SUCCESSFUL CROP DIVERSIFICATION IN IRRIGATED RICE LANDS: SIX CASE STUDIES

A. Miren Gonzalez-Intal

and

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Final Report Submitted to the

International Irrigation Management Institute

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Chapter 1

OVERVIEW, CONCLUSIONS AND IMPLICATIONS

I. Overview

Introduction

Traditionally, the existence of irrigation in the Philippines has meant two or more croppings per year of rice monoculture. Indeed, crop diversification in irrigated farms is the exception rather than the rule in spite of the fact that the profitability of rice farming has not increased proportionately with the (secular) increase in rice yield.

Crop diversification is important for achieving stable food supplies in the country and for earning and/or saving foreign exchange. More importantly, it could be the key means for increasing farmers' incomes. Hence, the impetus toward irrigated crop diversification. Given this impetus, and given that irrigated crop diversification is relatively uncommon, it is very informative and useful to examine areas where irrigated crop diversification is being successfully practiced.

Unfortunately, there is hardly any information in the literature on successful irrigated crop diversification. Siy's (1982) study[1] provides some data on irrigated crop diversification during the dry season along the northern side of the Bacarra-Vintar river in Ilocos Norte; however the major focus of his study was on the organization and management of the communal irrigation system and not on crop diversification. There is, therefore, a need to examine and document cases of successful irrigated crop diversification. The knowledge gained from such cases will be invaluable towards a clearer understanding of the dynamics of irrigated diversified cropping systems and lessons learned from such cases could be of great help to both government and private sector efforts aimed at converting other irrigated areas to crop diversification.

The objective of this study is to examine and document six cases of successful crop diversification in irrigated rice lands focusing particularly on the economic and institutional and (to a lesser extent) the physical and technical factors that have been supportive

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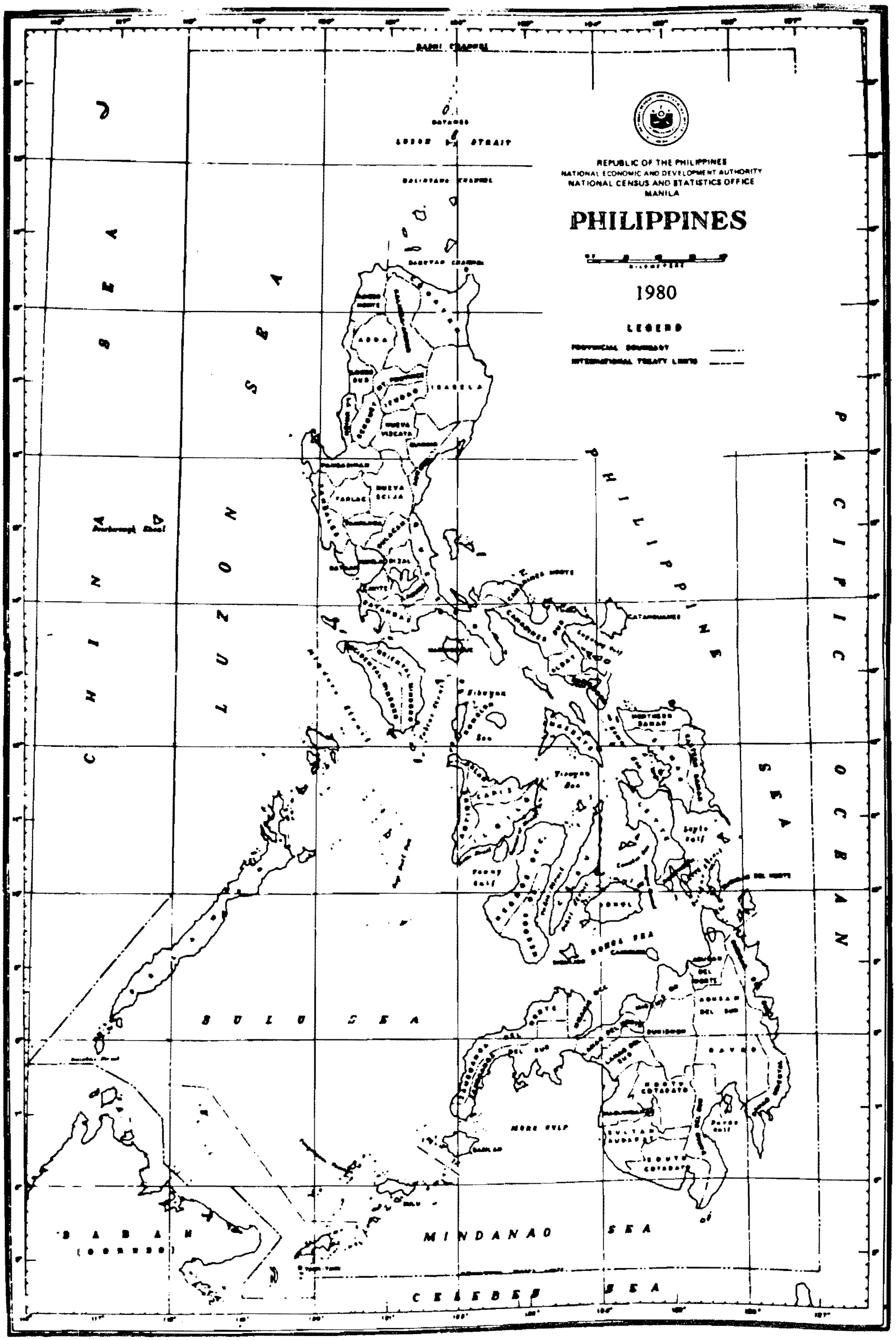
1 Siy, R.Y. Rural organizations for community resource management: Indigenous irrigation systems in the Northern Philippines. Ph.D. dissertation, Cornell University, 1982.

of the crop diversification. Successful crop diversification in irrigated rice lands refers to the situation where farmers in an irrigated area regularly grow one or more non-rice crops during the dry season. The six cases examined in this study are: tobacco farming in San Fabian, Pangasinan; cotton growing in Urdaneta and Manaoag, Panagasinan; tomato growing in Sta. Barbara and Mapandan, Pangasinan; mungbean farming in Manaoag and Urdaneta, Pangasinan; onion growing in San Jose, Nueva Ecija; and garlic, corn and peanut growing in Laoag, Ilocos Norte (see Figure 1).

A total of 266 farmers were interviewed: 40 tobacco farmers, 40 cotton farmers, 40 tomato farmers, 40 mungbean farmers, 40 onion farmers and 66 garlic/corn/ peanut farmers. The following types of information were obtained: demographics, farm and tenure status, production and cropping data for wet season 1985 and dry season 1985-86, data on the adoption of crop diversification and the farmers' cropping decision making, irrigation practices and problems, institutional aspects of irrigation management, cultural practices in crop cultivation, costs and returns, and the product disposal and marketing of the diversified crop.



REPUBLIC OF THE PHILIPPINES
NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY
NATIONAL CENSUS AND STATISTICS OFFICE
MANILA
PHILIPPINES
1980
LEGEND
PROVINCIAL BOUNDARY
INTERNATIONAL TREATY LIMITS
SOUTH CHINA SEA
LUZON SEA
PACIFIC OCEAN
SULU SEA
MINDANAO SEA
CELEBES SEA
SABAH
(BORNEO)
MORO GULF
ISABELA
NUEVA VIZCAYA
NUEVA ECIJA
TARLAC
CATANDUANES
BOHOL
DAVAO
NORTH COTABATO
SOUTH COTABATO

A Descriptive Model of Cropping Decision Making

A major component of the research is an attempt to model the cropping decision making of the farmers vis-a-vis diversified crops. A descriptive model of cropping decision making under uncertainty was developed for this purpose. A substantial portion of the analyses conducted in the six cases revolve around the model. The model and the rationale behind it are discussed below.

There are two general approaches to the modeling of decision making under uncertainty. The first is the positive or descriptive approach and the second is the normative or prescriptive approach. The major difference between the two lies in the objective of the model. Positive or descriptive models seek to describe how things are done in the real world. Thus, descriptive models seek to answer the following questions: How are decisions made in the real world? What is the actual behavior? What steps does the decision maker go through? In contrast, normative or prescriptive models emphasize not what is done but what ought to be done. Normative models prescribe rules for optimizing decisions. These models seek to answer the following questions: What is an ideal approach to problem solving? How should decisions be made?

Table 1. Models of decision making under uncertainty[1]

I. Methods for single attribute risky decisions

A. Maximizing methods

1. Utility function
    a. Expected utility
    b. Moment expected utility
    c. Expected profit

2. Security
    a. Safety principle
    b. Safety first
    c. Maximin

3. Lexicography
    a. Lexicographic safety first
    b. Elimination by aspects

B. Efficiency analysis methods

1. Stochastic dominance
    a. First degree stochastic dominance
    b. Second degree stochastic dominance
    c. Third degree stochastic dominance
    d. Decreasing stochastic dominance
    e. n-th order stochastic dominance
    f. convex stochastic dominance

2. Utility-family-specific orderings
    a. Polynomial
    b. Exponential

3. Others
    a. Mean-variance rule
    b. Mean-absolute deviation approach
    c. Mean-semivariance approach
    d. Mean-entropy method of efficiency analysis
    e. Partial first degree stochastic dominance
    f. E-safety

C. Satisficing methods

II. Methods for multiple attribute risky decision

M.A.1.a. Multiple attribute utility functions
M.A.1.b. Multiple attribute moment utility functions
M.A.2. Multiple attribute lexicography
M.A.3. Multiple attribute elimination by aspects
M.B.1.a. Multiple attribute FSD

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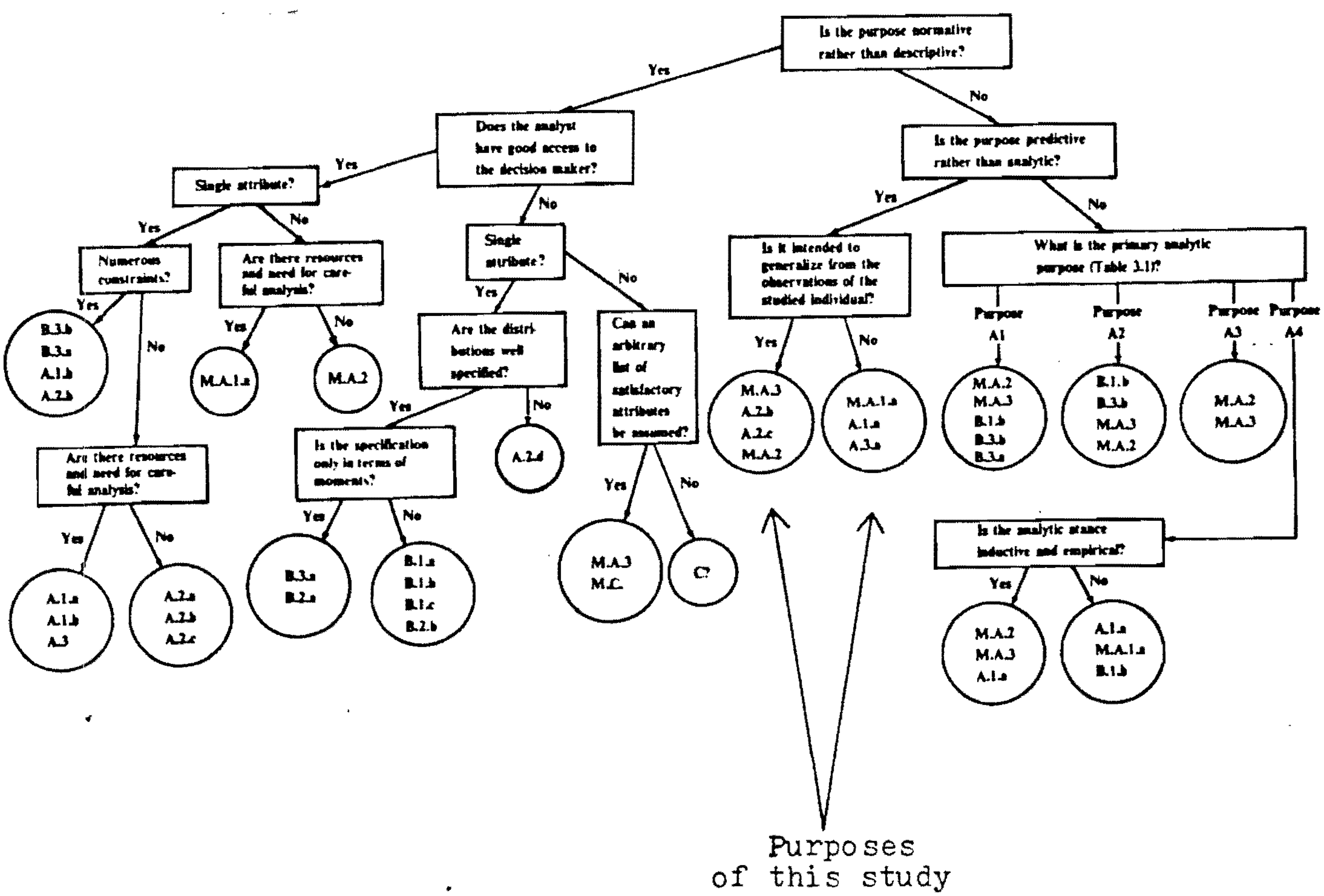
1 Source: Anderson, J.R. Perspective on models of uncertain decisions. In James Roumasset, J-M Boussard, & I. Singh (Eds.), Risk, Uncertainty and Agricultural Development. New York: Agricultural Development Council, 1979.

Early work on the modeling of decision making under uncertainty assumed (a) that people decide in terms of expected utility and (b) that the expected utility function is the statistically optimal way to make decisions. Both assumptions have been questioned in the literature and a number of alternative economic models of risky decision making have been proposed. Table 1 presents a summary of the different models of decision making under uncertainty.

Anderson (1979) points out that the different models of uncertain decisions have different suitabilities for various purposes. He categorizes the different models in terms of to which purposes they are best suited as follows:



From the above figure it is clear that for the purposes of this study, which is to describe individual cropping decision making, the following models could be used, namely: expected utility function, multiple attribute utility function, safety first, safety fixed, multiple attribute lexicography, lexicographic safety first, and multiple attribute elimination by aspects.

Recent work on the cognitive psychology of decision making points out (1) that people often violate the assumptions of expected utility theory in making decisions and (2) people often use simplifying procedures or heuristics in their decision making processes (see e.g., Slovic, Fischoff and Lichtenstein, 1977;2 Nisbett and Ross, 1980 3). Furthermore, recent descriptive modeling work on cropping decision making shows that cropping decision making involves the use of more than just one mode of processing or one decision rule (Gladwin, 1980).4

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2 Slovic, P., Fischoff, B. and Lichtenstein, S. Behavioral decision theory, In Annual Review of Psychology Vol. 28, 1977, pp. 1-39.

3 Nisbett, R. and Ross, L. Human Inference: Strategies and Shortcomings of Social Judgement. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1980.

4 Gladwin, C.H. A theory of real-life choice: Applications to agricultural decisions. In P. Bartlett (Ed.), Agricultural Decision Making: Anthropological Contributions to Rural Development. New York; Academic Press, 1980.

Gladwin (1980, 1983 5) has developed a "decision tree" descriptive model of cropping decision making that combines elimination by aspects, lexicography, and expected profit/utility. Furthermore, Gladwin's model takes into account the various aspects (physical, technical, and economic) that impinge on the cropping decision. None of the purely economic models of decision making is as comprehensive. Despite its comprehensiveness in the treatment of factors, Gladwin's model nonetheless takes into account the constraints on people's cognitive information processing capabilities, i.e., the model is cognitively simple (but definitely not simplistic). Gladwin (1983) tested the decision tree model of cropping decision making in six zones of the "Altiplano" in Guatemala and obtained a success rate of 90 percent prediction. That is, the model predicted the farmer's choices 90 percent of the time (the study involved 118 farmers). Because of its comprehensiveness, cognitive simplicity, and predictive success, this study has chosen the track of descriptive decision modeling along Gladwin. The model used in this study is a modified version of Gladwin's decision tree model. The model is presented in Figure 2. The model posits

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5 Gladwin, C.H. Contributions of decision-tree methodology to a farming systems program. Human Organization, Vol. 42, No.2, 1983, pp. 146-157.

Figure 2. A Descriptive Model of Cropping Decision Making

Stage 1. Satisfaction of Musts: Assuring rice consumption requirements

Q: Will the family's rice consumption requirements be met if the farmer plants other crops(s)?

YES (Move on to Stage 2)

NO: Is (are) there non-rice crop(s) with possible returns that will allow the family to meet its rice consumption requirements?

- YES (Move on to Stage 2)
- NO (Plant rice only)

Stage 2. Testing for Feasibility: Satisfaction of technical constraints and economic feasibility

Technical Constraints:

* soil, topography
  (Does crop X yield well at farmer's soil, topography?) ----- if no ----- eliminate crop X

* water requirements
  (Does farmer have irrigation or is the water enough to meet the requirements of crop X?) ----- if no ----- eliminate crop X

* timing of farm operations
  (Is the timing of farm operations for crop X acceptable to the farmer?) ----- if no ----- eliminate crop X

* knowledge
  (Does farmer know how to plant crop X or will he be able to obtain information?) ----- if no ----- eliminate crop X

Economic Feasibility:

* Demand
  (Can the farmer sell crop X in a nearby market or to a merchant?) ----- if no ----- eliminate crop X

* Time, labor
  (Does the farmer have the available time and accessible labor to help him plant crop X?) ----- if no ----- eliminate crop X

* Capital, Credit
  (Does the farmer have the capital or accessible credit to buy inputs for crop X?) ----- if no ----- eliminate crop X

Note: In Stage 2, there is no one particular sequence in which the farmer processes each alternative crop vis-a-vis the technical constraints and economic feasibility. Suffice it to say that any alternative crop that fails to meet any one of the above-mentioned four technical constraints or three economic feasiblity requirements is eliminated from consideration.

Stage 3. Cost-Benefit Analyses

Examination of the expected returns of each alternative crop vis-a-vis costs.

Q. Is returns from crop X n times greater than returns from previous crop (rice)?

```
                          :
                          :
    ------------------------------------------------
    ------------------------------------------------
    :                                              :
   YES                                            NO
Plant crop X                          Stick to old crop (rice)
```

Note: n is a value which represents the minimum profitability of crop X over the previous crop for which the farmer will be willing to take risk of planting crop X. n is an empirical value that is greater than 1.

three stages in the cropping decision. Stage 1 consists of assuring the family's rice consumption requirements. Specifically, it is hypothesized that a risk-averse farmer will first make sure that food for his family, i.e., rice, will not be compromised by planting other crops. If this is satisfied, the farmer then considers the technical (soil, topography, water, timing, knowledge) and economic (demand, time, labor, capital, credit) feasibility of planting the diversified crop. This constitutes Stage 2. If the crop satisfies the technical and economic feasibility requirements, its potential costs and returns (i.e., profitability) is then considered (Stage 3). A decision to plant the diversified crop will be made if the profitability of the crop is perceived as equal to or greater than the minimum profitability over the traditional crop (rice) for which the farmer is willing to take the risk of planting the diversified crop. The model was tested in each of the six cases. The detailed results on the model are presented in each of the case studies discussed in Chapters 2 to 7 of the report.

The Six Cases

Five of the six case studies are in Region I or Northern Luzon (four in the province of Pangasinan and one in Ilocos Norte); the Nueva Ecija case is in Region III or Central Luzon. Two of the cases -- tomato and cotton -- involve contract growing schemes; the farmers grow the crops on their own in the other four cases.

With the exception of the tomato and cotton farmers, the other farmers have had a long history of cultivating the diversified crops they are planting: the average number of years of growing the crop is 22.2 years for the tobacco farmers, 18.1 years for the mungbean farmers, 20.7 years for the onion farmers, 15.5 years for the garlic farmers, 14.8 years for the corn farmers, and 16.1 years for the peanut farmers. Although the tomato farmers had been growing native tomatoes for many years (an average of over 10 years), they started planting the imported variety only in the last one to three years as part of the contract growing scheme. The cotton farmers have been planting cotton for an average of only 2.4 years.

The tobacco farmers of San Fabian, Pangasinan plant burley tobacco. The Philippine Virginia Tobacco Administration (PVTA) office in Pangasinan oversees the burley production in San Fabian. Aside from the usual

extension services, the PVTA also assists farmers in the marketing of their produce by supervising licensed traders and sponsors the "Outstanding Burley Tobacco Grower of the Year" award.

Most of the tobacco farmers plant only rice in the wet season and only burley in the dry. Over the years, tobacco growing has been a profitable venture for the farmers -- the average ratio of the number of years of positive net to the total number of years the farmers have been planting tobacco is 0.92. In the dry season 1985-86, the average per hectare net returns above cash costs of the farmers' burley crop is 3.48 times greater than the average per hectare net returns above cash costs of their wet season rice crop.

The major buyer/trader of burley tobacco leaves in San Fabian is a Chinese middleman who lives in the area. the Chinese trader also acts as an informal money and input lender to the farmers. He lends the farmers money at an interest rate of 6 percent per cropping season. The input loans have no stipulated interest rates but their prices are marked up to take the interest costs into account.

The cotton farmers of Urdaneta and Manaoag, Pangasinan are contract growers for the Philippine Cotton Corporation (PCC), a government-controlled

corporation which is the central authority charged with undertaking and implementing the commercial production of cotton in the Philippines. PCC technicians regualrly visit farmers to convince them to plant cotton. In the contract growing scheme, PCC provides the farmers with technical advice and inputs -- seeds for free and fertilizer, chemicals and cash loans at no interest, the payment of which are deducted from the gross sales. PCC sets the purchase price of cotton before the cropping season. In dry season 1985-86 it was set at P8.00 per kg.

Although rice is the predominant wet season crop and cotton is the predominat dry season crop of the cotton farmers, many of the farmers nonetheless planted other diversified crops in both the wet and dry seasons (i.e., corn, mungbean, tomato, and stringbeans).

Cotton growing has been financially rewarding for the farmers: since they first began planting cotton, the farmers realized positive nets from their cotton crop an average of 90 percent of the time; furthermore, they report hitting the "jackpot" with their crop from one-third to one-half of the time. In dry season 1985-86, the farmers' net returns above cash costs for cotton was an average of 2.58 times greater than their

net returns above cash costs for preceeding wet season rice crop.

The tomato farmers of Sta. Barbara and Mapandan Pangasinan are also contract growers; the contractor in this case is the Philippine Fruit and Vegetable Industries, Inc. (PFVII) which introduced the contract growing scheme in the area in the 1983-84 dry season for the production of tomatoes for processing into tomato paste. Under the contract growing scheme, PFVII provides the farmers with technical assistance and credit in the form of seeds, fertilizer, chemicals and cash at the interest rate of 1.5 percent per month. PFVII buys the produce at a price that it sets before the cropping season. In dry season 1985-86, it was set at P0.80/kg.

