Participatory Policy Development for the Lowland Rainfed Rice-Based Farming Systems Towards Sustainable Agriculture and Rural Development

A Case Study of Nueva Ecija, Philippines

ANGOC
Asian NGO Coalition for Agrarian Reform and Rural Development

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Central Luzon State University (CLSU)

Farming Systems and Soil Resources Institute, University of the Philippines, Los Banos (FSSRI-UPLB)

Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD)

Food and Agriculture Organization of the United Nations (FAO-UN)

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List of Abbreviations

AFMA – Agriculture and Fisheries Modernization Act
ANGOC – Asian NGO Coalition for Agrarian Reform and Rural Development
ARCs – Agrarian Reform Communities
BAS – Bureau of Agricultural Statistics
BSWM – Bureau of Soils and Water Management
CARP – Comprehensive Agrarian Reform Program
CLOA – Certificate of Land Ownership Award
CLSU – Central Luzon State University
CLT – Certificate of Land Transfer
CSOs – Civil Society Organizations
DA – Department of Agriculture
DAR - Department of Agrarian Reform
DENR – Department of Environment and Natural Resources
DOST – Department of Science and Technology
EP – Emancipation Patent
FAO – Food and Agriculture Organization
FAO-Manila - Food and Agriculture Organization Manila Office
FGDs – Focused Group Discussions
FPA – Fertilizer Pesticide Authority
FS – Farming systems
FSSRI-UPLB – Farming Systems and Soil Resources Institute, University of the Philippines, Los Baños
GAP – Gintong Ani Program
GDP – Gross Domestic Product
GNP – Gross National Product
GO – Government organization
GPEP – Grains Production Enhancement Program
GVA – Gross Value Added
Ha - Hectare
HDI – Human Development Index
IPM – Integrated Pest Management
IRRI – International Rice Research Institute
KIIs – Key Informant Interviews
LEISA – Low External Input on Sustainable Agriculture
LGC – Local Government Code
LGU – Local Government Unit
MTPDP – Medium Term Philippine Development Plan
NEDA – National Economic and Development Authority
NFA – National Food Authority
NGA – National Grains Authority
NGO – Non-government organization
NIA – National Irrigation Administration
NSCB – National Statistics and Census Board
NSO- National Statistics Office
NWRB – National Water Resources Board
PA 21 – Philppine Agenda 21
PCARRRD – Philippine Council for Agriculture, Forestry and Natural Resources Research and Development
PCSD – Philippine Council for Sustainable Development
PhlRICE – Philippine Rice Research Institute
PRRM - Philipppine Rural Reconstruction Movement
PSC – Project Steering Committee
PSSD – Philippine Strategy for Sustainable Development
RPEP – Rice Productivity Enhancement Program

RT – Research Team
SA – Sustainable Agriculture
SARD – Sustainable Agriculture and Rural Development
SARD-FSE - Sustainable Agriculture and Rural Development-Farming Systems Evolution
SEARCA – South East Asia Regional Center for Graduate Study and Research in Agriculture
SFR – Small Farm Reservoir
SFS – Selected Farming System
STW – Shallow Tube Well
SWIP – Small Water Impounding Project
UNCED – United Nations Conference on Environment and Development
WSSD – World Summit on Sustainable Development

Preface

After fifty years, farmers in lowland, rainfed areas in the Philippines remain impoverished. Many of these lands remain unirrigated and underdeveloped. Both the farmer population and agricultural lands are facing extinction with such low economic returns offered by farming. The farmer either gives up tilling the land completely or sells his land to prospectors. Outmigration to the urban areas or even abroad, mostly by women, has become the best way out of this vicious cycle of poverty.

This gives a general picture of the findings of this study on lowland rainfed rice-based farming system. Nueva Ecija was selected given its long rice-farming history to cover the timespan of the study. The study ran for almost two years from 2003 to 2004.

ANGOC conducted this study, with the support of the Food and Agriculture Organization (FAO), to strengthen its call that sustainable agriculture is the viable alternative for resource poor farmers. Although the results of the study depict a disturbing scenario, we at ANGOC believe this is a powerful tool in urging governments to step up its support for such neglected areas in Philippine agriculture. The study also helps us present how sustainable agriculture is the best hope for the farmer in a lowland rainfed area with lower costs of inputs needed to sustain farming activities and better yield in time.

This study is part of the process of ensuring the relevance and effectiveness of ANGOC's work. It is intended to provide recommendations on how ANGOC can help call for the improvement of policy and programs in support of the small impoverished farmer.

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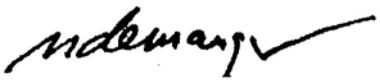
Sgd.



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EXECUTIVE SUMMARY

I. RATIONALE

Global interest in Sustainable Agriculture and Rural Development (SARD) has increased in recent years, along with the growing recognition of the dynamic and complex nature of the challenges facing rural areas and their communities. Yet, the means for assessing policy, change and options for the future are often lacking for decision-makers operating at the local, territorial, national and regional levels. Developing countries are also often confronted with shrinking resources and dramatic demands to increase food security, to alleviate poverty and to conserve natural resources and the environment. (FAO, 2003)

The Sustainable Agriculture and Rural Development – Farming Systems Evolution/ SARD-FSE Project (GCP/INT/819/MUL) was originally conceived and initiated by the Food and Agriculture Organization (FAO) in 2002. The overall stated objective of the SARD-FSE Project is *"to increase national capacity to prepare and implement SARD policies and thereby strengthen the participation of concerned stakeholders and targeted beneficiaries."* To achieve this objective, FAO initiated the conduct of case studies in selected developing countries, through which the institutional, social, economic and environmental factors influencing the evolution of farming systems towards SARD could be analyzed. (FAO, 2003)

II. METHODOLOGY

The Philippine Study on SARD/ Farming Systems Evolution seeks to examine macro and micro trends in the evolution of rainfed, lowland rice-based farming systems – driving forces, effects and responses – in three levels: *national* (Philippines), *territorial* (a province) and *farming systems* level (sample household in selected sites).

The key question addressed was *"Is the rainfed, lowland rice-based farming system in the Philippines sustainable?"* For the people who depend on the lowland, rainfed rice-based system, what can be done and by whom to make more sustainable towards rural development. What are the key priorities for policy and institutional interventions to accomplish this.

For this Study, two types of scenarios have been developed and described: (a) an *"anticipatory"* (status quo) scenario, or a projection of *what is likely* to happen if current trends continue; and (b) a *"better"* (what if) scenario, or a projection of *what could happen* if realistic interventions are done and the situation improves.

Selection of the province of Nueva Ecija as the "territory" for this study was *purposive*. Within Nueva Ecija province, two adjacent municipalities – *Guimba* and *Talugtug* – were selected as the farming systems sites for study. Moreover, three barangays (villages) – two rainfed areas and one irrigated area were further selected - . These barangays are *Villa Rosenda, Talugtug* (rainfed), *San Miguel, Guimba* (rainfed), and *Triala, Guimba* (irrigated). The inclusion of an irrigated area (Triala) was done for purposes of comparing irrigated with rainfed areas, and for assessing community changes as the rice farming system evolves from rainfed to irrigated.

The Research Team relied mainly on the use of published and unpublished secondary sources. Existing data gaps, especially historical data at barangay and municipal levels were researched through key informant interviews (KIIs), in-depth household interviews and focused group discussions (FGDs). A total of 52 respondents from Guimba and Talugtug were interviewed.

III. RESULTS AND DISCUSSION

Characterization and Diagnosis of the Farming System

Socio-economic factors in rainfed rice base farming systems

The two *dominant* farming systems in the study sites are "rice-rice" for irrigated areas, and "rice-fallow" for rainfed areas. In Talugtug, only 19.28% of the entire municipal agricultural area is currently irrigated and brought under cultivation during the dry season; the remaining 80% of the area is generally left idle during eight months of the year. Palay is the main municipal crop, while cassava, corn, onion and garlic are minor secondary crops. During the dry season, onions and garlic are planted commercially for the less irrigated areas; however, these cover only nine hectares out of the total 5,474 non-irrigated, palay-producing areas. During the dry season, some farmers also plant a variety of vegetables, but these are mainly produced in backyard gardens, and are not of commercial quantity. Instead, vegetables are cultivated mainly for household consumption and sometimes for vending among neighbors within the same barangay.

Low incomes from rainfed rice farms. Because of their dependence on a single annual rice crop, farm incomes are low. Key informant interviews reveal that rainfed farmers with a single rice cropping earn only about PhP 10,000 – PhP 12,000 per year from farming. On the other hand, those farmers with irrigation and manage two croppings, earn from PhP 40,000 to PhP 180,000 per year from rice farming alone.

Total annual household incomes range from a very low of PhP 29,682 for a "rice-fallow" farming system to a high of PhP 779,752 for a "rice/vegetables – rice/livestock and poultry" farming system. This indicates the relative significance of double cropping of rice and the integration of livestock and poultry in the farming system.

Proportion of non-farm incomes. The study found that a significant proportion of the annual household income of farming households actually comes from non-farm sources. These account for a low of 13% to a high of 90% of total household incomes. Nonetheless, the usual share of non-farm income to total household income is about 50%.

Interest rates from banks ranged from 30-40% per annum. Yet, as most rice farmers have unpaid production loans and land amortization dues with the Land Bank, they are rendered ineligible for bank loans. Thus, most farmers resort to informal sources. Input dealers charge higher interest rates at 30-60% per annum. Traders charge the highest interest rates at 60-90% per annum. The existing norm is 30% for a 4-month rice-cropping season. Effective interest rates are even higher if the source of credit is a palay trader, because loans must be paid in kind (in palay, or unhusked rice) at prices dictated by the trader.

Marketing outlets. Traders serve as the major market outlet of the farmers, particularly for the rice produce. There are farmers who sell their produce directly to the rice mill or buying stations. For vegetables, the usual markets are traders, buying stations, and the public market.

Off-farm work. Off-farm work opportunities are limited. In Talugtug, rainfed farming households seek off-farm employment *within* the barangay during the dry season. They engage in charcoal-making, *cogon* grass gathering (for rooftops & livestock grazing) and cogon grass handicrafts. Charcoal-making is practiced in 9 out of the 28 barangays. About 10 women in the barangay are currently engaged in cogon handicrafts-making, based on training received from the local Department of Trade and Industry. Some farmers also seek work as *arawan* (daily wage) workers in nearby irrigated farms.

In Guimba, where rainfed farmers have no access to (pasture or forest) public lands, the option for off-farm employment during the dry season work is limited mainly to finding daily wage work in irrigated farms.

Non-farm work. The employment pattern among the rainfed farming communities in both Talugtug and Guimba is for household members tend to seek temporary and seasonal work outside the municipality during the dry season. Since the rice-cropping period is between July to October, the trend is for family members to seek outside work (temporary migration) for the six-month period of January to June. Men work mainly as carpenters and construction workers in Manila – since the construction industry in urban areas also tends to peak towards the dry/ summer season. On the other hand, women tend to find jobs mainly as domestic helpers in Manila; others work as market vendors and storekeepers, casuals and factory workers in Nueva Ecija and neighboring provinces. Remittances are a major source of year-round household incomes and cash flow within the municipality. As mentioned, about half of farming household incomes come from non-farm employment.

Seasonal and permanent employment. Given the nature of outside non-skilled and semi-skilled work available, men usually take on *seasonal* jobs, while the women tend to take on *semi-permanent* employment. Thus, during the off-season, men usually visit their families about once every month, while women (especially domestic helpers and factory workers) are able to visit their

families only once a year. Because of women's traditional role in the family, the general preference is for women to seek alternative income sources within the community or vicinity.

Also, an estimated 5-10% of farming households in rainfed areas have members who work abroad, mainly in the Middle East. They send substantial remittances home, which tends to support both nuclear and extended families.

Education as the main pathway out of poverty. To most farming families, the education of children is seen as the main pathway out of poverty, and parents take every effort to send their children to school. Being able to send a child through high school or vocational school through farming is considered as a major achievement and source of pride. Among desperately poor families, however, the eldest sibling usually drops out of school early to assist as the second breadwinner for the family. Elder boys usually assist the father in farmwork, while elder daughters assist in housework or seek work elsewhere, usually as domestic helpers. The additional incomes remitted by elder children are then used to send younger siblings to school – to finish high school, or to pursue a post-secondary vocational course. The ultimate "dream" is for the children to find regular wage employment, or to land in a higher-paying job abroad, to enable them to send regular remittances home. Thus, early marriages by educated children are often met by parental disappointment.

Inheritance to children and the parcelization of farmlands. Under inheritance laws, the spouse is entitled to half of the estate, while children divide the other half equally among themselves. In the case of Nueva Ecija's rainfed rice farmers, however, the practice has been to distribute farm parcels to children once they get married, with priority given to those children who are directly dependent on farming. Thus, the tendency is to pass on farm parcels to sons who are directly engaged in farm work, or to daughters who marry farmers. As farmlands are divided among children, farms have become smaller and fragmented. However, there is no new data available on actual farm sizes. The last agriculture census was conducted in 1991, and a new agriculture census is currently being conducted in 2003. Based on farmer interviews, however, the stated average farm size per farmer is currently about one hectare.

Pawning of lands. In Talugtug and Guimba, the practice of pawning farmlands (*"sangla"*) to access informal credit appears rampant. By one estimate, about 30% of rice farmers in Barangays San Miguel and Triala in Guimba have portions of their farmlands under mortgage in the current cropping season. Furthermore, it is estimated that almost all CLT and EP holders have had portions of their land pawned to informal moneylenders at one time or another. This reveals a high level of farmer indebtedness. However, no written records exist on such loan transactions; these are largely informal. Also, because most farmlands are still under CLT amortization with the Land Bank, the sub-mortgaging of these lands is deemed illegal under the law. Hence, the preferred local term used for pawned lands is *"hiram"* (or "borrowed" lands).

The current going rate is PhP 40,000-60,000 for one-half hectare of riceland, redeemable after two years at a fixed 30% interest rate on the principal. Irrigated lands that allow two cropping seasons per year fetch higher prices under similar loan arrangements. The moneylender meanwhile acquires full control and use of the land until the loan is fully repaid.

The three common reasons for pawning lands, in cited order of importance are: (i) sickness or death in the family; (ii) to support a family member to work abroad; and (iii) to support the education of children. The first is need-driven, while the latter two are opportunity-driven. Losses due to crop failure do not seem to be a direct reason for pawning lands, as these are deemed as "natural occurrences". However, accumulated debts due to successive crop failures and other causes do seem to be a reason for pawning lands.

During FGDs, farmers said that they are able to redeem their lands if the loan has been used to send a family member to work abroad, or if a family member is currently working abroad. They refused to comment on other cases, although it can be surmised that such land mortgages are unlikely to be redeemed, given the current low family income levels among rainfed farmers.

Landlessness. Estimates of landless households in the three barangays are 30% for Bgy, Triala, Guimba (irrigated), and 10% for Bgy. San Miguel, Guimba and Bgy. Villa Rosenda, Talugtug (rainfed). One observation among farmers is that there is a greater tendency for seasonal in-migration among landless workers towards irrigated areas (e.g., Bgy Triala) because of the higher labor demand, and the presence here of more diverse farming systems. Sometimes, landless migrants settle or inter-marry in the local community. On the other hand, there is a greater tendency for families to out-migrate from rainfed areas (e.g., Bgy Villa Rosenda).

Diagnosis of the farming system related to SARD

Problems cited by farmers. Farm production-related problems commonly encountered by the farmers are the occurrence of natural calamities (such as typhoons) and the incidence of pests and diseases. High price of inputs was also perceived as a problem, resulting to lower farm profitability. The absence of irrigation facilities was also cited as a problem among rainfed farms in barangay San Miguel.

Marketing-related problems include low farm gate price and the dependence on traders as the main market outlet. In terms of credit, the farmer-borrowers cited the high interest rates, particularly among those who obtained loans from informal sources.

Low incomes. During the FGDs and validation workshop, farmers themselves estimated their net incomes at only about PhP 10,000 per hectare in rainfed rice areas. Among farmers with irrigation, the estimated profits are PhP 10,000 per hectare during the wet season and PhP 20,000 per hectare during the dry season. Net profits from rice farming tend to be much higher during the dry season, due to: (a) the higher average yields (photosynthetic effects on the crop), (b) lower yield losses (no typhoons, flooding or drying & storage problems), plus (c) the higher farmgate prices (lower seasonal supply, higher market demand).

Social impact of out-migration. Because of their inability to farm during the dry season, and lack of local employment opportunities, family members in rainfed areas are forced to seek seasonal or regular employment elsewhere. Farmer- respondents mentioned that usually, it is the women who find outside employment. Also, while men seek *seasonal* employment, the women tend to find more *regular* non-farm employment outside the community. This pattern of seeking non-farm employment

outside the community appears to be more pronounced in *rainfed* rather than in irrigated areas, and involves more the *women* than the men.

Farmers limited access to technologies and other forms of assistance. Results of the focus group discussions (FGD) and Key Informant Interview (KIIs) in Guimba and Talugtog showed that the gains from the devolution of powers from the national to the local governments, as a result of the Local Government Code of 1991, are mere trickles from the point of view of farmers. Although the LGUs have had remarkable autonomy in terms of extension work, farmers have yet to reap the significant benefits of such autonomy.

Limited training programs for farmers. Other than their direct access to information. Education and communication (IEC) materials, farmers rely on S and T institutions and LGUs for training opportunities. According to them, since the stint of Masagana 99 and Samahang Nayon, the farmers have not attended much of the government-sponsored training related to agriculture.

Problems related to technology adoption. The farmers also lament that they could not practice what they have learned from the trainings they attend. For instance, PhilRice and CLSU trained the Guimba and Talugtog farmers on a new technology, the hybrid rice program, purportedly to increase rice yield. They now say that the procedures are too difficult to follow and the financial requirements are beyond their means.

Limited instructional materials from government institutions. The dearth of information materials in Filipino is also a problem of the farmers. On their own, they search for information and assistance from various sources. They used to go to the office of the municipal agriculturist and other agencies like the Department of Agriculture (DA) office and the Philippine Rice Research Institute (PhilRice) to ask for IEC materials.

Reasons for continuing rice farming. Despite the low incomes derived from rice farming, farmers continue to focus on rice as their main crop. From FGDs, farmers indicated their preference for rice, due to the following:They have grown accustomed to rice farming *(“nakaugalian na”);*To ensure food security for the family and rice has a longer shelf-life, unlike fruits or vegetables. Unsold stocks can be saved for family consumption.Finally, soil quality and farm conditions are still deemed best for rice cultivation.

Drought. Drought is considered as a more serious problem in both municipalities of Guimba and Talugtog. Farmers observed that there is more drought occurrence at present than in the 1950’s. This associated with the changing climate pattern. Farmers relayed that for every 10 years there would normally experience drought for 2 years.

Soil fertility. Under the rainfed lowland rice environment where only one rice crop is grown per year, soil acidity was not observed as a serious problem since soils were either left fallow or planted with upland annual crops (ampalaya, watermelon, etc.) during the dry season. This practice allowed the field to be aerated thus the problem in soil acidity is not severe.

Water quality. At present major source of irrigation for crops and water for domestic consumption in Guimba and Talugtog were shallow tube wells. Compared in the 1950's or 60' where water can easily be extracted from a depth of 6 meters in Guimba and 9 meters in Talugtog now farmers have to bore shallow tube wells up to 36 meters depth in Guimba and 15 meters in Talugtog. This can be attributed to low ground water recharging due to deforestation and the many users of shallow tube well.

Income potentials of on-farm diversification. Farming systems that exist in the area are mainly rice–based, with the integration of backyard production of livestock and poultry

Annual household incomes of farmers vary greatly by farming system. Results of key informant interviews showed annual household income ranging from a very low of PhP 29,682 for a rice-fallow farming system to a high of PhP 779,752 for rice/vegetables – rice/livestock and poultry farming system. This indicates the relative significance of double cropping of rice and the integration of livestock and poultry in the farming system.

A significant proportion of the annual household income already comes from non-farm sources, ranging from a low of 13% to a high of 90%. Nonetheless, the usual share of non-farm income to total household income is about 50%.

Evolution and major changes of the rice based farming system in the country

Four phases. The long term evolution of rice production in the Philippines is characterized by peaks and dips. The trends in rice production, cultivated rice area, and rice yields are related to population growth, technological changes, relevant laws, policies, programs and institutions. In this respect, the evolution can be categorized into four distinct phases: Phase 1 – 1900-16; Phase 2 – 1917-60; Phase 3 – 1961-86; Phase 4 – 1987- the present

The first phase, 1900-1916, was characterized by a very unstable rice farming system as indicated by the wide fluctuations in production volume and yields. This was caused by the frequent occurrence of the El Niño, with four episodes for the period 1902-1915; and the transition stage from the country's liberation from Spain to the next colonizers, the Americans. During the period 1900-1916, rice production grew by 1.78% as a result of the 2.62% increase in yield. The land area grown to rice contracted to -0.4%. The production growth was insufficient to meet the country's food supply, and rice imports averaged 24.2% of the total production volume. Water was then the limiting factor, and irrigation development was seen to be the solution. Hence, the Irrigation Act of 1912 was passed; this Act however, benefited the latter part of the American rule.

The second phase, 1917-1960 was quite a stable phase, except during the 1940-45 war periods. This phase was characterized by static (non-increasing) rice yields, and a fairly increasing production, achieved mainly through expansion of cultivated rice area.

The third phase, 1961-1986 was characterized by the rapid increments in both production volume and rice yields, brought about by the Green Revolution; and a decreasing land area planted to rice.

The fourth phase, 1987 to the present, showed small increases in rice yields and volume of production as a result of environmental degradation and the limiting government resources to support agriculture. During this phase, budgets for agriculture have become limited due to the budget deficits, because of the high foreign debts, which swelled from the Marcos administration through the succeeding administrations.

In general, programs and policies of government had always been reactionary to adverse situations and negative factors that impinge upon food security initiatives. Any unforeseen negative consequences were then patched up by new policies. It has never been pro-active. Policy development and implementation for rice had been a trial-and-error cycle. Before a law or policy is enacted, the issue at hand would have become stale, and another new problem would have already arisen. Thus, in between the policy formulation and its implementation, the growth of the industry would have been compromised.

The future scenario of the rainfed lowland rice farming system

The scenarios here refer to storylines, or a series of emerging events and driving forces that cause change, to describe images of the future or alternative futures for the society and the environment. Scenarios start with the current base year and have a time horizon and steps depending on the subject, objectives and information available. For this study as stated in the methodology two types of scenarios have been developed and described: (a) an "anticipatory" (status quo) scenario, or a projection of what is likely to happen if current trends continue; and a "better" (what if) scenario, or a projection of what could happen if realistic interventions are done and the situations improves. The following scenarios are the results of the three scenario building activities with different stakeholders from farmers, support groups and policy makers in the farming systems, territorial and national levels.

ANTICIPATORY SCENARIO

Economic

- The economic situation of rainfed and irrigated areas will likely remain the same.
- Women will leave because more opportunities await them outside the farm. They will instead become domestic helpers, sales ladies, and factory workers in the urban areas.
- Farms will continue to decrease in size.
- Farming production costs continue to increase; while incomes continue to decrease.
- Prices of palay will drop because of the influx of imported rice; increased supply of imported rice will eventually make it cheaper and local rice prices might drop as well.
- Monocropping will continue – rice-rice and rice-fallow
- Multiple financing sought by farmers from different loan sources for production costs causes poor loan recovery of small farmers.

- Lack of investment in agriculture

Institutional

- Budget for agriculture will still decrease because of non allocation of funds to AFMA and low appropriations in Local Government Units.
- Local agricultural offices will be abolished because of the limited resources allocated by the local government units .
- Policies and programs will not be appropriate for farmers.
- Policies will not change. There will very small differences between governments.(old and new administrations)
- There will be no subsidy in relation to the liberalization of rice.
- Budget for research and extension is still inadequate.
- Research results lack application and does not respond to the needs of the farmers.
- Lack of extension services for farmers.
- No sustainable agriculture program

Environmental

- Land size is also decreasing as more land becomes converted into residential and commercial lots and subdivide their farms among their many children.
- There may be an increase in the number of Shallow Tube Wells (STWs). The water table continues to be low, and will become even lower in the rainfed areas
- Increase demand for water
- Our mountains becoming denuded
- Creeks will dry up.
- The soil will continue to become acidic as more chemical fertilizers will be used. Fertility of the soil will decrease. Chemical use on farms will eventually decrease yield.

Social

- For the rainfed areas, more farmers will grow discontent due to small returns in farming and will leave.
- Farmers will generally become older because the youth will prefer not to farm, especially those who are educated.
- The role of women does not change overtime.
- Farms will either mortgage or sold if farmers are to depend solely on rainfed.
- Only the rich people will own land because they are the only ones with buying capability.
- There will be land conversion.
- Farmers will no longer be able to send their children to school.
- Children will have to work at an early age. They will have to work as domestic helpers, factory workers, and other possible sources of livelihood away from the farm.
- Because of small returns, farmers may possibly search for other jobs elsewhere.
- There will be an increase of families and children dependent on the land.
- Population is increasing
- Great possibility of increase in out migration rates.

EXPLORATORY SCENARIO

Economic

- The government will find a way to irrigate the uplands.
- Farmers will be hi-tech; all steps of farming, from land preparation to harvesting, will be mechanized, maybe even up to the milling process. Income and production will increase. People will be extravagant because of the new technology and the benefits it brings.
- Tight competition in business. Prices of other countries will fall and farmers suffer more; rich countries will compete with each other.
- A technology package that is affordable to farmers (doable and affordable if needed is available.
- More farm to market roads are constructed
- Postharvest facilities-solar dryer, thresher-mobile rice mill-are complete.
- Market linkages/integration for farmers

Institutional

- Join together agencies that are similar in terms of programs, such as DAR, DA, PhilRice,etc. in order to save money
- Presence of established and stable cooperatives.
- Good partnership between different sectors and agencies including the government and NGOs
- A great need for more and better extension as well as information and technology promotion for agriculture. Effective strategies should be formulated and implemented to improve the dissemination of agricultural extension and information.

Environmental

- Implementation of complete organic farming program
- Restoration of watersheds

Social

- Because farmers depend only on their farm, farmers should learn to improve the conditions of their farms.
- More financial and technical assistance to farmers.
- Have better or flexible provisions for the small farmers especially those coming from rainfed areas.
- Counter the trend of out migration from farming communities
- Well informed farmers on DA programs.
- Moratorium on Land conversion
- More Livelihood projects for women

- Different institutions provide assistance and give farmers useful information on how to increase production.
- Women can help farmers by preparing their food, taking care of their children, engaging in family planning to help prevent population explosion, returning to the farm to sow, and harvest rice.

IV. SUMMARY AND CONCLUSIONS

An assessment of the trends in the evolution of the rainfed lowland rice farming system gave the following conclusions in terms of the properties of an agroecosystem, namely: productivity, stability, equitability, and sustainability.

A. Productivity:

There are still two other biophysical factors, which offer a large room for development - the country's water resources, and crop improvement.

There had been a continuous development of irrigation systems since the 1900s. However, the rate of development slowed down in the recent past due to financial constraints. Thus, from 25,000 ha during the Spanish regime, the irrigated area increased to about 87,000 ha during the American regime (1900-1946); to 663,000 ha at the time of NIA's establishment in 1964; doubled to 1.4 million ha towards the end of the Green Revolution in 1985; reached a peak of 1.5 million ha in 1993; and declined thereafter to 1.2 million ha in 2002.

In response to the decline in irrigation development and the consequent decline in irrigated area, the AFMA revived the government's priority to irrigation as an important input to production. The AFMA targets to irrigate some 1.4 million ha of rainfed areas at the end of 10 years through the following scheme: to increase the irrigated area by 100,000 ha/year for the first and second year, with 10% incremental increase from the third to the tenth year; and 200,000 ha/year thereafter. It is also projected that 90% of these newly irrigated areas will be served by the STWs and LLPs; the rest will be irrigated by the SWIPs, SFRs, NISs, and CISs (David, 2003).

On tapping the rice crop's full potential, the new developments in rice varietal improvement, indicated that hybrid rice could a bright outlook for increasing rice production. The current average rice yield of 2.9 t/ha is only 24% of 12 t/ha potential yield of hybrid rice. **Another technique for improving the crop's performance is through crop diversification and integrated farming system involving both plants and animals into one system, the crop's performance and the productivity of the whole farm are enhanced, ecological balance is achieved and increased income of the farmers.**

B. Stability

This stability of the lowland rice farming system could be attributed to the ability of farmers to make remedies through their own ways and means, the support services and policies of the

government in addressing problems of the industry (although tainted with graft and corruption), the technological developments in varieties, fertilizer, irrigation, farm machines, and the environment-friendly farming techniques, such as multiple cropping, intercropping, crop diversification, organic farming, and integrated pest management.

However, a foreseen major man-made threat to this stability is the continuing conversion of rice lands into other uses. In the past until the present, although there are land use policies and land use plans at hand, it was apparent that the government does not have much control over the landowners' decision on the use of their lands.

C. Equitability

In subsistence farming, where the farmer is the producer, and also the consumer, there is less intervention of external market forces, thus, there is more equitability. But in commercial farming, the traders, landowner-capitalists, and money-lenders get most of the benefits. To address this problem, the cooperative system was developed during the Marcos regime; however, success had been insignificant. Thus, making the cooperative system work poses to be a great challenge in addressing equitability.

D. Sustainability

It can be inferred from the trends that the issue of equitability poses as a major constraint to sustainability. It was observed that increasing the productivity through technological means was easier to achieve than by addressing the social issues and constraints to productivity, such as the skewed equitability. There are sure technological answers to low productivity, but there are no fixed answers to equitability. Therefore, the major challenge ahead for achieving sustainability and rural development is achieving social equitability first.

V. RECOMMENDATIONS

In order to enhance the rural growth and increase competitiveness of key agricultural commodities the following interventions are recommended:

1. Increase agricultural productivity by means of adoption of new cultivars by the farmers or users; explore other sources of irrigation water; generate more technology on water management and alternative cultural practices to improve soil fertility; strict implementation of land conversion laws and implement and alternative livelihood systems for farmers in the rainfed areas; introduce crop diversification and mixed cropping and increase farmers access to agricultural resources and support services.

2. Increase investment in agriculture in order to enhance the development of infrastructure for agriculture such as: irrigation, farm to market roads, post harvest; information and communication technology;

3. For the government to review it trade policy and market linkages specifically the standard and rationalization of transport policies including policy that will provide credit support to organic rice and organic vegetables producers; promote political commitment & continuity of good projects and professionalize the government external relations.

4. Strengthen peoples organization capability and capacity to undertake their own development and as conduits of government programs and projects; and by providing strong financial support to local organizations

5. Implement a farmer extension/education program by means of developing the capability of farmer volunteer or farmer scientist as extension/change agents for effective technology transfer and establish community/farmers information and technology shelters/training centers.

CHAPTER 1

Organization and management of the case study in the Philippines

Brief project background

1. Global interest in Sustainable Agriculture and Rural Development (SARD) has increased in recent years, along with the growing recognition of the dynamic and complex nature of the challenges facing rural areas and their communities. Yet, the means for assessing policy, change and options for the future are often lacking for decision-makers operating at the local, territorial, national and regional levels. Developing countries are also often confronted with shrinking resources and dramatic demands to increase food security, to alleviate poverty and to conserve natural resources and the environment. (FAO, 2003)

2. The Sustainable Agriculture and Rural Development – Farming Systems Evolution/ SARD-FSE Project (GCP/INT/819/MUL) was originally conceived and initiated FAO in 2002. The overall objective of the SARD-FSE Project is *"to increase national capacity to prepare and implement SARD policies and thereby strengthen the participation of concerned stakeholders and targeted beneficiaries."* To achieve this objective, FAO initiated case studies in selected developing countries, through which the institutional, social, economic and environmental factors influencing the evolution of farming systems towards SARD could be analyzed. (FAO, 2003)

Philippine SARD-FSE project

3. In December 2002, four local institutions, namely – the Asian NGO Coalition (ANGOC), Farming Systems and Soil Resources Institute of UP Los Baños (FSSRI-UPLB), SEAMEO Regional Center for Graduate Study (SEARCA), and the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) – were first approached by FAO regarding the SARD-FSE Project. A joint proposal submitted to FAO in February 2003, and later approved in principle by the Organization, laid down the basis for the organization and management of this country study. A contract was formally signed between FAO and ANGOC as the lead institutions on 31 March 2003 for the implementation of the project in the Philippines.

4. After conducting of the First SARD-FSE Team Leaders Meeting in the Philippines in March 2003, the project was formally launched in three pilot countries, namely: (a) *Honduras:* study of traditional maize-bean farming systems; (b) *Mali:* study of cereals and tubers in dry land ecosystems; and (c) *Philippines:* study of lowland, rainfed rice farming systems. The selection of these three countries and farming systems for study were based on the typology of farming systems used in "Farming Systems and Poverty" of FAO/World Bank and on the "representativeness" of specific conditions in the countries under consideration (FAO, 2003).

Organization & Management

5. This Philippine country study is the product of a collaborative effort and institutional partnership among a team of researchers from government, civil society organizations and the academe. The SARD-FSE Philippines Project consists of a country study and a series of related consultations and multi-stakeholder workshops, spanning a 30 month period from April 2003 to February 2005. It consists of two phases:

- ***Phase 1:*** Preparation of country case studies, to include research, workshops and dissemination of results through linkages (March 2003 to February 2005); and

- ***Phase 2***: Elaboration and dissemination of strategies, guidelines and decision-support tools (March 2004 to August 2005)

6. Under the contract with FAO, eight months were provided for preparation of the first draft of the country study, covering the period of April to November 2003. Moreover, a 25-page document, *"SARD-FSE Preliminary Guidelines for Case Study Teams"* defined a common modality for project implementation and a common outline for the final case study report in all three pilot countries. *(See Annex 1 for Case Study Outline)*

7. **Organization and Management.** The overall organization for the Philippine SARD-FSE Project is presented in Figure 1.1.

8. **Project Steering Committee (PSC).** For purposes of this project, an 11 member Project Steering Committee (PSC) was established at the national level to provide guidance, review findings, and to discuss recommendations and follow-up based on the research findings. The PSC brings together key institutions representing government, farmers, civil society, the academe and inter-governmental organizations *(See Annex 2 for Institutional Profiles).* The Project Steering Committee is composed of the heads and representatives of:

Government/GO Research Agencies

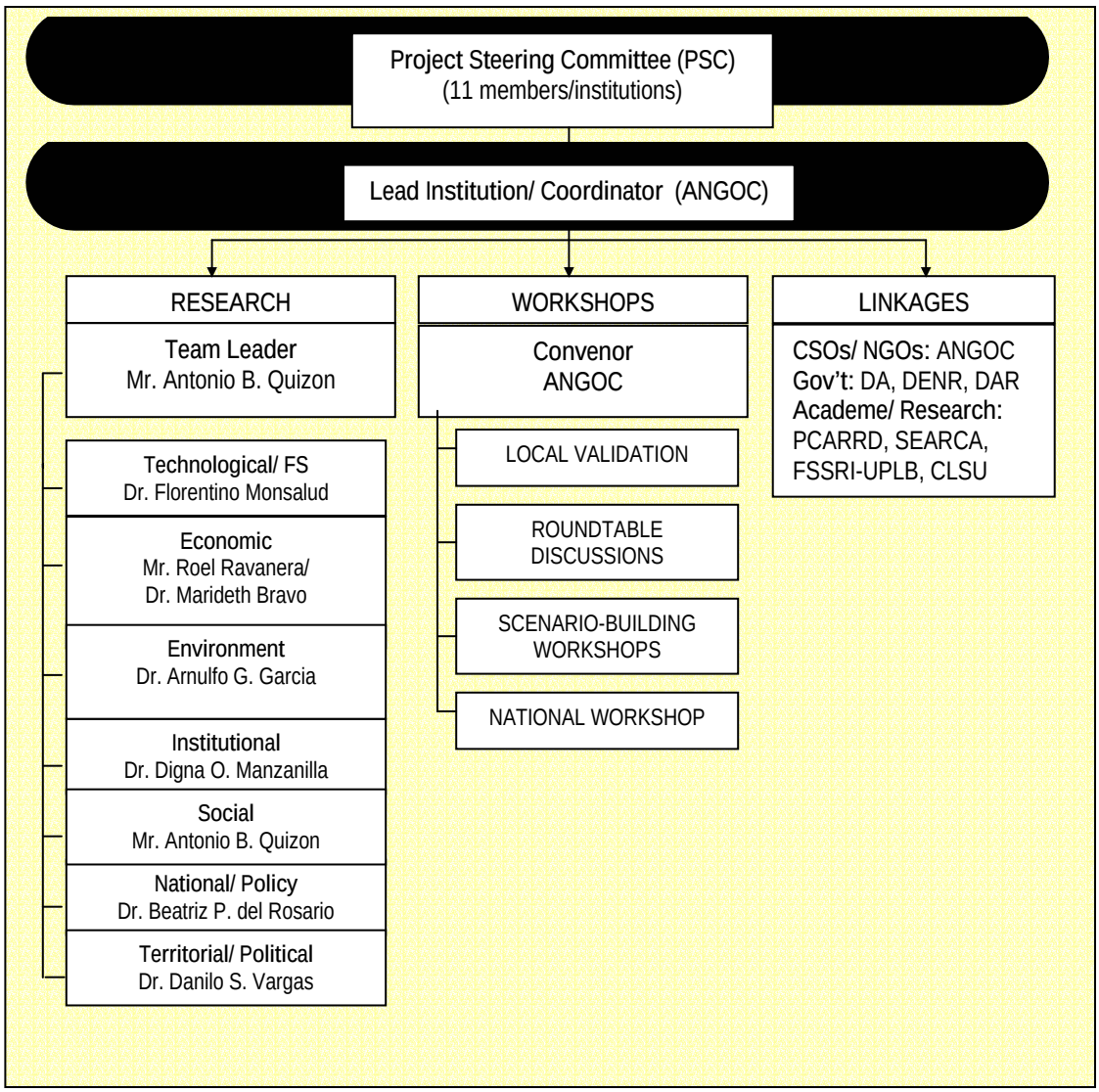
Department of Agrarian Reform (DAR)
Department of Agriculture (DA)
Department of Environment and Natural Resources (DENR)
National Economic and Development Authority (NEDA)

Philippine Council for Agriculture, Forestry and Natural Resources Research and Development , Department of Science and Technology (PCARRD-DOST)

CSOs/ Farmers

Asian NGO Coalition (ANGOC)

Figure 1.1 ***Management Structure***



Academe/ Universities

Central Luzon State University (CLSU)
Farming Systems and Soil Resources Institute (FSSRI), University of the Philippines, Los Baños (FSSRI-UPLB)

Inter-governmental organizations

Food and Agriculture Organization (FAO-Manila)

South East Asia Regional Center for Agriculture (SEARCA)

Research Team. Since farming systems deals not only with rice production but also with different areas in the social, political, economic, cultural and environmental conditions, an eight-member multi-disciplinary, multi-stakeholder research team was formed. It brought together experts from their respective fields and professions, i.e. agriculture, economics, social sciences, and environmental science. *(Refer to Annex 3 for Researchers' Profiles)*

9. The four participating institutions in this research: the Asian NGO Coalition (ANGOC), Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), FSSRI-UP Los Baños, and the Central Luzon State University (CLSU), also contributed their staff expertise, network linkages, facilities and resources for implementing this research project. Research assistants were hired to assist in the national, territorial and farm-level data gathering.

10. Two formal meetings of the PSC were to be convened in the course of the study. The first was held in July 2003 at the commencement of the field research process, and chaired by the Secretary of Agriculture. The second meeting was held in early 2004 to present and discuss the first draft and initial findings of the country study. A third meeting will review the final results and recommendations of the Project.

11. Lead Institution. As lead institution and project budget holder for the SARD-FSE project in the Philippines, the Asian NGO Coalition assumed the roles for contracting the Research Team, convening the Project Steering Committee, organizing consultations and workshops, writing project reports and managing overall logistics.

Expected outputs, and activities conducted

12. There are three stated, expected outputs of the global SARD-FSE Project:

- *Technical studies* analyzing the influence of external and internal factors on the success and/or failure of farming systems in the past (i.e. ex-post evolution) and in the future (i.e. ex-ante evolution), and on the lessons learnt in evolving towards SARD goals.
- *Tested, flexible, operational strategies and approaches* that can contribute significantly to the sustainable development of farming systems towards SARD – including the needs, expectations and incentives of important stakeholders.
- *Cost-effective and adoptable decision-support tool-kits* that can facilitate the design, implementation and evaluation of policies, programmes and projects based on institutionally oriented farming system and participatory approaches for SARD goals and policies.

13. On the other hand, the expected outputs and activities for the Philippine SARD-FSE Project, as stipulated under the FAO-ANGOC contract of March 2003 (and as amended in October 2003) are briefly summarized as follows:

Table 1.1 ***Stated commitments under the Philippines SARD-FSE Project***

Expected outputs	Deadline/ Due by
Prepare country report/case study	
• 1st Draft- *Mid-Term Report* (Chapters 1-4 + 5a & 6a)	Nov 30 2003
• 2nd Draft- *National Synthesis* (including Chapters 5b & 6b)	April 30 2004
• Validation of decision-making tool kits	March 30 2005
Convene 3 Project Steering Committee (PSC) meetings	
• 1st Meeting – Inception meeting	Aug 6 2003
• 2nd Meeting – Review of draft country case study	March 2004
• 3rd Meeting. – Final meeting	March 2005
Convene 4 workshops & roundtable meetings	
• Roundtable discussion #1 (Territory)	June 9-11 2003
• Roundtable discussion #2 (National)	July 14 2003
• Local validation consultation	Sept 2003/ 2nd week
• National Multi-stakeholder Workshop	March 2004
Convene 3 scenario-building workshops	
• Farmers' workshop (territorial & farming systems level)	Oct 1 2003
• Support groups' workshop (territorial & farming systems level)	Oct 2 2003
• National level workshop	Oct 7 2003
Attend 4 Global Team Leaders' meetings	
• 1st Meeting (Philippines)	March 10-13, 2003
• 2nd Meeting (Honduras)	June 23-29, 2003
• 3rd Meeting (Rome)	Nov 2003/ 4th week
• 4th Meeting (Mali)	Feb 2004/ 4th week

Source: ANGOC. "Philippines SARD-FSE Work Program (revised)." October 2003.

14. Research Team (RT) Meetings. In the course of the study, the Research Team conducted 12 internal meetings between March to November 2003, to clarify objectives, adapt the overall research framework and methodology, select indicators for study, establish criteria for site selection, discuss logistical arrangements, share findings, consolidate information and discuss analysis and findings. Three batches of field interviews with key informants and on-site focused-group discussions (FGDs) with farmers and local officials were conducted in August 2003. In addition, a three-day, live-in *"write-shop"* was held on 17-20 September 2003 for researchers to prepare individual reports. Several RT members likewise attended roundtable discussions, the local validation workshop, and scenario-building workshops conducted for this study.

