed considerable decreases in variable costs for both tillage systems; variable costs under conventional tillage decreased by 102% while variable costs under reduced tillage fell by 129.3%. In combination with the higher net revenues, it is evident that reduced tillage systems for corn will allow the farmers to become more profitable over time while preventing soil erosion and nutrient leaching.

Fava Bean Results

Fava beans exhibited the highest net revenue loss of all the crops observed in the Chimbo watershed. This is surprising given that the crop had little upkeep throughout production; with only one person taking the time to add fertilizer, (which was ignored in the budget) and weeding on average taking only 38.87 hours per hectare, 460.83 hours fewer than weeding potato fields. Farmers generally keep fava beans for household consumption, which cast more doubt on the results. The largest cost in production was soil preparation labor, constituting for 57% of total costs; followed by planting (18%), harvesting (15%), production interests (6%), with all other inputs making up the rest (4%).

Fava beans production was characterized with fewer activities than the other crops. Fertilizing, hilling, and tractor/oxen team use were dropped from the budget. When constructing sensitivity analysis, numbers were kept for herbicide and fertilizer man hours due to lack of observations. Nine observations of fava beans were analyzed with variable results; for example in soil preparation there was a range of 6213.29 hours per hectare between the highest and lowest values. After the highest values in each category were removed (the cost for fertilizer and herbicide activities were left unchanged), there was a 33% reduction in price. After increasing the price by 25% there was only a -5% change in net revenue. Price manipulations had little effect on the net revenues due to the high costs associated with the crop.

Bean Results

During construction of the baseline budget, one observation was discarded for all activities because it was an extreme outlier, averaging 20 times larger than other observations, and in the case of harvesting, this entry was 14,245 hours-- 50 times higher than the others which averaged at about 280. After removal of the outlier, the averages seemed more rational, allowing for a more accurate baseline representation of bean production.

For the conventional budget both the costs for the oxen-drawn plow and the tractor were included for reference, which were averaged separately. It is recognized that farmers use either oxen or tractor and not a combination. However, there were not enough observations to construct separate oxen and tractor conventional budgets. A combination of oxen-drawn plow with manual work was the dominant form of soil preparation for conventional bean production, so these two values were averaged and added together in the budget. The tractor cost was included only a reference for comparison as a substitute for the oxen-drawn plow hours and cost, but was not included in the total variable cost calculation.

In comparing conventional and reduced-tillage methods for beans, it is clear that more man-hours were needed for reduced-till systems in all activities except herbicide application. Reduced-till systems on average applied almost double the amount of herbicide per hectare, but spent one-fifth of the man-hours for application that conventional systems did. In reduced-till systems, farmers spent almost twice as much time planting and fertilizing the soil manually than those that prepared using conventional

methods. These numbers suggest that it is much easier to lay seed and fertilizer than it is when the ground is more compacted in a reduced-till system.

Trellising the beans accounted for 48% of the entire net cost in both budgets. Both the labor and material costs for trellising were the highest expenses for bean farmers—farmers reported spending over $300 a piece for both the labor and the strings for trellising.

Intercropped Corn and Bean Results:

Only one budget was constructed for the intercropping of corn and beans due to the lack of observations classified as reduced tillage. Out of the 12 observations included in the corn and bean budget, 10 were classified as conventional tillage while 2 were classified as reduced tillage. Although the baseline budget displayed negative net revenues from production, a later sensitivity analysis showed positive yearly net revenues of $89.65. Prices for the most commonly-cited seed varieties, "blanco" for corn and "canario" for beans, were used to calculate seed cost. $35 and $70 per quintal were the costs for blanco and canario seeds, respectively. Mancozeb, Cipermatrine, and Frunadan prices were used to calculate phytosanitary costs. The agro-store price for the herbicide Glyphosate was the only price used in budget construction, due to lack of data for the other herbicide costs.

Harvesting labor was the most expensive activity, with 276.15 man-hours per hectare. After sensitivity analysis, harvesting labor dropped 29% to 196 man-hours per hectare. Phytosanitary control labor hours were affected the most by the sensitivity analysis, dropping by 82%. Manual hours of land preparation were not included in the budget since only one observation indicated that this type of manual labor was used.

Sensitivity analysis

In performing sensitivity analysis, the highest value in the dataset was removed for each activity to create a possible range of information. With these sensitivity numbers, percentage changes were calculated to show the effect of the sensitivity analysis (Table 4). For each baseline budget, prices were manipulated 25% above and below the prices used in the budget, to indicate price sensitivity. Beans from the Alumbre watershed demonstrated the most price sensitivity, with net revenue falling by an average of more than 180 percent. Table 4 also shows the effect of removing the outliers during sensitivity analysis on net revenue; in all cases net revenue increased, with only conventional beans showing positive revenues.

Table 4: Sensitivity analysis

Crop	25% Price Increase: % Change in Net Revenue	25% Price Decrease: % Change in Net Revenue	Removal of Outliers % Change in Net Revenue
Potato Conventional	14.12%	12.37%	16%
Fava Bean Conventional	6%	5%	33%
Corn Conventional	9.5%	10.6%	257%

Crop	25% Price Increase: % Change in Net Revenue	25% Price Decrease: % Change in Net Revenue	Removal of Outliers % Change in Net Revenue
Corn Minimum	34%	31%	34.16%
Bean Conventional	173%	-27%	15%
Bean Minimum	194%	-6%	26%
Intercropped Corn & Bean	56%	-56%	80%

Knowledge of conservation agriculture practices

In order to evaluate farmer awareness of conservation agriculture practices, each interviewee was asked if they had heard of any of the practices listed in Table 4. "Crop rotations" was the most widely recognized and used in both the Illangama and Alumbre watersheds. Contour planting was recognized among 23% of the farmers interviewed in the Alumbre watershed, and was also a commonly used practice in corn production.

Even though some of the farmers had heard of these practices, very few were actually utilizing them. Formal words, or the technical name of the practice, were used in the survey and often were not understood until the interviewers gave further explanation.

