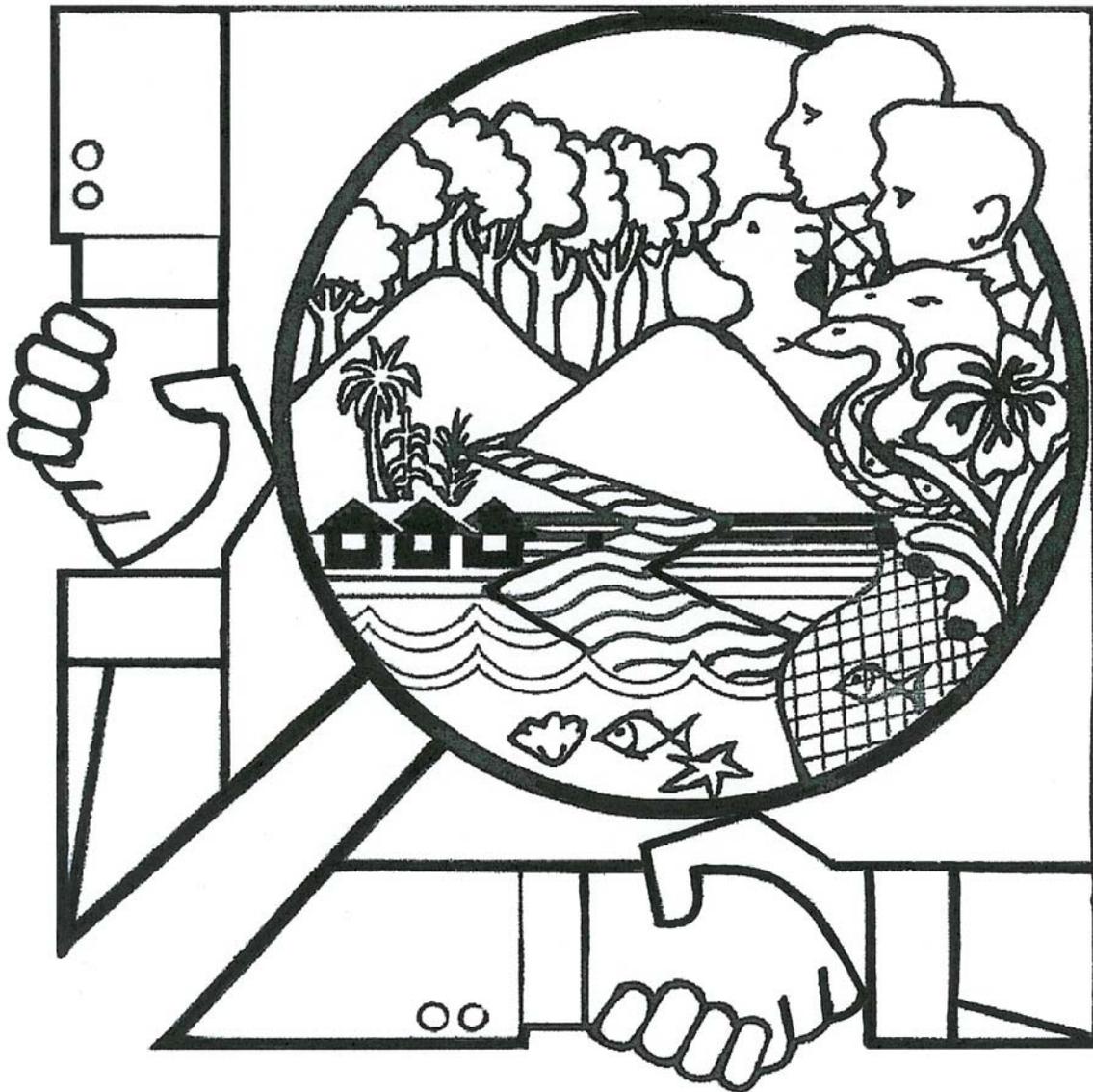


Participatory Rural Appraisal in the Lowland Ecosystem of Mt. Malindang, Misamis Occidental, Philippines



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under the

Biodiversity Research Programme (BRP) for Development in Mindanao:
Focus on Mt. Malindang and Environs

The Biodiversity Research Programme (BRP) for Development in Mindanao is a collaborative research programme on biodiversity management and conservation jointly undertaken by Filipino and Dutch researchers in Mt. Malindang and its environs, Misamis Occidental, Philippines. It is committed to undertake and promote participatory and interdisciplinary research that will promote sustainable use of biological resources, and effective decision-making on biodiversity conservation to improve livelihood and cultural opportunities.

BRP aims to make biodiversity research more responsive to real-life problems and development needs of the local communities, by introducing a new mode of knowledge generation for biodiversity management and conservation, and to strengthen capacity for biodiversity research and decision-making by empowering the local research partners and other local stakeholders.

The participatory rural appraisal in the lowland ecosystem of Mt. Malindang was conducted in 1999.

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Acronyms

ARC	Agrarian Reform Community
BHW	Barangay Health Worker
BRP	Biodiversity Research Programme
BSWM	Bureau of Soils and Water Management
CADC	Certificate of Ancestral Domain Claims
CARP	Comprehensive Agrarian Reform Program
CASAMA	Calaran sa Kaugnayang Magsasaka
CIDSS	Comprehensive and Integrated Delivery of Social Services
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DENR	Department of Environment and Natural Resources
DILG	Department of Interior and Local Government
DOH	Department of Health
DSWD	Department of Social Welfare and Development
EU	European Union
FGD	Focus Group Discussion
FPE	Foundation for Philippine Environment
HYVs	High-yielding varieties
IEC	Information, Education and Communication
IP	Indigenous People
IPM	Integrated Pest Management
KAMAS	Kahugpungan sa mga Mag-uuma sa Sinampongan
LGU	Local Government Unit
MAO	Municipal Agricultural Officer
NGO	Nongovernment Organization
NIA	National Irrigation Authority
NIPAP	National Integrated Protected Areas Programme
NIPAS	National Integrated Protected Areas System
PAO	Provincial Agricultural Officer
PASA	Protected Area Suitability Assessment
PCA	Philippine Coconut Authority
PCC	Philippine Carabao Center
PIP	Pre-Implementation Phase
PO	People's Organization
PRA	Participatory Rural Appraisal
RIC	Rural Improvement Club
SALT	Sloping Agricultural Land Technology
SARBA	Siloy Agrarian Reform Beneficiaries Association
SKA	Siya Kaunlaran Arso
STK	Soil Test Kit
SWOT	Strengths, Weaknesses, Opportunities, and Threats
ZPHEP	Zamboanga Peninsula Health and Extension Program

Executive Summary

The Lowland Ecosystem PRA

Eleven barangays were chosen for the PRA under the lowland ecosystem. These were predominantly farming communities that interfaced with the coastal and upland ecosystems. Two major river systems, the Langaran and Dियो Rivers, run through most of these barangays, with several creeks and their tributaries which eventually drain into the Murcielagos Bay.

Four of the 11 barangays were generally flat to gently rolling and were situated near the coastal area; four were inland barangays with higher elevations west of Mt. Malindang and Mt. Amparo. Analyses of soil samples taken from major land use areas in the selected barangays revealed that acidity increased with elevation and ruggedness of terrain. Soil color is usually brown to dark brown and becomes yellower and redder as elevation increases. Soil erosion was serious along riverbanks used for agriculture and in *kainjin* and marginal slopes with inappropriate farming technology.

The lowland ecosystem barangays have four major land uses namely, settlement, agriculture, reforestation areas, and secondary forest areas. Agricultural areas are predominantly planted to coconut, along with rice, corn, and root crops. Mahogany and Gmelina are chiefly found in the reforestation areas, along with other timber species. Secondary forests are the main sources of firewood and housing materials of the residents, including nontimber sources such as rattan and nito. Although coconut has been grown in large areas, hectareage is now decreasing because of its use as a cheap source of lumber and with the establishment and development of irrigation facilities in the near coastal and inland barangays.