15. Selected key activities conducted with other stakeholder groups between April and November 2003, include:

- ***Project Steering Committee meeting*** (Department of Agriculture, Quezon City, 6 August , 2003). Attended by 12 participants from nine out of the 11 institutions represented in the PSC.

- ***Field visits & interviews for site selection.*** Two reconnaissance field visits were conducted to 8 barangays in five northern municipalities of Nueva Ecija (Guimba, Talugtug, Munoz, San Jose and Lupao) prior to site selection.
- ***Roundtable discussions*** (Central Luzon State University, Munoz, Nueva Ecija, June 9-11 2003). This consisted of institutional visits (to PHILRICE, PRRM and KALIKASAN), on-site discussion with farmers in Guimba, and discussions with municipal officials and the academic community in CLSU.
- ***Local validation workshop*** (Central Luzon State University, Munoz, Nueva Ecija, 22 September, 2003). Participated in by 18 farmers and five municipal officials, including two barangay chairs and 1 barangay vice-chair from the study sites, in order to validate data and findings based on key informant interviews and focused group discussions.
- ***Territorial & FS-level scenario-building workshops*** (Central Luzon State University, Munoz, Nueva Ecija, 1-2 October, 2003). Attended by a total of 24 participants for the two workshops, consisting of farmers, provincial and municipal officials, NGOs and farmer organizations and the academic community.
- ***National-level scenario-building workshop*** (Department of Agriculture, Quezon City, 7 October, 2003). Attended by 32 participants, including representatives from FAO and seven members of the Research Team.

General research framework

16. A review of trends and driving forces. The Philippine Study on SARD/ Farming Systems Evolution seeks to examine macro and micro trends in the evolution of rainfed, lowland rice-based farming systems – driving forces, impacts and responses at three levels: *national* (Philippines), *territorial* (a province) and *farming systems* level (sample household in selected sites). It seeks to review trends in the selected farming system over the past 50 years, and to develop forward-looking descriptive scenarios towards year 2030. Given the above nature of the subject matter, which takes a long-term historical view, this paper may thus be considered as an *exploratory research study*.

17. Key question addressed. As proposed and discussed during the first meeting of the PSC, this study seeks to address one key question: *"Is the selected farming system sustainable?"* To paraphrase: *"Is the rainfed, lowland rice-based farming system in the Philippines sustainable"?* For the people who depend on the lowland, rainfed rice-based system, what can be done and by whom to make more sustainable rural development? What are the key priorities for policy and institutional interventions to accomplish this objective. Chapter two provides an overview discussion of the key issues affecting the selected farming system.

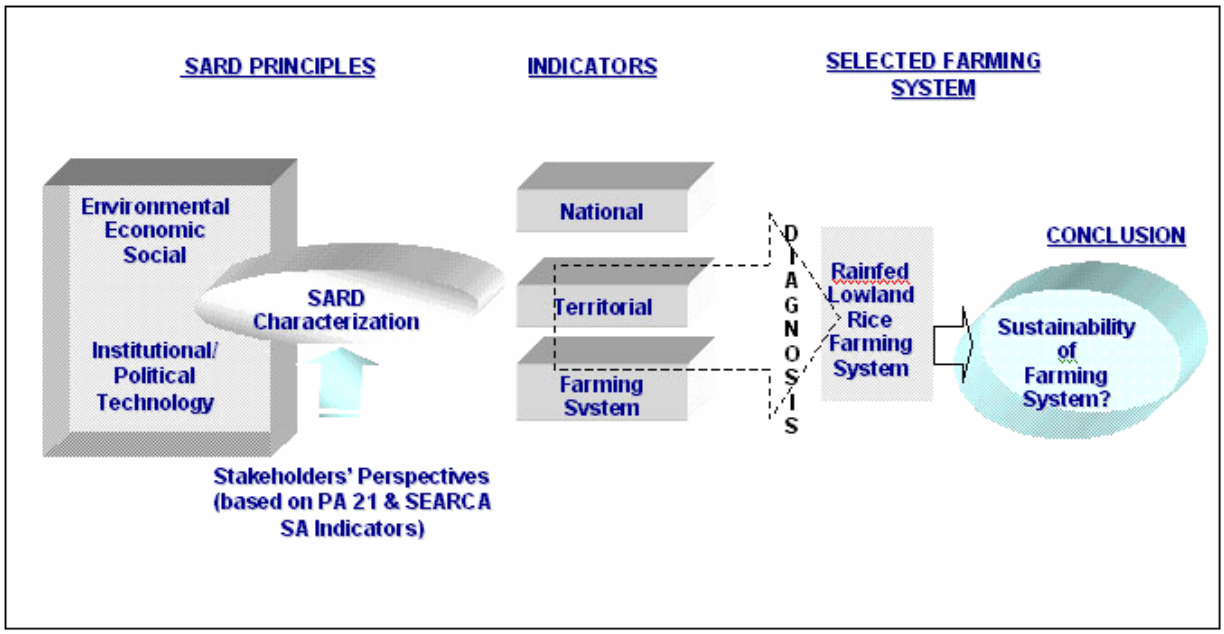
18. Defining the SARD "sustainability" indicators. Sustainable agriculture and rural development (SARD) is broadly defined by the FAO Council as "*the management and conservation of the natural resource base, and the orientation of technological and institutional change in such manner as to ensure the attainment and continued satisfaction of human needs for present and future generations.*" In terms of global inter-governmental agreements, the SARD concept and

mandate is contained in Chapter 14 of Agenda 21 (Earth Summit Declaration, 1992). For purposes of this Philippine country study, the Research Team utilized two broad consensus documents for selecting the specific indicators for examining the "sustainability" of rainfed, lowland farming system in the Philippine context. These two documents are:

- *Philippine Agenda 21 (1996)*, which is the official Philippine country strategy for sustainable development; and
- *SEARCA Sustainable Agriculture Indicators (1996)*, which was jointly developed by the academe and civil society organizations.

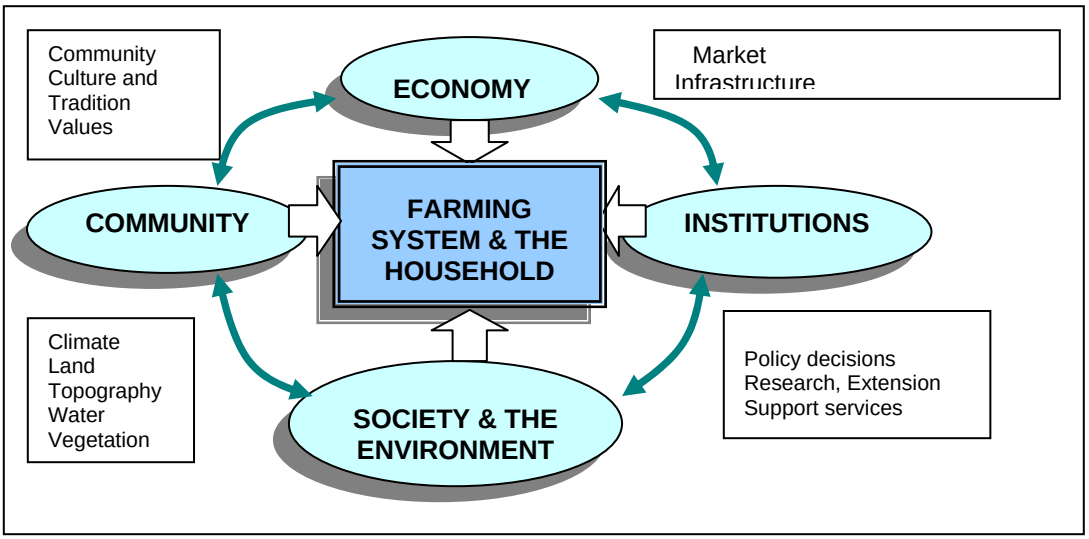
(Refer to Chapter 3.1 of this Study for the selected indicators.)

Figure 1.2 ***SARD Characterization and Farming System Diagnosis***



19. A farming systems (FS) approach. Furthermore, this study makes use of a multi-disciplinary, *farming systems approach*. The FS approach utilizes the decision-making and interactions of farming households within itself and with its community as a practical framework and unit for analysis of constraints, opportunities and potentials for agriculture and rural development. A *farming system* can be defined as a population of individual farm systems that have broadly similar resources, enterprise patterns, household livelihoods and constraints, and for which similar development strategies and interventions would be appropriate. The household, its resources, resource flows and interactions at this level are together referred to as the *farm system* (FAO, 2003)

Figure 1.3 ***Farming systems analysis at community level***

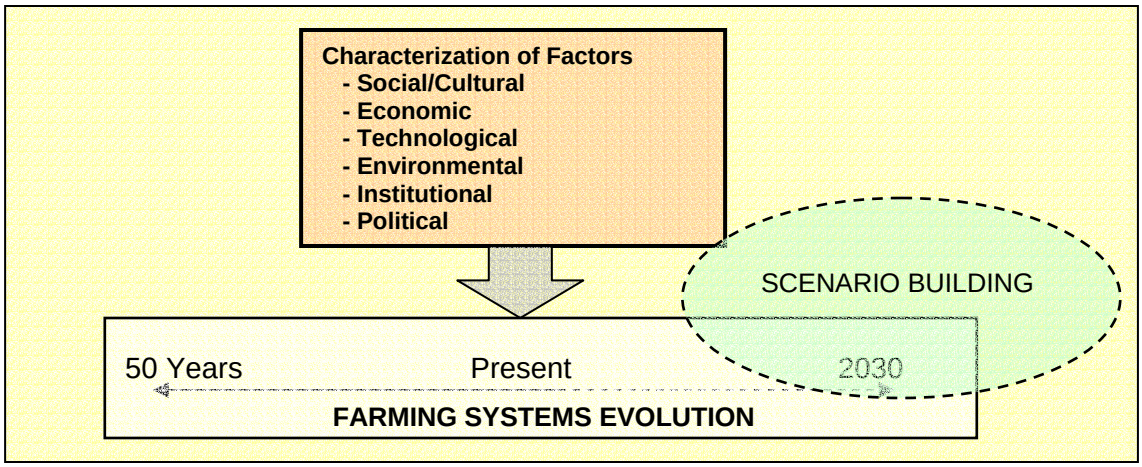


Source: Adapted from: FAO (1989), *Farming Systems Development*

20. Farming systems levels. Moreover, a farming system can also be related with the concept of a "territory**"** which refers to a geographical or agro-ecological area with a common" historical, geographical, cultural and social coherence" which is useful for a development purpose (as cited in FAO, 2003). Farming systems are broad characterizations which may embrace millions of hectares and as many households and may also comprise a large number of non-farm households from a range of socio-economic strata and engaged in various productive sectors. Hence, the Philippine study examines the selected farming system at three levels: *national* (country), *territorial* (province or region), and *farming system* (selected site or community).

21. Study of farming systems evolution (FSE). For the Philippine study, an exploratory and diagnostic study was done to assess the institutional, social, economic, technological and environmental factors that have influenced the evolution of Lowland Rainfed Rice Farming over the past 50 years. Based on this historical review, the Study then looks into possible future scenarios of the farming system towards the next 30 years. (See Figure1. 4)

Figure 1. 4 ***Characterization of factors***



22. Scenario-building. Scenarios here refer to "storylines," or a series of emerging events and driving forces that cause change, to describe images of the future or alternative futures for the society and the environment. Scenarios start with the current base year and have a time horizon and steps depending on the subject, objectives and information available. For this Study, two types of scenarios have been developed and described: (a) an "*anticipatory*" (status quo) scenario, or a projection of *what is likely* to happen if current trends continue; and (b) a "*better*" (what if) scenario, or a projection of *what could happen* if realistic interventions are done and the situation improves. In developing future scenarios, the Research Team organized three scenario-building workshops involving different groups of stakeholders at barangay (village)/municipal, provincial and national levels. The Research Team then analyzed the qualitative storylines for comparison with established data trends. Statistical modeling was not attempted, as this was not part of the original project design, and due to built-in project constraints in terms of limited time and budgets.

Site selection

23. Selection of the territorial site for study. In selecting the "territorial-level" site for the study, the Research Team reviewed and discussed the research framework, established the criteria for site selection, and collectively reviewed and compared statistical data on lowland, rainfed farming systems. Selection of the province of Nueva Ecija as the "territory" for this study was *purposive*, and based on the following considerations:

- Nueva Ecija's significance as the top rice-producing province, accounting for 20% of the country's total annual rice production;
- Nueva Ecija's long history in lowland rice production, having been declared as the "Rice Granary of the Philippines" as early as the 1930s (Baroman, 1987);
- It is one of the country's largest provinces, with 40 percent of its total rice area being rainfed;
- Over the past three decades, the province has also been a major focus of government rice production programs and infrastructure investments, as well as for research and development programs in rice agriculture-related policies, field research and extension by government, NGOs and the academe, especially through the local Muñoz Science Community;
- Finally, being the country's "showcase" for rice production, Nueva Ecija could show future scenarios for other "rice basins" currently undergoing similar development trends in the Philippines (e.g., Iloilo, Bukidnon, North Cotabato), as they look forward over the next ten to 15 years.

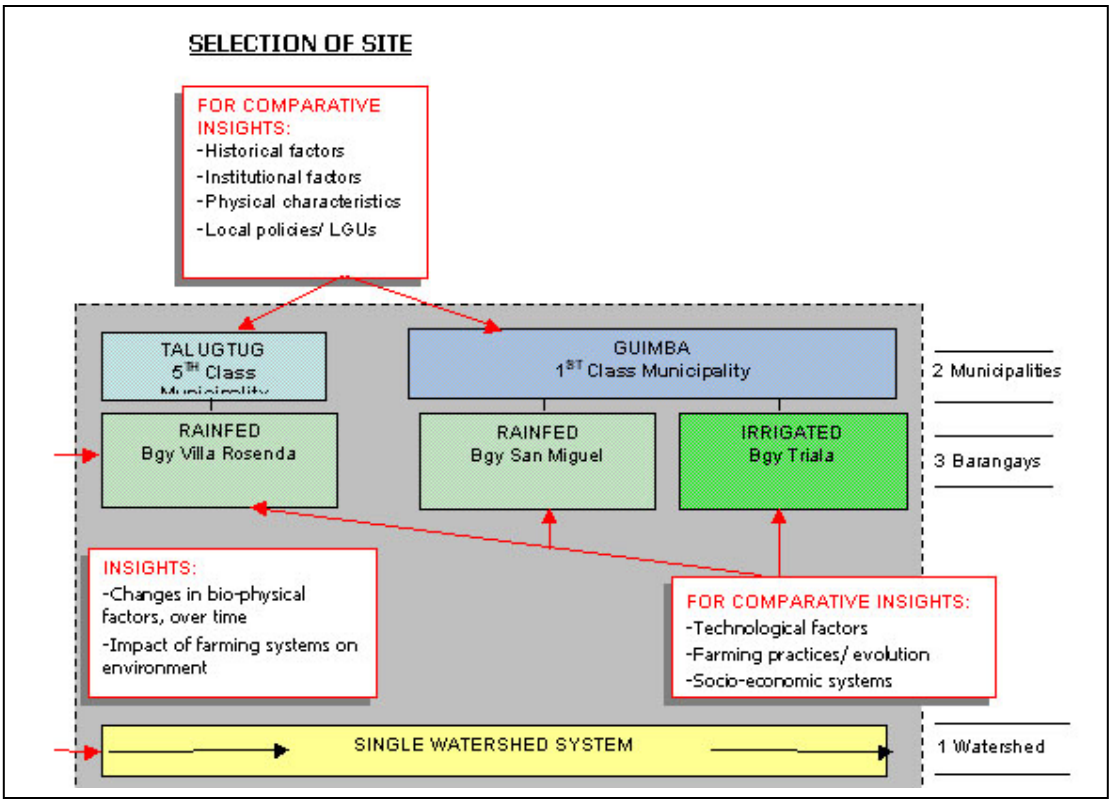
The basis for selection of Nueva Ecija also included practical considerations, i.e. – (a) the province's proximity to Manila in view of the limited time and budgets available; and (b) the presence here of strong R&D institutions, and thus the likelihood that local historical data and studies would be available.

24. Selection of farming systems sites. Within Nueva Ecija province, two adjacent municipalities – *Guimba* and *Talugtug* – were selected as the farming systems sites for study. Above selection of the two municipalities were based on the following criteria and considerations:

- Predominantly lowland, rainfed rice areas, in terms of total area and total hectarage;
- Adjacent municipalities belonging to a *single* (same) area ecosystem or watershed, as determined by experts (CLSU Water Resource Management Center), and based on a desk review of topographical maps of Nueva Ecija;
- The cooperation of local municipal officials; and
- The added consideration of possibly selecting two municipalities with varying institutional characteristics (e.g. Guimba, 1st class municipality, and Talugtug, 5th class municipality. First-class municipality are those who have highest income and population, while 5th class have lower income and population as classified by the Department of Finance).

25. *"Three barangays, two municipalities, one watershed system".* Moreover, three barangays (villages) – two rainfed areas and one irrigated area – were further selected to represent the farming systems in Guimba and Talugtug municipalities. These barangays are *Villa Rosenda, Talugtug* (rainfed), *San Miguel, Guimba* (rainfed), and *Triala, Guimba* (irrigated). The inclusion of an irrigated area (Triala) was done for purposes of comparing irrigated with rainfed areas, and for assessing community changes as the rice farming system evolves from rainfed to irrigated. Figure 1.5 below illustrates the overall approach used by the Research Team in the selection of sites, and for the farming systems review at the municipal and barangay levels.

Figure 1.5. ***Framework for selection of study sites at farming systems level***



Data sources

26. Data sources and data-gathering methodology. In view of the nature of the study, the huge volume of data and information required, and limited time and budgets available, the Research Team relied mainly on the use of published and unpublished secondary sources. Existing data gaps, especially historical data at barangay and municipal levels were researched through key informant interviews (KIIs), in-depth household interviews and focused group discussions (FGDs). A total of 52 respondents from Guimba and Talugtug were interviewed. The use of surveys and structured interviews based on representative samples were ruled out due to practical constraints in terms of time and budgets. On the other hand, the use of FGDs was found to be useful especially for establishing historical trends, for verifying secondary data, and for obtaining farmer perspectives on the evolution of their own community and farming systems.

Lessons Learned

27. The different stakeholders were involved to a different degree in data collection. All research team members were involved in identifying the different information generated and development of interview guides. The different expertise of RT help a lot in generating information required by the study. While, the PSC provides in terms of a broader perspective on a national level for the RT to work on during the data collection, consultations, and workshops other than giving the permission to RT to access their data banks. A division of labour among members of RT facilitates the generation and organization of data. The presence of CLSU in the territorial level and in the study team favored on the conduct of data collection, local validation workshop, territorial and FS level scenario-building workshop. On the other hand ANGOC as the lead institution strategically located in Quezon City worked for the conduct of National level scenario building workshop.

28. There is strong participation at the PSC and RT team levels where NGO is included. It involved the local government unit officials, local leaders, farmers for FGD and key informant interview. There was a diverse and well – represented composition of the stakeholders (e.g. farmer group leaders; Municipal Agricultural Officer, Mayor representatives, and representative of agrarian reform communities)

29. There is a feedback on results of the study and the regional workshop to the stakeholders. Reactions/suggestions/scenarios/policy recommendations were drawn from the stakeholders. Good response was received from local stakeholders.

30. There should be more leeway for the project implementers to adapt the procedure/ methodology to the local conditions/needs of the implementing countries. The project team consisted of a gender-balanced team who developed the project proposal.

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CHAPTER 2

Importance of a rainfed, lowland rice-based farming system

The Asian rice context

1. Asia accounts for 90% of the world's production and consumption of rice. Because rice is grown in millions of small farms primarily to meet family needs, marketable surplus is low and prices fluctuate widely with droughts, floods and typhoons. Less than five percent of rice production is traded in the global market and market studies suggest that a ten percent shortage of supply would lead to about 50 percent increase in rice prices. Hence, maintaining self-sufficiency in rice and stability in prices have become important twin political objectives of most Asian countries (Hossain, 1997).

2. With the growth of Asian populations at 1.8 percent per year, demand for rice is projected to increase by 70 percent by the year 2025. Asian production must increase to about 840 million tons by year 2025, from the 1995 level of 490 million tons. Meeting this demand will prove to be increasingly difficult with the growing scarcity of land, labor and water, and the competition for such resources from the non-farm sector (Hossain, 1997). Furthermore, the added challenge of maintaining self-sufficiency in rice arises from the task of how to bring about small, gradual increases in rice production across a large number of small farmers.

3. While most Asian governments and research institutions have previously focused on developing irrigated rice farming, the needs and productive potentials of rainfed areas cannot be ignored. Only 55 percent of Asian rice land is irrigated. And while there is scope for converting rainfed into irrigated ecosystems, this potential is limited by the growing scarcity and increasing competition for water, rising costs of irrigation development, and rising public concerns over the adverse environmental and social impacts of large-scale dam and irrigation projects in many Asian countries (Hossain, 1997).

4. **Rainfed rice ecosystem.** Some 90 percent of the 48 million ha of rainfed lowland rice areas in the world today are found in South and Southeast Asia. These areas are often marked by low and unstable productivity, high incidence of poverty and low resource-use efficiency. Because of the uncertainty and variability of rainfall, such production environments are risky and farmers are often discouraged from investing more in input-intensive technologies by persistent drought or

excessive water. Efforts to develop rainfed areas must therefore integrate inter-related objectives of poverty reduction, sound resources management and increased productivity.

Philippine rice farming in perspective

5. Agriculture plays a vital role in the Philippine economy. The agriculture sector currently accounts for 23 percent of the country's gross domestic product, and employs about 40 percent of the domestic labor force. In year 2000, *rice* production accounted for 17 percent of Gross Value Added (GVA) in agriculture, 3.27 percent of GNP, and 3.47 percent of GDP (Philippine Statistical Yearbook, 2000). About 30% of the country's total land area of 30 million hectares is classified as agricultural lands. Of the total arable land, 2.7 million hectares (30 percent) is planted with rice, covering more than half of the total area devoted to food crop production (DA, 2002).

6. **Rainfed, lowland rice areas.** Compared to its neighbors in the East Asian Region, the Philippines ranks second in terms of the least irrigated rice area (Adriano and Dumayas, 1999). Almost half or 48 percent (1.3 million ha) are rainfed, while 52 percent or 1.4 million ha are irrigated. Of the rainfed areas, lowland areas occupy 1.2 million ha, while upland areas occupy only 0.1 million ha (BAS 1994-2002).

7. In terms of average production yields, rainfed lowland rice produces 2.23 tons/ha, which is 30 percent lower than the average yield of 3.50 tons/ha for irrigated rice (PhilRice, 2001). Upland rainfed rice has the lowest average yield of 1.43 tons/ha (PhilRice-BAS, 1996).

8. Lowland rainfed rice farming is quite dispersed and is found in all but one of the 15 regions of the country. In terms of the area devoted to this farming ecosystem, Northern Luzon ranks first, with 262,721 ha. Second in rank is the Central Luzon Region, which covers 244,409 ha of rainfed lowland rice. However, Central Luzon only ranks fourth in yield among lowland *rainfed* rice producing regions in the country, thus indicating a huge potential for increasing the productivity of lowland rainfed rice in this region. Central Luzon currently also has the largest *irrigated* rice area with 300,341 ha (BSWM 1993; PhilRice-BAS, 1995) and is the biggest producer of rice in the country. In Central Luzon, the province of Nueva Ecija is the top rice-producing province in the country,[1] providing 20 percent of the nation's rice and registering the second highest average rice yield of 4.62 tons per ha.

Rice self-sufficiency and food security

9. As rice is the staple food for 85 percent of the population, rice self-sufficiency has become synonymous with food security. In terms of food requirements, the annual per capita consumption of milled rice in the Philippines is estimated at 99.2 kg. For 1999, the country had a total demand of 3.4 million metric tons to feed a population of 75 million. (PASCN, January 2003)

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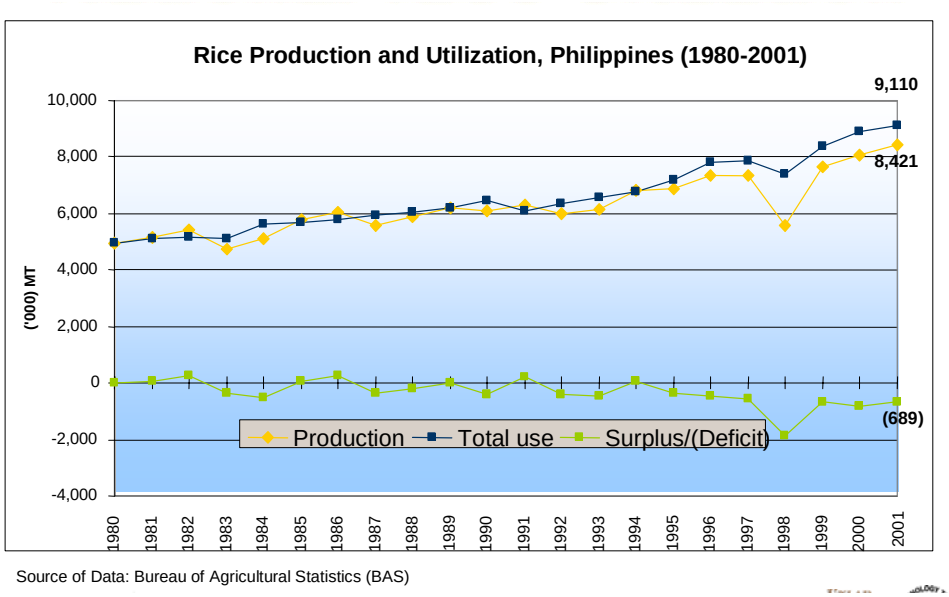
[1] Nueva Ecija province has been selected as the territorial-level subject for review in this study.

10. Yet Philippine rice production has been unable to satisfy and meet rising domestic demand. Compared to its immediate Southeast Asian neighbors, the Philippines has been the only net importer in terms of overall agricultural imports vs. exports in 1998. Malaysia and Thailand exported rice from 1988 to 1998 while Indonesia started exporting rice, in minor quantities, in 1996. The Philippines, however, has been a consistent net importer of rice over the same period.

Figure 2.1 ***National Rice Production and Utilization Trends***



Source of Data: Bureau of Agricultural Statistics (BAS)

While the country's gross rice production has been increasing, rice yield per hectare has been found to be generally low compared to other Asian countries:

Table 2.1 ***Rice yield in selected Asian countries (mt/ha), 1999-2001***

Country	*1999*	*2000*	*2001*
Korea	6.67	6.59	6.63
Japan	6.41	6.53	6.66
China	6.33	6.23	6.35
Indonesia	4.25	4.42	4.25
Vietnam	4.11	4.18	4.26
Philippines	2.89	3.21	3.19
Thailand	2.31	2.32	2.57

Source: FAO Statistical Yearbook, 2002

11. With a high annual population growth of 2.3 percent, and if rice production growth rates lag behind, the Philippines' rice deficit is expected to grow exponentially. To be self-sufficient in rice, projections indicate a need to increase the country's rough rice production by about 80 percent by the year 2025 in order to feed the expected population of 115 million people.

12. Studies indicate that since the frontiers for further expansion of lowland rice production have reached near-exhaustion, efforts to increase rice production must focus on *existing* rice areas, and the potential contribution of rainfed areas will be crucial. Currently, lowland rainfed rice systems provide 1/4 of the total annual production of 12.95 million MT (BAS, 2001). Efforts must focus on *increasing productivity per unit area*, either by (a) increasing *yields per ha*, or (b) increasing the *farming intensity*, or the number of annual cropping seasons especially in rain-dependent rice areas where farmers usually manage only a single cropping per year.[2] These efforts will have to be managed within the broader development objectives of reducing poverty and ensuring environmental sustainability

13. Furthermore, efforts must be taken against the continued reduction of rice lands due to their continued conversion towards urban and industrial uses (Senate Committee on Agriculture, 1997). Between 1988 and 2001, DAR approved an average of 2,504 ha per year for land conversion from agricultural to non-agricultural uses (Israel, 2002). Yet field studies suggest that about half of actual land conversions are done illegally and thus go unreported. Land conversions often occur on prime agricultural lands in flat, alluvial plains where population and economic pressures are highest.

14. **The politics of rice.** In the Philippines, rice is regarded not only as a staple food and economic commodity, but also as a "political crop". Self-sufficiency in rice and stability in rice prices are often used as indicators for food security, economic stability and political stability – and thus, as measures for political performance. Political uncertainty and urban social discontent have characterized those periods of rice insufficiency and sudden price fluctuations. Over the past decades, agricultural policies of successive administrations have thus been directed towards increasing production & productivity, achieving self-sufficiency, ensuring buffer stocks, stabilizing prices and protecting urban consumers through pricing controls, providing credit and pricing support to rice farmers, promoting rural development, pursuing R&D and instituting trade protection. However, many policies have been contradictory, e.g. efforts to control rice prices in favour of urban consumers, in turn, acts as a disincentive for rice producers. On the other hand, pricing support programs for farmers have been rendered partly ineffective due to the trading activity of rice cartels controlled by a few wealthy families. In addition, government development efforts are often hampered by the usual financial constraints, and budget cuts often tend to sacrifice those support services and institutions intended for the rural/ agriculture sector.

Rainfed rice farming and the task of poverty reduction

15. **Rural poverty.** One-third of all Filipino families, or 30.8 million Filipinos, was deemed to be poor in 2000, i.e. unable to meet their basic needs (poverty threshold). The proportion of families in poverty rose from 31.8 percent in 1997 to 33.7 percent in 2000, and their numbers increased in absolute terms. Rural areas account for roughly 71 percent, or 3.6 million out of the country's 5.1 million families in poverty. Nearly half of rural families (46.9 percent) were living below the

[2] Studies also show a huge potential for improving and expanding irrigated rice areas. Also, it should be noted that less than half of the farming area currently classified as "irrigated", or 0.6 million ha, in the country have reliable irrigation. An irrigated system is categorized as "reliable" when access to controlled water is available throughout the year. Many of the country's irrigated areas are also partly rainfall-dependent.

poverty threshold, compared to about one-fifth (19.9 percent) of urban families. Poverty incidence remained highest, about two-thirds, among farming and fishing families. Within agriculture, farm workers in sugarcane, small farmers in coconut, rice and corn, fishermen, and forester households were found to be among the poorest of the poor, accounting for about 70 percent of all subsistence households in 2000 (NSCB, 2000)

16. **Rice farmers.** As a traditional crop, rice is generally grown in small farms managed through household labour with a significant portion of the produce directed to household consumption. About 2.1 million Filipino farmers directly depend on rice farming as their source of livelihood. Of these, some 1.9 million consist of small farmers who till an average farm size of 1.5 ha. In the Philippines, such rice farms are owner-cultivated, leased or tilled under a sharecropping arrangement. Yet under whatever tenurial arrangement, it is often the small rice farmer who absorbs the risks and costs of credit, the rising costs of farming inputs, fluctuating farm-gate prices influenced by market traders and production losses due to pests, diseases and the vagaries of climate and weather.

17. Thus, studies indicate that small farmers barely profit from rice farming, and most live on subsistence. Among rice farmers, those in rainfed systems find themselves most vulnerable to sudden shocks or changes in weather and climactic conditions that aggravate already existing conditions of low productivity and poor incomes. As most rainfed farmers depend on a single crop and cropping season, recovery from such shocks also tend to extend over a longer period.

18. Poverty reduction in rainfed rice areas must be directed towards improving/ stabilizing yields thereby increasing farmer incomes, and increasing farmers' capacity to cope/deal with risks and vulnerability. In the province of Nueva Ecija, some technologies and programs being promoted include systems for supplementing water supply; these small-scale irrigation systems include small farm reservoirs, small water impounding ponds and shallow tube wells. Other R&D strategies for this ecosystem have focused on developing rice breeds (high yield, early maturing and drought-tolerant) specifically for rainfed conditions, instituting measures for rice production enhancement, promoting crop diversification and multiple-cropping, promoting higher value crops, and integrating cropping systems with fish, poultry and livestock. Yet rainfed production environments are risky and poor farmers and creditors are often discouraged or remain cautious about investing more in input-intensive technologies. Furthermore, farmers know that any changes in the farming system carry concomitant risks, and support systems must be in place, i.e. markets, facilities and infrastructure, support institutions, credit and financing, practical training and information, a supportive social and policy environment, and political will.

19. Moreover, support for the rainfed, rice-farming sector must extend beyond on-farm improvements, towards creating viable off-farm and non-farm livelihoods. During the dry season, many rice farmers are forced to seek other forms of employment. Other family members also migrate to seek temporary or permanent work. But given their limited skills and education, and with limited work opportunities, many end up among the burgeoning ranks of the urban poor.

Rainfed rice based farming and the environment

20. Rainfed rice areas tend to be vulnerable to either droughts or floods brought about by erratic rainfall and unpredictable weather. In the Philippines, rainfed rice areas may thus be classified into five sub-ecosystems: (a) favourable rainfed lowland, which uses technologies for the irrigated rice sector; (b) drought-prone; (c) submergence-prone; (d) drought and submergence-prone; and (e) medium-deep water. Besides water-related problems, rainfed lowlands are also vulnerable to pests, weeds and soil constraints, making them risk-prone and highly unstable.

21. In Central Luzon, lowland rainfed rice farmers tend to adopt Green Revolution technologies intended for the irrigated rice sector, where farming conditions are more predictable and favorable. Thus, rainfed rice farmers may use too little or too much of farm inputs (e.g., fertilizers, pesticides and herbicides) that may bring adverse effects on farm yields, family incomes, soil fertility and human health.

22. Unfavorable farming conditions may also lead poor farmers to engage in farming practices that could have adverse long-term environmental impacts. In Nueva Ecija, for instance, the proliferation of tubewells and unregulated extraction of groundwater for irrigation in rainfed areas may affect the aquifer, to an extent of receding groundwater levels or salinity intrusion. During the dry months, farmers usually seek alternative sources of livelihood, e.g. tilling erosion-prone riverbanks or uplands or extracting wood for charcoal making, which could affect the ecosystem if practiced on a community scale.

23. On the positive side, the study of rainfed ecosystems potentially offer valuable lessons and insights into farmers' coping strategies under unpredictable farming environments, systems for mutual help and community preparedness against sudden shocks and disasters, and indigenous practices especially on water management.

Lessons Learned

24. This chapter provides general framework to the research team and rationale justifying the conduct of the study.

25. It recognized the environmental conditions and economic potentials of rainfed rice based farming systems towards sustainable agriculture and rural development.

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CHAPTER 3

SARD Characterization and Diagnosis of the Farming System in the Selected Territories

3.1 Meaning of SARD to stakeholders

The policy context for SARD

1. **International context.** Sustainable agriculture and rural development (SARD) is broadly defined by the FAO Council as "the management and conservation of the natural resource base, and the orientation of technological and institutional change in such manner as to ensure the attainment and continued satisfaction of human needs for present and future generations." According to the WSSD Political Declaration (2002), the mutually reinforcing pillars of sustainable development are identified as economic development, social development and environmental protection, at the local, regional and global levels. Furthermore, poverty eradication, changing production and consumption patterns, and protecting and managing the natural resource base for economic and social development, have been defined as the overarching objectives of and essential requirements for sustainable development. Sustainable agriculture is a model of social and economic organization based on an equitable and participatory vision of development that recognizes the environment and natural resources as the foundation of economic activity. Thus agriculture is sustainable when it ecologically sound, economically viable, socially just, culturally appropriate, and humane. The concept of SARD is drawn from the definition of "sustainable development" itself, defined by 1992 United National Conference on Environment and Development (UNCED), or the Earth Summit, as "…development that meets the needs of the present without compromising the ability of future generations to meet their own needs." It contains two key concepts: the concept of "needs", in particular those of the poor, and the idea of "limitations" imposed by the state of technology and social organization vis-à-vis the environment.

2. The "environment agenda" first received attention at the international stage with the 1972 UN Conference on Human Environment in Stockholm. However, it was the publication of the 1987 Brundtland Report, "Our Common Future" by the UN World Commission on Environment and Development that expanded "environmental protection" into a broader concept of "sustainable development," thus significantly placing this concern at the forefront of national and international decision-making. The UNCED forged a comprehensive plan of action for sustainable development to be undertaken by various stakeholders at international, national and local levels.

3. **Philippine/ national policy context.** Prior to the 1970s, Philippine policies generally gave little attention to environmental problems as these were not thought to be critical then. The first comprehensive environmental policies were instituted in 1977 with the promulgation of the Philippine Environment Policy (PD 1151) and the Philippine Environment Code (PD 1152) that led to the incorporation of environmental concerns into national development planning. (Israel, 2002)

4. In 1987, with the widespread popularity of the Brundtland Report, and with the growing local environmental movement, the Philippine Cabinet adopted the Philippine Strategy for Sustainable Development (PSSD), a policy document crafted jointly by government and civil society organizations (CSOs).

5. Just three months following the 1992 Earth Summit, the government created the Philippine Council for Sustainable Development (PCSD), which was mandated to ensure the implementation of Agenda 21. On record, the Philippines was the very first country to formally respond to and put into action the internationally-crafted Agenda 21 agreement. An important achievement of PCSD was the later completion of *Philippine Agenda 21 (PA21)* in 1996. PA21 was a highly consultative policy document, formulated through a four-year process involving over 20 regional and national consultations with various multi-stakeholder groups.

6. The PA 21 is the updated version of the earlier 1987 PSSD, and it outlines the national agenda for sustainable development for the 21st century. Its stated vision is *"… a better quality of life for all, through the development of a just, moral, creative, spiritual, economically-vibrant, caring, diverse yet cohesive society characterized by appropriate productivity, participatory and democratic processes, and living in harmony within the limits of the carrying capacity of nature and the integrity of creation"* (PA 21, Section 1.4). Legal issuances related to PA21 include:

- Executive Order 15 (1992). *Creating the Philippine Council for Sustainable Development*
- Executive Order 370 (1996). *Strengthening the Philippine Council for Sustainable Development*
- Memorandum Order 33 (1992). *Directing the Integration of Philippine Agenda 21 into the Updated Medium-Term Philippine Development Plan and into the Plans of Local Government Units and the Operationalization of the Goals and Objectives of Sustainable Development as Embodied in the Philippine Strategy for Sustainable Development*
- Memorandum Order 399 (1996). *Directing the Operationalization of Philippine Agenda 21 and Monitoring Its Implementation*

Defining SARD in the Philippine context

7. Using PA21 as the basis for defining SARD. To manage the country's transition to sustainable development, PA21 identified the following areas of concern needing intervention: (a) integrating sustainable development in governance; (b) providing enabling economic policies; (c) investing in human and social capital; (d) mapping out a legislative agenda; and (e) addressing critical and strategic concerns, to include: population management, human health, food security, human settlements and land use (Israel, 2002). PA 21 takes on an "ecosystems approach," and presents the major issues and concerns of each ecosystem: upland/forest, lowland/agricultural, coastal and marine, freshwater, and urban. Across ecosystems, PA21 focuses on decision-making structures and processes, and shows how these are to be addressed using the basic ecological principles, and the ways to achieve the vision of sustainable development. In summary, PA21 takes on a broad policy and institutional approach towards institutionalizing sustainable development, and as such, it defines the broader objectives and framework for "sustainable *rural development*" under SARD.

8. For purposes of this SARD-FSE study, which focuses on the rainfed, lowland rice-based farming system, the more relevant section from PA21 is the sub-section on the lowland agricultural ecosystem that discusses eight areas of concern (Israel, 2002):

(a) Implementation of a genuine Comprehensive Agrarian Reform Program;
(b) Absence of a National Agricultural Land Use Policy;
(c) Impacts of agriculture on marginal lands;
(d) Deterioration of shore and water quality due to pollution;
(e) Dependence, excessive and improper use of pesticides and inorganic fertilizers/ chemicals;
(f) Lack of stakeholder participation and management of agricultural systems.

9. Moreover, this case study takes into account several cross-cutting themes (across ecosystems) highlighted in PA21 that are directly related to the concept of SARD for the selected farming system, particularly: (a) food security through self-sufficiency; and (b) integration of sustainable development in local governance. On the latter, the PA21 strategy was to "localize PA21," by integrating "sustainable development" into the planning and programs of local government units (LGUs), and by creating the enabling policy environment for involving all stakeholders including civil society.

10. Defining "sustainable agriculture" indicators. In the Philippines, the term, concept and field practice of "sustainable agriculture (SA)" was first popularized by CSOs in the early 1980s, as a countervailing reaction and direct response to the Green Revolution program in rice initiated by government starting in the 1970s. Since then, "sustainable agriculture" has developed and is now used to describe a wide package of practices and concepts, now variedly termed as "alternative agriculture," "ecological farming," "organic farming," and "low external input sustainable agriculture (LEISA)."

SARD Indicators

11. The key question. This SARD-FSE Study focuses on one key question: "Is the rainfed, lowland rice-based farming system in the Philippines sustainable?" For purposes of this Philippine study, the Research Team utilized the two above documents, *Philippine Agenda 21 (1996)* and *SEARCA SA Indicators (1996),* for defining "sustainability" of rainfed, lowland farming system in the Philippine context. PA21 focuses on the seven sustainable agriculture principles (SEARCA, 1996):

- Economically viable;
- Ecologically sound;
- Socially just/ acceptable;
- Culturally appropriate and humane;
- Technologically appropriate (based on holistic science); and
- Develops full human potential.

12. Table 3.1 provides a summary listing and description of the key indicators for SARD as used by the researchers for this study. It combines both quantitative and qualitative indicators and means for measurement. It should be noted here that some of the original indicators were deleted, and others were added in the course of this study. Highlighted here is the fact that, from FAO's perspective, the development of SARD indicators for the selected farming system itself has been one of the cited *outputs* of this Study. (*Preliminary Guidelines for Case Studies,* SARD-FSE Project Document/ FAO, 2003)

13. Finally, it should be noted that SARD itself is an evolving concept, with no fixed sets of standards for "sustainability thresholds". However, there are certain generally accepted and measurable standards that may be applied for selected and *specific* SARD indicators, e.g. income, poverty, water and soil quality, and these are applied here where relevant. Other indicators are best described in terms of "trends" over time. Chapter 3 of this paper describes the current state of the farming system, while Chapter 4 focuses on the evolution of the rainfed rice-based farming system and provides an assessment of the overall sustainability of the system.

