IMPACTS OF NEW AGRICULTURAL TECHNOLOGIES IN PERU

by

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(ABSTRACT)

The purpose of this study was to evaluate the impacts of Peru's research and extension programs on two regions in Peru and assess the implications of those impacts on institutional action by the Agrarian Bank and the Peruvian research and extension service. An LP model was constructed for two regions, Contumaza and Tarapoto, and was run under various levels of risk, alternative credit arrangements, selected price changes, and with and without the newly released varieties. Results from the various scenarios demonstrated that the introduction of new varieties increased net income, labor use, and the demand for credit in both regions. Also, altering the amount of credit available had a much more significant impact on the regions than altering the interest rate.

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CHAPTER I

INTRODUCTION

1.1 Introduction

Since the mid-1970's, agricultural production in Peru has stagnated while the population has grown at an annual rate approaching 3%. Because agricultural production has not kept pace with population growth, Peru has been forced to increase food imports. Foreign exchange used to pay for these imports has reduced the financial resources available for development efforts and has increased the awareness of the need to improve agricultural productivity in Peru.

The generation of new, and adaptation of existing, technologies are essential to improving agricultural productivity. The revitalization of Peru's long neglected agricultural research and extension system is recognized as a necessary first step in producing these technologies and expanding agricultural output.

Since 1980, with assistance from the World Bank, the U.S. Agency for International Development (A.I.D.), the Interamerican Development Bank, and others, the Peruvian government has moved to strengthen its agricultural research and extension (R & E) system. Under the auspices of the

National Agricultural Research and Extension Institute (INIPA), research and extension programs in corn, rice, wheat, potatoes, and beans have been established along with farming systems programs for the mountain and the jungle regions.

1.2 Problem Statement

New technologies, generated by the above agricultural research and extension programs, have the potential to increase production through higher yields per unit of land and, in some cases, through expansion of area under cultivation. Adoption of new technologies can affect crop mix; demand for fertilizer, water, labor, and other inputs; level and variability of income; and credit requirements in the major agricultural regions in Peru. INIPA, the primary agency responsible for agricultural R & E in Peru, has expressed an interest in assessing the impact of its programs. This thesis will contribute to such an assessment by examining the impact of new technologies on crop mix, factor use, income, and credit in two regions of Peru: Tarapoto, located in the upper jungle, and Contumaza, located in the foothills of the Andes.[1]

1. Another part of this assessment, being conducted outside of this thesis, is an evaluation of the economic rates of return on INIPA's research and extension investment.

1.3 Objectives

The objectives of this study are the following:

1) to evaluate the impacts of INIPA's agricultural R & E programs on crop mix, input use, the level and variability of income, and credit needs in two regions of Peru.

2) to assess the implications of those impacts for institutional action on the part of the Agricultural Bank, and INIPA, and

3) to develop a procedure which can be adopted by the agricultural economics program in INIPA for assessing the impacts of research and extension in other regions in Peru.

1.4 Hypotheses

The following working hypotheses will be examined in this study:

1) INIPA's R & E programs will alter the crop mix, water use, and increase labor use in each of the regions, even when other factors, e.g. price, and availability of credit, remain unchanged.

2) Adoption of new technologies, generated through research, will increase the demand for credit and will be influenced by agricultural pricing and credit policies followed by the Peruvian government.

3) The level and variability of farm income in Tarapoto and Contumaza will increase as a result of INIPA's R & E

programs, and

4) The labor short Tarapoto region will adopt labor-saving agricultural technologies, whereas the labor-abundant Contumaza region will adopt more labor-intensive technologies, if such technologies are available from the research stations.

The technique used to examine these working hypotheses will be reviewed in the procedures section, and then more thoroughly in the methods section of Chapter II.

1.5 Procedures

Linear programming will be used to help address the objectives of this thesis. Activities will be constructed for crops, labor use, and credit use with appropriate restrictions. Additional cropping activities will be introduced which incorporate new technologies that are emerging from the research stations. The resulting impacts on income, crop mix, labor, and water use will be examined. Changes in government policies, such as changes in interest rates, will be modeled through parametric programming. Although demand will not be modeled directly in the model, price impacts will be examined through parametric programming. Sensitivity analysis will be used to examine the stability of the optimal solution.

The LP model will be designed so that it can be adapted by INIPA's agricultural economics program. Once the initial input/output coefficients have been calculated, the LP model can be easily altered to model other facets of the agricultural sectors in the regions. LP algorithms exist for microcomputers which are available at the INIPA national office and are currently being installed in regional offices (CIPA's). An LP capability at the CIPA level would give INIPA the capacity to carry on additional analyses at the regional level.

An LP model cannot be constructed in a vacuum. A model is not simply built from a data set, but requires an understanding of the cultural and physical environments of a particular region. The following section gives a brief overview of the Peruvian setting and a background for this study.

1.6 The Setting

Peru, located between Chile and Ecuador on South America's Pacific coast, has a land area of 128.5 million hectares and an estimated population of 18.3 million (1982). The country is naturally divided into three geographic regions: The coast (Costa), a narrow strip of land running down the Pacific shore; the mountains (Sierra), 3 Andean mountain ranges that divide the country on a North/South axis; and the jungle (Selva), a watershed for the Amazon, in Eastern Peru.

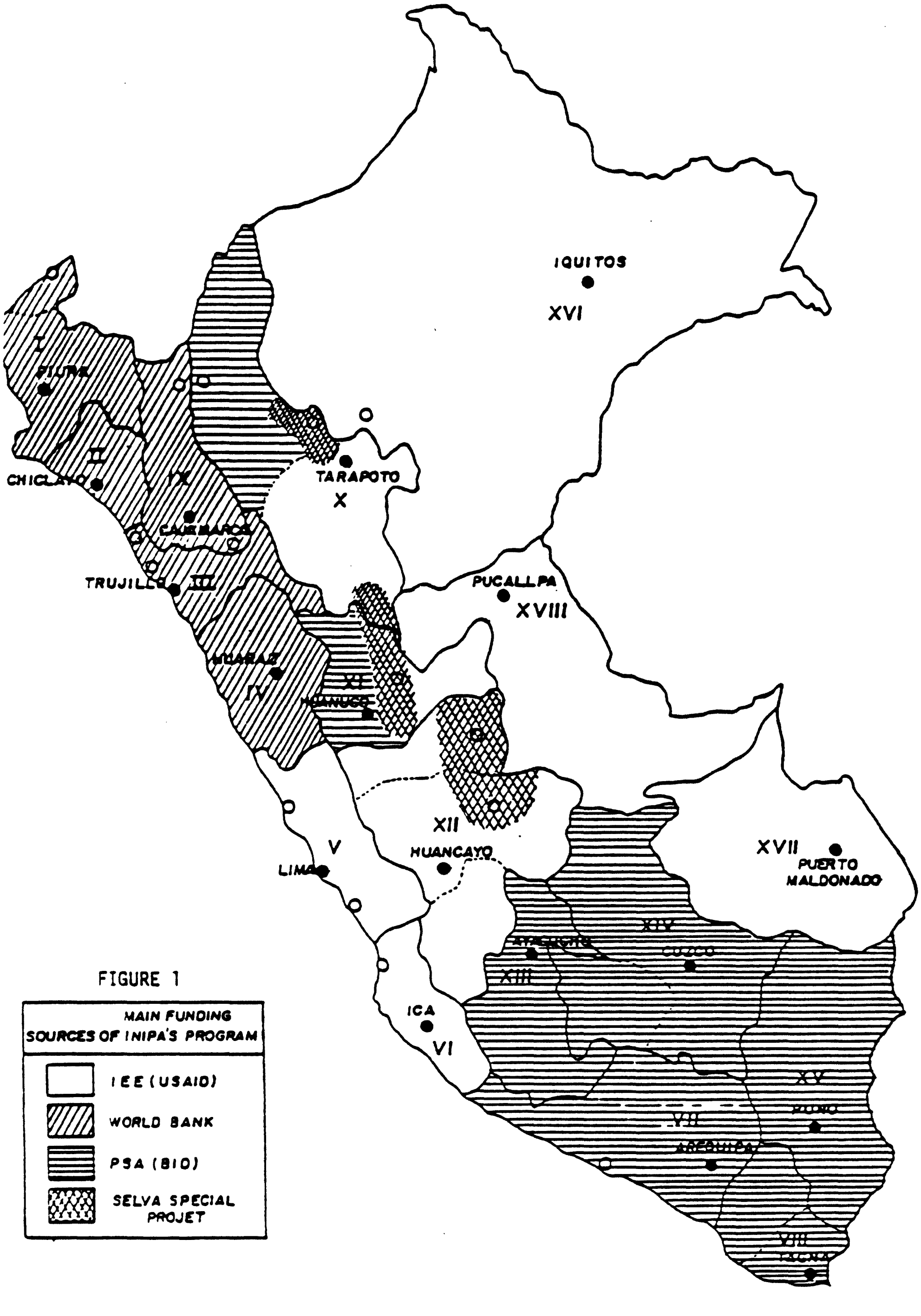

Figure I-1: Map of Peru

The Costa is the most economically active region. Although encompassing only 12% of Peru's territory, the Costa contains 45% of her population and most of her industry. The area is characterized by a very arid climate. Irrigation has permitted the region to become the center for Peru's commercial agriculture. Sugar is produced on large plantations, and cotton, rice, and other crops are produced on relatively small holdings or by share-cropping. In recent years, irrigation has become increasingly scarce, and salinity problems have developed. As new technologies for rice, corn, beans, potatoes, etc., are developed, their impact on water demand may play an important role in determining the crop mix.

The Sierra contains over 1/2 the cultivable land in Peru, and 50% of her population. The rugged terrain makes communication a problem and limits cultivation to a few mountain valleys and river bottoms. Agriculture becomes increasingly difficult at higher elevations. Above 4,200 feet, the climate will only support grazing of llama, vicuna, and alpaca. Marginal lands and steep slopes make most of the Sierra exploitable only through grazing. Rainfall is unevenly distributed throughout the year, and there are severe problems of deforestation and erosion. Most agricultural production takes place on large haciendas or small subsistence holdings. The major agricultural products of the region are livestock products, wheat, maize, and potatoes.

Sixty percent of Peru's land area is contained within the Selva, but only 6% of the country's population resides there. The climate of the rain forest is inhospitable, and the Andes cut off the Selva from the rest of the country. Any agricultural production faces enormous logistical problems, both in obtaining inputs and in marketing outputs. Yet, this area is the constant hope of Peruvian policy-makers, analogous to North America's western frontier in the 19th centruy. Rice production has been expanding in the area for the last 15 years, particularly in the upper Selva, which lies at the base of the Sierra.

In 1978, the government of Peru approached the United States Agency for International Development (A.I.D.) with a proposal for a complete review, or "Baseline Study", of Peru's research, extension, and education (REE) system. During the previous ten years the REE system had devoted its attention almost entirely to agrarian reform, and all but ignored research and extension. Agricultural production dropped 20% during that time and food imports increased to 14% of Peru's total import bill. Peru's foreign debt increased to 4.5 billion dollars. The research and extension service suffered from low morale; salaries were low, equipment aging, and materials few. The services were hit by an exodus of qualified personnel .

The Baseline Study resulted in a series of recommendations and the subsequent development of externally funded agricultural research, extension, and education projects. These projects were an attempt to redress some of the problems afflicting Peruvian agriculture and its REE system.

In 1980, Peru reorganized its agricultural research and extension services into one agency, INIPA (Instituto Nacional de Investigacion y Promocion Agropecuaria) with commodity and farming systems programs. Linkages were established with three international agricultural research centers, CIMMYT (Centro Internacional de Mejoramiento de Maiz y Trigo in Mexico) for technical assistance with wheat and corn, CIAT (Centro Internacional de Agricultura Tropical in Colombia) for assistance in tropical agriculture, particularly rice and beans, and CIP (Centro Internacional de la Papa in Peru) for technical assistance with potatoes.

INIPA is still in its formative years, but current austerity measures threaten to curtail its activities. The recently installed government has suggested reducing funds for agricultural research and extension. International program funds would be reduced if host country matching funds were unavailable. With this backdrop of financial uncertainty, the evaluation of agricultural research and extension becomes even more essential.

Through a research and extension evaluation project, of which this thesis is one component, INIPA hopes to demonstrate the benefits of agricultural research and extension in Peru and to generate evidence in support of institutional changes needed for maximum effectiveness of its R & E programs. This thesis proposes to give an impartial analysis of the available evidence in order to examine the impacts of agricultural research in Peru.

1.7 Thesis Organization

Chapter II examines the setting of each of the two regions included in this study. A review of the theories underlying this thesis is presented, followed by an overview of LP theory and an explanation of the methods used in construction of this thesis' models. The chapter concludes with an explanation of the data collection process.

Chapter III presents the results of the thesis, including basic analysis of the various models and sensitivity analysis. The chapter concludes with a section examining the limitations of the analysis. Chapter IV gives a summary of the results and conclusions. The chapter ends with a section examining the limitations of the analysis and gives suggestions for further research.

CHAPTER II

METHODS

This chapter briefly examines the settings of the two regions selected for study and presents a short review of the thought that forms the theoretical foundation for the analysis. It also summarizes the basic concept of linear programming and describes the data collection procedures used for this thesis.

2.1 Background

This thesis seeks results that will enable policy makers to assess the impacts of agricultural R & E programs on a regional level. Interregional comparisions are drawn to provide additional understanding of how regional resource differences can influence the impacts of new technologies on production, demand for credit, labor, and water use, and the effects of credit and other agricultural policies on technology adoption.

Two regions, one in the Selva, and one bordering the Costa, were selected for the analysis. The regions are competitive in the sense that they grow many of the same crops, especially rice and corn. The Selva has received many development resources recently as a result of preferential policies enacted to encourage agricultural development. A comparison between the Costa and the Selva allows examination of these policies and possible policy alternatives.

The area around Tarapoto, known as the Bajo Mayo, was chosen to represent the Selva. Contumaza was chosen to represent the coast. Contumaza is located in Cajamarca province and is not wholly representative of coastal agriculture, but possesses the major characteristics (i.e. irrigated cropping and significant rice and yellow corn production) that were sought by the study. It was chosen, in part, because a strike of public servants made data collection impossible at other coastal locations.

2.1.1 Contumaza

Contumaza is located in the province of Cajamarca, considered the gateway to the Andes. Located in Northern Peru, Cajamarca province borders the coastal provinces of Lambayeque and La Libertad but is considered part of the Sierra. The mountains rise out of the arid, desert-like coastal plains and quickly ascend into Andean peaks. Thus, Cajamarca encompasses several distinct micro climates: the native pasture of the high Andes, supporting llama, sheep and other omnivores, the mixed cropping on the lower mountains, pasture, wheat, potatoes, and corn, and the intensive cropping of the lower river valleys. The majority

Figure II-1: Map of Cajamarca Province.

of the farmers in Cajamarca are poor, eking out a meager existence from their mountainside plots. A few large livestock operations exist in some of the mountain valleys, shipping young animals to the coast for fattening. But most landholdings are small, seldom containing more than three hectares. Most of Cajamarca experiences ample rainfall, but as one moves closer to the coast, rainfall becomes less frequent and the climate becomes more arid.

The district of Contumaza borders the coastal province of La Libertad. The district is diverse, containing both, mountainous areas, characterized by traditional sierran agriculture, and river valleys, characterized by coastal, commercial agriculture. Because of its proximity to the coast, most of the district's commerce takes place with the coast rather than the departmental capital, Cajamarca. Although Contumaza receives its extension services and most other public services from Cajamarca, the services of E.N.C.I., E.C.A.S.A. (the state run rice purchasing board), and the Agrarian Bank come from the coast. The multiplicity of overlapping jurisdictions makes it difficult to gather and collate data for the area e.g., extension districts do not coincide with Agrarian Bank districts. Any study focusing on the area must take these jurisdictional problems into account.

The Jequetepeque valley begins as a narrow gorge in the Andes and winds its way through the mountains until opening up onto the broad coastal plain. Agriculture in the valley is almost entirely devoted to rice, corn, and fruit trees (mangoes). The agriculture in the valley is entirely under irrigation, with the river serving as the sole source of irrigation water. Thus, the area under cultivation varies directly with the river flow. Years of drought severely reduce the cultivated area. But contrary to expectations, wet years also reduce the cultivable area as the river overflows its banks and covers adjacent fields. This occurred in 1983 and 1984 with the floods brought on by the El Nino currents.

The modern commercialized agriculture of the Jequetepeque valley is juxtaposed with the traditional agriculture found on the mountain slopes in the area around the valley where very little machinery is used, and animal traction and hand hoeing are the traditional methods of cultivation. Common crops are wheat, barley, corn, and potatoes. Each landholder usually has a few chickens, perhaps some goats or sheep, and maybe a donkey or a cow. Practically all agriculture is devoted to subsistence production. While these farmers may appear "backward" because of their failure to use modern farming practices, modern practices may simply be uneconomical. In fact, some farmers who use absolutely no modern inputs in the production of low priced wheat or barley, use both fertilizer and pesticides on the more profitable potato crops in adjacent fields. Farming is tenuous on the steep mountain slopes, and erosion in the area has been severe. Yet farmers continue traditional cultivation practices. Traditional rotations include one season of wheat, a season of corn, and one of potatoes, followed by several years of pasture. Often, the necessities of subsistence force a reduction in the years of pasture.

2.1.2 Tarapoto

The subregion of Bajo Mayo is located in the department of San Martin in the Selva. Tarapoto, a city of 70,000, is the largest city in the region and the capital of San Martin. The region encompasses the entire lower reaches of the Mayo river. Bajo Mayo is located in the Eastern foothills of the Andes. Save for the river valleys and several escarpments, the region is quite hilly, with severe slopes on many of the ridges. The river valley contains most of the region's arable land, and the only land suitable for irrigation.

The opening of the road from the north coast in 1974 has permitted large numbers of migrants to enter the region. Over the past ten years, immigration has occurred at an average annual rate of 2.26%. Despite vast quantities of unsettled land, most of the region's arable land is already under cultivation.

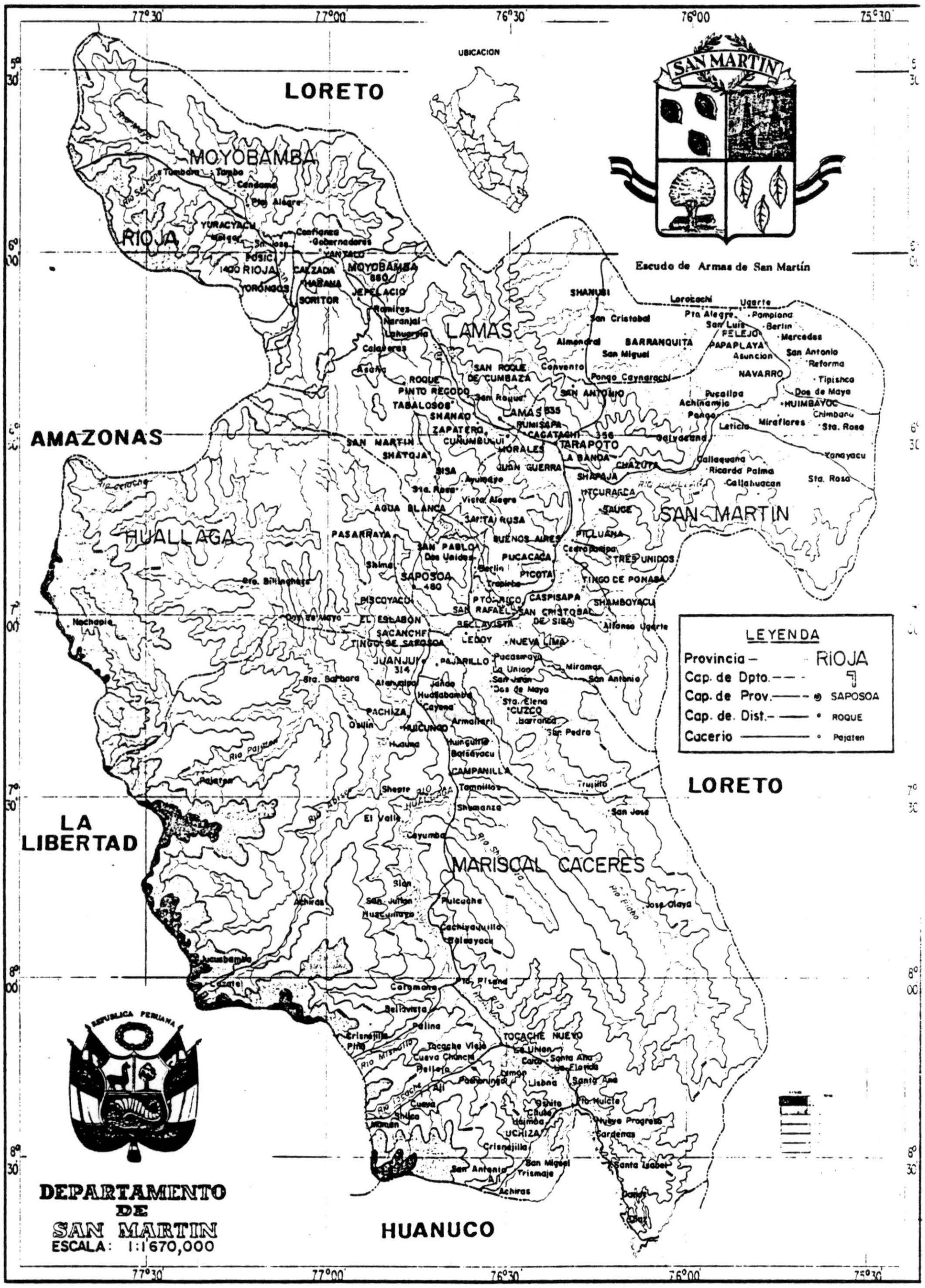

Figure II-2: Map of San Martin Province.

Traditionally, land was cultivated in a slash and burn type method, with intensive cultivation for 2-3 years followed by a 10 to 15 year fallow period, when the farmer would work other portions of his land. In this way, the land retained its fertility. In recent years, with increased population and higher producer prices, there has been pressure to put fallow land into production, with the fallow period being shortened, if not eliminated altogether. Commercial fertilizer has served, in part, as a substitute for fallow. However, with recent hikes in fertilizer prices, fertilizer use has been drastically reduced. With the rise, in real terms, of fertilizer prices in 1984, fertilizer sales by ENCI dropped, from 420,950 Kgs in 1982 to 158,950 kgs in 1984.

The average size of landholdings in the area is between 10 and 15 hectares. The largest group of farms (27%) hold from 5 - 10 ha, whereas medium size farms (20 - 50 ha) contain most of the cultivated land area (30%). Many of these farms are not contiguious, but consist of several scattered parcels. Typical practices of the small farmers include the cultivation of several crops, usually including corn, plantains, papaya, cassava, beans, and rice. Many of the crops are intercropped or planted in association, e.g. corn and tomatoes, plantains and vegetables, cotton and corn, tobacco and cotton, corn and beans, and palm trees and pasture. Because of the small size of the parcels and the multiplicity of crop associations, it is extremely difficult to obtain an accurate estimate of per hectare yields for many crops.

With the recent drop in fertilizer use and the shortening of the fallow period, yields for many crops have been dropping. This is especially true for corn, where traditional practices and varieties predominate and the impact of new technologies and varieties has not yet been felt.

On larger landholdings, monoculture, chiefly corn, tends to dominate. Corn is a main subsistence crop, and demand continues to be high for the product. Under irrigation, rice predominates. The government has set a guaranteed price for rice which has encouraged a large increase in its production, from 467,758 metric tons in 1978 to a 1982 level of 784,559 metric tons in Bajo and Alto Mayo. The increase can be attributed to expanded area devoted to rice production and the introduction of new high yielding, disease resistant varieties. Few farmers rotate their crops; low prices for legumes discourage this practice. Thus, it is common to observe two successive rice crops per year . The large rice producers do, however, tend to accept new technologies much more rapidly than the corn producers. New rice varieties are being introduced to the area, with no commensurate introduction of new legume varieties. The high initial investment in rice production may make the farmers more aggressive in their search for revenue, and thus more amenable to the introduction of new varieties and higher levels of inputs.

The Agrarian Bank is the official source of agricultural loans. In 1984, the Bank estimated that loans were offered at a nominal rate of 124%, or a -5% real rate of interest. Loans are offered only to titled landholders and untitled landholders who obtain a certificate of possession from the Ministry of Agriculture. This gives almost 90% of all farmers the right to receive loans from the Agrarian Bank. Yet, those farmers who are able to obtain official credit find that obtaining loans can often be a cumbersome and time consuming process. The amount loaned is usually set at 80-90% of a farmer's estimated costs. Inflation rapidly erodes the amount loaned and, as a result, farmers often find the amount of the loan insufficient to meet their needs. Default rates are high, with 14% of all loans failing to be repaid.

Despite the recent influx of immigrants, there remains a shortage of agricultural labor, and there appears no immediate solution to the problem. The region continues to be relatively isolated from the rest of the country, and health problems are more prevalent than on the coast. Wage rates for agricultural labor in the Selva are relatively high compared to the rest of the country, but labor is often lured to the more lucrative work in the coca fields. As long as coca (the base for cocaine) production remains as remunerative as it currently is, there appears to be no short term solution to the labor shortage.

The government's push to make Peru self sufficient in food has led to a great promotion of agricultural production in the area. Besides emphases in extension and research, the government's rice purchasing board, E.C.A.S.A., , provides a guaranteed price for rice that often exceeds world levels. This incentive has rapidly changed the face of agriculture in the region. Rice, both irrigated and dryland, has replaced other crops and livestock (especially cattle) production on the most fertile lands. Corn remains the predominant crop in the area; land suitable for the production of irrigated rice remains limited, although irrigated areas are currently being expanded.

