



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

CGPRT Centre WORKING PAPER No. 72

Coping Strategies against El Nino: The Case of Selected Communities in Talugtug, Nueva Ecija, Philippines

**Florentino C. Monsalud
Jaime G. Montesur
Edwin R. Abucay**



United Nations

The CGPRT Centre

The Regional Co-ordination Centre for Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT Centre) was established in 1981 as a subsidiary body of UN/ESCAP.

Objectives

In co-operation with ESCAP member countries, the Centre will initiate and promote research, training and dissemination of information on socio-economic and related aspects of CGPRT crops in Asia and the Pacific. In its activities, the Centre aims to serve the needs of institutions concerned with planning, research, extension and development in relation to CGPRT crop production, marketing and use.

Programmes

In pursuit of its objectives, the Centre has two interlinked programmes to be carried out in the spirit of technical cooperation among developing countries:

1. Research and development which entails the preparation and implementation of projects and studies covering production, utilization and trade of CGPRT crops in the countries of Asia and the South Pacific.
2. Human resource development and collection, processing and dissemination of relevant information for use by researchers, policy makers and extension workers.

CGPRT Centre Working Papers currently available:

Working Paper No. 58 *Food Security Strategies for Vanuatu*
by Shadrack R. Welegtabit

Working Paper No. 59 *Integrated Report: Food Security Strategies for Selected South Pacific Island Countries*
by Pantjar Simatupang and Euan Fleming

Working Paper No. 60 *CGPRT Crops in the Philippines: A Statistical Profile 1990-1999*
by Mohammad A.T. Chowdhury and Muhamad Arif

Working Paper No. 61 *Stabilization of Upland Agriculture under El Nino Induced Climatic Risk: Impact Assessment and Mitigation Measures in Malaysia*
by Ariffin bin Tawang, Tengku Ariff bin Tengku Ahmad and Mohd. Yusof bin Abdullah

Working Paper No. 62 *Stabilization of Upland Agriculture under El Nino-induced Climatic Risk: Impact Assessment and Mitigation Measures in Indonesia*
by Bambang Irawan

Working Paper No. 63 *Stabilization of Upland Agriculture under El Nino-induced Climatic Risk: Impact Assessment and Mitigation Measures in Thailand*
by Bhimbhata Suwanabatr and Thamrong Mekhora

Working Paper No. 64 *Prospects of Feed Crops in India: the Role of CGPRT Crops*
by P.S. Pathak

(Continued on inside back cover)

**Coping Strategies against El Nino: The Case of
Selected Communities in Talugtug,
Nueva Ecija, Philippines**

**“CGPRT Centre Works Towards Reducing Poverty Through Enhancing
Sustainable Agriculture in Asia and the Pacific Region”**

The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area of its authorities, or concerning the delimitation of its frontiers or boundaries.

The opinions expressed in signed articles are those of the authors and do not necessarily represent the opinion of the United Nations.

WORKING PAPER 72

**Coping Strategies against El Nino: The Case of
Selected Communities in Talugtug,
Nueva Ecija, Philippines**

**Florentino C. Monsalud
Jaime G. Montesur
Edwin R. Abucay**

CGPRT Centre
Regional Co-ordination Centre for
Research and Development of Coarse Grains,
Pulses, Roots and Tuber Crops in the
Humid Tropics of Asia and the Pacific

Table of Contents

	Page
List of Tables	vii
List of Figures	ix
List of Acronyms	xi
Foreword	xiii
Acknowledgements	xv
Executive Summary	xvii
 1. Introduction	
1.1 Objectives	1
 2. Methodology	
2.1 Selection of the study site	2
2.2 Data collection	2
 3. Results and Discussion	
3.1 The study site	3
3.1.1 Location	3
3.1.2 Biophysical characteristics	3
3.1.2.1 Topography	3
3.1.2.2 Soil	3
3.1.2.3 Climate	3
3.1.2.4 Land use	7
3.1.2.5 Farming systems	9
3.1.3 Socio-economic characteristics	12
3.1.3.1 Population distribution and density	12
3.1.3.2 Number of households	13
3.1.3.3 Age distribution	13
3.1.3.4 Educational attainment	14
3.1.3.5 Years in farming	14
3.1.3.6 Land holdings	14
3.1.3.7 Road network and irrigation facilities	14
3.1.3.8 Labor sources	15
3.1.3.9 Markets for the farm produce	16
3.1.3.10 Institutions	16
3.1.3.11 Credit system	16
3.1.3.12 Membership to the SWIPs	16
3.2 Impact of El Nino	17
3.2.1 Rainfall distribution	17
3.2.2 Rice yield	17
3.2.3 Income from rice	18
3.2.4 Total annual income of farmers	18
3.3 Coping strategies	19
3.3.1 SWIP as mitigating measure against El Nino	19
3.3.1.1 Consequences of the SWIP implementation	22
3.3.1.2 Needs of farmers	22

3.3.1.3	Reasons for planting rice during the dry season	22
3.3.2	Farmers' coping strategies	23
3.3.3	Appropriateness of SWIPs	24
3.3.4	Prospects and future of SWIPs	25
4.	Conclusions and Recommendations	
4.1	Conclusions	27
4.2	Recommendations	27
5.	References	29
	Appendix	31

List of Tables

	Page
Chapter 2	
Table 2.1 Number of respondents per village, Talugtug, Nueva Ecija, Philippines	3
Chapter 3	
Table 3.1 Land use in Talugtug, Nueva Ecija, Philippines	8
Table 3.2 Crops and area planted in Talugtug, Nueva Ecija, Philippines	8
Table 3.3 Agricultural profile of the selected villages in Talugtug, Nueva Ecija, Philippines	9
Table 3.4 Cropping patterns of the respondents at the project sites	10
Table 3.5 Livestock status in Brgy. Maasin, Talugtug, Nueva Ecija, Philippines (2000) ...	12
Table 3.6 Fishery areas in the project sites, Talugtug, Nueva Ecija, Philippines (1998) ...	12
Table 3.7 Population distribution and density, Talugtug, Nueva Ecija, Philippines (1995)	13
Table 3.8 Projected population in Talugtug, Nueva Ecija, Philippines	13
Table 3.9 Number of households, Talugtug, Nueva Ecija, Philippines (1995)	13
Table 3.10 Household size distribution of the respondents in the project areas	13
Table 3.11 Per cent distribution of the respondents' age in the project areas	13
Table 3.12 Per cent distribution of the respondents' educational attainment in the project areas	14
Table 3.13 Per cent distribution of the respondents' years in farming in the project areas	14
Table 3.14 Per cent distribution of the respondents' land holdings in the project areas	14
Table 3.15 Road network in Talugtug, Nueva Ecija, Philippines (1998)	15
Table 3.16 SWIP irrigation systems in the project areas, Talugtug, Nueva Ecija, Philippines (1998)	15
Table 3.17 Number of farm labourers per household at the project sites	16
Table 3.18 Small Water Impounding Projects in Talugtug, Nueva Ecija, Philippines	16
Table 3.19 Membership of the respondents to SWIP	17
Table 3.20 Effect of El Nino on rice yield, the case of Buted, Talugtug, Nueva Ecija, Philippines	18
Table 3.21 Effect of El Nino on net income per hectare of rice farm, the case of Buted, Talugtug, Nueva Ecija, Philippines	18
Table 3.22 Income distribution from fish (Tilapia), US\$	19
Table 3.23 SWIP beneficiaries with and without mitigating measures	20
Table 3.24 Non-SWIP beneficiaries with and without mitigating measures	20
Table 3.25 SWIP beneficiaries with and without benefit(s) derived	20
Table 3.26 Benefits derived from SWIPs	21
Table 3.27 Per cent distribution of non-farm income sources of the SWIP beneficiary respondents in the project areas	23
Table 3.28 Per cent distribution of non-farm income sources of the non-SWIP beneficiary respondents in the project areas	24
Table 3.29 Acceptance of Balanced Fertilization Strategy (BFS)	24
Table 3.30 Rice damage (reproductive stage) due to long drought in Talugtug, Nueva Ecija, Philippines, as of April 3, 2002	25

Chapter 4

Table 4.1	Methodologies, locations and El Nino impacts in the Philippines	28
Table 4.2	Mitigation measures against El Nino in the Philippines	28

Appendix

Table A.1	Land features and soil characteristics of SWIPs in Talugtug, Nueva Ecija	33
Table A.2	Monthly rainfall distribution, Talugtug, Nueva Ecija, Philippines (1971-2000)	34
Table A.3	Distribution of the respondents' age in the project areas	34
Table A.4	Major cropping patterns of Villa Boado, Talugtug, Nueva Ecija, Philippines	34
Table A.5	Major farming systems identified in Villa Boado, Talugtug, Nueva Ecija, Philippines	35
Table A.6	Distribution of the respondents' educational attainment in the project areas	35
Table A.7	Distribution of the respondents' land holding in the project areas	35
Table A.8	Distribution of non-farm income sources of the SWIP beneficiary respondents at the project areas	36
Table A.9	Distribution of non-farm income sources of the non-SWIP beneficiary respondents at the project areas	36
Table A.10	Rainfall deficit (mm) during the 1997-98 El Nino episode, Talugtug, Nueva Ecija	37
Table A.11	Average annual income (US\$) of SWIP beneficiaries during normal and El Nino year	37
Table A.12	Average annual income (US\$) of non-SWIP beneficiaries during normal and El Nino year	38

List of Figures

	Page
Chapter 3	
Figure 3.1 Location map of the Municipality of Talugtug, Nueva Ecija, Philippines	6
Figure 3.2 Location map of the project sites in Talugtug, Nueva Ecija, Philippines	7
Figure 3.3 Average monthly rainfall distribution, Nueva Ecija, Philippines (1971-2000)	8
Figure 3.4 Share of agricultural area devoted to irrigated and rainfed rice, Talugtug, Nueva Ecija, Philippines	10
Figure 3.5 Cropping pattern in the study area	11
Figure 3.6 Monthly rainfall distribution during the 1997-98 El Nino compared to normal values (1971-2000), Nueva Ecija, Philippines	17
Figure 3.7 Comparison of the annual total income of SWIP and non-SWIP beneficiaries during normal and El Nino years, Talugtug, Nueva Ecija, Philippines	19

List of Acronyms

AFMA	Agriculture and Fisheries Modernization Act
BFAR	Bureau of Fisheries and Aquatic Resources
BFS	Balanced Fertilization Strategy
BSWM	Bureau of Soils and Water Management
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DENR	Department of Environment and Natural Resources
DSWD	Department of Social Welfare and Development
IA	Irrigators Association
LGU	Local Government Unit
LLP	Low Lift Pump
MD	Man-day
MMD	Man-machine-day
PhilRice	Philippine Rice Research Institute
PRA	Participatory Rural Appraisal
SFR	Small Farm Reservoir
SSIPs	Small-Scale Irrigation Project
STW	Shallow Tube Wells
SWIP	Small Water Impounding Project
UPLB	University of the Philippines Los Baños

Foreword

The CGPRT Centre has successfully completed a three-year research project, “Stabilization of Upland Agriculture and Rural Development in El Nino Vulnerable Countries (ELNINO)” (April 2000 – March 2003) in collaboration with five participating countries, Indonesia, Malaysia, Papua New Guinea, the Philippines and Thailand.

The impacts of El Nino-induced abnormal weather vary from country to country and location to location depending on its natural and socio-economic conditions. Thus, it is vitally important to examine carefully the outbreak and consequences of El Nino in each country at a local level for establishing effective and practical mitigation measures against climatic risks. This volume, as research results of the second phase of the Philippines country study of the ELNINO project, provides relevant policy recommendations based on rich and useful information derived from in-depth study conducted in Talugtug, Nueva Ecija, Philippines.