3.2 Brief overview of the Philippine agricultural and rural context

Geography, climate and land use

14. Geography. The Philippines has total land area of about 30 million ha. It is situated in the 4° 23' and 21° 25' N latitudes and longitudes 116° 55' and 126° 34' E. It is bounded on the east by the Pacific Ocean, on the south by the Celebes Sea and on the west and north by the South China Sea. It is composed of 7,100 islands, divided into

Table 3.1 ***Key SARD Indicators used in the study***

	ENVIRON-MENTAL	ECONOMIC	SOCIO-CULTURAL	TECHNOLOGY	INSTITUTIONAL
KE KEY PRINCIPLES	*Ecologically sound*	*Economically viable*	*S Socially just/ acceptable; culturally appropriate & humane*	*Technologically appropriate*	*Socially just/ acceptable; develops full human potential*
FSFARMING SYSTEMS	Soil Fertility – soil pH (soil acidity); amount of chemical inorganic fertilizer used. Water Quality – depth of ground water table for irrigation and domestic use. Pesticide Use – amount of pesticide use; decrease in beneficial and edible farm dwelling organisms.	Household income; Income Sources Yield % of on-, off- and non-agri income sources Labor Farming Inputs; Other costs Price of Products	Fertility rate Migration rates % of Landless	Soil acidity(status and trend) Soil organic matter content (status and trend) Availability of technology to correct soil-related constraints to rice production Availability of crops that can tolerate adverse soil conditions Use of external and internal inputs Agricultural practices, management & performance Fishery practices, management and performance Forestry practices, management and performance	Governance: Identification and analysis of modalities and effectiveness of governance and participation of local populations (services provided, resources, Interrelationships, devolution, transparency, participation, level of accountability, facilitating and hindering factors for SA integration, etc.) Asset reform laws and implementation(land, water, credit, others) Participation of farmers in decision-making processes Farming system sustainable development strategies R&D investments in the system/ funding sources for R&D and other development activities in the FS level

TERRITORIAL	Soil fertility: soil organic matter, soil pH (soil acidity), amount of chemical inorganic fertilizer used. Water Quality – depth of ground water table; surface water from rivers, dams and creeks. Land Use and Land Conversion – land use area by category; total area legally and illegal converted into non-agricultural uses.	Labor Farming Inputs Other Expenses Yield Price of Products Land tenure Membership in orgs Credit & interest rates Subsidies to production and market	Population growth rates Low dependency ratio Migration rates % of landless	Availability of technology on water resources management Watershed condition (status & trend) Water quantity and quality (irrigation) Major risks from natural disasters Climate and biophysical factors Typology of selected Farming system	Governance: Identification and analysis of modalities and effectiveness of governance and participation of local populations (services provided, resources, interrelationships, devolution, transparency, participation, level of accountability, facilitating and hindering factors for SA integration, etc.) Public awareness and information Role of Civil Society Organizations

NATIONAL	Land Use and Land Conversion – land use area by category; annual land conversion rate and total area converted. Deforestation – annual deforestation rate and changes in forest land area; total area reforested by government and private sector.	Population – Urban & Rural Growth rate Total Average Family Income & Expenditure Poverty Incidence Literacy rate Area Harvested to Palay Palay yield/ hectare Distribution & utilization of Palay production.	Population growth rates Low dependency ratio Migration rates % of landless quality of life index.	Availability of technology on water resources management Watershed condition (status & trend) Water quantity and quality (irrigation) Major risks from natural disasters	Existence of national sustainable development strategies Ratification and implementation of ratified global agreements Expenditures on R & D

three major island groups: Luzon with an area of 14.1 million ha, Visayas with 5.7 million ha and Mindanao with 10.2 million ha. Politically, the country consists of 16 regions and 77 provinces. Figure 3-1 shows the map of the Philippines by region.

15. **Philippine climate**. Four typologies were taken from the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) and is based on seasonal rainfall distribution.[3] *Type I* climate covers the areas that have pronounced seasons: dry from December to May and wet the rest of the year. *Type II* climate with no dry season has a maximum rain period from November to January. In *Type III* climate areas, seasons are not very pronounced: relatively dry from November to April and wet the rest of the year. Maximum rain periods are not very pronounced but short dry season last only from one to three months. *Type IV* climate has rainfall more or less evenly distributed throughout the year.(The selected territory for this Study, Nueva Ecija province in Central Luzon Region, falls under the Type I climate, with pronounced wet and dry seasons). Figure 3-2 shows the climate map of the Philippines based on the "Modified Corona's Classification of Climate". Average annual rainfall varies from 965 mm to 4,064 mm. (Figures 3.3a to 3.3d) show the different rainfall distribution patterns of representative regions with the different climate type). While the mean annual temperature for all weather stations in the Philippines except Baguio City is about 26.6° C. Warmest months are April and May with average temperature of 26.6° C, while the coolest months fall from December to February with a mean temperature of 25.5° C.

16. **Land use.** The Philippines **c**urrent population density is already about 255 persons/ km^2. Approximately 10 million hectares out of the total land area of 30 million hectares is already devoted to agriculture (arable lands) and this area is almost the maximum area that is ideal for agriculture with a terrain slope of about 1 percent. Moreover, a bigger proportion of this agricultural land has high soil acidity. Of the more than ten million ha of agricultural land, rice, corn and coconut are the predominant crops planted. Only less than 1.5 million ha are devoted to other crops. The general land use in the Philippines is shown in Table 3.2.

17. **Flora and fauna.** Philippine tropical forests host one of the world's richest plant and animal species. It is estimated to harbour approximately 8,120 species of flowering plants, 3,500 species of indigenous species, 33 species of gymnosperms, 640 species of mosses, 2,400 species and sub-species of fish, 240 species and sub-species of mammals. It is reported that about 3,000 species of plants are endemic to the Philippines and cannot be found elsewhere in the world.

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[3] The so-called "Modified Corona's classification of Climate" considers a dry month as that with less than 50 mm of rainfall, although a month with more than 100 mm can still be considered as dry if it comes after three or more very dry months.

Figure 3.1 Map of the Philippines by region

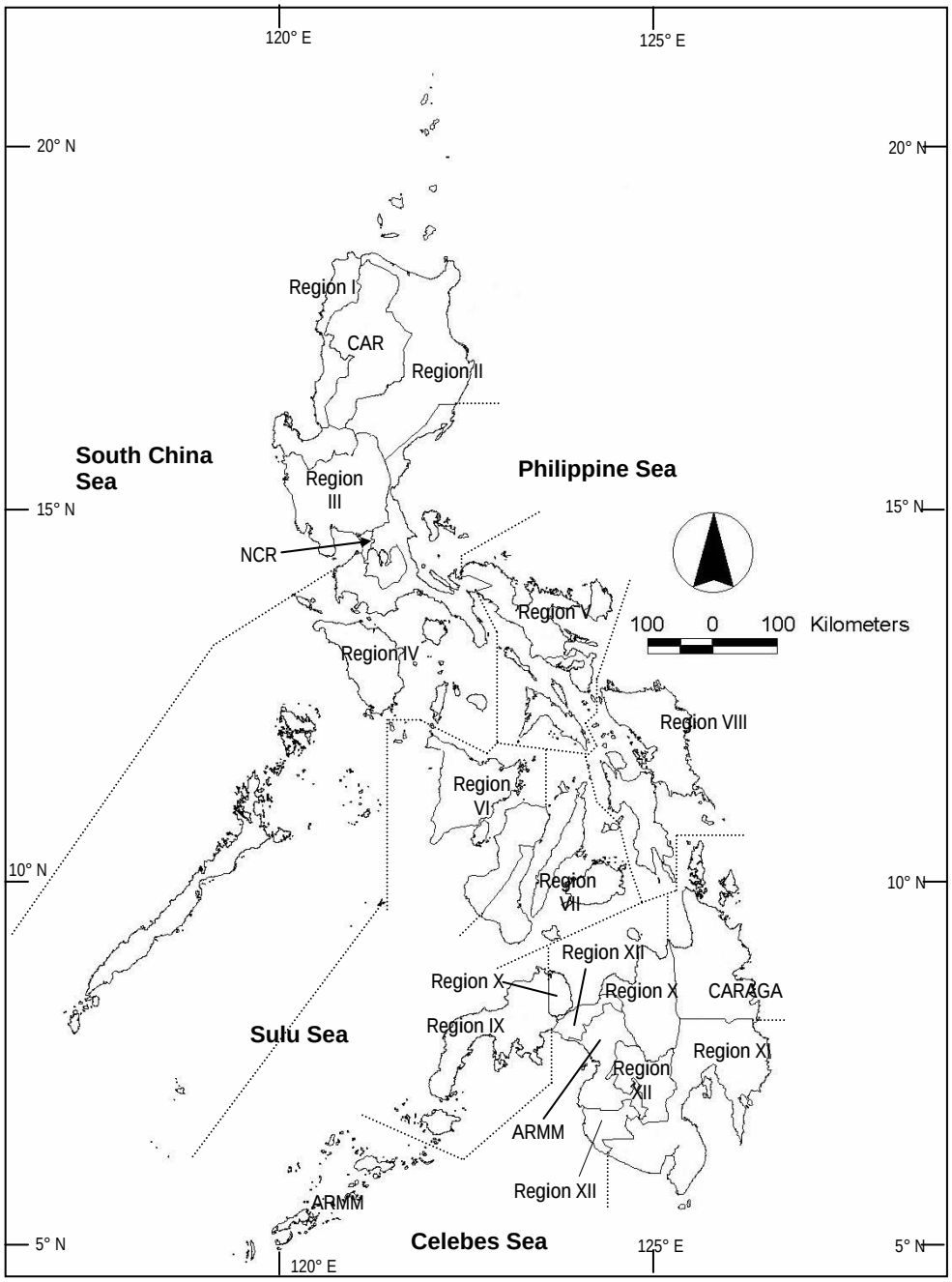
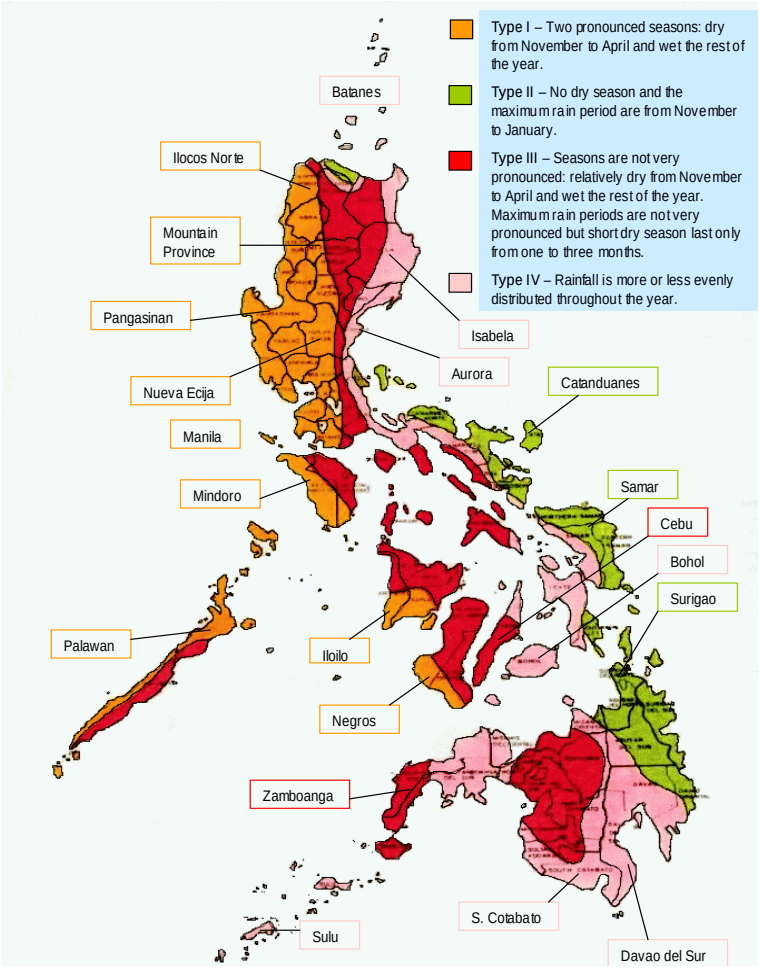


Figure 3.2 ***Climatic map of the Philippines based on the modified coronas classification system***



Adapted from: PAGASA (1984)

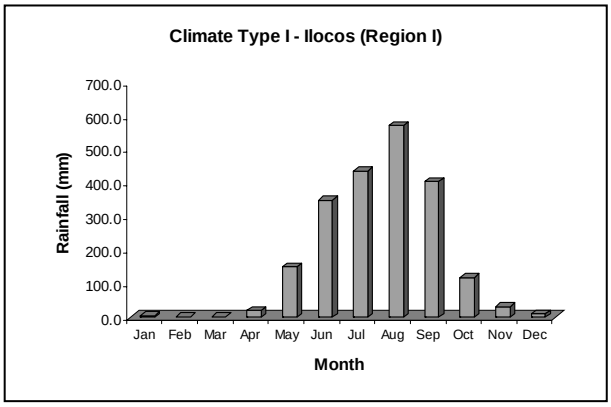
Rural population and poverty trends

18. Population and household profile. The Philippine population as of May 2000 was 78.8 million. Between 1995-2000, annual population growth rate remained high at 2.38 percent, although there has been an overall declining growth rate since the 1970s. If the present annual growth rate continues, population is expected to double in 29 years (Table 3.3). Dependents, i.e. 14 years old and below, comprise 37 percent of the population; median age is 21 years. Average household size is 5 persons and has been on a declining trend since the mid-80s. In 1980, some 62 percent of total

population was classified as rural; this declined to 52 percent in 2000.[4] However, the rural population still increased in absolute number (by 7.1 million) during this 20-year period, thus increasing population pressure on the available agricultural land.

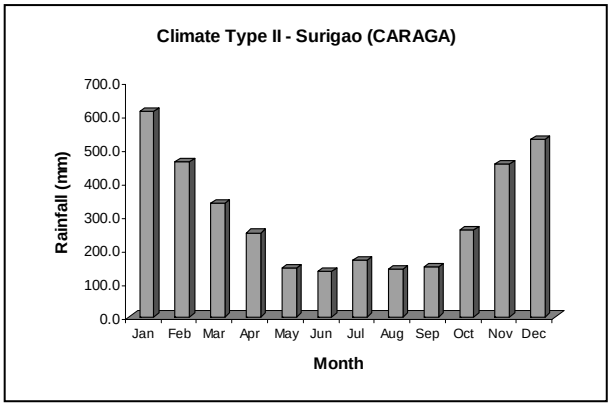
Figures 3.3a-3.3d Rainfall distribution patterns in the Philippines

Figure 3.3a. ***Rainfall distribution pattern, Climate Type I (1961-1995)***



Source of data: PAGASA

Figure 3. 3b. ***Rainfall distribution pattern, Climate Type II (1961-1995)***



[4] Urban areas in the Philippines are basically a matter of definition. Areas become classified as urban when population density rises to a certain level, even if activities in the area remain largely agricultural. Poverty in the Philippines remains largely an agricultural phenomenon, and the biggest contribution to poverty in many provincial urban areas is the same as in rural areas: dependence on subsistence agriculture (Quizon, 2002)

Figure 3. 3c. ***Rainfall distribution pattern, Climate Type III (1961-1995)***

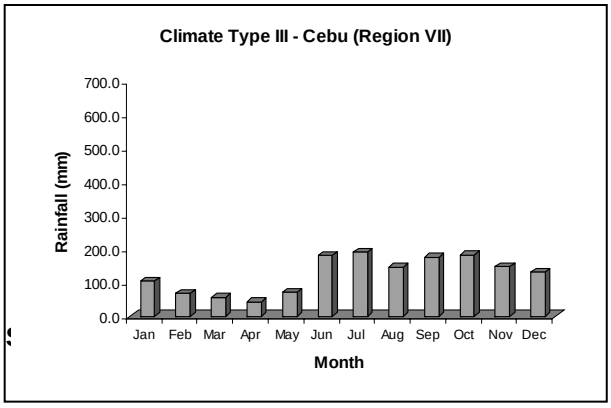
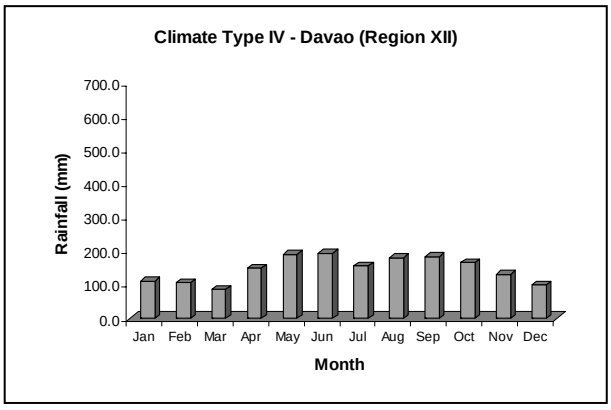


Figure 3. 3d. ***Rainfall distribution pattern, Climate Type IV (1961-1995)***



Source of data: PAGASA

Table 3.2 ***General land use in the Philippines, 1990 (de Jesus, 2001)***

Land use	**Luzon** ***(ha)***	**Visayas** ***(ha)***	**Mindanao** ***(ha)***	**Total Land Area** ***(ha)***	**% of area devoted**
Agricultural areas	4,333,980	2,512,324	3,439,437	10,335,741	34
Grassland/shrubland	4,023,003	2,020,839	2,951,337	8,995,179	30
Woodland	4,780,661	895,927	3,269,274	8,945,862	30
Wetland	275,692	164,215	333,895	773,802	3
Miscellaneous	676,156	85,230	205,947	967,333	3
TOTAL				**30,017,917**	100

19. Income-based poverty trends. One-third of all Filipino families (30.8 million), were deemed to be poor in 2000, unable to meet specified basic needs. Poverty reduction has been confined mainly to urban areas, where poverty incidence

impressively declined from 30.1 percent in 1988 to 19.9 percent in 2000. Moreover, poverty reduction has not been sustained, since poverty incidence in the country actually rose from 31.8 percent in 1997 to 33.7 percent in 2000. The reversal in the downward trend can be attributed mainly to the combined impact of the Asian financial crisis and El Niño in 1997-1998, with the latter having a greater impact on rural poverty. Rural areas currently account for roughly 71 percent, or 3.6 million out of the country's 5.1 million families in poverty. Nearly half of rural families (46.9 percent) were living below poverty threshold, compared to about one-fifth (19.9 percent) of urban families (Table 3.4 below). In addition, rural poverty remains "largely agriculture-driven" both in depth and severity (World Bank, 1997). Poverty incidence remains highest, about two-thirds, among farming and fishing families. Within agriculture, farm workers in sugarcane, small farmers in coconut, rice and corn, fishermen and forester households are among the poorest of the poor, accounting for about 70 percent of all subsistence households in 2000. Using income indicators, the number of poor families increased from 4.3 million families in 1985 to 5.1 million families, or 30.8 million poor people in 2000. Rural areas accounted for over two-thirds of the increase in the number of poor households for the period.

Table 3.3 ***Summary of Projected Population by Five-Year Interval, Philippines: 1995-2040 (in thousands)***

Sex	1995	2000	2005	2010	2015	2020	2025	2030	2035	2040
Low Assumption										
Male	34,450	38,027	41,303	44,209	46,922	49,589	52,024	54,090	55,694	56,845
Female	33,900	37,478	40,776	43,731	46,518	49,275	51,847	54,109	55,966	57,426
Both Sexes	68,349	75,505	82,079	87,940	93,440	98,864	103,871	108,199	111,660	114,271
Medium Assumption										
Male	34,450	38,443	42,394	46,206	49,766	52,979	55,904	58,612	60,977	62,915
Female	33,900	37,877	41,821	45,645	49,242	52,524	55,569	58,449	61,040	63,258
Both Sexes	68,349	76,320	84,215	91,851	99,008	105,503	111,473	117,060	122,016	126,174
High Assumption										
Male	34,450	38,665	42,992	47,334	51,576	55,642	59,435	62,862	65,911	68,590
Female	33,900	38,090	42,394	46,725	50,976	55,073	58,949	62,519	65,766	68,700
Both Sexes	68,349	76,756	85,386	94,058	102,552	110,715	118,384	125,381	131,677	137,290

Source: National Statistics Office, Manila, Philippines

20. Income distribution and regional disparities. In 2000, the bottom 40 percent of families received 12.3 percent of total income, while the richest 20 percent of families received 55.1 percent of total income. The Gini coefficient was 0.4818, a negligible improvement compared with the Gini coefficient of 0.4680 in 1985. Also, wide income disparities continue to mark the country's regions, provinces, and between urban and rural areas. The three poorest regions with the highest poverty incidence (above 50 percent of families) were the Autonomous Region of Muslim Mindanao (ARMM), Bicol provinces (Region 5) and Central Mindanao (Region 12).[5]

Table 3.4 ***Poverty in the Philippines, rural and urban, 2000***

Sector	Below Poverty Threshold		Below Subsistence/ Food Threshold	
	No. of Families	***% of Families***	***No. of Families***	***% of Families***
Philippines	5.1 M	33.7	2.5 M	16.7
Urban	1.5 M	19.9	0.5 M	7.2
Rural	3.6 M	46.9	2.0 M	25.8

Source: National Statistical Coordination Board (NSCB), 2001

21. The chronic and transient poor. The recent *Asian financial crisis* and *El Niño* episode of 1997-1998 show the poor remain highly vulnerable to shocks. Using NSO surveys, it was found that *half* of those considered poor in 1997 were consistently poor in 1998 and 1999. This means that half of poor families tend to move in and out of poverty, thereby suggesting that meeting the country's MDGs on poverty reduction is not insurmountable. However, the results also show how vulnerable certain segments of the population are. Further research is needed to identify who are the chronic and transient poor, and to identify the causes of their poverty. (Reyes, 2003)

22. Rural poverty and insurgency. Moreover, poverty and insurgency are very much related. There is an ongoing Communist movement as well as a Muslim separatist movement. The discontented rural poor provide the base for the insurgency movement, while insurgency also tends to limit economic activity thereby worsening the poverty situation. These could partly explain why ARMM, Bicol and Central Mindanao remain the three poorest regions. (Reyes, 2003)

[5] A recommended reading is the *Philippine Human Development Report*, which compares and analyzes regional and provincial HDI and poverty-related indicators.

23. Better performance in non-income indicators. Over the years, the Philippines has performed better with regards to *non-income* indicators rather than with income-based poverty indicators.

24. Health, nutrition, water and sanitation. Infant and child mortality rates have gone down from 80 in 1990 to 48 in 1998 and from 57 in 1990 to 35 in 1998, respectively.[6] Similarly, maternal mortality rates also declined from 209 per 100,000 live births in 1993 to 172 per 100,000 live births in 1998. Significant progress over the past 13 years has also been witnessed in life expectancy and prevalence of diseases such as TB and malaria. Malnutrition prevalence among children aged 0-5 has declined from 34.5 percent in 1990 to 30.6 percent in 2001. Food and nutritional intake appears highly vulnerable to sudden economic shocks, such as the 1996-97 Asian financial crisis (Table 3.5). The average daily consumption diet of Filipinos decreased from 869 grams in 1987 to 803 grams in 1993, with a corresponding decline in the mean one-day energy intake from 1753 kilocalories (kcal) to 1684 kcal. Lower consumption levels were observed for most of the food groups, indicating that vitamin and mineral intake remain grossly inadequate. Between 1990 and 2000, access to safe drinking water declined by two percent for both rural and urban households. On the other hand, sanitation facilities and services have generally been improving among Filipino families. Overall, urban households have better access to water and sanitation, and wide gaps persist in terms of access between urban and rural households.

Table 3.5 Incidence of malnutrition among children, 1989 - 1998, Philippines

Malnutrition indicators	1989	1996	1998
Incidence of moderately and severely underweight pre-school children, 0-5 years old	34.5	28.9	32.0
Incidence of children with stunted growth (due to prolonged food deprivation & frequent infections)	40.0	31.8	34.0

25. Education and functional literacy. Elementary (Grade 1 to 6) participation rate is 97 percent for all children of school age for school year (SY) 2000-2001, and the secondary level participation rate is 73.4 percent. Only 67.1 percent of those who entered Grade 1 were able to finish elementary level, while 73.2 percent of those who enrolled for first year were able to graduate for SY 2001-2002. Among the household population 10 years old and over, a high 92 percent were considered literate, able to read and write a simple message in any language or dialect. (NSO, 2000), a level which is higher than those of neighboring Asian countries. However, there has been growing concern over the deteriorating quality of education as highlighted by the lowering of NEAT & NSAT scores.[7] While more boys tend to enter elementary and

[6] Infant and child mortality rates are measured per one thousand (1,000) population.

[7] NEAT stands for National Elementary Assessment Test; NSAT stands for National Secondary Assessment Test.

secondary school, girls tend to survive more years in school, and to move on to the next level; thus they tend to dominate higher education levels. The greater opportunity given to girls is probably due to the perception that boys are more likely to get employed as farmhands or unskilled workers than girls, who at a young age are given household work. However, women tend not to fare well in the labour market. Men tend to have higher positions, and their earnings remain higher than those of women for the same positions.

26. Human Development Index (HDI). The HDI for the Philippines has been increasing since 1985, however the country's rank has generally been declining from 45th among 99 countries in 1975 to 85th out of the 175 as of 2001 (2002 UNDP Human Development Report). Consistent with this finding, the pace of improvement in the various indicators of social development, except for education, appears slower for the Philippines compared to other ASEAN countries.

27. Governance issues in targeting poverty. A recent assessment (Reyes, 2003) has raised several governance issues related to the anti-poverty programs implemented by different administrations:

a) there has been no continuity in the programs, which change with every administration; programs are dropped not on the basis of their value or relevance but simply they were part of the previous administration;
b) targeting schemes have been weak;
c) local government units lack the capacity to undertake poverty assessments and to formulate action plans; and
d) poverty monitoring and evaluation systems have yet to be organized at the local level.

The Philippine economy and agriculture

28. Overall status of Philippine economy and position of agriculture. In the 1980s, overseas labour overtook agricultural products as the country's main "export". Over recent years, remittances from an estimated 7.5 million overseas Filipino workers (OFWs) were the country's top source of foreign exchange earnings, contributing an estimated USD 8 billion annually to the Philippine economy.

29. The rice sector. Rice is the staple food to 85 percent of the population. On the average, production is just enough to meet the country's food consumption requirement. Between 1993 and 1998, average production was 6,675 million metric tons, against a food consumption requirement of 6,662 million metric tons. But average total requirement, including seeds, feeds and wastage, is 7,273 million metric tons. Average production deficit is 578 million metric tons or roughly eight percent of the projected requirement (Corpuz 2000).

30. The rainfed, lowland rice sector. Rainfed agriculture as the name suggests is solely dependent on rainwater. It could be well or overfed by rains and, by and large, it is still tradition and subsistence-oriented. It is characterized by low and uncertain productivity, diverse farming situations and practiced largely by farmers who cannot afford capital intensive technology and have little capacity to beat risk.(Prasad et.al. 1996).

31. Population growth vs agricultural growth. Production of rice and corn remained below the country's domestic requirements over the five-year period (1997-2001), with rice and corn registering an average of 87 percent and 93 percent *self-sufficiency ratio* (SSR), respectively (BAS, 2000). This suggests that the country will have to import around 13 percent and 7 percent of its rice and corn requirements, respectively, on average annual basis in order for the country to have sufficient supply of these basic cereals. The Philippines must reach an average yield of 5.4 tons/ha. if the country is to sustain its food security requirement. (Hossain, 1997).

Table 3.6 Palay yield, Philippines and Selected Asian Countries, in MT/Ha

Country	1989-91	Rank	1998-2000	Rank
Korea	6.23	1	6.63	1
Japan	6.12	2	6.38	2
China	5.61	3	6.30	3
Vietnam	3.17	4	4.08	4
Myanmar	2.92	7	3.30	5
Sri Lanka	3.02	5	3.25	6
Philippines	**2.83**	**8**	**2.93**	**7**
Malaysia	2.93	6	2.87	8
Thailand	2.10	9	2.31	9

Source: MTPDP 1999-2004

32. Some production issues in the rice sector. The Food and Agriculture Organization (FAO, URL: www.fao.org) has cited the following major constraint to sustainable rice production in the Philippines:

- Typhoons and drought in rainfed farming systems;
- Rice tungro virus, bacterial leaf blight and blast and major insects such as green leaf hopper and stem borers;
- An estimated 1.2 million ha or about one half of the national rice hectarage, are classified as problem soils;
- Degradation of irrigation facilities;
- Unfavorable pricing policy favoring urban consumers; and

- Devolution of extension services at its initial stage causing weak extension support.

Selected environmental factors affecting the lowland agricultural ecosystem

33. Natural disasters, particularly typhoons and droughts, directly affect the lowland agricultural ecosystem. *Philippine Agenda 21* (section on lowland ecosystems) also identified three major environmental issues for the lowland agricultural ecosystem – land conversion, soil erosion and excessive use of chemical farm inputs (note: chemical use is discussed in Section 3.3 at farming systems level). These are briefly described below.

34. Typhoons. The Philippines experiences an average of 19 typhoons (tropical cyclones) every year during the wet season. Due to this frequent occurrence, crop performance is generally low during the *wet* season since crops are often affected by strong winds and water logging/flooding brought about by excess water and successive typhoons. The occurrence of strong winds that cause rice crops to lodge coupled with flooding results to farmer losses in millions of pesos. Furthermore, the occurrence of the "La Nina" phenomena results in excessive moisture and flooding. The frequent occurrence of tropical cyclones (typhoons) and the periodic occurrence of "La Nina" severely affect rural communities and farmers who depend heavily on their rice crops for their income and survival.

35. Drought. The Philippines experiences the El Nino phenomena about 2 to 3 times every ten years. This occurrence results in severe crop losses due to drought even during the wet season when rainfall is supposed to be sufficient. Furthermore, the occurrence of the "El Nino" lowers the water levels stored in reservoirs and dams resulting in lesser area that can be serviced by existing irrigation systems. The drought problem contributes to low or no income for farmers due to crop losses. In addition, the growing of rice crop heavily relies on irrigation water during the dry season. When the source of irrigation becomes limiting during the dry season, farmers experience severe crop losses.

36. Soil erosion. Data as of 1991 shows that about 9 million ha of land as slightly eroded, 8.5 million ha as moderately eroded and 5 million ha as severely eroded. Mindanao was the most severely eroded region. All in all, about 45% of the national land area was classified as eroded. Man-made causes of soil erosion were improper land uses, cultivation practices, extensive deforestation of sloping areas, and improper use of chemicals. (Israel, 2002)

37. Land conversion. Between 1988-2001, total agricultural lands approved for conversion to non-agricultural uses were 50,719 ha or an average of 2,505 ha per year. The approved conversion was due to the increasing population and

industrialization that in turn precipitated the rising demand for land for residential, industrial and other economic activities. (Israel, 2002)

3.3 The territorial context: Nueva Ecija province

Bio-physical characteristics

38. Geography. Nueva Ecija is located in the Eastern rim of the Central Luzon Plains and is situated between 120^{o} 36' 28" to 121 ^{o} 21'45" East longitudes and 15 ^{o} 09'30" to 160 ^{o} 9'30" North latitudes. It is landlocked by the provinces of Pampanga and Bulacan to the South, Pangasinan and Nueva Viscaya to the North, Aurora and Quezon to the East and Tarlac to the West. Total land area reported are as follows: 528,443 ha (DENR Land Classification); 634,808 ha (City and Municipal estimates; 570,992 ha (planimetric estimate from Nueva Ecija) and 550,718 ha (Nueva Ecija Provincial Profile). The discrepancies in total land area estimates may be attributed to the different survey methods, and unsettled political boundary disputes. Composed of 27 municipalities and five cities with a total of 849 "barangays" or villages. Palayan City is the provincial capital and seat of the provincial government. The cities of Cabanatuan and San Jose serve as the principal trading and commercial centers of the province. (Figure 3.4 Map of Nueva Ecija)

39. Topography, Slope and Elevation. Nueva Ecija is comprised of low lying alluvial plains and rolling uplands. The alluvial plains are located in the western, central and southwestern parts. The rolling uplands are located in the northern, eastern and southeastern part of the province. Geographically, Nueva Ecija is protected on three sides by mountain ranges – the Sierra Madre on the East, the Cordillera on the West, and the Caraballo on the North, which has a rugged and complex topography. Small but non-active volcanic cones are also found near the boundaries of Pangasinan and Nueva Viscaya provinces. The highest mountain peak is located in the eastern part of the province. The north-south trending the Sierra Madre range in the border of Nueva Ecija and Quezon/Aurora provinces consist of scattered peaks with the highest elevation at about 1,724 meters above sea level. The lowest point in the province is located at the southwestern portion bordering the province of Pampanga where the vast Candaba Swamp is located with an elevation of only 12 meters above sea level.

40. Physiography and Soils. Soils in the province are generally complex materials and alluvial soils which are good for agriculture. Approximately one-third of the total land area is classified as Annam Clay Loam, which is suitable for a wide variety of agricultural crops such as root crops, vegetables, fruit trees and forage production. The other predominant soil type is the Quingua Silt Loam, which is best suited for rice cultivation and orchard crop production.

41. **Water Resources, Drainage, Tributary Patterns and Catchment Areas.** The water resources for the province are composed mainly of surface water and ground waters harnessed for irrigation, power generation, aquaculture production, recreation and domestic consumption. Four major rivers (Pampanga River, Malimba river, Talavera river and Chico River), eleven other river/creeks and numerous minor springs in various locations comprise the surface water resources. The aggregate total catchment area of these river systems is about 12,840 square kilometers. Ground waters are mainly extracted through deep well pumps and hand pumps. These rivers all flow southwest toward Pampanga province before reaching Manila Bay. The largest of these rivers is the Pampanga River, which is the main source of the Pantabangan Dam Reservoir.

42. **Climate**. Based on records on climatological normal from 1951 to 1985 from a station in Cabanatuan City, average rainy days totaled 121 days with an annual rainfall of 1,873 mm. August has the most number of rainy days (24 days) while February has the least with only one rainy day. July to October is the most pronounced wet season. The yearly mean temperature is 27.5 degrees Celsius. Coldest month is January with an average temperature of 20 degrees Celsius and the hottest month is April with an average temperature of 35.5 degrees Celsius. The mean sea level pressure is 1,010.9 millibars annually. The prevailing wind direction is northeast with an average wind speed of 2 miles per second. Shown in are climatological data recorded by PAGASA in year 2001 for the province of Nueva Ecija. The province is frequently hit by tropical cyclones (typhoons) during the months of June to October. The strong winds and excessive water normally results to losses to crops, houses and even lives. Table 3.8 shows the number of municipalities, barangays, persons affected and the damage to agriculture and infrastructure by some of the worst typhoons that hit Nueva Ecija from 1991 to 2000.)

Figure 3.4 ***Political Map of Nueva Ecija***

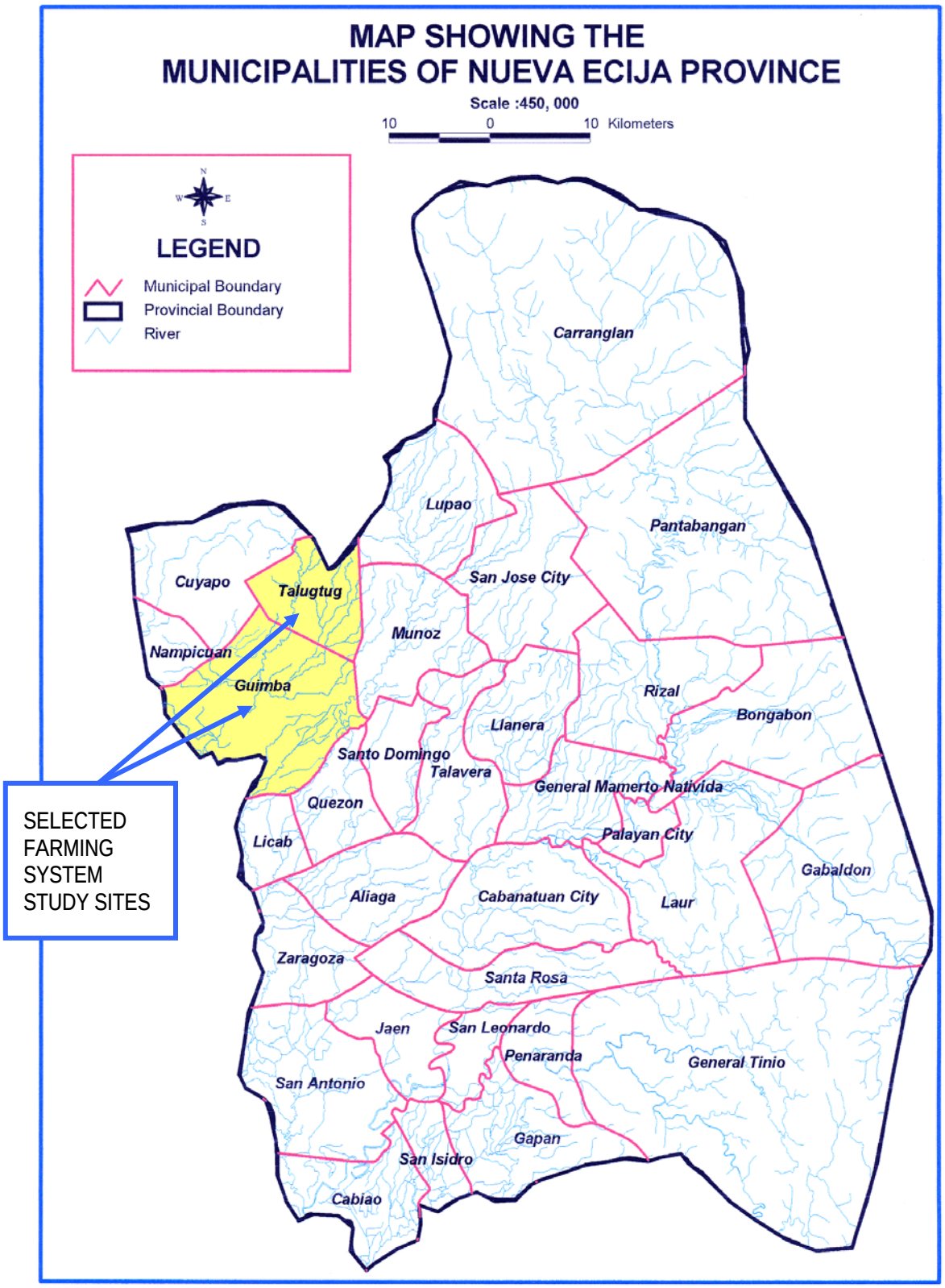


Table 3.7 ***Number of cities, municipalities, barangays, persons affected and the damage to agriculture and infrastructure by some of the worst typhoons that hit Nueva Ecija from 1991 to 2000.***

Typhoon name / Dates occurred	Cities	Municipalities	Barangays	Families	Persons	Damage to Agriculture (million pesos)	Damage to Infrastructure (million pesos)	Casualities
Diding (Sep 9, 1991)				14,983			19.15 M	11 (dead)
Ditang (Jul 19, 1992)	2	20	198	14,900		100.89 M	208.97 M	13 (dead) 5 (injured)
Gering (June 26, 1993)	3	9	43	582	2,239	1.023 M	61.82 M	
Mameng (Oct 18, 1995)	3	29	201	70,976	354,880	921.595 M	51.54 M	
Resing ((Nov 11, 1995)	1	9	25	733	3,037	281.38 M	86.25 M	
Gloring (Aug 7, 1996)		8	69	5,499	28,215	31.76 M	52.85 M	
Ibiang (Sep 3, 1997)	2	7	101	35,152	171,069	27.67 M	32.83 M	
Iliang (Oct 14-15, 1998)	2	9	29	2,253	11,839	128.9 M	30.95 M	
Ising (Aug 3-8, 1999)	3	26	186	16,164	69,942	105.39 M	64.38 M	4 (dead)
Ditang & Ebeng (Jul 3-10, 2000)	3	25	105	3,783	15,385	24.98 M	22.49 M	1 (dead) 1 (injured)
Biring (May 17-18, 2000)	1	1	3	288	1,440		87.5 M	

43. Land Classification. From 1981 to 1986, approximately 63% of the area (330,985 ha) is classified as certified alienable and disposal lands (A & D) while 37% (197,448 ha) is classified as forestlands some 166,000 ha were classified and the balance area were unclassified. Of the classified forest area, 64,000 ha were used as military and naval reservation, 63,000 ha were established forest reserve, 35,000 ha were established timberland, 4,000 ha were national parks and 483 ha were civil reservation.

44. Flora and Fauna. Of the 197,448 ha of classified forestlands, only 94,454 ha are still forested, predominately with dipterocarps and the remaining balance are either brush lands or cogonal lands. Majority of these are secondary growth forests, but isolated areas of old growth and mossy forest exist in the higher elevations. Major dipterocarp species are palosapis, apitong, guijo, red and white lauan. Since Nueva Ecija is a landlocked province, there are no mangrove forests. Different species of birds, reptiles, mammals and insects have been sighted and recorded. Many bird species are found in the Dalton Pass area near the Nueva Ecija and Nueva Viscaya boundary. Rare wildlife such as *Kochs pitta*, Philippine Deer, wild pig, wildcat, python, and crested myna are also found in the province. However, these bird species and rare wildlife are subjected to heavy hunting activities and are also threatened due to wanton destruction of their natural habitat.

45. Mt. Pinatubo Volcanic eruption. Although the province of Nueva Ecija was not hard hit by the 1990 Mt. Pinatubo eruption, it also resulted to a lot of damage to agriculture, property and lives. Three cities and 29 municipalities with a total of 19,983 families (91,185 persons) were affected by the eruption. It had caused a damage of P 41.986 million to agriculture and P 494.47 million to infrastructure. It left 250 people dead and 421 injured.

Provincial agriculture profile

46. Brief agricultural history. Nueva Ecija had evolved from a formless marshland into one of the key rice granaries of the archipelago between the years 1700 to 1940. The accelerated rate of change occurred during the early decades of the 20th century when its economy was restructured for commercial rice production. Pre-war agriculture was characterized by monoculture since that was the most logical outcome of the patterns of *hacienda* development in the region. During the period 1870 to 1887, the annual rice production in the province increased from 700,000 to 1.5 million cavans. In the early 1920's Nueva Ecija overtook Pangasinan province in rice production and became the new rice granary of the Central Plains. By mid-1930's Nueva Ecija produced eight to nine million cavans of rice per year, or about one-fifth of the total national production.

47. Current land use. Due to its high agricultural production, Nueva Ecija was named the "Food Bowl and Rice Granary of Central Luzon". Forty-five percent of its total land area is devoted to agriculture. The second largest area is occupied by grassland/ shrub land, while about 18% of the area is considered woodland.

48. Upland and lowland areas. Based on agro-ecosystem, *upland* farming areas are located in the eastern municipalities bordering Aurora province – i.e., Carranglan, Pantabangan, Lupao, Bongabon, Gabaldon, Laur, Rizal, Cuyapo and the provincial capital of Palayan City. The *lowland* farming areas include the municipalities of Talavera, Sto. Domingo, Aliaga, Zaragosa, Licab, Llanera, Sta. Rosa, Gen. Natividad, Peñaranda, San Isidro, San Leonardo, Jaen, San Antonio, Cabiao, Quezon, Nampicuan, Gen. Tinio and the cities of Muñoz, San Jose, Cabanatuan and Gapan.

Territorial Farming Systems and Diversification

49. Rice as the main crop. Based on year 2002 statistics, rice accounts for the biggest area (195,653 ha) planted in the province. Of this total area, 147,043 ha are irrigated and 48,610 ha are rainfed. The total production of the province is 1.35 million tons with at average rice yield of 4.36 tons per hectare.