The following section examines the methods used to analyze the impacts of new agricultural technologies on the above regions. It explores briefly the theoretical relationship between the relative resource scaricity in a region and the demand for particular types of technologies. These technologies may require new inputs to substitute for relatively scarce resources. A subsection then reviews some of the basic principles of linear programming, the technique used in this thesis to analyze the impacts of new technologies on input demand, credit needs, crop mix, and the level and variability of income in Tarapoto and Contumaza. The general structure of the model used in this study is then presented, followed by an examination of data collection for this thesis.

2.2 Methods

> "Traditionally, growth-oriented economic policy has focused on improving efficiency in resource utilization and on modifying savings and investment behavior. In the absence of successful efforts to achieve more rapid rates of technical and institutional innovation, the effects of efficiency gains and of modifications in savings and investment behavior can only be transitional." (Binswanger, Ruttan. p 2).

The majority of Peru's population, and the population of less developed countries in general, derives its livlihood from agricultural production. Reorganization of existing resources in order to bring about improvements in economic efficiency are likely to result in only limited increases in productivity. Thus, it is through improved technologies that the major opportunity for increasing production and income substantially lies.

Technical change in agriculture, resulting in part from the introduction of new varieties emerging from the research stations, can have several direct and indirect benefits. New varieties can increase the output per unit of land, holding costs of production constant, or they can decrease the costs of production while holding output per unit of land constant. Many new high yielding varieties have been criticized because of the high cost of their complimentary inputs, but returns per unit of product are often increased with the use of these new technologies. In general, new varieties will increase agricultural production. An increase in food production under free market conditions will lower food costs and thus foster improved nutrition and an increase in the real wage rate nationwide, thus affecting not only the rural but the urban sector as well. Increased food production may, at least in the long run, reduce food imports, a large part of Peru's import bill, saving valuable foreign exchange. Increases in agricultural exports will earn foreign exchange. Thus, the indirect benefits of increased agricultural production, through the introduction of new technologies, ripple throughout the entire economy.

A prominent theory explaining the impetus for, and the direction of, technical change has been the theory of induced innovation (Hicks, Ahmad, Hyami and Ruttan). Induced innovation views technical change not as an exogenous, random event, but as an endogenous process, brought about by economic factors.

> Induced innovation...indicates that factor scarcities or factor prices influence the direction of technical change for a particular commodity... this includes the response of the rate and direction of technical change to final demand conditions and to factor scarcities. (Binswanger in Arndt et. al. pp.526,527.).

Thus in Peru, the labor-abundant, land-constrained Costa should see a development of labor-intensive technologies. Whereas in the underpopulated Selva, a development of labor-saving technologies should occur.

Research can have an impact on commodity mix and the optimal factor ratios. For example, research on a relatively labor-intensive commodity resulting in a neutral technical change (with factor and goods prices held constant) increases the profitabilty of that commodity compared to others. The farmers produce more of the commodity and allocate more land and capital to its production. If a farmer can hire more labor at the going rate, the aggregate labor to land intensities in agriculture will increase despite the neutrality of the technical change.

According to the theory of induced innovation, much of the effects of resource (land, labor, water) saving technologies come about due to the resulting substitution of relatively cheaper (usually purchased) inputs for the more expensive, or scarce, factors of production. For example, the development and adoption of new varieties of rice may reflect the attempt to substitute new seeds, fertilizer, and irrigation for the scarce factor, land. Or, adoption of new machinery technologies may result in the substitution of machines for labor. Because these new inputs are usually purchased, they also may affect the demand for credit. The linear programming analysis which follows is an attempt to measure the effects of new technologies developed for the Costa and the Selva on the demand for particular types of inputs (labor, water, fertilizer) and for credit. It is also designed to explore the implications for farm level risk. If farmers are risk averse, the extent to which new technologies are risk reducing or risk increasing will likely influence their adoption.

2.2.1 The Linear Programming Model

Linear programming (LP) is probably the simplest and most computationally efficient of the various mathematical programming methods available. Time and data requirements are fewer for LP than for the other mathematical programming tools (e.g. quadratic programming). Many LP algorithms are available that can solve large problems at a nominal cost. Other mathematical programming algorithms are more cumbersome and expensive to solve. An LP model can be easily constructed and adapted to various Peruvian settings. LP algorithms also exist for the microcomputer, currently being installed in many CIPA's. This would give INIPA the capacity to carry on its own analyses at a regional level.

The basic linear programming problem maximizes (or minimizes) a linear objective function subject to a set of linear inequality constraints. The L.P. maximization problem can be formulated as,

$$\text{Max } Z = c'x$$

subject to

$$Ax \leq b$$
$$x \geq 0$$

where,

Z = the solution value of the objective function,
c' = a 1 x n vector of objective function coefficients,
x = a n x 1 vector of activity levels,
A = a m x n matrix of input-output coefficients, and
b = a m x 1 vector of constraints.

Every original problem, known as the "primal" problem, has a corresponding dual problem. The interpretation of the dual proves very useful in analysis of a model's results. If the above problem is the primal, then its dual can be specified as,

$$\text{Min } W = b'y$$

subject to

$$A'y \geq c$$
$$y \geq 0$$

where y is the activity level associated with the dual problem. More will be discussed about y's interpretation in the ensuing section.

Both the primal and dual problems find the extremum of a linear function by choosing non-negative variables subject to linear inequality constraints (Intrilligator).

The dual variables can be considered the lagrangian multipliers of the primal problem. Therefore, the above problem can be stated in equivalent terms as a lagrangian expression:

$$L(x,y) = c'x + y(b - Ax) = c'x + yb - yAx.$$

This results in the following Kuhn-Tucker conditions at the optimal levels of x and y denoted by x*, y*.

$$\begin{aligned} dL/dx &= c' - yA \leq 0 \\ (dL/dx)x &= (c' - yA)x = 0 \\ x &\geq 0 \end{aligned}$$

$$\begin{aligned} dL/dy &= b - Ax \geq 0 \\ (dL/dy)y &= (b - Ax)y = 0 \\ y &\geq 0 \end{aligned}$$

Had the primal problem been a minimization problem, then,

$$\text{Min } W = yb'$$

subject to

$$\begin{aligned} yA' &\geq c \\ y &\geq 0 \end{aligned}$$

would result in the following lagrangian,

$$L(y,x) = yb' + (c - y'A)x = yb' + cx - yA'x .$$

Then y* would be the solution if the following conditions hold at x*,y*:

$$\begin{aligned} dL/dy &= b' - A'x \geq 0 \\ (dL/dy)y &= y(b' - A'x) = 0 \\ y &\geq 0 \end{aligned}$$

$$\begin{aligned} dL/dx &= c - yA' \leq 0 \\ (dL/dx)x &= (c - yA')x = 0 \\ x &\geq 0 \end{aligned}$$

The Lagrangian and the Kuhn-Tucker conditions are the same for both problems (Intrilligator).

A simplified primal and dual representation of the model in this thesis can be represented in the following aggregate form:

PRIMAL

$$\text{Max } Z = 0x_1 \quad 0x_2 \quad 0x_3 \quad 0x_4 \quad 0x_5 \quad 1x_6$$

Resource	$a_{11}x_1$	$-1x_2$					$\leq b1$
Cash	$a_{21}x_1$	$a_{22}x_2$	$a_{23}x_3$	$a_{24}x_4$	$a_{25}x_5$	$1x_6$	$\leq b_2$
Credit			$a_{33}x_3$				$\leq b_3$

DUAL

$$\text{Min } W = b_1y_1 \quad b_2y_2 \quad b_3y_3$$

$a_{11}y_1$	$a_{21}y_2$		≥ 0
$-1y_1$	$a_{22}y_2$		≥ 0
	$a_{23}y_2$	$a_{33}y_3$	≥ 0
	$a_{24}y_2$		≥ 0
	$a_{25}y_2$		≥ 0
	$1y_2$		≥ 1

where,

x_1 = aggregate production activities
x_2 = aggregate labor hiring activities
x_3 = borrowing activity
x_4 = cash transfer
x_5 = selling activity
x_6 = activity transferring net returns to the objective function

a_{11}= technical coefficient for resource use
a_{21}= cash requirements for production activity

a_{22}= labor wage (cash requirements for labor)
a_{23}= cash from credit and cost of credit
a_{24}= cash transfer
a_{25}= cash obtained through selling of crops
a_{33}= credit requirements

b_1 = resource constraints
b_2 = residual cash from previous period
b_3 = credit limits

y_1 = shadow price on additional unit of resource
y_2 = shadow price on additional dollar of cash
y_3 = shadow price on additional dollar of credit

The dual variables (y_j's) can be thought of as shadow prices, i.e., the effect on the objective function of a one unit increase of the constraint. The shadow price of an additional dollar in the last month is one dollar. The other dual variables are determined by interactions among the variables. For example, the shadow price for a unit of resource is,

$$y_1 = - a_{21}y_2 / a_{11}$$

or, the marginal resource value is equivalent to the production activity cash requirements multiplied by the cash shadow price, divided by the input-output coefficient for resource usage.

Linear programming has it's limitations:

1. input-output relationships are assumed to be known with certainty,

2. because of linearity, LP cannot model increasing or

diminishing returns to scale,

3. inputs and outputs must be completely divisible.

4. price expectations cannot be incorporated into standard LP models, and

5. the model is static.

The linearity and certainty assumption could be relaxed through quadratic programming. Quadratic programming maximizes a quadratic objective function subject to linear constraints. But because of computational difficulties, LP is often used to approximate the uncertainty and nonlinearity problems handled by quadratic programming. For example, with the Mean Absolute Total Deviation (MOTAD) approach, LP can model risk in yield, price, and input cost (Hazell). Price expectations can also be approximated by changing the price parameters in the model.

This thesis uses two models, one for each region studied. The two models will contain the same basic structure, including the following activities,

1. cropping activities,
2. family and hired labor activities,
3. credit activities,
4. selling activities, and
5. cash, risk, and net revenue transfers.

The model incorporates the following constraints,

1. resource constraints,

2. cash flow constraints,
3. credit constraints,
4. extension constraints,
5. yield transfers, and
6. risk constraints.

The tableau on the following page represents the aggregate L.P. matrix. The model has a 23 month time horizon. This time frame was chosen in order to isolate a crucial 12 month period with overlapping activities, while minimizing the effects of terminal conditions on the solution. Any horizon less than 23 months would increase the effect of the choice of the time horizon on the selection of optimal activities, particularly cropping activities, in the model. A period longer than 23 months was considered unnecessary to address the objectives of the study.

2.2.2 The Crop Submatrix

The crop submatrix consists of both irrigated and non-irrigated crops disaggregated by time period and technology level. Technology levels are differentiated according to crop variety and cultivation practices. Brandao, McCarl, and Schuh used a similar technique in their 1984 study of Brazilian peasant farmers, distinguishing between traditional subsistence methods and proposed new cropping systems. Their model examined each system and its effects on

Equation\Activities	Irrigated Crop Production	Dryland Crop Production	Labor Hiring	Borrow Credit	Cash Transfer	Selling Activity	Risk Negative Deviations	Net Revenue	RHS
Expected Utility							-G	1	MAX
Irrigated Land	1								≤ LAND
Seed bed Transplant	-1								≤ 0
Dryland		1							≤ LAND
Water	A								≤ WATER
Labor	L	L	-1						≤ LABOR
Cash	M	M	W	-1	1	P		1	≤ 0
Credit				1					≤ CREDIT
Yield Transfer	-Y	-Y				1			≤ 0
Revenue Deviation Constraints							-1		
t=1	$RN1-\bar{RN}$								≤ 0
.	.								
.	.								
.									
t=6	$RM6-\bar{RM}$								≤ 0

Figure II-3: Linear Programming Tableau

distribution of income, employment, and marketable surplus. Goodwin, Sanders, and Hollanda (1980) used L.P. to examine the impact of sorghum as a substitute for corn in the same region of Brazil. Pomareda and Samayoa (1979) contrasted various production techniques in their study of governmental policy impacts on crop mix, yield, and area planted in Guatamala.

The cropping activities in this thesis' model use land, labor, and capital for production over several time periods. The activities enter the risk balance equation and contribute cost to net farm income.

A submatrix of ones reserves land for each activity for the length of that particular crop's growing season. Rice and tobacco are unique among the crops in that they are planted in seedbeds and, after 1 - 2 months, are transplanted to the field. This characteristic is incorporated into the model by transferring from seedbed to field at a 1/10 ratio.

Land area is measured in hectares; production is measured in kilograms. Input/output coefficients are calculated from budgets supplied by CIPA's, the Agrarian Bank, and experiment station researchers.

Livestock activities are not included in the model. Livestock production is negligible in Contumaza. Cattle production is not insignificant in Tarapoto, but is diminishing in importance. Furthermore, data on livestock production were unavailable in Tarapoto.

2.2.3 The Risk Constraint Submatrix

A risk constraint submatrix is included in order to model uncertainty in yields, prices, and costs. Because of the inherent yield uncertainty associated with new technologies, there is usually a high level of risk connected with their adoption. Consequently, the LP model used in this thesis will need to include a procedure that incorporates risk. In 1971, Hazell examined the current methods of modeling risk in mathematical programming. The Expected Income - Variance method incorporated risk into a quadratic programming model. Because of the difficulty of solving large problems with quadratic programming, Hazell proposed an alternative method using linear programing: the Mean Absolute Deviation (MOTAD) approach. MOTAD yielded similar results to the Expected Income - Variance method, but facilitated model solution because the model remained linear.

Hazell and Scandizzo (74) expanded upon this approach in their study of demand structures under risk. Hypothesizing that farmers maximize expected utility rather than simply expected profits, the authors linearized a quadratic objective function and simulated a market equilibrium under perfectly competitive, but risky, conditions.

Brink and McCarl (78) sought to determine if risk consideration in an L.P. model predicted actual farmer behavior. The authors compared a portfolio choice model (including risk) to a simple L.P. profit maximizing model without risk. Risk was divided into three catagories, each modeling a different farmer behavior pattern. The authors concluded that risk aversion was indeed a factor in farmer decision making.

In examining risk aversion among Brazilian peasant farmers, Dillon and Scandizzo (76) used an expected utility and safety first approach, hypothesizing that farmers are more risk averse when subsistence is threatened. However, the study showed a diverse distribution of risk attitudes on the part of the peasants.

Risk is incorporated into all the above studies through MOTAD. The same procedure will be used in this thesis. Hazell's MOTAD approach is based on the assumption that the decision maker(s) is either risk neutral or a risk averter, i.e., he must obtain a higher expected income in order to compensate for riskier enterprises. Higher risk is defined as a higher variance in income.

The risk submatrix coefficients are the gross margin ([Price x Yield] - variable costs) deviations from average for 6 periods. In order to take into account trends or cyclical changes, deviations from a moving average of 4 years is used to calculate the coefficient for each period.

Only positive transfer coefficients are included in the rows and, therefore, only negative sums are transferred to the objective function. The model thus minimizes the total negative deviations. The total negative deviation could be transformed into a standard deviation by multiplying by an appropriate factor, assuming that the data sampled comes from a normal distribution.

2.2.4 Credit

Information from the Agrarian Bank indicated that during the base year (1984), loans were made at a negative real rate of interest. However, the farmers faced hidden costs in obtaining the loans, essentially making the imputed costs positive. In the model, through parametric programming, real interst rates are varied to simulate the effect of various credit policy alternatives.

2.3 Model Validation

Model validation is a necessary, but difficult, component in confirming a model's accuracy. This thesis model measures the impacts of new technologies by introducing new technologies in the base year (1984). The new technologies are defined as new seed varieties (and their recommended package of inputs and cultivation practices), emerging from the research stations. Model validation would normally involve removing any high technology activities not yet adopted and running the model using only the remaining intermediate and low technology activities. The resulting optimal solution would then be compared to the mix of crops that was actually grown in the region in 1984. The closer the optimal solution is to the real crop mix, the greater the likelihood that the model approximates reality.

2.4 Parametric Programming

Parametric programming is required to analyze the effects of changes in exogeneous variables on the model's results. Changes in producer prices, credit policies, and risk can all be included in order to test their impacts on the final solution. Pomareda and Simmons, in their study of Mexican vegetable exports (1975), compared competitive and monopolistic pricing, tested risk coefficients, and varied other parameters to examine the effects of different governmental policies. Pomareda and Samayoa (1979) simulated a rise in Guatamalan producer prices in order to examine the impact on crop mix, yield, and area planted. This thesis alters the producer prices of various crops, interest rates, and the supply of credit in order to examine the impact of changes in government policies, and variations in the market.

The next section reviews the process of data collection for this study.

2.5 Data Collection

Coefficients for monthly labor use, machinery use, and use of other inputs were constructed from data obtained from three sources: the Agrarian Bank, the CIPA's, and interviews with research and extension personnel.

The Agrarian Bank is the main source of agricultural loans in the country. It has branches throughout the country whose jurisdictions usually coincide with local extension districts. The Bank targets specific crops or agricultural enterprises for loans. It then constructs a budget for each activity so targeted. These crop budgets include monthly requirements for labor, machinery, and animal traction. Also included are total costs for other inputs such as seed, fertilizer, and pesticides. Budgets are constructed on an annual basis for each crop at a given technology level. The budgets also show yields, total returns, and total costs for the activities.

Given the Agrarian Bank's national structure, there exists a uniform, systematic method for constructing these budgets. If there are errors in the budgets, the errors will be consistent within a region and among regions.

The Agrarian Bank is not simply a source of credit for farmers but is an arm of the government's agricultural development efforts. Thus, it does not behave as would a commercial bank. In its promotion effort, loans are offered at low, even negative (considering inflation), real rates of interest. The bank's promotion role also influences the construction of its budgets. Although loans are usually offered for only 80 to 90% of the production costs, these costs usually reflect a higher technological level (i.e. a higher level of inputs and costs) than many of the bank's customers follow. In this way, the bank gives an additional subsidy to the farmers. This also results in inflated costs of production for most cropping activity budgets. Yields may also be inflated to some extent.

The CIPA budgets, while similar in format to those of the Agrarian Bank, lack the systematization of the Bank budgets. Some regions may possess very complete budgets, while other regions have inadequate ones. Information may be poor for certain crops, and other crops may have no budgets at all. Many regions simply revise their previous year's budgets every year. While the budgets are supposed to reflect the costs of production on the average farms, many of the budgets seem to be based on demonstration plot or the experiment station results. Thus, yields tend to be inflated. CIPA budgets show corn yields in the Tarapoto area ranging from 1,500 to 3,200 kilos/ha, whereas conversations with extensionists indicated that typical yields for traditional practices would be 800 - 900 kg/ha. The differences between the yields would not be so significant if one knew that yields were inflated systematically. However, there seems to be a lack of standard criteria for constructing the budgets.

To obtain information on recently released varieties, or varieties that were pending release, investigators at the experiment stations were requested to fill out budgets. The forms for the budgets requested the same type of information that was available on the CIPA and Agrarian Bank budgets. Experimental data are lacking for rice in Cajamarca because the experiment station in Chiclayo handled the rice research for the region. The Chiclayo research station suffered from a terrorist fire bombing earlier in the year, damaging some research data. In addition, employees were on strike during the period of data collection.

Data also had to be collected on labor availability, credit policies, producer prices, availability of extension, as well as time series data on yields, prices, and costs of production mentioned above.

The primary source of data on labor availability in each region was the 1981 national census. Figures were obtained for the total population in each region, average size rural family, and the number of people over 15 years old who are active in the agricultural labor force. Secondary sources for the data were the ONERN reports for the regions. (Contumaza had no such report).

Producer price data was available from the farm budgets, and also from lists compiled by the CIPA's. Rice prices were obtained from E.C.A.S.A. Lists of input prices were also available at the CIPA 's and at E.N.C.I. in Pacasmayo.

Information on the availability of extension, as measured by the number of extension personnel, were obtained from the CIPA in Tarapoto. For Cajamarca, the office of the World Bank in Lima provided data on extension personnel.

Credit policy information was obtained from Agrarian Bank publications and discussions with Agrarian Bank personnel in Lima and in the field. Total loan amounts, loans per crop, and interest rates were obtained from personnel at each site.

Ten years of time-series data on crop yields were obtained from the Ministry of Agriculture in each department. Unfortunately, information on yields per crop variety were unavailable. Ten-year time-series data on producer prices for each crop in each department were obtained from INIPA. Time-series data on costs were unavailable. Background information on each area was gathered from interviews, CIPA and MOA publications, and ONERN studies.

The next chapter examines the result of the LP models, including a basic analysis of the two models, sensitivity analysis, and parametric programming results. In Chapter 4, the two models are compared, and the thesis concludes with a section examining the limitations of the analysis.

CHAPTER 3

RESULTS

Results of the linear programming models for Tarapoto and Contumaza are presented in this chapter. A base model is described for each region and compared with models containing differing levels of risk. The base plans are also compared to ones with changes in assumptions about prices, availability of credit and interest rates. Comparisons are made between the base models and models without the newly-released varieties. Shadow prices on constraints and non-selected activities are interpreted and implications of the model are discussed.

3.1 The Tarapoto Base Plan

A set of 3 L.P. runs is made under varying levels of risk. The run with no risk constraints (high risk) is considered the base run. Appendix tables B-1 and B-2 summarize the intermediate and low risk LP solutions.

The major irrigated crops selected were Cica 8 and Inti Irr 8 Naylamp - the same newly released variety of rice from two different budgets, Radin China and Peru - a traditional rice variety, and Improved Pelikan - an improved variety of soybeans. The soybean variety appears only in the initial months of the plan and seems to be filling irrigated land between seeding and transplanting of rice.

Major dryland crops selected are tobacco, Inti Ir 8 Naylamp - the same newly released variety rice as planted under irrigation, Perla - an intermediate technology rice, Estanquillo Carolina - a traditional rice variety, Marginal 28 Tropical - a newly released variety of yellow corn, Aspero Peruano - a traditional cotton variety, and Aspero Peruano grown in conjunction with cowpeas. Table III-1 shows the crops selected for the plan and the amount of land utilized by each crop. Table III-2 shows the crops actually grown in the region during the base year of 1984. The time horizon for the LP model is two growing seasons, while Table III-2 shows the results of only the 1984 growing season. Observe that the amount of corn suggested by the plan is considerably lower than what was actually grown in 1984. The acreage of cotton selected in the plan vastly surpasses the amount actually grown in the region. There appears to be several possible explanations for this. First, the price of cotton fluctuates widely with price changes on the international cotton market while corn, locally produced and consumed, does not see such wide changes in price. Thus, with a lower level of risk allowed, more corn and less cotton should be selected for the plan. Second, prices included in the model for cotton are uniform for all cotton varieties. However, Aspero Peruano is a much coarser variety than Upland American, a higher quality cotton also

TABLE III-1

Tarapoto Cropping Plan

Activity/Variety	Season	Hectares	Technology
IRRIGATED CROPS			
1. Rice/Inti, seedbed	Dec-Jan	91.5	High
2. Rice/Inti, field	Feb-Jul	915	High
3. Rice/Inti, seedbed	Apr-May	23.6	High
4. Rice/Inti, field	Jun-2Nov	236	High
5. Rice/Inti, seedbed	Jun-Jul	270	High
6. Rice/Inti, field	Aug-2Dec	2700	High
7. Rice/Inti, seedbed	2Nov-2Dec	63	High
8. Rice/Inti, field	2Jan-2Jul	633	High
9. Rice/Inti, seedbed	2Dec-2Jan	236.6	High
10.Rice/Inti, field	2Feb-2Jul	2366	High
11.Rice/Peru, seedbed	Jan-Feb	151.4	Traditional
12.Rice/Peru, field	Mar-Jul	1514	Traditional
13.Rice/Peru, seedbed	Feb-Mar	6.3	Traditional
14.Rice/Peru, field	Mar-Jul	63.	Traditional
15.Soy/Pelikan	Oct-Feb	1926	High
DRYLAND CROPS			
16.Tabacco, seedbed	2Jan-2Feb	266	Traditional
17.Tabacco, field	2Mar-2May	2662	Traditional
18.Rice/Inti	May-2Nov	11,119	High
19.Rice/Inti	Jun-2Dec	10,588	High
20.Rice/Inti	Jul-2Dec	17,614	High
21.Rice/Perla	Oct-May	1,167	Medium
22.Rice/Estanquillo	Oct-May	14,012	Traditional
23.Corn/Marginal 28	Feb-Jul	13,023	High
24.Cotton/Aspero	Jan-Aug	15,677	Traditional
25.Cotton/Aspero	2Jan-2Jul	25,540	Traditional
26.Cotton-Corn/Aspero	2Dec-2Jul	26,797	Traditional

TABLE III-2

Crops Grown in Tarapoto in 1984*

Activity	Hectares
IRRIGATED CROPS	
Rice	3064
NON-IRRIGATED CROPS	
Soy	100
Tabacco	593
Rice	7,567
Corn	38,870
Cotton	2,684
Sorghum	214

*Data for the base region do not exist for 1984. Cropping acreage is estimated from 1984 departmental data and the previous year's ratio of cropland in the region and cropland in the department.

grown in the region, and thus should receive a lower price on the market. Both a lower level of risk and a lower cotton price for Aspero Peruano are modeled in later runs.

Table III-3 shows some of the penalites for forcing into the base plan a hectare of each non-selected crop. For example, one interprets the value for rice5f to mean that the net worth would be reduced by $171.79 for each hectare of Inti 8 rice planted during March of the second growing season (heretofore referred to as the second March) forced into the model. Appendix A presents all the activities and constraints included in the models.

3.1.2 Labor Requirements

A total of 810,000 days of family labor are available per month. This labor is assumed to have a reservation wage rate of $.77 per day. There are 135,000 days of hired labor available at a daily wage rate of $1.28. Table III-4 shows the monthly demand for labor in the area. Peak demand for labor occurs during October (the first month of the cropping plan) February, May, June (harvest times), and November, December (planting times), February and July of the second season. Constraints on hired labor are binding during May and June of the first season, and July of the second season.