Table 5: Conservation Agriculture Awareness

Practices	Alumbre	Illangama
Contour Planting	10/43	4/45
Deviation Ditches	2/43	3/45
Strip crops	3/43	1/45
Live Barriers	6/43	6/45
Rotations	18/43	25/45
Reduced-tillage	12/43	2/45

Recommendations

While it is unclear after data analysis whether collecting more observations using the current broad questions would provide improved data, conducting interviews with fewer farmers, spending more time with the farmer, and asking more specific questions may improve labor estimation. Additionally, more emphasis on field dimensions would have allowed for the use of more observations during the analyses. Emphasizing the main crops in each watershed (corn for Alumbre watershed and potatoes for the Illangama watershed) would allow for more observations concerning the crops most important to the farmers in each area. Creating only two surveys for each crop would more narrowly focus the questioning process, in turn providing more clarity for the interviewer and allowing for a more in-depth analysis of specific crops.

Identifying farmers with a strong relationship with INIAP, and obtaining yield estimation from the farmer could also improve confidence in the data. Hosting a field day before any data collection in order to inform farmers of the intentions of the project, instead of explaining at the beginning of the interview could also help eliminate error and build rapport between the agricultural producers and the investigators.

Appendix A: Conventional Potato Budget

Crop: Conventional Potato	Production Value			
Enterprise Production Budget	Units	Quantity/ hectare	Price Per Unit	Cost Per Hectare
Gross Revenue				
Yield				
	quintals	208.30	$ 8.50	$ 1,770.55
Total				$ 1,770.55
Variable Costs				
Production				
Soil Preparation				
tractor	hours		varies	$ (186.59)
manual	hours	344.90	$ 1.02	$ (351.80)
Planting and Fertilizing				
manual	hours	471.10	$ 1.02	$ (480.52)
Seed Cost	quintals	39.88	$ 8.50	$ (338.98)
Fertilizer Cost				$ (680.84)
Weeding				
manual	hours	499.70	$ 1.02	$ (509.69)
Hilling				
manual	hours	400.74	$ 1.02	$ (408.75)
Fertilizer After Planting				
Fertilizer Application manual	hours	57.33	$ 1.02	$ (58.48)
Material Costs				$ (143.04)
Fitosanitary Control				
Fungicides/Insectisides				
manual	hours	23.10	$ 1.02	$ (23.56)
Material Cost	liters	varies	varies	$ (9.03)
Herbicides				
manual	hours	2.56	$ 1.02	$ (2.61)
Material Cost	liters	0.16	$ 5.15	$ (0.82)
Harvest				
Labor cost	hours	1193.22	$ 1.02	$ (1,217.08)
Production Interest				$ (485.30)
Total Variable Costs				$ (4,897.11)
			Price Per Unit	Cost per Year
Fixed Costs				
Tools				
hoe			$ 11.00	$ (2.20)
backpack sprayer			$ 59.00	$ (5.90)
Total Fixed Costs				$ (8.10)
Net Revenue				
Profit				$ 1,770.55
Total Variable Costs				$ (4,897.11)
Total Fixed Costs				$ (8.10)
Net Revenue				$ (3,134.66)

Appendix B: Conventional Fava Bean Budget

Crop: Fava Beans	Production Value			
Enterprise Production Budget	Units	Quantity/hectare	Price Per Unit	Cost per hectare
Gross Revenue				
Yield				
Fava	quintals	23.14	$ 35.00	$ 809.90
Total				$ 809.90
Variable Costs				
Production				
Soil Preparation				
Manual	hours	2577.53	$ 1.02	$ (2,629.08)
Planting				
Manual	hours	806.00	$ 1.02	$ (822.12)
Seed Cost	quintale			$ (96.14)
Weeding				
Manual	hours	31.87	$ 1.02	$ (32.51)
Fitosanitary Control				
Fungicides/Insectisides				
Manual	hours	2.72	$ 1.02	$ (2.77)
Herbicides				
Manual	hours	14.69	$ 1.02	$ (15.35)
Material Cost				$ (9.42)
Harvest				
Labor cost	hours	693.45	$ 1.02	$ (707.32)
Production Interest				$ (291.24)
Total Variable Costs				$ (4,605.95)
			Price Per Unit	Cost per Year
Fixed Costs				
Tools				
hoe			$ 11.00	-2.20
backpack sprayer			$ 59.00	-5.90
Total Depreciated Fixed Costs				$ (8.10)
Net Revenue				
Profit				$ 809.90
Total Variable Costs				$ (4,605.95)
Total Fixed Costs				$ (8.10)
Net Revenue				$ (3,804.15)

Appendix C: Conventional Corn Budget

Crop: Conventional Corn		Production Value		
Enterprise Production Budget	Units	Quantity/hectare	Price Per Unit	Cost per hectare
Gross Revenue				
Yield				
Choclo	quintals	2.01	$ 16.00	$ 32.16
Seco	quintals	21.83	$ 30.00	$ 654.90
Total				$ 687.06
Variable Costs				
Production				
Soil Preparation				
Tractor	hours	14.53	$ 19.00	$ (276.07)
Oxen Team	hours	1.12	$ 3.23	$ (3.62)
Manual	hours	141.60	$ 1.06	$ (150.10)
Planting and Fertilizing				
Manual	hours	242.50	$ 1.06	$ (257.05)
Seed Cost	quintale			$ (24.70)
Fertilizer Cost				$ (60.42)
Weeding				
Manual	hours	704.50	$ 1.06	$ (746.77)
Fertilizer After Planting				
Hilling + Fertilizer Application				
manual	hours	306.43	$ 1.06	$ (324.82)
Material Costs				$ (19.23)
Fitosanitary Control				
Fungicides/Insectisides				
Manual	hours	1.21	$ 1.06	$ (1.28)
Material Cost	liters			$ (0.85)
Herbicides				
Manual	hours	14.69	$ 1.06	$ (15.57)
Material Cost				$ (4.74)
Harvest				
Labor cost	hours	281.34	$ 1.06	$ (298.22)
Post-Harvest				
Corn Selection				
Manual	hours	1.30	$ 1.06	$ (1.38)
Corn De-Graining				
Manual	hours	17.48	$ 1.06	$ (18.53)
Production Interest				$ (148.73)
Total Variable Costs				$ (2,352.07)
			Price Per Unit	Cost per Year
Fixed Costs				
Tools				
hoe			$ 11.00	-2.20
backpack sprayer			$ 59.00	-5.90
Total Depreciated Fixed Costs				$ (8.10)
Net Revenue				
Profit				$ 687.06
Total Variable Costs				$ (2,212.90)
Total Fixed Costs				$ (8.10)
Net Revenue				$ (1,673.11)