50. Provincial data shows a total of 98,316 rice farmer-households. Of this number, 64,997 farmers have access to some form of irrigation, while 33,319 farmers depend entirely on rainfall for rice farming. Yields vary widely, based on farmers' access to irrigation, frequency of rainfall, and suitability of the soil for agricultural operations. While the "rice-fallow" system is practiced by most rainfed farmers, those with some access to irrigation are better able to diversify their farming system such as: rice-rice, rice-vegetables, rice-livestock, rice-poultry, rice-fruit tree, rice-corn, and rice-onion.

51. Irrigation systems and sources. Historically, Nueva Ecija was the setting of many haciendas before the Land Reform Era of the 1970's. These haciendas mostly produced rice and were heavily dependent on rainfall or irrigation water. Many haciendas developed communal irrigation systems some of these communal irrigation systems are still working and others were further developed after this period.

52. The Upper Pampanga River Integrate Irrigation System (UPRIIS) is one of the biggest irrigation systems in the country servicing the province of Nueva Ecija. The Pantabangan Dam and Reservoirs, built in 1974, serves the UPRIIS. This irrigation system provides water supply to approximately 92,000 hectares of rice lands. The other irrigation systems in Nueva Ecija are shown in Table 3.14. Other irrigation sources consist of communal irrigation systems, 1,159 small farm reservoirs (SFRs), 32 small water impounding projects (SWIPs), deep tube wells (DTWs), and shallow tube wells (STWs).

53. **Rice varieties** cultivated are mainly commercial varieties developed by IRRI, PHILRICE and others. In lowland rainfed/ irrigated areas, these consist of the IR-64, 7, 42, 28, 74, 10, 54, 56; PSB-RC-52, 54, 14, 74, 18, 28, 10, 56, 64, 66, 20; RC-10, 28; C-10, 54 and R-10 varieties. Common rice varieties grown in the uplands are IR-64, 36, 4; PSB-RC-4, 54 and PSB-14, 54.[8] Traditional rice varieties have all but vanished ever since the introduction of Green Revolution technology in the early 1970s; these are planted and promoted only by a few farmers and NGOs promoting organic farming and sustainable agriculture.

54. **Vegetables production.** Approximately 14,127 hectares are utilized for vegetable production in the province. Vegetables planted in the *lowland* rainfed and irrigated are ampalaya, eggplant, chilli, patola, cassava, beans, asparagus, sitao, pisitao, pole sitao, okra, tomato, squash, onion, upo and legumes. Vegetables like tomato, ampalaya, chilli, squash, upo, sitao, munggo, patola, onion, pole sitao, beans, eggplant and cassava are produced in the uplands. Vegetables are often grown in separate plots, but they are sometimes rotated on rice farms during the dry season. In those areas without irrigation, crops such as onions, corn and other vegetables are cultivated in the dry season using residual soil moisture, but at a limited scale. These diversified crops are usually planted right after the rainy season (October to November).

55. **Fruit trees production.** In the uplands, some 3,643 farmers grow 256,318 fruit and forest trees, while 19,502 lowland farmers account for 236,618 fruit and forest trees. Fruit trees include mango (carabao mango, apple mango and native mango), cashew, guyabano, calamansi, guava, chico, coconut, banana, jackfruit, guapple and tamarind, while common forest trees are mahogany, gmelina, acacia, ipil-ipil, neem and eucalyptus.

56. **Livestock and fisheries production.** Farmers raise livestock animals like native, mestizo, buffalo, murrah buffalo, bulgarian, upgraded native carabaos. Provincial data shows a total of 29,432 carabaos (water buffalos) which are still used mainly as working animals. A total of 627 hectares in Nueva Ecija are also utilized for fish (tilapia) production.

57. From the above stated data farmers in the province are practicing diversification because they are not only planting rice but they are also producing vegetables after rice, raised animals and fish and planted high value fruit trees in order to increase their income.

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[8] "IR" are those varieties developed by IRRI; "PSB" refers to the Philippine Seed Board.

Population & Demographic Characteristics

58. Population. Based on the 2000 Census, Nueva Ecija has a population of 1,659,883. The male population accounts for 51% of the total. Population density for the province is 301 persons per square kilometer, higher than the national average of 255 per sq. km. Farming is the main source of income. There are 340,158 households, with an average household size of 5 persons. The total economically active population is estimated at 850,000, while the total labor force is 675,000. The population growth rate of the province shows an erratic trend since 1918. The period 1903-1918 recorded the highest growth rate at 3.4%, and the lowest was recorded during the 1939-1948 period. Between 1995-2000, the province recorded an annual growth rate of 2.1%, slightly lower than that of the Philippines for the same period (2.4%), and lower than the growth rate (2.6%) of the earlier 1990-95 period. If the current growth rate continues, the population of Nueva Ecija is expected to double (to 3.3 million) by year 2033. (NSO, 2000a)

59. Poverty incidence and quality of life. Income indicators show that about 27.3% of families in Nueva Ecija were poor in 2000, lower than the national poverty incidence of 33.7% among families. The average monthly family income for the province was PhP 9,467, lower than the national average of PhP 12,003 (NCSB, 2000). However, Nueva Ecija performed well in human development and quality of life indices.[9] It ranked 28th among 77 Philippine provinces in the Human Development Index (HDI) for 2000[10]; 2nd in terms of the lowest Human Poverty Index for 2000;[11] and 9th among 79 provinces in the Quality of Life Index of 1999.[12] Table 3.9, drawn from different sources, shows the ranking of Nueva Ecija among 77 Philippine provinces across different poverty-related indicators.

60. Education. About 45% of the household population aged five years and over had attended or completed elementary education. Consistent with national trends, the entry and early levels of schooling tend to be dominated by males; there were more males than females who had attended or finished elementary, high school and post

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9 The National Statistical Coordination Board's *Report on the 2000 Philippine Human Development Index* (2002) describes the Human Development Index (HDI) as a measurement taken from the average of (1) life expectancy; (2) functional literacy and combined elementary and secondary net enrolment rate; and (3) real capita per income.

10 PF. *Philippine Provincial Poverty Indicators.*

11 Ibid. Human Poverty Index is a composite measure using the following factors: probability at birth of not surviving to age 40; population not using improved water sources; underweight children under age 5; and adult functional illiteracy rate.

12 The Quality of Life Index is a "composite index that uses a capability-based approach in measuring accomplishment in human development. It measures the basic dimensions of human capability: (1) to be well nourished; (2 for healthy and safe reproduction; (3) and to be educated and be knowledgeable. (Raya, 2002)

secondary (including vocational) education. However, women had higher survival rates in school, and dominated higher levels of education college undergraduates, college degree and post-baccalaureate courses. (Table 3.9)

61. Ethnic composition. The population of Nueva Ecija is rather homogenous, based on ethno-linguistic origin. *Tagalogs* (77.8%) and *Ilocanos* (19.3%) together account for 97.1% of the household population. The rest (2.9%) belong to 41 ethno-linguistic groups. The first wave of Ilocanos migrated to Nueva Ecija in search of land beginning at the turn of the 20th century with the passage of the Homestead Law in 1902 under the American occupation.

Table 3.8 ***Selected Socio-Economic Indicators for Nueva Ecija***

Indicators		***Statistics/ Rank*** *
Population, HDI, HPI, QLI and Poverty incidence	Population (2000 Census)	1,659,883
	Rank in HDI 2000	16th
	Rank in QLI 1999	9th
	Rank in HPI 2000	2nd
	Rank in poverty incidence (Philippine HD Report 2002)	39th
	Human Development Index (HDI-2000)	0.635
	Quality of Life Index (QLI 1999)	0.803
	Human Poverty Index (HPI in PHDR 2002)	8.9
Health	Life Expectancy at Birth (years) (HDI 2000)	70 yrs (Phils: 69 yrs)
	Life Expectancy Index (HDI 2000)	0.76 (Phils: 0.73)
	Probability at Birth of Not Surviving to Age 40 (% of Cohort) 1995 (HPI in PHDR 2002)	11.7%
	Births Attended by Trained Health Personnel Index (QLI-1999)	0.886
	Under-Five Nutrition Index (QLI 1999)	0.731
	Underweight Children Under Age Five (%) 1998 (HPI in PDR 2002)	7.5 %
	% of Families with Access to Safe Drinking Water (Annual Poverty Indicators Survey [APIS] 99)	98.8 %
	Population Not Using Improved Water Sources (%) 2000 (HPI in PHDR 2002)	0.1 %
Education	% High School Graduate 2000 (HDI 2000)	50.9 %
	Primary and High School Enrollment Rate (%) 1999 (HDI 2000)	91.7 %
	Education Index (HDI 2000)	0.713 (Rank: 8th)
	% of Families with Members 13-16 Years in High School (APIS 99)	75.7 %
	Elementary Cohort Survival Index 1999 (QLI 1999)	0.791
	% of Families with Children 6-12 Years Old in	92.7 %
	Elementary School (APIS 1999)	
	Functional Literacy Rate (%)	92.42 % (Philippines: 83.79 %)

* Refers to Nueva Ecija's ranking among the 77 provinces of the Philippines.

Income/ Poverty Indicators	Real Per Capita Income (HDI 2000)[13]	15,743 (Rank: 28th)
	Income Index (HDI 2000)	0.255 (Rank 32nd)
	Poverty Incidence 2000 (Based on PHDR 2002) (%)	31.8 % (Philippines: 28.4%)
	Poverty depth (Based on PHDR 2002)	6.0
	Poverty severity (Based on PHDR 2002)	1.79
	Rank in Magnitude of Poor Population	69th
	Magnitude of Poor Population (Poverty Incidence x Population)	527,178.84
Employment	% of Families with Gainfully Employed Family Head (APIS, 99) (%)	86.2 %
	% Families with Gainfully Employed Members 18 Years Old and Over (APIS, 99) (%)	97.0 %
	Unemployment Rate 1000 (97-00 Labor Force Survey [LFS]) (%)	10.7 %
	Underemployment Rate 2000 (97-00 LFS)	6.8 %

TECHNICAL NOTES:

1. Human Development Index attempts to measure the complex concept of human development by measuring a) life expectancy; b) weighted average of functional literacy and combined elementary and secondary net enrolment rate and c) real per capita income.

2. *Unemployment not linked to poverty*. It may be observed that provinces with relatively higher per capita income have higher unemployment rates. This is manifested in the industrialized provinces of Rizal, Cavite, Laguna and Batangas. On the other hand, provinces with low per capita income have low unemployment rates, as indicated by the ARMM provinces.

   The paradox exists because most of the unemployed and non-labor participants in well-off areas are not poor and can afford not to be gainfully employed, while those employed in poor areas are engaged in jobs with low productivity and low pay. Thus, unemployment is not linked to poverty. (Peace and Equity Foundation, citing Monsod and Ducanes in PHRD 2002)
3. Human Poverty Index is a composite measure using the following factors: probability at birth of not surviving to age 40; population not using improved water sources; underweight children under age 5; and adult functional illiteracy rate.

4. The Quality of Life Index is a "composite index that uses a capability-based approach in measuring accomplishment in human development. It measures the basic dimensions of human capability: (1) to be well nourished; (2) for healthy and safe reproduction; (3) and to be educated and be knowledgeable. (Raya, 2002)

[13] Income was deflated using the provincial Consumer Price Index (1994=100)

Table 3.9 Household population 5 years old and over by highest educational attainment and sex: Nueva Ecija, 2000

Highest educational attainment	HH population 5 years old & over	Male	Female	Male %	Female %
Nueva Ecija	**1,460,721**	**739,224**	**721,497**		
No grade completed	58,136	29,843	28,293		
Pre-school	29,868	15,184	14,684		
Elementary	652,409	333,320	319,089		
High school	440,828	226,490	214,338		
Post-secondary	38,782	19,738	19,044		
College undergraduate	148,523	73,243	75,280		
Academic degree holder	56,940	23,609	33,331		
Post baccalaureate	2,520	1,076	1,444		
Not stated	32,715	16,721	15,994		

Source: *NSO (2000) Census of Population and Housing*

62. First settlements in the northern part of the province – within the (present) municipalities of Cuyapo, Nampicuan, Guimba, Talugtog, Lupao, Munoz, and San Jose City. The dominance of these first Ilocano migrants is still strongly felt; Ilocano is mainly spoken in these northern municipalities of the province.

63. Cultural communities. There are nine (9) cultural communities in the province with an aggregate population of 33,473 individuals. Their settlements are concentrated in the mountainous municipalities along the eastern and northern parts of the province, within the mountain ranges of Sierra Madre, Caraballo and Cordillera. Upland farming, gardening, handicraft-making and farm labor are their major livelihoods. (Nueva Ecija Socio-Economic Profile, 2003) Cultural communities consist mainly of *Kalinga*s, *Kankanaeys*, *Ibalois*, *Aetas*, *Bagos*, *Applais*, and *Ilonggots*. Since the passage of the 1997 Indigenous People's Rights Act (IPRA), six ancestral domain claims have been delineated and awarded in the upland municipalities of Carranglan, Gabaldon, and General Tinio. (Figure/Map 3.4) Under the IPRA law, indigenous people (IP) communities are expected to formulate their own resource management plans, and their role in environmental management is recognized. Thus, IPs are likely to play a crucial role in the future management of portions of Nueva Ecija's watersheds.

64. Religious affiliation. Some 94.0% of the household populations are Christian. These are dominated by Roman Catholics (82.5%), Iglesia ni Cristo (5.6%), Aglipayans (2.5%), Methodists (1.7%) and Evangelicals (1.7%). In general there is little

discrimination on the basis of religion in all spheres of life. However the Christian tradition is the central source of values in this province.

65. Local elite. With regards to political and economic scene, a small number of families dominate both the political and economic scene in the province. Approximately 15 families control economic activities in the province. With their resource base and political power they control they direct a development process that does not always align with the needs of the most vulnerable groups.

Rural Development Institutions

66. The Muñoz Science Community. In 2001, Munoz municipality in Nueva Ecija was instituted as a chartered city, and came to be known as the "Science City of Munoz" in view of the numerous science and technology institutions that operate in the locality. The most prominent among these is the Central Luzon State University (CLSU), which was first established by the Americans in 1907 as the Central Luzon Agricultural School, and now stands as the country's oldest agricultural school. Since then, several national science and technology institutions were established in Munoz. These include, among others: the Bureau of Post Harvest Research and Extension (BPRE); National Irrigation Administration Upper Pampanga River Integrated Irrigation System (NIA-UPRIIS), Bureau of Fisheries and Aquatic Resources – National Freshwater Fisheries Technology Center (BFAR-NFFTC), Philippine Rice Research Institute (PhilRice), Philippine Carabao Center (PCC), Casecnan Multipurpose Irrigation and Power Project (CMIPP) and the National Freshwater Fisheries Technology Research Center (NFFTRC).

67. The presence of these S & T institutions in Nueva Ecija has proven beneficial to the local farming community. They undertake research and development activities in support to sustainable agriculture and rural development. Table 3.10, outlines the programs and strategies of these institutions that cater to the information and technological needs of local farmer communities.

Table 3.10 ***Programs of National/Line Agencies, Institutions in Nueva Ecija***

Agency	Activities, Programs Related to Technology Delivery
Department of Agriculture	Develops and gives IEC materials IEC materials to farmers
PhilRice	Develops and gives IEC materials to farmers Develops rice-related technologies

Agency	Activities, Programs Related to Technology Delivery
	For technology promotion, PhilRice conducts training courses and briefings on the various aspects of rice science and technology. PhilRice disseminates new scientific knowledge through print materials like pamphlets, leaflets, brochures, books, and manuals.
Central Luzon State University (CLSU)	Develops and gives IEC materials to farmers Serves as national multi-commodity center of excellence and develops packages of technologies, processes, methodologies and delivery systems Conducts Research and Extension projects and activities Develops R&E proposals and submits these to funding agencies Establishes agri-based demonstration sites for farmers to see and appreciate actual technology application.
Philippine Carabao Center	**Promotes profitable and sustainable Carabao-based enterprise designed to improve the income and nutrition of rural farming communities** Develops and gives IEC materials to farmers Develops carabao-milk products and extends these to malnourished communities to enhance their protein intake Implements carabao-dispersal program The Information and Training Division (ITD) of PCC disseminates technology to farmers, coordinates, and collaborates with different agencies in the production of manuals on artificial insemination, processing of different milk products and management of dairy buffaloes. PCC also conducts training courses to upgrade the farmers and technicians from the local government units.
Private companies	Develops and gives IEC materials to farmers Sells agri-based chemical products
National Irrigation Administration National Irrigation Administration-Upper Pampanga River Integrated Irrigation System (NIA-UPRIIS).	Administers/manages water distribution to irrigated areas Collects water fees Focuses on the General Appropriation Act (GAA) 2003 which covers the Repair and Rehabilitation of Existing National Irrigation Systems (RRENIS).
National Food Authority	Procure rice harvest of the farmers Provide technical assistance in Post-harvest

Agency	Activities, Programs Related to Technology Delivery
Department of Environment and Natural Resources	Implement environmental and natural resources preservation and protection laws
Bureau of Post-harvest Research and Extension (BPRE). Formerly known as NAPHIRE.	Generates post-harvest technologies and extends these to clienteles; Generates, extends improved post-harvest and processing technologies that minimize quantity and quality losses of agricultural and fishery commodities; Training and Extension Department (TED) of BPRE conducts training, demonstration, technical assistance, information communication, and extension and media support services.
Bureau of Fisheries and Aquatic Resources	Generate technology on aquatic resources Implement government program on fish production Implement laws protecting aquatic resources Conduct training and extension for farmers and other partners in aquatic resources development Provide technical assistance in aquatic resources
Agricultural Training Institute	Develops, design and conduct training programs in agriculture and other related program target to clientele
Department of Science and Technology	Provides central direction, leadership and coordination of all scientific and technological activities; and formulates policies, programs, and projects to support national development. The PSTCs implement technology transfer and commercialization, testing, analysis and consultancy services; training, promotion and education for different sectors (no only in agriculture). Funds projects such as Upgrading the Ice Cream Making Facility of the PCC at CLSU Dairy Farm; Improving Metals Fabrication and Upgrading the Production of Novelty Medieval Weapons; Ornaments; Establishment of a Common Service Facility (CSF) on Electroplating Technology; Technical Intervention in the Establishment of the Jaen Village-Based Mango Processing Center; and the Bamboo and Rattan Production: Upgrading the Central Luzon State University Tissue Culture Laboratory (CLSU-TCL).

68. Cooperatives. In 2001, the number of registered cooperatives in the province was 1,516. Of these, a large majority (or 69%) was classified as multipurpose agricultural cooperatives (Table 3.12). In 2002, however, the number of registered cooperatives dwindled to 1,488. Of this number, 1007 or 68% were "non-operating" (Nueva Ecija Socioeconomic Profile 2002). The latest report meanwhile indicates that as of June 2003, the total number of registered cooperatives has been further reduced to only 1,458 (CDA Cabanatuan City). Table 3.13 provides a summary of registered cooperatives in Nueva Ecija and their status as of 2002. Majority of the cooperatives are multipurpose and agriculture based. They focus on credit, consumers, producers,

and marketing, receiving assistance from financing institutions. The Provincial Cooperative Development Council disclosed that the cooperative concept has not been fully internalized by the farming community and therefore its potential contribution or role as vehicle for agricultural development is not maximized.

69. A number of internal and external reasons why cooperatives failed were cited in several reports. Internal problems related to management included unpaid loans of cooperatives owing to members' delayed loan repayment. Inactive cooperatives also stemmed from mismanagement and lack of leadership skills of officers, irregular meetings, and poor attitude of members and felt inequality in the provision of services. External problems bordered on inadequate support from the LGU in terms of fund allocation; inadequate technical assistance from relevant institutions; and inadequate information base for informed decision making in cooperative operations.

Table 3.11 ***Distribution and percentage of cooperatives in Nueva Ecija according to type, 2002***

Type	District I		District II		District III		District IV		Total
	No.	%	No.	%	No.	%	No.	%	
MPA	286	77.1	317	81	242	62	200	56	1045
MPN	34	9.3	24	6.1	96	24.5	106	30	260
Credit	23	6.3	14	3.5	28	7.14	28	7.7	93
Mktg	1	.27	2	.5	3	.8	5	1.3	11
Prod	9	2.4	11	2.8			13	3.6	33
Cons	2	.54	7	1.8			2	0.5	11
Service	7	1.9	9	2.3	13	3.5	4	1.0	33
Housing			1	.3	1	.25			2
Sec	5	1.3	9	1.5	8	2.0	5		27
Coop Bank					1	0.25			1
TOTAL	367	100	394	100	392	100	363	100	1516

Table 3.12 ***Summary of registered cooperatives and their status, 2002***

District	Total Registered	Operating		Non-Operating/For Cancellation	
		Number	%	Number	%
I	367	106	29	261	71
II	394	117	30	277	70
III	392	159	41	233	59
IV	363	82	23	281	77
TOTAL	1516	464	31	1052	69

70. NGOs and civil society organizations. The Nueva Ecija Provincial Profile for 2002 listed 68 NGOs and peoples organizations (POs), including the Philippine Rural Reconstruction Movement (PRRM) – Nueva Ecija Chapter. PRRM is the biggest and oldest NGO in the province who are advocate of sustainable agriculture and people empowerment. Center for Agrarian Reform Empowerment and Transformation, Inc. or CARET in Guimba, and KALIKASAN. Kalikasan-NE is one of the second biggest peoples organization in the province engaged in organic farming and advocates of sustainable agriculture. (See Table 3.14, for institutional descriptions.)

Table 3.13 ***NGO and Civil Society Institutional Description***

Year/ Period	Institution and Major Event	Focus
1952	NGOs Philippine Rural Reconstruction Movement (PRRM)	Founded by a group of civic minded citizens in education, government and business. Members include 600 civic minded individuals organized into 18 chapters throughout the country. Members include academicians, professionals, businessmen, government personnel and local government officials. PRRM's field programs span 17 provinces from Ifugao in the North to Cotabato in the south where "sustainable area development" and sustainable rural districts development models are being tested and refined.
1987	Alalay sa Kaunlaran sa Gitnang Luzon (ASKI)	ASKI was commissioned on March 23, 1987. The organization is linked to other poverty focused NGOs through APPEND (Alliance of Philippine Partners in Enterprise Development). Their mission statement states that the organization is in place to promote the alleviation of poverty through holistic focus on all spheres of life. They commit to reach 40,000 poor Filipino families by the year 2005. Focus is micro-financing under community –owned integrated development programs.
1988	Gratia Plena	A church-based NGO, focusing on institutional development and organic farming. A producer of organic vegetables models for their partners in development. They provide credit assistance, for small ruminants, poultry, swine, and ducks raising project.
1990	Empowerment (OPI)	Operating in South Nueva Ecija. It started operations in the 1990s with focus on institution building, establishment of livelihood projects and policy advocacy on agriculture, agrarian reform, and environmental protection. Majority of clients are men and women in farming community.
1993	POs KALIKASAN – Nueva Ecija	Founded by 64 farmers. Their aim was to develop sustainable rice-based organic agriculture. Each cooperator devoted about one hectare of his/her land to organic rice production. Activities include the provision of technical assistance, training of new members and making inputs such as chicken manure and rice seedlings available to farmers. As of June 2003, membership has reached 700 in 18 communities. The aim is gradually evolve their rice farming systems into diverse integrated farming systems. This is the second biggest PO in Nueva Ecija engaged in organic farming and advocates sustainable agriculture.
1991	KADAMA	This is a confederation of five farmers' organizations: DIWA, UGNAYAN, LIKHA, PMK and KADAMA. It has about 1,500 members, aimed to enhance farmers' cooperation, spread the use of MASIPAG technology and organize the marketing of MASIPAG rice. MASIPAG technologies are focused on collecting and evaluating traditional rice varieties, breeding improved traditional varieties appropriate to local soils, and climates; alternative pest management using locally produced pest traps; biological pesticides; resistant varieties and diversified farming techniques; organic farming using organic fertilizers; and training farmers in rice breeding and documentation.

71. Local Government Units(LGU) The territory are composed of 32 municipalities, that comprise of five (15.63%) cities; two (6.25%) 2nd class municipalities; five (15.63%) third class; 13 (40.03%) fourth class and seven (21.88%) were classified as fifth class municipalities. Classification of municipalities is base on their land area, income and population as set by the Department of Finance. The Local Government code (LGC) has underscored the economic role of the LGU,s. Supposedly with the devolved powers and authority, they are the with avenues to organize more systematic interventions into the local economy for more enterprising activities in the local areas. However, studies have shown that the passage of the LGC has failed to boost the state of agricultural extension and farming development in the country. Devolution was not able to sustain and enhance the agricultural development programs and extension services of the national government.

3.4 Farming systems level analysis

Selected sites for study

72. Site selection. Two adjacent municipalities in Nueva Ecija province – (a) Guimba and (b) Talugtug – have been selected to represent the Farming Systems Level for this study on the lowland, rainfed rice farming system. Moreover, three barangays (villages) two rainfed areas and one irrigated area – were further selected to represent the farming systems in Guimba and Talugtug municipalities. These three village are: (a) *Bgy. Villa Rosenda, Talugtug* (rainfed), (b) *Bgy. San Miguel, Guimba* (rainfed), and (3) *Bgy. Triala, Guimba* (irrigated).

73. Comparative data. The criteria for selection of Guimba and Talugtug as study sites have earlier been mentioned in Chapter 1. Table 3.21 below presents and compares some key statistical data on Guimba and Talugtug municipalities.

Brief history of Guimba and Talugtug

74. Guimba is the older of the two towns, established in 1892.. At the turn of the 20th century, Guimba used to be known as a place of wilderness with virgin forests found in the north and south of the Binituan River. Tall grasses grew in the vast plains north of this river, dotted by tall trees up to the place now called San Andres. From this point northward to Talugtug was a dense forest where bountiful wildlife existed.

75. At the time, Talugtug was still known as *Taluktuk"* (meaning "summit" or "top") due to its elevated physical location. The name was later changed to "Talugtug" to conform to an *Ilocano* accent. The first settlers in Talugtug were Tagalogs from the nearby lowland towns of Guimba, Cuyapo and Munoz who used here to come only during the planting and harvest seasons. In 1917, Talugtug was recognized as a

barangay of the Municipality of Cuyapo (west). Later, the municipality of Guimba annexed a portion of Talugtug and named it Barrio San Isidro.

Table 3.14 ***Comparative statistical profile of Guimba and Talugtug Municipalities***

Selected FS Characteristics	Guimba	Talugtug
Year established	1982	1948
Municipal class	1st Class	5th Class
Total land area *(ha)*	25,016.3097	10,122.2324
Number of Barangays	64 barangays	28 barangays
Population (2000)	77,935	18,119
Pop. Growth rate (1995-2000)	2.46%	0.9%
Land use (ha) - Agricultural	20,555	6,705
- Pasture	1	2,270
- Forest	0	508
- Bodies of water	1,374	214
- Residential	903	195
- Institutional	51	72
- Commercial/Ind.	76	20
- Open Space	458	139
- TOTAL	25,016	10,122
Rice Farm Area *(ha)* - Irrigated - Rainfed - TOTAL	 8,710 7,169 15,879	 1,300 5,322 6,622
Total number of farmers	7,401	3,485
Number of licensed grain establishments - Retailers - Wholesalers	 69 26	 3 1
Communal Irrigation System Service area *(ha)*	5,382	519
Sources of Potable Water (1999) - Cylinder pump - Jetmatic/ pitcher pump - TOTAL	 550 6,816 7,366	 608 378 986

76. New settlers. Beginning in the early 1900s, new settlers in search of land came into Guimba from the Ilocos Region and Pangasinan in the northeast. Clans from the

province of Bulacan in the south also came and settled in one of the barangays, now called Barangay San Miguel in Guimba. With Guimba's elaborate river systems, early settlers discovered the land to be productive for agriculture; they also engaged in pot making because of the abundance of clay. The process of hardening clay pots was locally called *"gebba"*, and this is where the municipality got its name. In 1911, the Philippine Commission on Geography officially adopted the name "San Juan de Guimba", later shortened and changed to "Guimba".

77. In 1903, Guimba already had a population of 6,298. Due to the Homestead Act of 1904, the introduction of public schools, and the increased road and irrigation infrastructure building under the American occupation period, successive waves of new settlers came in from the Ilocos Region. Guimba's population rapidly increased to 15,490 in 1918 and then to 27,681 in 1939, making it the third most populous among Nueva Ecija's 27 municipalities at the time (Baroman, 1993).

78. **Creation of Talugtug municipality.** Meanwhile, in 1946, the residents of Talugtug petitioned for their recognition as a separate municipality in view of their growing local population. In 1948, Talugtug was formally created as the 26th municipality of Nueva Ecija through Executive Order 113, signed by President Manuel Roxas. With this EO, Guimba returned some portions belonging to Talugtug that it had annexed, and Guimba's area coverage was reduced. However, Talugtug remained relatively isolated until 1955 when construction of the Talugtug-Guimba road was finished.

Guimba overview

79. Guimba is located about 153 kilometers northwest of Manila and can be reached via Cabanatuan City, about 36 km away. It covers a land area of 25,853 hectares, and is politically subdivided into 64 barangays – making it one of the largest municipalities of province. It is located in the northwestern part of Nueva Ecija Province, bounded on the north by Talugtug; east-northeast by Munoz, west-northwest by Cuyapo and Nampicuan, and on the south by Quezon, Sto. Domingo and Licab.

80. Guimba is located on a wide plain, traversed by the Binituan River, with an elevation suited for productive land within the range of 0 to 500 meters above sea level. Generally, the soil is sandy with a greater area of loam soil, very much suited for agriculture. There are several natural rivers and creeks whose water levels critically drop during the dry season. Ilog Baliwag, Cassanova River, Baloy River and the Sinulatan River are the other major rivers that transverse the municipality. These rivers have branching creeks distributed almost throughout the municipality which are tapped as source for irrigation water during the wet season. Man-made mini-dams and small water reservoirs collect and divert water for several communal irrigation systems, including Partida I Mini-Dam, Palestina Reservoir, San Marcelino Reservoir and the Gragasin Reservoir. The municipality is relatively flat, with slope ranging

from 0 to 3 percent. Due to the flat topography, the land is suited for agricultural, commercial or industrial development. Elevation is within the criteria for production land, which is in the range of 0 to 500 meters above sea level. Generally, Guimba belongs to the 3rd type of climate where it experiences dry season, from November to mid May, and wet season, from mid May to October.

81. Population. The population of Guimba based on the 2000 census is 77,935. The municipality registered an average population growth rate of 2.46 percent between 1995-2000, which was higher than the 2.11 percent growth rate for the province of Nueva Ecija or the 2.02 percent growth rate for the Philippines for the same period. The average family size is 4.59. The average population density is as low as 3.09 persons per ha, which means that it has enough land areas for the people to be accommodated. The productive age population consists of people with ages ranging from 15 to 64 years old, and outside this range is the dependent age population. In terms of gender structure, the male/female ratio is 1.04. The municipality working population of 49,438 represents 63.45 percent of the total population.

Talugtug overview

82. Population & population growth. Based on the 1995 NCSO Survey, Talugtug had a total population of 18,119, and a relatively low population density of 201 persons per square km.[14] On average, the annual population growth rate between 1990-1995 was 2.38%. On the other hand, the *natural* population growth rate (the difference in the rate of birth over deaths) between 1992-96 was higher at 2.97%,[15] thus showing early trends of out-migration.

83. However, between 1995-2000 Talugtug posted a sudden drop in its average annual population growth rate – from its previous 2.38 percent to only 0.9 percent. This ranked Talugtug as 4th with the lowest average population growth rates among Nueva Ecija's 32 municipalities. As of 2000, Talugtug's total population stood at only 18,895. Given the slow rate of population growth, Talugtug's population is expected to grow to only 20,596 by 2010.

84. An estimated 80 percent of Talugtug's households are directly dependent on farming. Municipal data as of January 2003 shows that there are 2,927 farming households tilling a total of 6,686 hectares of farmland. Non-irrigated/rainfed farms accounted for about 79 percent for both the total farm area and the number of farmers. The computed average farm size is 2.28 hectares per farming household, and average farm sizes are the same for both irrigated and rainfed areas. However farmer interviews and FGDs, reveal that actual farm sizes are smaller, because the lands have already

[14] Talugtug has the lowest population density among lowland municipalities in Nueva Ecija. Average population density for the province is 302 persons per square km.

[15] Talugtug Development Master Plan, 2001-2004, Table 3, which cites the Municipal Civil Registry, 1996.

been subdivided among the children, and that this is not reflected in official records. They estimate that the actual farm size per farmer is currently about 1 hectare.

85. Out of the 28 barangays of the municipality, only 15 are energized, leaving behind the remaining 46 percent in darkness. The municipality does not have any centralized water system that supplies potable water to the populace. A majority (87 percent) of the population sources of domestic water supply were artesian well or ground water.

Characteristics of rice based farming-households

86. **Selected household characteristics.** The rice farmers in the barangay study areas are predominantly male, married and mostly in their 50s. Most of them barely reached high school. Rice farming is the predominant and primary occupation. Some obtain additional income by working as hired laborers in neighboring farms. The spouses of farmers usually work as full-time housewives. Farming households usually consist of 4-6 members; most are nuclear families although some households consist of extended families.

87. **Farm Characteristics.** Farms in the study barangays consist of one (1) to four (4) parcels. Farm sizes are relatively small, generally ranging from 0.5 to 3.0 hectares. Rice is the predominant crop in the area. Farmers are mostly owner-cultivators or amortizing owners, and are beneficiaries of the country's 1972 Land Reform Program. They are holders of Certificates of Land Transfer (CLT) or Emancipation Patents (EP).

88. Rice farming is mainly a father-to-son affair. Although women participate in certain on-farm activities such as transplanting, weeding and harvesting, certain farm jobs remain exclusive to men, such as land preparation. No rice farming operations are the sole demand of women. Farmer interviews further reveal that men have come to dominate even those farming activities that used to be traditionally dominated by women, such as transplanting. On the other hand, more economically active women than men tend to engage in wage work outside the home or farm.

Past and present Trends of Farming Systems and Diversification

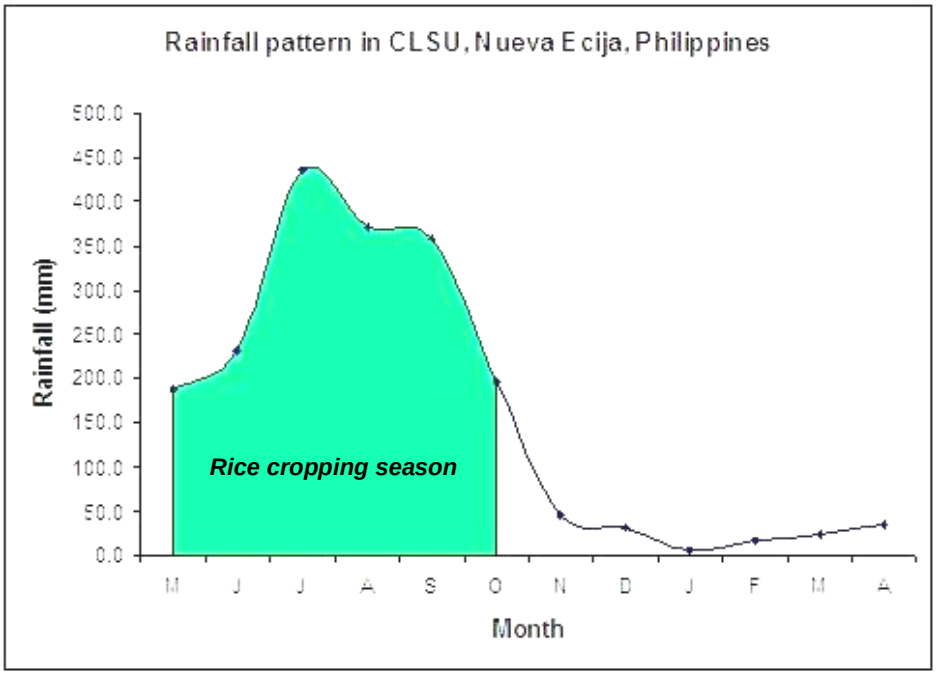
89. **Rice production.** Rice is the major crop planted in the area. Farmers in the study sites cited several reasons for planting rice. Some mentioned that they have been growing rice for a very long time and it is their tradition to plant rice. Planting of rice is also a way of securing the food supply of 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 their lack of capital as their main consideration.

89.1 ***Cropping calendar.*** The farm activities of rice farmers start at the onset of the rainy season in May. If adequate water allows early land preparation in May, planting of rice may be done in June. Rice crop transplanted in June may be harvested in October. Other farmer's plant rice in July, but if there is a late onset of the rainy season, planting is done in August. As shown in Figure 3.5, there is usually sufficient rainfall for rice production from May to November. This graph illustrates that without supplementary irrigation water, a second crop of rice is not possible.

89.2 ***Land preparation.*** Land preparation of rice paddies consists of one plowing and two to three times harrowing. These operations are mostly done with the use of mechanized power tillers. The carabao (water buffalo) is only used in the final leveling of rice paddies.

89.3 **Rice production practices** .In the 1950s, the varieties used by farmers in the study areas includes, Okinawa, Tjeremas, Intan, Wagwag, Elon-elon, Raminad and BE3, during that period farmers were not using fertilizer. For pest control there were farmers who used madre de cacao to control insect pests. No chemical pesticides were in use during this period. Likewise for weed control no chemical were used in the same period. In the 1960, farmers continue to the same varieties. In this decade the IR5 was introduced in the area. The use of chemical fertilizers started in this period. They were using complete, ammonium sulfate, and urea fertilizers. At the same time they also started the application of insecticides like Folidol and Malathion. Consequently the use of madre de cacao was stopped. But weed control, they continue to use the cultural method.

Figure 3.5 ***Rainfall patterns***



89.4 In the 1970s, Elo-Elon, Raminad, and BE-3 traditional rice varieties were still in the field but they started using the IRRI varieties such IR42, IR36, and IR64.It is also in this period the use of herbicide started. In 1980s, IR 36, IR42, IR64, remained in use. In the study area they started the application of ammonium phosphate. This fertilizer was used as a substitute to complete fertilizer or in combination. They also continue to use chemical pesticides and herbicides. In the 1990s, the IR64 and IR42 varieties were remained in use with other newly introduced varieties. Likewise, the fertilizers become now part of the conventional production technology for rice. At present the dominant varieties used by the farmers IR and PSB rice varieties. Soil fertility is maintained by applying synthetic fertilizers. Farmers usually use the recommended insecticide for rice. In weed control, the cultural method is still part of the farm practice that starts from land preparation. The average yield of the IR and PSB rice varieties planted in the study sites range from 5.0 tons/ha to 5.3 tons/ha.

89.5 **Organic Farming**. In 1996, although Triala farmers were already contented in using chemical fertilizers, they resorted back to the use of traditional varieties like C4 and Ag5 under the program of the Philippine Rural Reconstruction Movement (PRRM). Farmers found the effect of organic fertilizers to plants to be very slow compared to inorganic fertilizers. This only shows that farmers reverted back to the use of organic fertilizer with the basic objective of rehabilitating the fertility of the soil. At this time the Integrated Pest Management (IPM) was on its promotional stage and is practiced by those who underwent training on Low External Input on Sustainable Agriculture (LEISA). The farmers apparently reduced their expenses in insecticides and pesticides because they are only using water to control pests and insects. There was 50 percent reduction in the use of chemical fertilizers, 8 to 4 bags per ha. The farmers who underwent IPM and LEISA seminars volunteered to cut back on the use of chemical fertilizers and pesticides.