The shadow prices for labor provided by the dual solution can be interpreted as the reductions in the ending

TABLE III-3

Examples of Penalties for Non-Selected Crops

Activity	Penalty
Rice1b	158.21
Rice1c	289.60
Rice1g	419.05
Rice1j	22.11
Rice3d	88.07
Rice3e	262.38
Rice4a	80.00
Rice4bs	602.25
Rice4b	.31
Corn1a	115.26
Corn2a	421.27
Corn2b	534.06
Corn2f	157.02
Rice5a	11.21
Rice5f	171.79
Rice6c	72.04
Rice6e	208.82
Rice7z	11.33
Rice7e	264.02
Corn3e	15.30
Corn4b	34.27
Corn4e	1.02
Corn5b	73.95
Corn5c	165.43
Cotton5b	136.10
Cotton6c	335.02
Cotton7a	179.32
Cotton7d	395.43
Sorgd	43.85

TABLE III-4

Tarapoto Family and Hired Labor Use and Labor Shadow Prices

Month	Family Labor		Hired Labor		Shadow Price
	Amount	Cost reduced	Amount	Cost reduced	
Oct	17,343				
Nov	5,439				
Dec	4,224				
Jan	792,936				
Feb	810,000	.06			2.05
Mar	"	.28			2.27
Apr	459,867				
May	810,000	.17			.94
Jun	"	4.78	135,000	4.27	5.55
Jul	"	.51	2,367		1.28
Aug	"	.51	101,283		1.28
Sep	255,717				
2Oct	7,537				
2Nov	810,000	.56	135,000	.06	1.33
2Dec	"	2.48	"	1.97	3.25
2Jan	560,042				
2Feb	810,000	.51	96,484		1.28
2Mar	51,081				
2Apr	570,891				
2May	434,189				
2Jun	506,803				
2Jul	810,000	.51	53,525		1.28
2Aug		5.30	135,000	4.79	6.07

net worth which would arise if one unit of labor were removed. For example, in June and the second December when the hired labor constraint is binding, the shadow prices on labor are $2.48 and $4.78 respectively, meaning that farmers would be willing to pay those amounts for each additional unit of labor. The reduced costs on hired labor for these months are $4.27 and $1.97 meaning that for a one unit reduction of labor, the net revenue is decreased by those amounts. Notice that although the family labor constraints are binding for May, farmers would only be willing to pay .94 for each additional day of labor. Hired labor's wage is 1.28, therefore no labor is hired, thus the negative sign on hired labor's reduced cost.

3.1.3 Land

Table III-5 shows the use of land during the two growing seasons. The peak use for irrigated land comes in February through December of the second year and March through July of the second growing season. For non-irrigated land, peak land use comes in May, July, August, and December through June of the second growing season. Both irrigated and non-irrigated land have corresponding constraints and shadow prices on them for each month (Table III-6). The shadow price of a hectare of irrigated land in February is $144.80. However, this does not mean that a farmer would be willing to pay up to $144.80 for an

TABLE III-5

Tarapoto Land Use For Base Cropping Plan

Month	Irrigated Land	Non-Irrigated Land
Oct	570	177
Nov	813	177
Dec	813	177
Jan	3,000	37,267
Feb	3,000	37,267
Mar	2,460	51,202
Apr	2,460	51,202
May	2,730	55,000
Jun	3,000	49,059
Jul	3,000	55,000
Aug	3,000	54,524
Sep	3,000	34,716
2Oct	3,000	34,716
2Nov	3,000	34,716
2Dec	3,000	55,000
2Jan	487	55,000
2Feb	3,000	55,000
2Mar	3,000	55,000
2Apr	3,000	55,000
2May	3,000	55,000
2Jun	3,000	55,000
2Jul	3,000	49,621
2Aug	0	25,540

TABLE III-6

Shadow Prices on Land Constraints

Constraint	Unit	Shadow Price
IRRIGATED LAND		
Land Jan.	$/Hectare	33.50
Land Feb	"	144.80
Land Jun.	"	49.00
Land Jul.	"	294.00
Land Aug.	"	54.00
Land 2Nov.	"	195.00
Land 2Dec.	"	276.00
Land 2Feb.	"	79.00
Land 2May	"	525.00
NON-IRRIGATED LAND		
Land May	$/Hectare	55.00
Land Jul.	"	121.00
Land 2Dec.	"	6.05
Land 2May	"	299.00

additional hectare of irrigated land, because, as discussed below, a dollar spent at the beginning of the planning horizon is not the same as a dollar spent at the end of the planning horizon.

Table III-7 shows the shadow prices of the monthly cash constraints for the 23 month time horizon The shadow price of an extra dollar for the first six months is $2.58. This represents the value of an additional dollar during that period compounded to the 23rd month i.e. the opportunity cost of that dollar. The value of a dollar during the last month is $1 as one would expect. Thus, all shadow prices must be divided by the shadow price of money to obtain their real marginal values. The amount that a farmer can afford to pay for an extra hectare of irrigated land in February is not $144.80 but $144.80/2.58 = $56.12. This process must be performed on every shadow price in the model to obtain their real marginal values. After the first six months, the shadow price of an extra dollar is driven down to 1 indicating that the marginal value of a dollar is a dollar. Yet, even beyond this point shadow prices on some land constraints remain high. The high shadow price associated with land shows how constraining it is despite the labor shortage in the area. Non-irrigated land has an especially high shadow price during July, and May of the second season, the periods of corn harvest and cotton planting.

TABLE III-7

Tarapoto Shadow Prices on Cash Constraints

Month	Shadow Price
Oct	2.58
Nov	"
Dec	"
Jan	"
Feb	"
Mar	"
Apr	"
May	1.00
Jun	"
Jul	"
Aug	"
Sep	"
2Oct	"
2Nov	"
2Dec	"
2Jan	"
2Feb	"
2Mar	"
2Apr	"
2May	"
2Jun	"
2Jul	"

3.1.4 Credit Demand

Of the $3,538,169 of credit available, the entire amount is loaned during January. The amount of loanable funds becomes constraining in April. As shown in Table III-8, the shadow price for an extra dollar of credit in April is $1.55, or $.60 after being adjusted by the shadow price on money, indicating that for a loan of $1, a farmer would be willing to pay up to $1.60 six months later, when the loan is due. As money accumulates from crop sales, the need for credit decreases, until no credit is required after June. In reality, the demand for credit practically always surpasses the supply, especially at the low rates of interest currrently available. An absence of demand for credit indicates that activities in the model earn more than under actual farm conditions, or that the model does not incorporate all the costs accrued by farmers in the region. In the model, all profits are plowed back into the farming operation. There are no alternative expenditures other than on cropping activities, nor are there alternative investment activities.

3.1.5 Risk

Appendix tables B-1 and B-2 summarize the model's results under two levels of risk. Net revenue decreases incrementally with decreasing risk, from $53,895,157 in the base (high risk) run, to $52,997,382 under intermediate

TABLE III-8

Borrowing Plan for Tarapoto and Shadow Prices for an Additional Dollar of Credit

Month	Amount Outstanding	Shadow Price
Jan.	$3,533,200	0
Feb.	"	0
Mar.	"	0
Apr.	"	1.55
May	"	0
Jun.	"	0

risk, to $52,782,742 under the lowest level of risk. The amount of rice grown under irrigation shows virtually no change among the plans. Cica 8 acreage increases steadily as risk levels fall. None of the traditional rice variety is incorporated into the solution. This may accurately reflect the situation in the area as one variety of rice dominates; irrigated rice farmers are said to be relatively more progressive than the dryland farmers, and thus should more readily adopt new varieties. Soybean acreage dips during the intermediate risk scenario, but rebounds under low risk.

For non-irrigated acreage, high risk tobacco sees a steady decline until production is eliminated altogether under the low risk scenario. With newly released varieties of rice, acreage remains virtually constant for all levels of risk, but intermediate technology rice sees an increase in production under low risk conditions. This increase can be attributed to medium technology's marginally lower input requirements than the newly released variety. Cash becomes more constraining in the model as the model selects low risk, low return crops to replace the high risk, high return varieties. The traditional rice variety never enters the model because of its high labor requirements. For corn, the model favors the most recently released variety, Marginal 28. All corn production increases dramatically as risk decreases, with medium technology corn jumping from zero production in a risky environment to over 15,000 hectares in low risk situations. Low risk corn supplants high risk cotton as risk decreases. A comparison with actual conditions in 1984 shows corn production as the agricultural base for the region, with cotton production being relatively small.

3.1.6 Credit Policy

A comparison is made of alternative credit policies by varying the interest rates and the amount of credit available. The the effects of credit on the adoption of new varieties are also compared. The objective of the exercise is to see which policy alternative would have a greater impact on agriculture in the region. Current credit policy favors offering farmers low, even negative, interest rates. One result of this policy is that there exists excess demand for credit. If credit were offered at market rates of interest, what would be the net effect on agriculture? On the other hand, what would be the effect of raising or lowering the amount of credit available at current interest rates?

The interest rate on agricultural loans during the base period was set at 2.5% for a six month period, or a 5% annual rate. The interest rate is varied by raising it to a 10% annual rate and lowering it to 0. The amount of credit is also varied; it is both halved and doubled from a base year level of $3,533,200.

A reduction of the interest rate from 5% to 0 led to no change whatsoever in the cropping pattern. The reduction in the interest rate was not a sufficient incentive to induce the plan to change. This result may be explained by the model's ability to earn sufficient cash to cover operating expenses by the seventh month of the time period.

Nor does raising the interest rate to 10% change the cropping plan. The loan schedule does change with credit being dispersed in three different periods as opposed to one period in the base model. Credit becomes constraining in only one month, April, yielding a shadow price of $.60.

For an interest rate of 0 the loan schedule changes as well , with credit being dispersed in four periods, yielding a shadow price of $.61 in April, demonstrating a marginally higher demand for credit. All available credit is again utilized from January until June of the second year. Here, credit has a shadow price of 0, indicating that any additional credit is worth nothing, i.e. credit is being used in place of cash, although cash is not constraining during these months.

The effect of changes in the amount of credit available is more significant than changes in the interest rate with net revenue decreasing from $53,895,157 to $50,521,489 when credit is halved, and increasing to $55,661,866 when credit is doubled. With the drop in available credit, rice production remains relatively unchanged. Tobacco production is reduced and spread over two growing periods. The Perla variety of dryland rice is eliminated, and 18,561 new hectares of the newly released Inti rice is added. High-cost cotton production is decreased by 10,000 ha. The plan is substituting away from high cost commodities especially cotton and tobacco production.

Credit is utilized earlier in this scenario, and becomes constraining in January. The most severe constraint occurs during April when the shadow price for an additional dollar of credit is $.657. By June, no credit is demanded.

With less credit available, the demand for cash is higher. Cash on hand is reduced to zero during two months, with the shadow price reaching $.662 in April (the same as credit's shadow price) as compared to $.61 in the base model.

The drop in available credit decreases the demand for labor, especially the more expensive hired labor. In the base plan, during June, a farmer would be willing to pay up to $5.55 for an additional day of hired labor, but with credit reduced, he would be willing to pay only $3.19.

How does the drop in available credit affect the introduction of new varieties? One would anticipate that a drop in credit would make cash more constraining, with the model selecting low cost crops, many of which are traditional varieties. For dryland rice, production of the newly released variety is increased, replacing high cost cotton. However, newly released corn production is decreased while traditional cotton intercropped with cowpeas is increased.

With a doubling of available credit, net revenue is increased. Irrigated rice encroaches on soybean acreage and tobacco production decreases. Intermediate technology dryland rice production increases, and higher cost intermediate technology corn appears strongly in the solution, while the newly-released, labor-intensive, variety decreases. Traditional intercropped cotton and cowpea is replaced by high-cost cotton.

The pattern of loans changes as money is loaned in three installments. Available credit is never fully utilized so there is no shadow price on credit. Money is constraining during three months, with the shadow price, $.025 equaling the interest rate. Demand for labor increases.

3.1.7 Price Sensitivity

Sensitivity analysis of the base solution indicates not only what crops are in the solution, but how stable that solution is, e.g. the analysis will give the upper and lower limits that a price can change before a cropping activity level is changed. For example, one Aspero cotton activity is firmly ensconsced in the solution, revealing no change of acreage with a price between $.16 to $.22/kg. The level of 25,540 hectares remains unchanged through all the variations, including a reduction of the price of cotton from $.21 to $.17/kg. Other activities are much more sensitive to price changes, e.g. one tobacco activity level would change with any alteration in price. This is evidenced by its changes in cropping levels for every variation.

Prices for rice, corn, and cotton were changed to see the effect on the cropping plan. A fall in the price of rice by $.01 from $.17 to $.16 yields no change in irrigated rice acreage. However, total dryland rice acreage drops about 1800 ha. Perla, the traditional rice variety, drops out of the solution entirely. Cotton acreage also drops. The fall in cotton and rice acreage is made up by the strong increase in acreage devoted to improved corn. Table III-9 shows these results.

A penny rise in the price of corn from $.17 to $.18 yields no change in the cropping pattern for irrigated land. Dryland corn production increases by over 36,000 has, supplanting tobacco, rice, and cotton production. Table III-10 shows the results of this run.

TABLE III-9

Tarapoto Cropping Plan:
Price of Rice Falls

Activity/Variety	Ha
Irrigated Crops	
Rice/Inti, seed	3.4
Rice/Inti, field	34
Rice/Cica, seed	243
Rice/Cica, field	2430
Rice/Cica, seed	30
Rice/Cica, field	300
Rice/Cica, seed	266
Rice/Cica, field	2665
Rice/Cica, seed	300
Rice/Cica, field	3000
Soy/Pelikan	570
Dryland Crops	
Tobacco, seed	516
Tobacco, field	5162
Tobacco, seed	82
Tobacco, field	823
Rice/Inti	2128
Rice/Inti	30,754
Corn/Marginal 28	25,592
Corn/Marginal 28	329
Corn/Marginal 28	10,092
Corn/Marginal 28	5214
Cotton/Aspero	10869
Cotton/Aspero	25,540
Cotton/Corn	24,245

TABLE III-10

Tarapoto Cropping Plan:
Price of Corn Rises

Activity/Variety	Ha
Irrigated Crops	
Rice/Inti, seed	79
Rice/Inti, field	798
Rice/Cica, seed	243
Rice/Cica, field	2430
Rice/Cica, seed	30
Rice/Cica, field	300
Rice/Cica, seed	190
Rice/Cica, field	1901
Rice/Cica, seed	300
Rice/Cica, field	3000
Soy/Pelikan	30
Soy/Pelikan	540
Dryland Crops	
Tobacco, seed	246
Tobacco, field	2467
Tobacco, seed	43
Tobacco, field	431
Rice/Inti	31,573
Rice/Perla	164
Corn/Marginal 28	28,941
Corn/Marginal 28	18,144
Corn/Marginal 28	18,560
Corn/Marginal 28	10,898
Cotton/Aspero	4,850
Cotton/Aspero	25,540

One cent changes in the above prices were utilized because range analysis indicated that penny changes would affect the results. Range analysis showed that cotton required a larger change in price to substantially affect the solution, therefore price was changed by one standard deviation on a ten year time series. A drop in the price of cotton by one standard deviation from $.21 to $.17, leads to a drop in tobacco production, a slight drop in dryland rice production, and a significant increase in both improved varieties of corn (Marginal 28 and PMC 747). Over 40,000 ha of corn are added to the cropping plan. Table III-11 shows the change in the cropping pattern with the drop in cotton prices.

3.1.8 The Traditional Cropping Plan

In order to examine the impact of newly released varieties, the model is run with the recently released varieties removed. Cica 8 rice, Inti 8 rice, irrigated Planta Baja corn, Improved Pelikan soybean, dryland Inti 8 rice, Marginal 28 corn, and Upland American cotton are removed.

Net revenue decreases over $10,000,000 to $43,270,791 for the two year period. Radin China rice covers all the irrigated acreage. 7,000 ha of tobacco are grown over the two-year period. No dryland rice is grown. Cuban yellow corn is grown, and Aspero cotton again comes strongly into

TABLE III-11

Tarapoto Cropping Plan:
Price of Cotton Falls

Activity/Variety	Season	Ha	Technology
Irrigated Crops			
Rice/Inti, seed	Jun-Jul	253	High
Rice/Inti, field	Aug-2Jan	2534	High
Rice/Cica, seed	Nov-Dec	243	High
Rice/Cica, field	Jan-Jul	2430	High
Rice/Cica, seed	Apr-May	30	High
Rice/Cica, field	Jun-2Nov	300	High
Rice/Cica, seed	Jun-Jul	16	High
Rice/Cica, field	Aug-2Dec	164	High
Rice/Cica, seed	2Dec-2Jan	300	High
Rice/Cica, field	2Feb-2Jul	3000	High
Soy/Pelikan	Nov-Mar	570	High
Dryland Crops			
Tobacco, seed	Jan-Feb	198	Low
Tobacco, field	Mar-May	1987	Low
Tobacco, seed	Feb-Mar	36	Low
Tobacco, field	Apr-Jun	361	Low
Rice/Inti	Jul-2Dec	33,434	High
Rice/Perla	2Jan-2Jul	896	Med
Corn/Marginal 28	Feb-Jul	30,189	High
Corn/Marginal 28	Mar-Aug	19,077	High
Corn/Marginal 28	2Jan-2Jun	11,066	High
Corn/PMC 747	2Feb-2Aug	2,488	Med
Corn/PMC 747	2Jan-2Jul	18,392	Med
Cotton/Aspero	2Jan-2Aug	24,540	Low

the solution. Also, intercropped cotton and cowpea are planted widely. Table III-12 summarizes the results.

The result is not drastically different from the base run except that dryland rice is not selected. Demand for labor falls under the plan using only older varieties (henceforth referred to as the traditional cropping plan). Both hired labor and family labor use drops dramatically. During the peak month, the shadow price for labor is $5.55 in the base model, whereas in the traditional cropping plan it is $1.38. Credit use remains fairly similar between the two models. However, the credit shadow price in April under the traditional cropping plan is $.64 whereas in the base plan it is $.60. This indicates that the demand for credit is higher in the traditional cropping plan during this month.

The shadow price for money eventually falls to $1.0 by June in the traditional model, one month later than in the base model. The shadow price during the most constraining period is $.64 as compared to $.61 in the base model, showing that cash is more constraining under the less profitable base plan.

3.2 <u>The Contumaza Plan</u>

Three runs, simulating various levels of risk were run with the Contumaza model. The base model was run under the assumption of high risk i.e. the risk coefficient was equal

TABLE III-12

Tarapoto: Traditional Cropping Plan

Activity/Variety	Season	Ha
Irrigated Crops		
Rice/Radin, seed	Feb-Mar	300
Rice/Radin, field	Apr-Aug	3000
Rice/Radin, seed	2Dec-2Jan	300
Rice/Radin, field	2Feb-2Jun	3000
Dryland Crops		
Tobacco, seed	Jan-Feb	269
Tobacco, field	Mar-May	2698
Tobacco, seed	Mar-Apr	443
Tobacco, field	May-Jul	4430
Corn/Cuban	Dec-Jan	15,262
Corn/Cuban	Jan-Jul	14,586
Cotton/Aspero	Jan-Jul	18022
Cotton/Aspero	2Jan-2Aug	25,540
Cotton/Cowpea	2Dec-2Jul	29,459

to zero. Appendices C-1 and C-2 summarize the results from the low and medium risk runs.

The irrigated crops selected by the model are Viflor/Inti - a high technology variety of rice, Minabar - an intermediate technology rice, Arroz Commun - a traditional rice variety, green peas, and yellow corn.

More of the intermediate technology rice was chosen than the latest release. This seems to be the result of the high input costs for the newly-released variety. The intermediate technology rice was more labor-intensive. Thus, in a labor-abundant region, one would expect the labor-intensive variety to be selected.

Dryland crops selected by the model include Maiz Cancheros - a newly released white corn variety, potatoes, common barley, and Zapata Malvina - a newly released labor intensive barley variety. Table III-13 shows the crops selected for the plan. Table III-14 shows the crops actually grown in the region in 1984. The 23 month time horizon begins in July and ends in May.

Note that the model incorporates more white corn and potatoes than was grown in the region in 1984. One explanation for this phenomenon is that the environment in Contumaza is both Sierran and Coastal, yet not wholly one or the other. Budgets were utilized from both Coastal and Sierran areas. Budgets not specifically made for the area therefore may bias the results, e.g. Sierran budgets are

TABLE III-13

Crops Selected for the Contumaza Base Plan

Activity	Ha.	Technology	Season
A. Irrigated Crops			
Rice/Viflor seed	45.9	High	Apr-May
Rice/Viflor field	459.8	"	Jun-2Oct
Rice/Viflor seed	32.7	"	2Nov-2Dec
Rice/Viflor field	327	"	2Jan-2May
Rice/Minabar seed	257.5	Med	Dec-Jan
Rice/Minabar field	2575	"	Feb-Jul
Rice/Minabar seed	297.5	"	2Sep-2Oct
Rice/Minabar field	2975	"	2Nov-2May
Rice/Common seed	70	Low	Aug-Sep
Rice/Common field	708	"	Oct-Apr
Rice/Common seed	2.7	"	2Sep-2Oct
Rice/Common field	27	"	2Nov-2May
Pea	536		Jul-Dec
Pea	438		Aug-Jan
Pea	294		2Jul-2Dec
Corn/PM 701	45.9	High	Oct-Mar
B. Non-Irrigated Crops			
Barley/Local	4380	Low	Dec-May
Barley/Zapata Malvina	583	High	Feb-2Jul
Barley/Zapata Malvina	1144	"	2Dec-2May
Corn/Cancheros	4321	High	Sep-May
Potato/White	1144		Apr-2Nov
Potato/Mariva	390		Oct-Mar
Potato/Mariva	9285		2Oct-2Mar

TABLE III-14

Crops grown in Contumaza in 1983 and 1984

Crop	1984 Ha.	1983 Ha.
Irrigated Crops		
Rice	581	1277
Pea	1157	852
Yellow Corn	2220	2108
Yuca	130	130
Dryland Crops		
Barley	1360	1380
White Corn	284	1305
Potato	925	1134
Wheat	2190	5252

used for one potato variety. These budgets are based on wetter growing conditions than found in Contumaza. Thus, yields tend to be higher, and a model using these budgets would be biased toward growing these crops. However, Trujillo budgets were also used. Trujillo has a drier climate than Contumaza. Thus, a model incorporating Trujillo budgets would tend to select more drought resistant crops.

3.2.2 Labor Requirements

In Contumaza, 160,590 days of family labor are available per month. Hired labor is essentially unlimited because of the high population in the area, and the proximity of major urban areas. The price of hired labor is the same as in Tarapoto, $1.28 per day. Family labor's reservation wage is assumed to be lower in Contumaza because there is less alternative employment available than in Tarapoto. Table III-15 shows labor demand and the shadow prices on constrained labor. Peak demand for labor occurs during December, March, and May of the first year, and September through January of the second year. The highest shadow price for labor is $1.28, (adjusted by the shadow price of money equals the hired labor wage) occuring during September, November, and January of the second year. In November, one variety of rice is harvested, another is transplanted, and potatoes are harvested. A total of 193,005

TABLE III-15

Amounts of Family and Hired Labor Use and Shadow Prices

Month	Family Labor	Hired Labor	Shadow Price
Jul	15,569		
Aug	14,127		
Sep	34,574		
Oct	46,115		
Nov	24,900		
Dec	142,103		
Jan	52,485		
Feb	40,855		
Mar	160,590		1.34
Apr	26,703		
May	149,919		
June	13,795		
2Jul	19,620		
2Aug	66,967		
2Sep	160,590	48,636	1.63
2Oct	141,007		
2Nov	160,590	193,005	1.63
2Dec	160,590		.83
2Jan	160,590	66,095	1.63
2Feb	14,275		
2Mar	83,569		
2Apr	6,105		
2May	22,420		

days of extra labor are hired over the 23 month period, at the going daily wage of $1.28. Because of the unlimited supply of hired labor, farmers will only be willing to pay the going wage rate for an extra unit of labor.

Low demand for labor occurs at the beginning and end of the time horizon (July and May) and can be attributed to the inherent bias that startup and ending times can give to LP models. Otherwise, the lowest demand for labor occurs during the months of June to August, during the dry season.

3.2.3 Land

A total of 3,330 hectares of irrigated land and 10,430 hectares of dryland are available in the region. Irrigated land is used to its fullest capacity from February to July of the first year and from November to May of the second year. Table III-16 shows the shadow prices on fully utilized land. Highest shadow prices are obtained in March of both years at $245.32 and $335 respectively. Farmers would be willing to pay these prices for an extra hectare of irrigated land during these months of peak demand.

For non-irrigated land, the highest shadow price resulting from the model is $248.99 during November of the second year. This coincides with the harvest of one potato crop and the planting of another. The inclusion of a potato crop during the summer is somewhat questionable. The budget was obtained from the Cajamarca office and may have been

TABLE III-16

Shadow Prices on Contumaza Land Constraints

Constraint	Unit	Shadow Price
A. Irrigated Land		
March	$/Ha	248.11
April	"	298.7
July	"	76.
2November	"	66.
2March	"	335.
2April	"	35.5
2May	"	104
B. Non-Irrigated Land		
April	$/Ha	15.
May	"	68.
2November	"	318.47
2December	"	95.
2March	"	37.

created for a wetter climate than found in Contumaza. Its growing season coincides with Contumaza's dry season, a season that may be too arid for potatoes. A plan without this potato variety is described later. An intermediate shadow price for land, $53.16, is obtained during May of year 1, a month when barley is harvested.

3.2.4 Credit Demand

The base run shows the demand for credit peaking in October, November, and April of the first year. Credit demand then declines until August of the second year. All loans are paid off by September of the second year. By September, enough cash reserves are on hand so that no more credit is demanded. Again, this scenario does not reflect the existing situation in the region and probably indicates that some crops are modelled as being too profitable i.e their yields are too high, or some hidden expenses of the farm operator are not being included in the model.

Credit is most constraining during February of year 1. During February, the adjusted shadow price on credit is $.54 (for a six month period) showing that farmers would be willing to pay an annual interest rate of 108% for each extra dollar loaned. Table III-17 shows the shadow prices for credit and amounts loaned.