Appendix D: Reduced Till Corn Budget

Crop: Reduced Till Corn		Production Value		
Enterprise Production Budget	Units	Quantity/hectare	Price Per Unit	Cost Per Hectare
Gross Revenue				
Yield				
Choclo	quintals	2.01	$ 16.00	$ 32.16
Seco	quintals	21.83	$ 30.00	$ 654.90
Total				$ 687.06
Variable Costs				
Production				
Soil Preparation				
manual	hours	140.34	$ 1.06	$ (148.76)
Planting and Fertilizing				
manual	hours	242.50	$ 1.06	$ (257.05)
Seed Cost	quintals			$ (24.70)
Fertilizer Cost				$ (60.42)
Weeding				
manual	hours	109.50	$ 1.06	$ (116.07)
Fertilizer After Planting				
Hilling + Fertilizer Application				
manual	hours	182.02	$ 1.06	$ (192.94)
Material Costs				$ (19.23)
Fitosanitary Control				
Fungicides/Insectisides				
manual	hours	1.21	$ 1.06	$ (1.28)
Material Cost	liters			$ (0.85)
Herbicides				
manual	hours	6.42	$ 1.06	$ (6.81)
Material Cost				$ (11.82)
Harvest				
Labor cost	hours	281.34	$ 1.06	$ (298.22)
Post-Harvest	hours			
Corn Selection				
manual	hours	1.30	$ 1.06	$ (1.38)
Corn De-Graining				
manual		17.48	$ 1.06	$ (18.53)
Production Interest				$ (78.17)
Total Variable Costs				$ (1,236.23)
			Price Per Unit	Cost per Year
Fixed Costs				
Tools				
hoe			$ 11.00	$ (2.20)
backpack sprayer			$ 59.00	$ (5.90)
Total Fixed Costs				$ (8.10)
Net Revenue				
Profit				$ 687.06
Total Variable Costs				$ (1,236.23)
Total Fixed Costs				$ (8.10)
Net Revenue				$ (557.27)

Appendix E: Conventional Bean Budget

Crop: Conventional Bean	Production Value			
Enterprise Production Budget	Units	Quantity / hectare	Price Per Unit	Cost per hectare
Gross Revenue				
Yield	quintales	**58.29**	**$ 30.00**	**$ 1,748.70**
Total				$ 1,748.70
Variable Costs				
Production				
Soil Preparation				
manual	hours	91.67	**$ 1.06**	$ (97.17)
oxen team	hours	**15.48**	**$ 3.23**	$ (50.00)
OR tractor	hours	***3.91***	***$ 19.00***	*$ (74.29)*
Planting and Fertilizing				
manual	hours	61.80	**$ 1.06**	$ (65.51)
Seed Cost	quintale	**1.06**	**$ 73.00**	$ (77.38)
Material Cost		**0.01**	**$ 36.00**	**$ (0.36)**
Weeding				
manual	hours	46.68	**$ 1.06**	$ (49.48)
Fertilizer After Planting				
Hilling + Fertilizer Application costs	hours	**2.25**	**$ 1.06**	**$ (2.39)**
Material Cost		**0.01**	**$ 36.00**	**$ (0.36)**
Fitosanitary Control				
Fungicides/Insectisides				
manual	hours	**27.72**	**$ 1.06**	**$ (29.38)**
Material Cost	liters	**0.71**		**$ (6.76)**
Herbicides				
manual	hours	57.04	**$ 1.06**	$ (60.46)
Material Cost (Glyphosate)	liters	1.70	$ 5.48	$ (9.32)
Trellising				
manual	hours	**289.44**	**$ 1.06**	**$ (306.81)**
Material costs				
wire		**0.98**	**$ 82.26**	**$ (16.12)**
string		**3833.00**	**$ 0.10**	**$ (376.90)**
stakes		**0.09**	**$ 251.33**	**$ (22.62)**
Harvest				
Labor cost		**280.36**	**$ 1.06**	**$ (297.18)**
Production Interest (ex costs *.15)				$ (19.58)
Total Variable Costs				$ (1,487.77)
			Price Per Unit	Cost per Year
Fixed Costs				
Tools				
hoe			**$ 11.00**	**$ (2.20)**
backpack sprayer			**$ 59.00**	**$ (5.90)**
Total Fixed Costs				**$ (8.10)**
Net Revenue				
Profit				**$ 1,748.70**
Total Variable Costs				$ (1,487.77)
Total Fixed Costs				$ (8.10)
Net Revenue				$ 252.83

Appendix F: Reduced Till Bean Budget

Crop: Reduced-till Bean	Production Value			
Enterprise Production Budget	Units	Quantity / hectare	Price Per Unit	Cost per hectare
Gross Revenue				
Yield	quintales	**58.29**	**30.00**	**$ 1,748.70**
Total				$ 1,748.70
Variable Costs				
Production				
Soil Preparation				
manual	hours	115.89	**1.06**	$ (122.84)
Planting and Fertilizing				
manual	hours	146.13	**1.06**	$ (154.90)
Seed Cost	quintale	**1.06**	**73.00**	$ (77.38)
Material Cost		**0.01**	**36.00**	**$ (0.36)**
Weeding				
manual	hours	51.50	**1.06**	$ (54.59)
Fertilizer After Planting				
Hilling + Fertilizer Application costs	hours	**2.25**	**1.06**	**$ (2.39)**
Material Cost		**0.01**	**36.00**	**$ (0.36)**
Fitosanitary Control				
Fungicides/Insectisides				
manual	hours	**27.72**	**1.06**	**$ (29.38)**
Material Cost	liters	**0.71**		**$ (6.76)**
Herbicides				
manual	hours	11.45	**1.06**	$ (12.14)
Material Cost (Glyphosate & Killer)	liters	2.72	**5.48**	$ (14.91)
Trellising				
manual	hours	**289.44**	**1.06**	**$ (306.81)**
Material costs				
wire		**0.98**	**82.26**	**$ (16.12)**
string		**3833.00**	**0.10**	**$ (376.90)**
stakes		**0.09**	**251.33**	**$ (22.62)**
Harvest				
Labor cost		**280.36**	**1.06**	**$ (297.18)**
Production Interest (ex costs *.15)				$ (19.94)
Total Variable Costs				$ (1,515.57)
			Price Per Unit	Cost per Year
Fixed Costs				
Tools				
hoe			**$ 11.00**	**$ (2.20)**
backpack sprayer			**$ 59.00**	**$ (5.90)**
Total Fixed Costs				**$ (8.10)**
Net Revenue				
Profit				**$ 1,748.70**
Total Variable Costs				$ (1,515.57)
Total Fixed Costs				$ (8.10)
Net Revenue				$ 225.03