Figure 3.6 ***Farmer shift the use of traditional to modern varieties through the years***

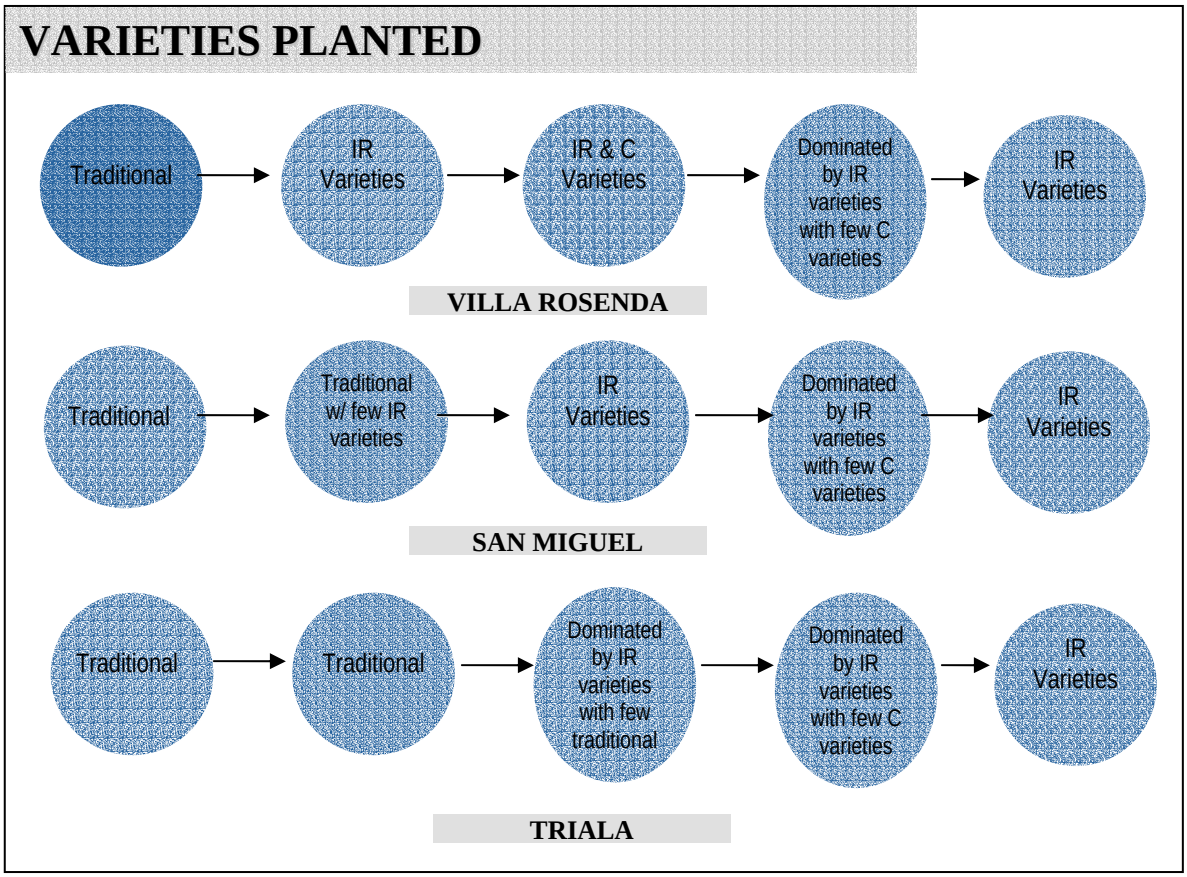


Figure 3. 7 ***Fertilizer usage in the three (3) study barangays***

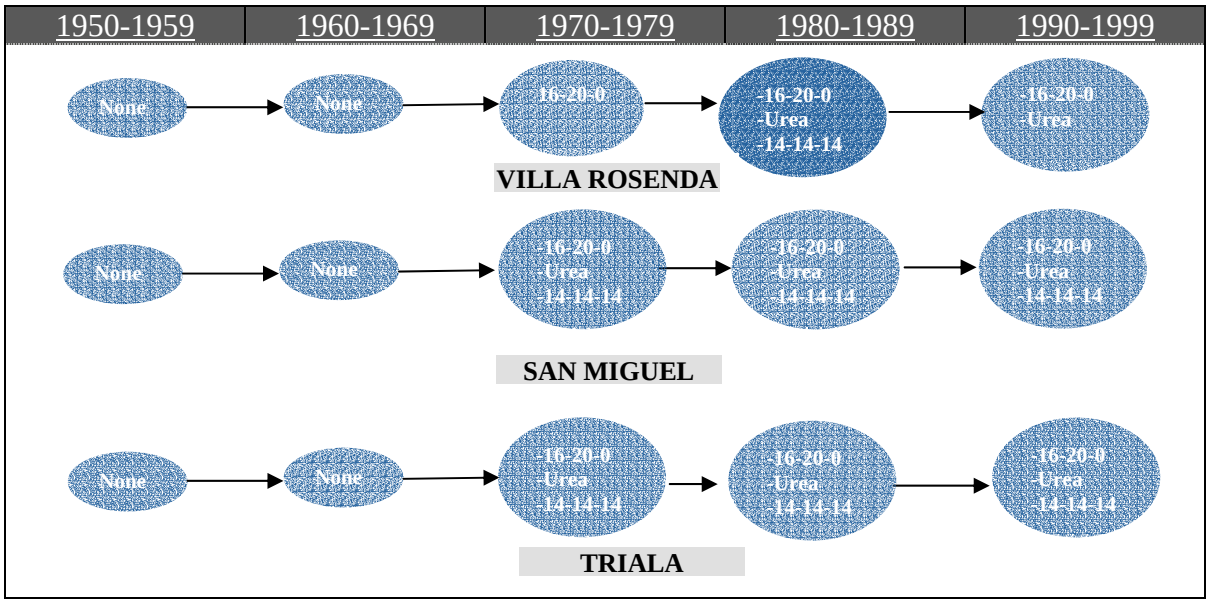
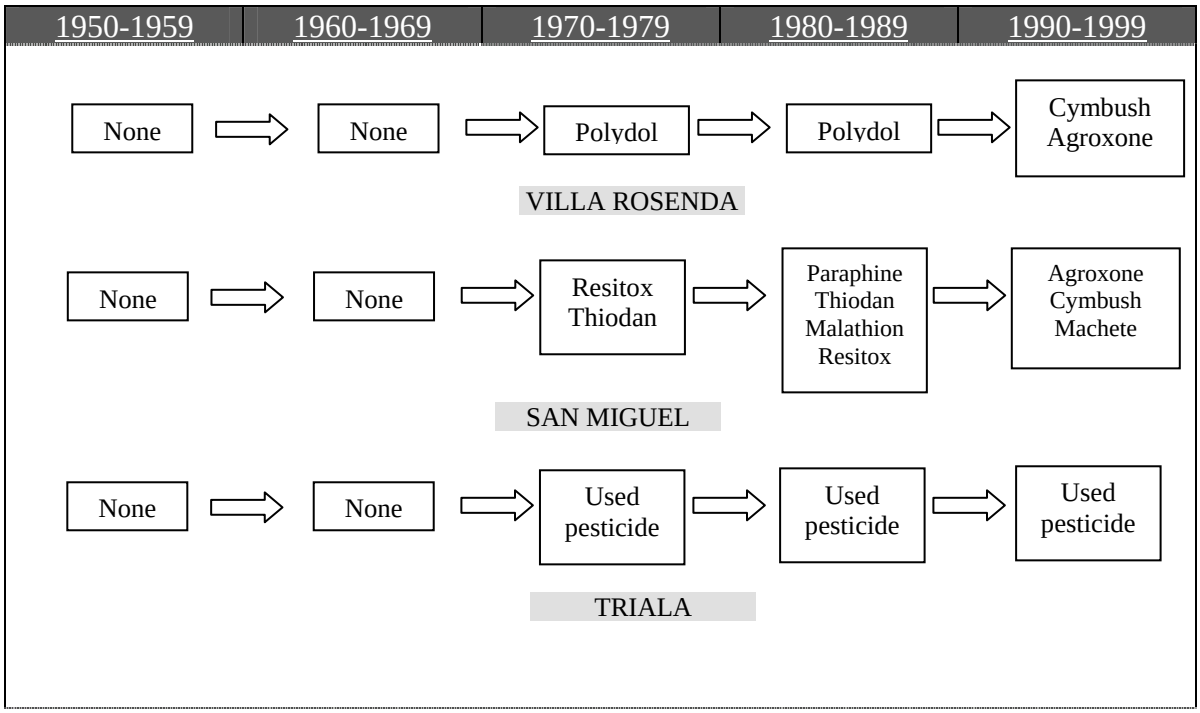


Figure 3.8 ***Pesticide application on palay production in the three (3) study sites.***



90. Vegetables after Rice. The planting of other crops after rice could be very risky for farmers since rainfall starts to decline sharply in October. Hence, the planting of vegetables on a small scale is done within the cropping period of the rice crop. The rainfall pattern clearly indicates that successful cropping after rice could be assured with supplemental water. Pole sitao, bitter gourd, patola and cucumber are planted in San Miguel and Triala. Watermelon, which is planted after rice, may not be considered under rainfed system because planting of this crop is possible with supplemental irrigation. In Villa Rosenda, pole sitao, okra, biter gourd, eggplant, mungbean, white gourd are planted in the rice areas. The objective of planting vegetables is primarily for home consumption.

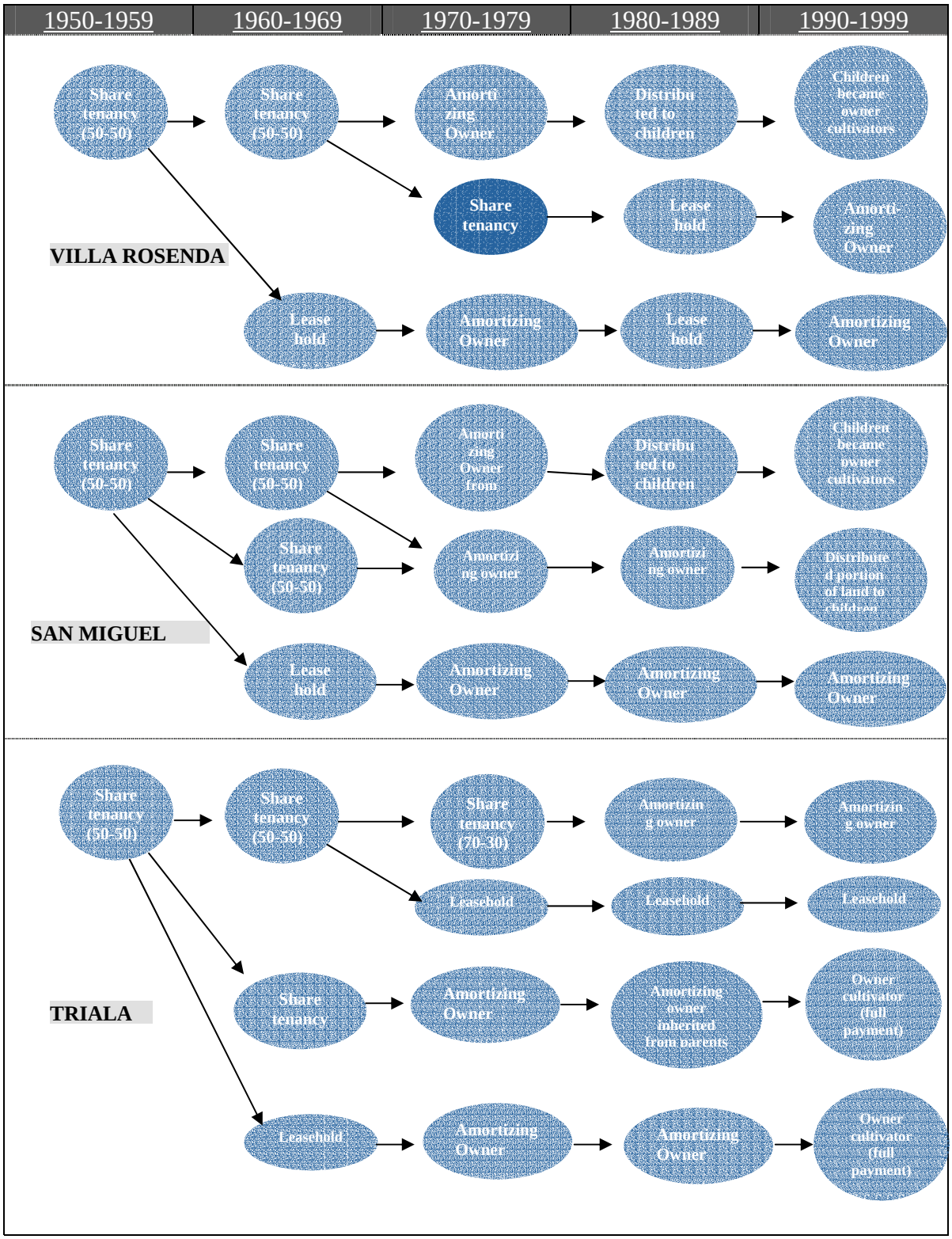
91. Rice - Animal. In San Miguel and Triala, raising of carabao, cattle and goat is an important farm activity. In this village, an estimated 9 out of 10 farmers have 1 to 3 heads of cattle. In Villa Rosenda, animals raised include goats, carabao and cattle. However, now only few farmers have carabaos and goats. Based on the key informant in Villa Rosenda, during the cropping season, June to October, they give rice straw to cattle. The straw is dried and stored at the backyard or in a *mandala* system for storing. This is supplemented with grasses gathered through the *cut-and-carry* system which is done twice a week. After harvest of the rice crop, the farm lots are then used as pasture area.

92. **Crops–Animal interactions**. One is the cattle and carabao being fed with rice straw and the other is the manure being applied to the farms by way of allowing animals to feed in the area where the rice crop will be planted later. The collection of manure and its application on the field was also mentioned as normal practice in the study sites. The discussions clearly show the relationship of crop-animal integration in the farming systems in order to sustain the economic needs of the farm family.

Rural Development Activities in the Study Sites

93. **Land tenure development and tenurial arrangements.** From 1950 to 1960s, farms in the study barangays were basically share-tenanted. Improvement in land tenure was observed in the farms with enactment of the Presidential Decree No. 27 or the Land Reform Code in 1972. Farms under share tenancy and leasehold were distributed to the farmer beneficiaries, who then become amortizing owners. Certificate of Land Transfer (CLTs) were then distributed, which require them to pay for the annual land amortization. It is of note, although, that in barangays Triala and Villa Rosenda, share tenancy and leasehold persisted among some farms. These maybe the farms that are relatively small and within the retained areas under PD 27. At the time of the study, most of the farms were still amortized by the farmer beneficiaries. Some of the original farmer-beneficiaries already distributed the land or portion of it to their children.

Figure 3.9 ***Evolution of Land Tenure in the Three (3) Study Barangays***



94. Rural employment and on farm labour arrangement. Almost all farmers hired labor. It was noted that farmer relationship with each other became more formal. Whenever farmer transact business regarding farm activities, a certain amount of monetary compensation was involved. A more important effect on the use of high yielding varieties, chemical fertilizers and herbicides was the shifting of the farmers from the spirit of cooperation through "bayanihan" system (working together or cooperativism without monetary involved in the labor inputs) in all stages of farming, from transplanting to harvesting to the use of hired labor. Bayanihan is one truly Filipino tradition associated with agriculture that was lost when farmers adopted modern varieties. Farmers were able to plant twice a year using the modern varieties, thus increasing the demand for labor that eventually led to commercialization of farm labor in the community. As Pingali et.al.(1997) also noticed, the shift from traditional varieties to modern varieties had an independent positive effect on the demand for labor. According to them, absolute quality of labor was required for transplanting, weeding, harvesting and threshing.

95. Other on-farm labor arrangements. Pakyawan or contract is another form of on farm labor arrangement wherein the labor provider will do the weeding without pay to ensure that they are the one who will do the harvesting for a fee or hunusan (for every 10 cavans harvested they will share one cavan).

Table 3.15 ***Evolving labor utilization among rice-based farmers.***

LOCATION	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999
Villa Rosenda					
Land Prep	"Bayanihan" system	Exchange labor, hired	Exchange labor, hired	Mechanized; man-animal	Mechanized
Planting		Exchange labor, hired	Hired	Hired	Hired
Harvesting		Hired	Hired	Hired	Hired
Threshing		1:15 sharing	1:15 sharing	1:15 sharing	1:15 sharing
San Miguel					
Land Prep	"Bayanihan" system	Provided by hacienda / bayanihan	Exchange labor	Exchange labor	"Pakyaw"
Planting			Hired	Hired labor "package"	"Pakyaw" / hired labor
Harvesting			Hired	Hired labor	"Pakyaw"/ hired labor
Threshing		3:100 sharing	5:100 sharing	7:100 sharing	6:100 sharing
Triala					
Land Prep	"Bayanihan" system	Bayanihan	Bayanihan	Hired "pakyaw"	Hired "pakyaw"
Planting			Hired	Hired	Hired
Harvesting			Hired	Hired (1:15 sharing)	1:15 sharing
Threshing	6: 100 sharing	6: 100 sharing	4: 100 sharing	6: 100 sharing	6:100 sharing

Farmer support services and local institutions

96. Support services. In three barangays, agricultural technicians from the Local Government Unit (LGU) conduct season-long training on rice production starting from land preparation to harvest time. Technicians from PhilRice are tapped in this training. Farmers are also given seminars on fertilizer use at different growth stages of the rice crop. Some of the usual topics of seminars are the use of organic fertilizer, application of insecticides and in some seminars, livestock production (LGU-Guimba 1999). Meanwhile, the private sector, particularly agricultural chemical companies, gives farmer seminars on the use of farm chemicals. On the other hand farmers were also served by financing institutions like Land Bank of the Philippines and Rural Banks in the area for their credit requirements, while the National Food Authority were in charge in terms marketing their rice produce. CLSU were the one who provide manpower development and new technologies to farmers.

97. Farmer organizations. Only one-third, or 23 out of the 79 registered cooperatives in Guimba continue to operate; the other two-thirds (56 cooperatives) are either inactive or have been dissolved. In Talugtug, only 3 out of the 17 registered cooperatives continue to operate; the rest (14) are inactive or have been dissolved. *(Nueva Ecija Socio-Economic Profile, 2003)* The Department of Agrarian Reform also established model villages or Agrarian Reform Communities (ARCs). These model villages embarked on various agricultural activities like rice milling operation and raising carabao's for dairy production. However, with low production from rainfed farms and lack of technical know – how farmer – members were not able to repay their loans.

98. Indigenous social security. Within local communities, several informal mutual-help societies exist – called "*paluwagan"* or *"damayan."* These are usually self-organized around neighborhood systems and are constituted by anywhere from 10 to 30 individuals or households. Under the *paluwagan* system, each member contributes a fixed amount to a pooled fund each week or month, and this pooled money is given to one member, then the next, then the next, until the round is completed. The *damayan* system operates similarly, except that a fixed amount is given to member-households in cases of death, sickness or disability in the family. *Paluwagan* and *damayan* are local forms of social security that extend beyond kinship patterns.

Socio-economic factors in rainfed rice base farming systems

99. The two *dominant* farming systems in the study sites are "rice-rice" for irrigated areas, and "rice-fallow" for rainfed areas. In Talugtug, only 19.28% of the entire municipal agricultural area is currently irrigated and brought under cultivation during the dry season; the remaining 80% of the area is generally left idle during eight months of the year. Palay is the main municipal crop, while cassava, corn, onion and garlic are minor secondary crops. During the dry season, onions and garlic are planted

commercially for the less irrigated areas; however, these cover only nine hectares out of the total 5,474 non-irrigated, palay-producing areas. During the dry season, some farmers also plant a variety of vegetables, but these are mainly produced in backyard gardens, and are not of commercial quantity. Instead, vegetables are cultivated mainly for household consumption and sometimes for vending among neighbors within the same barangay. (See Table 3.17 below)

Table 3.16 ***Areas and crops planted in Talugtug, 1998***

Crops Land Use	Land Area (in has)
A. Wet Season	
1. Palay	
-Irrigated	1,280
-**Non-Irrigated**	5,474
2. Cassava	5
3. String Beans	5
4. Corn	5
Sub-Total	6,768
B. Dry Season	
5. Palay	1,300
6. Onion	6
7. Garlic	3
Sub-Total	1,309

Source: Talugtug Municipal Development Plan, 2001-2004, p 56.

100. Low incomes from rainfed rice farms. Because of their dependence on a single annual rice crop, farm incomes are low. Key informants from Villa Rosenda and San Miguel revealed that rainfed farmers with a single rice cropping earn only about PhP 10,000 – 12,000 per year from farming. On the other hand, those farmers in Triala with irrigation and manage two croppings, earn from PhP 40,000 to 180,000 per year from rice farming alone.

101. Total annual household incomes range from a very low of PhP 29,682 for a "rice-fallow" farming system to a high of PhP 779,752 for a "rice/vegetables – rice/livestock and poultry" farming system. This indicates the relative significance of double cropping of rice and the integration of livestock and poultry in the farming system.

102. Proportion of non-farm incomes. The study found that a significant proportion of the annual household income of farming households in rainfed areas actually comes from non-farm sources. These account for a low of 13% to a high of 90% of total household incomes. Nonetheless, the usual share of non-farm income to total household income is about 50 percent.

103. Credit. Farmers obtained loans mainly to sustain farm production operations. Some of them borrow money to meet household needs as well as education of the children.

Banks served as the main source of formal credit; while traders, input dealers and relatives are the usual informal sources.

104. Interest rates from banks ranged from 30-40% per annum. Yet, as most rice farmers have unpaid production loans and land amortization dues with the Land Bank, they are rendered ineligible for bank loans. Thus, most farmers resort to informal sources. Input dealers charge higher interest rates at 30-60% per annum. Traders charge the highest interest rates at 60-90% per annum. The existing norm is 30% for a 4-month rice-cropping season. Effective interest rates are even higher if the source of credit is a palay trader, because loans must be paid in kind (in palay, or unhusked rice) at prices dictated by the trader.

105. Marketing outlets. Traders serve as the major market outlet of the farmers, particularly for the rice produce. There are farmers who sell their produce directly to the rice mill or buying stations. For vegetables, the usual markets are traders, buying stations, and the public market.

106. Off-farm work. Off-farm work opportunities are limited. In Talugtug, rainfed farming households seek off-farm employment *within* the barangay during the dry season. They engage in charcoal-making, *cogon* grass gathering (for rooftops & livestock grazing) and cogon grass handicrafts. Charcoal-making is practiced in nine out of the 28 barangays. About 10 women in the barangay are currently engaged in cogon handicrafts-making, based on training received from the local Department of Trade and Industry. Some farmers also seek work as *arawan* (daily wage) workers in nearby irrigated farms.

107. In Guimba, where rainfed farmers have no access to (pasture or forest) public lands, the option for off-farm employment during the dry season work is limited mainly to finding daily wage work in irrigated farms.

108. Non-farm work. The employment pattern among the rainfed farming communities in both Talugtug and Guimba is for household members tend to seek temporary and seasonal work outside the municipality during the dry season. Since the rice-cropping period is between July to October, the trend is for family members to seek outside work (temporary migration) for the six-month period of January to June. Men work mainly as carpenters and construction workers in Manila – since the construction industry in urban areas also tends to peak towards the dry/ summer season. On the other hand, women tend to find jobs mainly as domestic helpers in Manila; others work as market vendors and storekeepers, casuals and factory workers in Nueva Ecija and neighboring provinces. Remittances are a major source of year-round household incomes and cash flow within the municipality. As mentioned, about half of farming household income comes from non-farm employment.

109. Seasonal and permanent employment. Given the nature of outside non-skilled and semi-skilled work available, men usually take on *seasonal* jobs, while the women tend to take on *semi-permanent* employment (Figure 3.10). Thus, during the off-season, men usually visit their families about once every month, while women (especially domestic helpers and factory workers) are able to visit their families only once a year. Because of women's traditional role in the family, the general preference is for women to seek alternative income sources within the community or vicinity.

110. Also, an estimated 5-10% of farming households in rainfed areas have members who work abroad, mainly in the Middle East. They send substantial remittances home, which tends to support both nuclear and extended families.

111. Education as the main pathway out of poverty. To most farming families, the education of children is seen as the main pathway out of poverty, and parents take every effort to send their children to school. Being able to send a child through high school or vocational school through farming is considered as a major achievement and source of pride. Among desperately poor families, however, the eldest sibling usually drops out of school early to assist as the second breadwinner for the family. Elder boys usually assist the father in farm work, while elder daughters assist in housework or seek work elsewhere, usually as domestic helpers. The additional incomes remitted by elder children are then used to send younger siblings to school – to finish high school, or to pursue a post-secondary vocational course. The ultimate "dream" is for the children to find regular wage employment, or to land in a higher-paying job abroad, to enable them to send regular remittances home. Thus, early marriages by educated children are often met by parental disappointment.

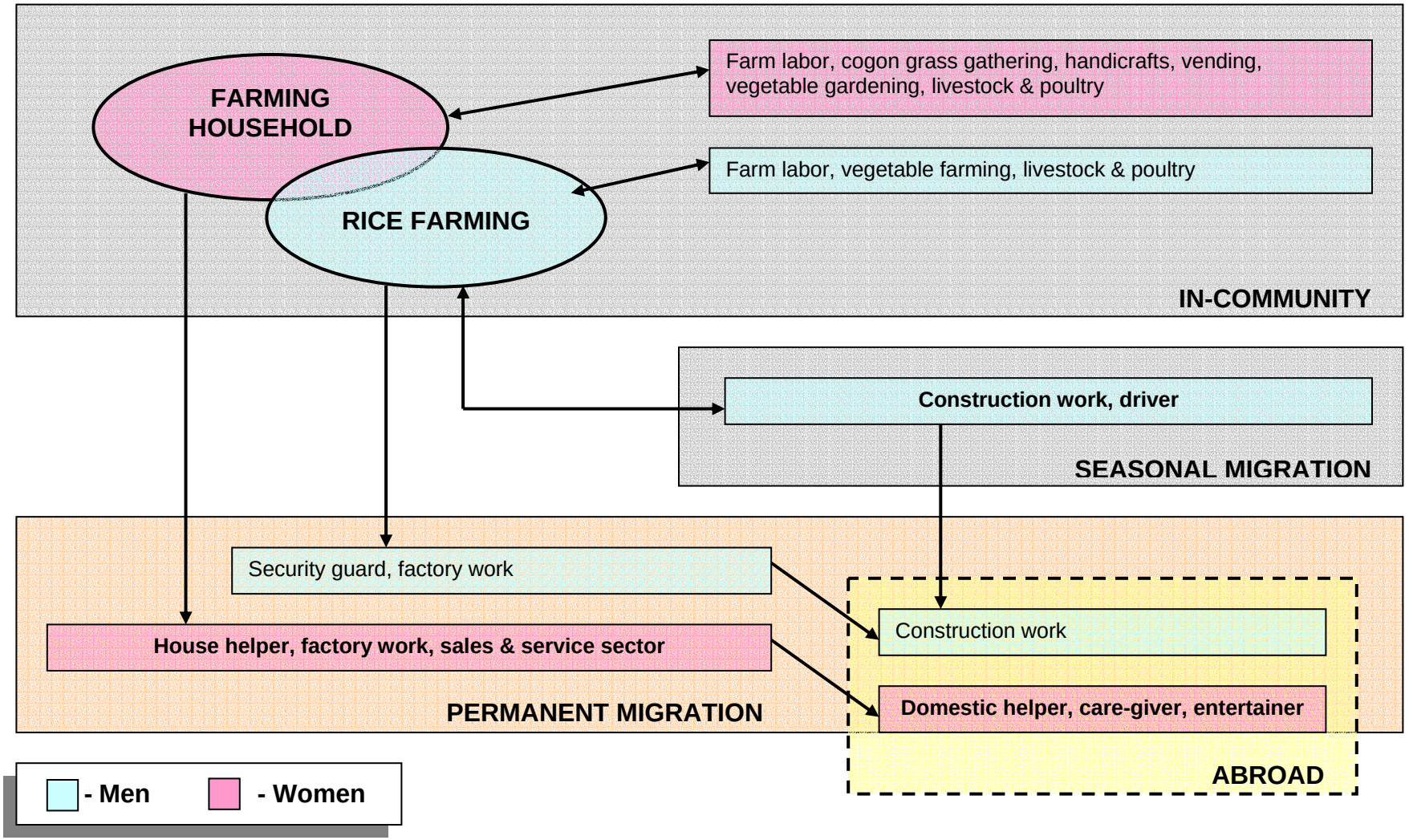
112. Inheritance to children and the parcelization of farmlands. Under inheritance laws, the spouse is entitled to half of the estate, while children divide the other half equally among themselves. In the case of Nueva Ecija's rainfed rice farmers, however, the practice has been to distribute farm parcels to children once they get married, with priority given to those children who are directly dependent on farming. Thus, the tendency is to pass on farm parcels to sons who are directly engaged in farm work, or to daughters who marry farmers. As farmlands are divided among children, farms have become smaller and fragmented. However, there is no new data available on actual farm sizes. The last agriculture census was conducted in 1991, and a new agriculture census was conducted in 2003. Based on farmer interviews, however, the stated average farm size per farmer is currently about one ha.

113. Pawning of lands. In Talugtug and Guimba, the practice of pawning farmlands (*"sangla"*) to access informal credit appears rampant. By one estimate, about 30% of rice farmers in Barangays San Miguel and Triala in Guimba have portions of their farmlands under mortgage in the current cropping season. Furthermore, it is estimated that almost all CLT and EP holders have had portions of their land pawned to informal moneylenders at one time or another. This reveals a high level of farmer

indebtedness. However, no written records exist on such loan transactions; these are largely informal. Also, because most farmlands are still under CLT amortization with the Land Bank, the sub-mortgaging of these lands is deemed illegal under the law. Hence, the preferred local term used for pawned lands is *"hiram"* (or "borrowed" lands).

114. The current going rate is PhP 40,000-60,000 for one-half hectare of rice land, redeemable after two years at a fixed 30% interest rate on the principal. Irrigated lands that allow two cropping seasons per year fetch higher prices under similar loan arrangements. The moneylender meanwhile acquires full control and use of the land until the loan is fully repaid.

Figure 3.10 ***Labor and Migration Patterns in Rainfed Rice Farming Systems (Bgy Villa Rosenda, Talugtug and Bgy San Miguel, Guimba)***



115. The three common reasons for pawning lands, in cited order of importance are: (i) sickness or death in the family; (ii) to support a family member to work abroad; and (iii) to support the education of children. The first is need-driven, while the latter two are opportunity-driven. Losses due to crop failure do not seem to be a direct reason for pawning lands, as these are deemed as "natural occurrences". However, accumulated debts due to successive crop failures and other causes do seem to be a reason for pawning lands.

116. By common practice, only a portion of one's farmland is used as loan collateral, since farmers usually cultivate more than one parcel. Sometimes, a portion of land is delineated from an existing land parcel. According to farmers, this prevents the formal reselling of the land, since land parcels cannot be sold unless covered by a separate title. Moreover, the agrarian reform law (RA 6657) prohibits the re-selling of Emancipation Patents (EPs) for 10 years after they are awarded. Farmers claim that they are able to eventually repay their loans and regain their lands, although this claim has been difficult to independently verify. During FGDs, farmers said that they are able to redeem their lands if the loan has been used to send a family member to work abroad, or if a family member is currently working abroad. They refused to comment on other cases, although it can be surmised that such land mortgages are unlikely to be redeemed, given the current low family income levels among rainfed farmers.

117. Landlessness. Estimates of landless households in the three barangays are 30% for Bgy, Triala, Guimba (irrigated), and 10% for Bgy. San Miguel, Guimba and Bgy. Villa Rosenda, Talugtug (rainfed). One observation among farmers is that there is a greater tendency for seasonal in-migration among landless workers towards irrigated areas (e.g., Bgy Triala) because of the higher labor demand, and the presence here of more diverse farming systems. Sometimes, landless migrants settle or inter-marry in the local community. On the other hand, there is a greater tendency for families to out-migrate from rainfed areas (e.g., Bgy Villa Rosenda).

118. *Barukan* system. In some cases, a *barok* (farm caretaker) is hired to oversee the rice farm for a given cropping season. Under this arrangement, the *barok* is entitled to a 10% share of the total harvest, plus an up-front, one-time allowance of PhP 500 and one sack of milled rice. Except for menial tasks, the *barok* is not expected to do on-farm labor; other workers are hired to work on the farm on either *pakyaw* (wholesale contract) or *arawan* (daily wage) basis.

119. Arrangements under the *barukan* system vary according to crop. In the case of watermelon, sometimes grown in rainfed areas during the dry season, the *barok* is entitled to one-half of net profit (gross sales minus expenses) plus one sack of milled rice per month. The *barukan* system appears to be increasingly practiced in Guimba, due to several evolving trends:

(i) Many children of the first generation of agrarian reform beneficiaries no longer engage in direct farm work and are now employed in other jobs or professions;
(ii) Farmers who find semi-permanent or regular non-farm jobs during the off-season may prefer to stay on in their jobs, and if their children are still young, they hire a caretaker to manage their farms;
(iii) Local moneylenders need to operate farm holdings accumulated through *sangla* (mortgaging of farmlands).

120. The *barok* is usually characterized as: (i) a permanent resident in the community; (ii) a landless or near-landless farmer or farm worker; and (iii) generally unskilled, and cannot find non-farm employment elsewhere. The local *barukan* system thus helps provide landless and marginal farmers with access to land. It marks the emerging evolution of a sub-tenancy system, one generation after the redistribution of rice lands under the Land Reform Program of 1972.

3.5 Diagnosis of the farming system related to SARD

121. Problems cited by farmers. Farm production-related problems commonly encountered by the farmers are the occurrence of natural calamities (such as typhoons) and the incidence of pests and diseases. High price of inputs was also perceived as a problem, resulting to lower farm profitability. Lack of post-harvest facilities. No decent places to dry their grains. Undeveloped farm- to-market roads. Transportation of farm products is costly. The absence of irrigation facilities was also cited as a problem among rainfed farms in barangay San Migue and Villa Rosenda. Farmers solely relied on rain for their rice crop.

122. Marketing-related problems include low farm gate price and the dependence on traders as the main market outlet. In terms of credit, the farmer-borrowers cited the high interest rates, particularly among who obtained loans from informal sources and limited credit service. Although the government – owned bank lent them money to buy farm inputs, many of them who borrowed were not able to pay back; either because of calamities, or lack of discipline to honor commitments. This lack of capital led many of the farmers to sell out their government – given lands to those who could afford, and slowly, the ball rolled back to the old system of rich landlords and absentee owners owning big parcels of land.

123. Low incomes. During the FGDs and validation workshop, farmers themselves estimated their net incomes at only about PhP 10,000 per hectare in rainfed rice areas. Among farmers with irrigation, the estimated profits are PhP 10,000 per hectare during the wet season, and PhP 20,000 per ha during the dry season. Net profits from rice farming tend to be much higher during the dry season, due to: (a) the higher average yields (photosynthetic effects on the crop), (b) lower yield losses (no typhoons, flooding or drying & storage problems), plus (c) the higher farm-gate prices (lower seasonal supply, higher market demand).

124. Social impact of out-migration. Because of their inability to farm during the dry season, and lack of local employment opportunities, family members in rainfed areas are forced to seek seasonal or regular employment elsewhere. Farmer- respondents mentioned that usually, it is the women who find outside employment. Also, while men seek *seasonal* employment, the women tend to find more *regular* non-farm employment outside the community. This pattern of seeking non-farm employment outside the community appears to be more pronounced in *rainfed* rather than in irrigated areas, and involves more the *women* than the men. A 1991 Study comparing sample households from a rainfed area and an irrigated area from two barangays in Nueva Ecija shows similar patterns.

125. In FGDs, farmers noted that their families are now "separated" (*"hiwa-hiwalay na ang mga pamilya"*). Given the traditional role of women as caretaker of the family, there is heavy social strain on tightly-knit Filipino families when women are forced to seek work elsewhere.

126. Farmers limited access to technologies and other forms of assistance. Results of the focus group discussions (FGD) and Key Informant Interview (KIIs) in Guimba and Talugtog showed that the gains from the devolution of powers from the national to the local governments, as a result of the Local Government Code of 1991, are mere trickles from the point of view of farmers. Although the LGUs have had remarkable autonomy in terms of extension work, farmers have yet to reap the significant benefits of such autonomy.

127. Limited training programs for farmers. Other than their direct access to information and education and communication (IEC) materials, farmers rely on S&T institutions and LGUs for training opportunities. According to them, since the stint of Masagana 99 and Samahang Nayon, the farmers have not attended much of the government-sponsored training related to agriculture.

128. Problems related to technology adoption. The farmers also lament that they could not practice what they have learned from the trainings they attend. For instance, PhilRice and CLSU trained the Guimba and Talugtog farmers on a new technology, the hybrid rice program, purportedly to increase rice yield. They now say that the procedures are too difficult to follow and the financial requirements are beyond their means.

129. Limited instructional materials from government institutions. The dearth of information materials in Filipino is also a problem of the farmers. On their own, they search for information and assistance from various sources. They used to go to the office of the municipal agriculturist and other agencies like the Department of Agriculture (DA) office and the Philippine Rice Research Institute (PhilRice) to ask for IEC materials. There exist discrimination in getting information materials from

many of these agencies. Although private companies gave information materials, they did so only when farmers bought first their products.

Table 3.17 ***Occupational patterns of rice farmer households in lowland irrigated (Bantug, Nueva Ecija, 1991)***

	Lowland Irrigated											
	Head		Wife		Children				Other members			
					Male		Female		Male		Female	
	No	%	No	%	No	%	No	%	No	%	No	%
Housekeeper	--	--	20	100	--	--	--	--	--	--	--	--
On-Farm												
Farming	19	100	1	5	14	44	--	--	--	--	--	--
Animal Prod'n	--	--	1	5	--	--	--	--	--	--	--	--
Off-Farm												
Operator (Handtractor, thresher, carabao)	1	5	--	--	--	--	--	--	--	--	--	--
Planting/ direct seeding	--	--	1	5	--	--	1	5	--	--	--	--
Non-Farm												
Gov't employee	1	5	2	10	1	3	1	5	--	--	--	--
Dressmaker	--	--	1	5	--	--	1	5	--	--	--	--
Overseas worker	--	--	1	5	--	--	1	5	--	--	--	--
Jeepney/ tricycle driver	1	5	--	--	1	3	--	--	--	--	--	--
Sari-sari store	--	--	1	5	--	--	--	--	--	--	--	--
Fisherman	1	5	--	--	--	--	--	--	--	--	--	--

Table 3.18 ***Occupational patterns of rice farmer households in lowland rainfed (Rizal, Munoz, Nueva Ecija, 1991)***

	Lowland Rainfed											
	Head		Wife		Children				Other members			
					Male		Female		Male		Female	
	No	%	No	%	No	%	No	%	No	%	No	%
Housekeeper	--	--	20	100	--	--	--	--	--	--	--	--
On-Farm												
Farming	19	100	1	5	4	12	--	--	1	14	--	--
Off-Farm												
Operator (Handtractor, thresher, carabao)	--	--	--	--	2	8	--	--	--	--	--	--
Planting/ direct seeding	--	--	2	10	--	--	--	--	1	14	--	--
Harvesting	--	--	--	--	1	4	--	--	--	--	--	--
Non-Farm												
Gov't employee	--	--	--	--	--	--	2	17	--	--	--	--
Dressmaker	--	--	--	--	--	--	1	4	--	--	--	--
Overseas worker	--	--	2	10	--	--	3	12	--	--	--	--
Jeepney/ tricycle driver	1	5	--	--	--	--	--	--	--	--	--	--

Sari-sari store	--	--	1	5	--	--	--	--	--	--	--	--
Market vendor	1	5	--	--	--	--	--	--	--	--	--	--
Mechanic	1	5	--	--	--	--	--	--	--	--	--	--
Sales agent	--	--	--	--	--	--	--	--	--	--	1	50
Fisherman	1	5	--	--	--	--	--	--	--	--	--	--
Factory worker	--	--	--	--	--	--	1	4	--	--	--	--

130. Reasons for continuing rice farming. Despite the low incomes derived from rice farming, farmers continue to focus on rice as their main crop. From FGDs, farmers indicated their preference for rice, due to the following:

- They have grown accustomed to rice farming *("nakaugalian na")*;
- To ensure food security for the family. Normally after harvest, farmers first deduct the amount of palay to be repaid for their production loans, then set aside between 10-20 cavans for household consumption. Only then is the balance sold for profit.
- There is a ready market for rice, and rice has a longer shelf-life, unlike fruits or vegetables. Unsold stocks can be saved for family consumption.
- Finally, soil quality and farm conditions are still deemed best for rice cultivation.

131. Flooding. Although farmers in the municipalities of Guimba and Talugtog experience flooding every year, it is not considered a major problem since drainage is still good. In Guimba, there is occasional overflowing of the Baloy and Binituan rivers during heavy rains. If flooding occurs it usually lasts for only three hours and a maximum of two days. Farmers at Barangay San Miguel in Guimba narrated that they only started to experience flooding in 1980 when dams in nearby barangay and adjacent municipalities of San Jose and San Roque were built. In the municipality of Talugtog, farmers believe that one of the causes of flooding is due to the cutting of trees (for charcoal making) and the burning of cogonal lands. Since cogon is one of the livelihood sources of village residents of Barangay Villa Rosenda in Talugtog, burning of the cogonal lands is practiced to produce better cogon growth.

132. Drought. Drought is considered as a more serious problem in the both municipalities of Guimba and Talugtog. Farmers observed that there is more drought occurrence at present than in the 1950's. This associated with the changing climate pattern. Farmers relayed that for every 10 years there would normally experience drought for 2 years.

133. Soil acidity and fertility. Unlike in the irrigated lowland rice environment, soil acidity was not observed as a serious problem in the rainfed lowland rice environment. Under the rainfed lowland rice environment where only one rice crop is grown per year, soil acidity was not observed as a serious problem since soils were either left fallow or planted with upland annual crops (ampalaya, watermelon, etc.) during the dry season. This practice allowed the field to be aerated thus the problem in soil acidity is not severe. However, soil fertility in terms of soil organic matter

content, soil N, soil P, and soil K had been declining due to several years of continuous cropping without adequate nutrient replenishment.

134. Water quality. Domestic, industrial and commercial water consumptions are largely dependent on ground water supplied by privately owned deep wells, hand pumps and local water utilities. There are 18 water districts operating in the province covering 56% of the cities and municipalities. In 1998 to 2002, acute gastroenteritis ranked number 1 in the leading causes of morbidity. It was reported that one of the major causes of this illness was due to the large number of households taking drinking water from doubtful sources such as shallow tube well, which was less than 50 feet depth. At present major source of irrigation for crops and water for domestic consumption in Guimba and Talugtog were shallow tube wells. Compared in the 1950's or 60' where water can easily be extracted from a depth of 6 meters in Guimba and 9 meters in Talugtog now farmers have to bore shallow tube wells up to 36 meters depth in Guimba and 15 meters in Talugtog. This can be attributed to low ground water recharging due to deforestation and the many users of shallow tube well.

135. Water for irrigation. The study shows that irrigation water as major driving force to better farm performance. This is due to increased yield per hectare because irrigation allows farmers to adopt productivity-enhancing technologies such as modern varieties, fertilizer and pesticides and increase cropping (s) season. Aside from the possibility of double cropping for rice, the availability of water also allows farmers to diversify their choice of crops. For instance, rice farmers in irrigated areas were able to raise other crops such as vegetables both during the dry and wet seasons. It was noted that farmers in irrigated farms obtained more income from crop production and have the capital requirements to raise hogs or poultry on a commercial scale.

136. Farm productivity performance and potentials. On a seasonal basis it is very clear in Table 3 that yield in the wet season planting is lower compared to the dry season crop. This is attributed to the climate-related to factors. Under rainfed culture, photosynthetic production is low during the regular wet season planting because the sun does not shine all the time. Weather hazards such as typhoon and drought limit the potential crop productivity. On average, about 20 tropical cyclones visit the Philippines per year (Anglo 1999).

137. Looking at the yield levels as supplied by the key informants which on the average range from 80 cav/ha (4.0 t/ha) in Villa Rosenda and about 120 cav/ha (6.0 t/ha), these values are comparable with the yields at the "Techno Demo" sites. In terms of technology and management, it is safe to say that the farmers have capability to obtain high yield levels. It should be mentioned that Techno Demo plots are given all the inputs as recommended by the DA. Hence, if farmers can afford to buy the needed inputs, production per se will not a problem.

Table 3.19 ***Yield performance of IR 64 and PSB Rc 18 in Techno Demo sites in Nueva Ecija***

Variety	1995 Wet Season		1995-96 Dry Season	
	Average Yield (t/ha)	Highest Yield (t/ha)	Average Yield (t/ha)	Highest Yield (t/ha)
IR 64	5.0	6.3	6.2	10.5
PSB Rc 18	5.0	6.6	-	-

Source: DA-PhilRice 1998

138. However, the high cost of the critical inputs such as fertilizer, pesticide and agricultural machinery have gone beyond the reach of the farmers, who have poor access to credit. Here, the new technologies are particularly inappropriate. It should be added that farmers are always subjected to abnormal climate-related risks.

139. The farmers having limited resources are unable to cope up with the adversities. These farmers usually work on small piece of land just about 1.0 ha. Access to credit and other resources is usually limited. Due to limited resources, they are likely to distort resources and ignore considerations of the future productivity in order to wrest today's subsistence from inadequate holdings by overexploiting them.

140. **Income potentials of on-farm diversification**. Farming systems that exist in the area are mainly rice–based, with the integration of backyard production of livestock and poultry (Table 3.21). The range of rice-based farming systems found in the barangay study areas are the following:

One Rice Cropping:

- Rice –Fallow
- Rice – Fallow with Fruit Tree (Mango)
- Rice - Fallow with Livestock and Poultry
- Rice – Fallow with Fruit Tree and Livestock and Poultry

Two Rice Croppings

- Rice – Rice
- Rice - Rice with Fruit Tree
- Rice - Rice with Livestock and Poultry
- Rice - Rice with Fruit Tree and Livestock and Poultry
- Rice/Vegetables – Rice
- Rice/Vegetables – Rice with Fruit Tree
- Rice/Vegetables – Rice with Fruit Tree and Livestock and Poultry

141. Annual household incomes of farmers vary greatly by farming system. Results of key informant interviews showed annual household income ranging from a very low of PhP 29,682 for a rice-fallow farming system to a high of PhP 779,752 for a

rice/vegetables – rice/livestock and poultry farming system. This indicates the relative significance of double cropping of rice and the integration of livestock and poultry in the farming system.