The farmers planted "California variety" tomatoes during the 1985-86 cropping season. The farmers were given the expectation by the PFVII technicians that the "California variety" has a potential yield of 40 tons per hectare. Majority of the farmers also planted other diversified crops in addition to the contract-grown tomato in dry season 1985-86 (e.g., native tomatoes, mungbean, corn, eggplant, gourd, beans, and sugarcane).

The farmers have been growing native tomatoes for an average of over 10 years. Over the years, the native

tomato crop has given the farmers good returns: the farmers realized positive nets from their tomato crop an average of 84 percent of the time and hit the "jackpot" with their crop an average of 20 percent of the time.

The picture was different for the 1985-86 "California variety" crop, however, in that many of the farmers incurred losses. The major reason for the loss was the low yield of about 7.7 tons per hectare which is only 19.4 percent of the PFVII projected harvest of 40 tons per hectare. The low yield was further aggravated by the farmers' high fertilizer and chemical usage, the low purchase price set by PFVII, and the failure of PFVII technicians to get the harvested tomato on time from a number of farmers resulting in the rotting of the produce. (This happened after the snap elections and the February revolution). As a consequence, many farmers owed PFVII money at the end of the cropping season because the gross sales was not enough to pay for the input loans advanced by PFVII. Given the poor performance, PFVII has decided to discontinue its contract growing scheme in the area. Most of the farmers indicated though that they will resume or continue planting the native variety.

Mungbean has been the traditional dry season crop of rice farmers around the border of Manaoag and

Urdaneta, Pangasinan. The lack of adequate irrigation water for rice or other diversified crops in the dry season is a major reason for the widespread cultivation of mungbean in the area during the dry season. Given this, the National Irrigation Administration (NIA) office in Urdaneta, Pangasinan has in fact been programming the area for mungbean production during the dry season. In dry season 1985-86, over 250 hectares in the area were programmed by NIA for mungbean production.

The mungbean cultivation in Manaoag and Urdaneta is characterized by very low labor and input usage. Specifically, most of the farmers do not plow the fields before planting, opting instead to simply broadcast the seeds into the field containing the rice stalks after which the field is harrowed. After emergence, little else is done on the crop except for the usually weekly spraying of pesticides. Fertilizers are not applied nor is weeding practiced.

The farmers have been planting mungbean for an average of 18.1 years and, over the years, the farmers have consistently realized net profits from their mungbean crop (the ratio of number of years of positive net returns to total number of years of planting the crop is 0.91). Nonetheless, the farmers' hitting of the

"jackpot" with their mungbean harvest has been relatively rare.

Unlike the other diversified crops discussed in this report, mungbean has much lower cash and non-cash costs than rice. Despite this and the relatively high mungbean price (in dry season 1985-86 it was around P11.00/kilo), mungbean production has, nonetheless, been much less profitable than rice production. In fact, many of the farmers lost on their mungbean crop in dry season 1985-86. There are two reasons for this: the first and more important one is the very low yields which averaged 385 kg./ha., arising from the poor cultivation practices of the farmers and the second is the high chemical (mainly pesticide) usage which averaged 52 percent of the cash returns from the harvest.

The farmers themselves market their mungbean harvest. The produce is brought to the Urdaneta Public Market by tricycle and sold to the traders/grain dealers or stall owners there.

The onion farmers come form San Jose, a city in the northern section of the province of Nueva Ecija, which is one of the biggest producers of onions in the dry season. The farmers regularly grow onions after their

wet seaon rice crop; they have been doing it for an average of 20.7 years.

The San Jose farmers plant four onion varieties: "Batanes" and "Tanduyong" which are native red onions and the hybrids "Red Creole" and "Yellow Granex". The native varieties, which are planted more extensively than the hybrids, fetch a higher price and can be stored for a longer period of time than the hybrids.

The major buyers of the onions produced in San Jose are the owners of cold storage facilities in Bongabon and Palayan City, Nueva Ecija. They get the onions in large quantities from a number of trading centers in San Jose City, which in turn buy the onions from individual traders who buy from the farmers.

Over the years, the farmers' onion crop has fared quite well. The farmers realized positive net returns from their harvests 87 percent of the time. Furthermore, the average "jackpot" ratio is 0.18 which indicates that on the average, nearly one in every five cropping seasons is a "jackpot". Dry season 1985-86 can be considered as one of these jackpot years, with the farmers realizing an average net returns above cash costs that is 4.7 times greater than their average net returns above cash costs for the preceeding wet season rice crop.

Laoag, Ilocos Norte is an area where farmers regularly grow a variety of diversified crops in the dry season. Garlic is the major diversified crop but farmers in the the area also grow corn, peanut, mungbean, watermelon, and a variety of vegetables such as cabbage and eggplant. The focus of the survey were farmers in the area planting garlic, corn and peanut or a combination of these three crops. Of the 66 farmers interviewed, 60 have been planting garlic in the dry season for an average of 15.5 years; 40 have been planting corn for an average of 14.8 years; and 46 have been planting peanut for an average of 16.1 years. Over the years of planting the crops, the farmers have consistently realized positive net returns from their harvests: 90 percent of the time for garlic, 96 percent of the time for corn, and 97 percent of the time for peanut. The crops, however, yielded few "jackpots" --with ratios ranging from 0.10 to 0.14 only.

Dry season 1985-86 was not a good one for garlic as the price of garlic was quite low during this period (the average price was only P13/kg). Many of the farmers opted not to sell their produce until a higher market price is reached. As of the interview date in April and May 1986, only 35 percent of the garlic farmers had sold their produce. The farmers blamed the

low market price to illegal and clandestine importation or smuggling of garlic in large quantities from Taiwan. Nonetheless, many farmers expressed optimism that the price would soon go up and that they would be able to sell their produce at a satisfactory price.

The farmers' corn and peanut harvests in dry season 1985-86 yielded positive per hectare net returns above cash costs that, overall, were better than the per hectare net returns above cash costs of the previous wet season rice crop.

The farmers sell their garlic, corn and peanut harvest to traders and stall owners at the Laoag City public market. Although a number of the farmers use some of their corn harvest for animal feed, the corn is sold in the market for human consumption.

The six cases are presented in detail in Chapters 2 to 7 of the report.

II. Conclusions and Implications

The six case studies point out the conditions that are conducive to the adoption and persistence of irrigated crop diversification in the dry season. They also point out problems that reduce the viability of crop diversification which need to be addressed.

It appears that the lack of sufficient irrigation water for rice in the dry season serves an an initial impetus to diversify. However, once the crop proves profitable, even if there is sufficient irrigation water, farmers will persist in planting the diversified crop.

A lower income from other sources appears to relate positively to a greater tendency to diversify during the dry season. A plausible reason for this is because the smaller one's income from other sources is, the greater is the need to both maximize the returns from one's farm as well as to spread one's risks. This twin objective can be best served by planting more than one crop in the dry season.

Results indicate that there is a greater tendency to plant only the diversified crop (and not rice also) during the dry season the smaller the farm size is and the fewer the parcels farmed. This is of course

entirely understandable given that rice cultivation will not be worthwhile if the area planted is very small.

The data clearly show that the farmers are willing to take the greater risks involved in crop diversification if they are convinced that is profitable -- especially if they have seen others reap profits from it -- provided that there is no better alternative and the support structures such as technical assistance, credit for inputs, and marketing mechanism are present.

The persistence of crop diversification appears to be strongly related to a trend of positive net returns punctuated by occasional "jackpots" every now and then. The ability to tolerate a negative net return increases the longer is the history of positive nets. Thus, over time, it is the long-run average that influences the persistence of crop diversification.

Across the six cases, the "hitting of the jackpot" is attributed to two major causes: high yields arising from proper care of the plant and high prices. This is very encouraging because it suggests that farmers see the high returns as also arising from their own efforts and not just from the vagaries of price fluctuations. It also indicates a strong sense of personal control which is the opposite of the usual notion of fatalism that is often ascribed to farmers. Indeed, hardly

anyone in the various samples attributed the hitting of the "jackpot" to luck.

Similarly, the farmers attribute their losses to two major causes: poor yield or crop destruction arising from lack of water, typhoons or bad weather, and pest infestations and to a low market price.

Overall, the model of cropping decision making found empirical support in the various cases except for the mungbean case which was not really a free choice situation for the farmers given that NIA had programmed the area for mungbean production. This suggests that the model is more applicable to free choice situations where farmers have a number of alternative crops to choose from.

The results on the model of cropping decision making yielded important points to consider regarding crop diversification which can be used by change agents as a diagnostic guide for determining whether or not farmers are ready to crop diversify. These are:

1. Farmers will be more willing to diversify in the dry season if their family's rice consumption requirements for the year are met by their wet season rice crop and other sources of income as this gives the farmer greater leeway to take bigger risks in the dry season. This points out the need to also pay attention

to the wet season rice production in efforts at encouraging crop diversification during the dry season.

2. The crop must be perceived as technically feasible by the farmer. In particular, the farmer must perceive it as suitable to the soil and topography of his farm and he must perceive the timing of the cropping season as "right," i.e., it suits his wet season schedule and at the same time has a good chance of hitting the high market price at harvest time. The irrigation water available must also be perceived as being sufficient to support the crop. Nonetheless, the fact that many farmers complained of inadequate water suggests that many went ahead and planted the diversified crop even if it was not absolutely certain that there would be enough water.

3. The crop must be perceived as economically feasible by the farmer. In particular, that it will be bought and that there will be sources of credit if needed. In this regard, the contract growing scheme appears to be a good vehicle for assuring the farmer of the crop's economic feasibility. However, as the tomato and cotton case studies have shown, certain points must be taken into consideration in order for the contract growing scheme to succeed. First, a fair market price must be paid for the produce (as in the case of the

cotton farmers) because if the price is too low (as in the case of the contract grown tomatoes), the only way for the farmers to realize a profit is to have very high yields which is not very realistic given the conditions under which most farmers operate. In fact, many of the tomato farmers were quite unhappy about selling their produce at P0.80/kg. to PFVII when the market price for native tomatoes hovered between P10-P12/kg. and even reached a high of P14/kg. Second, the yield estimates given to the farmers must be realistic. The 40,000 kg/ha. potential yield for the California variety tomato given to the farmers by PFVII created false expectations and, as shown by the large input expenditures, the farmers' behavior was guided by such expectations. Had the farmers been given more realistic estimates, they would probably have been more prudent in their input expenditures. Third, the farmers must be given sound advice by the technicians regarding the use of inputs (especially pesticides) and must be helped to be more aware of their input expenditures during the course of the cropping season.

4. The availability of hired labor does not appear to be a crucial economic feasibility variable because family labor is used overwhelmingly by the farmers for their diversified crops. The heavy use of family rather

than hired labor is critical, however, to the overall economic viability of the planting of diversified crops as in general (except in the case of mungbean, for example), diversified crops tend to be more labor-intensive than growing rice. The implications of this is that crop diversification is probably more viable for small farm areas which the family can work on because there is a need to get more hired labor with larger areas and this could adversely impact the net cash returns that the farmer eventually gets from the diversified crop. There is also a positive aspect to the high utilization of unpaid family labor in the growing of diversified crops which is that it absorbs the excess family labor that would otherwise be unemployed or underemployed in the dry season. One other point with regards to labor is that increasing the practice of exchange labor for labor intensive activites like land preparation and transplanting can greatly reduce the labor cash cost (as in the case of the tobacco farmers). In this regard, change agents pushing for crop diversification should direct some of their energies at helping farmers in adjacent areas organize for exchange labor during these activities. The water-users association can be a good vehicle for doing this.

5. Data on the cost-benefit analyses with respect to the diversified crop indicate that farmers tend to have high minimum profitability requirements for the diversified crop vis-a-vis rice, with this being mainly a function of the higher risks involved in planting diversified crops. The implication of this is that for a farmer to agree to plant a diversified crop in the dry season, he must be sufficiently convinced that it will yield high returns and not just marginally higher returns than rice. Indeed, we note from the cases that farmers are willing to plant crops that are much more time, input and labor intensive than rice provided they perceive it as having high profitability compared to rice. The data, nonetheless, also indicate that farmers are willing to plant diversified crops that fall below the minimum profitability that they would like to realize if they do not have much choice (e.g., not enough water for planting rice and no other alternative crops feasible under the circumstances, as in the case of the mungbean farmers) or if the other choices are worse than the crop under consideration, provided of course that they expect to realize some profit from the venture.

Two points should also be noted about the decision tree model of cropping decision making. First is that

overall, the decision tree does a reasonably good job of accounting for the farmers' cropping decision making. Nonetheless, the success rate of the model could have been higher were it not for the fact that a number of farmers across the samples (especially in the onion and mungbean samples) did not answer correctly the questions related to the model. For example, the reasons given by some farmers for why they are not planting the alternative crop (which had passed all conditions of the decision tree for them) indicate that they should have answered "No" instead of "Yes" to certain questions that relate to their reasons for not planting in the cropping decision making portion of the interview (and hence the crop would not have passed all conditions of the decision tree for them). Second is that some of the responses which were inconsistent with the model indicate areas or aspects which influence the farmers' decision making which are not taken into account by the model (and are therefore areas where the model could be enriched) such as: the influence of neighbors and people important to the farmer, whether or not there are other better alternative crops, the types of crops being planted in adjacent and nearby fields, the impact of uncertainty in the price (or price fluctuations) of the crop in the market, the number of different crops the

farmer is already planting (as it is difficult to take care of different types of crops), the space available in the field, and the availability of seeds.

Although many farmers have no water-related complaints in the dry season, lack of water for the diversified crop is nonetheless a problem for a substantial number. The results also indicate that farmers tend to use irrigation water during land preparation, transplanting and fertilizer application and that they tend to irrigate their diversified crop at certain pre-determined stages of crop growth depending upon the type of crop (e.g., flowering stage, fruiting stage) and/or at regular intervals (e.g., every 14 days). Other than these, the farmers use two major indicators for determining that the plant needs water: the wilting and/or curling of leaves and the dryness/ cracking of the soil.

Overall, the water users associations had little to do with the crop diversification beyond irrigation related matters such as the repair and maintenance of the canals, the irrigation schedule, arbitrating in water-related disputes among farmers, and bringing to the attention of the water masters or NIA the irrigation-related problems of the farmers. In this regard, water-users associations are a potentially good

organizational resource to tap in crop diversification programs. In particular, the association could be tapped as a support system for farmers engaging in crop diversification as results show that the influence of others is important in the decision to plant diversified crops. The associations could also be tapped in the marketing of the diversified crop and they could also be used as an informal (or even formal) credit mechanism for the farmers.

The need for a good credit mechanism in the promotion of crop diversification must be emphasized. The results of this study which show higher cash costs for the majority of the diversified crops compared to rice underscores this. As most farmers usually do not have sufficient capital to meet the cash needs of the diversified crops, having a good credit mechanism in place will go a long way towards encouraging farmers to plant diversified crops.

The costs and returns data for all of the cases except Ilocos point to the exceedingly heavy usage of pesticides by the farmers on their diversified crops. The ratios, which indicate levels which are very much higher than those for rice, are alarming. It appears that this is a function of the farmers' risk aversion. Most farmers are spraying unnecessarily in a preventive

mode out of fear of pest infestation and crop destruction. They are willing to shoulder the high costs of pesticides as this seems to be the lesser evil compared to a situation where they can be devastated financially by crop loss. Clearly, there is a need for educating the farmers on better pest management practices in order to increase the financial viability of crop diversification as chemical inputs are among the biggest cost items in the planting of diversified crops.

Overall, although the farmers' expectations of the crop tended not to be too far off from the crop's actual performance, nonetheless, the farmers tended to over-estimate the gross they would realize from it, tended to underestimate their cash expenditures, and consequently tended to overestimate the net returns above cash costs. This is wholly understandable from the psychological perspective in that it is an "optimism mechanism" that helps the farmers to cope and push through in the face of the often adverse circumstances that they have to operate in. Otherwise, if they will be pessimistic, they might as well not try.

One important finding with respect to the marketing of the produce that the case studies point out is the relatively large volume of sales during harvest time and a few weeks after of produce that could stand some

storage before sales. The volume of the sales at a time when market prices tend to be low underscores the need for cash of the farmers around harvest time such that they are willing to sell large quantities of their produce at less than the potential price they could get for it if they sell at a later date. This is one reason why the diversified crop is not as profitable for the farmer as it could be. In this regard, it would be worthwhile for projects and programs aimed at promoting crop diversification to direct some of their efforts at setting up viable market mechanisms (e.g., marketing cooperatives) and storage faciltles that will help farmers get better returns for their produce. The water-users associations could be used as an organizational vehicle for this.

To summarize, the results of the case studies indicate that the following conditions are conducive to the adoption of crop diversification during the dry season:

. insufficient irrigation water for rice in the dry season

. low levels of income from other sources

. the farmer has seen other farmers reap profits from the crop

. farmers in nearby fields are planting the crop

. there is no better alternative (i.e., it is the best under the circumstances)

. the family's rice consumption requirement for the year are met by their wet season rice crop and other sources of income

. the crop is perceived as technically feasible by the farmer (i.e., it is suitable to the soil and topography of his farm, the timing of the cropping season is "right", and the irrigation water available is sufficient to support the crop).

. seeds are available

. the crop is perceived as economically feasible by the farmer (i.e., his produce will be bought, there will be sources of credit if needed, and the labor required for the crop -- whether family or "hired" -- is available).

. the farmer is convinced that the crop will yield high returns and not just marginally higher returns than rice as farmers tend to have high minimum profitability requirements for diversified crops.

. the sale price of the produce is assured (as in a contract growing scheme) or the market price of the crop does not fluctuate too much (i.e., it is not a "price risky" crop).

. the support structures are present namely, technical assistance, a good credit mechanism, and a viable marketing system.

The results of the case studies also indicate that the following conditions are conducive to the success and persistence of crop diversification during the dry season:

. the persistence of crop diversification appears to be strongly related to a trend of positive net returns punctuated by occasional "jackpots" every now and then

. high yields arising from proper care of the plant

. high prices

. in contract growing schemes, a fair market price is paid for the produce

. the potential yield estimates given to the farmers are realistic

. less use of pesticides; better pest management techniques

. greater awareness among farmers of their input expenditures during the course of the cropping season

. small farm areas in which the family can provide the labor input

. increased practice of exchange labor for labor intensive activities like land preparation and transplanting

. the farmers in the area are planting the same type of diversified crops

. sufficient irrigation water

. a good credit mechanism because of higher cash costs of diversified crops compared to rice

. a viable marketing mechanism that will help farmers get better returns for their produce

Chapter 2

TOBACCO FARMING IN SAN FABIAN, PANGASINAN

San Fabian is a town in the northeastern section of the province of Pangasinan which is located in Northern Luzon (see Figure 3). It is reputed to grow the best burley tobacco in the Philippines; most farmers in San Fabian grow burley regularly during the dry season.

Burley growing in the area began even before World War II but the concentration of burley production in the area greatly increased after Presidential Decree 1143 issued in 1978 limited burley growing to Pangasinan, Tarlac, Zambales and Mindoro as a means of promoting diversification and preventing a glut in the Virginia tobacco market. The decree also transferred the supervision and control of burley production to the Philippine Virginia Tobacco Administration (PVTA) from the Philippine Tobacco Administration (PTA).

The PVTA office in Pangasinan oversees the burley production in San Fabian. Aside from the usual extension services, the PVTA also assists farmers in the marketing of their produce by supervising licensed traders to prevent farmers from being prey to unscrupulous middlemen; it also sponsors, as an incentive to farmers, the "Outstanding Burley Tobacco

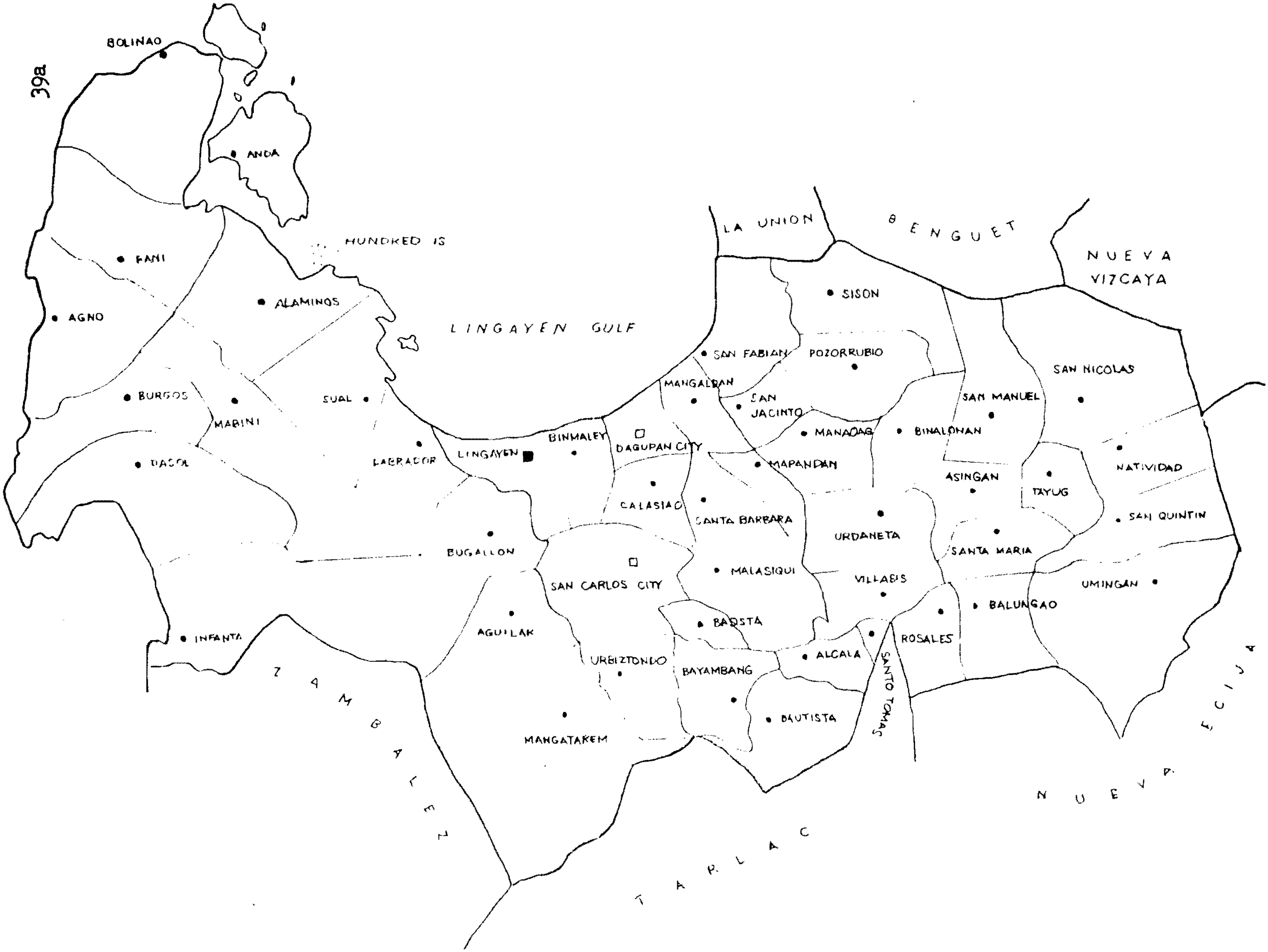

Figure 3a. The province of Pangasinan.