I thank Drs. Florentino C. Monsalud, Jaime G. Montesur and Edwin R. Abucay for their sincere efforts. Their fruitful work is truly appreciated. This three-year, wide ranging research project could only be accomplished with the continuous support from the University of the Philippines Los Banos. Dr. Rogelio N. Concepcion, Bureau of Soils and Water Management, the Philippines Department of Agriculture, and Mr. Shigeki Yokoyama provided useful guidance at every stage of the study as the Regional Advisor and the Project Leader respectively. I extend thanks to Mr. Matthew Burrows for his English editing. Finally, I would like to express my sincere appreciation to the Japanese Government for its financial support of the project.

July 2003

Nobuyoshi Maeno
Director
CGPRT Centre

Acknowledgements

This country report is part of the results of the research project, “Stabilization of Upland Agriculture and Rural Development in El Nino Vulnerable Countries (ELNINO)”, funded by the UN ESCAP CGPRT Centre.

We are grateful to Dr. Haruo Inagaki, former Director of the CGPRT Centre, for his initiative to organize this project. We highly appreciate the support extended by Dr. Nobuyoshi Maeno, current Director of the CGPRT Centre.

We would like to thank Mr. Shigeki Yokoyama, Project Leader, and Dr. Rogelio N. Concepcion, Regional Advisor, for their guidance, advice and support during the implementation of the project.

We highly appreciate the assistance provided by the Municipal Mayor of Talugtug, Mayor Facifco Monta; the Office of the Municipal Agriculturist of Talugtug, Engr. Dennis de Gracia and his staff for their support in the conduct of the field study; the Municipal Planning and Development Office, Engr. Elmer Caspillo and staff for their assistance in data gathering. We are also thankful to the Irrigators’ Association and the people of Alula, Buted, Maasin, Sampaloc and Villa Boado, the study sites, for their cooperation.

July 2003

Florentino C. Monsalud
Jaime G. Montesur
Edwin R. Abucay

Executive Summary

The occurrence of El Nino causes tremendous havoc to the economy. Recognizing this problem, the Philippine government has been introducing measures to mitigate the impact of the El Nino phenomenon. One of the measures to lessen the vulnerability of the farmers on El Nino-related risk are the Small Water Impounding Projects (SWIPs). Furthermore, farmers have their own initiatives and coping mechanisms to mitigate the effects of El Nino. This research was undertaken to document the coping mechanisms, which would be useful in policy formulation.

This study aims to: a) determine the impacts of El Nino-related abnormal weather changes on agricultural production and farmers' income; b) document the existing farming systems, resources, infrastructure, institutions, and other socio-economic characteristics of selected El Nino vulnerable areas; c) determine the strategies employed by the farmers and communities to cope with El Nino-induced agricultural risk; d) draw up specific recommendations for the stabilization of rainfed agricultural production.

The study focused on agricultural communities that have been implementing SWIPs. The four villages in the municipality of Talugtog, Nueva Ecija, selected for the study were Buted, Maasin, Alula-Sampaloc and Villa Boado. The selected sites are predominantly under rainfed agricultural production systems. The topography is generally rolling to hilly with small areas of flat to gently sloping. The climate in the area is characterized by two distinct seasons wet and dry. The wet months are from May to October while the dry period starts from November and ends in April. Mean annual rainfall is 1,931 mm with July the wettest and January the driest month. Mean annual temperature is about 27.1°C.

About 71.24 per cent of the respondents use a rice-rice cropping system. Only 28.76 per cent use a rice-fallow cropping pattern. Most of the farmers are in rainfed rice production. The other cropping patterns practiced on a limited scale include: rice-vegetables, cassava-fallow, sweet-potato-fallow, vegetables-fallow, fruit trees and banana. Animals being raised in the study area are cattle, water buffalo, goat, swine, chicken and duck. Water buffalo, cattle and goat are important components of the farming system in the area.

The size of households in the villages in terms of number of people, ranged from 3 to 6. The age of the majority of the farmers in the study area were from 30 to 50 years old. As to their educational attainment, most of the respondents had reached secondary level. The majority of the respondents were in farming for more than 30 years. Land holding sizes were from 1.1 ha to 5.0 ha. The available labor force per household of the respondents is generally low with at most 2 per household.

Analysis of the rainfall data shows a large rainfall deficit during the months of June and July in 1997. Moreover, the dry months in 1998 were extended. Rainfall deficits were as high as 193 mm. Effects of the 1997-1998 El Nino were experienced at the study sites. At the farm level, a significant reduction in rice yield and income were documented. However, rice yields with SWIPs as the source of water were not affected by the abnormal climatic conditions. Moreover, second cropping was still possible. However, rainfed areas suffered a decline in rice yield and consequently income from rice. It is evident that the occurrence of abnormal climatic conditions has an effect on the income of farmers. Generally, SWIP beneficiaries have higher annual total income compared to non-SWIP beneficiaries.

An economic benefit of SWIPs at the farm household level is the possibility of second cropping. Integration of livestock and growing of vegetables is also possible. Other benefits that can be derived from SWIPs are classified into infrastructure, institutional, ecological, cultural and recreational.

Farmers in the study areas have their own strategies in coping with the impact of El Nino. These include cogon gathering, charcoal making, harvesting of rice on other farms outside the community and other activities.

The study showed indications that rainfed agricultural communities are vulnerable to El Nino-induced risk. The occurrence of El Nino-induced abnormal weather causes a reduction in farm productivity and income. The study also indicates that the negative impacts of El Nino can be minimized if not totally avoided with the implementation of Small Water Impounding Projects (SWIPs). The individual farmers and communities under study have benefited from SWIPs. The study, however, also revealed that a SWIP does not guarantee adequate irrigation water for rice during long droughts brought about by El Nino. Also, farmers have not yet fully utilized water from SWIPs to increase their farm productivity. At the community and farm-household level, an appropriate and comprehensive support system to increase their level of preparedness in coping against El Nino appears inadequate. The existing coping strategies employed like charcoal making, cogon gathering and migration do not contribute to the enhancement of stable rainfed agriculture at the community level. The provisions of AFMA clearly indicate the government's support for water resources and irrigation development and management. However, the study showed indications that Filipino farmer and the concerned institutions mandated to assist them still lack the capacity to mitigate the adverse impacts of El Nino. Adequate resources and proper institutional arrangements are needed by the agricultural communities to respond appropriately against the El Nino-induced abnormal weather.

1. Introduction

The Philippines experiences drought at least every five years. It causes tremendous havoc to the economy. During the 1997-1998 El Nino, losses to rice and corn alone amounted to more than US\$ 240 million (Librero *et al.*, 1999). Under these circumstances the government reacted with a number of programs expected to address this problem. Among these include Small Water Impounding Projects (SWIP).

Along with the newly introduced mitigation measures against the effects of El Nino are the strategies employed by farmers to cope with the impact of El Nino. Understanding the factors contributory to the effectiveness of these measures will be a useful guide to planners and policy makers.

Vulnerability of farmers to El Nino is dependent on the biophysical characteristics of their farm and on the socio-economic conditions of the community. The institutional support available to them is also critical to the level of preparedness in confronting the impacts of El Nino.

1.1 Objectives

The specific objectives of this study are as follows:

- 1) To determine the impacts of El Nino-related abnormal weather changes on agricultural production and farmers' income.
- 2) To document the existing farming systems, resources, infrastructure, institutions, and other socio-economic characteristics of selected El Nino vulnerable areas.
- 3) To determine the strategies employed by farmers and communities to cope with El Nino-induced agricultural risks.
- 4) To draw up specific recommendations for the stabilization of rainfed agricultural production.

2. Methodology

2.1 Selection of the study site

The criteria in the selection of the study site were a) predominantly rainfed agricultural area; b) presence of a Small Water Impounding Projects (SWIP); c) the active involvement of the LGU.

2.2 Data collection

The study sites were characterized with special focus on the farming systems, agricultural resources, infrastructure, institutions, and basic socio-economic and biophysical characteristics. This information was gathered through Participatory Rural Appraisal (PRA) that was conducted by a multi-disciplinary team. At the farm level, data was collected through interviews of selected respondents representing SWIP beneficiaries and non-beneficiaries (Table 2.1).

Table 2.1 Number of respondents per village, Talugtug, Nueva Ecija, Philippines

Village	Number of respondents		Total
	SWIP beneficiary	Non-SWIP beneficiary	
Alula-Sampaloc	8	9	17
Buted	14	6	20
Maasin	14	8	22
Villa Boado	17	8	25
Total	53	31	84

3. Results and Discussion

3.1 The study site

3.1.1 Location

The study site is located in the Municipality of Talugtug, Nueva Ecija, Philippines (Figures 3.1 and 3.2). It is situated in central Luzon about 180 kilometers north of Manila. It is bound on the south by the municipality of Guimba, the municipality of Munoz to the southeast, to the west by Cuyapo and to the east by Lupao. It covers a total land area of approximately 10,122 hectares. It is divided administratively into 28 barangays (5 districts in the town proper and 23 agricultural villages).

3.1.2 Biophysical characteristics

3.1.2.1 Topography

The general topography of Talugtug is rolling to hilly in the northwestern and northeastern parts. The service areas of the SWIPs are located in the flatter areas (0-5 per cent slope) below the dam (Lucas *et al.* 2000). About 75 per cent of the total rice production area of Talugtug is found in the western portion of the town with plains to gently sloping topography.