142. A significant proportion of the annual household income already comes from non-farm sources, ranging from a low of 13% to a high of 90%. Nonetheless, the usual share of non-farm income to total household income is about 50%.

143. Income from rice ranged from PhP 9,752 for a rice-livestock and poultry farming system to a high of PhP 181,938 for double cropping of rice under a rice-rice farming system. Income from rice from one cropping alone amounts to about PhP 10,000 – PhP 12,000; while from two croppings, PhP 40,000 to PhP 180,000.

144. For households with poultry or livestock integrated in the farming system, they earn a low of PhP 3,200 from raising native chicken to a high of PhP 73,000 from hog rearing. A usual household, though, earns about PhP 3,000 – PhP 14,000 from raising hogs at the backyard level.

Table 3.20 ***Annual household income by source, selected farmers in three (3) selected barangays, Guimba and Talugtog, Nueva Ecija, 2002***

Barangay/ Municipality and Farming System	Net On-farm Income (in PhP) (A)	Off-farm Income (in PhP) (B)	Non-farm Income (in PhP) (C)	Total Household Income (in PhP) (D) =(A+B+C)
Villa Rosenda, Talugtog				
Rice/Vegetables – Rice with Livestock	55,822			55,822
Rice/Vegetables – Fallow	11,682	18,000		29,682
Rice – Rice, Fruit Trees	108,722		131,400	240,122
Rice – Livestock	10,622	512	104,000	115,134
Rice – Poultry	115,306	2,500	144,000	261,806
San Miguel, Guimba				
Rice – Fallow, with Livestock	73,205		56,600	129,805
Rice/Vegetables - Rice	105,686		97,004	202,689
Rice – Rice with Fruit Trees and Livestock	326,669		107,000	433,669
Rice – Livestock	54,426		14,400	68,826
Rice – Livestock and Poultry	58,861	2,700	50,040	111,601

Triala, Guimba				
Rice – Rice	181,983	19,000	28,840	229,778
Rice, Vegetables – Rice with Livestock and Poultry	101,009	1,680		102,689
Rice – Rice with Fruit Trees, Livestock and Poultry	264,243		204,000	468,243
Rice, Vegetables – Rice with Fruit Trees and Livestock	106,062			106,062
Rice, Vegetables – Rice with Poultry	678,952		100,800	779,752

Table 3.21 ***Crops planted during wet and dry season, tree crops, livestock and poultry in three study barangays, Talugtog and Guimba, Nueva Ecija, 2002***

Farming System	Crops Planted		Tree Crops Planted	Livestock and Poultry Raised
	Wet Season	Dry Season		
Villa Rosenda				
Rice/Vegetables – Rice with Livestock	Rice, Sitao	Rice		Goat
Rice/Vegetables – Fallow	Rice, Sitao			
Rice – Rice Fruit Trees	Rice		Mango	Native Chicken
Rice – Livestock	Rice			Hog Fattener
Rice – Poultry	Rice	Rice	Mango	Sow, Hogs, Piglets, Goat, Native Chicken
San Miguel	Rice			
Rice – Fallow, with Livestock	Rice			Native Chicken
Rice/Vegetables - Rice	Rice, Vegetables	Rice		
Rice – Rice with Fruit Trees and Livestock	Rice	Rice	Mango	Sow, Fattener, Piglets
Rice – Livestock	Rice			Cow, Native Chicken
Rice – Livestock and Poultry	Rice			Sow, Goat, Native Chicken
Triala, Guimba				
Rice – Rice	Rice	Rice		
Rice, Vegetables – Rice with Livestock and Poultry	Rice, Onion	Rice	Fattener, Native Chicken	
Rice – Rice with Fruit Trees,	Rice	Rice	Mango	Fattener, Duck,

Livestock and Poultry				Native Chicken
Rice, Vegetables – Rice with Fruit Trees and Livestock	Rice, Onion, Egg plant	Rice	Mango	Fattener
Rice, Vegetables – Rice with Poultry	Rice, Sitao	Rice		Native Chicken

Lessons Learned

145. The SARD definitions provide clear and common understanding on the concept underlying SARD among RT members. While the characterization of the farming systems guided the team in identifying different indicators for descriptions and analysis, existing indicators from SEARCA and FAO on SARD enrich the characterization components.

146. Diagnosis part gives understanding on the problems, needs and current situation of the rainfed rice-based farming systems. This component is crucial because this will be the take-off point in developing a comprehensive program for SARD in the area.

147. The chapter was able to come up with a very good documentation/comprehensive information dating several decades back which provide the background for making analysis of the future scenario and coping mechanisms.

148. In essence, NGO work independently of government (Farrington 2000). They are not mandated to collaborate with research and extension services the way government departments toe the line in bureaucratic ways. According to Farrington, they will only collaborate if government organizations "have something useful to offer. Studies show the success of local GO-NGO collaborations depends on the attitudes of locally elected officials (Quizon 1997). Patronage politics is hampering the delivery of services. A strong civil service bureaucracy at the local level is lacking. Technical positions tend to be filled up by political appointees.

149. The cases of some LGU-NGO partnerships in Nueva Ecija, Bulacan, and Zambales proved that mutual respect: independence and autonomy of functions, mutual accountability, transparency, and complementarity are important requirements for effective governance (Rose et al 1984). The study ascertained that the ideal premise for local agricultural extension is to establish a network of LGUs and NGOs that can be partners and protagonists in the context of integrated area development.

150. For genuine agricultural development to take place, there is a need to empower the farmers. They must be able to articulate their needs and that political and administrative authorities must be able to respond to farmers' demands for development (Leonard 1977). As such, delivery of agricultural extension services in the Philippines is entrenched in a social and political environment that erodes its efficiency and effectiveness. It is therefore imperative for the government to identify

and adopt institutional mechanisms that would involve the various groups in decision making critical to the attainment of sustainable development objectives.

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CHAPTER 4

Factors Influencing the Evolution of the Farming System

4.1 Evolution and major changes of the farming system in the country

National rice production trends vis-à-vis government policies and programs

1. **Four phases**. The long-term evolution of rice production in the Philippines is characterized by peaks and dips. The trends in rice production, cultivated rice area, and rice yields are related to population growth, technological changes, relevant laws, policies, programs and institutions. In this respect, the evolution can be categorized into four distinct phases: Phase 1 – 1900-16; Phase 2 –1917-60; Phase 3 – 1961-86; Phase 4 – 1987-to the present (Figure 4.1).

2. **The first phase, 1900-1916**, was characterized by a very unstable rice farming system as indicated by the wide fluctuations in production volume and yields. This was caused by the frequent occurrence of the El Niño, with four episodes for the period between1902-1915; and the transition stage from the country's liberation from Spain to the next colonizers, the Americans.

3. During the period 1900-1916, rice production grew by 1.78% as a result of a 2.62% increase in yield. The land area grown to rice contracted by -0.4%. The production growth was insufficient to meet the country's food supply, and rice imports averaged 24.2% of the total production volume.

4. Water was then the limiting factor, and irrigation development was seen to be the solution. Hence, the Irrigation Act of 1912 was passed; this Act however, benefited the latter part of the American rule.

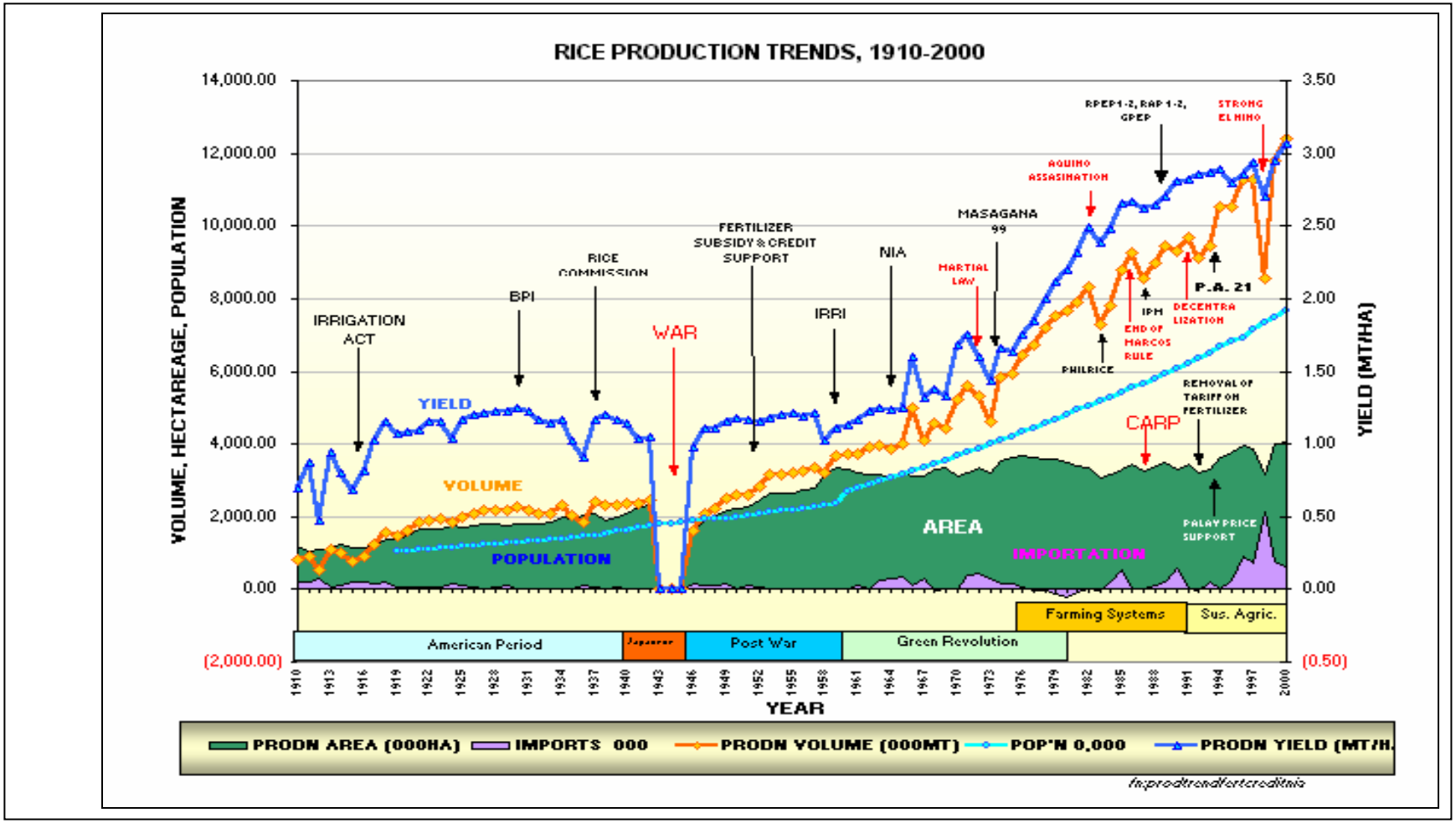


Figure 4.1 Milestones (1910-2000) represented by the peaks and dips in the evolution of the Philippine rice farming system showing the trends in rice production, cultivated rice area, and rice yields vis-à-vis the population growth, technological changes, relevant laws, policies, programs, and institutions behind each milestone.

5. The phase was also distinguished for the growth in education. Two notable agricultural schools were established: the Central Luzon Agricultural School (now the Central Luzon State University) and University of the Philippines College of Agriculture (now, the University of the Philippines at Los Baños).

6. **The second phase, 1917-1960** was relatively a stable phase, except during the 1940-45 war period. This phase was characterized by static (non-increasing) rice yields, and a fairly increasing production, achieved mainly through expansion of cultivated rice area.

7. Government interventions during this phase were aimed at increasing rice production by expanding the rice areas. The rice production area expanded by 3.9%, which brought about a corresponding 4.6% growth in production volume. With the production growth rate surpassing the 3.8% population growth, rice importation was reduced to 2.8% of total supply volume.

8. Government policies and programs also focused on irrigation, settlement of tenurial problems, inputs subsidies and provision of credit. However, the strategy failed to increase rice yields beyond a growth rate of only 0.27% over a period of 44 years.

9. The two sharp drops in production were experienced during this phase, were due to the agrarian unrest in the 1920s to the 30s, and due to the war in 1940 until 1945. The passing of the Land Tenancy Act, aimed at reforming tenancy relations, instead resulted into massive eviction of tenants by landlords and landowners.

10. During this phase three significant institutions were established: the Bureau of Plant Industry in 1930, the Rice Commission in 1936, and the Agriculture Credit and Financing Administration in 1952.

11. **The third phase**, 1961-1986 was characterized by the rapid incremental growth in both production volume and rice yields, brought about by the Green Revolution; and a decreasing land area planted to rice.

12. During this phase, the strategy to increase rice production shifted from expansion of the cultivated area expansion strategy (as in the second phase), to a combination of increasing crop yields and increasing land productivity per unit area. This strategy involved the introduction of high yielding varieties, expansion of irrigated areas, more generous input subsidy schemes, easily accessible credit, farmer organizing, development of market and post harvest infrastructures, and committed extension service.

13. The holistic approach taken by the administrations of Macapagal and Marcos during this phase resulted in remarkable 5.2% growth in yield, consequently raising rice production by a growth rate of 5.7%. The highest growth was registered during the

Marcos administration with production volume growing by 6.3%, primarily due to a 5.41% growth in yield.

14. Key policy decisions contributed to the high level of productivity, such as fertilizer and credit subsidy and palay price support, the integration of all the support services under the Masagana 99 program and the introduction of new varieties such as the IR8 or the "Miracle Rice" from the International Rice Research Institute (IRRI).

15. Several government structures were created to address specific problems of the rice industry. These include the National Irrigation Administration in 1963, the Department of Agrarian Reform (DAR) in 1971, the National Grains Authority (NGA) in 1972 (now known as the National Food Authority), the Fertilizer and Pesticide Authority (FPA) in 1977, and the Philippine Rice Research Institute (PHILRICE) in 1985.

16. Despite the political upheavals following the declaration of Martial Law in 1972 and the assassination of political oppositionist Benigno Aquino in 1983, the country not only achieved self-sufficiency in rice but even became a rice exporter from 1978 to 1982, with a total export of 503,000 metric tons. Exportation, however, was short lived as import volume soared to 6.1 percent of total rice volume in 1985.

17. **During the fourth phase, 1987 to the present**, Increases in rice yields and production volumes slowed down as a result of environmental degradation and the decline of available government resources to support agriculture. Budgets for agriculture shrank due to the budget deficits, brought about by a burgeoning foreign debt, which had swelled from the Marcos administration through the succeeding administrations.

18. This phase was also marked by increasing public social consciousness on the need for environmental protection, sustainable development, and sustainable agriculture. Thus government strategies for increasing and sustaining rice production shifted towards the promotion of improved high-yielding varieties that were drought and pest-resistant, cheaper and environment-friendly inputs, small-scale and user-operated irrigation systems, better access to credit through farmer organizations, and decentralized agricultural extension services.

19. Several social and structural reforms were instituted under the Aquino administration including the 1988 Comprehensive Agrarian Reform Program (CARP) and the 1991 Local Government Code. These reforms however temporarily saddled the implementation of rice production programs such as Rice Productivity Enhancement Program (RPEP) 1 & 2 and Rice Action Program (RAP) 1 & 2. Resistant landowners converted their lands to non-agricultural uses in order to evade coverage under CARP while, and the new landowners lacked the needed production capital. Rice growing areas were reduced by 1.3 percent dragging production volume by –0.21 percent. Loans granted by rural banks also dropped by -1.3 % suggesting an inability of farmers

to avail of new loans either because their lands were placed under CARP or they had pending unpaid loans contracted earlier under Masagana 99.

20. The Ramos Administration reinvigorated rice production through the Grains Production Enhancement Program (GPEP) and Gintong Ani Program (GAP). Using the "key production area" approach, resources were poured into selected provinces based on their climatic suitability and market availability. Under the GPEP, subsidies for fertilizer, seeds and credit were included in the package of interventions; later under GAP all these subsidies were removed. Rice production grew by 4.7 percent, and the rice area grew by 4.0 percent, primarily due to multiple-cycle planting, or the introduction of two to three planting seasons per year. However, yields maintained a modest growth of 0.6 percent.

21. These five-year gains, however, were quickly dissipated in 1998 after a prolonged El Nino drought that brought rice production to its sharpest drop ever of –24.1 percent, area by –17.5 percent and yield by –8.0 percent. The country had to depend on massive rice importation that soared above 2.0 million metric tons constituting 24.9 percent of total rice volume.

22. The perennial problems of low productivity and high rice importation, the increasing poverty, and other associated problems prompted Congress to conduct a comprehensive review of agricultural policies and programs, which led to the Agriculture and Fisheries Modernization Act (AFMA) of 1997. The AFMA aimed to strengthen the agriculture and fishery sectors through modernization, greater farmer participation, food security and self-sufficiency, private sector participation, and people empowerment.

23. The two-year administration of Estrada saw the recovery of losses incurred during the last year of the Ramos administration, posting unprecedented growth rates of 22.41% in production volume, 13.69% in area, and 6.85% in yield. This was achieved through the AFMA-guided Agrikulturang MakaMASA Program, which placed greater focus on improving the farmers' access to quality seeds and inputs, technology, credit, market support systems and maintenance and rehabilitation of existing irrigation systems and promotion of small communal user operated systems.

24. Concern for the environment highlighted the uniqueness of programs in the fourth phase. Among the policies which supported environmental protection were the promotion of Integrated Pest Management (IPM) and the banning removal of 24 harmful chemical pesticides from the market; and the incorporation of the sustainable development framework of Philippine Agenda 21 (PA21) in the plans and programs of all government agencies.

25. The key institutions that played major roles during the fourth phase, were as follows: the Department of Agrarian Reform (DAR) which was entrusted with the role of

implementing CARP; the Fertilizer and Pesticide Authority (FPA) for regulating pesticides and for promoting the use of organic fertilizers and pesticides; PHILRICE for introducing modern, high yielding, drought and pest tolerant varieties, and the NFA for implementing the palay price support scheme.

26. In the Philippines, rice has always been considered as a "political crop". Self – sufficiency in rice supplies, and stability in rice prices have been the overriding concerns of each government administration. However, programs and policies of government have always been reactionary to adverse situations and negative factors that impinge upon food security initiatives. Any unforeseen negative consequences were simply patched up by new policies. Government policies have rarely been pro-active. Policy development and implementation for rice had been a trial-and-error cycle. Before a law or policy was enacted, the issue at hand would have become stale, and another new problem would have already arisen. Thus, in -between the cycles of policy formulation and its implementation, the growth of the industry has been compromised (Figure 4.2).

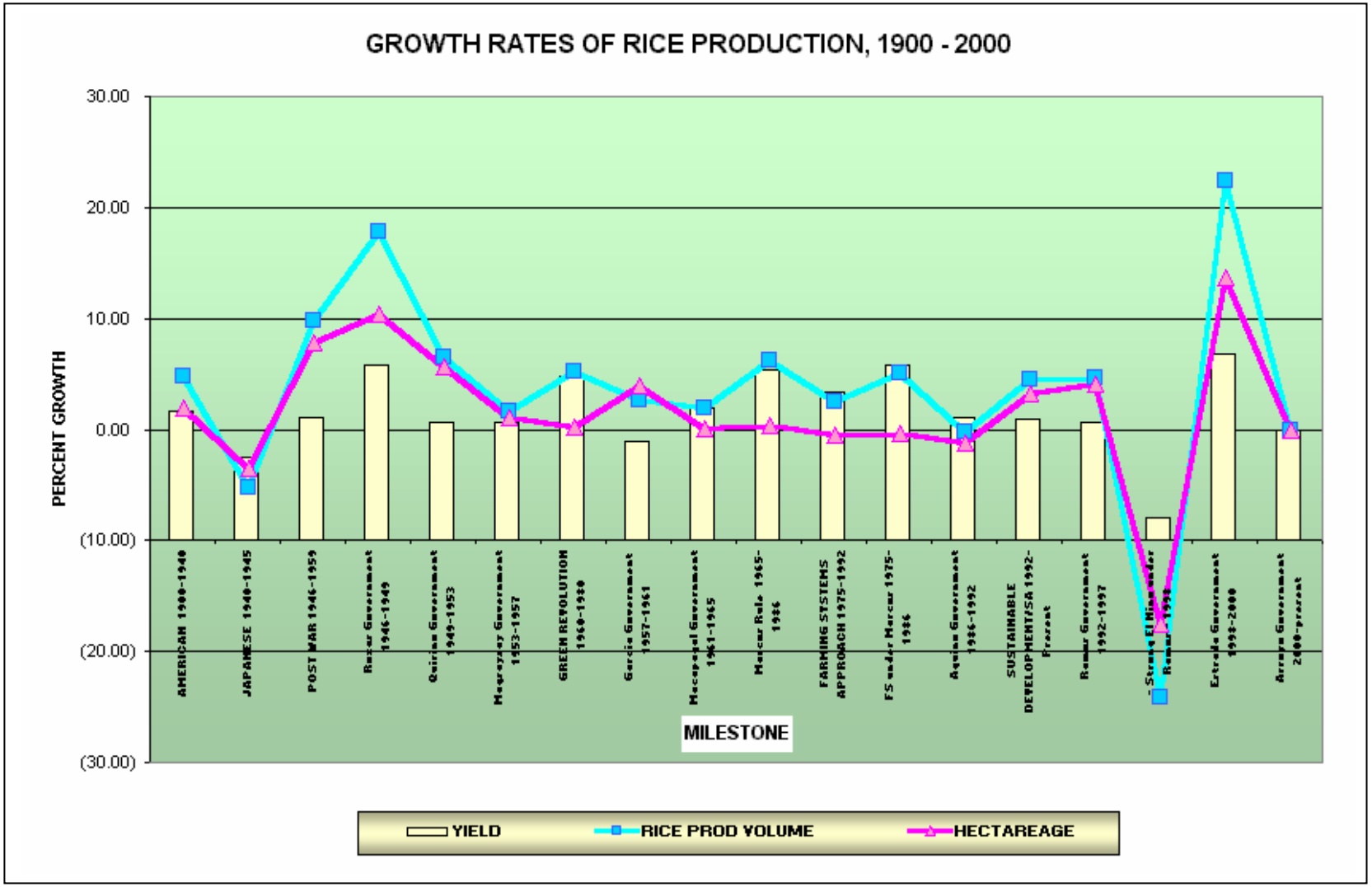


Figure 4-2. ***Rice production trends in growth rates for volume , area planted and yield, 1900-2000.***

Table 4-1. ***Summary of statistical trends in rice production and population vis-à-vis level of government support by milestone, 1900-2000***

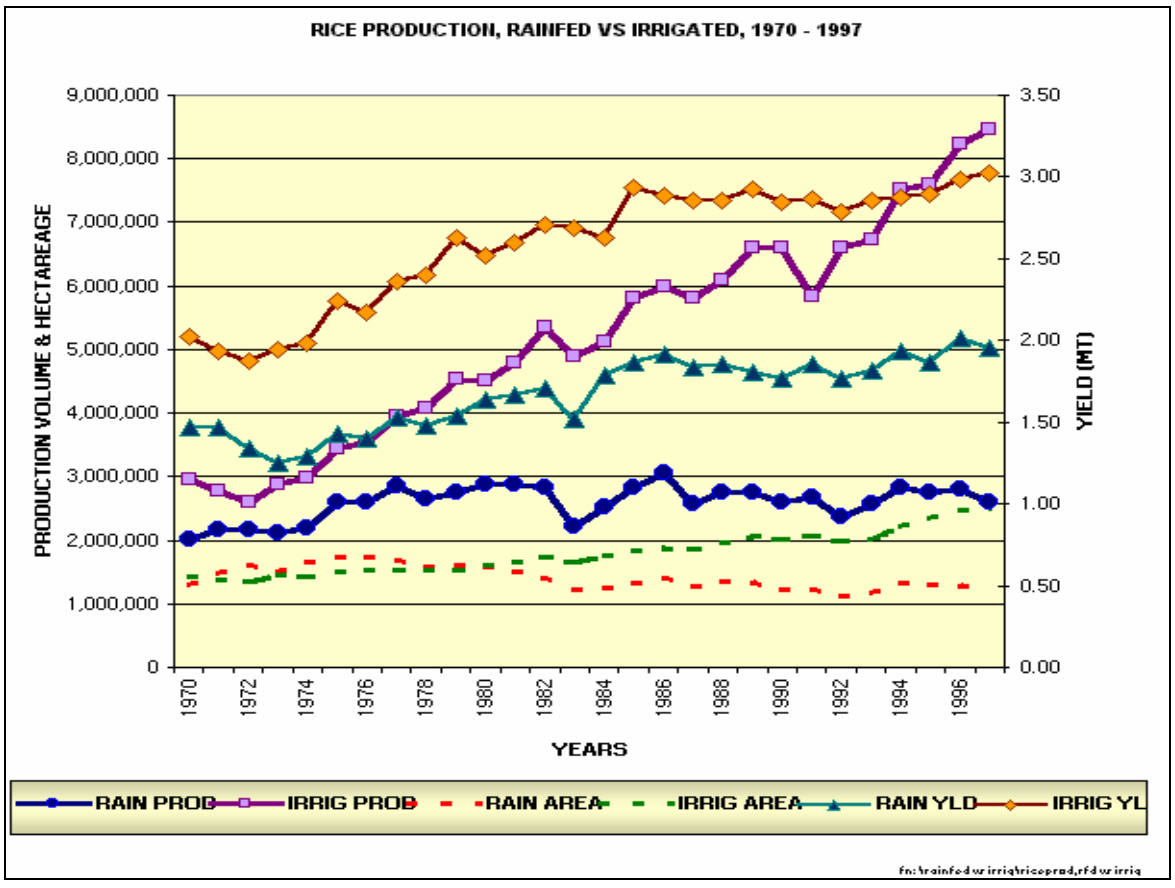
MILESTONES	POPULATION			RICE PRODUCTION GROWTH RATES			AVERAGES (REAL VALUE)			GROWTH RATE IN AREA			NIA IRRIGATION FACILITIES		FERTILIZER CONSUMPTION		AGRI-LOANS GRANTED BY RURAL BANKS	
	START OF PERIOD	END OF PERIOD	GROWTH RATE	RICE PROD VOLUME	HECTARE AGE	YIELD	VOLUME PRODUCTION (000mt)	TOTAL AREA (000Ha)	YIELD (MT/HA)	IRRIGATED	RAINFED	UPLAND	ADDITIONAL IRRIGATED AREAS	GROWTH RATE (%)	AVE '000 mt	GROWTH RATE	AVERAGE NUMBER OF BORROWERS	GROWTH RATE
AMERICAN 1900-1940	7.63	16.35	2.85	4.74	1.91	1.61	1,752	1,624	1.05	na	na	na	na	na	na	n.a.	na	na
JAPANESE 1940-1945	16.35	18.23	2.30	(5.22)	(3.45)	(2.54)	1,198	1,115	0.54	na	na	na	na	na	na	n.a.	na	na
POST WAR 1946-1959	18.63	27.09	6.49	9.77	7.83	1.02	2,336	2,065	0.96	na	na	na	na	na	na	n.a.	na	na
Roxas Government 1946-1949	18.63	19.60	1.74	17.82	10.39	5.78	2,111	1,930	1.09	na	na	na	na	na	na	n.a.	na	na
Quirino Government 1949-1953	19.60	21.14	1.96	6.55	5.67	0.65	2,738	2,350	1.16	na	na	na	na	na	na	n.a.	na	na
Magsaysay Government 1953-1957	21.14	22.80	1.96	1.60	1.06	0.64	3,230	2,693	1.20	na	na	na	na	na	143.80	21.40	na	na
GREEN REVOLUTION 1960-1980	27.09	48.10	3.88	5.22	0.25	4.73	5,783	3,336	1.73	1.25	1.42	(1.99)	538.00	5.07	358.45	5.47	515,848	35.00
Garcia Government 1957-1961	22.80	27.92	5.61	2.68	3.88	(1.03)	3,536	3,151	1.13	na	na	na	na	na	204.94	8.17	123,425	na
Macapagal Government 1961-196	27.92	31.52	3.22	1.94	0.01	1.94	3,883	3,165	1.23	na	na	na	na	na	261.56	6.15	293,794	48.79
Marcos Rule 1965-1986	31.52	55.31	3.59	6.27	0.39	5.41	6,342	3,352	1.89	1.91	0.18	(3.83)	761.00	5.46	433.40	11.80	610,535	0.88
FARMING SYSTEMS APPROACH 19	42.07	63.59	3.01	2.48	(0.54)	3.40	8,109	3,412	2.39	2.10	(1.81)	(4.43)	425.00	2.25	502.30	(12.98)	566,050	(3.85)
FS under Marcos 1975-1986	42.07	55.31	2.86	5.13	(0.42)	5.80	7,572	3,445	2.21	2.24	(1.94)	(5.89)	316.00	2.59	na	na	665,561	(5.69)
Aquino Government 1986-1992	55.31	63.59	2.50	(0.21)	(1.28)	1.12	9,191	3,362	2.73	1.47	(2.00)	(5.00)	109.00	2.55	495.20	5.19	366,163	(1.29)
SUSTAINABLE DEVELOPMENT/SA 1	63.59	78.33	2.32	4.46	3.28	0.96	10,547	3,655	2.88	3.45	0.41	0.79	(194.00)	(2.11)	na	n.a.	462,270	11.80
Ramos Government 1992-1997	63.59	71.47	2.48	4.69	4.03	0.58	10,366	3,614	2.87	3.04	(0.67)	5.35	(198.00)	(2.58)	601.80	8.09	444,467	(11.30)
- Strong El Nino under Ramos - 1	71.47	73.18	2.39	(24.09)	(17.50)	(7.99)	8,555	3,170	2.70	2.51	0.93	(27.46)	4.00	0.30	na	na	569,086	292.80
Estrada Government 1998-2000	73.18	76.50	2.27	22.41	13.69	6.85	10,910	3,736	2.90	5.12	5.91	(11.60)	na	na	na	n.a.	na	na
Arroyo Government 2000-present	76.50	78.33	na	na	na	na	na	na	na	0.34	(1.92)	23.31	na	na	na	n.a.	na	na

Rice Production Vis-à-vis Government Initiated Support Services

27. Where land resource becomes limiting, increasing the yield of rice offers the most practical and easily attainable solution for increasing overall production. However, this requires adequate and timely farm inputs and support services such as irrigation facilities, capital, and technology.

28. Irrigation. The availability and control of is critical for optimal plant growth. With irrigation, the farmer can also maximize utilization of the land by growing as many as two to three rice croppings a year.

Figure 4-3. ***Rice production in irrigated and rainfed environments, 1970– 1998***

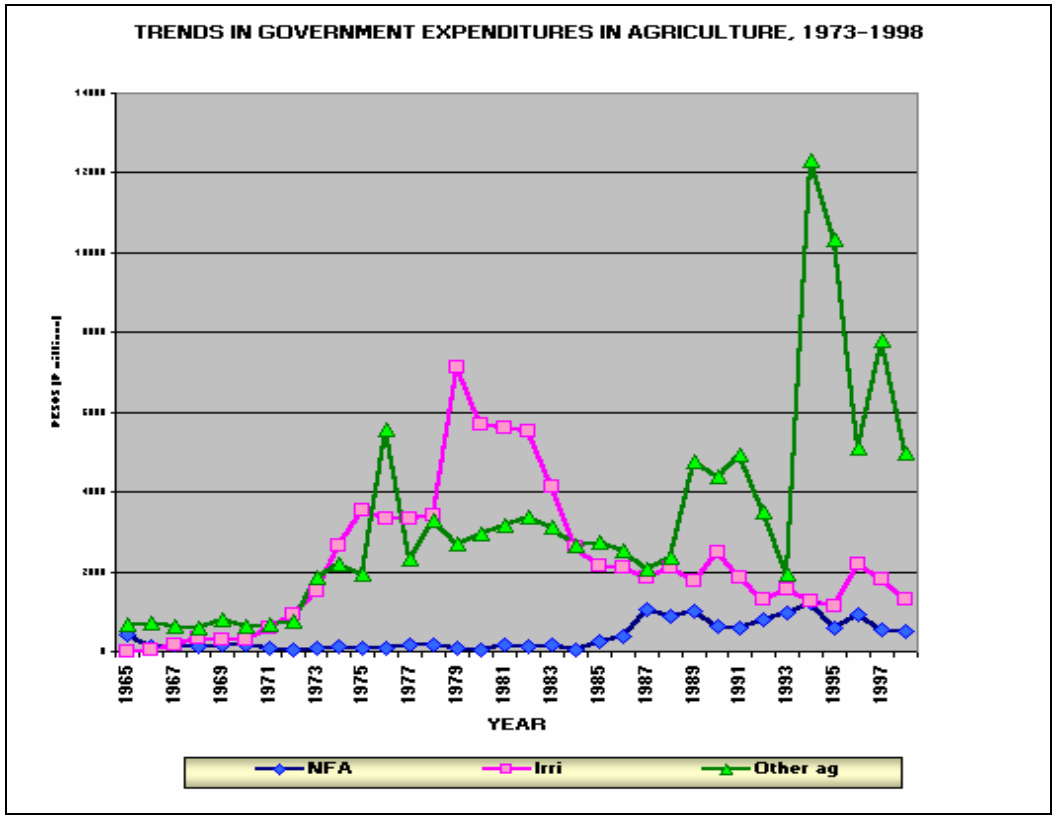


29. Given the wide disparities in yield between irrigated and rainfed systems (differences of more than 1.0 mt/ha) all administrations were encouraged to expand irrigation in the country's quest for food sufficiency. As a result, the total irrigated rice areas surpassed the total rainfed areas in 1973 (Figure 3.)

30. As early as the Spanish period irrigation systems servicing 27.681 hectares were constructed in 30 sites of friar lands thereafter, the American colonial government also provided strong support for irrigation. Laws passed to facilitate the development of irrigation included Act 1854 of 1907 creating an irrigation division within the Bureau of Public Works; and Irrigation Act of 1912 regulating the appropriation of public waters for different users. Later in 1936, the Office of the President was given the authority to administer the irrigation systems. This support for irrigation had helped maintain annual rice production above two million metric tons and average yields above the 1.0 mt/ha level (Figure 1). Growth rate during this period was 4.7% and yield level at 1.6%.

31. In 1963, the National Irrigation Administration (NIA) was created as a government controlled corporation (GOCC). The creation of NIA was complemented by Republic Act 6978, which authorized the release of a P10 – 16B fund for a 10 year, construction of irrigation project. This policy direction resulted in an increase in rice production volume from 3.98M mt in 1964 to 4.97M in 1965. Yield levels also increased by more than 0.4 t/ha.

Figure 4-4. ***Trends in the distribution of government expenditures for agriculture and the share of expenses for irrigation projects***



32. Under Marcos Martial Law administration (1972 – 86) the bulk of funds for agriculture were spent in opening up of more irrigation systems in support of the Masagana 99 program. From a mere 3.7% in 1966, government expenditures for irrigation peaked to as high as 72% of total expenditures for agriculture in 1979 (Figure 4). Irrigation became the single most important factor that transformed the country from a net importer to a rice exporter from 1977 to 1982 (Figure 1) However, growing political upheavals in the later years of the Marcos regime saw the constriction of financial resources for irrigation as government budgets were constrained by a failing Philippine economy.

33. After Marcos ouster in 1986, succeeding administrations redirected the bulk of government expenditures to other programs, causing a sudden decline in budget for irrigation development. The low budget support for irrigation development constricted the serviceable area by almost 200, 000 ha in 1994. Irrigated areas were further reduced by a systematic conversion of agricultural lands to non-agricultural uses, particularly among irrigated areas adjacent to urban centers. Since the mid – 1990s, the area serviced by NIA has been about 1.5M hectares (Figure 5)

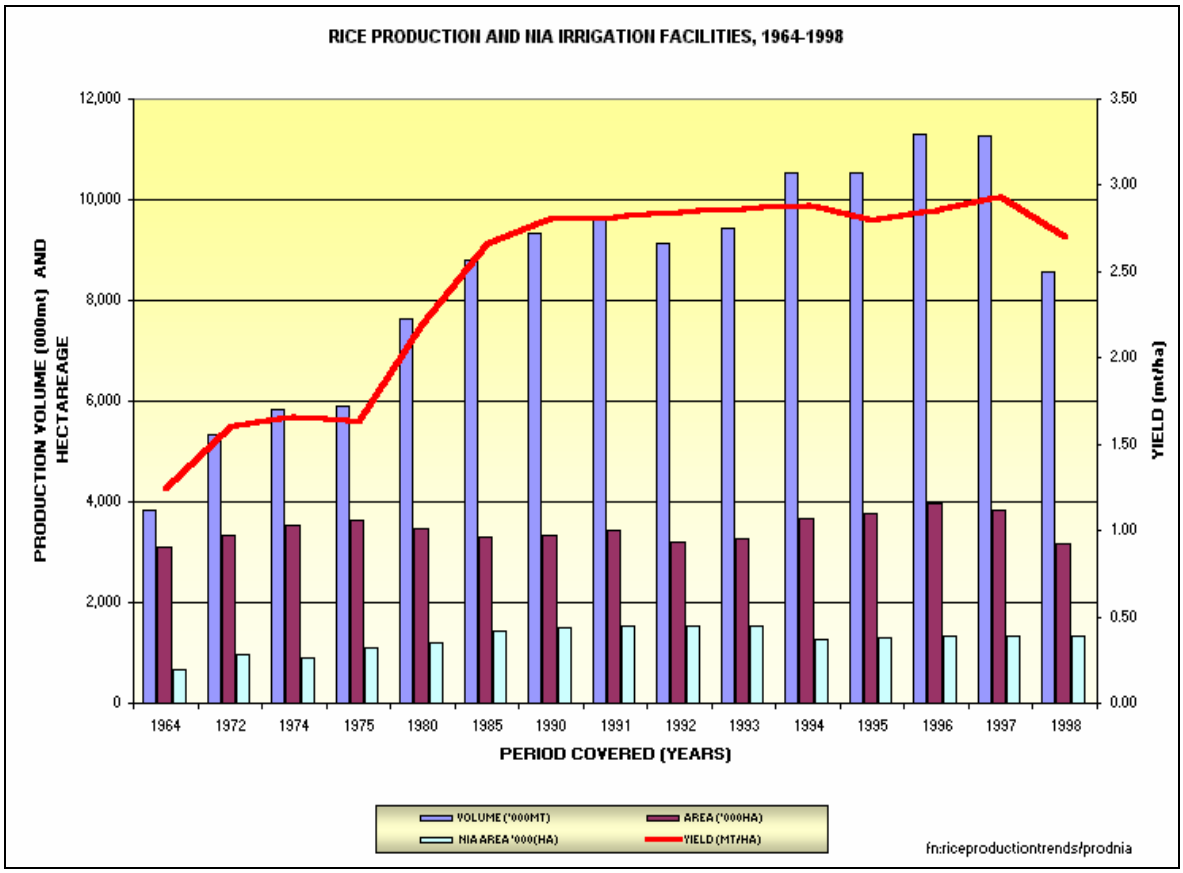
34. The prohibitive cost of setting up new irrigation systems and the ballooning fiscal deficit, led to a shift in policy towards small irrigation systems and other water impounding alternatives.

35. The 1997 AFMA stipulated that the future development of irrigation systems shall focus on alternative systems, which are less costly, sustainable, easy to maintain and control by its users, and preferably private sector initiated and operated. Policy studies have pointed toward shallow tube wells, low lift pumps and farm size small water impounding systems. There is a need, however, to conduct further research on their economic viability as well as environmental impacts to determine their sustainability.

36. **Credit.** With an average landholding of only 1.5 hectares Filipino rice farmers can barely survive from the meager incomes derived from rice production. And without any access to any lending facility, rice farmers often resorts to forward selling of their harvests for the coming season to informal lenders in exchange for a loans with usurious rates.

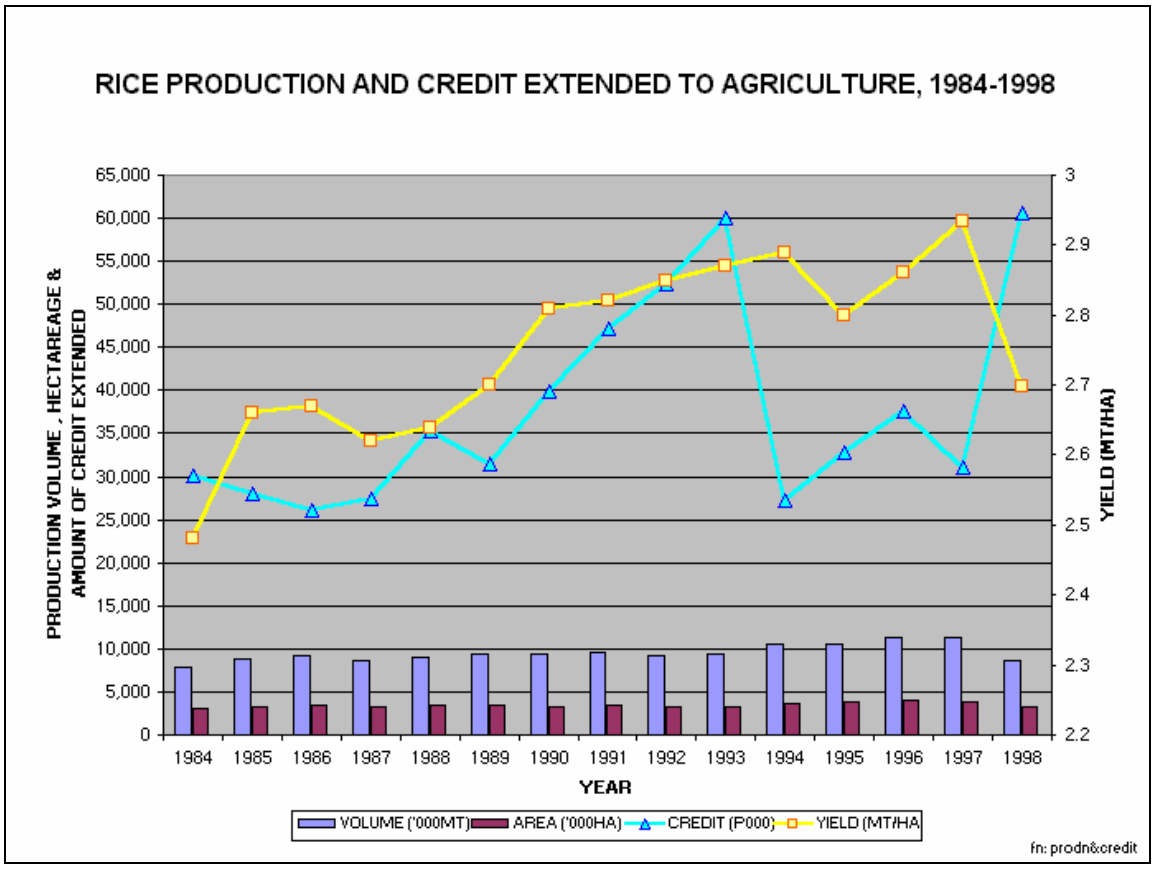
37. Government has long recognized the need to provide farmers with access to credit. In the 1950s, the Quirino Rice Program was complemented by the passage of the Rural Banking Act of 1952, and the creation of the Agricultural Credit and Cooperative Financing Administration (ACCFA). These Acts provided for production loans to be extended to rice and corn farmers without collateral. During this period, rice production grew by 6.6% and 5.7 percent.