Rainfall is fairly distributed throughout the year in these barangays without a very pronounced dry season. Near coastal barangays are dry in February until March but higher elevation barangays are dry from March to April. In all the barangays surveyed, elevation ranges from 25 to 610 m above sea level (asl).

Some primitive vascular plants are endangered and highly threatened due to habitat destruction by the local people. In addition, wild animals, which used to abound in these areas, have now disappeared due to overhunting. Few of these wildlife, however, could be sighted in Brgys. Siloy and Sinampongan. High-value fruits like mangosteen abound in small farm lots. Vegetable gardening is becoming an important feature of the landscape where high-value vegetables are grown and sold in the market.

Fertility rates in the barangays have remained unchecked although the delivery of health services and the increasing supply of potable water have also drastically reduced infant mortality. Average household size is 5.6 and lower elevation barangays have higher population density and have comparatively greater use of available resources. Out-migration is common among young men and women who have stayed in school longer and who saw opportunities in urban centers.

Farming is the general source of livelihood with coconut as the primary cash crop. However, in near coastal areas, fishing activities coexist with farming and growing of high-value fruits. Subsistence agriculture still remains high in the areas. Opportunities for additional off-farm income are available with people working in the factory and construction sectors in trading, quarrying, and nipa shingle production.

Labor is abundant but largely supplied by family members, especially in farm operations. Traditional labor exchange, such as *hunglos*, and others, still exist in communities not largely drawn into the cash economy. Generally, the farmers' level of living and income are still low and to survive, farmers sacrifice long-term conservation goals when they cut trees or gather rattan to support their families.

Farming practices are still traditional and largely influenced by indigenous traditional beliefs and rituals, in some cases. Landlord-tenant relationship sometimes resulted in conflicts but are often settled by the tribal leaders (*Timoay*) and the barangay captain. Village organizations serve as conduits for expressing community actions and the training ground for local

leadership, especially in solving problems and conflicts. In patterns/structures associated with beliefs, values, and kinship system, the Timoay plays a central role. Migration patterns are largely economic in nature, in search of better livelihood or higher education in urban centers.

The indigenous people (IP) of Mt. Malindang have high aspirations for their children but are constrained by poverty. They are aware of various laws and policies related to biodiversity conservation. However, their impoverished conditions and need for survival lead them to violating these policies.

The Researchable Areas and Research Themes

In the agricultural subecosystem, there is a need to evaluate the environmental and socioeconomic impact of land use conversion, decreasing soil fertility, and the propagation of rare and endemic species to sustain biodiversity.

The changing riverine ecology brought about by excessive quarrying, fishing and migration also necessitates research that involves hydrological, siltation, and limnological studies and their impact on the environment.

In the settlement subecosystem, the indigenous people stand out as an important resource. One major concern is how these people could be harnessed to promote biodiversity conservation efforts. There is also a need to study the leadership structures in IP communities surrounding Mt. Malindang and their probable roles in biodiversity conservation.

In the forest subecosystem, the biodiversity is rich in endemic, endangered, rare, economic, and primitive vascular plants and wildlife. However, there is an alarming rate of forest destruction. Thus, there is a need to conserve this rich biodiversity by in situ and ex situ conservation.

From the participatory rural appraisal (PRA) data, the lowland ecosystem team formulated two landscape and lifescape research themes, viz., "conserving biodiversity 'hotspots' in Mt. Amparo and its adjacent environs through appropriate land use practices" and "reversing land degradation in the Langaran River". With these themes, researchable areas have been determined and hopefully will be implemented to conserve the biodiversity resources in Mt. Malindang Range National Park.

Conclusion and Recommendation

Poverty, landlessness, and the commercialization of the economy have led to deforestation and biodiversity loss. The satisfaction of the basic survival needs of the local people is a powerful force in environmental destruction. It is therefore recommended that assistance programs aimed at addressing livelihood and landlessness problems be focused on activities that protect the environment and conserve the biodiversity resources in Mt. Malindang Range and its environs.

I. Introduction

The Mt. Malindang Range National Park is the sole representative forest area of the distinct biogeographical zone of the northwest Mindanao Island. It is found at the northeastern tip of Zamboanga Peninsula. It is located within the province of Misamis Occidental and was declared as a national park through Republic Act no. 6266 on June 19, 1971. With a maximum elevation of 2,404 m asl, it has a total land area of 53,226 ha.

This report presents the data gathered through PRA in a lowland ecosystem (Fig. 1) from 11 barangays of Misamis Occidental. Specifically, it aimed to: (a) document and analyze the data collected through PRA; (b) develop/adopt specific methods and techniques for conducting PRA; and (c) identify problems, opportunities, and research areas.

Through this report, along with data collected in other ecosystems (coastal and upland), a biodiversity research program envisioned to conserve the biodiversity resources in Mt. Malindang, will be developed.



Fig. 1. The lowland ecosystem.

II. Methodology

Site selection for the field reconnaissance

Using the map of Misamis Occidental, three transect lines were made starting from the coastal to the upland ecosystems based on the river and road systems. From these lines, five municipalities and 26 barangays were intercepted. Four of these barangays interface with the coastal and three with the upland ecosystems.

Field reconnaissance

A three-day field reconnaissance in the 26 barangays was conducted by the field reconnaissance team. It started with a courtesy call on Gov. Ernie Clarete and the municipal mayors. The Biodiversity Research Programme (BRP) for Mt. Malindang and the team members were introduced to the local officials. A permit was issued by the governor allowing the lowland ecosystem group to conduct the field reconnaissance and PRA.

The ocular survey was facilitated by the municipal agricultural officers (MAOs)/provincial agricultural officers (PAOs) and the Vice Mayor of Calamba. For every barangay, an entry protocol was made and the purpose of the visit was explained through an orientation on the BRP. A member of the team verified the stakeholders and its leaders while others noted the biophysical, socioeconomic, and cultural characteristics.

Selection of barangays for the participatory rural appraisal

Results of the field reconnaissance were presented to all members of the Lowland Ecosystem Team to finally select the barangays for the PRA.

Eleven barangays were finally chosen for the PRA based on the following criteria: presence of IPs, economic, endemic, or threatened biological resources, organizations, access to services, and local government units' (LGU) participation (Appendix Table 1).

Preparation and validation of checklist and guide questions

Specific members of the team were assigned to prepare the checklist and guide questions for the biophysical, socioeconomic, and sociocultural conditions of the lowland ecosystem. These guide questions were presented to all team members for comments and suggestions. Eventually, these were validated by the lowland ecosystem stakeholders during the multisectoral meeting prior to the conduct of the PRA.

PRA methods and techniques used

1. Participatory mapping

This is a method designed to integrate the spatial information about the residents. Residents were given the opportunity to place the information on maps based on their knowledge of the place and their prevailing conditions. Village and land use maps were generated through the joint efforts of the different sectors of the community and the team members.

The village map was generally prepared using the perimeter boundary of the barangay and the road that runs through the center of the barangay as reference points. With the guidance of the PRA team, village participants drew on a map the landmarks, houses, important buildings, and trails. They complemented and corrected each others' output, and if there were disagreements, actual observations were made to settle these differences.

The land use map was also prepared by the major informants and members of the community. Using the base map, croplands, grasslands, and forest lands were marked. In croplands, the types of crops were identified and the location of both annual and perennial crops was also noted. Biologically and economically important plants were also indicated. In addition to land use, the informants also indicated the location of water sources and drainage system.

2. Transect walk

Using the land use map prepared earlier by the participants, transect lines were drawn from either northeast or northwest direction based on the representativeness of the condition, like state of the resources, elevation, and settlement. The lines served as guides for observation walks by participants headed by the barangay captains with the PRA team members. During the transect walk, the participants described the conditions and uses of the land and resources, identified the local names and uses of medicinal plants, the problems encountered, and other biophysical features traversed by the transect.