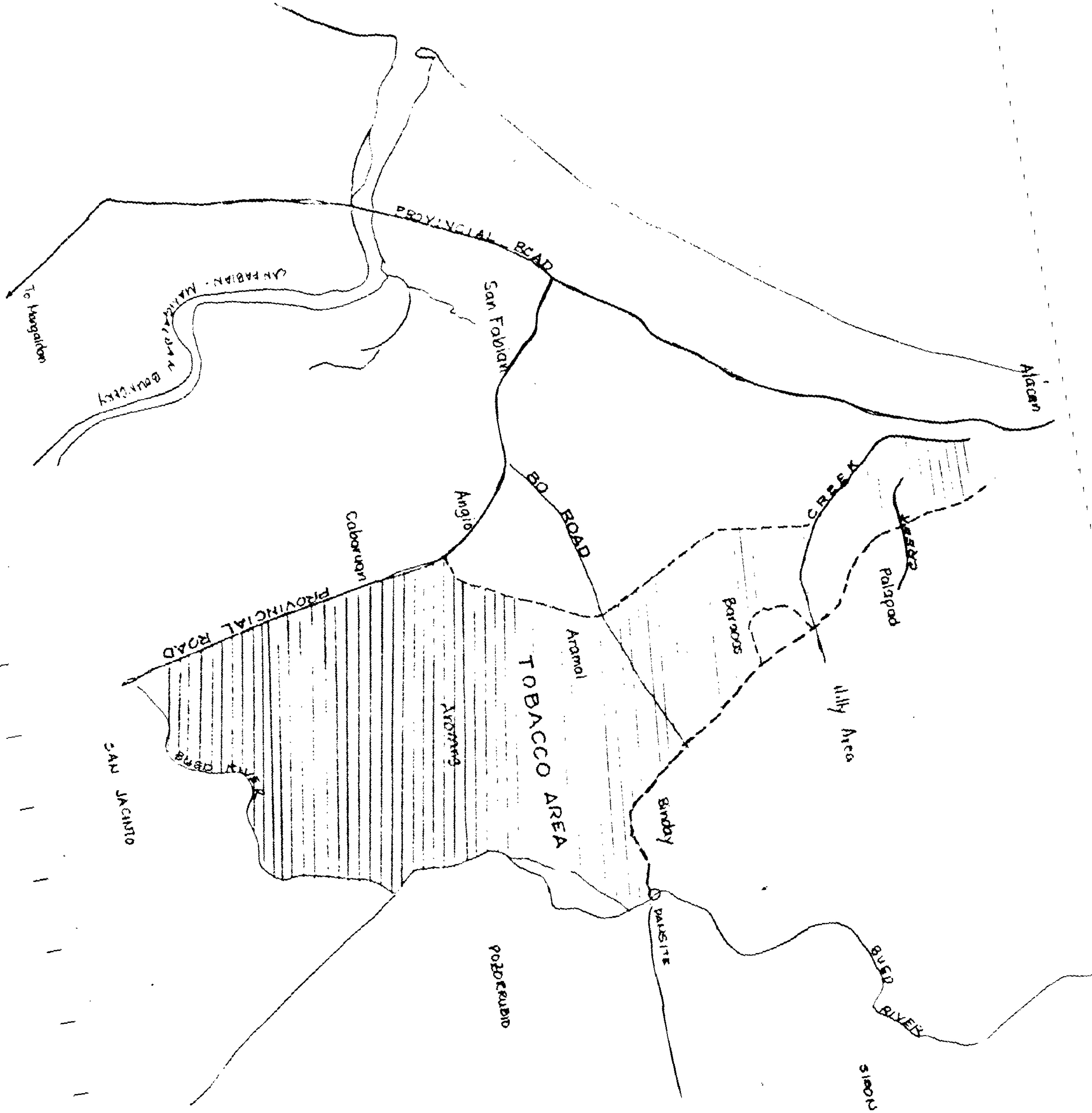

Figure 3b. The tobacco research site.

Grower of the Year" award which is given to the highest producer on a per hectare production basis.

The Survey

Forty farmers were selected at random from the NIA San Fabian Office list of burley tobacco farmers in the area. The farmers come from eight barrios of San Fabian, namely: Angio, Anonang, Aramal, Baraoas, Beyeng, Binday, Cabaruan and Palapad. The farmers averaged 48 years of age and have been farming on the average for 24 years. On the average they have been growing tobacco for 22 years. Forty-five percent of the farmers had some or had completed grade school, another 45 percent had some or had completed high school, 5 percent are vocational school graduates and 5 percent had some college education.

Farm and Tenure Status

Twenty-two and one-half percent of the farmers farm only one parcel of land with an average size of 0.755 hectares; 32.5 percent farm two parcels with an average farm size of 1.65 has. ; 27.5 percent have three parcels with an average farm size of 1.527 has.; and 17.5 percent have from four to seven parcels with the

average farm size being 2.09 hectares (Table 1a). In general, average farm size increased the more parcels are farmed but the average parcel size decreased. About a fourth of the parcels are owned by the farmers themselves while three fourths are leased (Table 2a). Ninety percent of the parcels are irrigated by NIA and 10 percent are rainfed.

Production and Cropping

Ninety-two percent of the farmers planted only rice in wet season 1985 (Table 3a1). Similarly, in dry season 1985-86, 80 percent planted only burley tobacco. The average area planted to rice is 1.23 hectares; for burley it is 1.062 hectares (Table 3a2).

Among the tobacco farmers, only five farmers (12.5 percent) also planted rice in the dry season while four farmers (10 percent) planted other diversified crops in addition to tobacco, namely: corn, peanut, bean, eggplant, gourd and sweet potato. The data in Table 4a indicate that farmers who plant more than one crop in the dry season have a lower average annual income from other sources compared with farmers who plant only one crop (P4,287 vs. P5,510). It appears from the data that

a lower average annual income from other sources is related to greater crop diversification in the dry season.

One reason for the low rate of rice farming in the dry season among the farmers is lack of sufficient irrigation water for rice culture (Table 5a). Only a third of the farmers get irrigation sufficient for planting rice. The farmers who do not get enough water were asked if they would plant rice if given sufficient water. Sixteen of the 27 farmers said yes. If we add to this figure the five farmers who receive sufficient irrigation who planted rice, we get a total of 21 farmers (or 52.5 percent) who will plant rice given sufficient irrigation. Nonetheless, close to one-half of the farmers choose not to plant rice even if there were enough water, indicating that growing burley tobacco is a more attractive alternative to rice farming in the dry season for these farmers. Indeed, this is borne out by the data. Among the farmers who receive sufficient water, those who did not plant rice perceive growing burley as 2.14 times more profitable than growing rice; the farmers who planted rice in the dry season, on the other hand, perceived burley as only 1.7 times more profitable than rice. Similarly, among those who do not receive sufficient water, those who say that they will not plant rice even if given sufficient

water have an average perceived profitability for burley of 2.45 whereas the farmers who say they will plant rice given sufficient water have an average perceived profitability of 1.88 (Table 5a). It is also interesting to note from Table 5a that those who choose to plant rice tend to have a larger average farm size than those who choose not to.

Cultural Practices

In dry season 1985-86, 75 percent of the farmers started planting burley in October, 20 percent in November, and 5 percent in late September. Seventy-five percent began harvesting in late January or February. Immediately before or after harvesting the rice crop in October, the farmers start preparing for the tobacco cropping.

Most of the farmers have a permanent site for their seedbeds which they leave unplanted during the rest of the year. These are usually exposed high grounds near a water supply and with good drainage. The seedbed is plowed and harrowed several times until the soil tilth becomes fine and beds 1 meter wide but of different lengths are prepared. A space of 90 cm. is provided between beds which serve as paths and drainage canals.

Dried rice straws are scattered over the beds and burned to sterilize the soil. The soil is then pulverized and levelled. The seeds are mixed with wood ash, fine sand and dry fine soil for even spreading during sowing. The seeds are scattered sparsely on each bed. After sowing, water is carefully sprinkled to moisten the soil. The soil is kept moist by regular watering. After emergence six days after sowing, the seedlings are covered with banana trunks or leaves in the morning but exposed free late in the afternoon until the next morning. Weak seedlings are thinned out. The seedlings are fertilized and sprayed with pesticides and the covers are gradually removed 10 days before transplanting to harden the seedlings.

Land preparation is done while waiting for the seedlings to be ready for transplanting. Many farmers irrigate by flooding during land preparation. The soil is plowed for at least three times usually using an animal drawn plow. After every plowing, the soil is harrowed using a spike-toothed harrow and comb harrow until the soil becomes fine. Furrows, 80 to 85 centimeters apart are made with the use of a native plow.

Forty-five to 50 days after sowing, the seedlings are transplanted. The seedbeds are soaked with water to

soften the soil. The seedlings are pulled with the the aid of a trowel or "bolo" knife to minimize injury to the roots. The seedlings are then planted upright in each hole along the furrows; they are spaced 55 cm. apart. The soil is pressed firmly after each seedling is transplanted. The plants are then immediately watered using a hand sprinkler or by furrow irrigation. Transplanting is done in the afternoon or during a cloudy day.

Six days after transplanting urea is applied at a rate of six bags per hectare using bands about three to four inches away from the plant. Other fertilizers such as 6-9-15 are also applied at other stages of crop growth. Furrow irrigation is practiced after every fertilizer application.

Among the insecticides commonly used are Bionex, Ambush, Thiodan, Decis, and Lannate. Farmers use more than one pesticide which are sprayed alternately once a week to prevent pests from developing resistance.

The field is cultivated 2 weeks after transplanting with the use of small-toothed cultivators. A second cultivation is done when the plants are about 30 cms. high with the use of an animal drawn plow to hill up the soil. Furrow irrigation is done at various

stages of plant growth, the frequency of which varies among the farmers.

Harvesting by priming begins 45 to 55 days after transplanting when the lower leaves show signs of ripeness such as swollen appearance, accentuated yellow color, brittleness, and noticeable change in color from light yellowish green to brownish green. From one to four leaves are primed every five to seven days. Irrigation water is applied before or after every priming. When only a few leaves are left in the plant, the plant is harvested as a whole.

The primed leaves are graded according to size and are strung into a bamboo stick usually about 1 meter long. The leaves are air dried under trees, under the house, or in sheds for about 45 to 50 days. The farmers claim that the longer the curing period, the better the quality of the dried leaves.

Irrigation-related Issues

The farmers were asked what indicators they use for determining that their burley plant needs irrigation. Sixty-seven and one half percent said "wilting" or "curling" leaves; 62.5 percent answered when the soil is dry or cracks up; 25 percent mentioned that the leaves turn yellow or reddish in color; 10 percent indicated

that they know that water is needed when the plant droops; and 7.5 percent said when the plant's growth is stunted.1

The farmers were also asked what were their irrigation problems in dry season 1985-86. Sixty seven and one-half percent said lack of water while 2.5 percent said lack of cooperation among the farmers. Thirty percent of the farmers indicated that they did not experience any problems.

To the question of what rules and regulations do they follow to ensure that everyone gets a fair allocation of water, almost all of the farmers (95 percent) answered "rotation" in water usage. Nonetheless, many farmers complained that there was not enough water when it was their turn to use it.

The water-users associations in San Fabian had just been newly organized when the interviews were conducted. Hence, only 40 percent of the farmers interviewed were members. The functions of the water-users associations deal mainly with the delivery schedules, the repair and maintenance of the canals, and as a mechanism to ensure the fair allocation of water among farmers. Beyond these the water-users association

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1 The numbers do not summate to 100 percent as some farmers mentioned more than one indicator.

did not have anything to do with the crop diversification.

Adoption of Crop Diversification.

About one-half of the farmers started planting tobacco before 1961 (47.5 percent) with only 15 percent starting after 1975 (Table 6a). Two-thirds of the farmers have been planting tobacco for over 15 years. On the average the farmers have been planting tobacco for 22 years, and majority have been planting it every dry season without fail. The data in Table 6a point out the major reason for the persistence of tobacco growing among the farmers: the farmers have consistently experienced positive net returns on their crop over the years (the average ratio of the number of years of positive net to the total number of years the farmers have been planting tobacco is 0.92).

A surprising finding in Table 6a is the result that the average ratio of the number of years the farmers report having hit the "jackpot" with their tobacco crop to the total number of years the farmers have been planting tobacco is very low (0.08). There are two possible reasons for this. One is that tobacco growing among the farmers has yielded consistently positive but moderate returns over the years with only a few

"jackpots" or high net returns. The other is that given the consistent positive returns, the amount of positive net which farmers consider a "jackpot" is quite high, hence, only a very few of the net outcomes are labelled by them as such.

Why did the farmers plant tobacco in the first place? Seventy percent said because it is profitable; 42.5 percent indicated that they planted the crop because most farmers in the area grow it, it is the traditional crop in the area and/or they followed their parents' example (Table 7a).

The 29 farmers who indicated that they had experienced hitting the "jackpot" with their tobacco crop were asked what were the causes(s) of their hitting the "jackpot" when they did. It is interesting to note from Table 8a that proper care of the plant, sufficient irrigation, fertilizer and high yield were mentioned just as frequently (and even slightly more frequently) than high price.

Similarly, the 17 farmers who indicated that they had experienced having a net loss with their tobacco crop were asked what were the cause(s) of their net loss. Again, it is interesting to note from Table 9a that lack of irrigation water was mentioned as frequently as low price (35.5 percent). The other

reasons given were: the high cost of fertilizer and chemicals, poor timing of planting, the plant was attacked by pests, typhoon destroyed the crop, and the buyer did not pay the farmer.

Cropping Decision Making

An in-depth examination of the cropping decision making vis-a-vis the diversified crop of the individual farmers was conducted. Information on the various aspects of the decision tree model of cropping decision making for burley tobacco was obtained from each one of the 40 farmers. For purposes of comparison, information on the various aspects of the model was also obtained for cotton (an alternative crop that is also grown in the area). All of the 40 respondent farmers grow burley; none of them grow cotton. Hence, if the model captures well the farmers' cropping decision making, burley should meet the requirements of all three stages of the model (since the farmers are planting it) while cotton should fail to meet the requirements of one or more stages for many farmers. The results of the analysis of the cropping decision making are presented in Table 10a.

The results provide substantial support for the model. For burley tobacco, fully 82.5 percent of the

farmers gave responses that are consistent with the predictions of the model. Similarly for cotton, fully 85 percent of the farmers gave responses that are consistent with the model. That is, burley passed all the conditions of the decision tree for 82.5 percent of the farmers while cotton failed to meet one or more conditions of the decision tree for 85 percent of the farmers.

Let us examine more closely the farmers whose responses are inconsistent with the model. Table 11a presents some data on the burley farmers for whom burley did not pass one or more conditions of the decision tree. The data in Table 11a suggest two possible reasons for why these farmers are planting the crop even if it does not meet all the requirements of the decision tree. First, the amount of irrigation water received by six of the seven farmers is not sufficient for planting rice, hence, these farmers cannot plant rice in the dry season. The lone farmer in the group who receives sufficient irrigation water did in fact plant rice. Second, for nearly all of the farmers, planting burley over the years has consistently yielded positive net returns (note the high ratios for number of years of positive net to the total number of years farmer planted tobacco).

On the other side of the coin, Table 12a presents the reasons given by the six farmers for whom cotton passed all of the conditions of the decision tree, for why they are not planting cotton. Three of the farmers gave reasons related to the usage of strong pesticides in planting cotton, two mentioned the heavy work involved in planting cotton, one said that no one in his immediate area is planting cotton and for this reason he does not want to plant it alone and another said that he simply prefers planting tobacco to cotton.

Table 13a presents in detail a crosstabulation of the farmers' perceived profitability of burley vis-a-vis rice compared with their minimum profitability requirement for it. The figures in the table indicate that for most of the farmers, the perceived profitability of burley meets their minimum profitability requirements (note the numbers above the diagonal).

The correlation between the farmers' perceived profitability for burley and the ratio of the farm area which they planted to burley to their total farm area is 0.34. This indicates that there is a slight tendency among the farmers to plant burley in a bigger proportion of their field the more profitable they perceive it to be.

Table 14a presents the farmers perceptions of the profitability of cotton vis-a-vis rice and tobacco and vis-a-vis the farmers' minimum profitability requirement for it. The data in the table indicate that although cotton is perceived by 37.5 percent of the farmers as more profitable than rice, 77.5 percent consider it as less profitable than tobacco. Furthermore, it does not meet the minimum profitability requirement of over one-half of the farmers. These results explain why the farmers are not planting cotton.

To recapitulate, the model of cropping decision making appears to account reasonably well for the farmers' cropping behavior. Nonetheless, the responses of the farmers whose behavior is inconsistent with the model suggest areas for possible enrichment of the model such as, for example, the taking into account of non-monetary costs in crop production like the health hazards posed by heavy pesticide usage and the "heaviness" of the work load involved in growing the crop as well as whether or not there are any better alternative crops that the farmer can plant.

Costs and Returns

The costs and returns for burley production in dry season 1985-86 and rice production for the immediately

preceeding wet season (1985) were obtained for the farmers. The results, which are presented in Table 15a, indicate that on a per hectare basis, as far as net returns above cash costs are concerned, tobacco production in the dry season is 3.48 times more profitable than rice production in the wet season. While one can argue that making a comparison between a dry season diversified crop and wet season rice is not entirely fair (especially given that rice yields in the dry season are higher than those in the wet season), nonetheless, the high profitability ratio of 3.48 strongly suggests that planting tobacco in the dry season is probably much more profitable than growing rice.

It is interesting to note from Table 15a, however, that the net farm income for tobacco (net return above cash costs minus non-cash costs) is negative whereas the net farm income for rice is positive. The negative net farm income for tobacco is due to the high cost of unpaid family labor which is five times greater than that for rice. Indeed, the farmers pointed out time and again during the interviews that tobacco growing is much more laborious than growing rice.

On the other hand, it is to be noted that tobacco production has a lower labor cash cost than rice. This

is because the farmers in San Fabian often practice exchange labor in tobacco production. Farmers with adjacent farms synchronize their farming activities such that they are able to help one another for labor intensive activities like land preparation and transplanting.

The data on returns in Table 15a indicate that rice is basically a non-cash crop for the farmers and that the family's cash requirements are obtained primarily from tobacco sales.

One final point on the costs and returns data that deserves attention is the high fertilizer and chemical expenditures in tobacco production compared to rice production (ratios of 1.82 and 5.60 respectively). These two together with land rent are the major cash costs of tobacco production for the farmers, accounting for 80 percent of the total cash costs.

The farmers were asked what their expectations were prior to planting their 1985-86 tobacco crop with regards to yield, price, gross, cash expenditures and net returns above cash costs. Table 16a presents the expectations and compares them with the actual performance. What is striking about the comparison is the close correspondence between the two which is probably a reflection of the farmers' long experience

with planting the crop. It is also interesting to note from the table that the farmers had quite underestimated their cash expenditures.

In the discussion on cropping decision making it was pointed out that the perceived profitability of burley farming met the farmers' minimum profitability requirement for 85 percent of the farmers. In Table 16a, however, we see that there are fewer farmers (67.5 percent) for whom the actual profitability of burley production meets their minimum profitability requirement. Nonetheless, it is to be noted that for 65 percent of the farmers, the actual profitability of burley is greater than the farmers perception of its profitability.

The Marketing of Burley Tobacco

There is one major buyer/trader of burley tobacco leaves in the San Fabian area: a Chinese middleman who lives in the area. He is a PVTA licensed trader who sells his purchases from the farmers to PVTA. There is also a Filipino trader but his volume of purchases is relatively small compared with the Chinese trader.

The Chinese trader also acts as an informal money and input lender to the farmers. The trader lends money at an interest rate of 6 percent per cropping season.

The farmers can also get fertilizer and chemical inputs from him which, together with the cash loan, are paid after harvest via deductions from the gross sales. There are no stipulated interest rates for the inputs but their prices are already marked up to take the interest costs into account.

When a farmer borrows from the Chinese trader, there is an implicit arrangement that the farmer will also sell his produce to him. However, the farmer is not totally bound to this arrangement. If the farmer does not like the price offered by the Chinese trader, he can sell his produce elsewhere but he has to pay his input loans (at the marked up price) and his cash loans at the stipulated 6 percent per cropping season interest rate.

The Chinese trader pays cash on delivery; the Filipino trader buys on credit which are paid later after he has sold the produce.

More specific data on the marketing of the tobacco are presented in Table 17a. The mean number of times the produce was sold is 1.5. It is interesting to note that 50 percent of the farmers had their first sale before the 45 to 50 days required for air drying. It appears that the need for cash is what prompted the

farmers to sell early. An average of 74.6 percent of the total yield was sold on the first sale.

Ninety percent of the farmers had some form of special arrangement with the trader in the form of money and input loans. Fifty-seven and one-half percent of the farmers borrowed money from the trader, 62.5 percent and 60 percent borrowed fertilizer and chemical inputs respectively. The average cost of the fertilizer borrowed is P2,515.24 while the average cost of the chemicals was P1,448.90. For 87.5 percent of the farmers, the sales price was not pre-agreed before planting.

The sales take place within the barrio. The trader visits the barrio on certain pre-arranged days and buys at some central location within the barrio such as at the barrio center. Only 8 farmers had to use transportation to bring their produce to the selling place but none incurred cash costs for it. Less than 1 percent of the produce was of poor quality during the first sale.

To sum up, the marketing system for the burley produce of the farmers in San Fabian is well established. Furthermore, the system appears to be satisfactory and convenient for the majority.