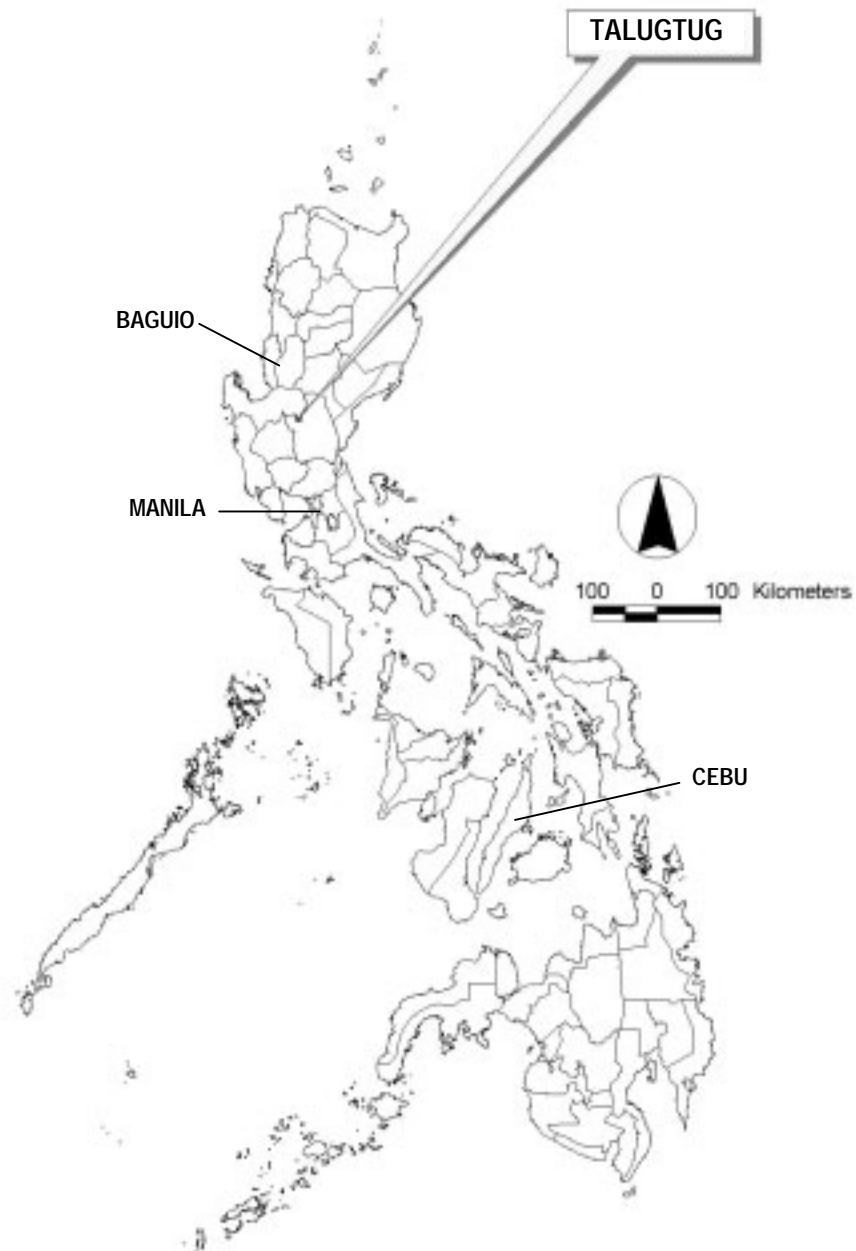
3.1.2.2 Soil

The dominant soils in the study area are Annam clay and clay loam, Maasin clay, Buted clay and Villa Boado clay (BSWM as cited by FSSRI, 2000 a and b). The study by Lucas *et al.* (2000) describes the land features and soil characteristics of the SWIPs in Talugtug. The soils of the service area are clay with a depth of 60 cm to more than 200 cm (Table A.1). The parent materials of the service area are alluvium and colluvium. Generally, the drainage of the service area is poor to moderate. Soil pH ranges from 6.0 to 8.1 and the fertility of the soil is generally moderate.

3.1.2.3 Climate

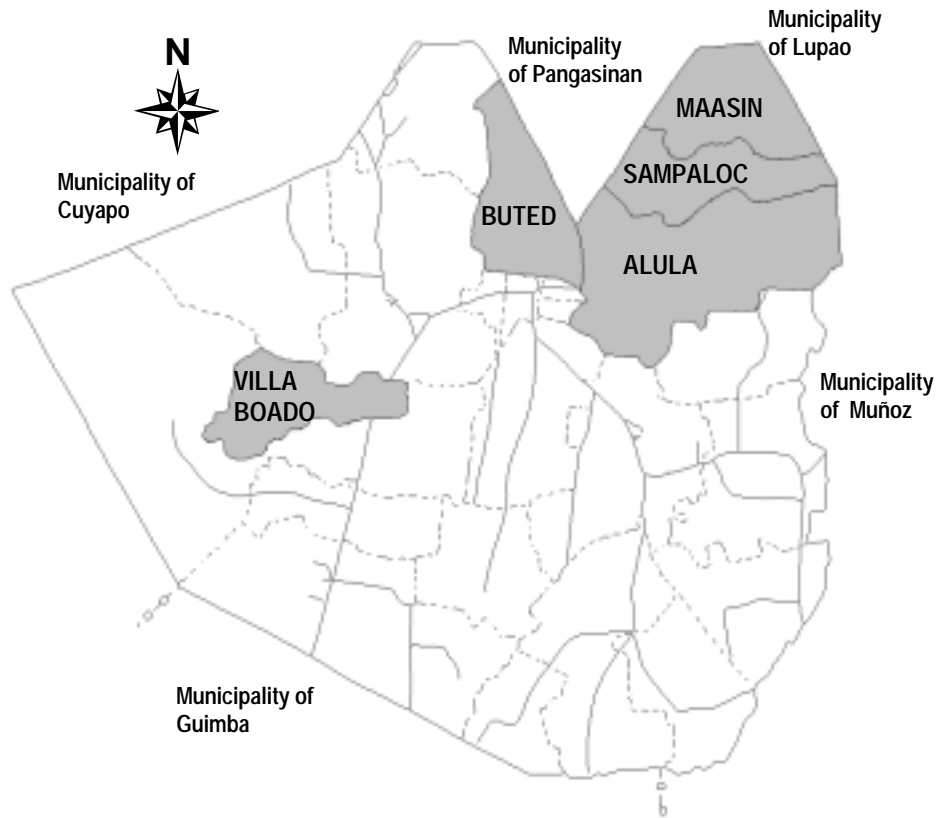
The climate in Talugtug is characterized by two distinct seasons, the wet and dry season. The wet months are from May to October while the dry period starts from November and ends in April (Figure 3.3). Mean annual rainfall is 1,931 mm with July the wettest and January the driest month (Table A.2). Mean annual temperature is about 27.1°C (Lucas *et al.*, 2000).

Figure 3.1 Location map of the Municipality of Talugtug, Nueva Ecija, Philippines



Adapted from: DENR, Region IV 1996.

Figure 3.2 Location map of the project sites in Talugtug, Nueva Ecija, Philippines



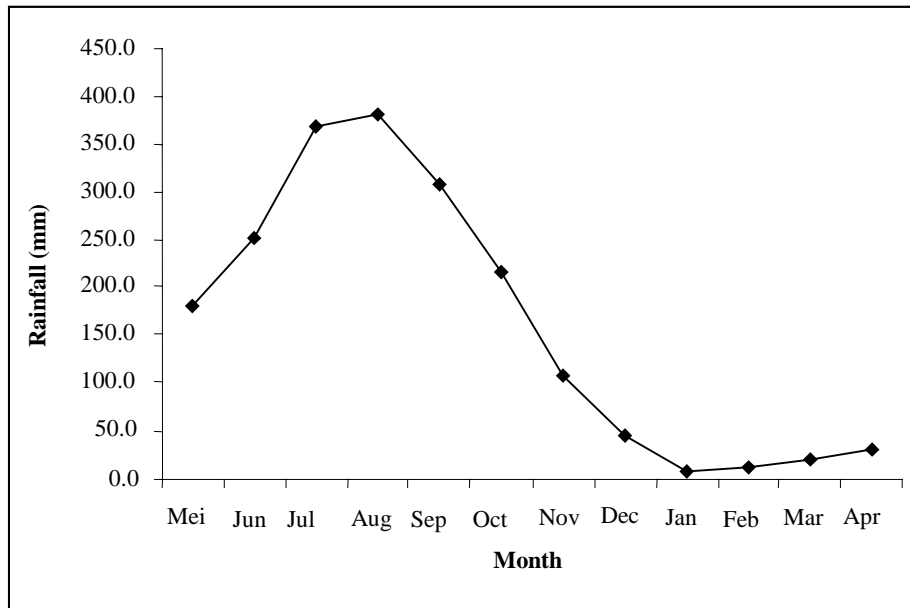
Adapted from: Development Master Plan (2000-2004), Municipality of Talugtug, Nueva Ecija, Philippines.

3.1.2.4 Land use

About 67 per cent of the land in Talugtug is devoted to agriculture while 22 per cent is pasture area (Table 3.1). About 11 per cent is committed to other land uses. The major portion of the agricultural area is cultivated with rice on about 6,704 ha (Table 3.2). Of this total area, about 81 per cent is used for rainfed rice while 18 per cent is for irrigated rice. The remaining area is used for other crops. Only about 1 per cent is used for the minor crops, which include rootcrops, corn and vegetables.

Chapter 3

Figure 3.3 Average monthly rainfall distribution, Nueva Ecija, Philippines (1971-2000)



Source of data: PAGASA (n.d.).

Table 3.1 Land use in Talugtug, Nueva Ecija, Philippines

Land use	Area (ha)	Percentage
Agriculture	6,788.42	67.06
Pasture	2,257.64	22.30
Forest	617.85	6.10
Bodies of water	166.55	1.65
Built-up area		
Residential	172.17	1.70
Institutional	21.20	0.21
Commercial/Industrial	0.92	0.01
Open Space	98.50	0.97
Total	10,123.23	100.00

Source: Development Master Plan (2000-2004), Municipality of Talugtug, Nueva Ecija, Philippines.

Table 3.2 Crops and area planted in Talugtug, Nueva Ecija, Philippines

Crops	Land area (ha)	% of total area
Rice		
Irrigated rice	1,200	17.68
Rainfed rice	5,504.4	81.09
Vegetables	8	0.12
Corn	20	0.29
Rootcrops	56	0.82
Total	6,788.4	100.00

Source: Development Master Plan (2000-2004), Municipality of Talugtug, Nueva Ecija, Philippines.

3.1.2.5 Farming systems

The selected sites for this study are predominantly under rainfed agricultural production systems. The topography is generally rolling to hilly with small areas of flat to gently sloping. The total land area and dominant crops planted in the study area are shown in Table 3.3. Relatively small areas are used for the cultivation of corn, vegetables and rootcrops while larger areas are used for rice production.

Table 3.3 Agricultural profile of the selected villages in Talugtug, Nueva Ecija, Philippines

Village	Land area (ha)	Irrigated rice		Rainfed rice		Area planted (ha)		
		Farmer	Area (ha)	Farmer	Area (ha)	Veg. (ha)	Corn (ha)	Roots crops (ha)
Alula	585.2	33	50	176	231	2	-	1
Buted	433.3	22	34	80	120	10	2	10
Maasin	470.8	143	165	85	130	-	-	-
Sampaloc	421.8	3	5	106	158	1	1	5
Villa Boado	233.2	20	30	80	120	5	-	2

Source: Development Master Plan (2000-2004), Municipality of Talugtug, Nueva Ecija, Philippines.

Crops and cropping pattern

Rice is the major crop planted in the municipality of Talugtug. Secondary crops include cassava, corn, onion and garlic. Farmers generally cultivate rice as a staple food. The transplanting of rice during the dry season is from December to January and it is harvested in April to May. For the wet season, rice transplanting is from July to August and harvesting takes place in November. The crops grown in Villa Boado and Maasin are as follows: rice, okra, string bean, chili, taro, cassava, bitter gourd, snake gourd, sponge gourd, water spinach, yam, tomato, maize, sweet potato, mango, jackfruit, papaya, citrus, star apple, banana, guava, santol (*Sandorium koetjape*), sugar apple and soursop (FSSRI, 2000b). There were nine identified cropping patterns in Villa Boado (Table A.4). The dominant cropping patterns were rice-fallow-fallow and rice-rice-fallow. In Maasin, the major cropping pattern was rice-rice-fallow, which covered 100 ha during both the dry and wet season.

There were 12 major farming systems identified in Villa Boado and the most common system was Crop-Carabao (Table A.5). The farmers look forward to the possibility of integrating more enterprises on their farms to generate higher income and a better livelihood. Off-farm activities of the farmers include cogon cutting, carpentry, selling labor, tricycle driving, etc.

Based on the survey, about 71.24 per cent of the respondents practice a rice-rice cropping system with Alula-Sampaloc and Maasin having 77.27 per cent and 75.00 per cent respectively (Table 3.4). Only 28.76 per cent practice a rice-fallow cropping pattern. Most of the farmers are in rainfed rice production (Figure 3.4). Between 28 per cent and 51 per cent of the farmers in all of the barangays, except Maasin, use this farming practice.