3. Temporal diagrams

These are graphic presentations of data and other information on various conditions, issues and concerns. These include the timeline, product flow, and seasonal and cropping calendar.

The time line was prepared by senior citizens, barangay captains, local officials, and other major informants. Entries in the timeline included significant and historical events contributing to the loss of biodiversity like logging, erosion, flooding, *kaingin*, etc. in the barangay.

The product flow diagrams depicted the flow of the different agricultural products, livestock, and other products, and were obtained from interviews with major informants and from focus group discussions (FGD).

The seasonal and cropping calendars were prepared by the farmers. Monthly variations in specific activities or conditions were reflected in the diagram. Also indicated were the cropping calendar composed of the rainfall pattern together with phases of crop production processes for different crops.

4. Semistructured interviews

The PRA team conducted interviews with the local people. The selection of the respondents depended on the types of questions and topics of the interview.

5. Focus group discussion

Focus group discussion sessions were conducted on specific topics and problems. The purpose of the FGD was to give the group an opportunity not only to answer specific questions but also to discuss issues and concerns peculiar to the sector or group. The members of the PRA team served as facilitators in the discussion.

6. Meetings and workshops

Meetings and workshops were conducted to orient the stakeholders on the BRP, PRA, preparation of maps, validation of the guide questions, and data collection. During these meetings, the stakeholders pledged to cooperate and participate in the planned activities of the lowland team.

Conduct of participatory rural appraisal

Two teams were formed composed of four to five members with biophysical, socioeconomics and sociocultural experts in each team. An entry protocol was secured before every barangay was visited. With the team leader, each team worked with six barangays and spent one and a half days in the barangay.

In the conduct of the PRA data collection and analysis, general tools were used, namely, visualized analysis and sharing method, interview and direct observation methods, and group and team dynamics method. Through these methods and with the involvement of the stakeholders in the community, spot map, resource use map, transect, timeline, resource flow, and network analyses were produced. The availability of the major informants facilitated data collection. When needed, the team stayed overnight in the community to gather additional data.

Information sharing between and among members of the team and between teams was done after the interview and even during night time. Mind mapping was also conducted to determine trends, relationships between barangays, and identification of researchable areas in the 11 barangays. Collected data on biophysical, socioeconomic, and sociocultural conditions were put in matrix form for analysis.

Data analysis

The data were analyzed using the following procedure:

1. The subecosystems in the lowland ecosystem were identified, viz., agriculture, settlement, and forest.
2. The subecosystems were crossed with the 11 barangays.
3. In a matrix form, the resources per barangay were identified and analyzed.
 - a. resource characteristics
 - b. resource uses
 - c. people using the resources
 - d. characteristics of the people who use the subecosystem
 - e. relationship to people
 - f. historical trends
4. The resources per barangay were subjected to SWOT analysis with participatory, equity, empowerment, sustainability and environmental security as bases for analysis.
5. The resources in the subecosystems were prioritized based on the number/size, linkages, urgency/timing, and expressed needs of the community.
6. From these priorities, resources, training needs, researchable areas, data banking, and urgent actions needed were determined.

Community validation meeting

A one-day community validation meeting was organized to validate the results collected during the PRA. It was attended by mayors, barangay captains, and heads of government and nongovernment organizations. General presentation of the results and research areas was done in Cebuano dialect and simplified by the use of visual aids (illustrations, tables, graphs, photos, etc.). In the presence of the lowland team members, invited stakeholders and major informants examined their outputs including the resource use map, spot map, and timeline, and made some comments and suggestions.

III. General features of the study area

Geographic location and accessibility

The lowland ecosystem of Mt. Malindang Range National Park lies in the coordinates 123°36'45" to 123°42'54" east longitudes and 8°27'06" to 8°37'49" north latitudes with elevation ranging from 25 m asl in Landing and as high as 610 m asl in Sinampongan.

Eleven barangays in five municipalities were included in the PRA, viz., Landing and Lumipac in Baliangao, Dioyo and Sixto Velez in Sapang Dalaga, Unidos and Tipolo in Plaridel, and Calaran, Mamalad, Dapacan Alto, and Siloy in Calamba. These are located in the northeastern part of Misamis Occidental.

The barangays are accessible by foot or vehicle from various entry points. A circumferential provincial road and feeder roads link these barangays to the coastal and upland barangays. Access to the upper parts of the range like Siloy and Sinampongan is through tracks and trails that mostly follow the upstream direction of its major drainage areas.

Area, topography and soils

The total land area of the 11 barangays studied is 6,610 ha. Dioyo has the smallest with only 147 ha and Sinampongan has the biggest with 1,500 ha. They are characterized by a flat to mildly rolling to rough and steep topography.

Soil analysis showed increasing acidity with elevation and ruggedness of terrain. The barangays are generally low in nitrogen (N) and phosphorus (P), while potassium (K) is mostly sufficient. The soil color is brown to dark brown, becoming yellower and redder with increasing elevation. Soil erosion is serious along riverbanks, and landslides are common in critical slopes with less vegetative cover.

Vegetative cover and land use

Second growth forests, forest plantations, agricultural crops, and grasslands characterize the lowland ecosystem of Mt. Malindang Range National Park.

The second growth forest is found in abandoned *kaingin* areas, while the forest plantation is observed in higher altitude barangays although patches of reforestation areas are found in lower altitude barangays.

About 23% or 12,139 ha of the protected area is devoted to agricultural perennial and annual crops like coconut, banana, fruit trees, rice, corn, and root crops like cassava and sweet potato are planted in steep areas (PASA Report 1993).

Grasslands are found in abandoned *kaingin* or agricultural areas left to fallow by farmers.

IV. Results and Observations

A participatory rural appraisal was conducted in 11 barangays in Misamis Occidental to collect data on the biophysical environment, socioeconomic, and cultural settings. These data are presented in this report.

Barangay Landing (Baliangao, Mis. Occ.)

Misamis Occidental was occupied by the Japanese Imperial Army during World War II. The American forces were also present in the province. In fact, an American settlement was established in what used to be the Municipality of Langaran (now Plaridel) in the 1800s. In 1945, there were plans to make what is presently called Barangay Landing a "landing field" for American planes, because of its flat and favorable terrain. The plan did not materialize, but the place came to be called "Landing" in 1946.

a. Biophysical environment

Area and location

Landing is bounded in the north by Barangay Mison, in the east by the Sinian River, and in the west by Barangay Lusot. It is located at 8°37'53.75" N and 123°37'53.75" E. Its total land area is 630.25 ha.

Topography/slope and elevation

Brgy. Landing is relatively flat to rolling with slopes ranging from 5-10% to 30-40% on rolling hills. Its elevation (measured using GPS-Magellan 2000) ranges from 25 to 55 m asl.

Roads/access

Landing is traversed by a concrete provincial/national highway that links to Calamba, Oroquieta City, and Dipolog City. Interior sitios have farm-to-market roads that are passable by 4-wheeled vehicles. Because of its good roads and strategic location, it is the municipal marketing center of agriculture and fishery products.

Land use patterns

Figure 2 shows the major land uses of Brgy. Landing. Agriculture occupies 72%, settlement 18%, while reforestation species (mahogany and Gmelina) and mangrove forest occupy 5% each of the entire area. The agricultural areas are dominated by coconuts (52%), followed by rice (34%) and corn (14%).

Soil conditions

Four samples were analyzed for pH, N, P, and K using the soil test kit (STK). Colors (moist) were measured using the American Munsell Soil Color Chart and soil texture was determined by the feel or finger test method. The pH test showed Landing soils have a pH of 5.6-6.0. Soil acidity is high (5.2) in the sloping lands planted to coconut. Probably due to overcultivation, soils have low N, generally high P except in the slopes, and sufficient K in rice paddies and deficient K in slopes planted to coconuts. Soil colors range from brown to dark brown to dark grayish brown. The former indicates well-drained conditions, while the latter shows the effects of waterlogging (paddy soil). Textures range from light to heavy reflecting on the data the influence of flooding and overflow of the Sinian River depositing its sediments. Farther from the banks and higher in the landscape, the texture gets heavier (Appendix Table 2).