Chapter 3

COTTON FARMING IN URDANETA AND MANAOAG, PANGASINAN

Historically, the Philippines was a cotton producer even dating as far as the pre-colonial period. The industry died, however, when cheaper and higher quality fabric imports displaced locally produced cotton in the domestic market. Cotton production was only revived in the 1970s, an offshoot of the high international cotton lint prices during the period. The creation of the Philippine Cotton Corporation (PCC), a government controlled corporation in 1973 and the Cotton Research Development Institute (CRDI) in 1978 boosted the revival of the industry. PCC became the central authority charged with undertaking and implementing the commercial production of cotton in the country while CRDI was established as the research arm of PCC charged with generating and disseminating cotton technology (Balisacan, 1982).[1]

The revival of the local cotton industry has been rather remarkable: whereas only 480 hectares were planted to cotton in the entire country in 1977, the

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1 Balisacan, A. Economic Incentive and Comparative Advantage in Philippine Agriculture: The Case of the National Cotton Development Program. Unpublished M.S. Thesis, UPLB, 1982.

figure had risen to 10,210 hectares by 1982; cotton production, which was only 232 M.T. in 1977, had increased to 7,138 M.T. by 1982 (Gonzales, 1984).2

Region 1, or northern Luzon, is the country's leading producer of cotton. Much of the cotton produced in Region 1 come from Pangasinan. Urdaneta and Manaoag, two towns in eastern Pangasinan, are areas in the province where there is a concentration of cotton farmers in the dry season (see Figure 4).

Cotton production in Urdaneta and Manaoag are the direct result of the efforts of PCC. PCC operates a $2.5 million gin in San Fabian, Pangasinan. PCC technicians regularly visit farmers to convince them to plant cotton and teach the farmers the technology for planting cotton successfully. The cotton farmers are contract growers for PCC in a scheme whereby PCC provides the inputs -- seeds for free, and fertilizer, chemicals and cash loans at no interest, the payment of which are deducted from the gross sales. PCC sets the purchase price of cotton before the cropping season. In dry season 1985-86 it was set at P8.00/Kg.Soon after the harvest, PCC technicians set the dates, time and

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2 Gonzales, L.A. Philippine Agricultural Diversification: A Regional Economic Comparative Advantage Analysis. Final report submitted to ADB, 1984.

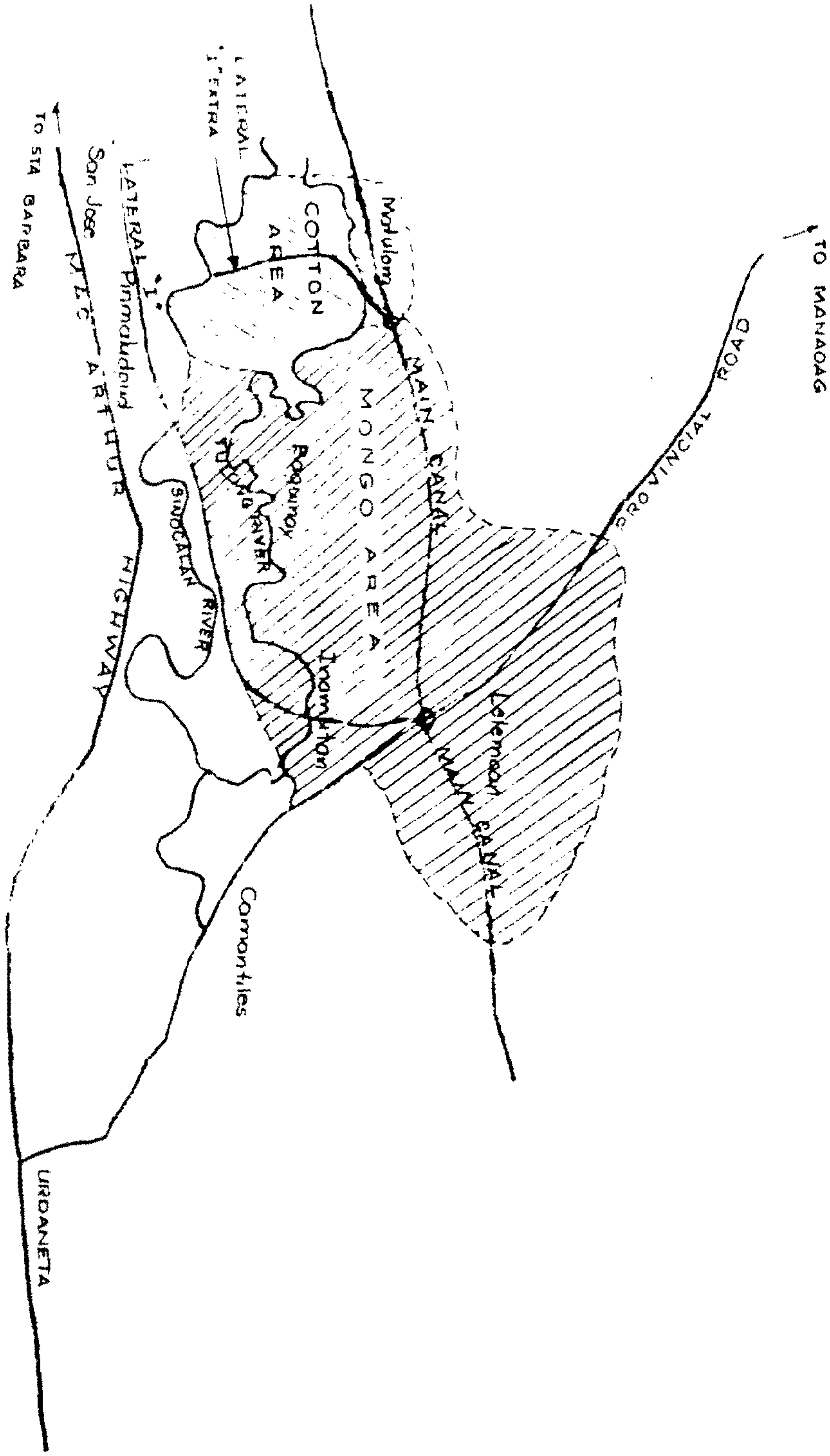

Figure 4. The cotton research site.

Note: See Figure 3a, p 39a, for the map of Pangasinan

place of the sales. Farmers are given certificates of sales which they can redeem for cash at the Land Bank.

The Survey

Forty cotton farmers were interviewed: 24 from Urdaneta and 16 from Manaoag. One-half of the farmers were selected at random from the NIA list of cotton farmers in the areas. As the NIA list was incomplete, the other half of the farmers were selected at random on site. The farmers come from two barrios in Urdaneta -- San Jose and Pinmaludpud and similarly, two barrios in Manaoag-- Matulong and Baguinay.

The farmers averaged 45.8 years of age and have been farming an average of 23 years. They have been farming cotton an average of two and a half years. Twelve percent of the farmers have had no formal education, 60 percent had some grade school education or are grade school graduates, 7.5 percent had some high school education while 17.5 percent are high school graduates. One farmer finished vocational school; none of the farmers had any college education.

Farm and Tenure Status

Thirty-five percent of the farmers farm only one parcel of land with an average size of 0.705 hectares (Table 1b). Twenty percent farm two parcels and have an average farm size of 1.141 has. The rest have from 3 to 5 parcels with the average farm size being 1.819 hectares. Eighty-nine percent of the parcels are irrigated by NIA; about 3 percent get water from communal systems and about 7 percent are rainfed. About 45 percent of the parcels are under leasehold tenancy, the farmers hold certificates of Land Transfer in another 45 percent ; only 10 percent of the parcels are owned by the farmers themselves (Table 2b)

Production and Cropping

Although rice is the predominant crop in the wet season, fully 40 percent of the farmers planted diversified crops in wet season 1985 (Table 3b1). Specificcally, 15 percent planted corn, 12.5 percent planted mungbean, 5 percent planted native tomatoes, and 20 percent planted stringbeans. Among the diversified crops, corn had the highest average area planted: 0.69 hectares. Mungbean followed with an average of 0.43 hectares. Native tomato averaged 0.30 ha. while stringbeans were planted in an average of only 0.14

ha. It is interesting to note that while the majority of the farmers farm only one or two parcels, the average number of parcels farmed by the 40 percent who planted one or more diversified crops in the wet season is 3.06. The data thus seems to suggest that the farming of more parcels promotes crop diversification in the wet season among these farmers.

Table 3b2 presents the types of diversified crops planted by the farmers in dry season 1985-86. Cotton was of course planted by all of the farmers on an average of 0.552 hectares of land. Mungbean was planted by 30 percent on an average of 0.384 hectares; tomato was planted by 22.5 percent on an average of 0.167 hectares; and stringbeans and corn were planted by 7.5 percent and 5 percent respectively on an average of 0.25 hectares. Fifty-two and one-half percent of the farmers planted one or more diversified crops in addition to cotton during the dry season; 40 percent also planted rice on an average of 0.799 hectares.

The data in Table 4b, which crosstabulates the number of different crops planted in the dry season with the average annual income from other sources of the farmers and their average number of parcels farmed, shows some interesting results. There is a clear trend

of more crop diversification the lower the average annual income from other sources is and the greater the number of parcels farmed. With respect to the latter, farmers who planted only one crop in the dry season farmed an average of 1.4 parcels of land while those who planted from two to five crops farmed an average of 2.54 parcels.

We see a somewhat similar result in Table 5b. Among the farmers who received sufficient irrigation water to plant rice in the dry season, those who did plant rice have on the average more parcels of land (3.31) than those who did not plant (2.00); furthermore, they have a larger average farm size (1.67 ha.) than those who did not plant (0.96 ha).

It is to be noted from Table 5b also that none of the 10 farmers who are not getting sufficient water for planting rice in the dry season want to plant rice even if they are given sufficient irrigation water.

Cultural Practices

The farmers in Urdaneta and Manaoag plant their cotton between October and December with the majority planting in November. The crop is harvested in March and April. According to the cotton farmers, growing cotton is more laborious than growing rice.

The cotton is usually planted in parcels of higher elevation. In preparing the land, the field is first plowed with the residue of stalks and leaves from the previous rice crop. This is done about 20 days before seed sowing. Immediately after plowing, the soil is harrowed to pulverize it and to kill the weeds. After harrowing, weeds are allowed to grow for about seven days after which the soil is plowed and harrowed again to eliminate the weeds.

Furrows about 50 cm. apart are made after harrowing. The field is irrigated prior to sowing the pre-treated seeds provided by PCC. Two or more seeds are sown to a hill which are spaced about 25 cm. apart. Some of the farmers apply nitrogen fertilizer one day before planting: the others apply it 3 to 4 days after sowing.

Three to four weeks after emergence, thinning is done by removing weak seedlings, at the same time the plants are also weeded. The farmers usually leave the two most vigorous seedlings on a hill. During this period also, the farmers offbar to loosen the soil and control weed growth with the frequency of this operation depending on the weed density in the hill. Some farmers also apply herbicides.

Fertilizer is applied by side dressing. After each ferilizer application, the soil is hilled up and furrow irrigation is done. The frequency of fertilizer application depends on the kind of soil in the farmer's field. Furrow irrigation is done at various stages of plant growth such as after fertilizer application, at the flowering stage and during ball formation, the frequency and time span of which varies among the farmers.

As cotton plants are susceptible to a number of pests, there is frequent use of pesticides, usually every 3 to 5 days starting 2 weeks after emergence until 10 days before harvesting. Many of the farmers interviewed complained about the health hazards posed by the heavy use of pesticides.

As soon as the fibers become fluffy and separate into segments, the balls are picked by hand and deposited in jute sacks. Picking is done on a weekly interval and must be finished before the rains begin (in May) as cotton losses its fluffiness when exposed to rain and consequently fetches a lower price. The cotton is picked from around 10 a.m. to 2 p.m. as this is the time when the cotton is least moist and the cotton balls easiest to detach. The farmers interviewed also complained about this aspect of the farm operation as

not only is it the hottest part of the day but also they experience much eye discomfort from the glare of the white cotton balls against the sunlight as they go about picking the harvest. After picking, the fibers are sundried in nets and packed in jute sacks.

Irrigation-related Issues

Most of the farmers use the wilting and/or curling of leaves and dryness/cracking of the soil as indicators that their cotton plants need water (72.5 percent and 80 percent respectively). Twenty percent of the farmers pointed out that when some of the plant's flowers fall off, that is an indicator that there is lack of water. The other indicators of lack of water which were mentioned are: the drooping of the plant (10 percent); some plants die (5 percent), plant growth is stunted (2.5 percent), and the canal is dry (2.5 percent).3

Thirty five percent of the farmers complained of lack of water in dry season 1985-86 with the nature of the complaints broken down as follows: 20 percent blamed the lack of water on the practice of some farmers in the upper portions of the canal of blocking the canal which

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3 The numbers do not summate to 100 percent because some farmers mentioned more than one indicator.

prevents farmers at the lower levels from getting water; 2.5 percent indicated that needed water could not be obtained before one's schedule; and 2.5 percent placed the blame on a broken down canal. The other irrigation-related complaints for dry season 1985-86 were: siltation (7.5 percent); farmers jostling for water because the canal is small (5 percent); and delays in water delivery (2.5 percent).4 A total of 55 percent of the farmers indicated that they had no irrigation-related problems in dry season 1985-86.

The farmers were asked what rules and regulations do they follow in the area to ensure that everyone gets a fair share of the water. Nearly everyone (95 percent) said "rotation"

Sixty-two and one half percent of the farmers interviewed are members of the water-users association. The function of the water-users association revolves around the digging, repair and maintenance of the canals, the water-delivery schedule, and interceding with NIA on behalf of the farmers when water is needed. The water-users association was also quite active in coordinating with Philcotton with regards to the production and marketing of the cotton.

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4 The numbers do not summate to 100 percent as some farmers had more than one complaint.

Adoption of Crop Diversification

The farmers adopted cotton production only fairly recently: ninety percent started planting after 1980 and over one-half began only in 1984 or 1985 (Table 6b). The farmers have been planting cotton for an average of 2.475 years with the majority planting it continuously since they first began.

Cotton growing has been financially rewarding for the farmers: note the high ratios of average number of years of positive net and average number of years of hitting the "jackpot" to the average number of years the farmers have been planting cotton in Table 6b. Overall, the cotton farmers realized positive nets 90 percent of the time and hit the "jackpot" from one-third to one-half of the time. These are impressive figures.

Table 7b presents the reasons given by the farmers for why they decided to plant cotton. Fully three-fourths of the farmers mentioned profit-related reasons. A number of these farmers indicated that seeing the farmers who planted cotton earlier realize big profits made them decide to try to plant the crop also. Seventeen and one-half percent said that they were convinced by the Philcotton technician while 10

percent were drawn by Philcotton's offer of capital and input loans at no interest.

A total of 30 farmers (75 percent) experienced hitting the "jackpot" one or more times with their cotton crop. What made them hit the "jackpot"? Over 80 percent of the farmers attributed the high returns to proper care of the plant, sufficient irrigation, sufficient fertilizer and pesticides, and consequently high yields (Table 8b). It is interesting to note from the table that only a few of the farmers mentioned high price (13.3 percent). Other causes given were the absence of interest on cash and input loans (10 percent), the plant was not destroyed by pests (10 percent), low cost of inputs (6.7 percent) and good weather (3.3 percent).

On the other hand, we see in Table 9b the two major reasons given by the 7 farmers who had experienced a net loss for such outcome: pest infestation (3 farmers) and insufficient irrigation water (3 farmers).

Cropping Decision Making

The model of cropping decision making was tested on the farmers. Data on the various aspects of the model were obtained from the farmers for cotton and, for comparison purposes, for tomato (an alternative crop

grown in the area). The results of the analysis are presented in Table 10b. We see from the table that for cotton, the responses of 62.5 percent of the farmers are consistent with the predictions of the model and for tomato, it is 67.5 percent. In other words cotton, which all the farmers planted, passed all three stages of the model for 62.5 percent of the farmers. Tomato, on the other hand, did not pass one or more conditions of the model for 55 percent of the farmers (who also did not plant the crop) but passed all three stages of the model for 12.5 percent of the farmers (who also planted the crop).

It is to be noted in Table 10b that only three farmers did not pass Stage 1 of the model. Similarly, for both cotton and tomato, the responses of only a very few of the farmers failed to pass Stage 2 of the model. In Stage 3, the perceived profitability of cotton over rice met the farmers minimum profitability requirement for it for nearly three-fourths of the farmers. In contrast, for tomato, this was true for only one-half of the farmers.

A total of fifteen farmers (37.5 percent) behaved inconsistently with the predictions of the model for cotton; for tomato it was 13 farmers (or 32.5 percent). Let us examine the responses of the inconsistent

farmers. Table 11b presents some data which may help explain why the inconsistencies among the 15 cotton farmers.

The reasons for the inconsistent behavior vis-a-vis the planting of cotton appear to vary by farmer. For example, for farmers 5 and 31, the rice consumption requirement was not met but they went ahead and planted the crop; for farmers 6 and 16, the capital/credit requirement was not met but they also went ahead and planted the crop. It appears that except for farmer 6, the lure of high profits made the abovementioned three farmers go ahead and plant cotton (perceived profitability was greater than minimum profitability for farmers 5, 16 and 31). Farmers 5, 16, 23, 31 and 32 do not have sufficient irrigation water for planting rice, hence, they have no choice with respect to the planting of rice. For farmers 9, 13, 16, 28 and 36, planting cotton allows them to plant a third crop. Most of the farmers have had a perfect record of positive net (no experience of loss) with the crop; this could very well be the single most important reason for planting the crop. Unfortunately, we could not find a reasonable explanation for the behavior of farmer 14 who, in the two years of planting the crop, consistently lost. His

stated reason for planting cotton is that he was convinced by the Philcotton technician to plant it.

Table 12b presents the reasons for not planting tomato (the alternative comparison crop) of farmers whose responses vis-a-vis tomato pass all the conditions of the decision tree. Three farmers said that they wanted to try planting cotton this dry season, two farmers indicated that the timing was no longer ideal --i.e., they would not hit the high price during harvest, and two farmers felt that it is difficult to take care of different types of crops. The following reasons were given by one farmer each: the parcel which is suitable for tomato is far from the farmer's house, uncertainty in the price of tomato, Philcotton contacted the farmer before Philippine Fruits (which contracts tomato farming in the area) -- by the time the Philippine Fruits came the farmer had already signed a contract with Philcotton, and the farmers in the adjacent and nearby fields are planting cotton.

Table 13b compares the farmers' perception of the profitability of cotton vis-a-vis rice with their minimum profitability requirement for it. We see from the table that planting cotton was perceived as more profitable than planting rice by 34 of the 40

farmers. Table 13b also shows that the perceived profitability of cotton meets the farmers minimum profitability requirement for majority of the farmers.

The results for tomato presented in Table 14b contrasts with the results for cotton. Forty-seven and one-half percent of the farmers perceived tomato as being not as profitable or equally profitable as rice; 42.5 percent saw it as being not as profitable as cotton. It is interesting to note that eleven farmers said that tomato is more profitable than cotton. Examination of the responses of these farmers indicate that what the farmers meant is that when the high price of tomato is "hit," tomato is more profitable than cotton.

Costs and Returns

The per hectare costs and returns for cotton in dry season 1985-86 and for rice in wet season 1985 are presented in Table 15b. It is to be noted from the table that dry season cotton is about two and one-half times more profitable than wet seaon rice both in terms of net returns above cash costs and in terms of net farm income. The data on returns in the table also indicate that much of the rice produced in the wet season is for home consumption and that the farmers by

and large get their cash requirements from their cotton crop.

Three things should also be noted in Table 15b. First, are the higher rates of fertilizer and chemical (mainly pesticides) costs for cotton compared to rice. While the fertilizer ratio is only 1.5, the chemical ratio is 8.57! Second, is the lower ratio of harvest and post harvest contract labor costs for cotton vis-a--vis rice and third, is the higher ratio of unpaid family labor costs for cotton than for rice. These results parallel those of tobacco in the previous case study.

Data were obtained on the farmers' expectations of their cotton crop prior to planting with regards to yield, price, gross, cash expenditures and net return above cash costs. These were compared with the farmers' actual performance (Table 16b). What is most striking about the comparison is the very close correspondence between expectations and performance. We note also that there is a slight underestimation of the cash expenditures.

Table 16b also compares the actual profitability of cotton with the farmers' minimum profitability requirement and their perception of cotton's profitability. For seventy percent of the farmers, the

actual profitability of cotton was above the farmers' minimum profitability; actual profitability was greater than perceived profitability for also 70 percent of the farmers.

The Marketing of Cotton

Philcotton, being the contractor, buys all of the farmers' produce. During harvest time, Philcotton technicians set up schedules with the farmers as to the time and place of sales. At the appointed day, the technicians arrive and set up a weighing station in the barrio. The cotton is weighed with the moisture content of the cotton (determined via a moisture meter) subtracted from the gross weight of the product. The cotton was bought at the Philcotton set price of P8.00 per kg. Payment was by credit with the farmers given a certificate to be redeemed at the Land Bank in Urdaneta, Pangasinan.

The farmers sold their produce an average of two times and most of the sales were done within one month after harvest (Table 17b). On the average, about one-half of the produce was sold during the first sale.

Seeds were provided the farmer free of charge by Philcotton. Philcotton also provided the farmer with fertilizer and chemical inputs and with cash loans all

at no interest. These were subtracted from the farmers' gross sales. The average cost of the fertilizer loan extended by Philcotton to the farmers is P950.26 while the average cost of the chemical loan was P1,351.22.

Chapter 4

TOMATO GROWING IN STA. BARBARA AND MAPANDAN, PANGASINAN

Tomato is a crop that farmers in Sta. Barbara and Mapandan, two adjacent towns in eastern Pangasinan have planted for many years during the dry season (see Figure 5). The farmers had been planting the native variety until Philippine Fruit and Vegetable Industries, Inc. (PFVII) introduced the contract growing scheme in the 1983-84 dry season for the production of tomatoes for processing into tomato paste. PFVII operates a processing plant in San Carlos City, Pangasinan that among other things processes tomato paste.

Under the contract growing scheme, PFVII provides the farmers with technical assistance and credit in the form of seeds, fertilizer, chemicals and cash at the interest rate of 1.5 percent per month. PFVII buys the produce at a price that it sets prior to planting. The contract with PFVII stipulates that participant farmers cannot sell their tomato harvest covered by the contract growing scheme to any other buyer but PFVII.