TABLE III-17

Borrowing Plan for Contumaza and Shadow Prices for an Additional Dollar of Credit

Month	Amount	Shadow Price
Oct	324,460	
Nov	357,401	
Jan	35,997	
Feb		1.67
Mar		.00005
April	324,460	.10798

3.2.5 Cash on Hand

A residual of $600,000 is assumed to be available to farmers in the region at the beginning of the time horizon. As would be expected, cash is constraining during the initial phase of the model, until cash can be generated from crop sales. The shadow price for money (i.e the value of money compounded to the 23rd month) is highest during the opening months of the model at $3.133; it falls to $3.098 during November and continues falling until it reaches 1 during March of the second year, i.e. for every dollar of cash, a farmer would be willing to pay only a dollar; money is no longer constraining.

Cash reserves fall to zero several times during the two cropping seasons: during October, December, February, March and April of year 1, and during February of year 2. These are periods of peak expenditures for farmers. The reduced cost for money in February of the first year is $.54, i.e. if a dollar is removed from the cash available, net revenue decreases by $.54.

3.2.6 Water Use

Irrigation water availability for the Contumaza region is set at 60% of the monthly flow of the Jequetepeque River, the sole source of irrigation water in the area. It is assumed that farmers cannot utilize the entire flow of the river, due to limitations set by the local water board.

Peak demand for water occurs during the months of November through March of both cropping seasons. Water is constraining in only three months, August and September of year 1 and August of year 2. In August of year 2 with a shadow price of $.247 a farmer would be willing to pay up to $.247 for each additional cubic meter of water.

3.2.7 Risk

Appendix tables C-1 and C-2 summarize two plans with varying levels of risk. Initially, as the risk level decreases, acreage devoted to the newly-released rice variety drops, but, the acreage increases for the lowest risk level. Intermediate technology rice acreage increases for a medium risk level. Traditional rice declines continually as risk decreases. Because time-series data on yield was not disaggregated by variety, a uniform level of risk was modelled for all rice varieites. One would expect newer varieties of rice of be riskier than the traditional varieties, but this could not be modelled. Therefore, changes in rice acreage is not a result of differing levels of risk among rice varieties.

Irrigated pea production replaces much of the rice as risk decreases. Rice production would appear to be less risky than the production of other crops because of a fixed price. However, rice has experienced high variability of yield over the past 10 years. At low levels of risk, low-risk yellow corn enters the solution at significant levels, contrasting sharply with the almost insignificant levels for the high risk scenarios.

In dryland areas, as risk decreases, a steady drop in high-risk potato production is observed. An unusual phenomenon is the increased production of peas and the decrease in low-risk barley production. The high technology barley is retained at a lower level and the traditional barley is eliminated altogether. Low-risk white corn appears to be supplanting barley production, and the pea season conveniently succeeds the corn season.

At lower risk levels, demands for labor and water are reduced as the less profitable, lower cost, lower risk crops are substituted for the high-revenue, high-risk crops. The shadow price of money falls as less income is generated by the model, i.e. the ability of one dollar to produce more money is diminished. Net revenue decreases from $14,093,210 in the high risk model, to $13,925,987 in the intermediate risk model, to $12,930,674 in the low risk model. As less revenue is generated, demand for credit increases and more money is loaned.

3.2.8 Credit Policy

Both the interest rate and the amount of credit available are varied in order to examine the impacts of credit various policies. The interest rate is altered from the base annual rate of 5% to 10% and lowered to zero in a subsequent run. Available credit is varied from a base of $717,860 to $1,435,720 and $358,730. Results of these runs are presented in Appendices C-3 through C-6.

By doubling the interest rate, net revenue decreases from $14,093,210 to $14,058,660, and the cropping plan is marginally altered. High-cost, traditional rice production falls and is replaced by the less costly newly-released rice variety. A small drop in the traditional higher-cost barley acreage is compensated for by a gain in the labor-intensive modern barley variety. High-cost white corn production decreases and a drop in the high-cost potato variety is replaced by less costly varieties. In general, higher cost production suffers under higher interest rates, although the level of the drop in production is marginal.

The shadow price for an extra dollar of credit in February drops from $.54 in the base plan to $.538 in the high-interest rate plan, indicating slightly less demand for credit. Yet, total money loaned is higher under the high-interest rate scenario. This seems to be because the higher interest rate reduces the return on money loaned, reducing cash on hand, and thus forcing cash to be more constraining. This is evidenced by the $.099 shadow price for cash in April, a higher figure than the base plan's $.091.

Under the low-interest rate scenario, net revenue increases to $14,127,275, and the cropping plan, in general, shifts to the more high-cost, high-return crops. Rice remains the anomaly, with the more labor-intensive Minabar variety gaining at the expense of the costlier Inti and Commun varieties. High-cost white corn production also drops, and a higher-cost potato variety takes over the production drops in the lower-cost varieties. The newly-released barley, Zapata Malvina, partially replaces drops in the costlier traditional variety.

The total amount of money loaned increases with the lowered interest rate. Demand for credit increases, with the February shadow price for an extra dollar of credit being $.545, higher than the base model's $.54. Cash becomes more constraining, receiving an April shadow price of $.098 as opposed to $.091 in April of the base model. The model appears to be shifting production to higher cost methods, thus increasing the demand for money.

When the amount of credit available is increased by a factor of two, revenue increases to $15,264,281 and the cropping plan changes dramatically. Minabar rice acreage expands, replacing declining pea acreage. Irrigated yellow corn acreage also expands. Traditional barley acreage drops to zero, replaced in part by the newly-released barley, but mainly by a dramatic increase in the high-cost, high-yield, white corn variety. High-cost Mariva potatoes totally replace the other white variety.

The amount of money loaned to farmers increases, and the shadow price for an extra dollar of credit during the period of peak demand decreases from $.54 to $.5. The shadow price for money also declines, falling to $1 by May of the first year as opposed to almost a year later in the second model. This is evidence that with more credit available, cash becomes less constraining.

When available credit is halved, net revenue decreases to $13,451,726. Labor-intensive Minabar rice replaces the high-cost common rice and also the high-cost irrigated pea. High-cost barley declines and high-cost white corn declines dramatically - both are replaced by less capital-intensive barley. Drops in high-cost potato production are replaced by gains in the less costly variety.

The level of loans drops in the model, but the expected rise in the shadow price of credit does not occur. The shadow price on credit is almost identical between the base and the low credit model. Demand for cash is not significantly different between the models, with only April's shadow price differing. The shadow price is $.098 for the low credit model and $.091 for the base. The absence of a noticable increase in the demand for credit or cash may indicate that the model has shifted into less costly methods and thus reduced demand. More likely, the initial amount of credit available in the base model is so low that any decrease in the amount would have little impact on the model.

3.2.9 The Traditional Cropping Plan

In order to examine the impact of newly released varieties, the model is run with these varieties removed. Viflor and Minabar rice are removed, PM 701 corn, and two wheat varieties, El Gavilan and INIAC-102 are withdrawn.

Common rice fills most of the irrigated area with a large portion of irrigated acreage devoted to peas at the beginning of the time horizon. Pea acreage drops off later in the time horizon. Dryland peas appear in the solution during the summer months. Again, it is not known whether this dryland pea budget is appropriate for the Contumaza region. Intermediate-technology barley and white potatoes continue to be selected, with a large increase in barley aceage. Net revenue falls from $14,093,210 to $12,947,890. Table III-18 shows the traditional cropping plan.

Total hired labor use falls by 1/3 in the model; total family labor use increases and is utilized to its fullest for six months in the traditional cropping plan. Money appears to be less constraining in the traditional cropping model, with shadow prices of $.515 and $.162 in February and the second March as opposed to $.54 and $.218 during the same periods in the base model. Credit use and demand for credit is higher in the base model. The shadow price for February credit on the base model is $.54 as opposed to $.50

TABLE III-18

Contumaza Traditional Cropping Plan

Activity/Variety	Season	Has
Irrigated Land		
Rice/Common, seed	Aug-Sep	141
Rice/Common, field	Oct-Apr	1417
Rice/Common, seed	Sep-Oct	152
Rice/Common, field	Nov-May	1525
Rice/Common, seed	Jan-Feb	38.6
Rice/Common, field	Mar-2Sep	386
Rice/Common, seed	2Sep-2Oct	333
Rice/Common, field	2Nov-2May	3330
Pea	May-2Oct	1417
Pea	Jul-Dec	38
Pea	Aug-Jan	347
Dryland Crops		
Pea	Mar-Aug	2178
Barley	Dec-May	6283
Barley	2Dec-2May	1457
Potato	Apr-2Nov	1457
Potato	Oct-Mar	1968
Potato	2Oct-2Mar	8972

in the traditional cropping plan.

3.2.10 Other Solutions

Because of uncertainty of whether off-season potatoes are correctly included in the model, a run is performed with these potatoes removed. Net revenue drops from $14,099,210 to $13,897,619. The removal of the potato variety leads to a change in the overall cropping pattern. The traditional rice variety entirely replaces both newly-released varieties during the second year. High cost white corn production increases along with a small increase in high-cost potato production. Traditional barley production drops while the improved variety increases production.

Total loans increase with the removal of off-season potatoes, but credit demand appears higher in the base model, with the peak shadow price on credit reaching $.54 in February, as opposed to $.52 in February of the no-potato model. However, in April, the shadow price for credit is higher in the no-potato model. The demand for money also seems lower in the no-potato model, and hired labor use declines by 2/3.

A further run was performed raising the price of yellow corn from $.17 to $.18, but the price increase led to no significant change in the model.

3.2.11 Model Validation

The purpose of model validation is to confirm that the model represents the characteristics of the region as accurately as possible. Keeping this in mind, several techniques were used for the validation process.

Initial runs of the model revealed some errors. One rice variety was removed from the Tarapoto model because the budget from which it was derived appeared to be adapted directly from the coastal region and thus did not reflect conditions in Tarapoto. Rice yields in Tarapoto have yet to equal yields on the coast, yet the aforementioned budget reported yields as high as any on the coast. Lentil beans were removed from the Contumaza model because of their minor significance in the region.

Some prices were changed in both models. With three different sources for prices, it was difficult to decide which set of prices was the most accurate. The initial $.41/kg price for Tarapoto cotton was abandoned in favor of a $.21/kg price, and, as is noted in Chapter III, this price may still be inflated. In Contumaza, a higher yellow corn price was chosen after the initial price was found to be too low. The corn planting period in Tarapoto was expanded from one month to three to ease the time constraint for growing corn, and more accurately reflect a diversity of planting times in the region. Water use in Contumaza was limited in an attempt to model the regulations of local water authorities.

Shadow prices were checked in order to see whether some constraints were excessively binding. Land shadow prices at the end of the time horizon in Tarapoto were found to be high, but this may simply be the result of a bias introduced by the beginning and ending points for the model. A high shadow price was obtained for labor in June, but high shadow prices are expected because of a labor shortage in the area. Save for high cotton production, the model's cropping plan was not extremely far from what was actually grown in the region. For Contumaza, cash and credit shadow prices were high, but both are constraining in reality. Again, the Contumaza model's cropping plan did not stray too far from what was grown in the region.

The next chapter presents a summary of the methods and results utilized in this thesis, and draws conclusions from the results. The final section of the thesis examines the limitations of the analysis, discusses the applicability of the procedure on the CIPA level, and gives suggestions for further research.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The objectives of this study were threefold: to evaluate the impacts of new technologies, defined as new seed varieties emerging from the research stations, on two regions; to assess the implications of these impacts for institutional action; and to develop a procedure that can be utilized by INIPA to assess the impacts of agricultural research and extension.

Linear Programming was selected as the method to achieve the above objectives. A base model was developed to describe the two regions of the study. Activities included irrigated and dryland cropping, borrowing, and selling.

Major constraints included in the model were irrigated and non-irrigated land, labor, irrigation water (in the case of Contumaza) cash, credit and risk. The mean total absolute deviation (MOTAD) approach was used to generate a series of plans under varying levels of risk.

The model was run under various levels of risk aversion, alternative credit arrangements, selected price changes, and finally, with the newly-released varieties removed from the model. Table IV-1 - IV-3 summarize the results of the various scenarios.

4.1 The Impact of Newly Released Varieties

The results of the models with and without the newly-released varieties were compared. The base model (including the new technologies) showed an increase in revenue, a rise in the demand for credit in both regions, and an increase in labor demand (Table IV-1). Cash is less constraining in both regions, as the more profitable new varieties generate more revenue.

The induced innovation theory suggests that in labor-short Tarapoto, labor-saving innovations would be introduced, and thus, with the adoption of the new technologies, demand for labor on a per acre basis would decrease. On the whole, Tarapoto showed a tendency to adopt the new labor-saving methods for rice and corn production, and decrease production of labor-intensive crops like cotton and tobacco. The profitability of the new varieties, and their shorter growing seasons led to an expansion of the area cultivated (within the constraints of the model) and a more intensive use of cultivated land. As a result, the introduction of new varieties with labor-saving methods led to the result of increasing aggregate demand for labor in the region.

In Contumaza, a labor-abundant region, the induced innovation theory suggests that the more labor-intensive technologies will be developed and adopted, and as a result, demand for labor per acre will increase. Of the two newly-released rice varieties, one is more labor intensive, yet

TABLE IV-1

Impacts of New Varieties, Lower Interest Rates, Greater Credit, and Risk on Revenue, Labor Demand and Borrowing in Contumaza and Tarapoto.

\Impacts on of\	Net Revenue		Labor Demand		Borrowing	
	CON	TAR	CON	TAR	CON	TAR
1. New Varieties	+9%	+25%	+.2%	+23%	+45%	0
2. Lower Interest Rates	+2%	0	0	0	+3%	+50%
3. Greater Credit Availability	+8%	+3%	+3%	0	+62%	+60%
4. INTERMEDIATE RISK	-1%	-2%	+9%	-1.7%	+11%	0
5. LOW RISK	-8%	-2%	-2%		+2.4%	0

TABLE IV-2

Impacts of New Varieties, Lower Interest Rates, Greater Credit, and Risk on Crop Mix and Adoption of New Varieties

\Impacts on of\	Major Crop Mix Changes		Adoption of New Varieties	
	CON	TAR	CON	TAR
1. New Varieties	RICE = +6% PEA = -30% BARLEY = -21% CORN = + POTATO = -12%	IRRICE = +40% TABACCO = -19% RICE = + CORN = +31 COTTON = -16%	—	—
2. Lower Interest Rates	PEA = -12% CORN = -15% BARLEY = +10%	0	RICE = +4.8% BARLEY = +96%	0
3. Greater Credit Availability	RICE = +3% PEA = -65% CORN = +67% BARLEY = -50% POTATO = -2%	RICE = =12% TOBACCO = -12% CORN = +29% COTTON = -21% SOY = -16%	RICE = +5% BARLEY = +76% IRCORN = +56%	RICE = -6% SOY = -16% CORN = -46%
4. INTERMEDIATE RISK	BARLEY = -88% PEA = + CORN = 10% POTATO = -5%	SOY = 30% TABACCO = -60% RICE = -9% CORN = +100% COTTON = -51%	BARLEY = -57% CORN = +10%	
5. LOW RISK	RICE = -45% PEA = +83% CORN = +7050% PEA = +5133% BARLEY = -91% CORN = +97% POTATO = -38%	RICE = +3.5% CORN = +103% COTTON + -55% TOBACCO = ILLIMINATED	RICE = -38% BARLEY = -70%	RICE = -4% CORN = +64%

TABLE IV-3

Impacts of Price Changes in Tarapoto

\Impacts on of\	Net Revenue	Major Crop Mix Changes	Labor Demand	Borrowing	Adoption of New Varieties
1. Raise Corn Price	+2%	Rice = -7% Tobacco = -50% Corn = +95% Cotton = -50%	-1%	0	Rice = -9% Corn = +68%
2. Lower Rice Price	-2%	Rice = -6% Tobacco = +3.8% Corn = +5%	0	0	Rice = -5% Corn = +5%
3. Lower Cotton Price	-9%	Corn = +4% Tobacco = -60% Cotton = -14%	-3%	0	Rice = -3.6% Corn = +54%

the most recently released variety is more costly. The base model selects substantially more of the labor-intensive variety. The base model also prefers the newly released labor-intensive barley variety. The results support the predictions of the induced innovation theory, as the model shows the tendency for the labor-abundant region to develop (except for high-cost Inti 8 rice) and adopt labor-intensive technologies (Table IV-2).

In summary, more labor is utilized in both regions with the introduction of new agricultural technologies. This occurs not only as a result of the intoduction of labor intensive technologies (in Contumaza), but also as a result of the more intensive use of land (in both regions). Demand for credit increases with the release of the new varieties, associated with the higher costs involved in the production of some of these varieties, and the increased intensity of land use. Cash becomes less constraining, especially later in the time horizon, as the more profitable crops are marketed.

4.2 Credit Policy

Altering the interest rates in Tarapoto had no effect on the cropping plan. The Tarapoto model earned sufficient money relatively early in the model to cover all operating expenses with cash on hand. Higher interest rates did not impinge on the availability of cash on hand to cover operating expenses.

In the Contumaza model, a higher interest rate led to a drop in the production of high-cost varieties, while production of newly-released labor-intensive varieties increased. In general, a high interest rate favored the utilization of the new varieties for the Contumaza region because of the nature of its resource base (abundant labor) and the development of new labor-intensive, low-cost varieties.

If higher interest rates encouraged the use of labor-intensive methods, the converse was not true with lower interest rates (Table IV-1, IV-2). A low interest rate yielded little gain in the production of high-cost crops. Labor-intensive rice increased production as did with labor-intensive barley. Economic theory would suggest that a lower interest rate would increase the cash on hand and thus encourage the use of higher-cost, higher-return production methods. The only higher-cost crop to expand production was potatoes.

Cropping changes resulting from altering the interest rate were marginal. Changes resulting from altering the absolute level of credit were more significant. In Contumaza, a drop in available credit resulted in a shift toward the newly-released labor-intensive varieties (Table IV-2). Yet, the opposite effect was not observed when the amount of credit available doubled. Labor-intensive newly-released varieties again increased their acreage. However, the rise in rice production was a result of its replacing low cost, less profitable peas. Labor-intensive barley appeared to fill a gap after the production of high-cost white corn. Thus, although the production of the newly-released labor-intensive varieties increased under conditions of higher credit availability, in general, the model did seem to be favoring higher-cost higher-yield cropping methods.

With available credit reduced, the Tarapoto model yielded mixed results with respect to the use of new varieties. Newly-released rice production expanded, but newly-released corn production fell. With an increase in available credit, the higher-cost intermediate technology corn supplanted the more recently released labor-intensive variety. Intermediate-technology rice also increased production at the expense of the latest release from the experiment stations. In both cases both the most recently released and the intermediate technology varieties were fairly recent releases from the experiment stations. Thus, the effect of credit availability on the introduction of new varieties seems to be difficult to generalize in Tarapoto. However, higher amounts of credit favor the high-yield, high-input varieties. Many of the latest releases from the experiment stations have been more "appropriate technology" varieties, requiring fewer inputs, but with lower yields than the high-yield, high-input varieties. The response of the "appropriate technology" varieties to a higher level of inputs is not known.

In summary, a policy of high interest rates favors production of low-cost varieties which encourages the introduction of new varieties in Contumaza. A low interest rate policy favors higher-cost production methods but does not appear to discriminate against the new varieties in Contumaza. The results from the Tarapoto model could not be generalized.

A much more significant impact is achieved through altering the amount of credit available rather than through altering interest rates. In Contumaza, net revenue is increased by 8% with increased credit, as compared to a 2% increase under a policy of low interest rates. Increasing available credit encourages the utilization of higher cost crops. Yet, because of the low-cost nature of many of the new production methods this does not seem to favor the introduction of new technologies in either Contumaza or Tarapoto. A drop in available credit favors the low-cost production methods, resulting in the adoption of new varieties in Contumaza but yielding mixed results in Tarapoto.

4.3 Conclusions

The results of this investigation can be summarized in five major conclusions:

1. The introduction of new varieties increases net income in both regions,

2. The introduction of new varieties increases labor use, both in labor-abundant Contumaza, and in labor-short Tarapoto,

3. The adoption of new varieties increases the demand for credit in both regions,

4. Under conditions of low risk, net revenue falls, and labor demand falls in both regions.

5. Altering the amount of credit available has a much more significant impact on agriculture in the regions than altering the interest rate.

Thus, regarding institutional action by the Agrarian Bank, a policy of lowering interest rates will have little effect on agriculture, and may have the drawback of decapitalizing the Bank. A policy of increasing the amount of credit available has a much more significant impact, permitting the adoption of high-cost, high-return varieties, and increasing overall income.

4.4 Limitations and Implications for Further Research

The main limitation of the analysis is one of data. Many crop budgets for the regions were incomplete and others unreliable. Prices were obtained from three sources which were sometimes conflicting. As a result, many judgements had to be made in constructing the budgets for the analysis.

Because of the limited time to gather data, and the inability to reconfirm certain data or gather additional data, the analysis was performed with the information at hand. Data problems is one of the main drawbacks of someone who is not close to the data source performing an analysis. However, with the adoption of the method discussed in this thesis by the CIPAs, this problem can be overcome. Local analysts, having a familiarity with the local agricultural conditions and institutional arangements, can utilize their knowlege to tailor the model to local conditions and correct for data deficiencies. In other words, an on-site analyst could modify a certain budget based on the information at hand or discard a budget entirely as being inappropriate. This effort could serve as a catalyst for improving systematically the method of data collection by INIPA. By knowing exactly what information is required to build or modify the model, appropriate budgets could be constructed and an improved method of data collection could be developed. Knowledge of the data requirements of the model may give local analysts the incentive to gather more accurate data and revise that data periodically.

Ideally, budgets could be constructed not only for individual varieties, but for individual varieties at different levels of input use. This would make the model more accurate, and an examination of the induced innovation hypothesis more fruitful. Furthermore, budgets could be obtained from the research stations in order to include emerging varieties in the model. For example, in Tarapoto, a new rice variety is being tested, PA-2. With a budget available, this variety could be incorporated into the model and its impact examined.

Current constraints could be divided into their components to yield richer results e.g. the capital constraint could be subdivided into a cash and machinery constraint in order to analyze the impact of machinery constraits on local agriculture. Further constraints could be added. In addition, alternative investment opportunities should be included in the model in order to make it more accurate.

The base model is fairly simple and small. It can be easily managed by microcomputers, and thus should not be difficult to transfer to INIPA. CIPA agricultural economists, with some training and practice, should be able to construct and analyze locally adapted LP models. The base model can be utilized not only for an examination of the introduction of new agricultural technologies, but can also be used as a framework to analyze credit policy, labor use, and pricing policy. There are numerous variations on the standard model which can provide insights into local agricultural situations.

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APPENDIX A

LISTING OF ACTIVITIES AND CONSTRAINTS IN THE LINEAR PROGRAMMING MODEL,

APPENDIX TABLE A-1. Activities in Tarapoto Model

1. Irrigated Crop Production

Rice1zs -	Cica 8, high tech rice,	seedbed,	Oct-Nov.
Rice1z -	Cica 8, high tech rice,	field,	Dec-Jun.
Rice1as -	Cica 8, high tech rice,	seedbed,	Nov-Dec.
Rice1bs -	Cica 8, high tech rice,	seedbed,	Dec-Jan.
Rice1a -	Cica 8, high tech rice,	field,	Jan-Jul.
Rice1b -	"	field,	Feb-Aug.
Rice1cs -	"	seedbed,	Apr-May.
Rice1ds -	"	seedbed,	May-Jun.
Rice1es -	"	seedbed,	Jun-Jul.
Rice1fs -	"	seedbed,	Jul-Aug.
Rice1c -	"	field,	Jun-2Jan.
Rice1d -	"	field,	Jul-2Jan.
Rice1e	"	field,	Aug-2Jan.
Rice1f -	"	field,	Sep-2Feb.
Rice1gs -	"	seedbed,	Sep-2Oct.
Rice1hs -	"	seedbed,	2Oct-2Nov.
Rice1is -	"	seedbed,	2Nov-2Dec.
Rice1js -	"	seedbed,	2Dec-2Jan.
Rice1g -	"	field,	2Nov-2Jan.
Rice1h -	"	field,	2Dec-2Jun.
Rice1i -	"	field,	2Jan-2Jul.
Rice1j -	"	field,	2Feb-2Jul.
Rice3as -	Inti 8, high tech rice,	seedbed,	Nov-Dec.
Rice3bs -	"	seed,	Dec-Jan.
Rice3a -	"	field,	Jan-Jul.
Rice3b -	"	field,	Feb-Jul.
Rice3cs -	"	seed,	Mar-Apr.
Rice3ds -	"	seed,	Apr-May.
Rice3es -	"	seed,	May-Jun.
Rice3fs -	"	seed,	Jun-Jul.
Rice3c -	"	field,	May-2Nov.
Rice3d -	"	field,	Jun-2Nov.
Rice3e -	"	field	Jul-2Dec
Rice3f -	"	field,	Aug-2Dec.
Rice3gs -	"	seed,	Sep-2Oct.
Rice3hs -	"	seed,	Oct-2Nov.
Rice3is -	"	seed,	2Nov-2Dec.
Rice3js -	"	seed,	2Dec-2Jan.
Rice3g -	"	field,	2Nov-2May.
Rice3h -	"	field,	2Dec-2Jan.
Rice3i -	"	field,	2Jan-2Jul.
Rice3j -	"	field,	2Feb-2Jul.
Rice4as -	Radin China trad. rice,	seed,	Dec-Jan.
Rice4bs -	"	seed,	Jan-Feb.