Climatic conditions

Brgy. Landing is classified under Type IV using the Modified Corona Climatic Classification. This means that Landing has rainfall evenly distributed throughout the year. The rainiest months are November and December, while the driest months are February and March. This decade, the country has experienced two prolonged droughts

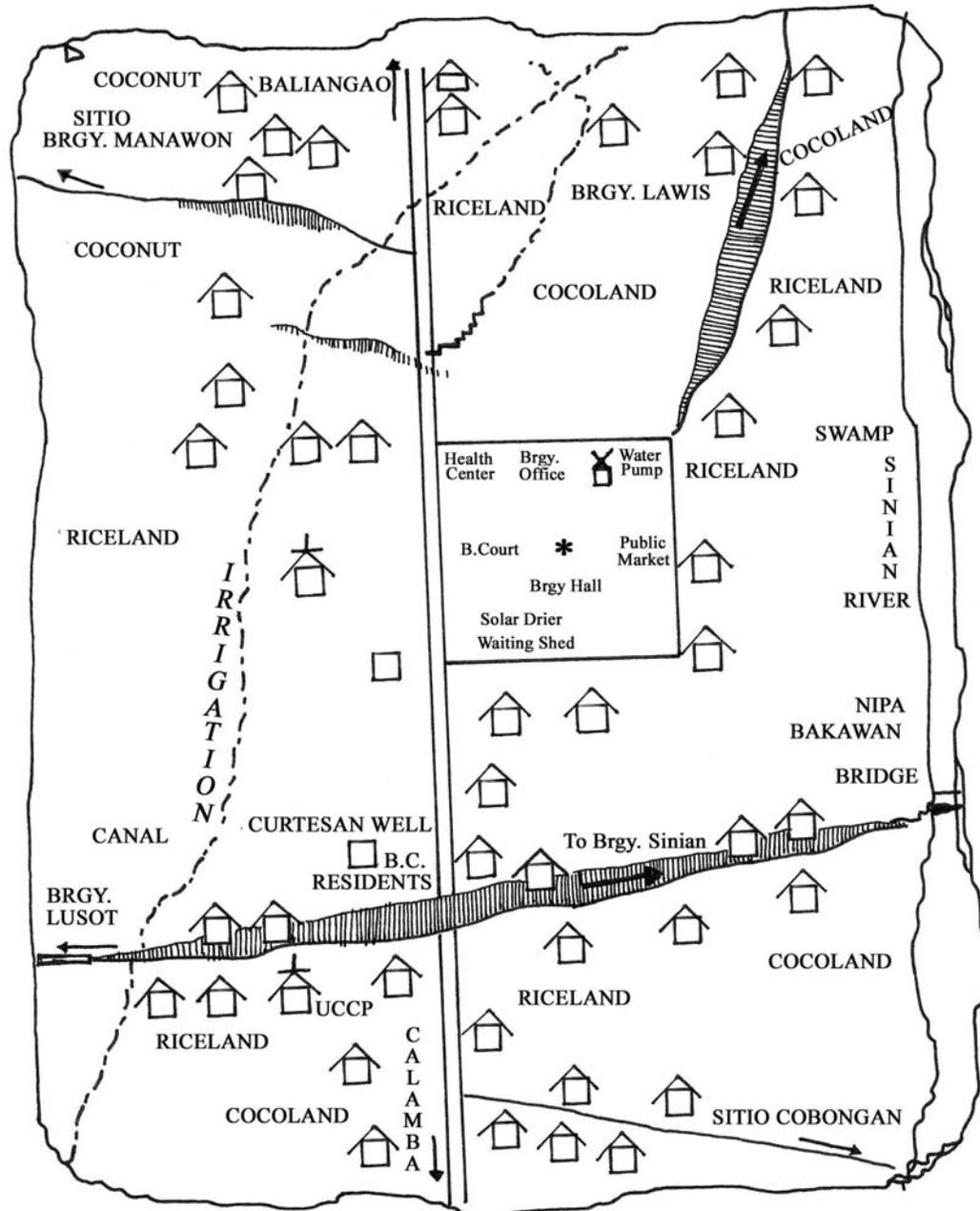


Fig. 2. Village and resource use map of Barangay Landing, Baliangao, Misamis Occidental.

(El Niño), the latest of which was in November 1997 to mid-1998. Landing was not spared from these droughts and the coconut industry suffered a major production decline.

Drainage, river systems, and water availability

Brgy. Landing drains southeast to the Sinian River, a major river system that bounds the barangay to the east. The rice fields are watered by the National Irrigation Authority (NIA) canals. However, the canals are undergoing major repair for one year and have temporarily affected the rice farmers. The barangay has two water pumps, artesian/jetmatic wells, and shallow wells (*atabay*) as sources of water for domestic use.

Transect

The Landing transect runs from a northeast to southwest direction (Fig. 3). In the northeast are the Sinian River and the mangrove/nipa vegetation, home to the native *lapay*. Leading to the southwest direction the transect shows rice paddies, coconut, and mango stands. The transect also shows the extent of the potable water problem, the *bunzalo* problem, and soil erosion on slopes.

Biological conditions

Appendix Tables 3 and 4 show a comprehensive listing of economic agricultural species, secondary forest species, reforestation species, medicinal plants, rare, economic, threatened, endemic, and endangered species (*bakauan*, *pagatpat*, *piapi*, *tabigi*). The presence of a few date palms (normally only growing in the Mediterranean areas and the Middle East) is notable in Landing. The potential of mass producing date palms, if found adaptable, is worth looking into. Coconut and rice are mostly planted as monocrops although a few farmers are beginning to accept diversification.

Plant pests and diseases and their control

Rats are prevalent both in rice and coconut fields. Control is mainly mechanical/manual (i.e., blanketing, beating). Tungro brought about by the green leaf hopper and the black bug are major problems in rice. A few farmers are

adopting integrated pest management (IPM) to control pests. If infestation is severe, they use pesticides such as Karate, Folidol, and Predator. A few farmers also resorted to using botanical species like *tubli*, *lagtang*, and *tabako*.

Cropping patterns/fertilizer use

Coconut farms in Landing are generally monocrops. Some farmers intercrop coconut with corn and root crops. Crop rotation is not practiced in wetland rice farms although a few farmers appreciate the value of doing it and of using organic fertilizers alongside inorganic ones.

b. Socioeconomic analysis

Demography

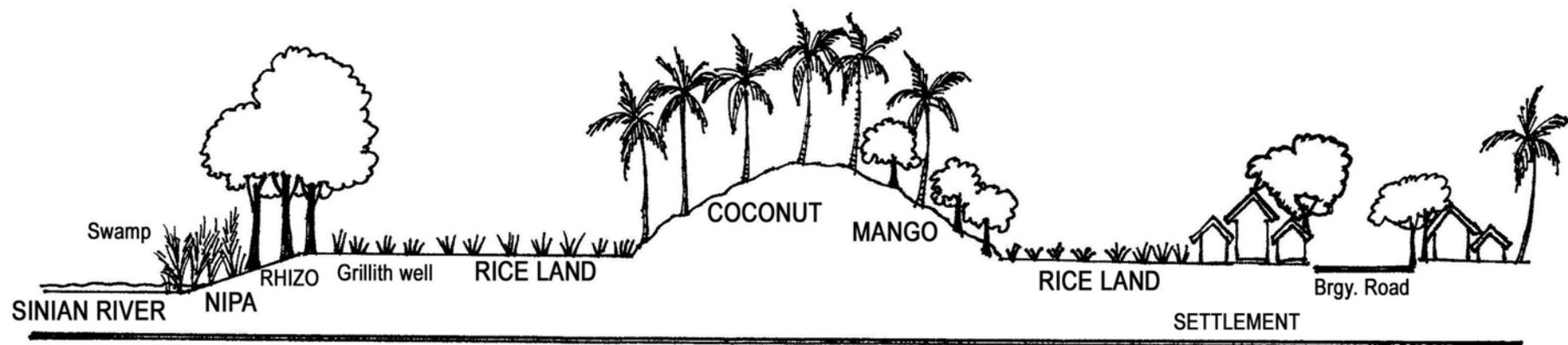
Population. Brgy. Landing has a population of 1,197. Of this number, 48% are males and 52% are females. The barangay has 248 households with an average of seven members. The population density is 1.899. Most members of the population belong to the 6-35 age bracket.