Appendix G: Intercropped Corn and Bean Budget

Crop: Intercropped Corn and Bean		Production Value		
Enterprise Production Budget	Units	Quantity/hectare	Price Per Unit	Cost per hectare
Gross Revenue				
Yield				
Choclo	quintals	29.27	$ 16.00	$ 468.32
Seco	quintals	11.28	$ 30.00	$ 338.40
Frejole	quintals	6.02	$ 30.00	$ 180.60
Total				$ 987.32
Variable Costs				
Production				
Soil Preparation				
Tractor	hours	14.53	$ 19.00	$ (276.07)
Oxen Team	hours	1.12	$ 3.23	$ (3.62)
Planting and Fertilizing				
Manual	hours	114.21	$ 1.06	$ (121.06)
Seed Cost	quintale			(51.83)
Fertilizer Cost				(38.74)
Weeding				
Manual	hours	173.81	$ 1.06	$ (184.24)
Fertilizer After Planting				
Hilling + Fertilizer Application				
manual	hours	228.24	$ 1.06	$ (241.93)
Material Costs				(39.37)
Fitosanitary Control				
Fungicides/Insectisides				
Manual	hours	21.43	$ 1.06	$ (22.72)
Material Cost	liters			(9.87)
Herbicides				
Manual	hours	25.00	$ 1.06	$ (26.50)
Material Cost				(4.93)
Harvest				
Labor cost	hours	276.15	$ 1.06	$ (292.72)
Post-Harvest				
Corn Selection				
Manual	hours	1.30	$ 1.06	$ (1.38)
Corn De-Graining				
Manual	hours	17.48	$ 1.06	$ (18.53)
Production Interest				$ (90.81)
Total Variable Costs				$ (1,423.52)
			Price Per Unit	Cost per Year
Fixed Costs				
Tools				
hoe			$ 11.00	-2.20
backpack sprayer			$ 59.00	-5.90
Total Depreciated Fixed Costs				$ (8.10)
Net Revenue				
Profit				$ 987.32
Total Variable Costs				$ (1,423.52)
Total Fixed Costs				$ (8.10)
Net Revenue				$ (2444.30)

Appendix H: Copy of Illangama Survey Questionnaire

Preguntas sobre los cultivos de Papa y Haba

Microcuenca del río Illangama

Nombre del entrevistador:_____ Fecha: _____

Nombre del entrevistado: _____

Género (M=1, F=2) **____ Edad: _____**

Clasificación: _____ (labranza convencional papa/haba=1, labranza convencional papa/haba con curvas de nivel=2, labranza mínima papa/haba=3, labranza mínima con curvas de nivel=4)

Cantón: _____ Parroquia: _____Comunidad: _____

Preguntas introductorias

Buenas días. ¿Cómo está?

- Somos estudiantes de Virginia Tech de los EEUU. Estamos trabajando en un proyecto del INIAP que se llama SANREM.
- Estamos haciendo una investigación sobre sistemas de agricultura de conservación en el Ecuador.
- Quisiéramos hacerle unas preguntas sobre su finca y sus cultivos.
- La entrevista durará más o menos una hora.
- Nos gustaría su ayuda en esta investigación, si tiene tiempo disponible.

¿Tiene tiempo para hablar con nosotros ahora o podemos visitarlo cuando tenga tiempo? ¿Cuándo?
¿Cómo está su familia?
¿Tiene hijos? ¿Cuántos?¿Qué edades?
¿Tiene hijas? ¿Cuántos?¿Qué edades?

Preguntas generales sobre la tierra

1. ¿Qué cultivos tiene en la finca? (papa=1, haba=2, cebada=3, quinua=4, otro=5 especifique)
_____

2. ¿Cuántas parcelas tiene usted en total? _____
3. ¿Cuántas de estas parcelas usan riego? _____

Cultivo específico (papa/haba)

4. ¿Cuántas de sus parcelas producen papa/haba? _____
5. ¿Puede mostrarnos una parcela dónde recientemente cosechó papa?
6. ¿Es posible medir su parcela ahora?
7. Dimensiones de la parcela (metros cuadrados) _____
8. ¿Qué cultivo sembró en esta parcela antes de la papa/haba? _____
9. ¿Qué cultivo va a sembrar usted en esta parcela?_____

Preguntas específicas sobre los cultivos

Preparación

10. ¿Dejó la parcela limpia después de la última cosecha? _____
11. ¿En qué mes comenzó la preparación del suelo? _____