Rice4cs -	"	seed,	Feb-Mar.
Rice4a -	"	field,	Feb-Jun.
Rice4b -	"	field,	Mar-Jul.
Rice4c -	"	field,	Apr-Aug.
Rice4ds -	"	seed,	2Dec-2Jan.
Rice4es -	"	seed,	2Jan-2Feb.
Rice4fs -	"	seed,	2Feb-2Mar.
Rice4d -	"	field,	2Feb-2Jun.
Rice4e -	"	field,	2Mar-2Jul.
Rice4f -	"	field,	2Apr-2Aug.
Corn1a -	Yellow Planta Baja,high tech corn		Jun-Dec.
Corn1b -	"		Jul-2Dec.
Corn2a -	Marginal 28, high tech corn		Jan-Jun.
Corn2b -	"		Feb-Jul.
Corn2c -	"		Mar-Aug.
Corn2d -	"		2Jan-2Jun.
Corn2e -	"		2Feb-2Jul.
Corn2f -	"		2Mar-2Jul.
Soy1z -	Improved Pelikan,high tech soybean		Oct-Feb.
Soy1x -	"		Nov-Mar.
Soy1a -	"		Jul-2Nov.
Soy1b -	"		Aug-2Dec.
Soy1c -	"		Sep-2Jan.
Soy1d -	"		2Oct-2Feb.

2. <u>Dryland Crop Production</u>

Tab1as -	Traditional tobacco,	seedbed,	Jan-Feb.
Tab1bs -	"	seed,	Feb-Mar.
Tab1cs -	"	seed,	Mar-Apr.
Tab1a -	"	field,	Mar-May.
Tab1b -	"	field,	Apr-Jun.
Tab1c -	"	field,	May-Jul.
Tab1ds -	"	seed,	2Jan-2Feb.
Tab1es -	"	seed,	2Feb-2Mar.
Tab1fs -	"	seed,	2Mar-2Apr.
Tab1d -	"	field,	2Mar-2May.
Tab1e -	"	field,	2Apr-2Jun.
Tab1f -	"	field,	2May-2Jun.
Rice5a -	Inti 8, high tech rice,		Mar-Sep.
Rice5b -	"		Apr-Aug.
Rice5c -	"		May-2Nov.
Rice5d -	"		Jun-2Dec.
Rice5e -	"		2Jul-2Dec.
Rice5f -	"		2Mar-2Aug.
Rice6a -	Perla, med tech rice,		Nov-Jun.
Rice6b -	"		Dec-Jul.
Rice6c -	"		Jan-Jul.
Rice6d -	"		2Nov-2Jun.
Rice6e -	"		2Dec-2Jul.
Rice6f -	"		2Jan-2Jul.

Rice7z -	Estanquillo Carolino low rice	Oct-May.
Corn3a -	Marginal 28 high tech corn,	Nov-Jun.
Corn3b -	"	Dec-Jul.
Corn3c -	"	Jan-Jul.
Corn3d -	"	2Nov-2Jun.
Corn3e -	"	2Dec-2Jul.
Corn3f -	"	2Jan1-2Jul.
Corn4a -	PMC 747, med tech corn,	Jan-Jul.
Corn4b -	"	Feb-Aug.
Corn4c -	"	Apr-Sep.
Corn4d -	"	2Jan-2Jul.
Corn4e -	"	2Feb-2Aug.
Corn4f -	"	2Mar-2Sep.
Corn5a -	Cuban Yellow, low tech corn	Dec-Jun.
Corn5b -	"	Jan-Jul.
Corn5c -	"	2Dec-2Jun.
Corn5d -	"	2Jan-2Jul.
Cotton1a -	Upland American high tech cotton	Feb-Aug.
Cotton1b -	"	2Feb-2Aug.
Cotton2a -	Upland American med cotton	Dec-Jul.
Cotton2b -	"	2Dec-2Jul.
Cotton3a -	Aspero Peruano,med cotton	Jan-Jul.
Cotton3b -	"	2Jul-2Aug.
Cotton4a -	Aspero Cotton/Cowpea, low	Dec-Jul.
Cotton4b -	"	Jan-Aug.
Cotton4c -	"	2Dec-2Jul.
Cotton4d -	"	2Jan-2Aug.
Cotton5a -	Aspero Cotton/Corn, low	Dec-Jul.
Cotton5b -	"	2Dec-2Jul.
Cotton6a -	Aspero, low tech cotton	Dec-Aug.
Cotton6b -	"	Dec-Sep.
Cotton6c -	"	2Dec-2Aug.
Cotton7a -	Aspero, low tech cotton	Nov-Jul.
Cotton7b -	"	Dec-Aug.
Cotton7c -	"	2Nov-2Jul.
Cotton7d -	"	2Dec-2Aug.
Soy2a -	Soybean	Mar-Jul.
Soy2b -	"	Apr-Aug.
Soy2c -	"	2Mar-2Jul.
Soy2d -	"	2Apr-2Aug.
Sorga -	Sorghum	Jan-Jun.
Sorgb -	"	Feb-Jul.
Sorgc -	"	2Jan-2Jul.
Sorgd -	"	2Feb-2Jul.

3. <u>Family Labor Activities</u>

Famlpo -	Reserving of Family labor,	October
Famln	"	Nov
Famld	"	Dec
Famlj	"	Jan

Famlf	"	Feb	
Famlmr	"	Mar	
Famla	"	Apr	
Famlmy	"	May	
Famljn	"	Jun	
Famljl	"	Jul	
Famlau	"	Aug	
Famls	"	Sep	
Famlo	"	Oct	
Famlnl	"	2nd	Nov
Famldl	"	"	Dec
Famljl	"	"	Jan
Famlfl	"	"	Feb
Famlmrl	"	"	Mar
Famlal	"	"	Apr
Famlmyl	"	"	May
Famljnl	"	"	Jun
Famljll	"	"	Jul
Famlaul	"	"	Aug

4. <u>Hire Labor Activities</u>

Hlabpo	- Labor Hiring Activity,	October	
Hlabn	"	Nov	
Hlabd	"	Dec	
Hlabj	"	Jan	
Hlabf	"	Feb	
Hlabmr	"	Mar	
Hlaba	"	Apr	
Hlabmy	"	May	
Hlabjn	"	Jun	
Hlabjl	"	Jul	
Hlabau	"	Aug	
Hlabs	"	Sep	
Hlabo	"	Oct	
Hlabnl	"	2nd	Nov
Hlabdl	"	"	Dec
Hlabjl	"	"	Jan
Hlabfl	"	"	Feb
Hlabmrl	"	"	Mar
Hlabal	"	"	Apr
Hlabmyl	"	"	May
Hlabjnl	"	"	Jun
Hlabjll	"	"	Jul
Hlabaul	"	"	Aug

5. <u>Credit Distribution Activities</u>

LOANPO	- Loan distributed in	October
LOANN	"	Nov
LOAND	"	Dec

LOANJ	"	Jan
LOANF	"	Feb
LOANMR	"	Mar
LOANA	"	Apr
LOANMY	"	May
LOANJN	"	Jun
LOANJL	"	Jul
LOANAU	"	Aug
LOANS	"	Sep
LOANO	"	Oct
LOANN1	"	Nov
LOAND1	"	Dec
LOANJ1	"	Jan
LOANF1	"	Feb

6. <u>Cash Transfer Activities</u>

MONTPO - Cash transferred from October to November

MONTN	"	Nov
MONTD	"	Dec
MONTJ	"	Jan
MONTF	"	Feb
MONTMR	"	Mar
MONTA	"	Apr
MONTMY	"	May
MONTJN	"	Jun
MONTJL	"	Jul
MONTAU	"	Aug
MONTS	"	Sep
MONTO	"	2nd Oct
MONTN1	"	" Nov
MONTD1	"	" Dec
MONTJ1	"	" Jan
MONTF1	"	" Feb
MONTMR1	"	" Mar
MONTA1	"	" Apr
MONTMY1	"	" May
MONTJN1	"	" Jun
MONTJL1	"	" Jul

6. <u>Crop Selling Activities</u>

SRA - Rice Selling Activity,		April
SRMY	"	May
SRJN	"	Jun
SRJL	"	Jul
SRAU	"	Aug
SRS	"	Sep
SRO	"	Oct
SRN1	"	2nd Nov
SRD1	"	" Dec

SRJ1	"	"	Jan
SRF1	"	"	Feb
SRMY1	"	"	May
SRJN1	"	"	Jun
SRJL1	"	"	Jul
SRAU1	"	"	Aug
SCJN - Corn selling Activity		June	
SCJL	"	Jul	
SCAU	"	Aug	
SCD1	"	2nd	Dec
SCJN1	"	"	Jun
SCJL1	"	"	Jul
SCAU1	"	"	Aug
SSYF- Soybean selling Activity		Feb	
SSYMR	"	Mar	
SSYJL	"	Jul	
SSYAU	"	Aug	
SSYN1	"	2nd	Nov
SSYD1	"	"	Dec
SSYJ1	"	"	Jan
SSYF1	"	"	Feb
SSYJL1	"	"	Jul
SSYAU1	"	"	Aug
STMY - Tobacco selling Activity		May	
STJN	"	Jun	
STJL	"	Jul	
STMY1	"	2nd	May
STJN1	"	"	Jun
STJL1	"	"	Jul
SCTJL - Cotton selling Activity		Jul	
SCTAU	"	Aug	
SCTS	"	Sep	
SCTJL1	"	2nd	Jul
SCTAU1	"	"	Aug
SCTUJL - Cotton selling Activity		Jul	
SCTAU	"	Aug	
SCTJL1	"	2nd	Jul
SCTAU1	"	"	Aug
SSGJN - Sorghum selling Activity		Jun	
SSGJL	"	Jul	
SSGJN1	"	2nd	Jun
SSGJL1	"	"	Jul
SPJL - Cowpea selling Activity		Jul	
SPAU	"	Aug	
SPJL1	"	2nd	Jul
SPAU1	"	"	Aug

7. Risk Transfers

RISKA
RISKB

RISKC
RISKD
RISKE
RISKF

8. Net Revenue

REVENUE

APPENDIX TABLE A-2

Constraints of Tarapoto Model

1. Irrigated Land Constraints

LANWPO -	Irrigated Land	October	
LANWN	"	Nov	
LANWD	"	Dec	
LANWJ	"	Jan	
LANWF	"	Feb	
LANWMR	"	Mar	
LANWA	"	Apr	
LANWMY	"	May	
LANWJN	"	Jun	
LANWJL	"	Jul	
LANWAU	"	Aug	
LANWS	"	Sep	
LANWO	"	2nd	Oct
LANWN1	"	"	Nov
LANWD1	"	"	Dec
LANWJ1	"	"	Jan
LANWF1	"	"	Feb
LANWMR1	"	"	Mar
LANWA1	"	"	Apr
LANWMY1	"	"	May
LANWJN1	"	"	Jun
LANWJL1	"	"	Jul
LANWAU1	"	"	Aug

2. Seedbed to Field Transplanting

STRAN1 to STRAN39 are rice transplants from seedbed to field

3. Dryland Constraints

LANDPO -	Dryland	October	
LANDN	"	Nov	
LANDD	"	Dec	
LANDJ	"	Jan	
LANDF	"	Feb	
LANDMR	"	Mar	
LANDA	"	Apr	
LANDMY	"	May	
LANDJN	"	Jun	
LANDJL	"	Jul	
LANDAU	"	Aug	
LANDS	"	Sep	
LANDO	"	Oct	
LANDN1	"	2nd	Nov
LANDD1	"	2nd	Dec

LANDJ1	"	"	Jan
LANDF1	"	"	Feb
LANDMR1	"	"	Mar
LANDA1	"	"	Apr
LANDMY1	"	"	May
LANDJN1	"	"	Jun
LANDJL1	"	"	Jul
LANDAU1	"	"	Aug

4. <u>Labor</u> <u>Contraints</u>

LABPO -	Labor	October	
LABN	"	Nov	
LABD	"	Dec	
LABJ	"	Jan	
LABF	"	Feb	
LABMR	"	Mar	
LABA	"	Apr	
LABMY	"	May	
LABJN	"	Jun	
LABJL	"	Jul	
LABAU	"	Aug	
LABS	"	Sep	
LABO	"	Oct	
LABN1	"	2nd	Nov
LABD1	"	"	Dec
LABJ1	"	"	Jan
LABF1	"	"	Feb
LABMR1	"	"	Mar
LABA1	"	"	Apr
LABMY1	"	"	May
LABJN1	"	"	Jun
LABJL1	"	"	Jul
LABAU1	"	"	Aug

5. <u>Cash</u> <u>Constraints</u>

MONPO - Cash residual of 1,000,000 available Oct

MONN - Cash constraint		Nov	
MOND	"	Dec	
MONJ	"	Jan	
MONF	"	Feb	
MONMR	"	Mar	
MONA	"	Apr	
MONMY	"	May	
MONJN	"	Jun	
MONJL	"	Jul	
MONAU	"	Aug	
MONS	"	Sep	
MONO	"	2nd	Oct
MONN1	"	2nd	Nov

MOND1	"	"	Dec
MONJ1	"	"	Jan
MONF1	"	"	Feb
MONMR1	"	"	Mar
MONA1	"	"	Apr
MONMY1	"	"	May
MONJN1	"	"	Jun
MONJL1	"	"	Jul
MONAU1	"	"	Aug

6. Credit Constraints

CREDPO - Credit Constraint		Oct
CREDN	"	Nov
CREDD	"	Dec
CREDJ	"	Jan
CREDF	"	Feb
CREDMR	"	Mar
CREDA	"	Apr
CREDMY	"	May
CREDJN	"	Jun
CREDJL	"	Jul
CREDAU	"	Aug
CREDS	"	Sep
CREDO	"	2Oct
CREDN1	"	2Nov
CREDD1	"	2Dec
CREDJ1	"	2Jan
CREDF1	"	2Feb
CREDMR1	"	2Mar
CREDA1	"	2Apr
CREDMY1	"	2May
CREDJN1	"	2Jun
CREDJL1	"	2Jul

7. Yield Transfers

YLDRA - Rice Yield Transfer		Apr
YLDRMY	"	May
YLDRJN	"	Jun
YLDRJL	"	Jul
YLDRAU	"	Aug
YLDRS	"	Sep
YLDRO	"	2Oct
YLDRN1	"	2Nov
YLDRD1	"	2Dec
YLDRJ1	"	2Jan
YLDRF1	"	2Feb
YLDRMY1	"	2May
YLDRJN1	"	2Jun
YLDRJL1	"	2Jul

YLDRAU1	"	2Aug
YLDCJN - Corn Yield Transfer		Jun
YLDCJL	"	Jul
YLDCAU	"	Aug
YLDCS	"	Sep
YLDCD1	"	2Dec
YLDCJN1	"	2Jun
YLDCJL1	"	2Jul
YLDCAU1	"	2Aug
YLDSYF - Soybean Yield Transfer		Feb
YLDSYMR	"	Mar
YLDSYJL	"	Jul
YLDSYAU	"	Aug
YLDSYN1	"	2Nov
YLDSYD1	"	2Dec
YLDSYJ1	"	2Jan
YLDSYF1	"	2Feb
YLDSYJL1	"	2Jul
YLDSYAU1	"	2Aug
YLDTMY1 - Tobacco Yield Transfer		2May
YLDTJN	"	Jun
YLDTJL	"	Jul
YLDTMY1	"	2May
YLDTJN1	"	2Jun
YLDTJL1	"	2Jul
YLDCTJL - Aspero Cotton Yield Transfer		Jul
YLDCTAU	"	Aug
YLDCTS	"	Sep
YLDCTJL1	"	2Jul
YLDCTAU1	"	2Aug
YLDKJL - Upland American Cotton Yield Transfer		Jul
YLDKAU	"	Aug
YLDKJL1	"	2Jul
YLDKAU1	"	2Aug
YLDSGJN - Sorghum Yield Transfer		Jun
YLDSGJL	"	Jul
YLDSGJN1	"	2Jun
YLDSGJL1	"	2Jul
YLDPJL - Cowpea Yield Transfer		Jul
YLDPAU	"	Aug
YLDPJL1	"	2Jul
YLDPAU1	"	2Aug

8. <u>Deviations from Net Returns for Risk</u>

RISK1
RISK2
RISK3
RISK4
RISK5
RISK6

APPENDIX TABLE A-3

CONTUMAZA ACTIVITIES

1. Irrigated Crop Production

ARROZA	- Viflor/Inti, high tech rice,	seedbed,	Nov-Dec
ARROZB	" "	seed	Dec-Jan
ARROZC	" "	field	Jan-May
ARROZD	" "	field	Feb-Jun
ARROZE	" "	seed	Apr-May
ARROZF	" "	seed	May-Jun
ARROZG	" "	field	Jun-2Oct
ARROZH	" "	field	Jul-2Nov
ARROZI	" "	seed	2Nov-2Dec
ARROZJ	" "	field	2Jan-2May
ARROZ2A	- Minabar, high tech rice,	seed	Sep-Oct
ARROZ2B	" "	seed	Oct-Nov
ARROZ2C	" "	seed	Nov-Dec
ARROZ2D	" "	seed	Dec-Jan
ARROZ2E	" "	field	Jan-May
ARROZ2F	" "	field	Dec-Jun
ARROZ2G	" "	field	Jan-Jul
ARROZ2H	" "	field	Feb-Jul
ARROZ2I	" "	seed	Feb-Mar
ARROZ2J	" "	seed	Mar-Apr
ARROZ2K	" "	seed	Apr-May
ARROZ2L	" "	seed	May-Jun
ARROZ2M	" "	field	Apr-2Oct
ARROZ2N	" "	field	May-2Nov
ARROZ2O	" "	field	Jun-2Dec
ARROZ2P	" "	field	Jul-1Dec
ARROZ2Q	" "	seed	2Sep-2Oct
ARROZ2R	" "	field	2Nov-2May
ARROZ3A	- Common, low tech rice	seed	Jul-Aug
ARROZ3B	" "	seed	Aug-Sep
ARROZ3C	" "	seed	Sep-Oct
ARROZ3D	" "	field	Sep-Apr
ARROZ3E	" "	field	Oct-Apr
ARROZ3F	" "	field	Nov-May
ARROZ3G	" "	seed	Nov-Dec
ARROZ3H	" "	seed	Dec-Jan
ARROZ3I	" "	seed	Jan-Feb
ARROZ3J	" "	field	Jan-2Aug
ARROZ3K	" "	field	Feb-2Aug
ARROZ3L	" "	field	Mar-2Sep
ARROZ3M	" "	seed	2Jul-2Aug
ARROZ3N	" "	seed	2Aug-2Sep

ARROZ3O	"	"	seed	2Sep-2Oct
ARROZ3P	"	"	field	2Sep-2Apr
ARROZ3Q	"	"	field	2Oct-2Apr
ARROZ3R	"	"	field	2Nov-2May
ARROZ3S	"	"	seed	Jul-Aug
ARROZ3T	"	"	seed	Aug-Sep
ARROZ3U	"	"	field	Sep-Apr
ARROZ3V	"	"	field	Oct-Apr
TPEA1A - Green Pea, Intermediate tech,				May-2Oct
TPEA1B	"	"		Jun-2Nov
TPEA1C	"	"		Jul-2Dec
TPEA1D	"	"		Aug-2Dec
TPEA1E	"	"		Jul-Dec
TPEA1F	"	"		Aug-Jan
CORN1A - Yellow Corn, Intermediate tech,				Aug-Apr
CORN1B	"	"		Sep-May
CORN1C	"	"		Oct-May
CORN1D	"	"		2Aug-2Apr
CORN1E	"	"		2Sep-2May
CORN1F	"	"		2Oct-2May
CORN2 - Yellow Corn, PM 701, High tech				Oct-May
CORN2B	"	"		Nov-Apr
CORN2C	"	"		2Oct-2Mar
CORN2D	"	"		2Nov-2Apr
YUCAA - Yuca, Intermediate tech				Oct-2Aug
YUCB	"	"		Nov-2Sep
YUCC	"	"		Nov-2Oct
YUCD	"	"		Jan-2Nov
YUCE	"	"		Feb-2Dec
YUCF	"	"		Mar-2Jan
YUCG	"	"		Apr-2Feb
YUCH	"	"		May-2Mar
YUCI	"	"		Jun-2Apr
YUCJ	"	"		2Jul-2May
YUCK	"	"		Jul-May
YUCL	"	"		Aug-Jun
YUCM	"	"		Sep-2Jul

2. Dryland Crop Production

CPEA1A - Green Pea, Intermediate tech			Jan-2Jul
CPEA1B	"	"	Feb-2Jul
CPEA1C	"	"	Mar-2Aug
CPEA1D	"	"	2Dec-2May
CPEA3A - Green Pea, Blanca, low tech			Feb-May
CPEA3B	"	"	2Feb-2May
CEB1A - Barley, low tech			Oct-Apr
CEB1B	"	"	Nov-May
CEB1C	"	"	Dec-1May
CEB1D	"	"	2Oct-2Apr
CEB1E	"	"	2Nov-2May

CEB1F	"	"	2Dec-2May
CEB2A - Barley Zapata Malvina, high tech			Jan-Jun
CEB2B	"	"	Feb-Jul
CEB2C	"	"	2Dec-2May
CORN3 - White Corn, Cancheros, high tech			Sep-May
CORN3B	"	"	2Sep-2May
CORN7A - White Corn, low tech			Sep-May
CORN7B	"	"	Oct-Jun
CORN7C	"	"	2Sep-2May
CORN9 - White Corn, Cajamarca 101, high tech			Sep-Mar
CORN9B	"	"	2Sep-2Mar
CPAP1A - Potato, White, intermediate tech			Apr-2Nov
CPAP1B	"	"	May-1Dec
TPAP1A - Potato, White, intermediate tech			Sep-May
TPAP1B	"	"	Oct-Jun
TPAP1C	"	"	2Sep-2May
CPAP2 - Potato, Mariva, intermediate tech			Oct-Mar
CPAP2B	"	"	2Oct-2Mar
TWHT1A - Wheat, intermediate tech			Nov-Jun
TWHT1B	"	"	Dec-2Jul
TWHT1C	"	"	2Oct-2Apr
CWHT1A - Wheat, low tech			Oct-Apr
CWHT1B	"	"	Nov-May
CWHT1C	"	"	2Oct-2Apr
CWHT1D	"	"	2Nov-2May
CWHT2A - Wheat, Ollanta, intermediate tech			Jan-Jun
CWHT2B	"	"	Feb-2Jul
CWHT2C	"	"	2Jan-2May
CWHT3A - Wheat, El Gavilan, high tech			Sep-May
CWHT3B	"	"	Oct-Jun
CWHT3C	"	"	Nov-2Jul
CWHT3D	"	"	2Sep-2May
CWHT4A - Wheat, INIAC-102, high tech			Sep-May
CWHT4B	"	"	oct-jun
CWHT4C	"	"	Nov-2Jul
CWHT4D	"	"	2Sep-2May

3. <u>Family Labor Activities</u>

FAMLPJL - Reserving of Family labor,		Jul
FAMLPAU	"	Aug
FAMLS	"	Sep
FAMLO	"	Oct
FAMLN	"	Nov
FAMLD	"	Dec
FAMLJ	"	Jan
FAMLF	"	Feb
FAMLMR	"	Mar
FAMLA	"	Apr
FAMLMY	"	May
FAMLJN	"	Jun

FAMLJL	"	2Jul
FAMLAU	"	2Aug
FAML1S	"	2Sep
FAML1O	"	2Oct
FAML1N	"	2Nov
FAML1D	"	2Dec
FAML1J	"	2Jan
FAML1F	"	2Feb
FAML1MR	"	2Mar
FAML1A	"	2Apr
FAML1MY	"	2May

4. <u>Hired</u> <u>Labor</u> <u>Activities</u>

HLABPJL	- Labor Hiring Activity,	Jul
HLABPAU	"	Aug
HLABS	"	Sep
HLABO	"	Oct
HLABN	"	Nov
HLABD	"	Dec
HLABJ	"	Jan
HLABF	"	Feb
HLABMR	"	Mar
HLABA	"	Apr
HLABMY	"	May
HLABJN	"	Jun
HLABJL	"	2Jul
HLABAU	"	2Aug
HLAB1S	"	2Sep
HLAB1O	"	2Oct
HLAB1N	"	2Nov
HLAB1D	"	2Dec
HLAB1J	"	2Jan
HLAB1F	"	2Feb
HLAB1MR	"	2Mar
HLAB1A	"	2Apr
HLAB1MY	"	2May

5. Credit Disbursement Activities

CREDPJL	- Loans disbursed in	Jul
CREDPAU	"	Aug
CREDS	"	Sep
CREDO	"	Oct
CREDN	"	Nov
CREDD	"	Dec
CREDJ	"	Jan
CREDF	"	Feb
CREDMR	"	Mar
CREDA	"	Apr
CREDMY	"	May

CREDJN	"	Jun
CREDJL	"	2Jul
CREDAU	"	2Aug
CRED1S	"	2Sep
CRED1O	"	2Oct
CRED1N	"	2Nov

6. Cash Transfer Activities

MONTPJL - Cash Transferred from		Jul	to	Aug
MONTPAU	"	Aug	"	Sep
MONTS	"	Sep	"	Oct
MONTO	"	Oct	"	Nov
MONTN	"	Nov	"	Dec
MONTD	"	Dec	"	Jan
MONTJ	"	Jan	"	Feb
MONTF	"	Feb	"	Mar
MONTMR	"	Mar	"	Apr
MONTA	"	Apr	"	May
MONTMY	"	May	"	Jun
MONTJN	"	Jun	"	2Jul
MONTJL	"	2Jul	"	2Aug
MONTAU	"	2Aug	"	2Sep
MONT1S	"	2Sep	"	2Oct
MONT1O	"	2Oct	"	2Nov
MONT1N	"	2Nov	"	2Dec
MONT1D	"	2Dec	"	2Jan
MONT1J	"	2Jan	"	2Feb
MONT1F	"	2Feb	"	2Mar
MONT1MR	"	2Mar	"	2Apr
MONT1A	"	2Apr	"	2May

7.Crop Selling Activities

RICEA - Rice selling Activity		April
RICEMY	"	May
RICEJN	"	Jun
RICEJL	"	Jul
RICEAU	"	Aug
RICE1S	"	2Sep
RICE1O	"	2Oct
RICE1N	"	2Nov
RICE1D	"	2Dec
RICE1A	"	2Apr
RICE1MY	"	2May
PEAVD - Pea selling Activity		Dec
PEAVJ	"	Jan
PEAVMY	"	May
PEAVJL	"	2Jul
PEAVAU	"	2Aug
PEAV1O	"	2Oct