Fertility rate, mortality rate, and longevity. Fertility rate remains unchecked despite family planning campaigns. The average number of children of married women who reach the age of 40 for many years now is five. Infant mortality is rare, while longevity is 70 years for men on the average and 80 years for women.

Outmigration. Outmigration is very high among young men and women in their early and mid-twenties, but especially among women who have had more years of education. The outmigration pattern is toward Oroquieta, Ozamiz, Iligan, Cebu, and even Manila where the women work as domestic helpers or as salesgirls. The men work in factories or in the service sector. Outmigration is due to the desire for better opportunities, which could not be obtained in the home area.

Health. The most prevalent illness among children are flu, fever, and cough, while diarrhea, tuberculosis, and hypertension are common among adults.

Ethnicity. There are no Subanons in the barangay. Majority of the residents hailed from the islands of Siquijor, Bohol, and Cebu.



SOIL PROPERTIES

Texture	Light	Heavy	Medium	Medium
Color	Dark grayish brown		Very dark grayish brown	Brown to dark brown
pH	6.0	5.6	5.8	5.2
Nitrogen	Low	Low	Low	Low
Phosphorus	High	High	High	Low
Potassium	Sufficient	Sufficient	Deficient	Deficient

Fig. 3. Transect map of Barangay Landing, Baliangao, Misamis Occidental.

Education. Majority attended elementary education. Several had secondary education and a few attended or had finished college. Common reasons for going to school are to improve the living condition of the family and to be able to work abroad.

Livelihood

Farming and fishing are the major sources of livelihood in Brgy. Landing. Other sources of income include operating a *sari-sari* store, trading, and carpentry.

Cropping patterns and gender relations in labor use

Figure 4 shows the cropping pattern for major crops produced, and the division of labor among men and women in planting these crops. The lean months and peak months of labor use are also indicated.

Labor availability and distribution

Disguised unemployment is high in the barangay with people of working age generally employed in the farm. But productivity remains low, implying zero marginal productivity of some farmers. Most of the farm activities involve family members. Those who can afford to pay make use of hired labor. *Hunglos* or labor exchange is the last resort.

Level of living

This is generally low since income is low or less than P3,000 a month. Such is the effect of low farm yield and practically no off-farm employment opportunities. Houses are of semipermanent materials. The barangay has electricity and some appliances can be found in households, the most common of which are radios and television sets.

Commodity flows

Product outflows include coconut, rice, vegetables, fish, and livestock. These products are sold in nearby barangays, in Plaridel, Calamba, Baliangao, Ozamiz, Oroquieta, Molave, Iligan, or Cebu. Basic household commodities and farm inputs are brought in from nearby municipalities and cities (Fig. 5).

Government assistance

Landing is an Agrarian Reform Community (ARC) and the support of the Department of Agrarian Reform (DAR) is felt in the area. Free fertilizer subsidy is also provided by the Philippine Coconut Authority (PCA) to small coconut farmers. The Department of Social Welfare and Development (DSWD), Department of Health (DOH), and Department of Environment and Natural Resources (DENR) are the other government agencies assisting the barangay.

Oral history

The oral history or timeline of Brgy. Landing, focusing on changes in the environmental and agricultural landscape is found in Appendix Table 5.

Network analysis

Figure 6 shows the results of the participatory network analysis. Low farm productivity is seen as the major problem of residents according to informants, members of people's organizations, and officials of the barangay.

c. Cultural setting

Indigenous practices, religious beliefs, and rituals

People in Landing are generally not superstitious in their farming system since they do not observe traditions such as offering food whenever they use the resources. However, people still observe *lihi* (ritual) in planting rice through the use of *mayana* for *sumpa sa dangan* or pest control. Corn and root crops are planted in the same manner as that in Tipolo, Calaran, and Sixto Velez. Products are dried in the *kamalig* mixed with *apog* or lime powder for protection from weevil attack. People also process their farm products.

Manifestation of cultural beliefs and norms

Beliefs and rituals are manifested in planting and harvesting through the *lihi* method. Generally, people set norms on planting of trees in the barangay.

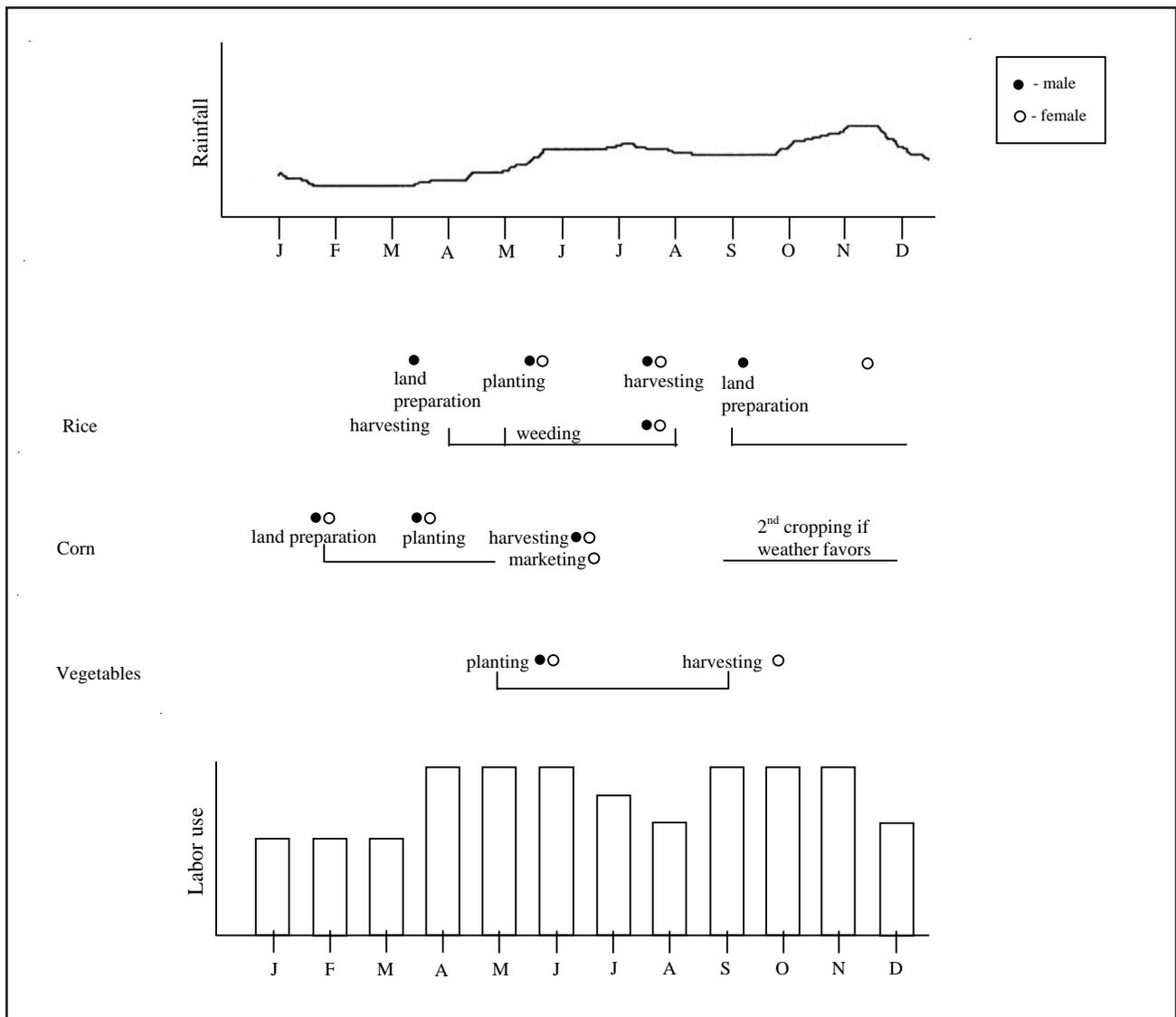


Fig. 4. Cropping calendar and gender relations in labor use in Barangay Landing, Baliangao, Misamis Occidental.