"Taiwan variety" tomatoes were grown during the first two years of the contract growing scheme. This was changed to the "California variety" during the 1985-86 cropping season. The farmers were told by the PFVII technicians that the "California variety" has a

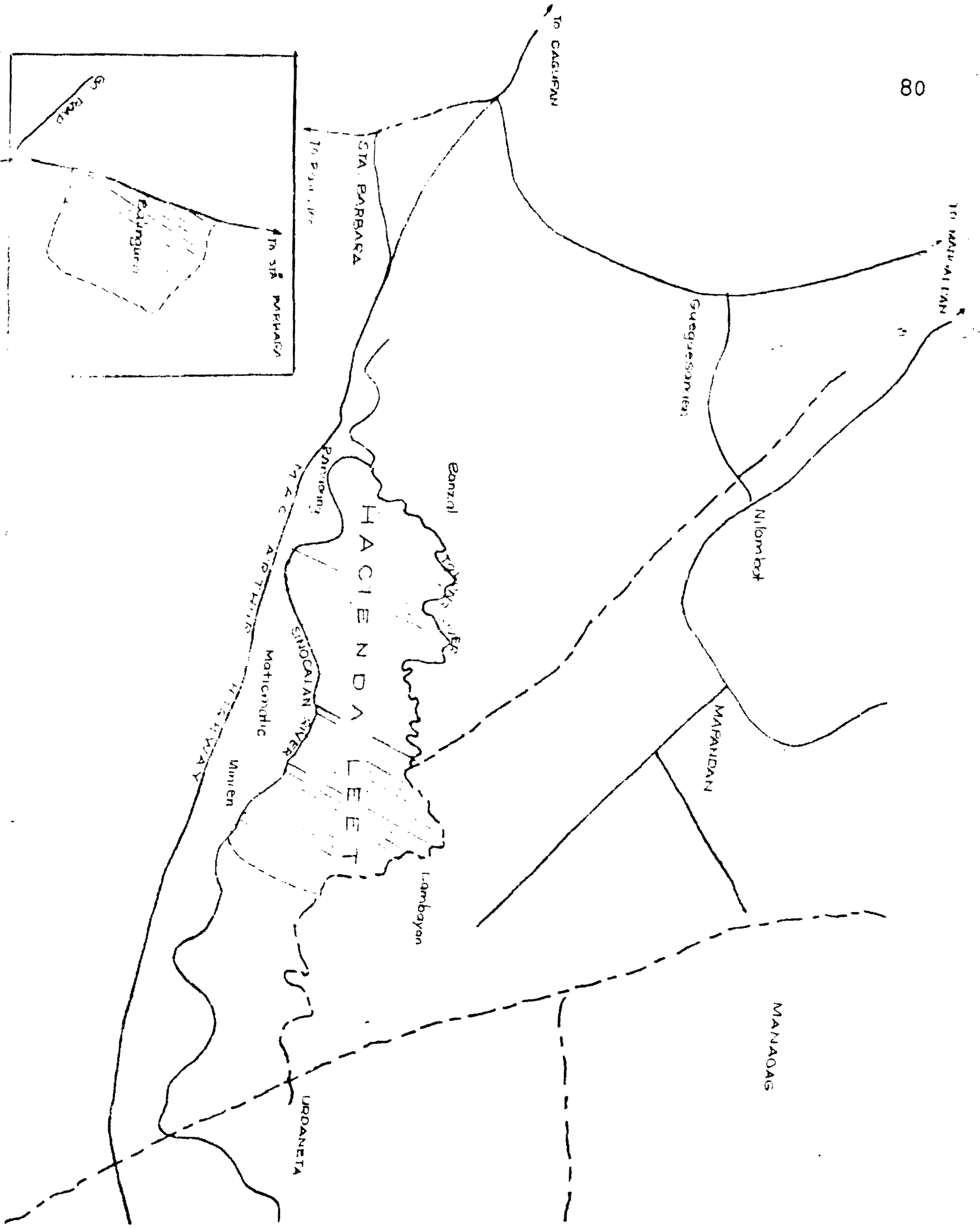

Figure 5. The tomato research site.

Note: See Figure 3a, p. 39a, for the map of Pangasinan.

potential yield of 40 tons per hectare. At the purchase price of P 0.80 per kg., this means a potential gross of P 32,000 per hectare. A number of farmers who participated in the program also planted native tomatoes in their farms at the same time that they were planting the California variety. These farmers used some of the fertilizer, chemicals and cash procured from PFVII on their native tomato crop, although this was done surreptitiously. Native tomato produces much lower yields than the California variety but its price is much higher. The farmers sell the native tomatoes to stall owners and traders at the Urdaneta Public Market.

THE SURVEY

Of the forty farmers who participated in the study, 16 were drawn at random from the NIA list of tomato contract growers while 14 were selected at random on site (as the NIA list was incomplete). Thirty-four farmers come from Sta. Barbara where the contract growing scheme is largely concentrated, and six from Mapandan. The Sta. Barbara farmers come from the barrios of Balingueo, Banaoang, Banzal, Erfe and Leet while the Mapandan farmers come from barrios Lambayan and Primicias.

The farmers averaged 51.4 years of age and have been farming an average of 28.8 years. On the average they have been growing tomatoes during the dry season for about 12 years. Except for the last two or three years (and for some farmers except for the 1985-86 dry season), the farmers have been growing the native variety and marketing their produce on their own. Seven and one-half percent of the farmers have had no formal education; 55 percent had some elementary education or are elementary school graduates; 12.5 percent had some high school education; 12.5 percent are high school graduates; and 12.5 percent had some college education.

Farm and Tenure Status

Twenty two and one-half percent of the farmers farm only one parcel of land with an average area of 0.816 hectares; 45 percent farm two parcels with an average area of 1.675 hectares; and 32.5 percent farm from 3 to 6 parcels with an average area of 2.00 hectares (Table 1c). Although only 4 percent of the parcels are owned by the farmers themselves, they have Certificates of Land Transfer on 51 percent of the parcels; the remaining 44 percent are leased (Table 2c). NIA provides the irrigation for 46.7 percent of the parcels; 20 percent are irrigated by the Farms Systems

Development Corporation (FSDC) using pump and gravity irrigation and the rest (33.3 percent) are rainfed.

Production and Cropping

All of the farmers planted rice in wet season 1985 although 25 percent also planted other crops (Table 3C1) namely, corn (15 percent), stringbeans (7.5 percent), mungbean (5 percent) and sugarcane (2.5 percent). The average area planted to rice is 1.386 ha. while the average areas planted to the diversified crops are 0.487 ha. for corn, 0.134 ha. for stringbeans, 0.2 ha. for mungbean and 0.33 ha. for sugarcane. The farmers who planted diversified crops in the wet season farmed an average of 2.5 parcels of land.

The "California variety" tomato was grown on an average area of about one-half hectare (Table 3C2). It is interesting to note in Table 3C2 that majority of the farmers planted one or more diversified crops in addition to the contract grown tomato. Thirty percent also planted native tomatoes on an average of 0.26 ha. of land; 35 percent planted mungbean on an average of 0.389 ha.; 17.5 percent planted corn on an average of 0.446 ha.; and a few others planted eggplant, bitter gourd, string beans, gourd, and sugarcane. Over one-third of the farmers also planted rice during the

dry season. From Table 4c we see that the farmers who planted one or more diversified crops in addition to the contract grown tomato tended to have a lower average annual income from other sources than those who planted only the contract grown tomato (P3,274 vs. P4,426). The average number of parcels farmed does not appear to be related, however, to a greater tendency to diversify in the dry season.

Table 5c presents data on sufficiency of irrigation water and the planting of rice during the dry season. A total of 19 farmers indicated that they receive sufficient irrigation water in the dry season for planting rice. Of these farmers, more did not plant than did plant rice (12 vs. 7). It is interesting to note that the farmers who did not plant rice have, on the average, a smaller average farm size and fewer parcels than those who planted rice. Furthermore, these farmers tended to perceive tomato growing as more profitable than the farmers who also planted rice.

Similarly, among the farmers who indicated that they are not receiving sufficient irrigation water in the dry season for planting rice, those who say that they will not plant rice even if given sufficient irrigation water have a smaller average farm size than those who indicate that they will plant. Although these

farmers also have slightly fewer parcels and a slightly higher perception of tomato's profitability than the farmers who say that they will plant, the difference is very small and can be considered negligible.

It is to be noted also that six of the 14 farmers who also planted rice in the dry season indicated that the irrigation water they received was not sufficient for their rice crop. Three of these farmers said that in the future, even if they are given sufficient water for planting rice, they will no longer plant rice but just concentrate on tomatoes because the profit from tomatoes is greater than that from rice.

Cultural Practices

The California tomato was planted between the months of September and November with the majority planting in October. The tomato was first sown on seedbeds, especially when it was to be planted in a relatively large area. The farmers in Sta. Barbara and Mapandan prepared seedbeds 1 meter wide but of different lengths. The seedbed site was first sterilized by burning rice straw over the moist soil. After the soil cooled off, it was plowed using an animal-drawn plow and harrowed until the soil tilth became fine. The soil was then formed into beds.

Pre-treated seeds provided by PFVII were sown on shallow furrows formed on the beds and covered with fine soil. Watering of the seedbeds using a hand sprinkler was done once or twice a day until the emergence of the seedlings. The watering was gradually reduced as the seedling grew.

Land preparation was done while waiting for the seedlings to be ready for transplanting. The field was plowed and harrowed until it became fine. Furrows about one meter apart were formed using an animal-drawn plow.

The seedlings were transplanted from four to six weeks after emergence. They were transplanted into the furrow bottom with a space of about 50-80 cm. between hills. The seedlings were fertilized immediately after transplanting with ammonium sulfate dissolved in water. About a third of the farmers did furrow irrigation either before or after the transplanting.

As the tomato plant grew, the farmers sidedressed the plant with urea and complete fetilizer, the frequency of which varied among the farmers. Shallow cultivation was done about 2 to 3 times while the plant was still small to control for weeds, to allow for better aeration of the roots, and so that the irrigation water can infiltrate better. The farmers irrigated the plant an average of three times throughout the growing

period, this usually occuring after fertilizer application and during the flowering or fruiting stage. The irrigation water was allowed to flow along the furrows formed during cultivation. A number of different pesticides such as Lannate, Decis, Thiodan, Sumicidin, Ripcord, and Sevin were alternately sprayed, often as a preventive measure.

Harvesting was done between the months of December and March. The tomatoes were picked by hand and placed in crates. The farmers rarely sorted their produce according to size but removed the rotten ones. The PFVII technicians collected the produce directly at the farmers fields or in their storage areas.

Irrigation-related Issues

The major indicators that the farmers use for determining that their plant needs water are wilting leaves (52.5 percent), dryness/cracking of the soil (52.5 percent), stunting of the plant (20 percent), dying of some plants (5 percent), and the falling of flowers (2.5 percent). Some farmers also mentioned that water is needed before or during flowering (25 percent), when small fruits appear (17.5 percent), after

fertilizer application (12.5 percent), and after transplanting (2.5 percent).1

The farmers were asked what irrigation-related problems they encountered during the dry season. The farmers who were getting their water from FSDC complained mainly of the breakdown of the engine of the water pump (arising from battery failure) which resulted in their not getting needed water as the battery was being fixed (15 percent). Among the NIA-irrigated farmers the complaints were lack of water (30 percent), the practice of some farmers in the upper portion of closing the gate of the lateral resulting in the farmers below not having any water (5 percent), overflow of water from the main canal (2.5 percent), siltation (2.5 percent), non-following of the water delivery schedule (2.5 percent), and the farmers being billed by NIA for the whole area of the farm and not in terms of the area irrigated (2 percent). A total of 42.5 percent of the farmers had no complaints or problems.2

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1 The numbers do not summate to 100 percent as some farmers mentioned more than one indicator.

2 The numbers do not summate to 100 percent as some farmers had more than one complaint.

The farmers were asked what rules and regulations they follow in order that everybody gets a fair allocation of the water. The farmers who get their water from FSDC answered that they agree among themselves on who gets the water first while the NIA-irrigated farmers answered "rotation".

Seventy eight percent of the NIA-irrigated farmers are members of the water-users association. The association's major functions revolve around the repair and maintenance of the canals, the water delivery schedule, ensuring the fair allocation of water among the members, and bringing to the attention of NIA, irrigation-related problems of the farmers especially the lack of water when it happens. The association also acts as an arbiter when farmers have water-related disputes, it tries to foster unity among the farmers and sometimes even lends money to some members who need cash badly.

The FSDC-irrigated farmers also have a water-users association. The association undertakes the repair and maintenance of canals, interfaces with FSDC, and collects the irrigation fees; it is involved in the maintenance of the water pump, as well as in the operation of the irrigation system, and sometimes even involves itself in the selling of the farmers' produce. For the contract grown tomato, it was the president of the association who negotiated for the

farmers with PFVII. (In contrast, the water-users association of the NIA-irrigated farmers had little to do with the crop diversification except in matters related to the irrigation of the farmers' fields).

Adoption of Crop diversification

Two thirds of the farmers started planting tomato between 1966 and 1980, 22.5 percent began prior to 1966 and 10 percent after 1980 (Table 6c). The average number of years the farmers planted tomato since the first planting is 11.9 years; the average number of years they did not plant since the first planting is 3.77. Actually, these figures are somewhat deceiving because 24 of the 40 farmers (60 percent) have been planting tomato consistently every dry season since they first began. The average was "pulled down" by seven farmers who did not plant the crop for many years in between (the average number of years the seven did not plant is 16.6 years). The farmers had been planting the native variety for most years except in the last three when PFVII introduced the contract growing scheme.

From Table 6c we see that over the years of planting the crop the farmers have, by and large, realized positive net returns (positive net ratio of

0.84) and that they hit the "jackpot" an average of 20 percent of the time.

Why did the farmers decide to plant tomato? From Table 7c we see that close to one-half (45 percent) gave profit-related reasons -- they were told or they heard that it is profitable or they saw other farmers in the area realize good profits from it. Twenty five percent indicated that they decided to plant the crop to have a source of cash to buy necessities and/or tomatoes are an easy source of cash. Seven and one-half percent wanted to try it just in case they might make money from it. Fifteen percent said that they were convinced by the PFVII technician; 5 percent agrered to join the contract growing scheme because PFVII provides credit while 2.5 percent participated because there is a ready buyer, namely, PFVII. Other reasons given are: the topography of the farm is suitable for planting tomatoes, the farmer cannot plant anything else on his farm, the farmer does not want to leave his land idle in the dry season, the farm operations for tomato are not difficult, good price, and the other farmers in the area are planting the crop.

A total of 31 farmers had experienced hitting the "jackpot" one or more times during their years of planting tomatoes. Over a third of the farmers

attributed the high returns to the high price of tomatoes at harvest time; another third indicated that proper care of the plant, sufficient application of fertilizer, sufficient water and high yield were responsible (Table 8c). About a fifth of the farmers said they hit the "jackpot" because their produce was bought in bulk at a high price; another fifth attributed the "jackpot" to good weather such that the crop was not destroyed. The other reasons given for the hitting of the "jackpot" are: the timing of planting was right, i.e. the harvest time coincided with the high price, insecticides and fertilizer were cheaper then, the plant was not destroyed by pests, and the variety planted was good -- i.e., giving high yields.

Twenty-nine farmers experienced net loss with their tomato crop one or more times (Table 9c). Among the most frequently mentioned reasons for the loss relate to the destruction of the crop: the plant was attacked by bacteria/pest (24.1 percent); too much water or water logged soil (20.7 percent); lack of water (6.9 percent); plant was destroyed by typhoon (27.6 percent); and plant was destroyed by the carabao (3.4 percent). Marketing-related reasons were also cited, namely: low price/

oversupply in the market (24.1 percent); the farmer was not paid by the buyer (13.8 percent); and PFVII did not get the produce on time so that it rotted (6.9 percent). Other reasons given were: the soil was not good for tomatoes and the technician taught the farmer the wrong things.

Cropping Decision Making

Data on the cropping decision making of the farmers are presented in Table 10C. All but one of the farmers passed Stage 1 of the model and all but two of the farmers passed Stage 2. That is, the rice consumption requirements of the farmers were met for all but one of the farmers; the technical constraints were met for all but one of the farmers; and the economic feasibility requirements were met for all but one of the farmers. As far as the cost-benefit analysis is concerned (Stage 3), the perceived profitability of tomato met the farmer's minimum profitability requirement for it for close to three fourths of the farmers (72.5 percent).

Why did the farmers who did not pass one or more conditions of the decision tree plant the crop? Table 11c presents some data on these farmers which may help explain why. It appears that for Farmer no.1 (for whom the rice consumption requirement was not met), his

perceived profitability for tomato over rice of 2.0, as well as his positive net ratio of 0.94 are important factors for why he is planting the crop. Farmers 7, 9, 25 and 26 report that the irrigation water they receive during the dry season is not sufficient for planting rice. This is probably a major reason for why they are plating tomatoes even if it does not meet their minimum profitability requirement. For most of the farmers, the high ratios of positive net over the years of planting tomatoes was probably important in their decision to plant the crop.

For purposes of comparison, data on cropping decision making was obtained from the farmers for cotton, a similarly contract-grown crop which the farmers are not planting, which is grown in the nearly towns of Manaoag and Urdaneta. From Table 10c we see that although cotton passes Stage 2 of the model for majority of the farmers, it fails for most in so far as the cost benefit analysis is concerned. Cotton's perceived profitability does not meet the farmer's minimum profitability requirement for 82.5 percent of the farmers.

Cotton passed all three stages of the model for five farmers who did not plant the crop. Table 12c presents the reasons given by these farmers for why they are not

planting cotton. Three of the farmers indicated that they did not plant cotton because they wanted to try plating the California variety tomato; the other two simply said that planting tomatoes is more profitable than planting cotton.

Tables 13c and 14c present more detailed information on the farmers'profitability perceptions vis-a vis tomato and cotton respectively. From the tables we see that cotton fares poorly compared to tomato. Forty-five percent of the farmers see cotton as less profitable than rice and seventy percent see it as less profitable than tomato; only four farmers perceived cotton as more profitable than tomato.

To sum up, the model of cropping decision making appears to account reasonably well for the farmers'decision making behavior. A total of 70 percent of the farmers gave responses consistent with the model with respect to tomato and a total of 87.5 percent gave consistent responses with respect to cotton,

Costs and Returns

The per hectare costs and returns for tomato in dry season 1985-86 and for rice in wet season 1985 are presented in Table 15c.

Overall, the farmers suffered losses on their tomato crop. The major reason for the negative net returns is the low yield of about 7,754.55 kg. per hectare which constitutes only 19.4 percent of the PFVII projected harvest of 40,000 kgs/ha. The low yield arises from two factors. First is that many farmers planted early. Unfortunately. a storm during the nursery operations weakened the seedlings. Second, the farmers were told by the PFVII technicians to irrigate before the flowering stage. This resulted in delayed flowering, some plants dying and generally low yields. Given the low yields, two other factors contributed to the overall low returns. One is the high fertilizer and chemical usage. The fertilizer usage on a per hectare basis is 1.95 times higher than that for wet season rice. Much worse is the chemical usage which is 9.15 times greater than that for wet season rice! The nature of the contract growing scheme in which farmers are provided the fertilizers and chemicals on demand by PFVII appears to have been a major contributory factor for the high fertilizer and chemical usage. During the interviews, the farmers could not accurately recall how much fertilizer and chemicals they had used. There was little record keeping of these. Instead, the farmers would simply say that the PFVII technician would give

them fertilizer and chemical inputs whenever they asked. (In fact, data on the inputs used by each farmer had to be obtained directly from PFVII). Since the farmers were not that aware of the extent of their usage as well as the costs of these (as payment for such was to be deducted later from the gross sales), there was a tendency to overuse. This was further aggravated by the fact that the farmers were expecting a yield of 40,000 kgs/ha. as indicated on their contracts with PFVII, and so thinking that they would be realizing a high gross (the average area planted is about one half hectare; P0.80/kg. for 20,000 kgs. gives a gross of P16,000), the farmers went ahead and asked for as much fertilizer and chemicals as they needed (a portion of which was used on their native tomato crop). A final factor which affected the returns realized by the farmers was the failure of PFVII to get the harvested tomato on time from several farmers. This happened after the snap elections and the subsequent February revolution. The PFVII technicians did not come to get the produce which then rotted.

Two points should also be noted about the data in Table 15c. The first is that the dry season tomato crop has a lower labor cash cost than wet season rice but a much higher non-cash labor cost (i.e. unpaid family

labor cost). The second is that wet season rice is largely a non-cash crop for the farmers.

Table 16c compares the farmers' expectations of their tomato crop with its actual performance. The farmers grossly overestimated (by an average of 3.72 times) their future yield. We note, however, that the farmers' mean estimate of 26,506 kg/ha. is actually much lower than the 40,000 kg/ha. figure that PFVII gave the farmers. We note too that the farmers under-estimated their cash expenditures. Finally, given the negative returns, the actual profitability of tomato did not meet the farmers' minimum profitability requirement for it for 95 percent of the farmers; the actual profitability was also less than the farmers' perceptions of the crop's profitability for 87.5 percent of the farmers.

The Marketing of "California" Variety Tomatoes

All of the contract grown tomatoes were sold to PFVII. Each farmer set a number of schedules for the PFVII technician to collect the tomatoes either at the farmer's farm or at the storage area. The farmers would harvest the day before each scheduled collection day. The farmers harvested and turned over their produce to PFVII an average of 14.15 times (Table 17c).

As mentioned earlier, PFVII provided the farmers with input loans (seeds, fertilizer, chemicals, and cash) at an interest rate of 1.5 percent per month. the average cost of the input loan extended was P286.88 for seeds, P960.45 for fertilizer, and P846.92 for chemicals (this is the simple average and not the per hectare value). In 60 percent of the cases, PFVII also provided the farmers with containers for the harvested tomatoes.

Table 17c also presents more specific data on the first sale of the produce. In this regard, an average of 14 percent of the produce were of poor quality during the first sale.

Each farmer was given a credit certificate in which the number of kilograms sold each time PFVII technicians collected their produce were listed. At the end of the season the certificate was redeemed for cash at the Ministry of Agrarain Reform (MAR) office in Sta. Barbara, Pangasinan. The cost of the inputs advanced by PFVII as well as the interest costs were already deducted from the cash payment.

As a result of the low yield and high input cost, the total amount of tomatoes sold to PFVII by 80 percent of the farmers was not enough to pay for the input loans (plus interest) advanced by PFVII. These farmers thus owed money to PFVII which they could not pay for in

cash. To solve the problem, PFVII arranged a scheme whereby PFVII would give these farmers tomato seeds for free which the farmers would plant in the ensuing dry season. The farmers are to pay their debts with their tomato harvest which PFVII will purchase at the same price of P0.80/kg. In this arrangement, PFVII would no longer provide the farmer with either cash or fertilizer and chemical loans. Given the poor performance, PFVII has further decided to discontinue its contract growing scheme in the area.

Chapter 5

MUNGBEAN FARMING IN MANAOAG AND URDANETA, PANGASINAN

Mungbean has been the traditional second crop of rice farmers around the border of Manaoag and Urdaneta, two adjacent towns in eastern Pangasinan (see Figure 6). In dry season 1985-86, over two hundred and fifty hectares were planted to mungbean in this area. The lack of adequate irrigation water for rice or other diversified crops is a major reason for the widespread cultivation of mungbean in the area during the dry season. Cognizant of this, NIA has in fact been programming the area for mungbean production during the dry season. The farmers are told by NIA to plant mungbean because the water they would receive will not be enough for planting rice. Thus, in one sense the farmers do not really have much of a choice in planting mungbean, even though the crop is the traditional second crop in the area. Many of the farmers grow a third crop of mungbean or white corn after the second mungbean crop.