PEAV1N	"	2Nov
PEAV1D	"	2Dec
PEAV1MY	"	2May
BRLYA - Barley selling Activity		Apr
BRLYMY	"	May
BRLYJN	"	Jun
BRLYJL	"	Jul
BRLY1A	"	Apr
BRLY1MY	"	May
CRNAMR - Yellow Corn selling Activity		Mar
CRNAA	"	Apr
CRNAMY	"	May
CRNA1MR	"	2Mar
CRNA1A	"	2Apr
CRNA1MY	"	2May
CRNBMR - White Corn selling Activity		Mar
CRNBMY	"	May
CRNBJN	"	Jun
CRNB1MR	"	2Mar
CRNB1MY	"	2May
POTMR - Potato selling Activity		Mar
POTMY	"	May
POTJN	"	Jun
POT1N	"	2Nov
POT1D	"	2Dec
POT1MR	"	2Mar
POT1MY	"	2May
WHTA - Wheat selling Activity		Apr
WHTMY	"	May
WHTJN	"	Jun
WHTJL	"	2Jul
WHT1A	"	2Apr
WHT1MY	"	2May
YCMY - Yuca selling Activity		May
YCJN	"	Jun
YCJL	"	2Jul
YCAU	"	Aug
YC1S	"	2Sep
YC1O	"	2Oct
YC1N	"	2Nov
YC1D	"	2Dec
YC1J	"	2Jan
YC1F	"	2Feb
YC1MR	"	2Mar
YC1A	"	2Apr
YC1MY	"	2May

8. Risk Introducing Activities

RSKA
RSKB

RSKC
RSKD
RSKE
RSKF

9. Net Revenue Transfer

REVENUE

APPENDIX TABLE A-4

CONSTRAINTS OF CONTUMAZA MODEL

1. Irrigated Land Constraints

LANWPJL	- Land Constraint	Jul
LANWPAU	"	Aug
LANWS	"	Sep
LANWO	"	Oct
LANWN	"	Nov
LANWD	"	Dec
LANWJ	"	Jan
LANWF	"	Feb
LANWMR	"	Mar
LANWA	"	Apr
LANWMY	"	May
LANWJN	"	Jun
LANWJL	"	2Jul
LANWAU	"	2Aug
LANW1S	"	2Sep
LANW1O	"	2Oct
LANW1N	"	2Nov
LANW1D	"	2Dec
LANW1J	"	2Jan
LANW1F	"	2Feb
LANW1MR	"	2Mar
LANW1A	"	2Apr
LANW1MY	"	2May

2. Seedbed to Field Transfers

STRAN1
STRAN2
STRAN3
STRAN4
STRAN4A
STRAN5
STRAN6
STRAN7
STRAN8
STRAN9
STRAN10
STRAN11
STRAN12
STRAN12A
STRAN13
STRAN14
STRAN15

STRAN16
STRAN17
STRAN18
STRAN19
STRAN20
STRAN21
STRAN22
STRAN23

3. Dryland Constraints

LANDPJL	- Dryland Constraint,	Jul
LANDPAU	"	Aug
LANDO	"	Oct
LANDN	"	Nov
LANDD	"	Dec
LANDJ	"	Jan
LANDF	"	Feb
LANDMR	"	Mar
LANDA	"	Apr
LANDMY	"	May
LANDJN	"	Jun
LANDJL	"	2Jul
LANDAU	"	2Aug
LAND1S	"	2Sep
LAND1O	"	2Oct
LAND1N	"	2Nov
LAND1D	"	2Dec
LAND1J	"	2Jan
LAND1F	"	2Feb
LAND1MR	"	2Mar
LAND1A	"	2Apr
LAND1MY	"	2May

4. Irrigation Water Constraints

WATPJL	- Water Constraint,	Jul
WATPAU	"	Aug
WATS	"	Sep
WATO	"	Oct
WATN	"	Nov
WATD	"	Dec
WATJ	"	Jan
WATF	"	Feb
WATMR	"	Mar
WATA	"	Apr
WATMY	"	May
WATJN	"	Jun
WATJL	"	2Jul
WATAU	"	2Aug
WAT1S	"	2Sep

WAT1O	"	2Oct
WAT1N	"	2Nov
WAT1D	"	2Dec
WAT1J	"	2Jan
WAT1F	"	2Feb
WAT1MR	"	2Mar
WAT1A	"	2Apr
WAT1MY	"	2May

5. <u>Labor Constraints</u>

LABJL - Labor	Constraint,	Jul
LABAU	"	Aug
LABS	"	Sep
LABO	"	Oct
LABN	"	Nov
LABD	"	Dec
LABJ	"	Jan
LABF	"	Feb
LABMR	"	Mar
LABA	"	Apr
LABMY	"	May
LABJN	"	Jun
LABJL	"	2Jul
LABAU	"	2Aug
LAB1S	"	2Sep
LAB1O	"	2Oct
LAB1N	"	2Nov
LAB1D	"	2Dec
LAB1J	"	2Jan
LAB1F	"	2Feb
LAB1MR	"	2Mar
LAB1A	"	2Apr
LAB1MY	"	2May

6. <u>Cash Constraints</u>

MONPJL - Cash Constraint,		Jul
MONPAU	"	Aug
MONS	"	Sep
MONO	"	Oct
MONN	"	Nov
MOND	"	Dec
MONJ	"	Jan
MONF	"	Feb
MONMR	"	Mar
MONA	"	Apr
MONMY	"	May
MONJN	"	Jun
MONJL	"	2Jul
MONAU	"	2Aug

MON1S	"	2Sep
MON1O	"	2Oct
MON1N	"	2Nov
MON1D	"	2Dec
MON1J	"	2Jan
MON1F	"	2Feb
MON1MR	"	2Mar
MON1A	"	2Apr
MON1MY	"	2May

7. <u>Credit Constraints</u>

TCREDPJL	- Credit Constraint,	Jul
TCREDPAU	"	Aug
TCREDS	"	Sep
TCREDO	"	Oct
TCREDN	"	Nov
TCREDD	"	Dec
TCREDJ	"	Jan
TCREDF	"	Feb
TCREDMR	"	Mar
TCREDA	"	Apr
TCREDMY	"	May
TCREDJN	"	Jun
TCREDJL	"	2Jul
TCREDAU	"	2Aug
TCRED1S	"	2Sep
TCRED1O	"	2Oct
TCRED1N	"	2Nov
TCRED1D	"	2Dec
TCRED1J	"	2Jan
TCRED1F	"	2Feb
TCRED1MR	"	2Mar
TCRED1A	"	2Apr

8. <u>Yield Transfers</u>

YLDRA	- Rice Yield Transfer,	Apr
YLDRAMY	"	May
YLDRJN	"	Jun
YLDRJL	"	2Jul
YLDRAU	"	2Aug
YLDR1S	"	2Sep
YLDR1O	"	2Oct
YLDR1N	"	2Nov
YLDR1D	"	2Dec
YLDR1J	"	2Jan
YLDR1F	"	2Feb
YLDR1MR	"	2Mar
YLDR1A	"	2Apr
YLDR1MY	"	2May

YLDP1D - Pea Yield Transfer,		2Dec
YLDP1J	"	2Jan
YLDP1MY	"	2May
YLDP1JL	"	2Jul
YLDP1AU	"	2Aug
YLDP11O	"	2Oct
YLDP11N	"	2Nov
YLDP11D	"	2Dec
YLDP11MY	"	2May
YLDBA - Barley Yield Transfer,		Apr
YLDBMY	"	May
YLDBJN	"	Jun
YLDBJL	"	Jul
YLDB1A	"	2Apr
YLDB1MY	"	2May
YLDC1MR - Yellow Corn Yield Transfer,		Mar
YLDC1A	"	Apr
YLDC1MY	"	May
YLDC11MR	"	2Mar
YLDC11A	"	2Apr
YLDC11MY	"	2May
YLDC2MR - White Corn Yield Transfer,		Mar
YLDC2M	"	May
YLDC2JN	"	Jun
YLDC21MR	"	2Mar
YLDC21A	"	2Apr
YLDC21MY	"	2May
YLDPOMR - Potato Yield Transfer,		Mar
YLDPOMY	"	May
YLDPOJN	"	Junn
YLDPO1N	"	2Nov
YLDPO1D	"	2Dec
YLDPO1MR	"	2Mar
YLDPO1MY	"	2May
YLDWA - Wheat Yield Transfer,		Apr
YLDWMY	"	May
YLDWJN	"	Jun
YLDWJL	"	2Jul
YLDW1A	"	2Apr
YLDW1MY	"	2May
YLDYMY - Yucca Yield Transfer,		May
YLDYJN	"	Jun
YLDYJL	"	2Jul
YLDYAU	"	2Aug
YLDY1S	"	2Sep
YLDY1O	"	2Oct
YLDY1N	"	2Nov
YLDY1D	"	2Dec
YLDY1J	"	2Jan
YLDY1F	"	2Feb
YLDY1MR	"	2Mar

YLDY1A	"	2Apr
YLDY1MY	"	2May

9. Deviations from Mean Net Returns for Risk

Risk1
Risk2
Risk3
Risk4
Risk5
Risk6

APPENDIX B

LISTING OF OTHER SOLUTIONS TO TARAPOTO MODEL

APPENDIX TABLE B-1

Tarapoto Cropping Plan Under Conditions of Intermediate Risk*

Activity/Variety	Ha
<u>Irrigated Crops</u>	
Riceles/Cica8	87.8
Ricele	878
Rice3as/Inti8	259.7
Rice3a	2597
Rice3cs	13.2
Rice3c	132
Rice3fs	182
Rice3f	1821
Riceis	167
Ricei	1678
Ricejs	132
Ricej	1321
Soylz/Pelikan	13.2
Soylx	388
<u>Dryland Crops</u>	
Tablas	222
Tabla	2228
Rice5e/Inti	31689
Rice6z/Perla	224
Corn3a/Marginal 28	29236
Corn3c	19052
Corn3d	18560
Corn4d/PMC 747	10898
Cotton3a/Aspero	4258
Cotton3b	25540

*Risk coefficient = .25

APPENDIX TABLE B-2

Tarapoto Cropping Plan Under Conditions of Low Risk*

Activity/Variety	Ha
<u>Irrigated Crops</u>	
Riceles/Cica8	233
Ricele	2335
Rice3as/Inti8	244.7
Rice3a	2447
Rice3cs	28
Ricec	282.5
Ricefs	36.4
Ricef	364
Riceis	17
Ricei	174
Ricejs	282
Ricej	2825
Soylz/Pelikan	28
Soylx	524
<u>Dryland Crops</u>	
Rice5e/Inti8	33223
Rice6z/Perla	2902
Corn3a/Marginal 28	30320
Corn3c	19745
Corn3d	14340
Corn4d/PMC 747	15119
Cotton3a	2031
Cotton3b	25,540

*Risk coefficient = .5

APPENDIX TABLE B-3

Tarapoto Cropping Plan with Available Credit Halved

Activity/Variety	Ha
Irrigated Crops	
Rice3as/Inti8	243
Rice3a	2430
Rice3cs	30
Rice3c	300
Ric3fs	270
Rice3f	2700
Rice3js	300
Rice3j	3000
Soy1z/Pelikan	570
Dryland Crops	
Tablas	370
Tabla	3706
Tablcs	51
Tablc	512
Rice5b/Inti8	18561
Rice5c	3976
Rice5f	30717
Corn3a/Marginal 28	27011
Corn3d	5177
Cotton3a/Aspero	1230
Cotton3b	25540
Cotton4c/Aspero-Cowpea	24282

APPENDIX B-4

Tarapoto Cropping Plan with a Doubling of Available Credit

Activity/Variety	Ha
Irrigated Crops	
Riceles/Cica8	189
Ricele	1894
Rice3as/Inti8	251
Rice3a	2529
Rice3cs	21
Rice3c	210
Rice3fs	80
Rice3f	805
Rice3is	89
Rice3i	894
Rice3js	210
Rice3j	2105
Soylz	21
Soylx	459
Dryland Crops	
Tablas	501
Tabla	5016
Rice5e/Inti	32763
Rice6z/Perla	6572
Corn3a/Marginal 28	21174
Corn4a/PMC 747	1895
Corn4d	27538
Cotton3a	20340
Cotton3b	25540
Cotton4c	1920

APPENDIX C

LISTING OF OTHER SOLUTIONS TO THE CONTUMAZA MODEL

APPENDIX C-1

Contumaza Cropping Plan Under Conditions of Intermediate Risk *

Activity/Variety	Ha
Irrigated Crops	
Arroze/Inti	44
Arrozg	443
Arrozi	23
Arrozj	232
Arroz2d/Minabar	267
Arroz2h	2678
Arroz2q	309
Arroz2r	3097
Arroz3t/Common	60
Arroz3v	608
Tpealc/pea	208
Tpeale	570
Tpealf	445
Corn2/Yellow PM 701	44
Dryland Crops	
Cpealc/green pea	5791
Ceb2c/Zapapta Malvina	744
Corn3/Grano Cancheros	3795
Corn3b	1031
Cpapla/White Potato	744
Cpap2/Mariva Potato	843
Cpap2b	8654

*Risk coefficient = .25

APPENDIX C-2

Contumaza Cropping Plan Under Conditions of Low Risk *

Activity/Variety	Ha
Irrigated Crops	
Arroze/Inti	38
Arrozg	388
Arrozi	131
Arrozj	1312
Arroz2d/Minabar	176
Arroz2h	1760
Arroz2q	15.9
Arroz2r	159
Arroz3t/Common	27
Arrozv	278
Tpealc/green pea	1180
Tpeale	680
Tpealf	466
Corn2/Yellow	1290
Corn2c	1560
Corn2d	298
Dryland Crops	
Cpealc/green pea	5133
Ceb2b/Zapatpa Malvina	520
Corn3/Cancheros	4776
Corn3b	3756
Cpap2b/Mariva potato	6673

*Risk coefficient = .5

APPENDIX C-3

Contumaza Cropping Plan:
Interest Rate = 0

Activity	Ha
Irrigated Crops	
Arroze	40
Arrozg	402
Arroz2d	292
Arroz2h	2927
Arroz2q	333
Arroz2r	3330
Arroz3t	36
Arroz3v	361
Tpeale	652
Tpealf	461
Corn2	40
Dryland Crops	
Ceb1c	3361
Ceb2b	2296
Ceb2c	1095
Corn3	3675
Cpap1a	1095
Cpap2	583
Cpap2b	9334

APPENDIX C-4

Contumaza Cropping Plan:
Annual interest rate = 10%

Activity	Ha
Irrigated Crops	
Arroze	45
Arrozg	458
Arrozi	32
Arrozj	322
Arroz2d	258
Arroz2h	2580
Arroz2q	300
Arroz2r	3007
Arroz3t	70
Arroz3v	703
Tpealc	290
Tpeale	538
Tpealf	438
Corn2	45
Dryland Crops	
Ceblc	4355
Ceb2b	602
Ceb2c	1185
Corn3	4286
Tpapla	1185
Cpap2	406
Cpap2b	9244

APPENDIX C-5

Contumaza Cropping Plan with Low Available Credit
Available Credit = $358,930

Activity	Ha
Irrigated Crops	
Arroze	40
Arrozg	403
Arrozi	.65
Arrozj	6.5
Arroz2d	292
Arroz2h	2920
Arroz2q	332
Arroz2r	3323
Arroz3t	36
Arroz3v	368
Tpealc	5
Tpeale	650
Tpealf	460
Corn2	40
Dryland Crops	
Ceblc	3296
Ceb2b	3784
Ceb2c	1793
Corn3	1555
Cpapla	1793
Cpap2	693
Cpap2b	8636

APPENDIX C-6

Contumaza Cropping Plan with High Available Credit
Available Credit = $1,435,720

Activity	Ha
Irrigated Crops	
Arroze	72.8
Arrozg	728
Arroz2d	260
Arroz2h	2601
Arroz2q	333
Arroz2r	3330
Arroz3t	65
Arroz3v	655
Tpealf	442
Corn2	72
Dryland Crops	
Ceb2b	3051
Corn3	7213
Cpap2	165
Cpap2b	10430

APPENDIX D

TARAPOTO CROP BUDGETS

Appendix Table D-1. Tarapoto, Ricel

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1				CROP BUDGETS											
2	CROP		ricel		AGENCY										
3	VARIETY		cica 8-9		SUBAGENCY		Tarapoto								
4	TECHNOLOGY		med		DATE		11-3-85								
5	PLANT/HARVEST		sep-dec/jun-jul		SOURCE		B.A.								
6	IRRIGATION		yes		CROPS/YR		2								
7	YIELD		5000												
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
9															
10	LABOR														
11	Land Prep		3								13	2			
12	Planting		30		3						1				
13	Irrigation				1						3				
14	Fertilization				3										
15	Cultivation				10										
16	Pesticides				4						2				
17	Harvest							30							
18	Other														
19															
20	MACHINERY														
21	Land Prep		348000								1001000	106000			
22	SEED														
23	Amount										80				
24	Cost										128000				
25															
26	PESTICIDE/FERTILIZER														
27	Type				pesticide										
28	Amount														
29	Cost				300000										
30	Type				fertilizer			transport							
31	Amount				300										
32	Cost				570000			750000							
33															
34	TOTAL														
35	MACHINERY		348000	0	0	0	0	0	0	0	1129080	106000	0	0	
36	OTHER		0	0	870300	0	0	750000	0	0	0	0	0	0	
37	CAPITAL		36.192	0	90.5112	0	0	78	0	0	117.424	11.024	0	0	333.152
38	LABOR		33	0	21	0	0	30	0	0	19	2	0	0	105
39														total	438.152

Appendix Table D-2. Tarapoto, Rice3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		rice3		AGENCY		tarapoto							
3	VARIETY		inti ir 8 naylam		SUBAGENCY									
4	TECHNOLOGY		med		DATE		1/6/84							
5	PLANT/HARVEST		sep-dec/jun-jul		SOURCE		B.A.							
6	IRRIGATION		yes		CROPS/YR		2							
7	YIELD		5000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep										13	2		
12	Planting											1		
13	Irrigation		30	3	1							3		
14	Fertilization				3							1		
15	Cultivation				10									
16	Pesticides				4									
17	Harvest							30				1		
18	Other				3									
19														
20	MACHINERY													
21	Land Prep		3									10		
22														
23	SEED													
24	Amount											138		
25	Cost											138000		
26														
27	PESTICIDE/FERTILIZER													
28	Type							transport				fertilizer		
29	Amount											300		
30	Cost							200000				198000		
31	Type							bags				pesticide		
32	Amount													
33	Cost							150000				150000		
34														
35	TOTAL													
36	MACHINERY		93000	0	0	0	0	0	0	0	0	310000	0	0
37	OTHER		0	0	0	0	0	350000	0	0	0	348300	0	0
38	CAPITAL		28.83	0	0	0	0	108.5	0	0	0	204.073	0	0
39	LABOR		30	3	21	0	0	30	0	0	13	8	0	0

Appendix Table D-3. Tarapoto, Rice4

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		rice4		AGENCY									
3	VARIETY		radin china y pe		SUBAGENCY		tarapoto							
4	TECHNOLOGY		med		DATE		5/83							
5	PLANT/HARVEST		dec-feb/jun-aug		SOURCE		cipa							
6	IRRIGATION		yes		CROPS/YR									
7	YIELD		4500											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep		22											22
12	Planting		.5		12									
13	Irrigation		5	5										
14	Fertilization		1											
15	Cultivation				1	10								
16	Pesticides		.5	2	4	2								
17	Harvest								30					
18	Other													
19														
20	MACHINERY													
21	Land Prep		14											
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep		2											
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount		80											
37	Cost		43680											
38														
39	PESTICIDE/FERTILIZER													
40	Type		pesticid	pesticid	pesticid	pesticide								
41	Amount													
42	Cost		4260	35625	71250	35625								
43	Type		fertilizer		fertilizer									
44	Amount													
45	Cost		1175		27500									
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		140000	0	0	0	0	0	0	0	0	0	0	0
56	OTHER		49117	35625	98750	35625	0	0	0	0	0	0	0	0
57	CAPITAL		132.382	24.9375	69.125	24.9375	0	0	0	0	0	0	0	0
58	LABOR		29	7	17	12	0	30	0	0	0	0	0	22

Appendix Table D-4. Tarapoto, Cornl

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		cornl		AGENCY									
3	VARIETY		amarillo plant b		SUBAGENCY		TARAPOTO							
4	TECHNOLOGY		MED		DATE		5/84							
5	PLANT/HARVEST		JUN-JUL/DEC		SOURCE		CIPA							
6	IRRIGATION		YES		CROPS/YR									
7	YIELD		4500											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep							6						
12	Planting								12					
13	Irrigation							8						
14	Fertilization													
15	Cultivation									12				
16	Pesticides								6					
17	Harvest													44
18	Other													
19														
20	MACHINERY													
21	Land Prep							147600						
22	Planting													
23	Irrigation													
24	Cultivation								5000					
25	Harvest													67500
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount								25					
37	Cost								25000					
38														
39	PESTICIDE/FERTILIZER													
40	Type								PESTICIDE					TRANS
41	Amount													
42	Cost								80000					14500
43	Type													
44	Amount													
45	Cost													
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	0	0	0	147600	5000	0	0	0	0	67500
56	OTHER		0	0	0	0	0	0	105000	0	0	0	0	14500
57	CAPITAL		0	0	0	0	0	49.446	36.85	0	0	0	0	27.47
58	LABOR		0	0	0	0	0	14	18	12	0	0	0	44

Appendix Table D-5. Tarapoto, Corn2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		corn2		AGENCY		TARAPOTO							
3	VARIETY		marginal 28		SUBAGENCY									
4	TECHNOLOGY		med		DATE		6/85							
5	PLANT/HARVEST		FEB/JUL		SOURCE		B.A.							
6	IRRIGATION		YES		CROPS/YR									
7	YIELD		3000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep			3										
12	Planting			10	2									
13	Irrigation				5									
14	Fertilization				5		5							
15	Cultivation			2										
16	Pesticides				2									
17	Harvest								34					
18	Other													
19														
20	MACHINERY													
21	Land Prep			795000										
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount			25										
37	Cost			100000										
38														
39	PESTICIDE/FERTILIZER													
40	Type			PESTICID	FERTILIZER				SACKS					
41	Amount													
42	Cost			200000	540000				150000					
43	Type								TRANSP					
44	Amount													
45	Cost								450000					
46	Type								THRESHER					
47	Amount													
48	Cost								150000					
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	795000	0	0	0	0	0	0	0	0	0	0
56	OTHER		0	300000	540000	0	0	0	750000	0	0	0	0	0
57	CAPITAL		0	102.383	50.49	0	0	0	70.125	0	0	0	0	0
58	LABOR		0	15	14	0	5	0	34	0	0	0	0	0

Appendix Table D-6. Tarapoto, Soy1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		SOY1		AGENCY		CIPA-X							
3	VARIETY		IMPROVED PELIKAN		SUBAGENCY		TARAPOTO							
4	TECHNOLOGY		MED		DATE		5/84							
5	PLANT/HARVEST		JUL/NOV,OCT/JAN		SOURCE		CIPA							
6	IRRIGATION		YES		CROPS/YR									
7	YIELD		2500											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep								6					
12	Planting								2					
13	Irrigation									4	2	2		
14	Fertilization													
15	Cultivation								10					
16	Pesticides										2			
17	Harvest												26	
18	Other													
19														
20	MACHINERY													
21	Land Prep								196500					
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest												50000	
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount								70					
37	Cost								56000					
38														
39	PESTICIDE/FERTILIZER													
40	Type								TRANSP		PEST		SACKS	
41	Amount													
42	Cost								1400		70000		15000	
43	Type													
44	Amount													
45	Cost													
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	0	0	0	0	196500	0	0	0	50000	0
56	OTHER		0	0	0	0	0	0	57400	0	70000	0	15000	0
57	CAPITAL		0	0	0	0	0	0	85.0565	0	23.45	0	21.775	0
58	LABOR		0	0	0	0	0	0	18	4	4	2	26	0

Appendix Table D-7. Tarapoto, Tabl

	A	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1			CROP BUDGETS										
2	CROP	TABAC1		AGENCY		TARAPOTO							
3	VARIETY	TABACO NEGRO		SUBAGENCY									
4	TECHNOLOGY	LOW		DATE		1/6/84							
5	PLANT/HARVEST	JAN-FEB/MAY-AUG		SOURCE		B.A.							
6	IRRIGATION	NO		CROPS/YR		.							
7	YIELD	1200											
8		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9													
10	LABOR												
11	Land Prep	4											
12	Planting	1		20									
13	Irrigation	10(SEEDS)											
14	Fertilization												
15	Cultivation	12		60									
16	Pesticides	3		10									
17	Harvest					70							
18	Other												
19													
20	MACHINERY												
21	Land Prep	186000											
22	Planting												
23	Irrigation												
24	Cultivation												
25	Harvest												
26	Other												
27													
28	YUNTA												
29	Land Prep												
30	Planting												
31	Cultivation												
32	Harvest												
33	Other												
34													
35	SEED												
36	Amount												
37	Cost												
38													
39	PESTICIDE/FERTILIZER												
40	Type	FERT											
41	Amount												
42	Cost	66000											
43	Type	PEST											
44	Amount												
45	Cost	202000											
46	Type	TOOLS											
47	Amount												
48	Cost	13000											
49	Type												
50	Amount												
51	Cost												
52	Other												
53													
54	TOTAL												
55	MACHINERY	186000	0	0	0	0	0	0	0	0	0	0	0
56	OTHER	281000	0	0	0	0	0	0	0	0	0	0	0
57	CAPITAL	144.77	0	0	0	0	0	0	0	0	0	0	0
58	LABOR	30	0	90	0	70	0	0	0	0	0	0	0