Traditional forms of labor cooperation

Local labor pattern also follows the *domdoman* system of labor exchange where whoever plants the crops could automatically help in the harvest and receive a share. This system does not entail payment of wages for work extended.

Desire for change and aspiration

Similar to other barangays, the people of Landing have high aspirations to improve their level of living. They have the desire for change but they are financially constrained.

Support services

Landing receives government support from the following: (a) Department of Agriculture (DA), a program for promoting agricultural productivity; (b) PCA, a program to replant/replace old coconut trees on their area; and (c) DAR, for assisting in working out land tenure status. Generally, Landing also needs market support for fishing activities.

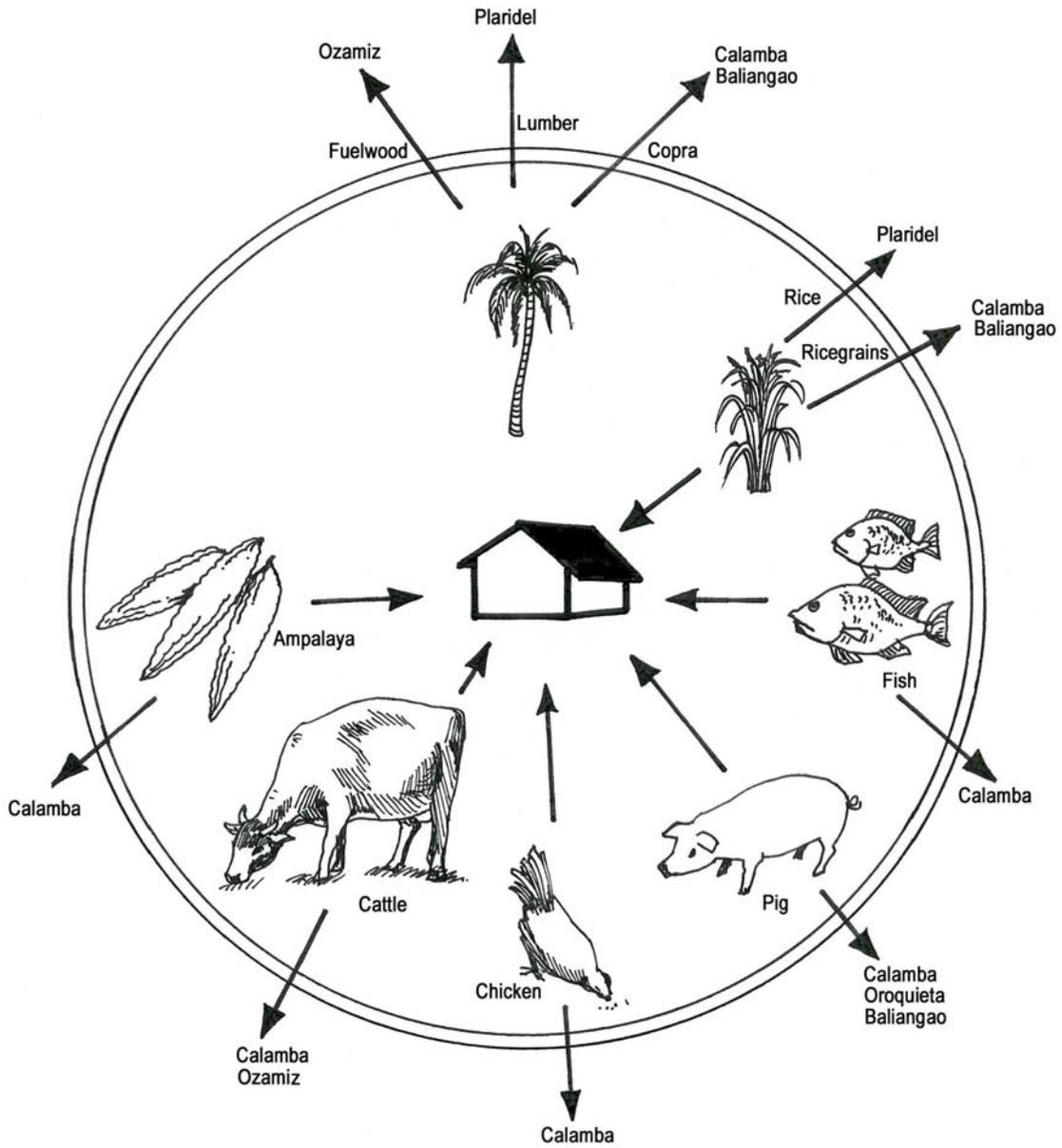


Fig. 5. Commodity flow in Barangay Landing, Baliangao, Misamis Occidental.

Barangay Dioyo (Sapang Dalaga, Mis. Occ.)

a. Biophysical environment

This place is bounded on the east by the Dioyo River. Many of its residents depend on the river for many of their livelihood activities like fishing, ferry business, and even nipa gathering along its banks. When the area was declared a barangay, the residents found it appropriate to be called Brgy. Dioyo.

Area and location

Barangay Dioyo is one of the eastern barangays of the Municipality of Sapang Dalaga. It is bounded in the north by Bitibot Creek and Dioyo River, in the south by Mt. Simulay, in the east by Dioyo River, and in the west by Brgy. Sapang Ama. Brgy. Dioyo has a total land area of about 147 ha. The barangay hall is located at coordinates North latitude 8°35'1.75" and East longitude 123°35'43" (Fig. 7).

Topography (elevation and slope)

The barangay has flat to rolling terrain. The elevation of Dioyo proper is from 30 to 50 m asl. The slope of the land ranges from 10 to 50%. The settlement area is near the foot of Mt. Simulay.

Road/Access

The national highway cuts across the barangay. Barangay roads are well laid within. Dioyo River serves water transportation needs toward the Murcielagos Bay in the northwest.

Land use pattern

Land uses in the barangay are broadly grouped under four major categories: settlement (25%), agriculture (60%), reforestation area (5%), and secondary forest growth (10%) dominated by nipa. A variety of crops is grown including coconut, corn, cassava, sweet potato, and fruits. Coconut is the dominant crop, while the next most common crops are corn and sweet potato (Fig. 7).

Soil conditions

Five soil samples were taken from Brgy. Dioyo representing areas of different land uses. These samples were analyzed for pH, N, P, and K using STK. The analysis revealed increasing acidity as the soils were put into intensive agriculture (pH 5.4-5.8). Soils taken along riverbanks showed lesser acidity (pH 6.0-6.4). Nitrogen is low, P is low to high, and K is sufficient. Color and texture were also taken. Soil color ranges from light brown to dark brown, while soil texture is heavy. Erosion of soils in sloping areas and riverbanks is serious.

Climate

Brgy. Dioyo falls under Type IV or Intermediate B type of the Corona System of Classification. This means that rainfall is more or less fairly distributed throughout the year. There is no pronounced dry season. The wet months are in November and December, the latter being the rainiest. The barangay is dry in March to April, with the latter being the driest month.