Figure 4.5 ***Status of NIA irrigation facilities and rice production, 1964 – 1998***



38. The Green Revolution Era saw the extensive implementation of credit programs under the Marcos Martial Rule when all banks were obligated to provide agricultural credit at subsidized rates to spur rural development. However, farmers failed miserably in managing their loans resulting in very poor repayment rates that discouraged banks from continuing their rural lending programs. The failures of rural credit programs made it difficult for latter administrations to encourage banks to continue its lending program to the rural sector. Despite the strict implementation of the Agri-Agra Law that mandated banks to set aside at least 25% of their portfolio for agriculture became biased towards agribusiness corporations and other bankable agricultural endeavors such as commercial and high-value crops. Because of the higher risk and non-bankability of the rice sector banks preferred to comply through the option of investing in government approved securities, further constricting the facility in the 1980s and 1990s (Figure 4. 6).

Figure 4.6. ***Trends rice production and credit extended to agriculture, 1984-1998***



39. Years of lending through the formal banking sector have not achieved the desired results. On the other hand, it was the informal sectors that played a critical role in keeping the rural sector productive. In spite of their usurious and sometimes "shocking" interest rates, the informal sectors provided, accessibility and timely delivery of credit services to rice farmers and their contribution to sustaining the growth of the industry remain very significant.

40. More innovative lending schemes, recently brought into the agricultural scenery by non-government organizations had been gaining some success in reversing the "non-bankable" state of farmers. The Grameen-type concept, which originated from Bangladesh, has slowly become an acceptable lending system for the rural areas. In spite of the relatively high interest nature of its loans, its unique schemes and guiding principles makes it affordable, workable and acceptable to the rural sector. No less than the Bangko Sentral ng Pilipinas had endorsed the concept to rural banks and had set aside funds for this purpose.

41. **Fertilizer Subsidies**. As early as the Quirino Administration, fertilizer subsidies were introduced as a key strategy to increasing rice production. The Magsaysay government amended the Fertilizer Subsidy Program (RA 2076 and 2080 of 1957) increasing the fertilizer subsidy to five bags per hectare. Since then until the early part of the Ramos

Administration, fertilizer was subsidized in the form of giving out another free bag or two for every fertilizer purchase: the objective of this was to increase the amount of fertilizer being applied by farmers on their fields. Thus, fertilizer consumption grew by 13.9 percent from 1956 to 1995. Yields as well as the production levels correspondingly grew with increased fertilizer consumption (Figure 7).

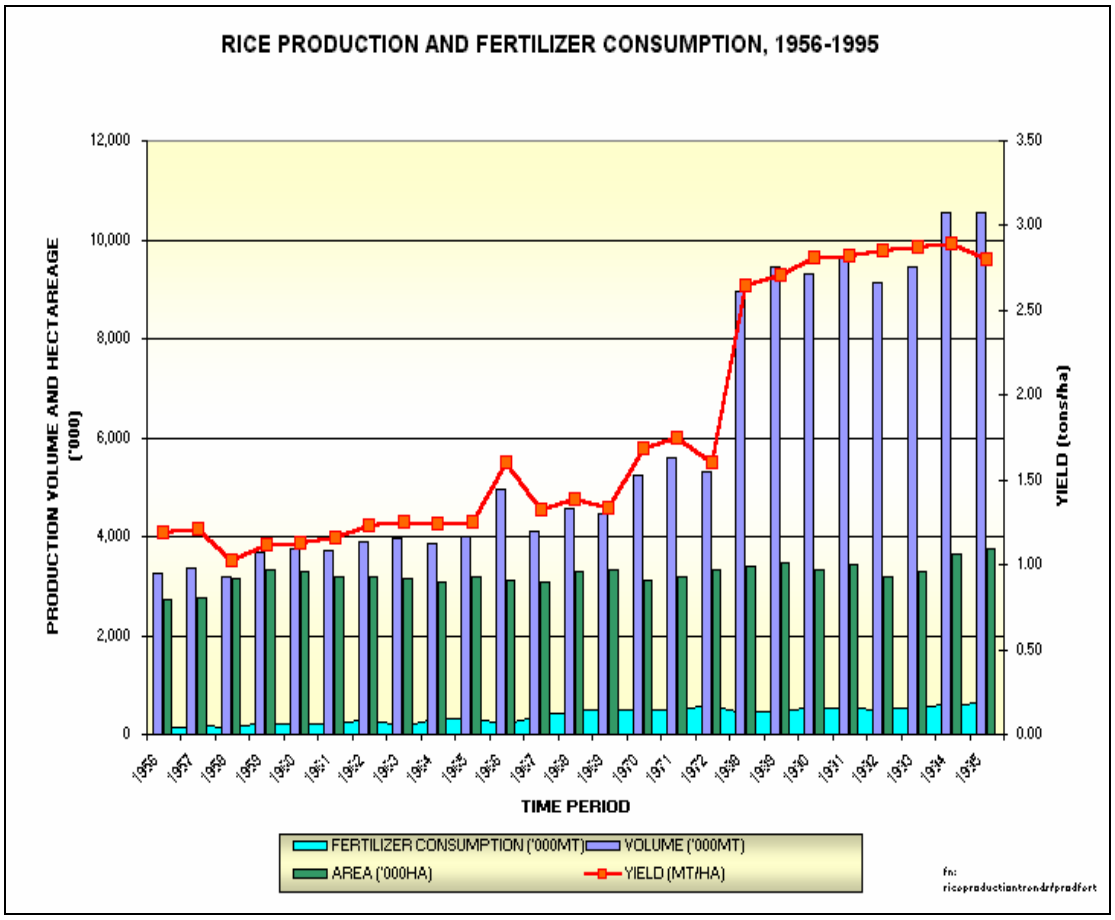
42. As the demand for fertilizer grew, the government found it necessary to create a body that will handle the trade as well as to regulate the fertilizer industry. Thus in 1973, the Fertilizer Industry Authority (FIA) was created. This body was later abolished by PD 1144 and replaced by the Fertilizer and Pesticide Authority (FPA) under the Department of Agriculture to regulate, monitor, and evaluate pesticide and fertilizer use.

43. In the early years of the Aquino Administration, the fertilizer industry was deregulated with the hope of that increased market competition would force fertilizers prices down. In later years, tariff on fertilizers was lowered to 3% to further reduce domestic prices. Succeeding administrations issued a series of Executive Orders that further lowered the tariff rate until all tariffs were finally removed with the issuance of EO 517 in 1992. As an incentive under AFMA, direct or end-users (cooperatives and farmers associations and other agricultural entities) were also given the privilege to import tariff free fertilizers.

44. Productivity may eventually decline with frequent and heavy fertilizer use. Recognizing this problem, particularly in intensively cropped areas, government launched corrective programs to re-condition and preserve the limiting land resource. In 1991, the PCARRD launched the Rapid Composting Program, to encourage the production and use of organic fertilizers.

45. **Technology and research**. Government policy interventions have focused on increasing crop yields by the introduction of modern varieties.

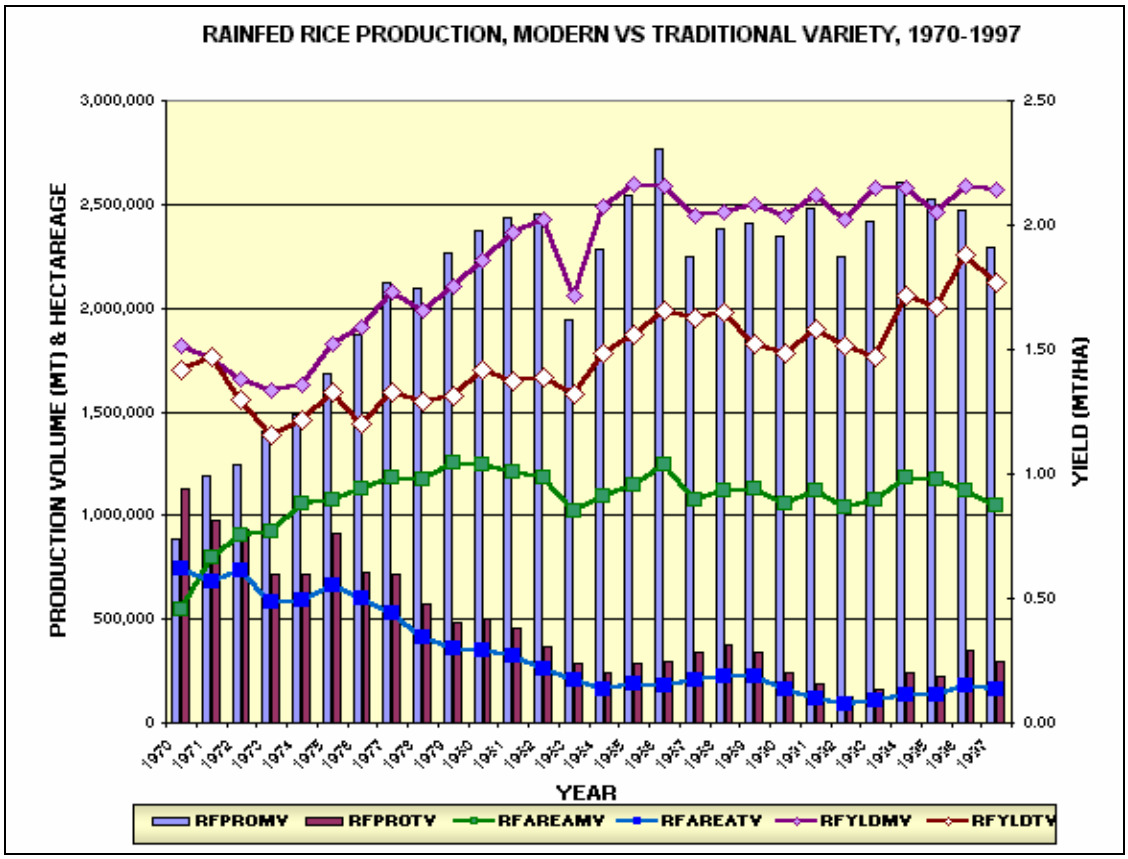
Figure 4.7. Rice production and fertilizer consumption, 1956-1995



46. Figure 4. 8 reveals the benefits of using modern varieties vis-à-vis traditional varieties on rice productivity under rainfed conditions. Under rainfed conditions, for the period 1970-1997, modern variety gave a production growth rate of 5.9%, while the traditional varieties gave a negative growth rate of -2.7 %; yields of modern varieties grew by 1.53%, while traditional varieties grew by only 0.93%; land area planted to modern varieties increased by 3.33%, consequently reducing the land area for traditional varieties to –2.9% (Figure 9).

47. Similar trends were observed in irrigated areas. The modern varieties gave increased growth rates of 11.2% in terms of production volume; 5.5% in cultivated area; and 2.31% in yield. On the other hand, traditional varieties performed poorly, with -2.2% growth rate in production; and -2.6% in area planted. However, with irrigation, yield of traditional varieties were improved, with a growth rate of 1.3%.

Figure 4.8. ***Rice production using traditional and modern varieties under rainfed conditions, 1970-1997***

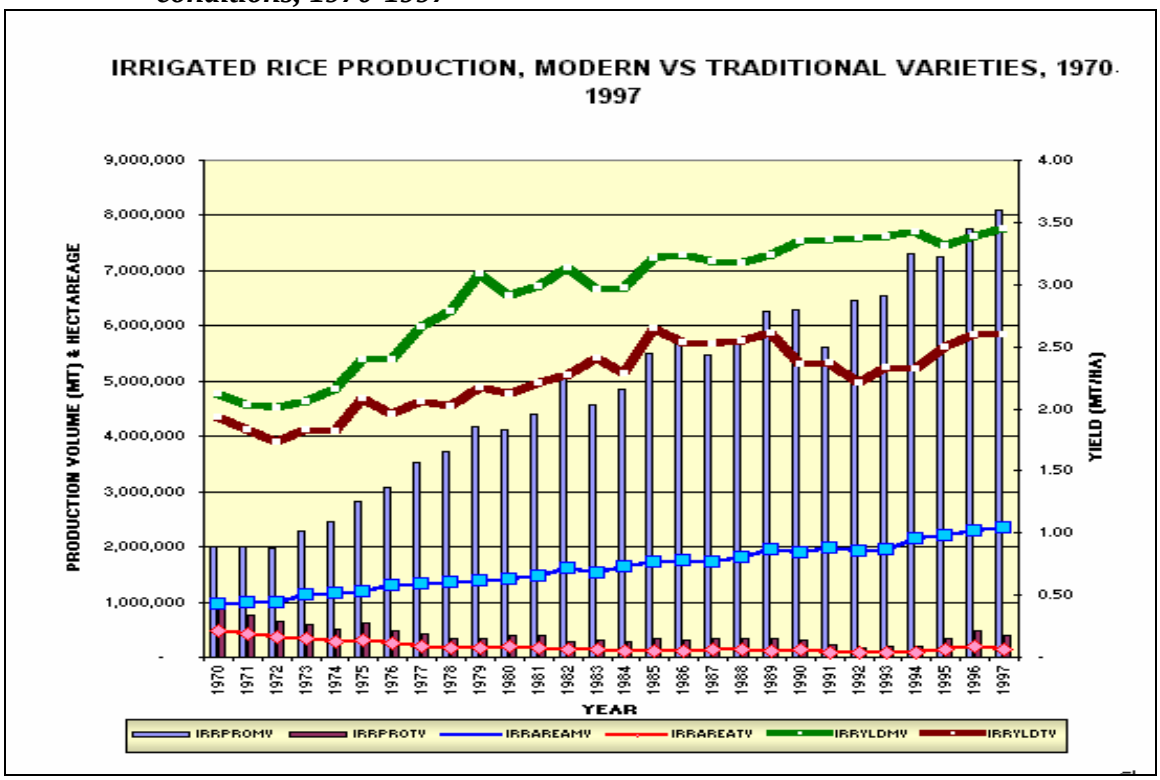


48. Gains in productivity, which briefly transformed the status of the country to an exporter during the 1970s can be attributed mostly to the introduction of the high yielding "Miracle" variety, the IR-8, developed by the International Rice Research Institute (IRRI). However, IRRI changed its research focus from varietal development to improvement of rice ecosystems.

49. In 1985, the Philippine Rice Research Institute (PhilRice) was created to fill up the vacuum left by IRRI. The most recently released new high yielding hybrids with potential yields of 5t/ha to 12t/ha were as follows: PSB Rc26H or "Magat", PSB Rc72H or "Mestizo", and PSB Rc 76H or "Panay".

50. Developing high yielding varieties usually takes more than five years; technology pilot testing and incubation takes another 2-3 years before widespread adoption. By then, changes in environmental as well as social conditions may have already affected the relevance of the technology. Thus, proactive research is necessary, to keep pace with the population growth rate and the changing bio-physical and socio-economic environments.

Figure 4.9 ***Rice production using traditional and modern varieties under rainfed conditions, 1970-1997***



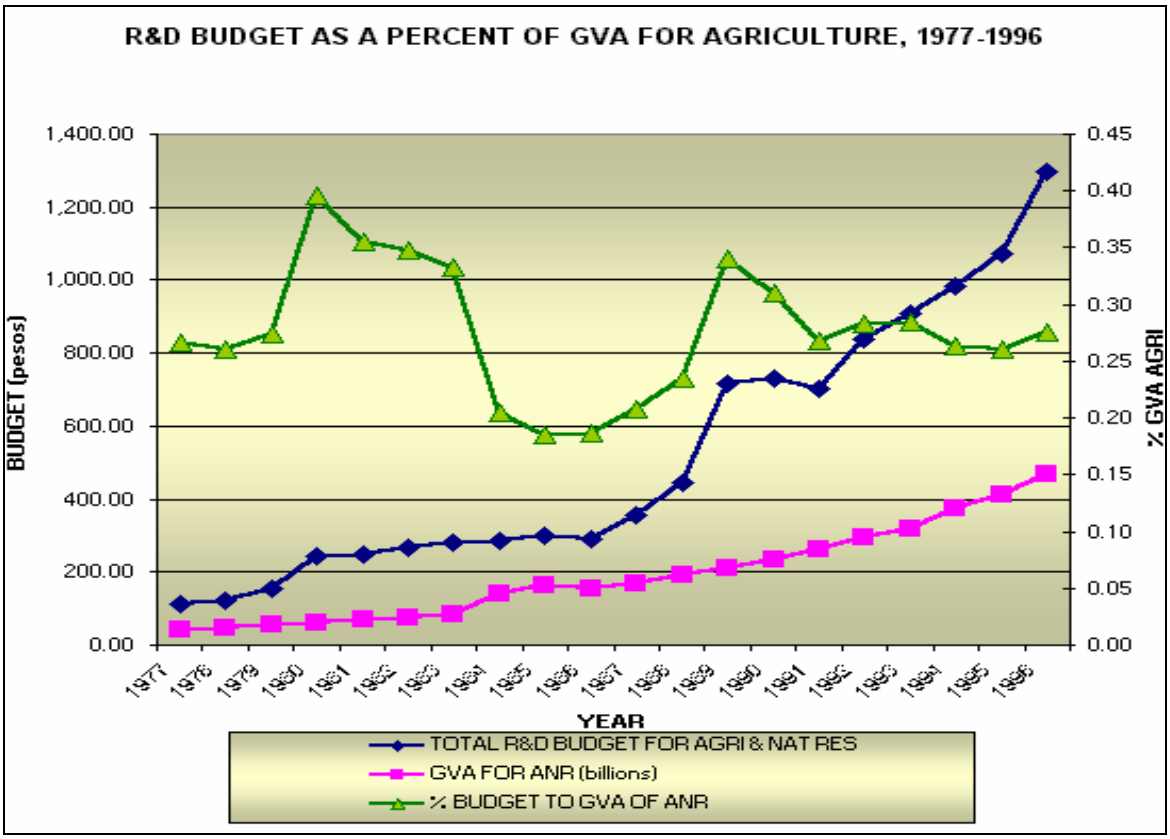
51. PhilRice has a network of research institutions (from national to the local level) to ensure that the Research-Development-and-Extension Continuum will facilitate the dissemination and transfer of rice technologies to farmers. PhilRice programs explicitly address needs in the rainfed environment in terms of seed varieties, cultural management practices and cropping systems. Among it current thrusts is value addition and product development to increase profitability from the rice system. Examples of these products are rice cakes, candies, and rice wine. Studies have shown that rice farming per se is not a profitable business, and that technologies are not the main bottlenecks; rather the marketing and distribution of rice remains a big challenge.

52. Despite the critical role of R&D in helping the country's food production, R&D investments for rice, or for agriculture in general, have not received the necessary attention from government. From 1977 to 1996, budget for research in agriculture and natural resources averaged only 0.28% of gross value added (GVA) for agriculture (figure 10). Today, while it has increased to 0.38 % of GVA (primarily because of the increased in the R & D budget of the Department of Agriculture –Bureau of Agricultural Research in 1999-2002), R & D investment is still falls way below World Bank's recommendation of at least 1.0% of GVA for developing countries.

53. Under AFMA, this investment is targeted to be 10% of the total AFMA budget (₱20 B or US$40 M), which will approximate the World Bank recommendation. AFMA however, is explicit that technology-based (rather than resource based) interventions must make agriculture competitive, market-oriented, private sector-led, and environment-friendly.

54. Aside from funding constraints, the AFMA policy paper cited disproportionate distribution of allocated resources, fragmentation and duplication of functions, and weak link between research and extension as the limiting factors for the seemingly sluggish contribution of R & D in rice production in the Philippines.

Figure 4-10. ***Research and Development Budget vs Gross Value Added of Agriculture, 1970-1996***



4.2 Characterization of Factors

55. Four major factors that influence the major changes in the evolution of the rainfed rice based farming systems was identified. Two factors were planned changes from the government made possible by the implementation of the Agrarian Reform and the Green Revolution with technology interventions. The other one is natural calamities, the El Nino, La Nina phenomenon that force to change the farming systems. Environmental degradation is the

effect of the Green Revolution and technology interventions that push the utilization of chemical fertilizers and pesticides.

A. LAND TENURE AND AGRARIAN REFORM

56. Agrarian reform is a social or political movement to bring about land reforms and to improve the economic status of the farmer. It is a package of services which includes land reform and other services designed to provide a way of life which will elevate the status of the farmer and release him from the bondage of the soil. It pertains to services in the form of credit support, infrastructure, farm extension, legal assistance, electrification and the development of the rural institutions.

57. Lot of changes was brought to the lives of farmers from 1972 to 1985 under PD 27, the hacienda were subjected to land reform wherein farmers were given certificates of land transfer (CLT). Others who were not given CLT resorted to leasehold. The period 1986 to 1997 under Comprehensive Agrarian Reform Program of Aquino and Ramos administration is characterized by the shift of the tenure status of farmers into amortizing owners. Most had an average of 3 hectares of land, some of which were sold to them while others remained leased.

58. These program gave the farmers access and full control to means of production and make their own decisions on the kinds of crops to be planted and kind of technology to be used and improvement to be made in the farm. Farmers claimed that their standard of living changed after the implementation of Agrarian Reform. Their becoming owners of the land they till gave them a sense of pride. Likewise, they were able to send their children to college, build houses, buy appliances and farm equipments such as hand tractors, water pump and others. Studies on farmers aspirations and perceptions conducted showed that farmers were emotionally attached to the land they till. They have a feeling of security at the thought of owning their farms.

B. NATURAL CALAMITIES

59. El Nino is a large scale oceanographic/meteorological phenomenon that develops in the Pacific Ocean, It is a climate anomaly causing a 40 percent reduction in rainfall and is associated with extreme climatic variability, i. e. devastating rains, winds and drought, while La Nina brings continuous rains that causes floods in affected areas.

60. El Niño brought extensive damage to Phillipine economy particularly in the agriculture sector. Concepcion (1998) noted: “the 1982 - 83 crop year drought had the most serious damage to palay production while the 1992-93 dry spell brought the biggest destruction to corn crops in the past 26 years within six crop years drought episodes which occurred in the Philippines. These are crop years 1977 -78, 1978 – 79; 1991 – 92; and 1992 – 93.

61. In terms of peso value it was in 1992 – 93 that the damage on rice and crops reached the billion peso mark. As documented by the Philippine Atmospheric Geophysical and

Astronomical Service Administration (PAG-ASA), El Nino spawned drought hit the different regions and provinces in the country between 1968 and 1993. These happened at intervals of one to six years and at different times of the year in the first half, in the second half, or in the last quarter of the year through the first quarter of the next year.

62. Before the 1980's Bicol and Visayas were hit by the El Nino related drought but afterwards, El Nino has become a country – wide phenomenon (CPDS policy forum 1997 as cited by Battad et.al 1999). The effect of El Nino phenomenon was greatly felt by farmers, drought has forced the farmers to stop their second cropping season. Incidence of flood, drought, pests and diseases, health problems and other calamities meant heavy loss for the farmers.

C. GREEN REVOLUTION AND TECHNOLOGY INTERVENTION

63. According to Pingali et. al (1997) as cited by Vargas, et.al. (1998), in the three decades, following the introduction of modern rice varieties to Tropical Asia in1965, rice production doubled. Seventy percent of the production increase came from increased yields and increased cropping intensity. It was observed that food production grew at a rate of three percent per annum, faster than the growth in population, mainly through the replacement of traditional with modern rice varieties. Many traditional rice-importing countries have achieved self-sufficiency and average per capita rice consumption in 1993 was 25 percent higher than that in 1965. Modern agricultural technology brought the Philippine barangays from mere subsistence communities to market oriented communities.

64. The adoption of modern rice technology is more than just an issue of a switch in varieties; it involves a change in inputs, crop management practices and informed farmer decision-making. The primary reason for the rapid adoption and spread of modern rice varieties in Asia was that it was enormously profitable in compared to the use of traditional varieties.

D. ENVIRONMENTAL DEGRADATION

65. The era of HYVs, chemical fertilizers and pesticides reduced the farm dwelling organisms. The harmful effect of chemicals to the natural insect-predators resulted to the resurgence of pests and diseases. The farmers perceived that their sickness is associated with the utilization of chemical pesticides. Rola and Pingali (1993) observed that farmers and agricultural workers face acute and chronic health effects due to prolonged and unsafe exposure to pesticides.

66. Nowadays, found in the rice fields are the golden snails (golden kuhol) which abounds together with the toads. The shrimps, edible frogs, edible snails, fishes that were common in the 1950s and the 1960s diminished in the rice fields. Not only were the important organisms gone, but the farmers also observed that the soil was deficient in nutrients and it became acidic. They said that heat comes out of the soil resulting to its breaking. They also observed changes in their environment, perceived the air and water becoming toxic.

4.3 Evolution of Farming System in the Future

67. In developing future scenarios, the Research Team organized three scenario-building workshops involving different groups of stakeholders at barangay (village)/municipal, provincial and national levels. The research then analyzed the qualitative storylines for comparison with established data trends for the selected farming system sites in Nueva Ecija Province. Scenarios here refer to storylines, or a series of emerging events and driving forces that cause change, to describe images of the future or alternative futures for the society and the environment. Scenarios start with the current base year and have a time horizon and steps depending on the subject, objectives and information available. For this study as stated in the methodology two types of scenarios have been developed and described: (a) an "anticipatory" (status quo) scenario, or a projection of what is likely to happen if current trends continue; and a "better" (what if) scenario, or a projection of what could happen if realistic interventions are done and the situations improves. The following sections consolidate the views and perspectives of the different stakeholders.

68. Anticipatory Scenario (What is likely to happen if current trends continue?)

Economic

- The economic situation of rainfed and irrigated areas will likely remain the same.
- Women will leave because more opportunities await them outside the farm. They will instead become domestic helpers, sales ladies, and factory workers in the urban areas.
- Farms will continue to decrease in size.
- Farm production costs continue to increase; while incomes continue to decrease.
- Prices of palay will drop because of the influx of imported rice; increased supply of imported of imported rice will eventually make it cheaper and local rice prices might drop as well.
- Mono-cropping will continue – rice-rice and rice-fallow
- Multiple financing sought by farmers from different loan sources for production costs causes poor loan recovery of small farmers.
- Lack of investment in agriculture

Institutional

- There should be one package/programs that provides technology and information support services, marketing, and others. The solutions should be bundled so that government's costs for employment will be efficient.
- Complete technologies should be taught and demonstrated to farmers to improve farming.
- Budget for agriculture will still decrease because of non-allocation of funds to AFMA and low appropriations in Local Government Units.

- Local agricultural offices will be abolished because of the limited resources allocated by the local government officials.
- Policies and programs will not be appropriate for farmers.
- Policies will not change. There will very small differences between governments.
- There will be no subsidy in relation to the liberalization of rice. A way of helping is to provide subsidies.
- There will be research and extension program for farmers but the budget will be inadequate.
- Research results lack application and does not respond to the needs of the farmers.
- Lack of extension services for farmers.
- No sustainable agriculture program

Environmental

- Land size is also decreasing as more land becomes converted into residential and commercial lots.
- Land size is also decreasing because farmers sub-divide their farms among their many children.
- There may be an increase in the number of Shallow Tube Wells(STWs). The water table continues to be low, and will become even lower.
- Increase demand for water
- Every year, water in rainfed areas becomes deeper. Our mountains becoming denuded
- Creeks will dry up.
- The soil will continue to become acidic as more chemical fertilizers will be used. Fertility of the soil will decrease. Chemical use on farms will eventually decrease yield.
- The used of lime will mean increased costs for the community.

Social

- For the rainfed areas, more farmers will grow discontent due to small returns in farming and will leave.
- Farmers will generally become older because the youth will prefer not to farm, especially those who are educated.
- The role of women does not change overtime.
- Farms will either mortgaged or sold if farmers are to depend solely on rainfed.
- Only the rich people will own land because they are the only ones with buying power/ability.
- There will be land conversion.
- Farmers will no longer be able to send their children to school.
- Children will have to work at an early age. They will have to work as domestic helpers, factory workers, and other possible sources of livelihood away from the farm.
- Because of small returns, farmers may possibly search for other jobs elsewhere.
- There will be an increase of families and children dependent on the land.

- Rate of conversion is apparent in the province
- Population is increasing
- Farmers are aging. In ten years, farmer children who are students will become farmers, but the general trend is that children do not want to return to farming.
- Great possibility of increase in out migration rates.

69. EXPLORATORY SCENARIO (what could be a better scenario?)

Economic

- There will be irrigation; perhaps the government will find a way to irrigate the uplands.
- Farmers will be hi-tech; all steps of farming, from land preparation to harvesting, will be mechanized, maybe even up to the milling process. Income and production will increase. People will be extravagant because of the new technology and the benefits it brings.
- Tight competition in business. Prices of other countries will fall and farmers suffer more; rich countries will compete with each other.
- A technology package that is affordable to farmers (doable and affordable if needed is available.
- More farm to market roads are constructed
- Post-harvest facilities-solar dryer, thresher-mobile rice mill-are complete.
- There is irrigation and new technologies to help reduce production costs.
- Market linkages/integration for farmers

Institutional

- Join together agencies that are similar in terms of programs, such as DAR, DA, PhilRice, etc. in order to save money
- Presence of established and stable cooperatives.
- Good partnership between different sectors and agencies including the government and NGOs
- A great need for more and better extension as well as information and technology promotion for agriculture. Effective strategies should be formulated and implemented to improve the dissemination of agricultural extension and information.
- Better coordination among agencies

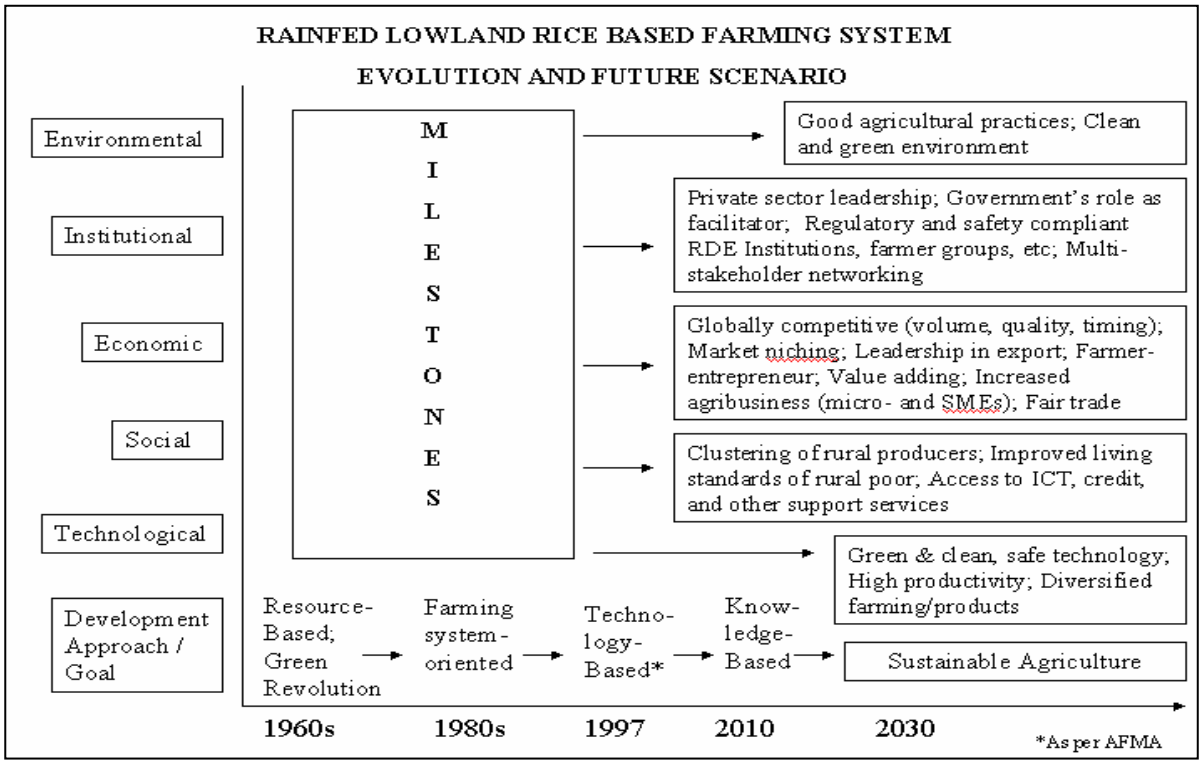
Environmental

- Implementation of complete organic farming program
- Restoration of watersheds

Social

- Because farmers depend only on their farm, farmers should learn to improve the conditions of their farms.
- More financial and technical assistance to farmers.
- Have better or flexible credit provisions for the small farmers especially those coming from rainfed areas.
- Counter the trend of out migration from farming communities by developing rural enterprise as employment generation program and livelihood systems for the farming communities.
- Well informed farmers on DA programs.
- Moratorium on Land conversion
- More Livelihood projects for women
- Different institutions provide assistance and give farmers useful information on how to increase production.
- Women can help farmers by preparing their food, taking care of their children, engaging in family planning to help prevent population explosion, returning to the farm to sow, and harvest rice.

Figure 4-11. ***The future scenario of the rainfed lowland rice farming system***



70. OBSTACLES TO "OPTIMISTIC" SCENARIOS

Economic

- Limited budget/ resources
- Lack of credit
- WTO effect/impact: Threat of trade liberalization to the sustainability of small farmers.
- Low investment potential or entrepreneurship and livelihood opportunities (Farmers do not have capital)

Institutional

- Cooperatives capacity and capability to become a business unit and manage their own affair

Social

- Lack of leaders political will
- Population growth
- Lack of interest of the people to defend their rights
- Lack of cooperation – inability of people to be united inn their belief
- Desire of leaders to remain in power and self-vested interests
- Lack of implementation of programs at the local level: there are some programs that are not completed, Technology does not reach the farmers.
- Over politicking (promises are broken,)
- Implementation of existing laws/policies
- (lack of) Networking/Linkages among farmers and concerned agencies, NGOs, etc.
- Low literacy level among farmers
- Intervention of religious institutions to government affairs like elections, family planning programs.
- Lack of human reform (Values change and lack of respect for old traditions and customs.
- Biased support for groups in favor with incumbent politicians
- Lack of capacity of LGU officials/staff
- Farmers fail to meet requirements of credit institutions
- Credit institutions are biased towards farmers with capital
- Farmers surprisingly can pay loan sharks but have a hard time paying formal credit institutions.
- No consistently strong and reliable bureaucracy

SUMMARY AND CONCLUSIONS

71. The lowland rice farming system evolved from rainfed to irrigated, from having low productivity from the 1900 to the early part of the 1960s, into a highly productive system during the late 1960s to the mid 1980s when the Green Revolution peaked due to massive government support programs. However, the system then experienced slow-growth during the late 1980s and early 1990s until the present, as the environment taking its toll from the damages resulting from the indiscreet use of the natural resources.

72. An assessment of the trends in the evolution of the rainfed lowland rice farming system gave the following conclusions in terms of the properties of an agro ecosystem, namely: productivity, stability, equitability, and sustainability.

Productivity:

73. Productivity is defined as the output of valued product per unit of resource input (Conway, 1985). Overall, the productivity of the rainfed lowland rice farming system can be described as following an increasing pattern from a low of 0.70 t/ha in 1910, to a high of 3.07 t/ha in 2000, a 339% increase within a century. Although the trends show an increasing productivity, this level is still way below its full potential. Compared to the neighboring Asian countries, the country ranks ninth in terms of volume of production and area planted; China ranks first in terms of volume and in terms of yield with 6.24 t/ha, although second in term of area planted. Among the other significant top producers are India, Indonesia, and Vietnam.

74. As seen from the trends, the land area cultivated for rice is continuously declining, which means that in terms of the biophysical factors, the area planted to rice has now become the most limiting factor in rice production. Even as fertilizer supplementation was able to correct the low soil fertility problem, its excessive use resulted in second-generation soil degradation such as soil compaction and soil acidity.

75. There are still two other biophysical factors, which offer a large room for development - the country's water resources, and crop improvement. The National Water Resources Board (NWRB) estimated that the country has 421 principal rivers, with a drainage area of 2.55 million ha, 59 natural lakes, and four major groundwater reservoirs with an aggregate area of 5 million ha. These water resources have not been tapped to the fullest because of lack of appropriate technologies. Under the AFMA of 1997, the government shifted irrigation development to cost-effective, privately-owned small-scale irrigation systems, such as the shallow tube wells (STWs), low lift pumps (LLPs), small water impounding projects (SWIPs), and small farm reservoirs (SFRs).

76. There had been a continuous development of irrigation systems since the 1900s. However, the rate of development slowed down in the recent past due to financial constraints. Thus, from 25,000 ha during the Spanish regime, the irrigated area increased to about 87,000 ha

during the American regime (1900-1946); to 663,000 ha at the time of NIA's establishment in 1964; doubled to 1.4 million ha towards the end of the Green Revolution in 1985; reached a peak of 1.5 million ha in 1993; and declined thereafter to 1.2 million ha in 2002.

77. In response to the decline in irrigation development and the consequent decline in irrigated area, the AFMA revived the government's priority to irrigation as an important input to production. The AFMA targets to irrigate some 1.4 million ha of rainfed areas at the end of 10 years through the following scheme: to increase the irrigated area by 100,000 ha/year for the first and second year, with 10% incremental increase from the third to the tenth year; and 200,000 ha/year thereafter. It is also projected that 90% of these newly irrigated areas will be served by the STWs and LLPs; the rest will be irrigated by the SWIPs, SFRs, NISs, and CISs (David, 2003).

78. On tapping the rice crop's full potential, the new developments in rice varietal improvement, indicated that hybrid rice could a bright outlook for increasing rice production. The current average rice yield of 2.9 t/ha is only 24% of 12 t/ha potential yield of hybrid rice. Another technique for improving the crop's performance is through crop diversification and integrated farming system involving both plants and animals into one system, the crop's performance and the productivity of the whole farm are enhanced, ecological balance is achieved and increased income of the farmers.

79. However, to sustain its productivity, the natural resource base on which depends the productive capacity of the rice ecosystem should be protected according to ecological/ ecosystems principles and through appropriate and integrated institutional arrangements and policy instruments.

Stability

80. Stability refers to the constancy of productivity in response to small disturbances caused by the normal fluctuations of the surrounding environment – both biophysical and socio-economic environments (Conway, 1985). The rice ecosystem has always been confronted by the normal tropical climatic cycle of rains, typhoons, and dry periods. This was evident when even the big stressor such as the World War II in the 1940s and the strong El Niño event in 1997-98 has shattered this stability. After the World War II, growth in productivity easily rose to 9.77% from a drop of –5.22%. After the 1997-98 El Niño, rice production had a sharp swing to 22.41% from a plunge of –24.09%.

81. This stability of the lowland rice farming system could be attributed to the ability of farmers to make remedies through their own ways and means, the support services and policies of the government in addressing problems of the industry (although tainted with graft and corruption), the technological developments in varieties, fertilizer, irrigation, farm machines, and the environment-friendly farming techniques, such as multiple cropping, intercropping, crop diversification, organic farming, and integrated pest management.

82. However, a foreseen major man-made threat to this stability is the continuing conversion of rice lands into other uses. In the past until the present, although there are land use policies and land use plans at hand, it was apparent that the government does not have much control over the landowners' decision on the use of their lands.

83. These issues on land conversion and economic viability of rice farming, connects to the issue of equitability. As long as there is no equitability in the farming business, the producers or farmers, who almost always do not get much return, will always resort to other forms of livelihood from where they could be better off. This explains the decline in the contribution of agriculture, particularly rice, to GDP and GVA, and the increase in the GDP from remittances from abroad. This also explains the population migration pattern from rural to urban areas until the mid-1990s. Although in the recent past, rural population was observed to be increasing faster than the urban population, which could mean two things: (a) migration of the urban poor back to the rural areas because of the realization of the dismal life conditions in the city or the relatively higher birth rate in the rural areas.

Equitability

84. Equitability refers to the evenness of distribution of the production of the ecosystem among the human beneficiaries (Conway, 1985). In general, there is low equitability in the country, as evidenced by the highly skewed distribution of income between the rich and the poor. The rich comprises 30% of the population, while the poor belongs to the 70% of the population, majority of which are small farmers.

85. As mentioned earlier, a skewed equitability impacts on the productivity of the farm system as well as the productivity of the national economy, and the distribution of the population.

86. In subsistence farming, where the farmer is the producer, and also the consumer, there is less intervention of external market forces, thus, there is more equitability. But in commercial farming, the traders, landowner-capitalists, and money-lenders get most of the benefits. To address this problem, the cooperative system was developed during the Marcos regime; however, success had been insignificant. Thus, making the cooperative system work poses to be a great challenge in addressing equitability.

Sustainability

87. Sustainability is the ability to maintain the productivity in spite of the major disturbances in the environment (Conway, 1985); it also an emerging property as a result of the combination of all the other properties – productivity, stability, and equitability.

88. With respect to the biophysical attributes, it can be inferred that the rainfed lowland rice farming system has a **high potential for sustainability** given the appropriate technologies, and the coordinated support and commitment of all the stakeholders from the society, from the grassroots to the government.

89. However, it can be inferred from the trends that the issue of equitability poses as a major constraint to sustainability. It was observed that increasing the productivity through technological means was easier to achieve than by addressing the social issues and constraints to productivity, such as the skewed equitability. There are sure technological answers to low productivity, but there are no fixed answers to equitability. Therefore, the major challenge ahead for achieving sustainability and rural development is achieving social equitability first.

Lessons Learned

90. The relevant public expenditures subsidy relate to broader public roles in the development of other services. These subsidy ease the burden of adjustment by the farmers Government subsidy could facilitate the increase in production of rice because the farmers could buy more farm inputs to support the needs in the farm**.**

91. A comprehensive program that includes support services like technology, irrigation facilities, credit, institutional development in the rural areas, markets, post harvest facilities, infrastructure and technical assistance will surely increase the production output of the rainfed areas.

92. Agrarian reform is a social justice program but there is a need to consolidate the land into cooperatives considering the economy of scale and economic viability. The change in tenurial status of farmers from share tenancy to amortizing ownership and Certificate of Land Transfer is a result of the agrarian reform program of the government that gave the opportunity to have access and control to the means of production.

93. Technology development is one factor that helps to maintain and protect the environment as long as this is environment friendly. Initially, the economic positive impact of modern varieties /technologies was the increase in their harvest but also increased their expenses due to utilization of chemical inputs including irrigation fee and labor expenses.