12. ¿Cómo la preparó?:
    12a. ¿Con yunta? _____ (si es positiva vaya a la 13, si no continua)
    12b. ¿Con tractor?_____ (si es positiva vaya a la 13, si no continua)
    12c. ¿Con manual?_____ (si es positiva vaya a la 13, si no continua)
    12d. ¿Con herbicida? ____ (si es positiva vaya a la 14, si no vaya a la 20)
13. ¿Cuánto pagó por este trabajo (por la yunta/el tractor/manual)? _____
    13a. ¿Si tuviera que pagar, cuánto pagaría por este trabajo? _____
14. ¿Quién o quienes le ayudaron en la preparación de la parcela?
    14a. ¿Su esposa?_____
    14b. ¿Sus hijos? _____
    14c. ¿Los vecinos?_____14ci. ¿Cuántos? _____
    14d. ¿Otras personas? ____ 14di. ¿Cuántos? _____
    14e. ¿En minga?____ 14ei. ¿Cuántas personas?_____
    14f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
15. ¿Nombre del herbicida? _____
    15a. ¿De dónde obtuvo el herbicida? _____
    15b. ¿Cuántas unidades aplicó del herbicida? _____
    15c. ¿Cuál fue la cantidad por cada bomba? _____
    15d. ¿De cuántos litros es su bomba? _____
    15e. ¿Cuántas bombas aplicó en esta parcela? _____
16. ¿En cuánto tiempo Usted aplicó el herbicida? _____
17. ¿En cuánto tiempo en total aplicó el herbicida? _____
18. ¿Quién le ayudó?
    18a. ¿Su esposa?_____
    18b. ¿Sus hijos? _____
    18c. ¿Los vecinos?_____18ci. ¿Cuántos? _____
    18d. ¿Otras personas? ____ 18di. ¿Cuántos? _____
    18e. ¿En minga?____ 18ei. ¿Cuántas personas?_____
    18f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
19. ¿Cuánto pagó para aplicar el herbicida? _____
20. ¿Cuánto tiempo trabajó usted en la preparación de la parcela? _____
21. ¿Cuánto tiempo se demoró en la preparación total de la parcela? _____

Siembra

22. ¿En qué mes sembró este cultivo? _____

Mano de Obra

23. ¿Quién es el responsable de la siembra? _____
24. ¿Cuánto tiempo trabajó Usted para la siembra de esta parcela? _____
25. ¿Quién o quienes ayudaron en la siembra?
    25a. ¿Su esposa?_____ 25ai. ¿Cuánto tiempo? _____
    25b. ¿Sus hijos? _____25bi. ¿Cuánto tiempo?____
    25c. ¿Los vecinos?_____25ci. ¿Cuántos? _____
    25d. ¿Otras personas? ____ 25di. ¿Cuántos? _____
    25e. ¿En minga?____ 25ei. ¿Cuántas personas?_____
    25f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
26. ¿Cuánto tiempo se demoró en la siembra total de la parcela? _____

Insumos

27. ¿Qué cantidad de semilla sembró en esta parcela?_____ (kg, sacos, quintales)
28. ¿Qué variedad sembró? _____
29. ¿Compró la semilla? _____ (si es negativa vaya a la 31)
30. ¿Cuánto costó? _____
31. ¿De dónde obtuvo la semilla?_____ semilla propia=1, INIAP=2, vecinos=3, otro=4, (especifique)
    _____
32. ¿Aplicó abono **al sembrar**? _____ (si es no vaya a la 33)
    32a. ¿Qué tipo? _____

32b. ¿Cuánto?_____ (kg, quintales)
32d. ¿Cuánto costó?_____
32c. ¿De dónde obtuvo?_____ (fertilizante propio=1, INIAP=2, vecinos=3, vendedores de agroquímicos=4, otro=5) _____

33. ¿Qué herramientas usó usted para sembrar? (azadón, machete, pala) _____
_____

34. ¿Aplicó abono en esta parcela después de la siembra? _____
34a. ¿En qué mes aplicó el abono?_____
34b. ¿Qué tipo?_____
34c. ¿Cuánto? _____(kg, quintales)
34d. ¿De dónde obtuvo el abono? _____
34e. ¿Cuánto costó? _____
34f. ¿Cómo se aplicó el abono? _____
34g. ¿Cuánto de su tiempo utilizó para aplicar el abono?_____

35. ¿Alguien le ayudó? _____
35a. ¿Por cuánto tiempo?_____

36¿Cuánto tiempo en total usó para aplicar el abono? _____

Aporque

37. ¿Aporcó esta parcela? _____ (si es positivo vaya a la 38, si no es vaya a la 42)

Mano de Obra

38. ¿Quién es el responsable del aporque? _____
39. ¿Cuánto tiempo trabajó usted en el aporque? _____
40. ¿Quién o quienes le ayudaron en el aporque?
40a. ¿Su esposa?_____
40b. ¿Sus hijos? _____
40c. ¿Los vecinos?_____40ci. ¿Cuántos? _____
40d. ¿Otras personas? ____ 40di. ¿Cuántos? _____
40e. ¿En minga?____ 40ei. ¿Cuántas personas?_____
40f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
41. ¿Cuánto tiempo se demoró en el aporque total de la parcela? _____

Rascadillo

42. ¿Cuántas veces hizo el rascadillo en esta parcela? _____
43. ¿Quién es el responsable del rascadillo? _____

Rascadillo 1

44. ¿En qué mes empezó usted el primer rascadillo? _____
45. ¿Cuánto tiempo trabajó usted en el primer rascadillo?_____
46. ¿Quién o quienes le ayudaron en el primer rascadillo? _____
46a. ¿Su esposa?_____
46b. ¿Sus hijos? _____
46c. ¿Los vecinos?_____46ci. ¿Cuántos? _____
46d. ¿Otras personas? ____ 46di. ¿Cuántos? _____
46e. ¿En minga?____ 46ei. ¿Cuántas personas?_____
46f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
47. ¿Cuánto tiempo total utilizó en el primer rascadillo? _____

Rascadillo 2

48. ¿En qué mes empezó usted el segundo rascadillo? _____
49. ¿Cuánto tiempo trabajó usted en el segundo rascadillo?_____
50. ¿Quién o quienes le ayudaron en el segundo rascadillo? _____
50a. ¿Su esposa?_____
50b. ¿Sus hijos? _____
50c. ¿Los vecinos?_____50ci. ¿Cuántos? _____

50d. ¿Otras personas? ____ 50di. ¿Cuántos? _____
50e. ¿En minga?____ 50ei. ¿Cuántas personas?_____
50f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
51. ¿Cuánto tiempo total utilizó para el segundo rascadillo? _____
52. ¿Cuánto tiempo total utilizó para los dos rascadillos? _____

Controles Fitosanitarios en Papa/Haba

¿Qué plagas tiene/tuve esta parcela?
*1. Lancha; 2. Gusano Blanco; 3. Polilla o Tecia, 4. Trips

53. ¿Cuántos controles de plagas y enfermedades necesitó esta parcela en el ciclo pasado? ___

No. Control	Plaga*	Producto	Unidad	Cantidad por bomba	Número de bombas	Tiempo que se demora	Quien hizo**
A	B	D	E	F	G	H	I