Drainage, river systems, and water availability

The major river system in Brgy. Dioyo is the Dioyo River. Bitibot Creek connects to Dioyo River in the northwest portion, which subsequently drains to the Murcielagos Bay. Dioyo River is widening due to flooding. Erosion of riverbanks is noticeable. There is a lack of potable water supply in the community. A jetmatic near the barangay captain's house pumps water from the ground. The water distribution system enjoyed in the community is a combination of Levels I and II.

Transect

A transect of Brgy. Dioyo was run in the northwest direction. The left portion of the map shows the national highway cross-section, followed by Mt. Simulay. Toward the northern part is the swamp forest dominated by nipa. The riverbanks in the southern portion of the barangay are highly eroded (Fig. 8).

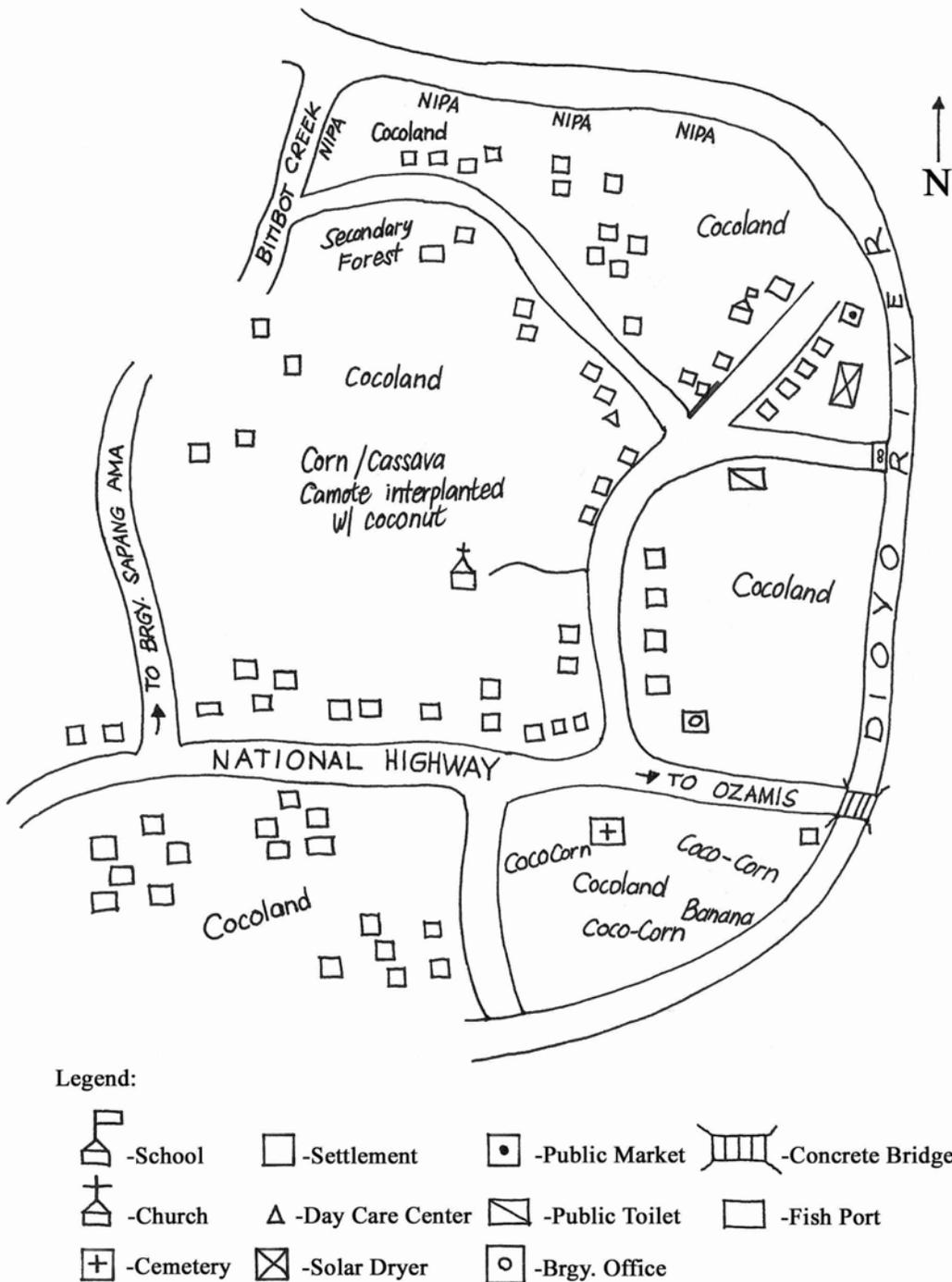
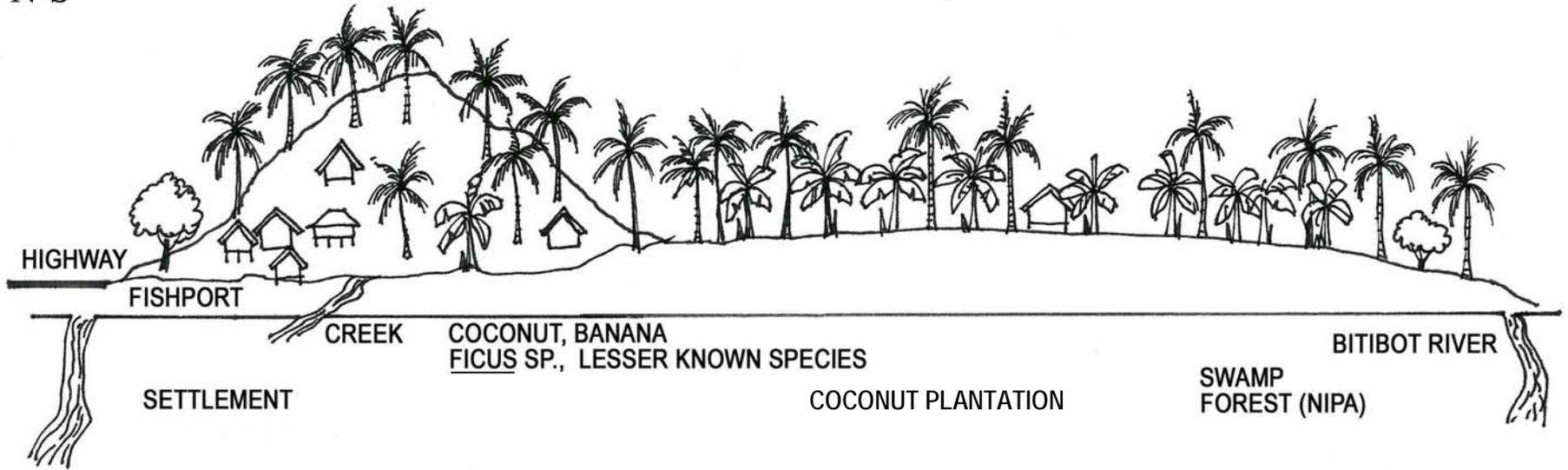


Fig. 7. Village and land use map of Barangay Dioyo, Sapang Dalaga, Misamis Occidental.

N-S



SOIL PROPERTIES

Texture	Heavy	Heavy	Heavy	Heavy	Heavy
Color	Light brown	Dark brown	Brown	Light brown	Brown
pH	6.0	5.8	5.8	5.4	6.4
Nitrogen	Low	Low	Low	Low	Low
Phosphorus	High	Low	Low	Low	Low
Potassium	Sufficient	Sufficient	Sufficient	Sufficient	Sufficient

Fig. 8. Transect map of Barangay Dioyo, Sapang Dalaga, Misamis Occidental.

Biological conditions

Brgy. Dioyo farmers suffered from low productivity of coconut (*sandaw sa lubi*) during the long drought brought about by the El Niño.