94. Decentralization provides a meaningful local autonomy to enable the local government to attain their fullest development as self-reliant communities and make them more effective partners in the attainment of the national goals. Local government units dependency to national government in terms of agricultural program/projects does not address the local problems specifically the rainfed rice based area.

95. The inclusion of factors influencing the evolution of the FS provides insights to the RT to assess the government policies/programs/projects influence the program in the farming systems practices across time and identify specific factors that directly alter the production practices of the farmers at the farming systems level. The information could be used as a basis in developing future program interventions for rainfed rice-based farming systems. It

clearly indicated that the national government policy interventions in agricultural development directly influence the farming systems level.

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CHAPTER 5

Elements of Recommendations for SARD Evolution

1. From the identified anticipatory and exploratory scenarios the different stakeholders were asked "Which trends should be continued and supported? Which trends should be/can be changed? What interventions or recommendations would be necessary? From the said questions stakeholders develop the recommendations base on what they perceived the priorities in order to support or changed the trends in rice based farming systems towards sustainable agriculture and rural development.

2. Results of the regional workshop, feedbacking and consultations with stakeholders at the territorial and farming system were further integrated in the recommendations.

3. The details of the specific recommendations were further discussed in the matrix considering objectives, existing policy instruments in the national, territorial, farming systems level, valuation of existing policy measures by stakeholders whether the recommendations are favorable, disfavourable, neutral to them, policy gap, stakeholders' priorities, key result areas, execution level (National, territorial, farming systems level), responsible stakeholders, and time frame (short, medium, and long term).

4. The strategic goal of the developed stakeholders' recommendations is "to enhance rural growth through crop diversification and increased competitiveness of key agricultural commodities".

Priority	Recommendations
1	Increasing Agricultural Productivity
2	Increase Investment in Agriculture
3	Trade and Market Linkages
4	Institutional Strengthening of Peoples Organization
5	Farmer Extension/Education

I. ***INCREASING AGRICULTURAL PRODUCTIVITY***

Objectives	Existing policy instruments (national, territorial, farming systems level)	Valuation of existing policy measures (favorable, disfavorable, neutral)	Policy Gap	Recommendations	Priority ranking (will be done by the stakeholders)	Key Result Areas	Execution Level (National, territorial, farming systems level)	Responsible stakeholders/ Who	Time frame (short, medium, long)
1. Develop high yielding varieties of rice and other crops species and livestock breeds well suited for rainfed lowland environments; 2. Conduct other related research on crops, livestock, and social component that will influence the agricultural productivity	AFMA, National Rice Production Programs DA-BAR Research program	Favorable Favorable	- Strengthen breeding research on the regional level - On-site testing of suitable varieties and crop species Limited to national thrusts program	Appropriate more resources to regional breeding center. Localize the testing of appropriate varieties and crop species Equal importance should be given to organic farming Look at the policy gaps-gov't has not done documentation of community efforts on crop improvement Researches on community developed seeds should be done	3 4	-Adoption of new cultivars by the farmers or users -Adoption of organic farming technologies -	National, Territorial Farming sytem National Territorial	Philippine Rice Research Institute, Bureau of Agricultural Research, Fruits and Vegetables Research Center at CLSU, Bureau of Animal Industry NGO, PO	Medium term Medium term
3. Develop irrigation facilities and provide alternative sources of irrigation water;	AFMA, NIA, DA-LGU	Favorable	-Policy on credit with lower interest - Alternative sources of irrigation water	Generate more technology on water management and utilization Explore other sources of irrigation water	1	-Efficient and equitable water supply and distribution	National Territorial, Farming Systems	NIA, DA- LGUs, Irrigators Association	Short Term

				Consider possible dislocation of communities, emerging water problems, participation of communities					
4. Identify and promote cultural management practices that improve soil fertility and with emphasis on organic production; 5. Introduce crop diversification and mixed cropping	AFMA, DA-LGU	Favorable Favorable	- Promotion of cultural practices to improve soil fertility without totally depending chemical fertilizer use. -Promote crop diversification and mixed cropping	Generate alternative cultural practices to improve soil fertility Integrate crop diversification and mixed cropping program to regular program of DA and LGU	6 5	-Soil fertility rehabilitation and improvement -Adoption of crop diversification and mixed cropping practices	Territorial, Farming Systems National, Territorial Farming Systems level	Phil Rice, Bureau of Soils and Water Management DA-LGU, NGOs DA, LGU, PO	Short Term Long Term
6. Non-conversion of agricultural lands for other uses;	AFMA, DAR	Favorable	Mechanisms to monitor illegal conversion of agricultural lands	Develop a mechanisms in strict implementation of land conversion laws	7	Maintaining agricultural productivity, food security. Better livelihood for the people who only depend on agriculture.	National, Territorial	DAR, LGU, DA	Short Term
7. Protect and restore watershed areas.	AFMA, DENR, PA21	Favorable	-Strict implementation of deforestation and replanting policy	Implement an alternative livelihood systems for farmers in the upland and watershed areas	8	Restored and protected watershed areas	National Territorial Farming System	DENR, LGU, DILG, NGOs, POs	Short, Medium and Long Term
8.Increase farmers access to agricultural resources and support services	AFMA, DAR, DENR, LBP, DBP, Rural Banks, DA, LGU	Favorable	-Limited access of farmer to support services	Strengthen the capacity of LGU Modification of credit policies	2	Increased production	National Territorial Farming system	DA, LBP, DAR, DENR, LGU, Rural Banks	Short, Medium and Long Term

II. *INCREASING INVESTMENT IN AGRICULTURE*

Objectives	Existing policy instruments (national, territorial, farming systems level)	Valuation of existing policy measures (favorable, disfavorable, neutral)	Policy Gap	Recommend ation	Priority ranking (will be done by the stakeholders)	Key Result Areas	Execution Level (National, territorial, farming systems level)	Responsible stakeholders/ Who	Time frame (short, medium, long)
1. To adopt a sustainable market-oriented approach to Research, Development and Extension (RDE)	AFMA, dost-National S&T Action Plan, PCARRD Corplan 2004-2010 (draft), DA-BAR Strategic Plan (being updated), DA-ATI Strategic Plan 2004-2010, Regional RDE Agenda	Favorable	Convergence of DA, DOST, DENR RDE Agenda	Converge the DA,DOST, DENR Research,Development and Extension Agenda	2	Unified RDE Agenda: Generation and adoption of technologies by the users/producers	National, territorial and farming system levels	PCARRD, BAR, ATI, LGUs, DTI, NGOs, SCUs	Short and medium term
2. To enhance development of infrastructure for agriculture, such as irrigation, farm to market roads, post harvest, and information and communication technology (ICT)	AFMA	Favorable	Effective monitoring and sustainability	Establish an efficient monitoring systems Appropriate Budget for AFMA implementation	1	Right quality products in sufficient volume; Timely delivery of agricultural products Increase production and diversification Well informed farmers	National, territorial, and farming system levels	DA and its line agencies, LGUs, Private sector, DTI, Cooperatives, POs, and NGOs	Long Term
3.To increase investment for small farmers/sustainable agriculture at all levels	AFMA	Favorable	Limited investment	Strengthen capacity of LGU and Convergence of DA-DAR- and other government agencies working with small farmers	3	Sustain the agricultural production	National, Territorial, and Farming system levels	DA, LGU, DAR	Medium Term

III. ***TRADE AND MARKET LINKAGES***

Objectives	Existing policy instruments (national, territorial, farming systems level)	Valuation of existing policy measures (favorable, disfavorable, neutral)	Policy Gap	Recommendation	Priority ranking	Key Result Areas	Execution Level (National, territorial, farming systems level)	Responsible stakeholders/ Who	Time frame (short, medium, long)
1. Improve product quality through postharvest practices (e.g. storage , transport, and processing)	AFMA, DA, NFA, DTI	Favorable	Establish regulations for products standards (including organic rice); Rationalization of transport policies	Formulate product standards and rationalization of transport policies Develop village processing	1	Adoption of product standards; appropriate post harvest and transport facilities	National, territorial	DA, NFA, BAFS, DTI	Medium- term
2. Improve access to price information	DA, DTI, KBP	Favorable	Information not reaching the farmers/producers Mechanisms to increase accessibility to market information by the producers	Develop the capability of local government units	3	Broadcast media policy for farmers to access Farmers using price information to make invest and planting decisions Gov't should initiate the development of operational marketing system	National, territorial	PIA, DTI, KBP, NTC	Short -term
3. Provide credit and other support to organic rice producers	BARS, AMAS, DA	Favorable	Unavailability of credit support to organic rice producers	Formulate a policy that will provide credit support.	2	Credit window for organic rice producers	National	Quedancor-DA	Short term
4. Promote political commitment & continuity of good project	National Gov't, Congress, LGU	Favorable	Unsustained good project and political commitment	Continuous advocacy/lobbying work	4	Sustainability of good projects	National, Territorial Farming System	NGO, PO	Long Term
5. Professionalize the government external relations	DFA	Favorable	Limited specialists on external relations	Strengthen external relations	5	Implemented policy	National	DFA, Congress	Long term

IV. *INSTITUTIONAL STRENGTHENING OF PEOPLES ORGANIZATION*

Objectives	Existing policy instruments (national, territorial, farming systems level)	Valuation of existing policy measures (favorable, disfavorable, neutral)	Policy Gap	Recommendation	Priority ranking (will be done by the stakeholders)	Key Result Areas	Execution Level (National, territorial, farming systems level)	Responsible stakeholders/ Who	Time frame (short, medium, long)
1.Improve *local governance* through enhanced program planning, monitoring and evaluation of agricultural/development programs/projects	AFMA, Eco-governance program of the DENR, PA21/SIAD, LGC (RA 7160)	Favorable	• Participatory translation of national agenda into local programs • Reinforcing on the ground/localizing SARD principles and concerns • Effective planning (prioritization), monitoring and evaluation of agricultural program	Develop an effective mechanisms in the translation of national agenda into local programs Reinforced the localization of SA principles and concerns. Strengthen the capability program of the LGU in program evaluation	3	• Effective governance, reflecting better accountability, transparency and participatory decision making at local and national levels	National, farming systems, and national levels	DA, LGUs, DILG, DOST	Medium-term
2. Build *capacity* for government extension agents in tandem with farmer-volunteers/leaders and other instrumentalities (ATI, MAOs, ATs, others)	AFMA, LGC	Favorable	• Policy or strategy to build capacity building for the extension arm of the government and the private extension groups	Appropriate more resources to agriculture office of the local government	4	• Enhanced knowledge and skills of the extension agents for more effective and expedient technology and information transfer	Territorial and farming systems level	DA, DA-ATI, LGUs, DILG	Short-term
3. *Strengthen CSOs* (cooperatives, non-government organizations, and peoples organization) as conduits of development activities/programs	AFMA, DILG, CDA (Cooperative Code-RA 6938), CDA Act-RA 6939), DAR programs, NEDA	Favorable	• Massive promotion of cooperativism through local government units, NGO and POs • Strengthened	Revitalization of all cooperatives Implement a comprehensive institutional development for	5	• Improved farmers and other beneficiaries' access to product-ion inputs, markets, technical and other	Territorial, Farming Systems	CDA, LGU, NGO, PO,DA, DILG, DAR, DOST, SCUs	Short-to medium - term

	Board Resolutions, MTPDP		formation, value-reorientation, and improved management of cooperatives, NGOs and POs	cooperatives		agricultural support services. • Capable cooperatives to provide services to the community they serve.			
4. *Strengthen government, academe, and CSOs tie ups/partnerships* as well as promote integration and complementation of GOs agricultural program at the local levels	AFMA, DILG, DAR, DOST, CHED/SCUs programs, MTPDP	Favorable	• Integration/coherence of GOs and CSOs programs and activities (including better collaboration) between DA and LGUs) • Strengthened linkages among stakeholders (CSOs, private entities with GOs) for sharing of resources and reduction of transaction costs of programs. • Network of LGUs, NGOs, academic institutions and GOs as partners in the context of agricultural development	Integrate GOs and CSOs development programs/projecst and activities Operationalize all the linkages among stakeholders and networks	6	• Fast track/Improved accessibility of production inputs services. • Coherent and cost-effective programs and services delivery in the communities. • Participatory decision-making in all stages of agricultural development/communities greater awareness of government programs	Territorial Farming Systems	DA, DILG, DAR, DOST, SCUs	Short-to medium-term
Provide sufficient fund transfer/allocation to LGUs for more effective technology transfer and delivery of agricultural services	AFMA, DA programs, DILG, LGUs (Local Government Code)	Favorable	• Design and enact adequate funding mechanism (additional funds and or/percentage of local budgets to be channeled to agricultural programs) • Policy for mobilizing resources	Appropriate more resources to agricultural programs of LGU	2	• Better access to agricultural support services • Systematic and equitable distribution/process of delivery of services in the communities	Territorial Farming Systems	DA, DILG, LGUs	Short-to medium term

6. *Increase investments for more effective R and D* and enhanced S and T institution building.	DA, DOST, DBM, CHED/SCUs	Favorable	• Sufficient investments in R and D/ S and T • Enhanced capabilities of S and T institutions (facilities, equipment, human resources)	Increase the appropriations in R&D/S& T	7	• More responsive/ focused S and T activities • Improved technologies and information	National level	DA, DOST, DBM, CHD/SCUs	Long-term
7. Strong financial support to local organizations	DA, Land Bank of the Philippines, CDA, LGU, NAFC	Favorable	• Limited funds received by the local organizations	Increase financial assistance Develop the enterprise capability Strengthen the horizontal linkages of local organizatiuons Monitor the internal conflict management	1	• Empowered local organizations with information technology	National Territorial	DA, LBP, LGU, NAFC	Medium term

V. FARMER EXTENSION/ EDUCATION

Objectives	Existing policy instruments (national, territorial, farming systems level)	Valuation of existing policy measures (favorable, disfavorable, neutral)	Policy Gap	Recommendation	Priority ranking (will be done by the stakeholders)	Key Result Areas	Execution Level (National, territorial, farming systems level)	Responsible stakeholders/ Who	Time frame (short, medium, long)
1. Conduct farmers' training through Participatory Technology Development process;	AFMA, DA-LGU, National Crop Production Programs	Favorable	Limited capability/capacity development program for farmers (such as farmers' clinic, for a, field schools and farmers classes) On-farm research and demonstration farm/trails.	Develop and implement a comprehensive capability development program for farmers Farmers should be linked with local government planning and be part of the whole local government programs Implement gender sensitive training and livelihood program	3	Adoption of recommended and appropriate technologies Develop local specialists in the community Farmer needs based program Participation of women in all development program	Territorial, Farming Systems	LGU, Research Institutions, NGOs, POs	Short Term
2. Develop suitable extension materials for farmers.	AFMA, DA-LGU, National Crop Production Programs	Favorable	Limitied production and promotion of various extension materials (information education and communication or IEC materials).	Implement a more effective &comprehensive program in the production of information ,education and communication materials	4	Effective transfer of technologies to farmers Increase accessibility of farmers to appropriate communication materials.	Territorial, Farming Systems	LGU, Research Institutions, State Universities and Colleges, NGOs, POs	Short Term

3. Capacitate farmer-volunteers or farmer-scientist as extension/change agents for effective technology delivery	AFMA-DA-BAR, DA-ATI, DOST-PCARRD, DENR-ERDB	Favorable	Formation and empowerment of extension agents/instrumentalities at the community level.	Implement a capability development program for farmer volunteer/scientist as change agents	1	Participation of farmers in technology delivery	Territorial, farming systems	LGU, Research institution, NGO,PO	Long term
4. Establish Community/Farmers Information and Technology Shelters/Training Centers	AFMA-DA-BAR, DA-ATI, DOST-PCARRD, DENR-ERDB	Favorable	Readily available materials on technology and information	Increase the accessibility of materials on technology and information	2	Better access to materials on technology and information	Territorial, Farming systems	LGU, Research institution, NGO,PO	Long term

ANNEX 1

Outline of Each Case Study Report *

From each of the case studies, the Project will produce a report identifying methodologies, recommendations, lessons learned and tools for policy making that can promote SARD and will adapt them according to the specificities of each beneficiary. The proposed outline of each country report is as follows (in parentheses, approximate length).

Executive summary (3 p.)

Introduction (1p.)

- GCP Project justification, objectives, expected outputs and approach

1. Organization, management and methodology of case study in country (3 p.)

- Inter-institutional arrangements, i.e. national steering committee, research team and institutional participation

2. Importance of Selected Farming System (SFS) in World, Region & Country (2 p.)

- Cultural, social, economic, environmental and political importance

3. SARD Characterization and Diagnosis of Farming System in Selected Territory (15 p.)

- Meaning of SARD for national/local stakeholders
- National context
- Territorial context
- Current status of farming system(s) **
- Diagnosis of farming system related to SARD

4. Factors Influencing SFS(s) Evolution towards SARD (45 p.)

Part 1: Evolution and major changes of SFS(s) in country (25 p.)

- Main historical milestones of agricultural development in country and territory
- Long-term trends of SFS(s) 1900-2002, using key indicators (endogenous and exogenous)

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* Taken from the FAO document "*SARD-FSE Preliminary Guidelines for Case Study Teams,* 6 June 2003.

** At the territorial level, the selected farming system could appear to be heterogeneous and sub-farming systems should be analysed.

- Future directions and potentials of SFS(s) 2002-2030 (alternative plausible scenarios and indicators)

Part 2: Characterization of factors (20p.)

- Natural resources and climate
- Socio-cultural values, human capital and aspirations
- Policies, institutions and public goods,
- Trade liberalization and market development
- Science and technology
- Natural and man-made disasters and vulnerability

5. Elements of Recommendations for SARD Evolution of the Farming Systems (20 p.)

Part 1: Country proposals

- Guidelines on SARD policies
- Operational strategies and approaches for SARD objectives
- Methods, tools and indicators for performing specific analysis and tasks in support of SARD

Part 2: Results of validation of Project outputs

- Outputs' relevance, flexibility, cost-effectiveness, user-friendliness
- Country proposals for improvement of the Project outputs

6. Conclusions & Recommendations for Project Stakeholders (20 p)

Part 1: Country proposals

- Government at national, sub-national and local levels
- NGOs, CSOs /CBOs and private sector
- Other stakeholders, i.e. research, extension and educational institutions, and external cooperation and donor agencies.

Part 2: Adjustments of preliminary conclusions and recommendations following validation of Project outputs

ANNEXES:

- Composition of local case study team, including consultants and/or collaborators, and a résumé of each member
- Composition of National Steering Committee of the Project, i.e. representatives of main stakeholders such ministries, NGOs, private sector and other partners
- Description of institutional partners, including mandate, size, and, if relevant, donors
- List of Project documents published or to be published (e.g. info bulletins, guidelines, pedagogic tools, methodologies, etc)
- Identification of participants in local and national workshops, and roundtables if relevant, including gender, position, functions and contact address
- Identification of participants in training activities (if executed), including gender, institutional affiliation, position, functions and contact address

ANNEX 2

Profile of Philippine Research Team Members

Mr. Antonio B. Quizon
Team Leader/ Social

Mr. Quizon, finished his AB in Sociology, and short courses on Development Management, Organizational Development, and Monitoring & Evaluation. A former Executive Director and is currently Board Member/Project Director of the Asian NGO Coalition. He has spent the past 30 years working with farmers and non-profit organizations in various capacities, such as: community organizer, journalist, researcher, secretary-general of a national peasant federation, and as chief executive officer. He sits as Board Director in 9 other NGOs and community-based organizations in the Philippines and Asia working on field projects and advocacy on issues of agrarian reform, sustainable agriculture, coastal resources management, and community-based plant genetic conservation. Formerly, he was a member of, e.g., the World Bank-NGO Committee, CGIAR External Review Panel, CGIAR-NGO Committee, the International Council of Voluntary Agencies, and various international NGO committees for the Earth Summit, as Asian representative. He has undertaken project implementation, research and M&E work for IFAD, FAO, ADB, UNDP, International Land Coalition, and other international/ local NGOs and foundations. Previous engagements include: international project supervision missions, impact evaluations, project appraisals, and policy research studies. He has several published books & articles on varied themes of agrarian reform; participatory tools and techniques; government-NGO relations and economy, ecology and spirituality.

Dr. Meredith Bravo
Economic

Dr. Bravo obtained her Ph.D. in Urban and Regional Planning and MS in Agricultural Economics from the University of the Philippines. An expert on Agricultural Economics, Agrarian Studies and Urban and Regional Planning, She is currently the Director of Graduate Studies and an Associate Professor in Urban and Regional Planning at the School of Urban and Regional Planning of the University of the Philippines, Diliman, Quezon City. Previously, she worked for 12 years with the Institute of Agrarian and Rural Development Studies at the University of the Philippines, Los Baños. She has been involved in a number of projects and consultancies, mostly on agrarian reform. Dr. Bravo has also been the recipient of a number of awards and scholarships such as the Best Paper Award on "An Analysis of the Resettlement Program for the Victims of Mt. Pinatubo Eruption in the Philippines" (Taiwan); Best Research Award on "Agrarian Reform Beneficiaries Monitoring and Evaluation System (STARDEC Symposium, 1995); and as a Grantee of the Philippine Social Science Council Research Awards program for her doctoral dissertation on Regional Agri-Industrial Centers (RAICs). She has several publications to her credit as part of IARDs and from her numerous consultancies.

Dr. Beatriz P. del Rosario
National Policy

Dr. del Rosario received her Ph.D. with major in Agronomy and Soils and minor in Regional Planning from the University of Hawaii, U.S.A., in 1982. She has been Deputy Executive Director for Research and Development of the

Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) since 1991. Moreover, she is the Coordinator of Biotechnology Programme and serves as Gender focal person of PCARRD. Dr. del Rosario was involved in the national implementation of Agenda 21 as Chair of the Philippine Committee on Means and Implementation and Subcommittee on Science and Technology from 1996-2000. More recently, she served as convenor of an FAO expert panel on Biodiversity, Biotechnology, Biosecurity: towards an Evergreen Revolution, commissioned by FAO Regional Office for Asia and the Pacific to develop a strategic framework for the region vis-à-vis FAO's Strategic Framework: 2000-2015.

Dr. Arnulfo G. Garcia

Environment

Dr. Arnulfo G. Garcia holds a BS in Agriculture and an MS in Agronomy degree from the University of the Philippines at Los Baños (UPLB) and a Ph.D. degree from Iowa State University, USA. His fields of specialization are on Farming Systems, Natural Resource Management, Crop Simulation Modeling, and Crop Physiology. He was the Head of the Research and Development Department and also the Head of the Natural Resource Management Program of the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEAMEO-SEARCA). Formerly, he served as the Farming Systems Agronomist and Representative/Liaison Scientist of the International Rice Research Institute (IRRI) to Myanmar. He was also a former professor of UPLB teaching undergraduate and graduate courses for more than 20 years. Among his other achievements were several scientific publications and books he has written, served as team leader of local and international projects as well as international consultancies.

Dr. Florentino C. Monsalud

Technological/ Farming Systems

Dr. Florentino C. Monsalud received his Ph.D in Agricultural Science with major in Soil Conservation, and minor in Agro forestry) from Kyoto University, Japan in 1993. He also has a MS in Soil Science with major in Soil Classification and Land Use and minor Crop Physiology from the University of the Philippines, Los Baños. His fields of specialization are soil conservation, farming systems, and land use planning. At the time of the study, he was the director of the Farming Systems and Soil Resources Institute (FSSRI) of the College of Agriculture, University of the Philippines, Los Baños. Dr. Monsalud is also a University researcher. His present assignment involves conducting research on farming systems and agricultural resources management and providing technical assistance and other extension services.

Dr. Digna Orduña-Manzanilla

Institutional

Dr. Manzanilla holds a PhD in Environmental Science from the University of the Philippines Los Baños, and an MS in Agricultural and Resources Economics from the University of Hawaii, U.S.A. She has extensive experience in the field of research management with the national agriculture and resources research and development system. Her interests in resource management include solid waste management, water resources/soil and water conservation and environmental impact valuation and assessment. Dr. Manzanilla is currently the Division Director (Chief Science Research Specialist), Agricultural Resources Management Research Division (ARMRD) of the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD). The ARMRD division handles R & activities planning, programming, monitoring and evaluation for the agricultural engineering and agroecosystem sectors, including farming systems, soil and water conservation for sustainable development.

Mr. Roel R. Ravanera

Economic

Mr. Ravanera holds a MSc. in Environmental Resource Management from the University College Dublin, Ireland, and a MA in Agrarian Studies from the University of the Philippines. He is presently the Executive Director of the Philippine Development Assistance Programme (PDAP). Prior to his current post from 1998 - 2001, he served as Executive Director of the Asian NGO Coalition for Agrarian Reform and Rural Development (ANGOC). He has had extensive work exposure in South, Southeast and East Asia. He participated in various international training and conferences on food security and sustainable agriculture, natural resource management, capacity building of NGOs and campaigns to reform financial institutions. He has been involved in ODA reviews particularly in enhancing NGO participation in ODA-funded programs, participating in policy dialogues with government and inter-governmental organizations. He has spent over 22 years in NGO development work.

Dr. Danilo S. Vargas

Territorial/ Political

Dr. Vargas holds a Ph.D. degree in Community Development from the University of the Philippines, Los Baños and teaches sociology, rural development, development management, public policy, environmental management and agricultural extension at the Institute of Graduate Studies and Open University at the Central Luzon State University (CLSU). He occupies various positions in CLSU such as Associate Professor, Program Director of the CLSU Agriculture & Agrarian Reform Special Projects, Deputy Director for Training, and Deputy Director of the Center for Central Luzon Studies. Dr. Vargas has worked as project and study leader of various research projects covering extension delivery systems, farming systems, participatory technology development, watershed management, El Niño and La Niña, gender and development, cooperative and livestock development, women's health and safe motherhood and adolescence reproductive health. He also became the Branch Manager of the Philippine Rural Reconstruction Movement (PRRM) in Nueva Ecija.

Ms. Maria Teresa S. Agarrado

National Policy

Ms. Agarrado holds a BS degree in Agriculture and MSc in Environmental Science from the University of the Philippines Los Baños (UPLB). As a Science Research Specialist of PCARRD-DOST, she coordinates and directly participates in the planning, development, monitoring, and evaluation of the National Agricultural Ecosystem R&D Program, which covers R&D areas in soil and water resources, farming systems, agrobiodiversity, and environmental management of agro ecosystems. She also acts as resource person, facilitator, and evaluator in various R&D reviews, trainings, workshops, meetings and conferences pertaining to agricultural ecosystems and related fields, such as soil, water, farming systems, and environmental management. Moreover, she writes technical and popular papers, packages R&D information for publication and press release, and prepares process documentation of trainings, workshops, meetings, and the like. Outside of PCARRD-DOST, she serves as tutor/lecturer in the subject "Environment and Natural Resource Management", dealing on the "Principles of Ecology," in the University of the Philippines Open University (UP-OU).

ANNEX 3

Brief Institutional Profiles of the Project Steering Committee

Asian NGO Coalition for Agrarian Reform and Rural Development (ANGOC)

Fr. Francis B. Lucas, Board Chair
Mr. Nathaniel Don Marquez, Executive Director
5-B Marilag St., UP Village, Diliman, Quezon City
Tel: (63-2) 4337653 to 54 Fax: (63-2) 9207434
Email: angoc@angoc.ngo.ph or fblangoc@philonline.com.ph

ANGOC is a regional association of 24 national and regional NGO networks from 12 Asian countries actively involved in issues of food security, agrarian reform and resource rights, sustainable agriculture and rural development. Founded in 1979, ANGOC's member-networks cover some 3,000 NGOs and community-based organizations (CBOs) throughout the region, which includes the countries of Bangladesh, Cambodia, China, India, Indonesia, Japan, Malaysia, Nepal, Pakistan, the Philippines, Sri Lanka and Vietnam. Over the past 23 years, the ANGOC network has been actively engaged in joint field programs and policy discussions with national governments, bilateral and multilateral institutions. It acts as a servicing institution for NGOs and CBOs through policy and action research, pilot projects, training and capacity building and information dissemination. It also provides the broader platform for NGO advocacy and actions in the region, extending beyond its membership constituency. ANGOC is governed by a 13-member Asian Regional Board. The Regional Secretariat is located in Quezon City, Philippines.

Central Luzon State University (CLSU)

Dr. Rodolfo C. Undan, President
Science City of Muñoz, 3120 Nueva Ecija
Tel: (63-44) 4560688 Fax: (63-44) 4560107
E-mail: clsu@mozcom.com

The Central Luzon State University at Science City of Muñoz, Nueva Ecija was founded in 1907 as the Central Luzon Agricultural School (CLAS). It became the Central Luzon Agricultural College (CLAC) in 1954 with the mission to promote agricultural education. In 1964, CLAC was elevated into a university to give professional and technical training in agriculture and mechanic arts, provide advanced instruction, and promote research in arts and humanities and sciences and technology. It was named as the state regional University for Agriculture in 1974. As Central Luzon's science capital, it serves as coordinating center of the Muñoz Science Community. It is one of four national research and development centers of the Philippine Council for Agricultural Development.

Department of Agrarian Reform (DAR)

Hon. Roberto Pagdanganan, Secretary
DAR Building, Elliptical Road, Quezon City, Philippines
Tel: (63-2) 9200380 Fax: (63-2) 9293088
E-mail: obet_pagdanganan@dar.gov.ph

The Department of Agrarian Reform (DAR) is the principal agency of the government responsible for implementing the Comprehensive Agrarian Reform Program (CARP). It ensures the equitable sharing/distribution of access to, and benefits of development to the broadest possible spectrum of stakeholders in the rural sector. This task starts with land distribution and shifts to social capital formation by enhancing the participation of all stakeholders in rural development through organizational development, institution building and cooperative enterprise promotion.

Department of Agriculture (DA)

Hon. Luis Lorenzo, Jr., Secretary
Elliptical Road, Quezon City
Tel: (63-2) 9204323 Fax: (63-2) 9298183
E-mail: da.gov.ph

The Department of Agriculture of the government coordinates and is responsible in the formulation and implementation of the overall plan for agriculture and fisheries modernization, develops and promotes integrated systems for agricultural ecosystems/ productivity zones. It is responsible for providing technical assistance for high-value agriculture and fisheries production, as well as for increasing productivity of staple foods, i.e., rice and corn *(Medium-Term Philippine Development Plan 1999-2004).* Its vision is "Power to the Countryside!" It pursues three main goals to attain this vision, namely: to increase the incomes of farmers and fisher folk; to generate additional jobs; and to achieve greater food sufficiency and stable prices in basic commodities.

Department of Environment and Natural Resources (DENR)

Hon. Alicia Gozun, Secretary
Visayas Ave., Diliman, Quezon City
Tel: (63-2) 9252329 Fax: (63-2) 9204352
E-mail: denr.gov.ph

The Department of Environment and Natural Resources is mandated under Executive Order 192 as the primary government agency responsible for the integrated management of watersheds, forests, soil and other natural resources and habitats. The DENR's mission is "to be the dynamic force behind people's initiatives in the protection, conservation, development, and management of the environment through strategic alliances and partnerships, participatory processes, relevant policies and programs and appropriate information technology towards sustainable development." At the operational level, DENR reflects a line structure whose functions are decentralized down to three levels: regional, provincial, and community.

Farming Systems and Soil Resources Institute - University of the Philippines, Los Baños (FSSRI-UPLB)

Dr. Florentino C. Monsalud, Director
College of Agriculture (CA),
University of the Philippines, Los Baños
College, Laguna 4031
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E-mail: fssri@laguna.net

The Farming Systems and Soil Resources Institute was established on October 16, 1982 by virtue of Executive Order 840 issued by the President of the Philippines to provide leadership in the development of strategies that will promote the adoption of technologies by small farmers which will improve productivity and income. FSSRI is a research arm of the University of the Philippines in Los Baños (UPLB), and was recognized as the "National Center of Excellence" in farming systems by the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), and by the Board of Regents of the UP System.

Food and Agriculture Organization of the United Nations – Manila (FAO-Manila)
Dr. Sang Mu Lee, Country Representative

4th Floor, NEDA sa Makati,
106 Amorsolo St., Legaspi Village, Makati City
Tel: (63-2) 8171654; 8939593; 8171507; 8920611 Fax: (63-2) 8171654
E-mail: www.fao.org

The Food and Agriculture Organization is the lead agency of the United Nations for agriculture, forestry, fisheries and rural development. To help advance its goals, which are to: raise levels of nutrition and living standards; improve agricultural productivity; and improve the condition of rural populations, FAO provides technical assistance and policy advise to developing countries, serve as a neutral forum for countries, for cooperation and provides information on key areas of its mandate. Sustainable agriculture and rural development is a key priority of FAO, as well as a long-term strategy for increasing food production and food security while conserving and managing natural resources.

National Economic Development Authority (NEDA)
Felizardo K. Virtucio, Director, Agriculture Division

3rd floor NEDA Bldg.,
Jose Maria Escriva Drive,
Ortigas Center, Pasig City
Tel: (63-2) 6313714
Email: skvirtucio@neda.gov.ph

The National Economic Development Authority is mandated by the Philippine Constitution as the country's social and economic development planning and policy coordinating body. It is headed by the President as chairman of the NEDA board, with the Secretary of Socio-Economic Planning, concurrently NEDA Director-General, as vice-chairman. All Cabinet members, as well as the Central Bank Governor, are members of the NEDA Board. *(From NEDA homepage)*

Philippine Council for Agriculture, Forestry & Natural Resources Research & Development (PCARRD)
Dr. Patricio Faylon, Executive Director

Los Baños, Laguna 4030 Philippines
Tel: (63-49) 5360014 Fax: (63-49) 5360016
E-mail: pccard.@ultra.pcaard.dost.gov.ph

The Philippine Council for Agriculture, Forestry and Natural Resources Research and Development was originally created on November 10, 1972 by Presidential Decree No. 48 as the Philippine Council for Agricultural Research (PCAR). Its mandates were broadened to cover natural resources (PCARRD) in 1975, and development (PCARRD) in 1982. Its mandates were strengthened through Executive Order No. 128 issued in 1987. PCARRD is one of the five sectoral councils of the Department of Science and Technology (DOST), serving as the government's main arm in planning, coordinating, evaluating and monitoring the national R & D programs in agriculture, forestry, and natural resources. By so being, it helps develop science and technology in the country. PCARRD allocates government and external funds and generates funds for projects through its network, embracing both local and international donors and entities.

SEAMEO Regional Center for Graduate Study and Research in Agriculture (SEARCA)
Dr. Arsenio Balisacan
Executive Director

College, Los Baños, Laguna
Tel: (63-49) 5362290; 5363459 loc. 161 or 138 Fax: (63-49) 5364105

Email: agg@agri.searca.org

The Southeast Asian Ministers of Education Organization (SEAMEO) Regional Center for Graduate Study and Research in Agriculture (SEARCA) traces its roots back to 1967, when six Southeast Asian education ministers formed it to reinforce scientific and technological knowledge that would hasten development. Its goal is to produce better agriculture professionals who will advance the cause of agricultural development in their respective countries. SEARCA envisions itself as Southeast Asia's leader in sustainable agriculture, committed to strengthening institutional capacity for food security in Southeast Asia through human resources development, research, knowledge exchange and policy support.

Annex 4

Profile of selected science and technology institutions in Nueva Ecija

Bureau of Postharvest Research and Extension

Formerly known as NAPHIRE, this agency spearheads the country's post-harvest industry. It generates and extends improved post-harvest and processing technologies that minimize quantity and quality losses of agricultural and fishery commodities. BPRE's R&D programs focus on all post-production operations. This post-production phase includes primary post-harvest and processing operations of different agricultural and fishery commodities. This involves all operations from harvesting to by-product utilization. For its technology-transfer program, the Training and Extension Department (TED) of BPRE conducts training, demonstration, technical assistance, information communication, extension and media support services.

National Freshwater Fisheries Technology Research Center (NFFTRC)

The Center carries out a continuous improvement and maintenance program of good quality strain of Tilapia brood stocks and fingerlings in the country. This program is done by collecting the Philippine Germplasm Reference for Tilapia and other major freshwater species in the country and from other countries, technology verification studies and field- testing trials and assists fish farmers/cooperatives in establishing Model Farms. NFFTRC develops and evaluates different studies on aquaculture production system techniques.

Philippine Rice Research Institute (PHILRICE)

PhilRice aims at alleviating household poverty in rice-based farming system by developing and promoting value-added rice and technologies that increase the productivity and profitability of rice farming communities and rice-based industries. Rice products for value-adding include rice-based snacks, rice wine, rice flour, instant rice and rice-based products, and special purpose rice. For technology promotion, PhilRice conducts training courses and briefings on the various aspects of rice science and technology. PhilRice disseminates new scientific knowledge through print materials like pamphlets, leaflets, brochures, books, and manuals.

Philippine Carabao Center (PCC)

The Center promotes profitable and sustainable Carabao-based enterprise designed to improve the income and nutrition of rural farming communities. Its Carabao development program components include the strengthening of the Carabao gene pool, intensified Carabao crossbreeding program, Carabao-based enterprise development and research and development. The Information and Training Division (ITD) of PCC disseminates technology to farmers, coordinates, and collaborates with different agencies in the production of manuals on artificial insemination, processing of different milk products and management of dairy buffaloes. PCC also conducts training courses to farmers and technicians from local government units.

The R & E of Central Luzon State University (CLSU)

The CLSU Research Program has two features: the R&E and the academic features. In relation to its academic thrust, the R&D program develops packages of technologies, processes, methodologies, and delivery systems to contribute to agricultural development. On the other hand, CLSU implements the extension thrust through the University Program-Management Institute for Rural Development or the UEP-MIRD. UEP is woven within two major programs, the

Barangay Integrated Development Approach for Nutrition Improvement or BIDANI and the Regional Integrated Applied Communication or RIACP.

CLSU Research Extension and Training (RET) is one of the national multi-commodity centers of excellence under the National Agriculture and Resources and Development Network or NARRDN. As such, it has some commodities assigned to its jurisdiction, which are included in its priority areas. Some R & E projects or programs are short-lived while some are of long-term duration. This may depend on the funding of the project and acceptance of the technology or institutionalization of the project or program. Some projects/commodities of CLSU that are implemented include sunflower, apiculture, and soybean. On the other hand, projects of Palay-Isdaan and Binhi ng Buhay have been terminated.

National Irrigation Administration-Upper Pampanga River Integrated Irrigation System (NIA-UPRIIS)

This entity focuses on the General Appropriation Act (GAA) 2003 that covers the Repair and Rehabilitation of Existing National Irrigation Systems (RRENIS). Particularly, Districts I, II, III, IV, and the Dam Reservoir Division (DRD) are the areas covered by this year's operation. However, there are still projects initiated last year that have not yet been completed, and are being continued, particularly the construction part this year. In addition, District III, under the Sanggalang Along-Along Program of Work (POWs), has a total budget of P12, 000,000. Likewise, the Casecnan Multipurpose Irrigation & Power Project (CMIPP)-Funded UPRIIS Rehabilitation has a financial plan of P25.108, 38.71% of which is physically accomplished, and 35.15%, financially accomplished. All these projects are all on-going. The main concern of the agency is to sustain the needs of the farmers, and provide them the services of the NIA-UPRIIS.

Department of Science and Technology

The Department of Science and Technology (DOST) provides central direction, leadership and coordination of all scientific and technological activities; and formulates policies, programs, and projects to support national development. The DOST is composed of 5 Sectoral Councils, 7 Research and Development Institutes, 6 Service Institutes, 2 Advisory Bodies, 13 Regional Offices and 73 Provincial S&T Centers. Each has its complementary functions with others. It has regional offices nationwide that coordinate with other government agencies and with local government units in the region. These regional offices deal with S&T matters, as well as carry out the laws, rules, regulations, policies, plans, programs and projects of the department. They also provide S & T services to the people in the area.

Provincial Science and Technology Centers or PSTC, established in every province of the country, are attached under the regional offices. Projects and services are implemented through technology transfer and commercialization; information dissemination; testing, analysis and consultancy services; training, promotion and education. The PSTC in Nueva Ecija is located at the CLSU compound in the Science City of Muñoz. Its programs and projects are focused on the needs and concerns of the whole province. Most of these are identified through inter-agency consultations and planning. Government and NGOs support and execute vital roles in the activities of the Center. Although export-oriented industries are the first priority in any activity of the PSTC, the agricultural nature of Nueva Ecija province forces the concentration of a greater portion of the Center's resources towards the development of agriculture-based projects.

PSTC-Nueva Ecija allocates considerable effort on institutional linkages. DOST Programs include Upgrading the Ice Cream Making Facility of the PCC at CLSU Dairy Farm; Improved Metals Fabrication, and Upgrading the Production of Novelty Medieval Weapons. Other programs include Ornaments; Establishment of a Common Service Facility (CSF) on Electroplating Technology; Technical Intervention in the Establishment of the Jaen Village-Based Mango Processing Center; and the Bamboo and Rattan Production: Upgrading the Central Luzon State University Tissue Culture Laboratory (CLSU-TCL).

Annex 5

Labor arrangements practiced in rice farming systems

Several contractual and seasonal labor arrangements, with flexible payment schemes and varied applications, continue to be practiced in rice farming:

- ***Kabisilya.*** The leader (kabisilya) of a team of transplanters negotiates a contract with a farmer on the terms of payment according to coverage per ha or the number of workers he/she supplies. The *kabisilya* receives a lump sum, which is paid to the workers at a negotiated daily rate. The lump sum may also be divided equally among workers with the kabisilya counted as one worker. For transplanting activities, the current rate is PhP 1,500 per ha; workers receive an average of PhP 100 per day.

- ***Hunusan.*** In many areas, the traditional labor contract for harvesting and threshing is called *hunusan*. Under this system, a farmer specifies at least two days for harvesting and threshing, and any villager can participate and receive a share of the output, ranging from one-fourth to one-tenth of the farmer's produce. The common sharing system is one-sixth. For the landlord and the tenant, the output is divided into two parts after the harvester's share is deducted. In the *hunusan* system, the harvest (using sickles) is bundled and each harvester gets one out of every six bundles he/she has cut. In cases where threshing and harvesting are combined as one activity, the worker gets one-sixth of the threshed palay.

- ***Upahan.*** Under the mechanized threshing system (*tilyadora*) in which crop cutting and threshing are separate activities, the harvesters are employed at a fixed daily rate (*upahan*) for a certain area to be harvested.

- ***Arkila.*** Another widely practiced arrangement is the *arkila*, also called *aqui-aqui* in Bicol, and *tampa* in Pangasinan. The system is similar to *hunusan*, except that the employment for harvesting and manual threshing is limited to workers who are willing to weed without wages. A variation called *atorga* in Pangasinan requires that workers pull seedlings for free to establish their "right" to be employed as crop cutters. Another variation gives the harvesting rights to workers who provide free services for transplanting.

- ***Bayanihan.*** The *bayanihan* or *suyuan* system used to be a popular form of labor arrangement in rice areas. This essentially means "exchange of labor" in which groups of farmers agree to work for free on each other's farms by turns. However, the bayanihan system disappeared, as labor arrangements began to be monetized with the introduction of Masagana 99 in the 1970s.