Chapter 3

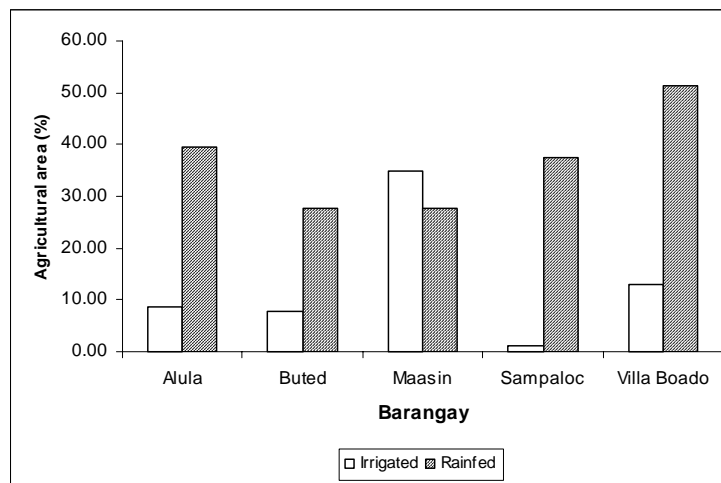
Table 3.4 Cropping patterns of the respondents at the project sites

Village	Rice-rice ¹	Per cent	Rice-fallow	Per cent	Total
----- Number of farmers -----					
Alula-Sampaloc	17	77.27	5	23.73	22
Buted	17	68.00	8	32.00	25
Maasin	15	75.00	5	25.00	20
Villa Boado	11	64.71	6	35.29	17
Total	60		24		84
Per cent	71.24		28.76		100

Note: ¹ Including those who practice both rice-rice and rice-fallow systems.

Source: Survey data.

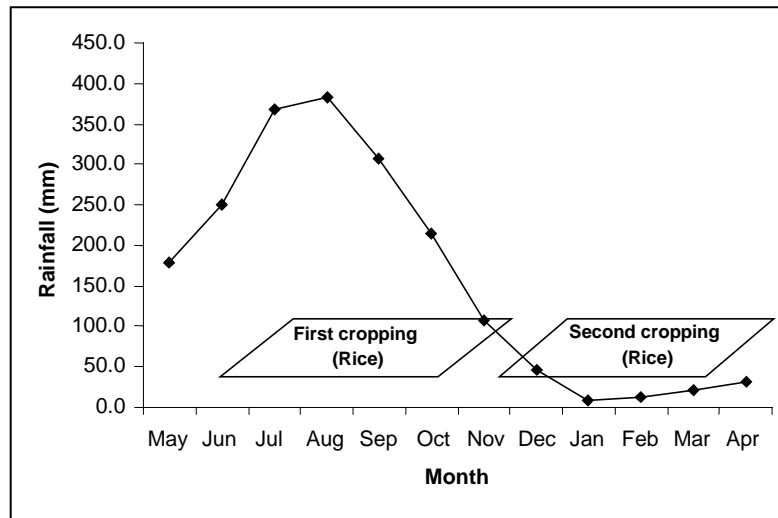
Figure 3.4 Share of agricultural area devoted to irrigated and rainfed rice, Talugtug, Nueva Ecija, Philippines



Source: Survey data.

Based on the rainfall pattern, the first crop of rice is planted during the months of June and July while the second crop is planted during November and December (Figure 3.5). The other cropping patterns practiced on a limited scale include: rice-fallow, rice-vegetables, cassava-fallow, sweet potato-fallow, vegetables-fallow, fruit trees and banana. Animals that are raised in the study area are as follows: cattle, water buffalo, goat, swine, chicken and duck. Water buffalo, cattle and goat are important components of the farming system in the area.

Figure 3.5 Cropping pattern in the study area



Source: Survey data.

Livestock

The farmers in Villa Boado generally raise cattle, carabao, goat, swine, chicken, duck, turkey and pigeon (FSSRI, 2000b). The estimated number of livestock in the barangay were 350 cattle, 50 carabaos, 25-30 swine, 100 goats, 500 chickens, 100 ducks, 3 turkeys and 30 pigeons. Carabaos are used mainly for draft purposes and sometimes as a source of milk. Other domestic animals are generally raised for home consumption only. A lack of capital is one of the problems in increasing the number of animal heads per farm. In Maasin there were about 106 cattle, 53 heads of carabao, 265 heads of goat, 106 heads of swine, 212 heads of chicken and about 212 heads of duck (FSSRI, 2000a as cited in Brgy. Profile of Maasin, 2000). The livestock raised were the same as in Villa Boado except for turkey and pigeon. The animals were raised mainly for draft purposes and consumption.

Table 3.5 shows the livestock status in Maasin. There is a two-way relation in crop-livestock integration for three animals, namely, cattle, carabao and goat. The crops provide the by-products that are used as feed for livestock such as rice bran, rice straw and rice polish. The manure from carabao, cattle and goat is used for organic fertilizer in rice farming and backyard gardening.

Fishery

Table 3.6 shows the fishery areas at the project sites. The fishery areas are located in SWIP areas. The Irrigators Association operates small-scale tilapia fish cages. Estimated fishery area ranges from 2 to 5 ha.

Fishery activities in the barangays are very poor considering the presence of 21 reservoirs/ponds (FSSRI, 2000a). The villages have 1 Small Water Impounding Project (SWIP) and 20 Small Farm Reservoirs (SFR). The dominant fish species is tilapia, however, hito and mudfish were cultured in small quantities. Only one farmer cultured fish commercially. Due to the lack of capital, other farmers raise fish only for home consumption. The reported net income from a SWIP reservoir is PhP 38,000/yr. For a commercial SFR farmer, net income is PhP 24,000/year. Five per cent of the income from the SWIP goes to the barangay fund while fifty per cent of the rest is distributed among the fish growers and the rest to the SWIP Authority.

Chapter 3

Table 3.5 Livestock status in Brgy Maasin, Talugtug, Nueva Ecija, Philippines (2000)

Items	Types of livestock					
	Cattle	Carabao	Swine	Goat	Chicken	Duck
Av. No / Family Breed	2	1	2	5	4	4
	Native and cross bred of native and Brahman	Native	Native and Largewhite	Native and Anglo-Nubian	Native	Native
Purpose	Sale and own consumption	Draft	Sale and consumption (esp. on special occasions)	Sale and consumption	Home consumption	Home consumption
Rearing system	Scavenging, tethering	Scavenging, tethering	Intensive	Scavenging, tethering	Scavenging	Scavenging
Feed	Native pasture, rice bran, UMMB*	Native grass and rice straw	Commercial feed, leftover food	Native grass	No supplementary feed	No supplementary feed
Breeding	Natural services	Natural services	Natural services	Natural services through Anglo-Nubian buck	-	-
Diseases	Foot and mouth	Foot and mouth	Foot problems	Liver fluke and colds	Colds and fowl pox	Duck cholera
Problems	Lack of capital	Lack of capital	-	Lack of concentrate feeds	Diseases	Diseases
Income/Yr.	₱ 10,000	-	₱ 10,000	₱ 1,100	-	-

UMMB = Urea Mollases Multi-nutrient Block.

Source: FSSRI 2000b.

As reported in the PRA Report of Villa Boado (FSSRI, 2000b), intensive fish culture is possible. The 4.2 ha of water (normal water surface) used for irrigation under the SWIP provide the potential for aquaculture. There were already 50,000 fingerlings of tilapia and 10,000 of carp released in 2000 by the project authority. Backyard fishponds were also present with various fish species. These include “*tilapia*”, “*hito*”, “*dalag*”, “*carpa*”, “*bunog*”. The preferred fish species in the area was tilapia.

Table 3.6 Fishery areas in the project sites, Talugtug, Nueva Ecija, Philippines (1998)

Barangay	Fishery description	Estimated area (ha)	Remarks
1. Buted	SWIP area	2	Small-scale Tilapia Fish Cage operated by Irrigators Association
2. Maasin	SWIP area	5	Small-scale Tilapia Fish Cage operated by Irrigators Association
3. Sampaloc	SWIP area	2	Small-scale Tilapia Fish Cage operated by Irrigators Association
4. Villa Boado	SWIP area	2	Tilapia Fish Cage

Adapted from: Development Master Plan (2000-2004), Municipality of Talugtug, Nueva Ecija, Philippines.

3.1.3 Socio-economic characteristics

3.1.3.1 Population distribution and density

The population of the Municipality of Talugtug in 1995 was 18,114 (Table 3.7). About 70 per cent of the population is in the rural area while the remainder is in the Poblacion area. Highest population density was in the Poblacion area (59.97) compared to 1.26 in the rural area. Table 3.8 shows the projected population from 1999-2004.

Table 3.7 Population distribution and density, Talugtug, Nueva Ecija, Philippines (1995)

Location	Area (ha)	Population	Per cent	Density
Poblacion	91.4506	5,484	30.27	59.97
Rural	10,030.7818	12,630	69.73	1.26
Total	10,122.2324	18,114	100.00	61.23

Source: Development Master Plan (2000-2004), Municipality of Talugtug, Nueva Ecija, Philippines.

Table 3.8 Projected population in Talugtug, Nueva Ecija, Philippines*

Year	Population
1999	19,999
2000	20,372
2001	20,856
2002	21,352
2003	21,860
2004	22,380

*2.38 per cent per year growth rate, 1995.

Source: Development Master Plan (2000-2004), Municipality of Talugtug, Nueva Ecija, Philippines.

3.1.3.2 Number of households

There were a total of 3,887 households in the municipality of Talugtug in 1995 (Table 3.9). Average household size was 4.74 and 4.66 in 1990 and 1995 respectively.

Table 3.9 Number of households, Talugtug, Nueva Ecija, Philippines (1995)

Year	Population	No. of households	Ave. HH size
1990	14,003	2,961	4.74
1995	18,114	3,887	4.66

Source: Development Master Plan (2000-2004), Municipality of Talugtug, Nueva Ecija, Philippines.

Most of the households (84.4 per cent) in the villages contained 3 to 6 people (Table 3.10). Households with more than 6 members accounted for 12.21 per cent and those with less than 2 members 3.39 per cent.

Table 3.10 Household size distribution of the respondents in the project areas

Village	<3	3 to 6	>6
Alula-Sampaloc	4.55	86.36	9.09
Buted	4.00	88.00	8.00
Maasin	5.00	75.00	20.00
Villa Boado	0.00	88.24	11.76
Mean	3.39	84.40	12.21

Source: Survey data.

3.1.3.3 Age distribution

The age of the majority of the farmers in the study area ranges from 30 to 50 years old (Table 3.11). Nearly 15 per cent and 18.58 per cent belong to the age groups of 20-30 and 51-70 respectively with 10.15 per cent belonging to the above 70 years of age group.

Table 3.11 Per cent distribution of the respondents' age in the project areas

Village	Age in years				
	20-30	31-40	41-50	51-70	>70
Alula-Sampaloc	9.09	36.36	31.82	13.64	9.09
Buted	23.08	32.00	23.08	15.38	3.85
Maasin	10.00	30.00	40.00	10.00	10.00
Villa Boado	17.65	17.65	11.76	35.29	17.65
Mean	14.95	29.00	26.66	18.58	10.15

Source: Survey data.

Chapter 3

3.1.3.4 Educational attainment

As to their educational level, 49.97 per cent of the respondents had reached or surpassed secondary level (Table 3.12). Only 5.08 per cent of the respondents have studied on vocational courses while 13.24 per cent did not pass grade 4, elementary level or equivalent.