Appendix Table D-8. Tarapoto, Rice5

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		rice5		AGENCY		tarapoto							
3	VARIETY		inti ir 8 naylam		SUBAGENCY		lagunas							
4	TECHNOLOGY		med		DATE		6/6/85							
5	PLANT/HARVEST		nov-mar/set-dec		SOURCE		B.A.							
6	IRRIGATION		no		CROPS/YR		1							
7	YIELD		2000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep												22	
12	Planting					3								
13	Irrigation													
14	Fertilization													
15	Cultivation						11							
16	Pesticides					2								
17	Harvest										28			
18	Other								25					
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount						50							
37	Cost						100000							
38														
39	PESTICIDE/FERTILIZER													
40	Type						pesticide				transp			
41	Amount													
42	Cost						12000				67000			
43	Type													
44	Amount													
45	Cost													
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
56	OTHER		0	0	0	0	112000	0	0	0	67000	0	0	0
57	CAPITAL		0	0	0	0	10.472	0	0	0	6.2645	0	0	0
58	LABOR		0	0	0	5	11	0	25	0	28	0	22	0

Appendix Table D-9. Tarapoto, Rice6

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		RICE6		AGENCY									
3	VARIETY		PERLA		SUBAGENCY		TARAPOTO							
4	TECHNOLOGY		MED		DATE		5/83							
5	PLANT/HARVEST		SEP-JAN/JUN-JUL		SOURCE		CIPA							
6	IRRIGATION		NO		CROPS/YR		1							
7	YIELD		2000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep										30			
12	Planting										10			
13	Irrigation													
14	Fertilization			1										
15	Cultivation				20									
16	Pesticides				4									
17	Harvest							22						
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount										50			
37	Cost										27300			
38														
39	PESTICIDE/FERTILIZER													
40	Type			FERT	PEST			SACKS						
41	Amount													
42	Cost			11750	27250			24000						
43	Type													
44	Amount													
45	Cost													
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
56	OTHER		0	11750	27250	0	0	24000	0	0	27300	0	0	0
57	CAPITAL		0	8.225	19.075	0	0	16.8	0	0	19.11	0	0	0
58	LABOR		0	1	24	0	0	22	0	0	40	0	0	0

Appendix Table D-10. Tarapoto, Rice7

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		RICE7		AGENCY		TARAPOTO							
3	VARIETY		ESTANQUILLO CAROSUBAGENCY											
4	TECHNOLOGY		LOW		DATE		26/6/85							
5	PLANT/HARVEST		SEP-JAN/JUN-JUL		SOURCE		B.A.							
6	IRRIGATION		NO		CROPS/YR		1							
7	YIELD		1800											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep											42		
12	Planting											10		
13	Irrigation													
14	Fertilization													
15	Cultivation			20										
16	Pesticides			4										
17	Harvest								24					
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount											50		
37	Cost											97500		
38														
39	PESTICIDE/FERTILIZER													
40	Type			PESTICIDE				TRANSP						
41	Amount													
42	Cost			110000				288000						
43	Type													
44	Amount													
45	Cost													
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
56	OTHER		0	110000	0	0	0	288000	0	0	97500	0	0	0
57	CAPITAL		0	10.285	0	0	0	26.928	0	0	9.11625	0	0	0
58	LABOR		0	24	0	0	0	24	0	0	52	0	0	0

Appendix Table D-11. Tarapoto, Corn3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		CORN3		AGENCY		MOYOBAMBA							
3	VARIETY		MARGINAL 28 TROPSUBAGENCY											
4	TECHNOLOGY		LOW		DATE		3/5/85							
5	PLANT/HARVEST		FEB/JUL		SOURCE		CIPA							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		2500											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep			23										
12	Planting			8										
13	Irrigation													
14	Fertilization													
15	Cultivation				22									
16	Pesticides				2									
17	Harvest								30					
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount			20										
37	Cost			50000										
38														
39	PESTICIDE/FERTILIZER													
40	Type			PESTICIDE					SACKS					
41	Amount													
42	Cost			172000					51000					
43	Type								TRANSP					
44	Amount													
45	Cost								125000					
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
56	OTHER		0	222000	0	0	0	0	176000	0	0	0	0	0
57	CAPITAL		0	23.088	0	0	0	0	18.304	0	0	0	0	0
58	LABOR		0	31	24	0	0	0	30	0	0	0	0	0

Appendix Table D-12. Tarapoto, Corn4

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		CORN4		AGENCY		MOYOBAMBA							
3	VARIETY		PMC 747		SUBAGENCY		TARAPOTO							
4	TECHNOLOGY		HIGH		DATE		5/84							
5	PLANT/HARVEST		FEB/AUG		SOURCE		CIPA							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		3200											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep			2										
12	Planting				10									
13	Irrigation													
14	Fertilization					6								
15	Cultivation						6							
16	Pesticides						7							
17	Harvest									26				
18	Other													
19														
20	MACHINERY													
21	Land Prep				176100									
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount			TRANS	25									
37	Cost			1000	25000									
38														
39	PESTICIDE/FERTILIZER													
40	Type					FERT	PEST			SACKS				
41	Amount													
42	Cost					85000	84000			18750				
43	Type													
44	Amount													
45	Cost													
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	176100	0	0	0	0	0	0	0	0	0
56	OTHER		0	1000	25000	85000	84000	0	0	18750	0	0	0	0
57	CAPITAL		0	.335	67.3685	28.475	28.14	0	0	6.28125	0	0	0	0
58	LABOR		0	2	10	6	13	0	0	26	0	0	0	0

Appendix Table D-13. Tarapoto, Corn5

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		CORN5		AGENCY		MOYOBAMBA							
3	VARIETY		CUBAN YELLOW		SUBAGENCY		TARAPOTO							
4	TECHNOLOGY		LOW		DATE		5/84							
5	PLANT/HARVEST		DEC/JUN		SOURCE		CIPA							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		1800											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep													23
12	Planting		16											
13	Irrigation													
14	Fertilization													
15	Cultivation			22										
16	Pesticides													
17	Harvest							33						
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount		20											
37	Cost		10000											
38														
39	PESTICIDE/FERTILIZER													
40	Type							SACKS						
41	Amount													
42	Cost							11250						
43	Type							TRANSP						
44	Amount													
45	Cost							20000						
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
56	OTHER		10000	0	0	0	0	31250	0	0	0	0	0	0
57	CAPITAL		3.35	0	0	0	0	10.4688	0	0	0	0	0	0
58	LABOR		16	22	0	0	0	33	0	0	0	0	0	23

Appendix Table D-14. Tarapoto, Cotton1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		cotton1		AGENCY		TARAPOTO							
3	VARIETY		upland american		SUBAGENCY									
4	TECHNOLOGY		med		DATE		7/85							
5	PLANT/HARVEST		FEB/AUG		SOURCE		EL PORVENIR							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		2000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep													
12	Planting				8	2								
13	Irrigation													
14	Fertilization					2								
15	Cultivation						20	15	15					
16	Pesticides				2		2	2	2					
17	Harvest									30				
18	Other													
19														
20	MACHINERY													
21	Land Prep			318000	212000									
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount													
37	Cost													
38														
39	PESTICIDE/FERTILIZER													
40	Type			PESTICIDE		PEST								
41	Amount													
42	Cost			560000		643000								
43	Type					FERT								
44	Amount													
45	Cost					40000								
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	318000	212000	0	0	0	0	0	0	0	0	0
56	OTHER		0	560000	0	683000	0	0	0	0	0	0	0	0
57	CAPITAL		0	74.3666	17.9564	57.8501	0	0	0	0	0	0	0	0
58	LABOR		0	0	10	4	22	17	17	30	0	0	0	0

Appendix Table D-15. Tarapoto, Cotton2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		COTTON2		AGENCY		MOYO							
3	VARIETY		UPLAND AMERICAN		SUBAGENCY		TARAPOTO							
4	TECHNOLOGY		MED		DATE		10/83							
5	PLANT/HARVEST		DEC/JUL		SOURCE		CIPA							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		1700											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep													10
12	Planting		1											
13	Irrigation													
14	Fertilization													
15	Cultivation			17										
16	Pesticides			2										
17	Harvest								40					
18	Other													
19														
20	MACHINERY													
21	Land Prep													72000
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount													
37	Cost													
38														
39	PESTICIDE/FERTILIZER													
40	Type			HERB										
41	Amount													
42	Cost			40000										
43	Type			PEST										
44	Amount													
45	Cost			46000										
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	72000
56	OTHER		0	86000	0	0	0	0	0	0	0	0	0	0
57	CAPITAL		0	41.538	0	0	0	0	0	0	0	0	0	34.776
58	LABOR		1	19	0	0	0	0	40	0	0	0	0	10

Appendix Table D-16. Tarapoto, Cotton3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		COTTON3		AGENCY		TARAPOTO							
3	VARIETY		ASPERO PERUANO		SUBAGENCY									
4	TECHNOLOGY		MED		DATE		7/85							
5	PLANT/HARVEST		JAN/AUG		SOURCE		EL PORVENIR							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		3600											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep													
12	Planting			7	2									
13	Irrigation													
14	Fertilization					2								
15	Cultivation					20	15	15		10				
16	Pesticides			2			2		2	2				
17	Harvest									25				
18	Other													
19														
20	MACHINERY													
21	Land Prep		318000	212000										
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount													
37	Cost													
38														
39	PESTICIDE/FERTILIZER													
40	Type		PEST		FERT	PEST								
41	Amount													
42	Cost		180000		40000	643000								
43	Type													
44	Amount													
45	Cost													
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		318000	212000	0	0	0	0	0	0	0	0	0	0
56	OTHER		180000	0	40000	643000	0	0	0	0	0	0	0	0
57	CAPITAL		42.1806	17.9564	3.388	54.4621	0	0	0	0	0	0	0	0
58	LABOR		0	9	2	22	17	15	2	37	0	0	0	0

Appendix Table D-17. Tarapoto, Cotton4

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		cotton4		AGENCY		NOYO							
3	VARIETY		ASPERO/COMPEA		SUBAGENCY		EXTENSION							
4	TECHNOLOGY		MED		DATE		10/83							
5	PLANT/HARVEST		DEC-JAN/AUG-SEP		SOURCE		CIPA							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		900/700											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep													
12	Planting		16											
13	Irrigation													
14	Fertilization													
15	Cultivation			17										
16	Pesticides			2										
17	Harvest								30					
18	Other													
19														
20	MACHINERY													
21	Land Prep													72000
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount													
37	Cost													
38														
39	PESTICIDE/FERTILIZER													
40	Type			HERB					TRANSP					
41	Amount													
42	Cost			40000					29000					
43	Type			PEST										
44	Amount													
45	Cost			46000										
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	72000
56	OTHER		0	86000	0	0	0	0	29000	0	0	0	0	0
57	CAPITAL		0	41.538	0	0	0	0	14.007	0	0	0	0	34.776
58	LABOR		16	19	0	0	0	0	30	0	0	0	0	0

Appendix Table D-18. Tarapoto, Cotton5

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		COTTON5		AGENCY		MOYO							
3	VARIETY		ASPERO/MAIZ		SUBAGENCY		TARAPOTO							
4	TECHNOLOGY		LOW		DATE		10/83							
5	PLANT/HARVEST		DEC/JUL		SOURCE		CIPA							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		800/1200											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep													25
12	Planting		14											
13	Irrigation													
14	Fertilization													
15	Cultivation			30										
16	Pesticides													
17	Harvest								25					
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount													
37	Cost													
38														
39	PESTICIDE/FERTILIZER													
40	Type								SACKS					
41	Amount													
42	Cost								24000					
43	Type													
44	Amount													
45	Cost													
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
56	OTHER		0	0	0	0	0	0	24000	0	0	0	0	0
57	CAPITAL		0	0	0	0	0	0	11.592	0	0	0	0	0
58	LABOR		14	30	0	0	0	0	25	0	0	0	0	25

Appendix Table D-19. Tarapoto, Cotton6

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		COTTON6		AGENCY		I-MOYO							
3	VARIETY		ASPERO		SUBAGENCY		TAROPOTO							
4	TECHNOLOGY		LOW		DATE		5/85							
5	PLANT/HARVEST		DEC/AUG-SEP		SOURCE		CIPA							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		900											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep													25
12	Planting		8	2										
13	Irrigation													
14	Fertilization													
15	Cultivation			28						30	6			
16	Pesticides													
17	Harvest													
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount													
37	Cost													
38														
39	PESTICIDE/FERTILIZER													
40	Type										TRANSP			
41	Amount													
42	Cost										90000			
43	Type										SACKS,ETC.			
44	Amount													
45	Cost										167000			
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
56	OTHER		0	0	0	0	0	0	0	0	257000	0	0	0
57	CAPITAL		0	0	0	0	0	0	0	0	26.728	0	0	0
58	LABOR		8	30	0	0	0	0	0	30	6	0	0	25

Appendix Table D-20. Tarapoto, Cotton7

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		COTTON7		AGENCY		TARAPOTO							
3	VARIETY		ASPERO		SUBAGENCY									
4	TECHNOLOGY		LOW		DATE		5/85							
5	PLANT/HARVEST		NOV-DEC/JUL-SEP		SOURCE		B.A.							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		800											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep												32	
12	Planting		8											
13	Irrigation													
14	Fertilization													
15	Cultivation			10										
16	Pesticides		2											
17	Harvest								16					
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount													
37	Cost													
38														
39	PESTICIDE/FERTILIZER													
40	Type		PEST						SACKS					
41	Amount													
42	Cost		190000						90000					
43	Type								TRANSP					
44	Amount													
45	Cost								80000					
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
56	OTHER		190000	0	0	0	0	0	170000	0	0	0	0	0
57	CAPITAL		19.76	0	0	0	0	0	17.68	0	0	0	0	0
58	LABOR		10	10	0	0	0	0	16	0	0	0	32	0

Appendix Table D-21. Tarapoto, Soy2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		SOY2		AGENCY		TARAPOTO							
3	VARIETY				SUBAGENCY									
4	TECHNOLOGY		MED		DATE		11/3/85							
5	PLANT/HARVEST		MAR-APR/JUL-AUG		SOURCE		B.A.							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		1500											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep													
12	Planting				16									
13	Irrigation													
14	Fertilization													
15	Cultivation						16							
16	Pesticides						2							
17	Harvest								20					
18	Other													
19														
20	MACHINERY													
21	Land Prep				312000									
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount				60									
37	Cost				120000									
38														
39	PESTICIDE/FERTILIZER													
40	Type					PEST			TRANSP					
41	Amount													
42	Cost					100000			90000					
43	Type								SACKS					
44	Amount													
45	Cost								60000					
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		0	0	312000	0	0	0	0	0	0	0	0	0
56	OTHER		0	0	120000	100000	0	0	150000	0	0	0	0	0
57	CAPITAL		0	0	55.296	12.8	0	0	19.2	0	0	0	0	0
58	LABOR		0	0	16	0	18	0	20	0	0	0	0	0

Appendix Table D-22. Tarapoto, Sorg

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		SORG1		AGENCY		TARAPOTO							
3	VARIETY		GRAIN SORGHUM		SUBAGENCY									
4	TECHNOLOGY		LOW		DATE		26/6/85							
5	PLANT/HARVEST		JAN-FEB/JUN/JUL		SOURCE		B.A.							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		1500											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep													
12	Planting		10											
13	Irrigation													
14	Fertilization													
15	Cultivation				10									
16	Pesticides													
17	Harvest							12						
18	Other													
19														
20	MACHINERY													
21	Land Prep		371000											
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount		15											
37	Cost		15000											
38														
39	PESTICIDE/FERTILIZER													
40	Type								TRANSP					
41	Amount													
42	Cost								150000					
43	Type								SACKS					
44	Amount													
45	Cost								65000					
46	Type													
47	Amount													
48	Cost													
49	Type													
50	Amount													
51	Cost													
52	Other													
53														
54	TOTAL													
55	MACHINERY		371000	0	0	0	0	0	0	0	0	0	0	0
56	OTHER		15000	0	0	0	0	0	215000	0	0	0	0	0
57	CAPITAL		36.091	0	0	0	0	0	20.1025	0	0	0	0	0
58	LABOR		10	0	10	0	0	12	0	0	0	0	0	0

APPENDIX E

CONTUMAZA CROP BUDGETS

Appendix E-1. Contumaza, Arroz1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Arroz		AGENCY		Trujillo							
3	VARIETY		Inti		SUBAGENCY									
4	TECHNOLOGY		High		DATE		20-08-84							
5	PLANT/HARVEST		Sept/May		SOURCE		Banco Agrario							
6	IRRIGATION		14000		CROPS/YR		2							
7	YIELD		6000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9											21.5	5		
10	LABOR											32		
11	Land Prep										21	5		
12	Planting										1	32		
13	Irrigation													
14	Fertilization		2	1										
15	Cultivation													36
16	Pesticides													2
17	Harvest						32							
18	Other													
19														
20	MACHINERY													
21	Land Prep										6.5			
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount										120	120		
37	Cost		0	0	0	0	0	0	0	0	120000	300000	0	0
38														
39	PESTICIDE													
40	Type													
41	Amount													
42	Cost		0	0	0	0	0	0	0	0	0	0	0	897600
43	Type													
44	Amount													
45	Cost		0	0	0	0	0	0	0	0	0	0	0	0
46	Type													
47	Amount													
48	Cost		0	0	0	0	0	0	0	0	0	0	0	0
49	Other													
50														
51	FERTILIZER													
52	Type		Urea											
53	Amount		668											
54	Cost		1401464	0	0	0	0	0	0	0	0	0	0	0
55														
56	TOTAL													
57	LABOR		2	1	0	0	32	0	0	0	22	37	0	38
58	MACHINERY		0	0	0	0	0	0	0	0	234000	0	0	0
59	OTHER		1401464	0	0	0	0	0	0	0	120000	300000	0	897600
60	CAPTIAL COSTS		1401464	0	0	0	0	0	0	0	354000	300000	0	897600

Appendix E-2. Contumaza, Arroz2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Arroz2		AGENCY		Trujillo							
3	VARIETY		Minabar		SUBAGENCY									
4	TECHNOLOGY		high		DATE		28-04-83							
5	PLANT/HARVEST		Sep/May		SOURCE		Banco Agrario							
6	IRRIGATION		16000		CROPS/YR		2							
7	YIELD		5500											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep										21	5		
12	Planting										1	32		
13	Irrigation													
14	Fertilization		1	1										
15	Cultivation													36
16	Pesticides													2
17	Harvest						26							
18	Other													
19														
20	MACHINERY													
21	Land Prep										6.5			
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount										120			
37	Cost		0	0	0	0	0	0	0	0	300000	0	0	0
38														
39	PESTICIDE													
40	Type													
41	Amount													
42	Cost		0	0	0	0	0	0	0	0	0	0	0	472440
43	Type													
44	Amount													
45	Cost		0	0	0	0	0	0	0	0	0	0	0	0
46	Type													
47	Amount													
48	Cost		0	0	0	0	0	0	0	0	0	0	0	0
49	Other													
50														
51	FERTILIZER													
52	Type		urea											
53	Amount		334											
54	Cost		700732	0	0	0	0	0	0	0	0	0	0	0
55														
56	TOTAL													
57	LABOR		1	1	0	0	26	0	0	0	22	37	0	38
58	MACHINERY		0	0	0	0	0	0	0	0	234000	0	0	0
59	OTHER		700732	0	0	0	0	0	0	0	300000	0	0	472440
60	CAPITAL COSTS		700732	0	0	0	0	0	0	0	534000	0	0	472440

Appendix E-3. Contumaza, Arroz3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Arroz3		AGENCY		Cajamarca							
3	VARIETY		Comun		SUBAGENCY									
4	TECHNOLOGY		High		DATE		6-6-85							
5	PLANT/HARVEST		Jul/May		SOURCE		Banco Agrario							
6	IRRIGATION				CROPS/YR		1							
7	YIELD		4300											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep								15					2
12	Planting								1					
13	Irrigation								1			15		
14	Fertilization								1					2
15	Cultivation								1					32
16	Pesticides								1					2
17	Harvest						25							
18	Other	(pajareo o guardiania)			8									
19														
20	MACHINERY													
21	Land Prep								6					
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other					Transport harvest			344000					
27														
28	YUNTA													
29	Land Prep													
30	Planting								96000					
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount								100					
37	Cost		0	0	0	0	0	0	250000	0	0	0	0	0
38														
39	PESTICIDE													
40	Type								generic					
41	Amount													
42	Cost		0	0	0	0	0	0	180000	0	0	0	0	0
43	Type													
44	Amount													
45	Cost		0	0	0	0	0	0	0	0	0	0	0	0
46	Type													
47	Amount													
48	Cost		0	0	0	0	0	0	0	0	0	0	0	0
49	Other													
50														
51	FERTILIZER													
52	Type								Urea					
53	Amount								400					
54	Cost		0	0	0	0	0	0	975200	0	0	0	0	0
55														
56	TOTAL													
57	LABOR		0	0	8	0	25	0	20	0	0	15	0	38
58	MACHINERY		0	0	0	0	0	0	636000	0	0	0	0	0
59	OTHER		0	0	0	0	0	0	1501200	0	0	0	0	0
60	CAPITAL COSTS		0	0	0	0	0	0	2137200	0	0	0	0	0

Appendix E-4. Contumaza, Tpeal

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		TPEA		AGENCY		Trujillo							
3	VARIETY				SUBAGENCY									
4	TECHNOLOGY		high		DATE		8-16-84							
5	PLANT/HARVEST		May/Aug		SOURCE		Banco Agrario							
6	IRRIGATION		6000		CROPS/YR									
7	YIELD		3000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep						15							
12	Planting						4							
13	Irrigation						10							
14	Fertilization													
15	Cultivation										8			
16	Pesticides										6			
17	Harvest											25		
18	Other													
19														
20	MACHINERY													
21	Land Prep						9							
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount						60							
37	Cost		0	0	0	0	300000	0	0	0	0	0	0	0
38														
39	PESTICIDE/FERTILIZER													
40	Type						elementos menores							
41	Amount													
42	Cost		0	0	0	0	187000	0	0	0	0	0	0	0
43	Type						pesticides generic							
44	Amount													
45	Cost		0	0	0	0	374000	0	0	0	0	0	0	0
46	Type													
47	Amount													
48	Cost		0	0	0	0	0	0	0	0	0	0	0	0
49	Type						Water							
50	Amount						6000							
51	Cost		0	0	0	0	3600	check	0	0	0	0	0	0
52	Other													
53														
54	TOTAL													
55	LABOR		0	0	0	0	29	0	0	0	14	25	0	0
56	MACHINERY		0	0	0	0	324000	0	0	0	0	0	0	0
57	OTHER		0	0	0	0	864600	0	0	0	0	0	0	0
58	Captital Costs		0	0	0	0	1188600	0	0	0	0	0	0	0

Appendix E-5. Contumaza, Corn1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Maiz Amarillo		AGENCY		Cajamarca							
3	VARIETY				SUBAGENCY									
4	TECHNOLOGY		Medium		DATE		3-11-85							
5	PLANT/HARVEST		Aug/Apr		SOURCE		Banco Agrario							
6	IRRIGATION		Yes		CROPS/YR									
7	YIELD		2800											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep										2			
12	Planting													
13	Irrigation		1	1							1	1	1	1
14	Fertilization										2			2
15	Cultivation													26
16	Pesticides													2
17	Harvest					22								
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep									210000				
30	Planting										42000			
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount									25				
37	Cost		0	0	0	0	0	0	0	62500	0	0	0	0
38														
39	PESTICIDE/FERTILIZER													
40	Type										Urea			
41	Amount										141			
42	Cost		0	0	0	0	0	0	0	0	295818	0	0	0
43	Type										Ammonium Phosphate			
44	Amount										195			
45	Cost		0	0	0	0	0	0	0	0	520650	0	0	0
46	Type										Cloruro de Potasio			
47	Amount										50			
48	Cost		0	0	0	0	0	0	0	0	72350	0	0	0
49	Type													
50	Amount													
51	Cost		0	0	0	0	0	0	0	0	0	0	0	0
52	Other	(generic pesticide)												150000
53														
54	LABOR		1	1	0	22	0	0	0	0	5	1	1	31
55	TOTAL		0	0	0	0	0	0	0	0	0	0	0	0
56	LABOR		15000	15000	0	330000	0	0	0	0	75000	15000	15000	465000
57	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
58	OTHER		0	0	0	0	0	0	0	272500	930818	0	0	150000
59	CAPITAL COSTS		0	0	0	0	0	0	0	272500	930818	0	0	150000

Appendix E-6. Contumaza, Corn2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Maiz Amarillo duroAGENCY				Cajamarca							
3	VARIETY		Pm 701, Pioneer, pSUBAGENCY				Sierra Norte							
4	TECHNOLOGY		Medio		DATE		9-1984							
5	PLANT/HARVEST		Oct/Mar		SOURCE		Cipa							
6	IRRIGATION		Yes		CROPS/YR		?							
7	YIELD		4000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep											12		
12	Planting											4		
13	Irrigation											2	4	
14	Fertilization											3		
15	Cultivation												16	
16	Pesticides												8	
17	Harvest				21									
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep											240000		
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount											25		
37	Cost		0	0	0	0	0	0	0	0	0	150000	0	0
38														
39	PESTICIDE/FERTILIZER													
40	Type			Tamaron	Dipterex								Urea	Parathion
41	Amount			1	10								200	2
42	Cost		0	165807	151300	0	0	0	0	0	0	0	419600	111499.2
43	Type												Superfosfato Tripi	
44	Amount												100	
45	Cost		0	0	0	0	0	0	0	0	0	0	224200	0
46	Type												Cloruro de Potasio	
47	Amount												50	
48	Cost		0	0	0	0	0	0	0	0	0	0	72350	0
49	Type												Cidial 50L	
50	Amount												30	
51	Cost		0	0	0	0	0	0	0	0	0	0	4005	0
52	Other		Tranporte de insumos									12000		
53														
54	TOTAL													
55	LABOR		0	0	315000	0	0	0	0	0	0	315000	420000	0
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		0	165807	151300	0	0	0	0	0	0	402000	720155	111499.2
58	Captital Costs		0	165807	151300	0	0	0	0	0	0	402000	720155	111499.2