**Quien hizo 1=agricultor; 2=esposa; 3=hijo(a); 4=empleado

Cosecha

54. ¿Cuándo cosechó o cuando va a cosechar esta parcela? _____
55. ¿Cuántos sacos/quintales cosechó? _____
55a. ¿Cuántos sacos/quintales cree que va a cosechar? _____
56. ¿Cuánto tiempo trabajó usted en la cosecha?_____
57. ¿Quién es el responsable de la cosecha? _____
58. ¿Quién o quienes ayudaron en la cosecha? _____
58a. ¿Su esposa?_____
58b. ¿Sus hijos? _____
58c. ¿Los vecinos?_____58ci. ¿Cuántos? _____
58d. ¿Otras personas? ____ 58di. ¿Cuántos? _____
58e. ¿En minga?____ 58ei. ¿Cuántas personas?_____
58f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
59. ¿En cuánto tiempo total cosechó esta parcela? _____

Preguntas generales sobre la producción

60. ¿Cuánto cuesta un jornal?/ Si tuviera que pagar para un jornal, cuánto pagaría? _____

61. ¿Ha oído de prácticas como: 1=curvas de nivel, 2=zanjas de desviación, 3=barreras vivas, 4=rotaciones, 5=cultivos en fajas, 6=labranza mínima? _____
62. ¿Ha pensado en utilizarlos? _____
63. ¿Porque no ha adoptado éstas prácticas?
_____
_____

64. Meses en que realiza las actividades del cultivo

	Actividades				
Mes	Preparación del Suelo	Siembra	Deshierba	Controles Fitosanitarios	Cosecha
Junio					
Julio					
Agosto					
Septiembre					
Octubre					
Noviembre					
Diciembre					
Enero					
Febrero					
Marzo					
Abril					
Mayo					

Appendix I: Copy of Alumbre Survey Questionnaire

Preguntas sobre los cultivos de Maíz y Fréjol

Microcuenca del río Alumbre

Nombre del entrevistador:_____ Fecha: _____

Nombre del entrevistado: _____

Género (M=1, F=2) **____ Edad: _____**

Clasificación: _____ (labranza convencional maíz/fréjol=1, labranza convencional maíz/fréjol con barreras vivas=2, labranza mínima maíz/fréjol=3, labranza mínima con barreras vivas=4)

Cantón: _____ Parroquia: _____Comunidad: _____

Preguntas generales sobre la tierra

1. ¿Qué cultivos tiene en la finca? (maíz=1, frejol=2, arveja=3, zapallo=4, otro=5 especifique)
_____
_____

2. ¿Cuántas parcelas tiene usted en total? _____
3. ¿Cuántas de estas parcelas usan riego? _____

Cultivo específico (maíz/frejol)

4. ¿Cuántas de sus parcelas producen maíz/frejol? _____
5. ¿Puede mostrarnos una parcela donde recientemente cosechó maíz?
6. Dimensiones de la parcela (metros cuadrados) _____
7. ¿Qué cultivo sembró en esta parcela antes del maíz/frejol? _____
8. ¿Qué cultivo va a sembrar usted en esta parcela?_____

Preguntas específicas sobre los cultivos

Preparación

9. ¿Dejó la parcela limpia después de la última cosecha? _____
10. ¿En qué mes comenzó la preparación del suelo? _____
11. ¿Cómo la preparó?:
    - 11a. ¿Con yunta? _____ (si es positiva vaya a la 12, si no continua)
    - 11b. ¿Con tractor?_____ (si es positiva vaya a la 12, si no continua)
    - 11c. ¿Con manual?_____ (si es positiva vaya a la 12, si no continua)
    - 11d. Con herbicida? ____ (si es positiva vaya a la 13, si no vaya a la 19)
12. ¿Cuánto pagó por este trabajo (por la yunta/el tractor/manual)? _____
    - 12a. ¿Si tuviera que pagar, cuánto pagaría por este trabajo? _____
13. ¿Quién o quienes le ayudaron en la preparación de la parcela?
    - 13a. ¿Su esposa?_____
    - 13b. ¿Sus hijos? _____
    - 13c. ¿Los vecinos?_____13ci. ¿Cuántos? _____
    - 13d. ¿Otras personas? ____ 13di. ¿Cuántos? _____
    - 13e. ¿En minga?____ 13ei. ¿Cuántas personas?_____
    - 13f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
14. ¿Nombre del herbicida? _____
    - 14a. ¿De dónde obtuvo el herbicida? _____

14b. ¿Cuántas unidades aplicó del herbicida? _____
14c. ¿Cuál fue la cantidad por cada bomba? _____
14d. ¿De cuántos litros es su bomba? _____
14e. ¿Cuántas bombas aplicó en esta parcela? _____
15. ¿En cuánto tiempo Usted aplicó el herbicida? _____
16. ¿En cuánto tiempo total aplicó el herbicida? _____
17. ¿Quién le ayudó?
17a. ¿Su esposa?_____
17b. ¿Sus hijos? _____
17c. ¿Los vecinos?_____17ci. ¿Cuántos? _____
17d. ¿Otras personas? ____ 17di. ¿Cuántos? _____
17e. ¿En minga?____ 17ei. ¿Cuántas personas?_____
17f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
18. ¿Cuánto pagó para aplicar el herbicida? _____
19. ¿Cuánto tiempo trabajó usted en la preparación de la parcela? _____
20. ¿Cuánto tiempo se demoró en la preparación total de la parcela? _____

Siembra

21. ¿En qué mes sembró este cultivo? _____

Mano de Obra

22. ¿Quién es el responsable de la siembra? _____
23. ¿Cuánto tiempo trabajó Usted para la siembra de esta parcela? _____
24. ¿Quién o quienes ayudaron en la siembra?
24a. ¿Su esposa?_____
24b. ¿Sus hijos? _____
24c. ¿Los vecinos?_____24ci. ¿Cuántos? _____
24d. ¿Otras personas? ____ 24di. ¿Cuántos? _____
24e. ¿En minga?____ 24ei. ¿Cuántas personas?_____
24f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
25. ¿Cuánto tiempo se demoró en la siembra total de la parcela? _____