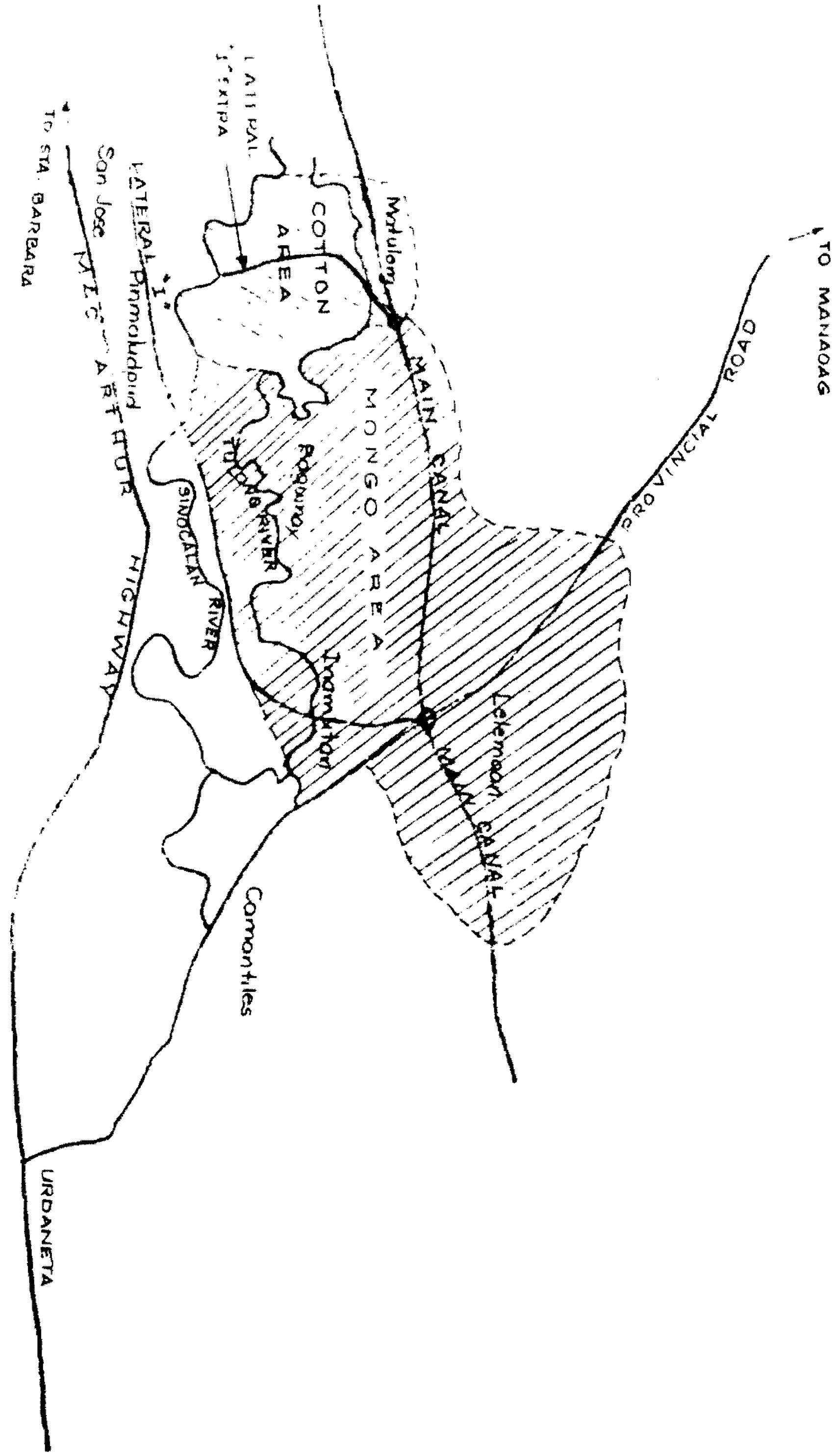

Figure 6 The mungbean research site

Note: See Figure 3a, p. 39a, for the map of Pangasinan

The Survey

Forty farmers selected at random on site were interviewed -- 36 from Manaoag, where the cultivation of mungbean is more extensive, and 4 from Urdaneta. The Manaoag farmers come from three barrios, namely: Baguinay, Inamotan and Lelemaan while the Urdaneta farmers are from the barrio of Pinmaludpud. The farmers, who averaged 49.7 years of age, have been farming an average of 26.3 years. They have been planting mungbean in the dry season for an average of 18 years. Sixty percent of the farmers have had some or had completed elementary school while 32.5 percent have had some or had completed high school. Seven and one-half percent did not have any formal schooling.

Farming and Tenure Status

Majority of the farmers farm either one or two parcels of land (42.5 percent and 35.0 percent, respectively, Table 1d). Although the average farm size is 1.2 hectares, the farmers who farm only one parcel have very small farms (average size is 0.626 ha.). The farmers with two parcels have an average farm size of 0.98 hectares while those who have 3 to 5 parcels (22.5 percent) have an average farm size of 1.46 has. Close

to three fourths of the parcels are leased by the farmers while a fourth are owned by the farmers themselves (Table 2d). Ninety seven percent of the parcels are irrigated by NIA; the remaining 3 percent are rainfed.

Production and Cropping

Eighty five percent of the farmers planted only rice in wet season 1985; 75 percent planted only mungbean in dry season 1985-86 (Tables 3d1 and 3d2). The average area planted to rice is 0.844 ha.; for mungbean it is 0.744 ha. All of the farmers started planting their mungbean crop in December with 80 percent harvesting in February and 20 percent in March. The other crops planted in the dry season are eggplant, tomato, string beans, and corn. Only four out of the forty farmers also planted rice in dry season 1985-86.

From Table 4d we see that the farmers who planted mungbean only in the dry season have a higher average annual income from other sources than the farmers who planted other crops besides mungbean (P3,848 vs. P1,395). The number of parcels farmed does not appear to be related to the number of different crops planted in the dry season.

Although NIA had informed the farmers that there would not be enough water for planting rice in dry season 1985-86, nonetheless, over one-half of the farmers interviewed indicated that there was in fact enough water available for planting rice (Table 5d). A probable reason for this response is that since nearly everyone in the area planted mungbean (which has very low water requirements) and very few planted rice, there was surplus water which would have allowed some more farmers to plant rice in the dry season (although if many more did, there would not have been enough water for everybody). The farmers who reported that there was actually enough water for planting rice but who did not plant rice did so because of the earlier NIA announcement and its mungbean program for the area. Overall, mungbean is perceived by the farmers as being slightly less profitable than rice (average perceived profitability is 0.89). Thus, if given a choice, most farmers would prefer to plant rice than mungbean in the dry season (note in Table 5d that 11 of the 14 farmers who reported not receiving sufficient water for rice would plant rice if given sufficient water).

Cultural Practices

The farmers start planting mungbean in December, not long after harvesting the wet season rice crop. Most of the farmers do not plow the fields before planting, opting instead to simply broadcast the seeds into the field containing the rice stalks. Many farmers irrigate the field by flooding before broadcasting the seeds. After broadcasting, the field is harrowed using a spike-toothed harrow.

The farmers do not apply fertilizer to the mungbean plant because of the belief that using fertilizer will only prolong the vegetative stage of plant growth which will result in lesser pod formation while at the same time promoting weed growth. The farmers do not weed either, opting instead to use herbicides. The farmers also use pesticides -- the mungbean plant is sprayed regularly with different pesticides often on a weekly basis. Irrigation water is supplied as the soil becomes dry. Most farmers irrigate only once during the plant growth, often before or during flowering.

Harvesting is done manually by picking the ripened pods. The harvested pods are then sun-dried. Threshing is done by placing the still brittle pods in sacks and pounding the sacks with wooden clubs. Winnowing is done after pounding to separate the seeds from the

pods. This is followed by drying of the seeds for storage or marketing.

Irrigation-related Issues

Dryness/cracking of the soil and the wilting/curling of leaves are the two major indicators used by the farmers for determining that the plant needs water (67.5 percent and 45 percent respectively). The other indicators mentioned were: the plants' growth is stunted (17.5 percent); before flowering (12.5 percent); and some plants dying (7.5 percent).[1]

The vast majority of the farmers (90 percent) had no irrigation-related problems in dry season 1985-86, which is probably a reflection of the low water requirements of the mungbean crop. The problems mentioned by the four farmers(i.e. 10 percent) who encountered problems are: water theft (2.5 percent), lack of water (2.5 percent), too much water (2.5 percent), and uneven distribution of water because some farmers in the upper portion blocked the water (2.5 percent).

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1 The numbers do not summate to 100 percent because some farmers mentioned more than one indicator.

To the question of what rules and regulations do they follow to ensure that everyone gets a fair share of the water, ninety percent answered "rotation."

Seventy-five percent of the farmers are members of the water-user association. The association is primarily concerned with the repair and maintenance of the canals, with the irrigation schedule and with resolving irrigation-related problems and conflicts. Other than these, the association was not involved in the crop diversification.

Adoption of Crop Diversification

Over three-fourths of the farmers have been planting mungbean in the dry season for at least 10 years; 22.5 percent first planted mungbean on or before 1960, 55 percent between 1961 and 1975 and another 22.5 percent between 1976 and 1985 (Table 6d). Overall, the farmers have been planting the crop for an average of 18.13 years with the average number of years of non-planting since they first began being only 1.5 years. Table 6d also shows the reason for the persistence of mungbean production in the area: over the years, the farmers have consistently realized net profits from their mungbean crop (+ net ratio of 0.91; net loss ratio

of 0.08). Nonetheless, the farmers' hitting of the "jackpot" with their mungbean harvest has been relatively uncommon ("jackpot" ratio of 0.11).

Table 7d presents the reasons given by the farmers for why they are planting mungbean. For 37.5 percent, mungbean is cultivated in the dry season because of lack of irrigation water, because mungbean is the only crop that can be planted in the farmer's field in the dry season, and/or because the crop is suitable to the farmer's soil and topography or to the climate. About 35 percent pointed out that it is a ready source of cash for buying the family needs while 25 percent indicated that the crop is profitable, it is relatively easy to realize some profit from it, or it is the only crop that the farmer knows will give him some cash or profit. Tradition was important for nearly a third of the farmers who indicated that they planted mungbean because everyone in the area plants it during the dry season. A few (7.5 percent) mentioned that the crop is easy to plant, requiring little labor; another 7.5 percent indicated that they planted because the harvest could also be used for home consumption. It is interesting to note from Table 7d that only two farmers specifically mentioned the NIA directive as their reason for planting the crop. One can surmise that this is

probably because for most farmers, the directive was superfluous as they were going to plant mungbean anyway.

The farmers who had experienced hitting the "jackpot" were asked why they hit it when they did. Table 8d presents the reasons given. The most common reason is the proper care of the plant, sufficient application of pesticides, sufficient irrigation, and consequently high yield (61.8 percent). A related reason given by 20.6 percent is that the plant was not destroyed by pests. The other reasons given are: less cash expenditures because the farmers did not use pesticides then or that pesticides were cheaper then (17.6 percent); high mungbean price (11.8 percent); and good weather (11.8 percent). Among the reasons given for the experience of net loss (Table 9d) are: the plant did not grow well (28.6 percent); irrigation-related problems such as too much water (17.8 percent), too little water (10.7 percent), or siltation in the irrigation water (3.6 percent); the plant was attacked by pests (14.3 percent); the plant was not properly cared for (14.3 percent); and poor quality seeds (10.7 percent).

Cropping Decision Making

Data on the model of cropping decision making were obtained from the farmers; these are presented in Table 10d. What is striking in the farmers' pattern of responses is that mungbean passed all of the technical and economic feasibility requirements of Stage 2 of the model for all the farmers but fared rather poorly when it came to the minimum profitability requirement of Stage 3. Mungbean did not meet the farmers' minimum profitability requirement for nearly one-half of the farmers. In Table 11d we see that mungbean is perceived as less profitable than rice by nearly all of the 20 farmers for whom mungbean did not meet this minimum profitability requirement. Given this, the question is: Why are these farmers planting mungbean in the dry season? The reason seems to be that the farmers do not really have much of a choice about what crop to plant given the NIA directive and the irrigation water available. Under these circumstances, mungbean appears to be a reasonable choice for a dry season crop for the farmers. Without plowing, the mungbeans are broadcast soon after the rice harvest in December. After one harrowing, the plants establish themselves on the soils. Overall, the plants require minimal labor and material inputs except for the (usually) weekly spraying

of pesticides. It must be mentioned also that planting mungbean as a second crop allows the farmer to plant a third crop of either mungbean or corn if he plants the second mungbean crop early enough in December. Indeed, as Table 11d indicates, eleven of the twelve farmers who indicated that the dry season mungbean crop allows them to plant a third crop did so.

For purposes of comparison, the 40 farmers were asked questions relating to the model of cropping decision making for tomato, a dry season crop grown in the neighboring towns of Mapandan and Sta. Barbara. Only three of the 40 farmers were also growing tomatoes in dry season 1985-86. For the farmers who did not plant tomatoes, the expectation is that tomato will fail one or more conditions of the decision tree; it will, however, pass all of the conditions for those who planted it. The results indicate that the responses of 82.5 percent of the farmers are consistent with the expectation (Table 10d). Specifically, 32 of the 34 farmers for whom tomato failed to pass one or more conditions of the decision tree did not plant the crop and one of the six farmers for whom tomato passed all conditions of the decision tree planted the crop, giving a total of 33 consistent and seven inconsistent responses.

Why did five of the six farmers for whom tomato passed all conditions of the decision tree not plant crop? Table 12d presents the reasons given by the farmers. One farmer indicated that he has no draft animal to use for plowing the field in the dry season which is required for tomato cultivation. The farmer is not willing to hire for the land preparation required because this requires a large cash outlay for him while the alternative-mungbean-does not necessitate it. Another farmer was influenced by the uncertainty in the price fluctuations of tomato: the farmer is not sure that he will hit the high price come harvest time. The third farmer simply stated that NIA had scheduled the area for mungbean cultivation so he had no choice. The fourth farmer pointed out that the tomato plant has a tendency of dying, the reason for which he does not know and the fifth indicated that he prefers planting mungbean because the tomato plant is harder to care for.

Tables 13d and 14d present more detailed information on the farmers' perceptions of the relative profitabilities of mungbean and tomato vis-a-vis rice, vis-a-vis the farmers' minimum profitability requirement for each crop, and vis-a-vis each other. The data indicate that while mungbean failed to meet the farmers' minimum proftiability requirement for 47.5 percent of

the farmers, tomato failed to meet the minimum profitability requirement for over three-fourths of the farmers (77.5 percent). What is a rather surprising finding in Table 14d, however, is the result that 82.5 percent of the farmers find tomato as more profitable than mungbean and yet they are not planting it. There are two major reasons for this: the first is that the farmers tend to have a higher minimum profitability requirement for planting tomato than for planting mungbean. Thus, even if tomato is perceived as more profitable than mungbean, it fails to meet the farmers' minimum profitability requirement for more farmers than does mungbean (77.5 percent for tomato vs. 47.5 percent for mungbean). One can conjecture that perhaps the reason why mungbean has a lower minimum profitability requirement than tomato is because of the farmers' long experience and history of growing mungbean whereas tomatoes grown on a commercial scale is relatively alien to the farmers and therefore probably perceived as more risky. Second, the farmers have a variety of specific reasons and/or objections to planting tomatoes. Table 12d1 presents these. Most of the reasons have to do with the crop's technical feasiblity (such as the crop is not suitable to the farm's soil and/or topography, lack of irrigation water, lack of knowledge in growing

the crop) and/or objections relating to the crop's economic feasibility (e.g. uncertainty in the price of tomato, growing tomato is laborious/more laborious than growing mungbean). It should be noted that these technical and economic feasibility-related reasons are taken into account in the model of cropping decision making, which indicates that the farmers did not answer correctly the questions related to these aspects when they were asked about them in connection with the model of cropping decision making. Three farmers mentioned reasons related to social factors (e.g. no one in the area is planting tomato; NIA scheduled the area for mungbean cultivation) and one farmer simply stated a preference for mungbean to tomato.

To sum up, the findings on the farmers' cropping decision making with respect to the planting of mungbean show relatively high levels of inconsistency with the study's decision tree model. This result is not surprising, however, given the fact that most of the farmers do not really have much of a choice under the circumstances. Indeed, the mungbean crop makes do for a less than ideal situation which the farmers in the area have to contend with.

Costs and Returns

The eosts and returns for mungbean production in dry season 1985-86 and for rice production in wet season 1985 are presented in Table 15d. On a per hectare basis, mungbean requires a much lower cash cost outlay than rice (pre-harvest cash costs ratio vis-a-vis rice of 0.51 and harvest and post harvest cash costs ratio of 0.39). In fact, the cash costs ratios are all very low except for chemicals and seeds. The chemical cash cost ratio of 2.00 is due to the heavier usage of pesticides for the mungbean crop.

Unlike the other diversified crops discussed in this report, mungbean has a much lower non-cash cost (i.e., unpaid family and other labor cost) than rice. Except for the (usually) weekly pesticide application, little else is done on the mungbean crop during its growth. Land preparation is also minimal. Harvesting is the only activity requiring a relatively high level of labor input.

Although the cash returns for mungbean is much higher than that for rice (a ratio of 3.85), the overall returns for mungbean (cash plus non-cash) is very much lower than that for rice (a ratio of 0.25). In fact, the per hectare average net returns above cash costs for mungbean is -P384.84 compared with P3,514.02

for rice. There are two reasons for this: the first and more important one is the very low yield of 385.65 kg/ha arising from the poor cultivation practices of the farmers (i.e., little land preparation, non-weeding and possibly the non-use of fertilizer); the second reason is the high chemical (mainly pesticides) usage. In fact, the average cost of chemicals (P933.59) is 52 percent of the average cash returns (of P1,779.27) and 30 percent of the total returns (of P3,111.09)

Table 16d compares the farmers' expectations with their performance vis-a-vis the mungbean crop. What is striking about the figures in the table is that the farmers had overestimated their yield and gross projections and underestimated their cash expenditures projections. As far as the profitability of the mungbean crop is concerned, the actual profitability is less than the farmer's minimum profitability requirement for 92.5 percent of the farmers; it is also less than the farmer's perception of its profitability for 87.5 percent of the farmers. The result of the Pearson r of -0.382 betwen expected yield (kg/ha) and the ratio of the area planted to mungbean to the farm's total area indicates that the smaller the proportion of the farm area is planted to mungbean, the greater is the tendency to overestimate the yield.

Given the dismal performance of the mungbean crop, the question is, why are the farmers planting it? Here we must recall that historically, over the years, the farmers report realizing positive net returns from their mungbean crop, although it appears that the size of these positive net returns are relatively small. Considering the fact that the farmers cultural practices in growing the crop lead to poor yields and that chemical inputs are not getting any cheaper, it appears that the days of mungbean as a dry season crop among the farmers may be numbered. For as long as the farmers do not have much choice vis-a-vis crops to plant in the dry season, they will probably persist for a short while longer in planting mungbean. However, one cannot go on for long having negative returns -- either the cultural practices will have to change towards those more conducive to higher yields or the farmers will eventully cease to plant mungbean in the dry season (except perhaps for purposes of home consumption).

The Marketing of Mungbean

The farmers themselves undertake the marketing of their mungbean harvest. They bring their produce to the Urdaneta Public Market and sell them to traders/stall owners there. As mungbean can be stored for quite a

while (or eaten by the family), two factors determine when the produce will be brought to market: the family's cash needs and the prevailing market price.

Table 17d presents data on the marketing of mungbean. From the table we see that 57.14 percent of the farmers first sold their produce during harvest week; another 31.43 percent had their first sale 1-2 weeks after harvest. About 30 percent of the produce was sold during the first sale. The proximity of the first sale to harvest time as well as the quantity sold belies the need for cash of the farmers, especially because prices tend to be low around harvest time.

Few farmers had any special arrangements with their buyers; whatever arrangements there were consisted mainly of the farmer borrowing rice from the trader/ stall owner (who are also grains dealers) as he ran out of rice during the dry season.

The farmers transported their produce via the tricycle. The average cost of transport is quite small.

Chapter 6

ONION GROWING IN SAN JOSE, NUEVA ECIJA

San Jose, a city in the northern section of the province of Nueva Ecija, is one of the biggest producers of onions in the dry season (see Figure 7). Farmers in San Jose regularly grow onions after their wet season rice crop. Based on interviews with some farmer informants, it appears that a handful of farmers started planting the crop before the second world war. These farmers did reasonably well that soon other farmers followed suit.

The farmers of San Jose plant their onion crop on their own, i.e. no contract growing scheme. Several years back, technicians from University of the Philippines at Los Banos (UPLB) and from the Central Luzon State University (CLSU) would come and give farmers technical advice. This is no longer the case. Neither do the farmers have any special arrangement with the NIA office in Munoz, Nueva Ecija for their onion crop. Nonetheless, onion growing continues to thrive in San Jose.