Table 3.12 Per cent distribution of the respondents' educational attainment in the project areas

Village	Educational attainment				Vocational
	Elementary		Secondary		
	Grade 4 and below	Grade 5-6	1st and 2nd year	3rd and 4th year	
Alula-Sampaloc	18.18	40.91	4.55	31.82	4.55
Buted	8.00	36.00	12.00	40.00	4.00
Maasin	15.00	35.00	5.00	45.00	0.00
Villa Boado	11.76	35.29	17.65	23.53	11.76
Mean	13.24	36.80	9.80	35.09	5.08

Source: Survey data.

3.1.3.5 Years in farming

Most of the respondents, 55.66 per cent, had been farming from 31 to 50 years (Table 3.13). About 14.95 per cent had been farming for 20-30 years in the community and 28.73 per cent had been in farming from 51 to more than 70 years.

Table 3.13 Per cent distribution of the respondents' years in farming in the project areas

Village	Years				
	20-30	31-40	41-50	51-70	>70
Alula-Sampaloc	9.09	36.36	31.82	13.64	9.09
Buted	23.08	32.00	23.08	15.38	3.85
Maasin	10.00	30.00	40.00	10.00	10.00
Villa Boado	17.65	17.65	11.76	35.29	17.65
Mean	14.95	29.00	26.66	18.58	10.15

Source: Survey data.

3.1.3.6 Land holdings

The majority of the respondents (47.74 per cent) own land of size 1.1 to 5.0 ha (Table 3.14). About 38.44 per cent have land with an area of 0.25 to 1.0 ha. Only about 9.55 per cent own 5 ha of land while 4.27 per cent own no land at all.

Table 3.14 Per cent distribution of the respondents' land holdings in the project areas

Village	Land area (ha)				
	<0.25	0.25-0.5	0.5-1.0	1.1-5.0	>5
Alula-Sampaloc	9.09	13.64	18.18	54.55	4.55
Buted	8.00	8.00	16.00	52.00	16.00
Maasin	0.00	20.00	25.00	55.00	0.00
Villa Boado	0.00	0.00	52.94	29.41	17.65
Mean	4.27	10.41	28.03	47.74	9.55

Source: Survey data.

3.1.3.7 Road network and irrigation facilities

The barangay road constitutes the bulk of the road network in Talugtug with 72.69 per cent of the total network in 1998 (Table 3.15). This totaled 104.74 km in length. Municipal and provincial roads accounted for 11.84 km (8.22 per cent) and 20.60 km (14.23 per cent) respectively. National roads make up only about 7.00 km (4.86 per cent).

Table 3.15 Road network in Talugtug, Nueva Ecija, Philippines (1998)

Road classification	Total length (km)	Per cent
National road	7.00	4.86
Provincial road	20.50	14.23
Municipal road	11.84	8.22
Barangay road	104.74	72.69
Total	144.08	100.00

Source: Development Master Plan (2000-2004), Municipality of Talugtug, Nueva Ecija, Philippines.

Table 3.16 shows the irrigation system in the project areas. Current irrigable area is 164 hectares while its potential is 280 ha. The service areas of these SWIPs include the barangays of Buted, Maasin, Alula, Sampaloc and Villa Boado.

Table 3.16 SWIP irrigation systems in the project areas, Talugtug, Nueva Ecija, Philippines (1998)

Irrigation system	Service area	Irrigable area (ha)	
		Current	Potential
Buted SWIP	Buted	32	60
Maasin SWIP	Maasin	60	100
Sampaloc SWIP	Alula, Sampaloc	36	60
Villa Boado SWIP	Villa Boado	36	60
Total		164	280

Source: Development Master Plan (2000-2004), Municipality of Talugtug, Nueva Ecija, Philippines.

The major source of water for irrigation in Villa Boado was from rainfall. Other sources include the SWIP, hand tube wells, low lift pumps (LLP) and shallow tube wells (STW). The water table in the area ranges from 10m to 35 m. The use of SWIP water is regulated by the Village Committee. The SWIP has a watershed area of 80 ha with a potential irrigable area of 100 ha. The SWIP also creates the opportunity for fish culture.

3.1.3.8 Labor sources

Labor sources for the farm households in Maasin were mainly family. Hired labor is necessary for planting, transplanting, weeding, fertilizer application, harvesting and post harvesting in rice farming. Males are generally involved as hired labor. Scarcity of labor was experienced during the peak months of land preparation, planting and harvesting. This also holds true for Villa Boado. Group discussions with the community during the PRA revealed that peak periods for labor demand were during the planting and harvesting seasons.

The Key Informant Panel interview of the PRA in Maasin reported the following wage rates:

Land preparation	:	a) Ploughing- PhP 1, 200/MMD b) Harrowing/leveling – PhP 1,200/MMD
Pulling of seedlings	:	PhP 100/MD
Transplanting	:	PhP 100/MD
Application of fertilizer or insecticides:		PhP 100/MD
Harvesting	:	a) Harvesting/pilling/hauling (1/14 share) b) Drying/bagging – PhP 300/MD
Threshing	:	6 cav. of rice for every 100 cavans threshed

The available labor force per household of the respondents is generally as low as two or less with 74.42 per cent (Table 3.17). About 25.76 per cent of the respondents have 3 to 4 farm labourers per household.

Chapter 3

Table 3.17 Number of farm labourers per household at the project sites

Village	2 and below	Per cent	3 to 4	Per cent	Total
Alula-Sampaloc	17	77.27	5	23.73	22
Buted	15	60.00	10	40.00	25
Maasin	19	95.00	1	5.00	20
Villa Boado	11	64.71	6	35.29	17
Total	62		22		84
Per cent	74		26		100

Source: Survey data.

3.1.3.9 Markets for the farm produce

Results of the PRA show that 80 per cent of the harvested rice in Maasin is sold to traders and rice buying stations in Talugtug, Lupao, Muñoz and San Jose. The traders mostly come to the barangay to buy the harvested rice. The remaining 20 per cent of the harvest is used for home consumption. The products of livestock raising are also sold to traders and markets near the barangay.

3.1.3.10 Institutions

The government organizations identified during the PRA in Villa Boado were DA, DSWD, DENR, BFAR, PhilRice, UPLB and DAR. These are involved in development work in the barangay. Local organizations were also present which include the Village Boado Irrigators Associations, Samahan ng Kababaihan (Women's Organization), Samahan ng Kabataan (Youth Organization), and Seniors' and Juniors' Association. The Rural Bank of Talugtug and the Land Bank of the Philippines are the two banks engaged in lending money. Generally, the interest rate varies from 16 per cent to 26 per cent. In Maasin, organizations include the Barangay Council led by the Barangay Captain and active irrigators' groups due to the presence of a SWIP.

3.1.3.11 Credit system

Based on PRA reports from Maasin and Villa Boado (FSSRI, 2000 a and b), the major source of credit for the farmers was informal in nature. Although two banks are present in Villa Boado, farmers generally resort to informal money lenders due to the tedious paper work required by the banks. The absence of credit institutions in Maasin gave way to this credit system. Sources of finance by the farmers were mainly from relatives, wealthy acquaintances and neighbors. This type of credit has about a 70 per cent interest rate per annum. Sources of credit in Villa Boado include relatives, friends, neighbors and wealthy acquaintances. Interest rates were very high compared to Maasin, ranging from 100 per cent to 120 per cent. The duration of the loan was generally 4 months (transplanting to harvesting period) at 40 per cent interest rate, thus 120 per cent interest rate per annum exists.

3.1.3.12 Membership to the SWIPs

The SWIPs under study were established in 1993 (Sampaloc), 1995 (Buted), 1997 (Maasin) and 1999 (Villa Boado). Descriptions of the SWIPs in the study areas are presented in Table 3.18.

Table 3.18 Small Water Impounding Projects in Talugtug, Nueva Ecija, Philippines

Location	Service area (ha)		Watershed (ha)	Reservoir area (ha)	Year completed
	Wet season	Dry season			
Sampaloc	60	36	80	7.00	1993
Buted	60	32	70	7.84	1995
Maasin	100	60	218	22.64	1997
Villa Boado	60	36	75	6.19	1999

Source: Survey data.

Table 3.19 shows the respondent's membership to the SWIP in the project areas. Just over 62 per cent were members of the SWIPs. Predominantly SWIP members were from the villages of Alula-Sampaloc, Buted and Maasin.

Table 3.19 Membership of the respondents to SWIP

Village	Member	Per cent	Non-member	Per cent	Total
Alula-Sampaloc	14	63.64	8	36.36	22
Buted	17	68.00	8	32.00	25
Maasin	14	70.00	6	30.00	20
Villa Boado	8	47.06	9	52.94	17
Total	53		31		84
Per cent	62.17		37.83		100

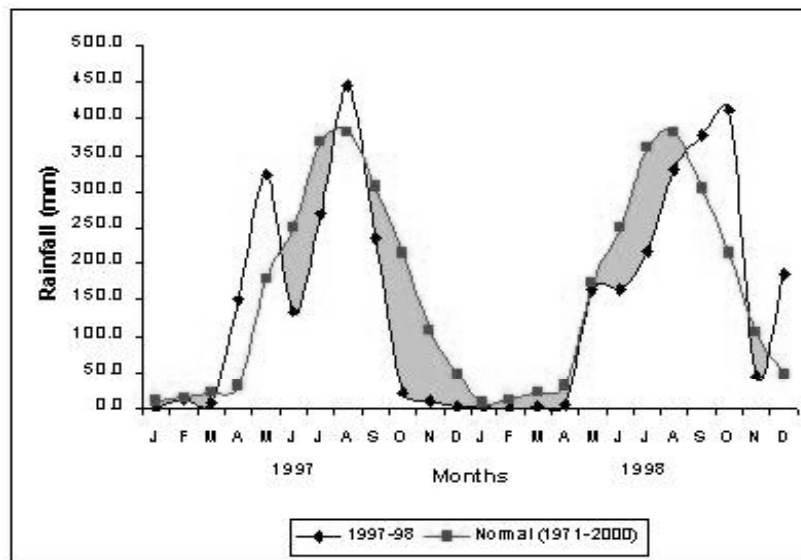
Source: Survey data.

3.2 Impact of El Nino

3.2.1 Rainfall distribution

Based on the analysis, large rainfall deficits were observed during the months of June and July in 1997 (Figure 3.6). This eventually dropped from September to November. Moreover, the dry months in 1998 were extended, which occurred from July to August. Rainfall deficits were as high as 193 mm in October (Table A.10). Total annual rainfall deficit in 1997 was 308.3 mm. This abnormal rainfall distribution can affect the cropping calendar for rice and other crops in the study area, which can eventually lead to crop failure and reduction in yield due to the limited available water to support crop growth and development.

Figure 3.6 Monthly rainfall distribution during the 1997-98 El Nino compared to normal rainfall normal values (1971-2000), Nueva Ecija, Philippines



* Shaded portion represents rainfall deviation from the normal values.

Source of data: PAGASA (n.d.)

3.2.2 Rice yield

Effects of the 1997-1998 El Nino were experienced at the study sites. At the farm level, significant reductions in rice yield and income were documented. Rice yields with a SWIP as the source of water were not affected by the abnormal climatic condition (Table 3.20).

Chapter 3

Moreover second cropping was still possible with a significant increase in yield (4,750 to 5,000 kg/ha). Rainfed areas suffered a decline in rice yield by 2,000 kg/ha during the 1997-98 El Nino event. Second cropping was not possible due to the unavailability of water for irrigation.