Insumos

26. ¿Qué cantidad de semilla sembró en esta parcela?_____ (kg, sacos, quintales)
27. ¿Qué variedad sembró? _____
28. ¿Compró la semilla? _____ (si es negativa vaya a la 31)
29. ¿Cuánto costó? _____
30. ¿De dónde obtuvo la semilla?_____ semilla propia=1, INIAP=2, vecinos=3, otro=4, (especifique)
_____
31. ¿Aplicó abono **al sembrar**? _____ (si es no vaya a la 33)
31a. ¿Qué tipo? _____
31b. ¿Cuánto?_____ (kg, quintales)
31d. ¿Cuánto costó?_____
31c. ¿De dónde obtuvo?_____ (abono propio=1, INIAP=2, vecinos=3, vendedores de agroquímicos=4, otro=5) _____
32. ¿Qué herramientas usó usted para sembrar? (azadón, machete, pala) _____
_____

Deshierba

33. ¿Cuántas veces hizo la deshierba en esta parcela? _____
34. ¿Quién es el responsable de la deshierba? _____

Deshierba 1

35. ¿En qué mes empezó usted la primera deshierba? _____
36. ¿Cuánto tiempo trabajó usted en la primera deshierba?_____
37. ¿Quién o quienes le ayudaron en la primera deshierba? _____

37a. ¿Su esposa?_____
37b. ¿Sus hijos? _____
37c. ¿Los vecinos?_____45ci. ¿Cuántos? _____
37d. ¿Otras personas? ____ 45di. ¿Cuántos? _____
37e. ¿En minga?____ 45ei. ¿Cuántas personas?_____
37f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
38. ¿Cuánto tiempo en total utilizó para la primera deshierba? _____

Deshierba 2

39. ¿En qué mes empezó usted la segunda deshierba? _____
40. ¿Cuánto tiempo trabajó usted en la segunda deshierba?_____
41. ¿Quién o quienes le ayudaron en la segunda deshierba? _____
41a. ¿Su esposa?_____
41b. ¿Sus hijos? _____
41c. ¿Los vecinos?_____49ci. ¿Cuántos? _____
41d. ¿Otras personas? ____ 49di. ¿Cuántos? _____
41e. ¿En minga?____ 49ei. ¿Cuántas personas?_____
41f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
42. ¿Cuánto tiempo en total utilizó para la segunda deshierba? _____
43. ¿Cuánto tiempo total utilizó para las dos deshierbas?_____

Aporque

44. ¿Aporcó esta parcela? _____ (si es positivo vaya a la 37, si no es vaya a la 41)

Mano de Obra

45. ¿Quién es el responsable del aporque? _____
46. ¿Cuánto tiempo trabajó usted en el aporque? _____
47. ¿Quién o quienes le ayudaron en el aporque?
47a. ¿Su esposa?_____
47b. ¿Sus hijos? _____
47c. ¿Los vecinos?_____39ci. ¿Cuántos? _____
47d. ¿Otras personas? ____ 39di. ¿Cuántos? _____
47e. ¿En minga?____ 39ei. ¿Cuántas personas?_____
47f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
48. ¿Aplicó abono en esta parcela al mismo tiempo del aporque? _____ (sí/no)
48b. ¿Qué tipo?_____
48c. ¿Cuánto? _____(kg, quintales)
48d. ¿De dónde obtuvo el abono? _____
48e. ¿Cuánto costó? _____
48f. ¿Cómo se aplicó el abono? _____
48g. ¿Cuánto de su tiempo utilizó para aplicar el abono? _____
49. ¿Alguien le ayudó? _____
49a. ¿Por cuánto tiempo?_____
50. ¿Cuánto tiempo en total usó para aplicar el abono? _____
51. ¿Cuánto tiempo se demoró en la apoque total de la parcela? _____

Tutoreos

52. Hizo los tutoreos para los fréjoles en esta parcela? ____ (si/no)
53. Cuando los construyo? _____
54. Que cantidad de alambre usó? _____
54a. De donde obtuvo el alambre? _____
54b. Costo? _____
54c. Por cuantas siembras usa-usted el alambre? _____

55. Que cantidad de piolas usó? _____
    55a. De donde obtuvo las piolas? _____
    55b. Costo? _____
    55c. Por cuantas siembras usa las piolas? _____
56. Que cantidad de palitas usó? _____
    56a. De donde obtuvo las palitas? _____
    56b. Costo? _____
    56c. Por cuantas siembras usa las palitas? _____
57. Quien/quienes ayudó/ayudaron en la construcción?
    57a. ¿Su esposa?_____
    57b. ¿Sus hijos? _____
    57c. ¿Los vecinos?_____57ci. ¿Cuántos? _____
    57d. ¿Otras personas? ____ 57di. ¿Cuántos? _____
    57e. ¿En minga?____ 57ei. ¿Cuántas personas?_____
58. Pagó el minga? ____ (si/no)
    58a. Cuánto? _____
59. Cuánto tiempo se demoró la construcción? _____

Controles Fitosanitarios en Maíz/Fréjol

¿Qué plagas tiene/tuve esta parcela?

- Enfermedades de Maiz: Lancha=1, Gusano de Choclos=2, Cogollero=3
- Enfermedades de Fréjol: Lancha/antracnosis=4, Mustia=5, Cenicilia=6, Roya=7
- Plagas de Fréjol: Cutzo=8, Mosca Blanca=9, Lorito Verde=10

60 .¿Cuántos controles de plagas y enfermedades necesitó esta parcela en el ciclo pasado?