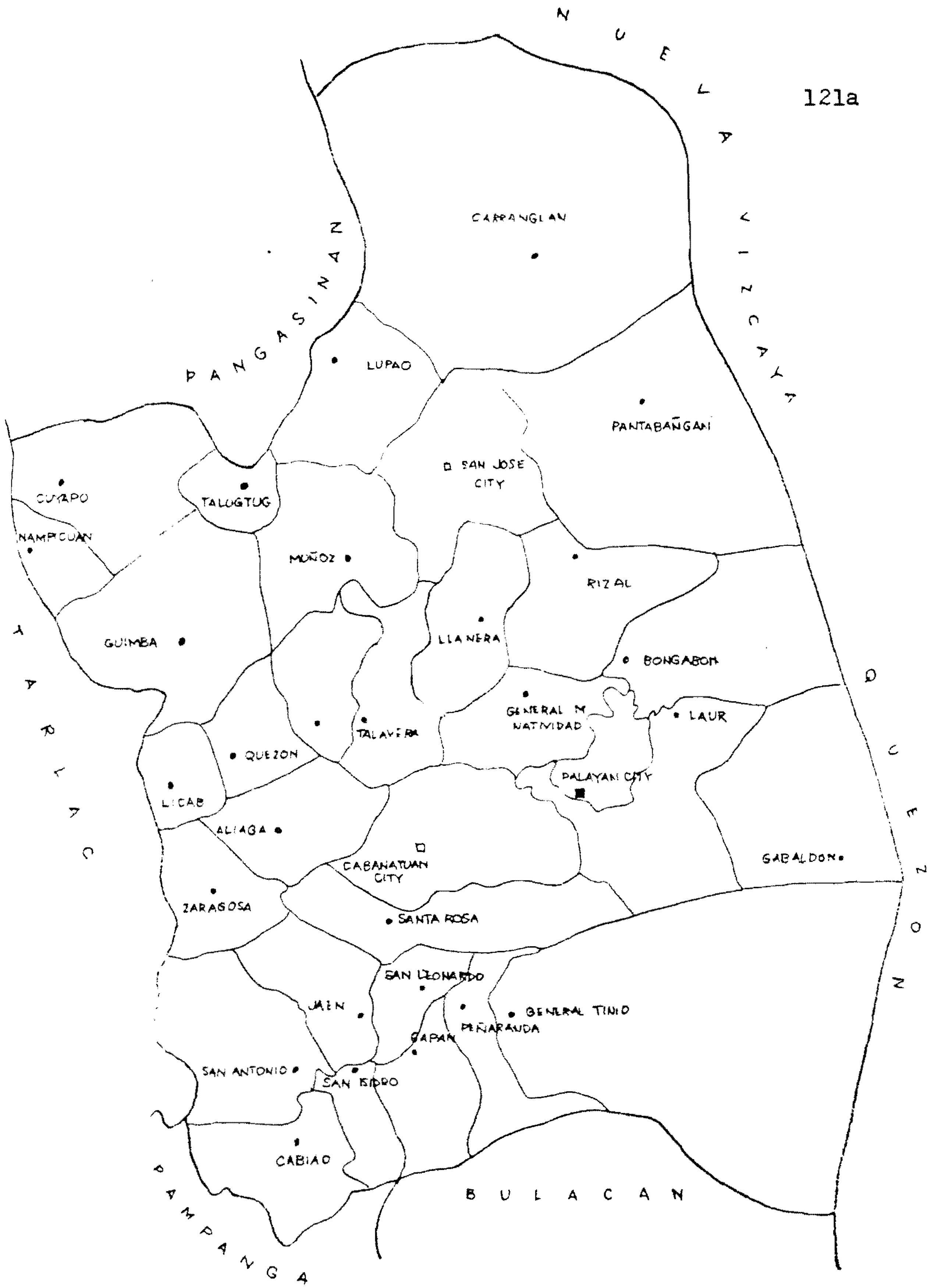

Figure 7a. The province of Nueva Ecija.

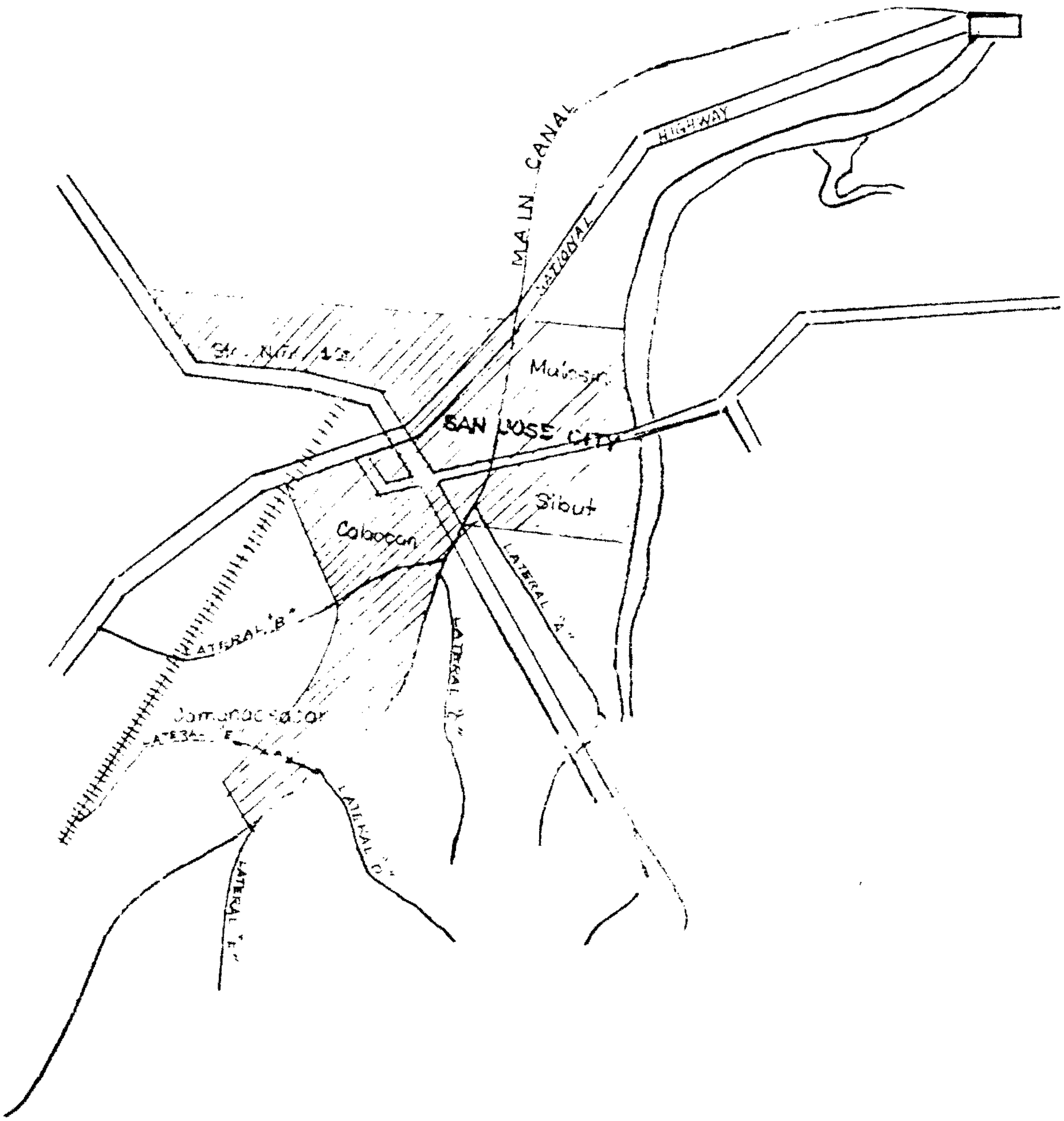

Figure 7b. The onion research site.

The major buyers of the onion are the owners of cold storage facilities in the town of Bongabon and in Palayan City, both of which are located in the western section of Nueva Ecija. Traders from other places also come before or during harvest time to buy the crop.

The Survey

Forty farmers, selected at random from the NIA Munoz office list of onion farmers in San Jose, were interviewed. The farmers come from five barrios in San Jose City, namely, Calaocan, Sto. Nino, Sibut, Camanacsacan, and Malasin. The farmers averaged 50.9 years of age and have been farming an average of 27 years. They have been growing onions for an average of 20.76 years. Sixty percent of the farmers had some or had completed elementary school; 27.5 percent had some or had completed high school; and 10 percent had some or had completed college. Two and one-half percent had no formal education.

Farm and Tenure Status

About one-half of the farmers (52.5 percent) farm only one parcel of land (Table 1e). These farmers have an average farm size of 1.377 hectares. Twenty seven

and one-half percent farm two parcels and have an average farm size of 2.095 hectares; 12.5 percent farm three parcels with an average farm size of 3.088 hectares; and 2.5 percent each farm 4, 5, and 6 parcels with the respective farm sizes being 4.4 ha., 5.0 ha., and 8.6 ha. About a fifth of the parcels (22.2 percent are owned by the farmers themselves; 62.5 percent are leased; and the farmers have Certificates of Land Transfer on 15.28 percent (Table 2e). Over 95 percent of the parcels are irrigated by NIA; the rest are rainfed.

Production and Cropping

All of the farmers plant rice in the wet season. The average area planted to rice is 1.975 hectares. Only one farmer planted another crop (string beans) in addition to rice during the 1985 wet season (Table 3e1).

In dry season 1985-86, the farmers planted onion on an average area of 0.4975 hectares (Table 3e2). Most of the farmers (85 percent) started planting in November. Harvest time was in March for 62.5 percent and in April for 37.5 percent. Over one third of the farmers (37.5 percent) also planted other diversified crops besides onions, namely; peanut (7.5 percent), string beans (2.5 percent); okra (2.5 percent), tomato (10 percent),

garlic (5 percent), eggplant (5 percent), and vegetables such as gourd and squash (20 percent). Thirty five percent of the farmers also planted rice in the dry season.

Table 4e presents a crosstabulation of the number of different crops planted by the farmers in the dry season by their average annual income from other sources and the average number of parcels farmed. The data indicate the absence of a relationship among the three variables with respect to the onion farmers.

The farmers were asked whether or not they receive sufficient irrigation water in the dry season for planting rice. Of the 16 farmers (40 percent) who said yes, 8 also planted rice in dry season 1985-86 while 8 did not (Table 5e). The farmers who did not plant rice have a higher mean perceived profitability for onion vis-a-vis rice than the farmers who did (2.34 vs. 1.91 respectively). The non-rice planters, furthermore, tended to have a smaller average farm size and fewer parcels farmed than the rice planters.

Six of the 22 farmers who indicated that they were not getting enough water for rice production nonetheless planted rice in dry season 1985-86. The 22 farmers were asked if they would plant rice if given sufficient water. Thirteen farmers said no. These farmers tended

to have a smaller farm size than the farmers who said yes. The farmers who said yes and those who said no did not differ, however, in their perceptions of the profitability of onion vis-a-vis rice.

Cultural Practices

There are four onion varieties that the farmers in San Jose plant: "Batanes" and "Tanduyong," which are native red onions that the farmers have planted traditionally for many years, and the hybrids "Red Creole" and "Yellow Granex." The native varieties, which are planted more extensively than the hybrids, fetch a higher price and can be stored for a longer period of time than the hybrids.

In preparing seedbeds, the farmers first weed the seedbed sites. After four days the soil is plowed and harrowed 3 or more times until the soil becomes fine. The soil is formed into beds about 1 meter wide but of different lengths. The seeds are sown densely on the nursery beds. Water is applied once in the morning and once in the afternoon with the use of a hand sprinkler. The seedlings are sprayed and fertilized once before transplanting; the seedlings are ready for transplanting 45 days after sowing.

Farmers in barrios Calaocan, Sto. Nino, Camanacsacan, and Malasin practice mulching. The soil is plowed and harrowed 3 to 4 times until it becomes fine. Canals are prepared by plowing along the perimeter of each paddy and one or two furrows are prepared in the middle of each paddy. The soil is leveled and then irrigated by allowing water to flow slowly through the paddy, after which rice straws are spread over the soil with a thickness of 5-10 cm. The seedlings are transplanted randomly by making holes passing through the mulch where the seedling is set. The farmers irrigate the crop an average of about 8 times throughout the whole cropping season.

Mulching is not practiced in barrio Sibut. The farmers in Sibut plow and harrow the soil until it is throughly pulverized after which it is irrigated. The soil is leveled and straight lines are made on the soil which serve as guides in transplanting. The seedlings are planted directly into the soil. Irrigation water is applied once a week.

Weed control is done by applying herbicides and by hand weeding. Pesticides are sprayed once a week. Complete fertilizer and urea are applied at planting time with a second application by sidedressing being done when bulbing begins.

Harvesting is done when most of the bulbs have matured, i.e., when the neck tissues begin to soften and the tops are almost ready to fall. The bulbs are pulled out of the soil and allowed to dry for a day, after which the tops are cut. The bulbs are cleaned by pulling off the dried skin. They are stored by piling or by hanging on bamboo poles under a shed with good air circulation.

Irrigation-rlated Issues

The farmers basically use two indicators for determining whether or not the onion plant needs water: dryness/cracking of the soil (67.5 percent) and the wilting of leaves (32.5 percent). Ten percent of the farmers said that they do not use indicators but instead simply count the days after planting and irrigate based on a predetermined schedule. [1]

Lack of water was the major irrigation-related problem of the farmers in dry season 1985-86; a total of 57.5 percent of the farmers reported this problem. The other problems mentioned were: favoritism by the ditch tender (2.5 percent), conflict with other farmers regarding water (2.5 percent), the irrigation service

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1 The numbers do not summate to 100 percent as some farmers mentioned more than one indicator.

fee being too expensive (2.5 percent), and the diversion of the water by some farmers (2.5 percent). Thirty-seven and one-half percent of the farmers indicated that they had no irrigation-related problems in dry season 1985-86. 2

The farmers were asked what rules and regulations they followed in order to ensure that everyone gets a fair share of the water. Seventy-two and one-half percent answered "rotation;" 22.5 percent indicated that the farmers just "give and take" in a cooperative spirit; 5 percent said that whoever needs water just opens the turn-out; and 2.5 percent answered that what the water master says is what is followed.

Fifty-five percent of the farmers are members of the water-users association. The water-users association is concerned mainly with the repair and maintenance of the canals, with solving the irrigation-related problems and conflicts among the farmers, and with reminding the farmers to pay the irrigation service fees. Beyond these, the association had little to do with the crop diversification.

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2 The numbers do not summate to 100 percent as some farmers mentioned more than one problem.

Adoption of Crop Diversification

One-fourth of the farmers started planting onions before 1961; close to one-half between 1961 and 1970; and the rest between 1971 and 1975 (Table 6e). Overall, the farmers have been planting the crop for an average of 20.76 years with the vast majority (87.5 percent) planting it every dry season without fail since they first began. Over the years, the farmers' onion crop has fared quite well. The ratio of the average number of years of positive net to total number of years planted is 0.87 with the "jackpot" ratio being 0.18. The "jackpot" ratio indicates that, on the average, nearly one in every five cropping seasons is a "jackpot". This is a relatively high ratio.

Table 7e presents the reasons given by the farmers for why they are planting onions. Sixty percent gave reasons relating to its profitability; 17.5 percent indicated that the income they derive from their wet season rice crop is not enough so they decided to plant onions to augment their income and to buy necessities; 7.5 percent said that they do not know of any other crop that is a ready source of cash; another 7.5 percent indicated that they followed the other farmers in the area who were planting it; and 5 percent mentioned that the lack of water for planting a second crop of rice

made them plant onions. Other reasons given were: the farmer learned that it is feasible to plant onion in his farm so he tried it, onion is suitable for the farm's topography, and the landlord wanted the farmer to plant onions.

A total of 35 farmers (87.5 percent) reported that they hit the "jackpot" one or more times with their onion crop. Table 8e presents the reasons given by these farmers for why they hit the "jackpot". The most frequently mentioned reasons were high yield (68.6 percent) and high price (62.9 percent) with many farmers attributing their high returns to a combination of the two. The other reasons given were good weather and the absence of typhoon; the cost of inputs were still low at that time, hence, a lower cash expenditure; and the farm's soil is suitable to the crop.

The farmers gave many more reasons for why they experienced a net loss when they did (Table 9e). Of the 25 farmers who experienced a net loss, 60 percent blamed low prices. Several of the farmers gave reasons related to the destruction or poor performance of the crop, namely: the typhoon destroyed the crop/there was too much rain (16 percent); low yield (12 percent); infestation of the onion crop (12 percent); excessive weeds (4 percent); lack of water (4 percent); improper

care of plant (4 percent); and insufficient fertilizer and pesticides because of lack of capital (4 percent). Other reasons given were: high cost of labor and inputs (12 percent); the onions were not bought, they rotted /the onions rotted in storage while waiting for a high price (12 percent); and the trader did not pay the farmer (4 percent).

Cropping Decision Making

Data on the cropping decision making of the farmers were obtained for onions and, for comparison purposes, for tomatoes. Table 10e presents the results. All of the farmers passed Stage 1 of the model. In Stage 2, the planting of onions is perceived as both technically and economically feasible by most of the farmers. The same is true for tomatoes. The big difference is in Stage 3. Whereas the perceived profitability of onion meets the farmer's minimum profitability requirement for it for 82.5 percent of the farmers, tomato's perceived profitability meets the farmer's minimum profitability requirement for only 47.5 percent of the farmers.

Overall, a total of 72.5 percent of the farmers gave responses consistent with the predictions of the model for onions; the figure is lower for tomatoes (60 percent). Table 11e presents some data on the farmers

who did not pass one or more conditions of the decision tree for onions but who planted the crop. From the table we see that the irrigation water received in the dry season by Farmers 11, 12, 14, 19, 24, 31, 32 and 35 is not enough for planting rice, hence, these farmers cannot plant rice in the dry season. Of the three farmers (Farmers 5, 8 and 9) who receive sufficient irrigation water, two farmers (5 and 9) did plant rice. It is to be noted from the table also that most of the ratios for years of positive net to total number of years the farmer planted the crop tend to be very high (the exceptions being those for Farmers 8, 9, and 11 who are relative newcomers in planting the crop) and that the actual profitability of the 1985-86 onion crop exceeds the farmer's minimum profitability requirement for it for all of the farmers except two (Farmers 9 and 32). These factors -- lack of sufficient irrigation water and the long history of positive returns -- may explain why the farmers persist in planting onions.

Seventeen of the 40 farmers (42.5 percent) passed all of the conditions of the decision tree for tomato. Fourteen of the 17 farmers did not plant the crop. The farmers were asked why they are not planting tomatoes. The reasons given are presented in Table 12e. Six farmers gave reasons related

to the economic feasibility of planting the crop, namely: reasons related to the low price of tomatoes, time/labor constraints, and the greater demand for onion in the area by buyers. The answer of Farmer 26 -- that he never hit the jackpot with tomatoes -- relates to cost-benefit analysis. The above mentioned reasons, which indicate that planting tomatoes is not economically viable for these farmers, are taken into account in the model of cropping decision making. It thus appears that these farmers did not respond correctly to the questions related to the economic feasibility of planting tomatoes during the interview.

Farmers 4, 22 and 37 indicated that they did not plant tomatoes because there was no more space available in their fields for planting it; Farmers 23 and 40 pointed out the lack of seeds; Farmer 3 said that it is not practical for him to plant tomatoes as all of his neighbors are planting onions; and Farmer 36 gave the reason that it has not been his practice to plant tomatoes. It is to be noted that these reasons are not taken into account by the model of cropping decion making and therefore suggest possible areas for refinement of the model.

Tables 13e and 14e present more detailed information on the farmers' perceptions of the profit-

ability of onion and tomato vis-a-vis rice, vis-a-vis each other, and vis-a-vis the farmers' minimum profitability requirement for each crop. We note from the tables that the perceived profitability of onion meets the farmer's minimum profitability requirement for it for most of the farmers and, furthermore, that onion is perceived as more profitable than tomato by 77.5 percent of the farmers.

Costs and Returns

The data one the per hectare costs and returns for onion in dry season 1985-86 and for rice in wet season 1985 point out that while onion is much more input and labor intensive than rice, its returns far exceed those of rice (Table 15e). Specifically, the pre-harvest contract labor cash costs for onions is 5.68 times greater than that for rice; the post-harvest contract labor cash costs is 2.09 times greater; unpaid family labor is 7.01 times greater; exchange labor is 12.05 times greater; and management and supervision is 3.5 times greater. With respect to inputs, the cost of seeds is 9.84 times greater than that for rice, the cost of fertilizers is 4.57 times greater, and the cost of chemicals is 3.72 times greater. Interest expense and land rent are also higher for onion than for rice

(3.47 and 2.05 times greater, respectively). One may wonder how the farmers manage to finance the relatively higher cash investment required by onion production. Many farmers get a capitalist for the cash costs and then share the net returns with the capitalist. In some cases the farmer and the landowner share in the inputs. Often, the farmers borrow money which is reflected in the relatively higher interest expense incurred for the onion crop.

The onions, however, give very good returns relative to rice. The per hectare cash returns for onions of P38,620 is 7.69 times greater than that for rice; the net return above cash costs is P 15,922 which is 4.77 times that for rice; and the net farm income is P8,729 which is 3.75 times greater than that for rice. No wonder the farmers persist in planting the crop every dry season!

Table 16e compares the farmers' expectations of their 1985-86 onion crop with its actual performance. We note from the table that the farmers had quite overestimated the yield, gross and net returns above cash costs of the crop which are 1.58 times, 2.27 times, and 4.27 times greater than its actual performance respectively. The farmers also underestimated their cash expenditures.

The actual profitability of the onion crop met the farmer's minimum profitability requirement for it for 70 percent of the farmers; it was equal to or greater than the farmer's perceptions of its profitability for also 70 percent of the farmers.

We note from Table 16e the Pearson r of -0.272 between expected yield (Kg./Ha.) and the ratio of the area planted to onion to the total farm area. The low negative correlation indicates that the smaller the area planted, the greater is the tendency to overestimate the yield.

The Marketing of Onions

The major buyers of the onions produced in San Jose are the owners of cold storage facilities in Bongabon and Palayan City, Nueva Ecija. They get the onions in large quantities from a number of trading centers in San Jose City, which in turn buy the onions from individual traders who buy from the farmers.

The farmers sold their onion harvest an average of about two times (Table 17e). The first sale, in which 47.4 percent of the total yield was sold occurred during harvest week for 60 percent of the farmers; it occurred 3 to 4 weeks after harvest for 25 percent, and 5 to 6 weeks after harvest for 15 percent. The size of the

first sale, as well as the fact that 60 percent sold during harvest week, indicates that many farmers were quite in need of cash as prices tend to be low during harvest time.

About a third of the farmers had some type of special arrangement with the buyer. The buyer lent the farmer seeds in 15 percent of the cases, the farmer was lent money in 5 percent of the cases, and the buyer lent the farmer fertilizer and chemicals in 5 percent and 2.5 percent of the cases, respectively. For 25 percent of the farmers, there was an agreement with the buyer on the purchase price before planting.

The place of the first sale was on the farm for 47.5 percent of the farmers; it was within the barrio, usually at some designated house or cental location where the kilogram scale was placed, for 42.5 percent. Ten percent of the farmers sold directly at the market place or at the trading center.

An average of only 3.5 percent of the produce was of poor quality during the first sale. In this regard, the percentage of poor quality increases with the subsequent sales as the farmers wait for a higher price (they are able to do these for the subsequent sales as the first sale has already provided them with needed

cash). Usually, most farmers have sold all of their produce by late May.

Mode of payment is cash on delivery in many cases. Credit and installment payments are also used but the arrangement is highly informal, often being done by verbal agreement only without the use of certificates.

Chapter 7

GARLIC, CORN AND PEANUT GROWING IN LAOAG, ILOCOS NORTE

Laoag, Ilocos Norte (see Figure 8) is an area where farmers regularly grow a variety of diversified crops in the dry season. Garlic is the major diversified crop but farmers in the area also grow corn, peanut, mungbean, watermelon, and a variety of vegetables such as cabbage and eggplant.

The area is serviced by the Laoag-Vintar Irrigation System which has a service area of 2,377 hectares. In the dry season, from 900 to 1,100 hectares are planted to rice while from 400 to 700 hectares are planted to diversified crops. The diversified crops are mostly planted in farms of higher elevation which are deficient in water during the dry season.