Table 3.20 Effect of El Nino on rice yield, the case of Buted, Talugtug, Nueva Ecija, Philippines

Source of irrigation	Cropping pattern	Normal climatic condition		Abnormal climatic condition (1997-1998)	
		Average yield, kg/ha		Average yield, kg/ha	
		Main crop	Second crop	Main crop	Second crop
SWIP	R-R-F	3,500	4,750	3,500	5,000
Rainfed	R-F	3,500	-	1,500	-

Source: Survey data.

3.2.3 Income from rice

In terms of net income from rice, farms with SWIPs were not affected. Net income increased during the El Nino episode from \$736.82 to \$808.18 (Table 3.21). However, rainfed farms suffered a loss in net income.

Table 3.21 Effect of El Nino on net income per hectare of rice farm, the case of Buted, Talugtug, Nueva Ecija, Philippines

Source of irrigation	Normal climatic condition	Abnormal climatic condition (1997-1998)
	Net income/ha/year (US\$)	Net income/ha/year (US\$)
SWIP	736.82	808.18
Rainfed	312.59	8.08

Note: Net income = Gross products – (Production cost + Post production cost).

Production cost = Current inputs (fertilizer, pesticide, fuel, oil) + Hired labor (land preparation, seeding, establishment, planting, weeding, spraying, harvesting).

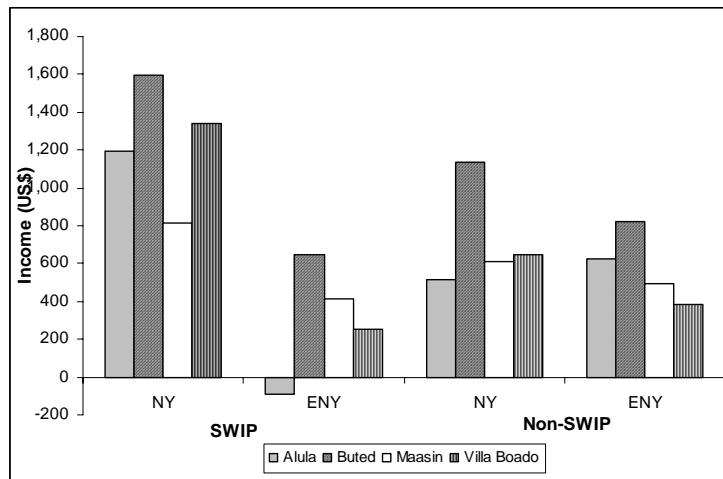
Post production cost = Threshing + Transportation.

Source: Survey data.

3.2.4 Total annual income of farmers

Figure 3.7 shows the comparison of annual total income of SWIP and non-SWIP beneficiaries of the selected sites in Talugtug, Nueva Ecija. It is evident that the occurrence of abnormal climatic conditions has an effect on the income of farmers. Generally, SWIP beneficiaries have higher annual total income compared to the non-SWIP beneficiaries. The former have an average annual income of \$1,235 (Table A.11). However, during the El Nino year, annual total income was only \$305. On the other hand, non-SWIP beneficiaries' income was \$726 and \$583 during the normal and El Nino years respectively (Table A.12). However, non-SWIP beneficiaries were only slightly affected during the El Nino year because of their numerous non-farm activities that serve as a source of income other than crop production. These activities include hired farm labouring, tractor operating, cogon gathering, fuel wood gathering, charcoal making, sound system operating, carpentry, honorarium (barangay official) and plumbing.

Figure 3.7 Comparison of the annual total income of SWIP and non-SWIP beneficiaries during normal and El Nino years, Talugtug, Nueva Ecija, Philippines



3.3 Coping strategies

3.3.1 SWIP as a mitigating measure against El Nino

Benefits derived from SWIPs, other than rice production, include extra income from fish production, recreational uses, irrigation for vegetables and forage production along the canal. The dam also serves as a drinking area for livestock. There are members of the community who use the water in the reservoir for performing household activities. Some farmers who are not direct beneficiaries of the SWIP also enjoy the same benefits, particularly in terms of fish catch, forage crops and recreational uses. In Alula, non-SWIP members participate in tilapia harvesting in April when the dam is drained with the arrangement of 50:50 sharing of the total catch. Table 3.22 shows the distribution of income from fish production in Buted, Maasin and Villa Boado.

Table 3.22 Income distribution from fish (Tilapia), US\$

Village	Year	Harvester share	Barangay share	Irrigators assn. share	Landowner share
Buted	1998	495.35	24.76	235.29	235.29
Maasin	2000	1,183.69	59.18	562.25	562.25
Villa Boado	2000	176.98	8.84	84.08	84.08

Sold at US\$ 0.88 – 0.98 per kg.

Tables 3.23 and 3.24 show the number and distribution of SWIP and non-SWIP beneficiary respondents with and without mitigating measures to cope with El Nino. SWIP beneficiaries have stated that they have mitigating measures. About 65.02 per cent of the respondents indicate that they have mitigating measures while 34.98 per cent have no mitigating measures. About 21.53 per cent of the non-SWIP beneficiaries mentioned that they have mitigating measures while the remaining 78.47 per cent do not.

Chapter 3

Table 3.23 SWIP beneficiaries with and without mitigating measures

Village	With mitigating measure	Per cent	Without mitigating measure	Per cent	Total
Alula-Sampaloc	4	50.00	4	50.00	8
Buted	11	78.57	3	21.43	14
Maasin	11	78.57	3	21.43	14
Villa Boado	9	52.94	8	47.06	17
Total	35		18		53
Per cent	65.02		34.98		100

Source: Survey data.

Table 3.24 Non-SWIP beneficiaries with and without mitigating measures

Village	With mitigating measure	Per cent	Without mitigating measure	Per cent	Total
Alula-Sampaloc	4	44.44	5	55.56	9
Buted	1	16.67	5	83.33	6
Maasin	0	0.00	8	100.00	8
Villa Boado	2	25.00	6	75.00	8
Total	7		24		31
Per cent	21.53		78.47		100

Source: Survey data.

The majority of the SWIP beneficiary respondents (83.98 per cent) indicated that they have benefited from the SWIP (Table 3.25). In Maasin, 100 per cent of the respondents derived benefits. Only 16.02 per cent of the total respondents indicated they had derived no benefits at all.

Table 3.25 SWIP beneficiaries with and without benefit(s) derived

Village	Benefits	Per cent	No benefits	Per cent	Total
Alula-Sampaloc	6	75.00	2	25	8
Buted	11	78.57	3	21	14
Maasin	14	100.00	0	0	14
Villa Boado	14	82.35	3	18	17
Total	45		8		53
Per cent	83.98		16.02		100

Source: Survey data.

Based on the Key Informant Survey and interviews with the farmer respondents, a number of benefits derived from SWIPs were enumerated. As presented in Table 3.26, these benefits were categorized under economic, infrastructure, institutional, ecological, cultural and recreational. In terms of economic benefits, rice double cropping and the increase in yield were significant to the farm/household, community and up to the municipal level. As in the case of the farm in Buted (Table 3.20), the 1997-98 El Nino had a positive effect on rice yield. This was made possible by the irrigation water from the SWIP. The integration of livestock was also mentioned as an opportunity to increase farm productivity and the income of the farmers. The farmers indicated that forage crops were observed to be vigorously growing along the canal. The introduction of vegetables was made possible even during relatively dry months because of the available water from the SWIP. The survey, however, revealed that only a few farmers tried to plant vegetables and on a very limited scale. At the barangay level, the barangay where the SWIP is located receives its share of the income generated from fish production. The availability of cheap fish, increased demand for labor and additional sources of income are among the benefits that can be derived from SWIPs. A possible increase in tax collection (municipal level) can also result due to heightened economic activity.

The key informants indicated that the construction of better roads may not be directly implemented because of a SWIP but considered it as one of the justifications made for giving

priority to a road improvement project. The local executive who was responsible for road improvements was also very supportive of the SWIPs in the municipality.

In terms of institutional benefits, at the municipal level, the key informants argued that SWIPs contributed to making their municipality known to other institutions or donors and as a consequence, other development projects were introduced. The appreciation by the local government of the SWIP in a number of barangays within Talugtug, as perceived by other informants, somehow facilitated the development of a road network. The total support received and projects implemented in the municipality were linked to SWIPs and hence, are considered benefits derived from SWIPs.

Ecologically, with the construction of a SWIP, increases in ground water recharge are observed. SWIPs also serve as temporary habitats for migratory birds. There was an observation that the air surrounding SWIPs is becoming more humid.

SWIPs also serve cultural and recreational functions. Dams are used for bathing and the washing of clothes. SWIPs are also used as picnic and fishing areas, which show their potential for eco-tourism.

Table 3.26 Benefits derived from SWIPs

Benefits	Municipal	Community (Barangay)	Farmer (Farm household)
Economic	<ul style="list-style-type: none"> - possible increase in tax collection due to heightened economic activity. 	<ul style="list-style-type: none"> - 5 per cent of SWIP income goes to the barangay. - increased demand for labor due to increases in cropping intensity and fish culture. - availability of cheap fish. - additional source of income from fish (harvester's share). 	<ul style="list-style-type: none"> - two croppings of rice made possible. - increase yield per unit area. - growing of vegetables made possible. - integration of livestock made possible. - forage crops grow vigorously along irrigation canals. - water in the dam is used for cleaning the animals (carabao, horse) and for drinking (cattle).
Infrastructure	<ul style="list-style-type: none"> - development of road networks. 	<ul style="list-style-type: none"> - construction of farm-to-market roads. - construction of office building for IA. 	<ul style="list-style-type: none"> - source of irrigation water. - improved farm-to-market roads.
Institutional	<ul style="list-style-type: none"> - enhanced coordination and support from national and local agencies. 	<ul style="list-style-type: none"> - spirit of cooperation put into practice. - new techniques in farming provided by LGU through training. 	<ul style="list-style-type: none"> - gained knowledge on improved/new farming techniques.
Ecological	-	<ul style="list-style-type: none"> - increased recharge of groundwater. - temporary habitat for migratory birds. - after SWIP construction air becomes more humid. 	<ul style="list-style-type: none"> - increased recharge of ground water for domestic water use.
Cultural	-	<ul style="list-style-type: none"> - dam used for bathing and washing clothes. 	<ul style="list-style-type: none"> - dam used for bathing and washing clothes.
Recreational	<ul style="list-style-type: none"> - used as picnic area for local tourists (potential for eco-tourism). 	<ul style="list-style-type: none"> - dam used as picnic area. - used for fishing. 	<ul style="list-style-type: none"> - dam used as picnic area. - used for fishing.

Chapter 3

3.3.1.1 Consequences of SWIP implementation

The following are the consequences of SWIP implementation:

1. No need for farmers to go to other towns to work as rice harvesters.
2. Increased income.
3. Farmers are able to buy mini tractors and farm animals.
4. Additional income for the education of the children.
5. Raises the living conditions in the community.
6. Farmers are able to build concrete houses.
7. Farmers are able to buy home appliances.
8. Provides better road access.

SWIPs are important not only because they give assurance for the availability of water during the dry season but also contribute to elevating the level of preparedness of the farmers to be able to mitigate the impact of El Nino. At the community level, they also offer a number of reasons why they are vital to the lives of the people in the community.

Before the construction of the SWIP, about 45 per cent of the farmers in Sto. Domingo worked elsewhere during long dry spells but now with the SWIP, only about 30-35 per cent go out of the barangay to look for work.