Appendix E-7. Contumaza, Yuca

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Yuca		AGENCY		Cajamarca							
3	VARIETY				SUBAGENCY									
4	TECHNOLOGY		Medio		DATE		6-6-85							
5	PLANT/HARVEST		Oct/Aug		SOURCE		Banco Agrario							
6	IRRIGATION		Yes		CROPS/YR									
7	YIELD		10000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep													
12	Planting													4
13	Irrigation			12										
14	Fertilization													
15	Cultivation			24										
16	Pesticides			2										
17	Harvest									20				
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep											180000		
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount													10
37	Cost		0	0	0	0	0	0	0	0	0	0	0	600000
38														
39	PESTICIDE/FERTILIZER													
40	Type													Ammonium
41	Amount													200
42	Cost		0	0	0	0	0	0	0	0	0	0	0	384000
43	Type													Superf. C
44	Amount													200
45	Cost		0	0	0	0	0	0	0	0	0	0	0	193000
46	Type													Cloruro d
47	Amount													50
48	Cost		0	0	0	0	0	0	0	0	0	0	0	72350
49	Type			Pesticide generic										
50	Amount													
51	Cost		0	141120	0	0	0	0	0	0	0	0	0	0
52	Other													
53														
54	TOTAL													
55	LABOR		0	38	0	0	0	0	0	20	0	0	0	4
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		0	141120	0	0	0	0	0	0	0	180000	0	1249350
58	Captital Costs		0	141120	0	0	0	0	0	0	0	180000	0	1249350

Appendix E-8. Contumaza, Cpeal

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Arveja Verde		AGENCY		Cajamarca							
3	VARIETY				SUBAGENCY									
4	TECHNOLOGY		medio		DATE		3-11-85							
5	PLANT/HARVEST		Jan/Jul		SOURCE		Banco Agrario							
6	IRRIGATION		No		CROPS/YR									
7	YIELD		1500											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep		4											
12	Planting		2											
13	Irrigation													
14	Fertilization		1											
15	Cultivation					8								
16	Pesticides													
17	Harvest								12					
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep		105000											
30	Planting		30000											
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount		120											
37	Cost		600000	0	0	0	0	0	0	0	0	0	0	0
38														
39	PESTICIDE/FERTILIZER													
40	Type		Ammonium Phosphate											
41	Amount		100											
42	Cost		267000	0	0	0	0	0	0	0	0	0	0	0
43	Type		elementos menores											
44	Amount													
45	Cost		20000	0	0	0	0	0	0	0	0	0	0	0
46	Type													
47	Amount													
48	Cost		0	0	0	0	0	0	0	0	0	0	0	0
49	Type													
50	Amount													
51	Cost		0	0	0	0	0	0	0	0	0	0	0	0
52	Other													
53														
54	TOTAL													
55	LABOR		7	0	0	8	0	0	12	0	0	0	0	0
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		1022000	0	0	0	0	0	0	0	0	0	0	0
58	Captital Costs		1022000	0	0	0	0	0	0	0	0	0	0	0

Appendix E-9. Contumaza, Cpea3a

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Arveja verde		AGENCY		Cajamarca							
3	VARIETY		blanca		SUBAGENCY									
4	TECHNOLOGY		low		DATE		9-84							
5	PLANT/HARVEST		Feb/May		SOURCE		Cipa							
6	IRRIGATION		No		CROPS/YR									
7	YIELD		800											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep			12										
12	Planting				3									
13	Irrigation													
14	Fertilization				2									
15	Cultivation					6								
16	Pesticides													
17	Harvest						18							
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep			288000										
30	Planting			48000										
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount				100									
37	Cost		0	0	500000	0	0	0	0	0	0	0	0	0
38														
39	PESTICIDE/FERTILIZER													
40	Type				Urea									
41	Amount				50									
42	Cost		0	0	104900	0	0	0	0	0	0	0	0	0
43	Type													
44	Amount													
45	Cost		0	0	0	0	0	0	0	0	0	0	0	0
46	Type													
47	Amount													
48	Cost		0	0	0	0	0	0	0	0	0	0	0	0
49	Type													
50	Amount													
51	Cost		0	0	0	0	0	0	0	0	0	0	0	0
52	Other	transport			6000									
53														
54	TOTAL													
55	LABOR		0	12	5	6	18	0	0	0	0	0	0	0
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		0	336000	610900	0	0	0	0	0	0	0	0	0
58	Captital Costs		0	336000	610900	0	0	0	0	0	0	0	0	0

Appendix E-10. Contumaza, Cebl

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Cebada Grano		AGENCY		Cajamarca							
3	VARIETY				SUBAGENCY									
4	TECHNOLOGY		Medium		DATE		3-11-85							
5	PLANT/HARVEST		Oct/Apr		SOURCE		Banco Agrario							
6	IRRIGATION		No		CROPS/YR									
7	YIELD		1500											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep													
12	Planting											4		
13	Irrigation													
14	Fertilization		2											
15	Cultivation		10											
16	Pesticides													
17	Harvest					9								
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep											49		
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount											100		
37	Cost		0	0	0	0	0	0	0	0	0	110000	0	0
38														
39	PESTICIDE/FERTILIZER													
40	Type		Urea											
41	Amount		50											
42	Cost		104900	0	0	0	0	0	0	0	0	0	0	0
43	Type		Ammonium Phosphate											
44	Amount		100											
45	Cost		267000	0	0	0	0	0	0	0	0	0	0	0
46	Type													
47	Amount													
48	Cost		0	0	0	0	0	0	0	0	0	0	0	0
49	Type													
50	Amount													
51	Cost		0	0	0	0	0	0	0	0	0	0	0	0
52	Other	(generic	20000											
53														
54	TOTAL													
55	LABOR		180000	0	0	135000	0	0	0	0	0	60000	0	0
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		391900	0	0	0	0	0	0	0	0	110049	0	0
58	Captital Costs		391900	0	0	0	0	0	0	0	0	110049	0	0

Appendix E-11. Contumaza, Ceb2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Cebada		AGENCY		Cajamarca							
3	VARIETY		Zapata Malvina		SUBAGENCY		Sierra Norte							
4	TECHNOLOGY		Medio		DATE		9-1984							
5	PLANT/HARVEST		Jan/Jun		SOURCE		Cipa							
6	IRRIGATION		No		CROPS/YR									
7	YIELD		2000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep		9											
12	Planting		4											
13	Irrigation													
14	Fertilization		2		1									
15	Cultivation		10											
16	Pesticides				2									
17	Harvest							19						
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep		64											
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount		100											
37	Cost		110000	0	0	0	0	0	0	0	0	0	0	0
38														
39	PESTICIDE/FERTILIZER													
40	Type		Urea											
41	Amount		135											
42	Cost		125280	0	0	0	0	0	0	0	0	0	0	0
43	Type		Superfosfato Simple de Ca.											
44	Amount		200											
45	Cost		102400	0	0	0	0	0	0	0	0	0	0	0
46	Type				Metasystox									
47	Amount				1									
48	Cost		0	0	78320	0	0	0	0	0	0	0	0	0
49	Type													
50	Amount													
51	Cost		0	0	0	0	0	0	0	0	0	0	0	0
52	Other	transport	9000					12000	9000					
53														
54	TOTAL													
55	LABOR		375000	0	45000	0	0	285000	0	0	0	0	0	0
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		346744	0	78320	0	0	12000	9000	0	0	0	0	0
58	Captital Costs		346744	0	78320	0	0	12000	9000	0	0	0	0	0

Appendix E-12. Contumaza, Corn3

	A	C	D	E	F	G	H	I	J	K	L	M	N
1			CROP BUDGETS										
2	CROP	Maiz Grano		AGENCY		Cajamarca							
3	VARIETY	Cancheros		SUBAGENCY									
4	TECHNOLOGY	Media		DATE		8-85							
5	PLANT/HARVEST	Oct/may		SOURCE		Experiment Station							
6	IRRIGATION	No		CROPS/YR									
7	YIELD	3000											
8		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9													
10	LABOR												
11	Land Prep									8			
12	Planting										4		
13	Irrigation												
14	Fertilization												1
15	Cultivation												18
16	Pesticides		4								5		2
17	Harvest					17							
18	Other												
19													
20	MACHINERY												
21	Land Prep												
22	Planting												
23	Irrigation												
24	Cultivation												
25	Harvest												
26	Other												
27													
28	YUNTA (Check amounts)												
29	Land Prep									192000			
30	Planting											48000	
31	Cultivation												
32	Harvest												
33	Other												
34													
35	SEED												
36	Amount										35		
37	Cost	0	0	0	0	0	0	0	0	0	140000	0	0
38													
39	PESTICIDE/FERTILIZER												
40	Type		Sevin								Superf Triple		Dipterex
41	Amount		1.5								87		10
42	Cost	0	242550	0	0	0	0	0	0	0	195054	0	374850
43	Type										Urea		Urea
44	Amount										59		119
45	Cost	0	0	0	0	0	0	0	0	0	123782	0	249662
46	Type										Cloruro Potasio		
47	Amount										67		
48	Cost	0	0	0	0	0	0	0	0	0	96949	0	0
49	Type												
50	Amount												
51	Cost	0	0	0	0	0	0	0	0	0	0	0	0
52	Other												
53													
54	TOTAL												
55	LABOR	0	4	0	0	17	0	0	0	8	9	0	21
56	MACHINERY	0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER	0	242550	0	0	0	0	0	0	192000	555785	48000	624512
58	Captital Costs	0	242550	0	0	0	0	0	0	192000	555785	48000	624512

Appendix E-13. Contumaza, Corn7

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Maiz Amilaceo		AGENCY		Cajamarca							
3	VARIETY				SUBAGENCY									
4	TECHNOLOGY		medio		DATE		2-8-83							
5	PLANT/HARVEST		Set/may		SOURCE		Banco Agrario							
6	IRRIGATION		No		CROPS/YR									
7	YIELD		1800											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep													
12	Planting											1		
13	Irrigation													
14	Fertilization		2									1		
15	Cultivation		8	10										
16	Pesticides		3											
17	Harvest						16							
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep										240000			
30	Planting											48000		
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount											30		
37	Cost		0	0	0	0	0	0	0	0	0	180000	0	0
38														
39	PESTICIDE/FERTILIZER													
40	Type		pesticide generic									Urea		
41	Amount											150		
42	Cost		243612	0	0	0	0	0	0	0	0	314700	0	0
43	Type											Ammonium Phosphate		
44	Amount											100		
45	Cost		0	0	0	0	0	0	0	0	0	267000	0	0
46	Type											Cloruro de Pot		
47	Amount											50		
48	Cost		0	0	0	0	0	0	0	0	0	72350	0	0
49	Type													
50	Amount													
51	Cost		0	0	0	0	0	0	0	0	0	0	0	0
52	Other	transportation									18090			
53														
54	TOTAL													
55	LABOR		13	10	0	0	16	0	0	0	0	2	0	0
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		243612	0	0	0	0	0	0	0	258090	882050	0	0
58	Captital Costs		243612	0	0	0	0	0	0	0	258090	882050	0	0

Appendix E-14. Contumaza, Corn 9

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Maiz amilaceo		AGENCY		Cajamarca							
3	VARIETY		Cajamarca 101		SUBAGENCY									
4	TECHNOLOGY		medio		DATE		7-84							
5	PLANT/HARVEST		Sep/Mar		SOURCE		Cipa							
6	IRRIGATION		No		CROPS/YR									
7	YIELD		2000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep										2			
12	Planting										7			
13	Irrigation													
14	Fertilization												2	
15	Cultivation											2	15	
16	Pesticides													
17	Harvest				29									
18	Other	transport				2								
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep										282000			
30	Planting										54000			
31	Cultivation													
32	Harvest													
33	Other								transport	2acemila	6000			
34														
35	SEED													
36	Amount										50			
37	Cost		0	0	0	0	0	0	0	0	300000	0	0	0
38														
39	PESTICIDE/FERTILIZER													
40	Type										Urea	Dipterex		
41	Amount										200	10		
42	Cost		0	0	0	0	0	0	0	0	419600	90900	0	0
43	Type										Superf.	tSevin		
44	Amount										100	3		
45	Cost		0	0	0	0	0	0	0	0	224200	357540	0	0
46	Type										Cloruro de Pot.			
47	Amount										50			
48	Cost		0	0	0	0	0	0	0	0	72350	0	0	0
49	Type										Aldrin			
50	Amount										1			
51	Cost		0	0	0	0	0	0	0	0	76760	0	0	0
52	Other								Gesaprin	2	242400			
53														
54	TOTAL													
55	LABOR		0	0	29	2	0	0	0	0	9	2	17	0
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		0	0	0	0	0	0	0	2	1677310	448440	0	0
58	Captital Costs		0	0	0	0	0	0	0	2	1677310	448440	0	0

Appendix E-15. Contumaza, Cpapl

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Papa		AGENCY		Cajamarca							
3	VARIETY		Blanca		SUBAGENCY									
4	TECHNOLOGY		Medium		DATE		3-11-85							
5	PLANT/HARVEST		Apr/Nov		SOURCE		Banco Agrario							
6	IRRIGATION		No		CROPS/YR		1							
7	YIELD		10000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep					4	2							
12	Planting						5							
13	Irrigation													
14	Fertilization						5				4			
15	Cultivation										26			
16	Pesticides						5				10			
17	Harvest												28	
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep					210000								
30	Planting						96000							
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount						1200							
37	Cost		0	0	0	0	1440000	0	0	0	0	0	0	0
38														
39	PESTICIDE/FERTILIZER													
40	Type					Urea								
41	Amount					150								
42	Cost		0	0	0	314700	0	0	0	0	0	0	0	0
43	Type					Ammonium Phosphate								
44	Amount					200								
45	Cost		0	0	0	534000	0	0	0	0	0	0	0	0
46	Type					Cloruro de Potasio								
47	Amount					150								
48	Cost		0	0	0	217050	0	0	0	0	0	0	0	0
49	Type					Minor Elements								
50	Amount													
51	Cost		0	0	0	45000	0	0	0	0	0	0	0	0
52	Other	(generic pesticide)				804000								
53														
54	TOTAL													
55	LABOR		0	0	0	4	17	0	0	0	40	0	28	0
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		0	0	0	1320750	1536000	0	0	0	0	0	0	0

Appendix E-16. Contumaza, Tpapl

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		TPAP(POTATO)		AGENCY		TRUJILLO							
3	VARIETY		BLANCA		SUBAGENCY									
4	TECHNOLOGY		MEDIUM		DATE		10-12-82							
5	PLANT/HARVEST		SPT/MAY		SOURCE		BANCO AGRARIO							
6	IRRIGATION		NO		CROPS/YR									
7	YIELD		10000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep										3			
12	Planting										3			
13	Irrigation													
14	Fertilization										3			
15	Cultivation										20			
16	Pesticides										2			14
17	Harvest						12							
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep										324000			
30	Planting													
31	Cultivation													
32	Harvest						36000							
33	Other													
34														
35	SEED													
36	Amount										1000			
37	Cost		0	0	0	0	0	0	0	0	1000000	0	0	0
38														
39	PESTICIDE													
40	Type										UREA			
41	Amount										173			
42	Cost		0	0	0	0	0	0	0	0	362954	0	0	0
43	Type										AMMONIUM PHOSPHATE			
44	Amount										348			
45	Cost		0	0	0	0	0	0	0	0	929160	0	0	0
46	Type										CLORURO DE POTASIO			
47	Amount										150			
48	Cost		0	0	0	0	0	0	0	0	217050	0	0	0
49	Other	GENERIC									840000			
50														
51	FERTILIZER													
52	Type										GUANO			
53	Amount													
54	Cost		0	0	0	0	0	0	0	0	6400	0	0	0
55	OTHER	(TRANSPORT, BAG, FOOD)									363000			
56														
57	TOTAL													
58	LABOR		0	0	0	0	12	0	0	0	31	0	0	14
59	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
60	OTHER		0	0	0	0	36000	0	0	0	2839564	0	0	0
61	CAPTIAL COSTS		0	0	0	0	36000	0	0	0	2839564	0	0	0

Appendix E-17. Contumaza, Cpap2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Papa		AGENCY		Cajamarca							
3	VARIETY		Mariva		SUBAGENCY									
4	TECHNOLOGY		Medio		DATE		9-84							
5	PLANT/HARVEST		Oct/mar		SOURCE		Cipa							
6	IRRIGATION		no		CROPS/YR									
7	YIELD		15000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep											16		
12	Planting												14	
13	Irrigation													
14	Fertilization													12
15	Cultivation													10
16	Pesticides		13											
17	Harvest				23									
18	Other				Market prep		11							
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep											240000		
30	Planting												72000	
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount											1200		
37	Cost		0	0	0	0	0	0	0	0	0	1440000	0	0
38														
39	PESTICIDE/FERTILIZER													
40	Type			Cupravit								Urea	Toxafeno	Dithane
41	Amount			4								225	44	4
42	Cost		0	272696	0	0	0	0	0	0	0	472050	231827.2	213600
43	Type											Sup.Fosf.Triple de		Tamaron
44	Amount											175		1
45	Cost		0	0	0	0	0	0	0	0	0	392350	0	160200
46	Type											Cloruro de Pot.		Adherente
47	Amount											100		1
48	Cost		0	0	0	0	0	0	0	0	0	144700	0	40050
49	Type											Tecto 60		
50	Amount											.2		
51	Cost		0	0	0	0	0	0	0	0	0	64080	0	0
52	Other									transport		43000		
53														
54	TOTAL													
55	LABOR		13	0	23	0	11	0	0	0	0	16	14	22
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		0	272696	0	0	0	0	0	0	0	2796180	303827.2	413850
58	Captital Costs		0	272696	0	0	0	0	0	0	0	2796180	303827.2	413850

Appendix E-18. Contumaza, Twhtl

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Trigo		AGENCY		Trujillo							
3	VARIETY				SUBAGENCY									
4	TECHNOLOGY		Medium		DATE		8-16-84							
5	PLANT/HARVEST		Nov/Jun		SOURCE		Banco Agrario							
6	IRRIGATION		Rain		CROPS/YR		1							
7	YIELD		1500											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep												3	
12	Planting													1
13	Irrigation													
14	Fertilization													1
15	Cultivation			3										
16	Pesticides			1										
17	Harvest							15						
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep												36000	
30	Planting													48000
31	Cultivation													
32	Harvest													
33	Other			337500(transport, bags, food, et. al.)										
34														
35	SEED													
36	Amount												120	
37	Cost		0	0	0	0	0	0	0	0	0	0	240000	0
38														
39	PESTICIDE													
40	Type			Ammonium Nitrate										
41	Amount			173										
42	Cost		0	332160	0	0	0	0	0	0	0	0	0	0
43	Type			Ammonium Phosphate										
44	Amount			130										
45	Cost		0	347100	0	0	0	0	0	0	0	0	0	0
46	Type			Cloruro de Potasio										
47	Amount			50										
48	Cost		0	72350	0	0	0	0	0	0	0	0	0	0
49	Other	PESTICIDES		280500										
50														
51	FERTILIZER													
52	Type													
53	Amount													
54	Cost		0	0	0	0	0	0	0	0	0	0	0	0
55														
56	TOTAL													
57	LABOR		0	4	0	0	0	15	0	0	0	0	3	2
58	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
59	OTHER		0	1089110	0	0	0	0	0	0	0	0	276000	48000
60	CAPITAL COSTS		0	1089110	0	0	0	0	0	0	0	0	276000	48000

Appendix E-19. Contumaza, Cwhtl

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Trigo		AGENCY		Cajamarca							
3	VARIETY				SUBAGENCY									
4	TECHNOLOGY		Medium		DATE		3-11-85							
5	PLANT/HARVEST		Oct/Apr		SOURCE		Banco Agrario							
6	IRRIGATION		No		CROPS/YR			1						
7	YIELD		1200											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep											4		
12	Planting											2		
13	Irrigation													
14	Fertilization		2									2		
15	Cultivation		14											
16	Pesticides													
17	Harvest					9								
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA											120000		
29	Land Prep													
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount											100		
37	Cost		0	0	0	0	0	0	0	0	0	150000	0	0
38														
39	PESTICIDE													
40	Type											urea		
41	Amount											150		
42	Cost		0	0	0	0	0	0	0	0	0	314700	0	0
43	Type											Superfosfato calcio simple		
44	Amount											300		
45	Cost		0	0	0	0	0	0	0	0	0	289500	0	0
46	Type											Cloruro de Potasio		
47	Amount											50		
48	Cost		0	0	0	0	0	0	0	0	0	72350	0	0
49	Other								Pesticides			140000		
50														
51	FERTILIZER													
52	Type													
53	Amount													
54	Cost		0	0	0	0	0	0	0	0	0	0	0	0
55														
56	TOTAL													
57	LABOR		240000	0	0	135000	0	0	0	0	0	120000	0	0
58	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
59	OTHER		0	0	0	0	0	0	0	0	0	1086550	0	0

Appendix E-20. Contumaza, Cwht2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Trigo		AGENCY		Cajamarca							
3	VARIETY		Ollanta		SUBAGENCY		Cajamarca							
4	TECHNOLOGY		Medio		DATE		9-1984							
5	PLANT/HARVEST		Jan/Jun		SOURCE		Cipa							
6	IRRIGATION		No		CROPS/YR									
7	YIELD		1200											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep		9											
12	Planting		4											
13	Irrigation													
14	Fertilization		2		1									
15	Cultivation				10									
16	Pesticides				2									
17	Harvest							19						
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep		192000											
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount		100											
37	Cost		200000	0	0	0	0	0	0	0	0	0	0	0
38														
39	PESTICIDE/FERTILIZER													
40	Type		Urea											
41	Amount		150											
42	Cost		314700	0	0	0	0	0	0	0	0	0	0	0
43	Type		Superf. Simple de Ca.											
44	Amount		200											
45	Cost		193000	0	0	0	0	0	0	0	0	0	0	0
46	Type		Metasystox											
47	Amount		1											
48	Cost		78320	0	0	0	0	0	0	0	0	0	0	0
49	Type													
50	Amount													
51	Cost		0	0	0	0	0	0	0	0	0	0	0	0
52	Other	transport	6000					8000	13000					
53														
54	TOTAL													
55	LABOR		15	0	13	0	0	19	0	0	0	0	0	0
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		984020	0	0	0	0	8000	13000	0	0	0	0	0
58	Captital Costs		984020	0	0	0	0	8000	13000	0	0	0	0	0

Appendix E-21. Contumaza, Cwht3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Trigo		AGENCY		Cajamarca							
3	VARIETY		El Gavilan		SUBAGENCY		Estacion							
4	TECHNOLOGY		low		DATE		8-84							
5	PLANT/HARVEST		Dec/Jul		SOURCE		Experiment Station							
6	IRRIGATION		No		CROPS/YR									
7	YIELD		1000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep										10			
12	Planting													
13	Irrigation													4
14	Fertilization													3
15	Cultivation				4									
16	Pesticides													
17	Harvest							25						
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep										60000			
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount													120
37	Cost		0	0	0	0	0	0	0	0	0	0	0	240000
38														
39	PESTICIDE/FERTILIZER													
40	Type	(dec 84)			hedonal (herbicide)									
41	Amount													
42	Cost		0	0	161700	0	0	0	0	0	0	0	0	0
43	Type				N-P									
44	Amount				60-40									
45	Cost	(dec 84)	0	0	514500	0	0	0	0	0	0	0	0	0
46	Type													
47	Amount													
48	Cost		0	0	0	0	0	0	0	0	0	0	0	0
49	Type													
50	Amount													
51	Cost		0	0	0	0	0	0	0	0	0	0	0	0
52	Other													
53														
54	TOTAL													
55	LABOR		0	0	4	0	0	25	0	0	10	0	0	7
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		0	0	676200	0	0	0	0	0	60000	0	0	240000
58	Captital Costs		0	0	676200	0	0	0	0	0	60000	0	0	240000

Appendix E-22. Contumaza, Cwht4

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1				CROP BUDGETS										
2	CROP		Trigo		AGENCY		Cajamarca							
3	VARIETY		INIAC-102		SUBAGENCY		Estacion							
4	TECHNOLOGY		low		DATE		8-84							
5	PLANT/HARVEST		Dec/Jul		SOURCE		Experiment Station							
6	IRRIGATION		No		CROPS/YR									
7	YIELD		1000											
8			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
9														
10	LABOR													
11	Land Prep										10			
12	Planting													
13	Irrigation													4
14	Fertilization													3
15	Cultivation				4									
16	Pesticides													
17	Harvest							25						
18	Other													
19														
20	MACHINERY													
21	Land Prep													
22	Planting													
23	Irrigation													
24	Cultivation													
25	Harvest													
26	Other													
27														
28	YUNTA													
29	Land Prep										60000			
30	Planting													
31	Cultivation													
32	Harvest													
33	Other													
34														
35	SEED													
36	Amount													120
37	Cost		0	0	0	0	0	0	0	0	0	0	0	240000
38														
39	PESTICIDE/FERTILIZER													
40	Type				hedonal (herbicide)									
41	Amount													
42	Cost		0	0	161700	0	0	0	0	0	0	0	0	0
43	Type				N-P									
44	Amount				60-40									
45	Cost		0	0	514500	0	0	0	0	0	0	0	0	0
46	Type													
47	Amount													
48	Cost		0	0	0	0	0	0	0	0	0	0	0	0
49	Type													
50	Amount													
51	Cost		0	0	0	0	0	0	0	0	0	0	0	0
52	Other													
53														
54	TOTAL													
55	LABOR		0	0	4	0	0	25	0	0	10	0	0	7
56	MACHINERY		0	0	0	0	0	0	0	0	0	0	0	0
57	OTHER		0	0	676200	0	0	0	0	0	60000	0	0	240000
58	Captital Costs		0	0	676200	0	0	0	0	0	60000	0	0	240000

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