No. Control	Plaga*	Época mes	Producto	Unidad	Cantidad por bomba	Número de bombas	Tiempo que se demora	Quien hizo**
A	B	C	D	E	F	G	H	I

**Quien hizo 1=agricultor; 2=esposa; 3=hijo(a); 4=empleado

Cosecha

61. ¿Cuándo cosechó o cuando va a cosechar esta parcela para maíz/fréjol? _____ (if maíz, go to 61a.)
    61a. ¿Choclo (mes)? _____ 53b. ¿Seco (mes)? _____
    61c. ¿ Cuánto de la cosecha usa para choclo? _____

61d. ¿ Cuánto de la cosecha usa para seco? _____
62. ¿Cuántos sacos/quintales cosechó (cree que va a cosechar) en total? _____
63. ¿Cuánto tiempo trabajó usted en la cosecha?_____
64. ¿Quién es el responsable de la cosecha? _____
65. ¿Quién o quienes ayudaron en la cosecha? _____
    65a. ¿Su esposa?_____
    65b. ¿Sus hijos? _____
    65c. ¿Los vecinos?_____65ci. ¿Cuántos? _____
    65d. ¿Otras personas? ____ 65di. ¿Cuántos? _____
    65e. ¿En minga?____ 65ei. ¿Cuántas personas?_____
    65f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
66. ¿En cuánto tiempo cosechó esta parcela? _____

Desgrano (maíz seco)

67. ¿Hizo/va a hacer un desgrano? _____ (si/no)
68. ¿ Cuándo va a hacer el desgrano? _____
69. ¿ Quién es el responsable del desgrano? _____
70. ¿Quién/quienes va(n) a ayudar con el desgrano?
    70a. ¿Su esposa?_____
    70b. ¿Sus hijos? _____
    70c. ¿Los vecinos?_____70ci. ¿Cuántos? _____
    70d. ¿Otras personas? ____ 70di. ¿Cuántos? _____
    70e. ¿En minga?____ 70ei. ¿Cuántas personas?_____
    70f. Pagó usted los vecinos, o fue un intercambio de trabajo? _____
71. ¿En cuánto tiempo se demoró/ va demorar el desgrano? _____

Preguntas generales sobre la producción

72. ¿Cuánto cuesta un jornal?/ Si tuviera que pagar para un jornal, cuánto pagaría? _____
73. ¿Ha oído de prácticas como: 1=curvas de nivel, 2=zanjas de desviación (camina de agua), 3=barreras vivas, 4=rotaciones, 5=cultivos en fajas, 6=labranza mínima? _____
74. ¿Ha pensado en utilizarlos? _____
75. ¿Porque no ha adoptado éstas prácticas?

_____
_____
_____

Appendix J: Guaranda Agriculture Store Prices

Seed Variety	Product		Price	Units	Quantity
Potato	temprano perfecto		$ 2.00	kg	
Pea	semanga		$ 1.60	kg	
Corn	guagal		$ 1.40	kg	63.7
Fertilizer	**Product**	**Variety**	**Price**	**Units**	**Quantity**
	fertisa	15-15-15	$ 30.00	kg	50
	fertisa	10-30-10.0	$ 31.00	kg	50
	fertisa	18-46-0	$ 42.00	kg	50
	fertiandino	11-52-0	$ 42.00	kg	50
	cristoloan	30-10-10	$ 1.50	g	250
	engrose (Agri K600)		$ 5.00	half liter	
	asufre		$ 4.00	kilo	
Chemical Controls	**Product**		**Price**	**Units**	**Quantity**
fungicides					
	mancozeb		$ 3.00	g	500
	Cymoxanil		$ 5.80	g	500
	propamocarb		$ 12.00	g	700
	Metasen		$ 8.50	g	500
	oxithane		$ 8.50	g	500
	acrobat		$ 14.50	g	750
	cursate (mancoceb)		$ 6.45	pound	
pesticides					
	permasect		$ 22.50	liter	
	Karate		$ 3.80	ml	100
	hortisect 75%		$ 2.00	g	100
	monitor				
	orthane		$ 3.00	cm	250

herbicides					
	atrasina		$ 9.75	g	900
	Rondy G		$ 4.00	liter	
	Ranger		$ 4.80	liter	
	Paraquat		$ 6.00	liter	
	Dacocida (2,4-D)		$ 7.50	liter	
	flex		$ 35.00	liter	
Tools			**Price**		
back pack sprayer			$25, 65, 85, 180		
hoe			$ 10.00		
shovel			$ 8.00		
machete			$ 5.00		
hand hoe			$ 7.00		
sack			$ 0.25		
box			$ 0.50		
scissors			$13, 18		
escavadora			$ 12.00		
sickel			$ 1.00		

Appendix K: Granujo Agriculture Store Prices

Seed Variety	Product	Variety	Price	Units	Quantity
	Potato		$12-14	quintales	200-300 quintales
	rye grass		$1.07	kilo	
	Wheat		$16-18		
	Barley		$22	30-40 quintales	
	Fava bean		$22	5-10 quintales	
Fertilizer	**Product**		**Price**	**Units**	**Quantity**
	10-30-10 (N-P-K)		$32	kilo	50
	15-15-15		$35.80	kilo	50
	animal fertilizer		$4	kilo	50
	Organic Mix		$12		
	18-46-0		$4.50	kilo	
	10-20-20		$3.50	kilo	
	40-60-40		$3.80	kilo	
Phytosanitory Controls					
Fungicides					
	Fitopetera		$6.80-8-50	kilo	
Insecticides					
	Cipemetrina		$20	liter	
	Furadan		$20	liter	
	Ozero - Cines		$20	liter	
Herbicides					
	Glyphosate		$5.50	liter	
Tools			Price		
	Backpack Sprayer		$20-$100		16 L - 20 L
	Hoe		$12		
	Pala		$8		

	Machete		$3-20		
	Sack		$0.25		

Appendix L: Chillanes Agriculture Store Prices

	Product	Variety	Price	Unit	Quantity
Fertilizer					
	Kalex		$18.00	Liter	1
	HTP Crop	1-1.5-1.5	$10.00	Milliliter	500
	Complejo Ferrico		$5.50	Gram	500
Phytosanitary Controls					
Fungicides					
	Metarranch	Mancozeb, Metalaxyl	$5.00	Gram	500
	Oxithane	Mancozeb, Oxicloruro de Cubre,	$5.50	Gram	500
Insecticides					
	Zero 5EC	Lamba Cihalotrina	$4.50	Milliliter	500 mL
	Cipemetrina 20EC	Cipemetrina			
	Malathion 57EC		$7.00	L	1
Herbicides					
	Parquat 24-5		$6.50	L	1
	Paraquat	2,4-D	$2.90	mL	500
	Glifomat		$5.48	L	1
Tools			Price		
	Backpack sprayers		$85.00	L	20