The effect of El Nino can be very serious to farmers who are not served by irrigation or a SWIP because of the following situations, which are the results of crop failure:

1. More activity on charcoal making.
2. Migration, which may result in the neglect of agricultural activities.

Charcoal making affects the stability of the watershed. If the majority of farmers resort to gathering trees for charcoal making, further destruction of the watershed may take place. Consequently, the problem with water availability will be aggravated.

Migration may impact agricultural productivity because many of the farmers may find the work outside their barangay or municipality more rewarding. This will consequently cause a lowering of agricultural productivity and hence food security could be affected.

3.3.1.2 Needs of farmers

The farmers have different perceived needs in their farming activities. Many expressed the need for capital, which is intended for the purchase of farm inputs such as fertilizer, seeds, pesticides, field supplies and materials. It should be noted, however, that the needs vary from the different villages considered.

Buted was the only site that did not express the need for capital. It instead focused on the need of the association to improve the canal by having it cemented. The other crop production related concern that was expressed was on pest control.

The Sampaloc site also communicated concern for the canal to be cemented to minimize the loss of water along the canal. The need for capital for farm inputs and pumps was also conveyed at this site.

3.3.1.3 Reasons for planting rice during the dry season

The farmers in the study areas have several reasons for planting rice during the dry season even without sufficient water. Some mentioned that they have been growing rice for a very long time and it is their tradition to plant rice. Planting of rice is also a way of securing food supply for their household. Although farmers are aware of other crops such as high value crops, they pointed out the lack of technical knowledge in cultivating these crops and the lack of capital as their main consideration. Others reasoned that many stray animals, such as goat and cattle will destroy high value vegetable crops.

3.3.2 Farmers' coping strategies

The farmers in the study areas have their own strategies in coping with the impacts of El Nino. Below are the major activities they have been employing:

1. Cogon (*Imperata cylindrica*) gathering.
2. Charcoal making.
3. Harvesting rice on other farms, mostly outside the community or other municipalities/provinces.
4. Working in construction and other non-farm jobs both within and outside the community.
5. Renting pumps to access supplemental irrigation water from the creek.
6. Working as hired farm laborers in nearby towns.
7. Backyard production of swine.
8. Reduce household spending.

In barangay Alula, about 25 to 30 per cent of farmers went to the municipalities of Muñoz, Zaragosa and Licab during the month of April to work as farm laborers during the harvesting of rice ("nakikigapas"). Some of the farmers (20 per cent) in the barangay also worked as construction workers in Manila, Cabanatuan City and other places from March to September. Other farmers (in non-service areas of a SWIP) resorted to the rental of water pumps to access supplemental irrigation water from the creek.

Table 3.27 shows the percentage distribution of non-farm income sources of the SWIP beneficiary respondents during long dry periods. On average, 8.02 per cent of the respondents in all of the villages practice cogon gathering. About 18.87 per cent and 7.55 per cent of the respondents in Villa Boado and Maasin respectively engaged in cogon gathering. In Buted, 7.55 per cent of the respondents practice charcoal making as their alternative source of income. Other sources of income include ranching, animal raising, fuelwood gathering, vegetable selling/vending and tricycle driving. Respondents from all the villages also derived income from their salaries and wages as construction workers and factory workers among others.

Table 3.27 Per cent distribution of non-farm income sources of the SWIP beneficiary respondents in the project areas¹

Source	Village				Mean
	Alula-Sampaloc	Buted	Maasin	Villa Boado	
1. Charcoal making	1.89	7.55	3.77	-	4.40
2. Cogon gathering	1.89	3.77	7.55	18.87	8.02
3. Animal raising	3.77	1.89	1.89	3.77	2.83
4. Fuelwood gathering	-	1.89	-	-	1.89
5. Vegetable selling/vending	-	-	3.77	-	3.77
6. Tricycle driving	-	1.89	-	-	1.89
7. Salaries and wages ²	3.77	7.55	1.89	5.66	4.72
Mean	2.83	4.09	3.77	9.43	3.93

¹Multiple answers.

²Construction, security guard, carpentry, plumber, ranch caretaker, teacher, mechanic and factory worker
n = 53.

Source: Survey data.

Non-SWIP beneficiary respondents have also resorted to other means of income sources (Table 3.28). Cogon gathering (8.06 per cent) was also an alternate activity to derive income. Other respondents also worked in carpentry, as tractor operators and as tailors. About 7 per cent of the respondents in all villages were involved in these activities.

Chapter 3

Table 3.28 Per cent distribution of non-farm income sources of the non-SWIP beneficiary respondents in the project areas

Source	Village				Mean
	Alula-Sampaloc	Buted	Maasin	Villa Boado	
1. Cogon gathering	6.45	3.23	19.35	3.23	8.06
2. Charcoal making	-	3.23	9.68	-	6.45
3. Fuelwood gathering	-	3.23	-	-	3.23
4. Animal raising	-	-	-	-	-
5. Salaries and wages ²	9.68	-	6.45	6.45	7.53
Mean	16.13	9.68	35.48	9.68	25.27

¹ Multiple answers.

² Carpentry, tractor operator, tailor.

n = 31.

Source: Survey data.

3.3.3 Appropriateness of SWIPs

The appropriateness of a SWIP as a mitigating measure against the effects of El Nino can be evaluated based on the farming system. In the study area, the main crop is rice and the design of the SWIPs was intended for the crop and for possible diversification. The well-known additional item is fish through its introduction in the ponds. One should not forget that rice production is the farmers' primary objective; their intention is to use the water in the reservoir for rice production first before any other commodity, including fish. Therefore, in times of prolonged dry periods, major components of the farming system are affected.

It should be noted, however, that changing the cropping system would always be faced with resistance from the side of the farmers. The introduction of Balanced Fertilization Strategy (BFS) technology by the Bureau of Soil and Water Management (BSWM) apparently revealed that many farmers are not yet ready to adopt the technology, which aimed to increase the productivity and decrease the cost of fertilizer input (Table 3.29). Farmers acknowledge a lack of capital in their production system but even when the inputs are offered to them still a number of farmers are hesitant to accept the technology. It should also be mentioned that in 1999, when the planting of onion to diversify the cropping system was introduced, no one tried to plant onion even though the inputs were to be given free. As indicated by the Agricultural Technicians from the Office of the Municipal Agriculturist of Talugtug, Nueva Ecija, the farmers did not categorically state the reason for not accepting onion. It was opined that farmers prefer to plant rice. This needs further attention in introducing measures to mitigate the impact of El Nino.

Table 3.29 Acceptance of Balanced Fertilization Strategy (BFS)

Village	Target number of cooperators	No. participated	% participation
Buted	15	7	47
Maasin	26	20	77

Source: Unpublished data from the Office of the Municipal Agriculturist, Talugtug, Nueva Ecija.

What is appropriate, especially during El Nino, is the avoidance to plant rice on the second cropping. This is to prevent possible crop failure as experienced in Villa Boado in the second crop of 2001-2002. This happened because of insufficient irrigation water stored in the dam. As presented in Table 3.30, even in Villa Boado where there is a SWIP, about 72 per cent (21.6 ha) of the total irrigated area (30 ha) was damaged. If this is not acceptable, then the association should make all efforts to make sure that the SWIP is operating only to its capacity.

If the planting of rice cannot really be avoided then there must be some modifications made to the cropping calendar. This way the use of water can be maximized. Also, other water conservation measures should be introduced to farmers. If no water conservation is practiced, having the SWIP alone will not be enough.

3.3.4 Prospects and future of SWIPs

In the country, small water impoundments have great potential. The tributaries of the 421 principal rivers of the country could offer the development of these water impoundment structures. Considering the countries' topography, the depressions and inland valleys in between hills in the upland areas are ideal sites for SWIPs. These possibilities are yet to be explored and harnessed.

As of 2000, there were already 268 SWIPs and 888 diversion dams constructed in the Philippines providing supplemental irrigation to a total area of 52,331 ha (Lucas and Contreras, 2001).

Table 3.30 Rice damage (reproductive stage) due to long drought in Talugtug, Nueva Ecija, Philippines, as of April 3, 2002*

Village	Area (ha)	Area affected (ha)	Per cent
Alula	50.0	0.0	0.0
Baybayabas	65.0	33.5	51.5
Buted	34.0	2.0	5.9
Cabaiangan	43.0	9.5	22.0
Casilitan	33.0	5.5	16.7
Cinense	26.0	2.5	9.6
Culiat	195.0	53.5	27.4
Fronza	215.0	40.5	18.8
Maasin	165.0	0.0	0.0
Mayamot I	110.0	3.0	2.7
Mayamot II	49.0	12.0	24.5
Nangabulan	25.0	4.0	16.0
Patola	32.0	4.0	12.5
Saguing	70.0	10.0	14.3
Sampaloc	5.0	0.0	0.0
Saverona	60.0	35.5	59.2
Sta. Catalina	30.0	10.0	33.3
Sto. Domingo	30.0	0.0	0.0
Tandoc	74.0	1.0	1.4
Tibag	15.0	0.0	0.0
Villa Boado	30.0	21.6	72.0
Villa Rosario	14.0	2.5	17.9
Villa Rosenda	44.0	22.5	51.1

*Values in boldface are the project sites.

Source: Unpublished data from of the Municipal Agriculturist, Talugtug, Nueva Ecija, Philippines.

4. Conclusions and Recommendations

4.1 Conclusions

The study showed indications that rainfed agricultural communities are vulnerable to El Nino-induced risk. The occurrence of El Nino-induced abnormal weather caused reductions in farm productivity and income. The study, on the other hand, indicated that the negative impact of El Nino could be minimized if not totally avoided with the implementation of Small Water Impounding Projects (SWIPs).

Individual farmers and the communities under study have benefited from SWIPs. The study, however, also revealed that SWIPs do not guarantee adequate irrigation water for rice during long droughts brought about by El Nino. It also showed the farmers have not yet fully utilized the water from the SWIPs to increase their farm productivity.

At the community and farm-household level, an appropriate and comprehensive support system to increase their level of preparedness in coping against El Nino appears inadequate. The existing coping strategies employed, like charcoal making, cogon gathering and migration, will not contribute to the enhancement of stable rainfed agriculture at the community level.

The provisions of the Agriculture and Fisheries Modernization Act (AFMA) clearly indicate the government's support for water resources and irrigation development and management. However, the study showed indications that Filipino farmer and the concerned institutions mandated to assist them still lack the capacity to mitigate the adverse impacts of El Nino. Adequate resources and proper institutional arrangements are needed by the agricultural communities to respond appropriately to the El Nino-induced abnormal weather.

4.2 Recommendations

Based on the experiences of the rainfed agricultural communities in Talugtug, Nueva Ecija, the Philippines, the following are recommended:

1. Integration of more non-farm-based livelihood components in the package of appropriate and site- specific abnormal weather-related drought mitigating measures.
2. Favorable credit policy and crop insurance. Credit access and crop insurance are two important measures in coping against El Nino.
3. Community-based watershed rehabilitation and protection should be promoted. Gathering of forest products for cash, like charcoal making, should be discouraged. This can be done with the creation of a barangay ordinance on forest protection.
4. Priority for R & D on technologies for water resource conservation and management. The importance of water, whether during El Nino or normal weather is recognized. The national research system should recognize this as a number one priority. Adequate financial support must be given to this commodity. Technologies to be generated or developed should be adaptable to the socio-economic conditions of the small farmers.
5. The Local Government Units (LGUs) and institutions involved in the delivery of support services should have a clear understanding of the needs and problems of the farmers and communities for them to be able to provide appropriate support to cope against the adverse effects from El Nino

Chapter 4

6. Continuous education is necessary for the farmers to be prepared against El Nino.

The methodologies, locations, El Nino impacts and mitigations measures in the Philippines are summarized in Tables 4.1 and 4.2 below.