The Survey

Sixty-six farmers were selected at random on site from among the farmers in the area planting garlic, corn, peanut, or a combination of these three crops. The farmers come from five barrios in Laoag City,

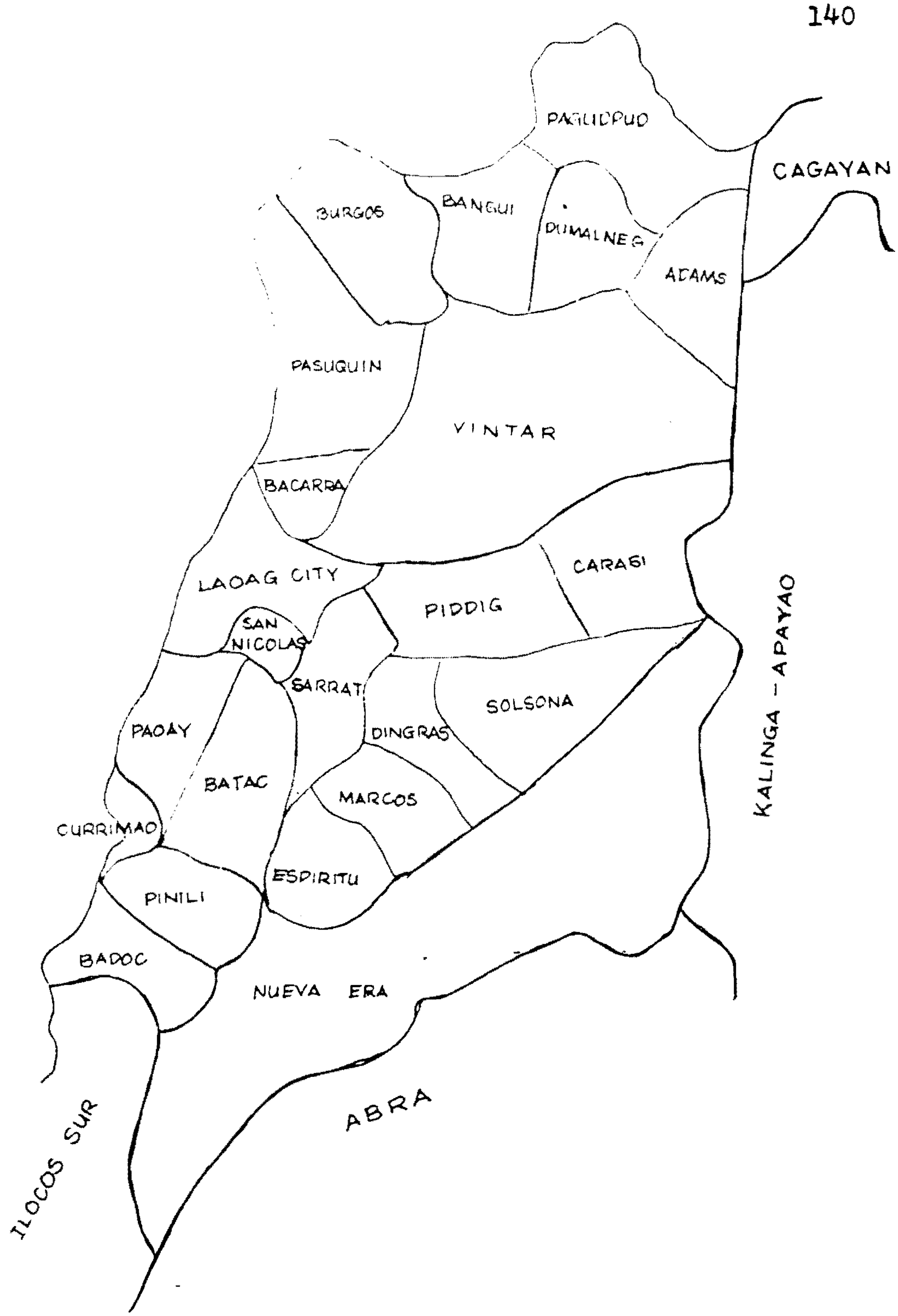

Figure 8. The province of Ilocos Norte.

namely, Dibua North, Dibua South, Casili, Pila and Navotas. The farmers averaged 47.4 years of age and have been farming an average of 21.7 years. Fifty-one percent of the farmers had some or had completed elementary school, 36.4 percent had some high school or have a high school diploma; 10.6 percent had some college education or have a college degree; and 2.5 percent went to vocational school.

Farm and Tenure Status

Table 1f presents the number of parcels farmed by the farmers and the average farm and parcel sizes. What is most striking about the figures in the table is that in general, the farms are very small and the parcel sizes are also very small. Majority of the farmers farm several parcels (57.6 percent farm from 4 to 8 parcels; only 12.1 percent have just one parcel). Almost all (98.5 percent) of the parcels are on leasehold tenancy (Table 2f). None of the farmers have Certificates of Land Transfer on any parcel. All but 3 percent of the parcels are irrigated by NIA.

Production and Cropping

In wet season 1985, all of the farmers in the sample planted rice. The average area planted to rice is 0.842 hectares. In the dry season 1985-86, 90.9 percent of the farmers planted garlic on an average area of 0.345 hectares; 69.7 percent planted peanut on an average area of 0.17 hectares; 60.6 percent planted corn on an average area of 0.16 hectares; and 15.2 percent planted mungbean on an average area of 0.31 hectares (Table 3f). The other crops planted by 1.5 percent each are watermelon, beans and stringbeans. A total of 29 farmers (43.9 percent) also planted rice in dry season 1985-86 with the average area planted being 0.33 hectares.

Close to one half of the farmers planted three different crops in dry season 1985-86; about a third planted two different crops; and one sixth planted four different crops (Table 4f). In general, the number of different crops planted increased as the average annual income from other sources decreased and as the average number of parcels farmed increased.

Table 5f shows us the major impetus for crop diversification among many of the farmers interviewed: fully three-fourths of the farmers do not receive sufficient irrigation water for planting rice in the dry

carefully so as not to inflict damage. This is done one day before planting.

The levelled field is irrigated the day before planting. After irrigation, complete fertilizer is applied basally at the rate of 4 to 5 bags per hectare. The field is then covered with rice straws as mulch after which the seeds are planted. The plants are spaced about 20 cm apart.

The plants emerge one week after planting. Irrigation is done from two to four weeks after planting and every two to three weeks thereafter. Urea fertilzier is applied when the plants are about 10 cm. high; irrigation is applied after the fertilizer application. Insecticides are used sparingly.

The garlic is ready for harvesting 100 days after planting. The harvested garlic are tied in bundles and then dried under the sun to remove moisture, after which they are stored.

Corn. After the rice harvest, the land is plowed and harrowed in several passes until the soil is thoroughly pulverized and the field levelled. Plowing and harrowing are repeated if weeds emerge before the corn is planted.

On the day of planting, furrows spaced about 75 cm. apart are made. Corn is planted at the rate of 2 to 3 seeds per hill. The hills are spaced about 50 cm. apart. The corn plants emerge 4 to 5 days after planting. Off-barring is done by a few farmers two weeks after emergence to control for weeds. Hilling-up is done four weeks after emergence. Usually irrigation is not applied until after hilling-up. Residual soil moisture takes care of the plants' consumptive use from planting to hilling-up. After hilling-up, irrigation is done every two weeks. Off-barring and hilling-up are done with the use of the ordinary carabao-or-cow-drawn plow.

The crops are ready for harvesting 100 days after emergence. The harvested corn are dehusked but the husks are not detached from the cob as these are used for bundling up the corn. The bundled corn are then dried under the sun before storage.

Part of the corn harvest is used for home consumption or as feed for pigs raised by the farmers.

Peanut. After the rice harvest, the land is plowed and harrowed (using a spike-toothed harrow) to thoroughly pulverize and level the soil. On the day of planting, shallow furrows spaced about 50 cm. apart are made. The peanut seeds are planted at the rate of 2 to

3 seeds per hill with the hills spaced about 50 cm. apart.

The plants emerge 4 to 5 days after planting. Hilling-up using a carabao-drawn plow is done four weeks after emergence. No irrigation is done until after the hilling-up as the residual moisture is enough for the plants until after the hilling up. Right after hilling-up, irrigation is applied and every two weeks thereafter.

Fertilizer is not applied on the peanut crop. During the early stages of crop growth, the plants use the residual fertility in the soil from the previous rice crop. As peanut is a leguminuous crop, it assimilates nitrogen from the air once the root nodules are formed. Pesticides are also not used. The yearly crop rotation seems to prevent the build-up of harmful insects.

The peanuts are ready for harvesting 100 days after emergence. The plants are dried under the sun before storage. The peanuts are generally marketed in dried pods.

Irrigation-related Issues

The farmers basically use two indicators for determining that their diversified crop needs irri-

gation: dryness/cracking of the soil (83.3 percent) and the wilting of leaves (62.1 percent). Eighteen percent of the farmers mentioned particular stages of crop growth as times when water is needed while 9 percent said water is needed when the plant droops.1

The major irrigation-related complaints of the farmers in dry season 1985-86 were lack of water (42.4 percent) and delayed water delivery (30.3 percent). One farmer complained of water grabbing while another complained of the absence of a water delivery schedule. In all, 30.3 percent of the farmers had no irrigation-related complaints for dry season 1985-86.2

Four-fifths of the farmers pointed out that rotation is the means by which everyone is assured of a fair share of the water. The other means mentioned were: farmers in need of water are given water (10.6 percent), unity in requesting for water so that enough will be supplied (7.6 percent), proper use of water (1.5 percent), and the equal distribution of water (1.5 percent).

Majority of the farmers (72.7 percent) are members of the water-users association. The functions of the

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1 The numbers do not summate to 100 percent as some farmers mentioned more than one indicator.

2 The numbers do not summate to 100 percent as some farmers had more than one complaint.

water users association center on the proper allocation of water, the repair and maintenance of the canals, and the promotion of unity and cooperation among the farmers especially in regard to water usage and irrigation-related matters. The association also acts to try to solve the farmers' irrigation-related problems, it disciplines erring members in particular those who use the water illegally, and serves as the farmers' liaison with NIA. Beyond these, the association had little to do with the crop diversification.

Adoption of Crop Diversification

The 60 farmers who planted garlic have had a long history of planting the crop: almost one-half of the farmers (48 percent) have been planting it for 24 years with the overall average being 15.55 years (Table 6f1). The overwhelming majority of the farmers have been planting garlic every dry season without fail since they first began. We also see from Table 16f1 the reason why. Over the years of planting the crop, the farmers realized positive net returns 90 percent of the time. The "jackpot" ratio though is not very high-only 14 percent.

The patterns for corn and peanut are very similar to that for garlic (Tables 16f2 and 16f3). The farmers

have been planting corn for an average of 14.8 years with 55 percent of the farmers planting it for an average of 22.6 years. Similarly, the farmers have been planting peanut for an average of 16.06 years with one half of the farmers planting it for an average of 23.8 years. The overwhelming majority of the farmers have been planting corn every dry season since they first began; the same is true for peanut. Just like for garlic, over the years of planting the crop, the farmers realized positive net returns from their corn crop 96 percent of the time; for peanut it is 97 percent of the time. The jackpot ratios for corn and peanut are also rather low (13 percent and 10 percent, respectively).

Seventeen out of the 66 farmers (25.8 percent) interviewed planted all three crops -- garlic, corn and peanut -- in dry season 1985-86. Another 17 (25.8 percent) planted garlic and corn. Twenty six farmers (39.4 percent) planted garlic and peanut; 3 (4.5 percent) planted peanut and corn; and another 3 (4.5 percent) planted corn only.

Table 7f presents the reasons given by the farmers for why they are planting the diversified crops that they are planting. The responses across all three crops in Table 17f indicate four major reasons : as a cash crop or source of income, because the crop is perceived

as profitable, because of the crop's high price, and because the crop is suitable to the farm's soil and the water available. The first three abovementioned reasons are economic, the fourth is technical. It is to be noted also that some corn farmers are planting the crop because they use it for animal feed.

Table 8f presents the reasons given by the farmers for why they hit the "jackpot" when they did. Across crops the farmers attributed the high returns to two major causes: high price and high yields/high quality produce resulting from proper care of the plant and sufficient water.

On the other hand, Table 9f presents the reasons given by the farmers for the net loss(es) that they experienced. Across crops, four major reasons emerge: low price, destruction of the crop by pests and diseases, poor quality produce/low yield, and either lack of water or too much water.

Cropping Decision Making

The model of cropping decision making was tested on garlic, corn and peanut. The results are presented in Tables 10f1, 10f2 and 10f3 respectively. We note that in all three tables, almost all of the farmers except one or two passed Stage 1 of the model -- i.e., the

farmers' rice consumption requirements were met or assured. Similarly, all three crops passed Stage 2 of the model -- i.e., they were perceived as both technically and economically feasible -- by the vast majority of the farmers. The results are not as good for Stage 3, however. While garlic met the farmer's minimum profitability requirement for 80 percent of the farmers, corn and peanut did not do as well. Corn met the farmers' minimum profitability requirement for only 52.5 percent of the farmers; for peanut the figure is 50 percent. Overall, combining the farmers' responses across the three stages of the model we find that 63.3 percent of the farmers gave responses consistent with the predictions of the model for garlic; for corn it is 45 percent and for peanut it is 39.1 percent. How do we account for these low results, especially for corn and peanut?

First of all we must recognize that for nearly all of the farmers (i.e., 60 out of 66 farmers), of the three crops, garlic is the major diversified crop for the dry season. Corn and peanut are only secondary diversified crops. Therefore, one would expect that garlic would pass all three stages of the model for more farmers than would corn and peanut. We note that garlic farming is more input intensive than either corn

or peanut farming, i.e., garlic farming demands more water, fertilizer and labor than corn and peanut farming. It appears, therefore, that the farmers also planted corn or peanut because of the technical and financial constraints to planting the entire farm with garlic. Moreover, planting corn and peanut spreads out the farmers' risk-taking as well as serves to absorb his and/or his family's slack labor time while allowing for the generation of cash income. In light of these, the result that a farmer would pass all three stages of the model for garlic but would fail in his subsidiary crop(s) becomes entirely reasonable.

Table 11f presents a tabulation of the farmers whose responses are inconsistent with the predictions of the model for all the crops which the farmer planted. These are the truly inconsistent farmers. We note from the table that one-third of the farmers fall in this category and that the two major sources of inconsistencies have to do with the water and minimum profitability requirements. Ten farmers (or 45 percent of the 22 inconsistent farmers) planted the diversified crop even if they were not sure that there would be enough water for the diversified crop. Nineteen farmers (or 86 percent of the 22 farmers) rated the profitability of the diversified crop as less than their minimum

profitability requirement. Nine of the 19 farmers (or 47.4 percent) gave this type of response for garlic. In this regard, it must be pointed out that the price of garlic was exceptionally low in dry season 1985-86 (P12-P13/kilo). This may have likely influenced the farmers' perceptions and responses to the perceived profitability question for garlic in the interview.

Table 12f presents additional information which helps explain the cropping decision making and cropping behavior of these 22 farmers whose responses are inconsistent with the predictions of the model for all the crops they planted. We see in the table that the irrigation water received in the dry season by most of these farmers is not sufficient for planting rice. Hence, even if none of the crops that these farmers are planting in the dry season are truly satisfactory for them, they really do not have much choice but to plant the crops as they cannot plant rice. Furthermore, we note from the table that the crops did not do badly: over the years of planting the crops, the farmers have consistently realized positive net returns from them (note the high ratios of "No. of Years of + Net/No. of Years Farmer Planted" in Table 12f).

Table 10f1, 10f2 and 10f3 also presents cropping decision making data for peanut and corn as alternative

crops for farmers who did not plant these crops. In Table 10f1 we see that 22 of the 60 farmers who planted garlic did not plant corn. The model was tested for corn on these 22 farmers. The results in Table 10f1 indicate that corn failed to meet one or more conditions of the decision tree for 19 of the 22 farmers(or 86.4 percent).

In Table 10f2 we see that 16 of the 40 farmers who planted corn did not plant peanut. The model was tested for peanut on these 16 farmers. The results indicate that peanut failed to meet one or more conditions of the decision tree for 13 of these 16 farmers (81.2 percent).

Twenty three of the 46 farmers who planted peanut did not plant corn (Table 10f3). Just as in Tables 10f1 and 10f2, the model was tested for corn on these 23 farmers in Table 10f3. Corn failed to meet one or more condtions of the decision tree for 20 of the 23 farmers (87 percent).

The above results on corn and peanut as alternative crops indicate high degrees of consistency with the predictions of the model of cropping decision making -- i.e., farmers who are not planting the crops have responses which indicate that the crops do not satisfy one or more of the conditions which the model stipulates as necessary for planting the crop.

Tables 13f1-3 and 14f1-3 present more detailed information on how well garlic, peanut and corn meet the minimum profitability requirements of the farmers who planted them and those who did not plant them. We note from Tables 13f2-3 and Tables 14f1-3 that while peanut and corn did not do very well vis-a-vis the minimum profitability requirements of the farmers who planted them, the crops did far worse vis-a-vis the minimum profitability requirements of the farmers who did not plant them.

Costs and Returns

Table 15f1 presents the per hectare costs and returns for the 1985-86 dry season garlic crop and the 1985 wet season rice crop. As of the interview date (in April and May 1986), only 21 of the 60 garlic farmers (35%) had sold their produce. The large percentage of farmers who did not sell their produce yet was because (as mentioned earlier) the price of garlic was exceptionally low at that time. The costs and returns data for the farmers who had sold their produce and those who had not yet sold them are disaggregated in Table 15f1 because the returns of those who had not yet sold are estimated returns based on the prevailing garlic price of P13/kg. at the time of interview. It must be noted

that these estimated returns underestimate the actual returns of the farmers given that they were waiting for a higher price for their produce.

Garlic production is more cash intensive than rice production: the seeds, fertilizer, and chemical cash costs for garlic are higher than those for rice and although the harvest and post harvest labor cash cost for garlic is less than for rice, its pre-harvest labor cash cost is very much higher than that for rice. The non-cash costs of garlic production, in particular the unpaid family labor cost, is also very much higher than that for rice.

The returns data in Table 15f1 indicate that the farmers plant rice mainly for home consumption. Overall, despite the fact that the garlic was sold (and priced for those who had not sold yet) at a much lower price than what the farmers normally get for their produce, garlic yielded higher net returns above cash costs than rice. The net farm income for garlic is negative, however, because of the very high unpaid family labor cost which is deducted from the net returns above cash costs in the computation of the net farm income.

It is interesting to note in Table 15f1 that the farmers who had already sold their produce tended to

have higher per hectare cash costs than those who had not yet sold them. The higher cash outlay is probably an important factor for the earlier sales of the garlic in spite of the very low prevailing price.

It is to be noted from the table also that on a per hectare basis, while the farmers used much fertilizer on their garlic crop, the chemical usage was quite low. In general, the farmers tend to use pesticides sparingly on both their garlic and rice crops (note the very low per hectare chemical costs for both garlic and rice).

Table 15f2 presents the per hectare costs and returns for the dry season 1985-86 corn crop and the 1985 wet season rice crop for the 40 farmers who planted corn. The costs and returns for corn are also disaggregated as some farmers had not yet sold their produce as of interview time. The returns of these farmers were estimated by using the prevailing corn price at interview time of P4/kg, shelled.

It must be pointed out that the estimated returns greatly underestimate the farmers' returns given that the farmers who had sold their produce as of interview time received an average of P8.63/kg, shelled for their produce (more than twice the P4/kg price used here for estimating the returns for those who had not yet sold their produce).

Corn production had higher per hectare cash costs than rice production in so far as seeds, fertilizer (for the farmers who had already sold their produce), and chemicals are concerned. Its labor cash costs, however, are very minimal compared to rice. This is because corn production is not only less labor intensive than rice production but also, almost all of the labor for the corn crop is supplied by unpaid family labor.

Although many of the farmers use some of their corn produce for animal feed, corn is nonetheless a cash crop for the farmers. It is to be noted from Table 15f2 that corn has higher per hectare net returns above cash costs than rice among the farmers who had sold their produce and that its lower net returns above cash costs vis-a-vis rice for those who had not yet sold their produce is probably erroneous given that the price used in the estimation is very low.

The per hectare costs and returns for the 1985-86 dry season peanut crop and for 1985 wet season rice crop for the 46 farmers who planted peanut are presented in Table 15f3.

Just like corn production, peanut production entailed very minimal labor cash costs. The labor input was supplied almost wholly by unpaid family labor in all aspects of production except only for the harvesting.

Peanut also entailed absolutely no fertilizer cash cost and little if any chemical cash cost. The only major cash expense in peanut production is for seeds which the farmers purchase: on a per hectare basis, this seed cash outlay is very much higher than that for rice.

While the per hectare gross returns for peanut are lower than for rice, the net returns above cash costs are higher than for rice because of peanut's much lower cash costs.

Tables 16f1-3 compare the farmers' expectations of their diversified crop with its actual performance. The garlic farmers tended to underestimate their yield, overestimate the price, overestimate their gross returns, underestimate their cash expenditures, and consequently overestimate their net returns above cash costs (Table 16f1). The corn farmers also tended to underestimate their yield and their cash expenditures (Table 16f2). The peanut farmers tended to have realistic price expectations but tended to underestimate their cash expenditures and consequently tended to overestimate their net returns above cash costs (Table 16f3).

Unfortunately, it is not possible to fully determine how well the actual profitabilities of the garlic, corn and peanut crops fared compared with the

farmers' minimum profitability requirement for each crop and their perceptions of each crops' profitability beacuse many farmers had not yet sold their produce as of interview time.

The Marketing of Garlic, Corn and Peanut

The farmers sell their garlic produce primarily to traders and stall owners at the Laoag City public market cash on deliverty (Table 17f). Most of the farmers transport their produce to the public market via tricycle although in some cases the traders get the produce from the farmers' house themselves.

As of the interview time in April and May 1986, only 35 percent of the garlic farmers had sold their produce. Those who did not sell did so because of the very low garlic price of P12-P13 per kg. The farmers blamed the low market price to illegal and clandestine importation or

smuggling of garlic in large quantities from Taiwan which they said depressed the market price. Nonetheless, many farmers expressed optimism that the price would soon go up and that they would be able to unload their produce at a satisfactory price.

The corn and peanut are also sold by the farmers to traders and stall owners at the Laoag City public

market, cash on delivery. As with garlic, the produce is transported to the public market via tricycle although in some cases, especially for corn, the sales is conducted on the farm. The peanut and corn produce are sold for human consumption.

Finally, it is to be noted from Table 17f that very few farmers had any type of special arrangement with the buyer whether in regard to seeds, credit for inputs and for cash, or in regard to the sales price of the produce. Most of the transactions with the buyers take place after harvest when the farmers take their produce to the public market.