Table 4.1 Methodologies, locations and El Nino impacts in the Philippines

Approach/methodology	National: Trend analysis Community: Participatory Rural Appraisal, Interview, Case Study
Reference years	1970-2000: Rice and corn production/yield data (National level study) 1997-98: Community level study
Level of analysis	Regional Level: Vulnerability analysis (based production losses on rice and corn) Village Level: Phase II
Crops/animals	Rice (irrigated and rainfed), corn, sweet potato, cassava, potato and peanut
Direct effects	Rainfall reduction
Positive impacts	Farm level increase in rice yield (irrigated)
Negative impacts	Water shortage Consequences of water shortage: Production losses (rice and corn) Reduced household income Temporary migration

Table 4.2 Mitigation measures against El Nino in the Philippines

Level	Time frame		
	Ex ante	Interactive	Ex post
National/ Provincial Community	Awareness campaign Implementation of Small Water Impounding Project	Provision of planting materials	
Farm/household		Cogon grass (<i>Imperata cylindrical</i>) gathering Charcoal making Migrating to other villages/municipalities to harvest rice Rental of pump to access supplemental irrigation from the creek	Working in construction/hired laborers Backyard production of swine Reduce household spending

5. References

- Development Master Plan (2000-2004), Municipality of Talugtug, Nueva Ecija, Philippines.
- FSSRI, 2000a. Participatory Rural Appraisal, Barangay Maasin, Talugtug, Nueva Ecija, Philippines, Farming Systems and Soil Resources Institute, College of Agriculture, U.P. Los Baños, College, Laguna, Philippines. August 2000.
- FSSRI, 2000b. Participatory Rural Appraisal, Barangay Villa Boado, Talugtug, Nueva Ecija, Philippines, Farming Systems and Soil Resources Institute, College of Agriculture, U.P. Los Baños, College, Laguna, Philippines. August 2000.
- Librero, A. D., Decena, F.L.C. and Duran, A.B.C., 1999. Assessment of the Effect of El Niño Phenomenon in the Philippine Agriculture. Socio-economic Research Division, Philippine Council for Agriculture, Forestry, and Natural Resources Research and Development; Department of Science and Technology – Los Baños, Laguna, Philippines.
- Lucas, R.M., Contreras, S.M., Sandoval, T.S. and Garcia, D.P., 2000. Small Water Impounding Project (SWIP) for improvement of paddy soils: The Case of Talugtug, Nueva Ecija, Philippines. Paper presented during the 3rd Annual Meeting and Symposium of the Philippine Soil Science Society and Technology Inc., (Theme: Improved Soil Productivity, A Keystone for Food Security for the Millennium), held at the Philippine Rice Research Institute, Maligaya, Muñoz, Nueva Ecija, 18-19 May 2000.
- Lucas, R.M. and Contreras, S.M., 2001. Status of minor irrigation schemes (Small-Scale Irrigation Projects or SSIPs) development. Paper presented during the 50th Golden Anniversary of the Bureau of Soils and Water Management (1951-2001), College Week, SRDC Bldg., Diliman, Quezon City, Philippines, 9 March 2001.
- PAGASA. <http://www.pagasa.dost.gov.ph/> (March 2003).

Appendix

Table A.1 Land features and soil characteristics of SWIPs in Talugtug, Nueva Ecija

Project site	Buted		Maasin		Sampaloc		Villa Boado	
Portion	Service area	Watershed	Service area	Watershed	Service area	Watershed	Service area	Watershed
Dominant slope (%)	2 to 5	2 to 5	2 to 5	2 to 5	0 to 2	8 to 18	0 to 1	18 to 25
Series	Buted (Bt)	Sn. Fabian (Sf)	Maasin	Annam	Buted (Bt)	Buted (Bt)	Villa Boado (Ba)	Annam
Soil taxonomic classification	Typic Epiaquepts	Typic Ustropepts	Typic Epiaquepts	Typic Haplustalfs	Typic Epiaquepts	Vertic Haplustalfs	Typic Epiaquepts	Typic Haplustalfs
Texture	Clay	Clay	Clay	Clay	Clay	Clay	Clay	Clay
Depth (cm)	200	100-140	200	200	80-140	80-200	90-200	55-200
Parent Material	Alluvium/coluvium	Conglomerates	Alluvium/coluvium	Conglomerates	Alluvium	Conglomerates	Alluvium	Conglomerates
Drainage	somewhat poorly drained	moderate to well drained	poorly drained	well drained	Moderate	well drained	well to imperfect	well drained
pH	7.0-8.0	7.0	6.0-7.8	6.1-6.7	6.2-6.8	5.4-5.6	7.6-8.1	6.6
Fertility	moderate	moderate	moderate	moderate	moderate	moderate	high	moderate

Source: Lucas *et al.*, 2000.

Appendix

Table A.2 Monthly rainfall distribution, Talugtug, Nueva Ecija, Philippines (1971-2000)

Month	Amount (mm)
January	8.4
February	13.1
March	21.6
April	31.7
May	179.1
June	250.4
July	368.4
August	381.9
September	307.3
October	214.6
November	107.5
December	46.8
Annual	1,930.9

Source of data: PAGASA (n.d.)

Table A.3 Distribution of the respondents' age in the project areas

Village	Age in years					Total
	20-30	31-40	41-50	51-70	>70	
Alula-Sampaloc	2	8	7	3	2	22
Buted	6	8	6	4	1	25
Maasin	2	6	8	2	2	20
Villa Boado	3	3	2	6	3	17
Total	13	26	23	15	8	84

Source: Survey data.

Table A.4 Major cropping patterns of Villa Boado, Talugtug, Nueva Ecija, Philippines

Cropping patterns
1. Rice-fallow-fallow
2. Rice-rice-fallow
3. Sweet potato-fallow
4. Cassava-fallow
5. Upland rice + mungbean-fallow
6. Rice-vegetable-fallow
7. Ribbed gourd-fallow
8. Banana
9. Sitao-fallow-fallow

Source: FSSRI, 2000b.

Table A.5 Major farming systems identified in Villa Boado, Talugtug, Nueva Ecija, Philippines

Farming Systems
1. Crop-carabao
2. Crop-carabao-cattle
3. Crop-carabao-swine
4. Crop-swine
5. Crop-cattle-swine
6. Crop-cattle-poultry
7. Crop-carabao-poultry
8. Crop-poultry
9. Crop-swine-poultry
10. Crop-cattle
11. Crop-carabao-cattle-swine-poultry
12. Crop-cattle-swine-poultry

Source: FSSRI, 2000b.

Table A.6 Distribution of the respondents' educational attainment in the project areas

Village	Educational attainment					Total
	Elementary		Secondary		Vocational	
	Grade 4 and below	Grade 5-6	1st and 2nd year	3rd and 4th year		
Alula-Sampaloc	4	9	1	7	1	22
Buted	2	9	3	10	1	25
Maasin	3	7	1	9	0	20
Villa Boado	2	6	3	4	2	17
Total	11	31	8	31	4	84

Source: Survey data.

Table A.7 Distribution of the respondents' land holdings in the project areas

Village	Land area (ha)					Total
	None	0.25-0.5	0.51-1.0	1.01-5.0	>5.0	
Alula-Sampaloc	2	3	4	12	1	22
Buted	2	2	4	13	4	25
Maasin	0	4	5	11	0	20
Villa Boado	0	0	9	5	3	17
Total	4	9	22	42	8	84

Source: Survey data.

Appendix

Table A.8 Distribution of non-farm income sources of the SWIP beneficiary respondents at the project areas¹

Source	Village			
	Alula-Sampaloc	Buted	Maasin	Villa Boado
1. Charcoal making	1	4	2	-
2. Cogon gathering	1	2	4	10
3. Ranching	1	-	-	-
4. Animal raising	2	1	1	2
5. Fuelwood gathering	-	1	-	-
6. Vegetable selling/vending	-	-	2	-
7. Tricycle driving	-	1	-	-
8. Salaries and wages ²	2	4	1	3
Total	7	13	10	15

¹Multiple answers.

²construction, security guard, carpentry, plumber, ranch caretaker, teacher, mechanic and factory worker.

n = 53

Source: Survey data.

Table A.9 Distribution of non-farm income sources of the non-SWIP beneficiary respondents at the project areas¹

Source	Village			
	Alula-Sampaloc	Buted	Maasin	Villa Boado
1. Cogon gathering	2	1	6	1
2. Charcoal making	-	1	3	-
3. Fuel wood gathering	-	1	-	-
4. Animal raising	-	-	2	2
5. Salaries and wages ²	3	-	-	-
Total	5	3	11	3

¹Multiple answers.

²carpentry, tractor operator and tailor.

n = 31

Source: Survey data.

Table A.10 Rainfall deficit (mm) during the 1997-98 El Nino episode, Talugtug, Nueva Ecija

Month	Normal (1971-2000)	1997	1997 Deficit	1998	1998 Deficit
January	8.4	12.6	-4.1	20.9	-12.5
February	13.1	11.6	1.5	T	n.a.
March	21.6	7.0	14.6	3.0	18.6
April	31.7	151.5	-119.8	3.8	27.9
May	179.1	323.7	-144.6	164.4	14.7
June	250.4	133.8	116.6	164.6	85.8
July	368.4	268.3	100.1	217.2	151.2
August	381.9	445.2	-63.3	329.7	52.2
September	307.3	235.1	72.2	377.1	-69.8
October	214.6	21.6	193.0	412.1	-197.5
November	107.5	9.2	98.3	45.8	61.7
December	46.8	3.0	43.8	185.6	-138.8
Annual	1,930.9	1,622.6	308.3	1,924.2	6.7

Source of data: PAGASA (n.d.)

T- Trace amount n.a. – not applicable

Table A.11 Average annual income (US\$) of SWIP beneficiaries during normal and El Nino years

Barangay	Normal Year			El Nino Year		
	On Farm		Total	On Farm		Total
	Rice	Others*		Rice	Others*	
Alula	1,194		1,194	-239	148	-91
Buted	1,173	322	1,594	413	231	645
Maasin	498	317	815	98	317	415
Villa Boado	1,040	298	1,338	22	161	250
Average	976		1,235	74		305

*crop production (pole sitao, squash, mango), livestock production (cattle, goat, swine, carabao), duck egg production.

**hired farm worker, tractor operator, cogon gatherer, fuel wood gatherer, charcoal maker, sound system operator, carpenter, honorarium (barangay official), plumber.

Note: US\$ 1 = PhP 35.1819 (average of 1997 and 1998).

Source: Author's estimation based on survey data.

Appendix

Table A.12 Average annual income (US\$) of non-SWIP beneficiaries during normal and El Nino year

Barangay	Normal Year			Total	El Nino Year			Total
	On Farm		Others**		On Farm		Others**	
	Rice	Others*			Rice	Others*		
Alula	489	24		512	207	20	401	627
Buted	772	186	177	1135	264	96	464	824
Maasin	608			608	318		178	496
Villa Boado	563	64	21	648	-99	150	333	384
Average	608	24		726	173			583

*crop production (pole sitao, squash, mango), livestock production (cattle, goat, swine, carabao), duck egg production.

**hired farm worker, tractor operator, cogon gatherer, fuel wood gatherer, charcoal maker, sound system operator, carpenter, honorarium (barangay official), plumber.

Note: US\$ 1 = PhP 35.1819 (average of 1997 and 1998).

Source: Author's estimation based on survey data.