Plant pests and diseases

The farmers articulated well their concerns on the *bunzalo* problem. They said that they applied salt or ash on the banana plant.

Cropping patterns/fertilizer use

The farmers practice intercropping and crop rotation. Corn and cassava are intercropped with coconut. Corn is planted in April and harvested in August before the onset of the rainy season. Cassava is planted in May and is due for harvest in December. Rice is raised in only one cropping per year. It is planted in May and harvested in September. During February to April there is less agricultural activity (Fig. 9).

b. Socioeconomic analysis

Demography

Population. Brgy. Dioyo has a population of 647 people. Of this, 442 are males and 205 are females. The population density is 4,406 persons/ha. As of the conduct of the PRA there was no available data to describe the age structure of the population.

Fertility rate, mortality rate, and longevity.

Fertility is high with married women giving birth to more children as they advance in years. The barangay informants mentioned no noticeable decline in fertility. Family planning methods are not well accepted. Infant mortality is insignificant due to the improving health services made available through rural health units. Longevity is 70 years on the average, with women outliving men in many instances.

Outmigration. Outmigration is an ordinary phenomenon in Dioyo especially because it is an area that is constantly flooded. Many houses and microbusiness ventures near the riverbank have been washed away by floods such that several families have moved out to nearby municipalities. Outmigration is also common since most Dioyo residents are at least high school graduates. Success stories of those who have gone abroad are common. Young people try their

luck in Cebu and Manila due to the inability to find jobs in the area or anywhere in the province.

Health. Fever and cough are the common complaints among adults and children. When the two go together, respiratory tract infection is likely to result. People in the area are generally healthy.

Ethnicity. There are only a few Subanons in the area and they are mostly from Mamalad, Siloy, Lumipac, and Don Victoriano. The in-migrants are mostly from Siquijor and Bohol.

Education. Brgy. Dioyo is a coastal barangay with several high schools. It is therefore not surprising that most residents are high school graduates. There are even those who made it to college. Several also finished vocational courses.

Livelihood

The major economic activity of residents in the barangay is coconut production. However, the decreasing coconut production brought about by the El Niño phenomenon has resulted in low income from coconut production. Hence, farmers engage in planting various agricultural crops such as corn, sweet potato, cassava, and rice merely for consumption. They also engage in other off-farm activities such as nipa weaving, fishing, carpentry, and tricycle driving to augment the family income. There is also a motorized *banca* business; the motorized *banca* is being used to transport people and commodities to adjacent barangays.

Labor availability and distribution

There is high unemployment and under-employment level due to lack of land and employment opportunities. Labor in the farm is commonly provided by family members of both sexes. *Hunglos* is still observed by a few farmers, while those who have the means resort to the use of hired labor.

Level of living and income

Those living along the riverbank are generally more enterprising and hence get higher income. The level of living is therefore relatively higher there also. A household near the river, for instance, can afford to buy a karaoke or sing-along component. Income for most is still below P3,000, yet there are a few who make more

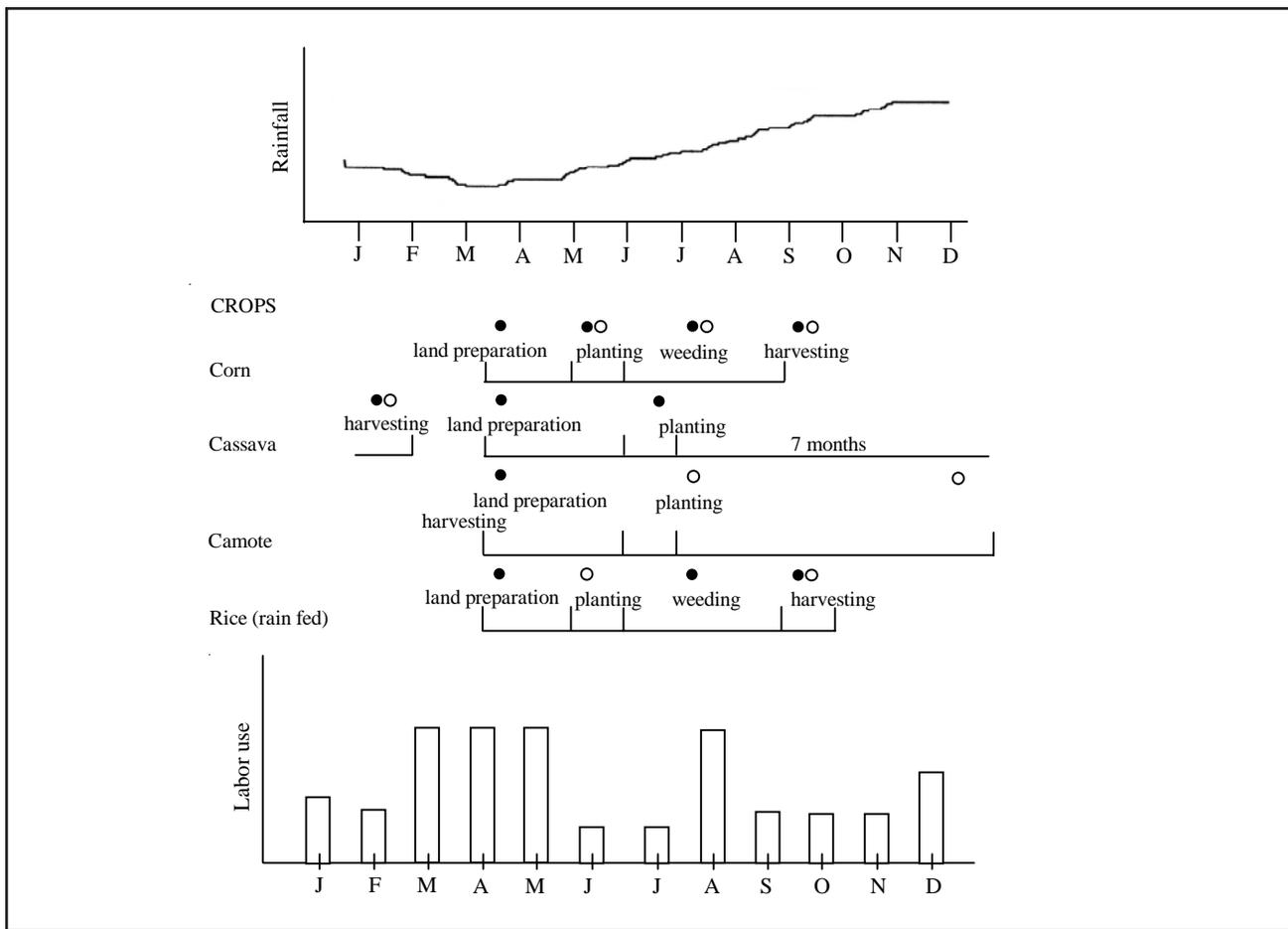


Fig. 9. Cropping calendar and gender relations in labor use in Barangay Dioyo, Sapang Dalaga, Misamis Occidental.

than P10,000 a month by engaging in informal finance, transport business, and trading in addition to farming.

Commodity flows

Coconut is the major product in Dioyo. It is processed into copra and is sold in Calamba. Dioyo residents also produce nipa shingles and sell fish in Calamba. Other agricultural crops such as rice, corn, sweet potato, cassava, and bananas are not taken outside the barangay since these are subsistence items. Farm inputs such as fertilizers and pesticides, together with other basic commodities, are brought in the barangay from nearby municipalities (Fig. 10).

Land tenure and landholdings

Majority of the lands the farmers till are inherited. Their landholdings range from 0.5 to 1.5 ha. Few own large tracts of lands. Those who do not own farms borrow other farms, some

of which are abandoned, without any sharing arrangement and interplanted with agricultural crops for consumption.

Government assistance

Despite the proximity and accessibility of Brgy. Dioyo, it is surprising that it has availed of very limited government assistance programs. This may be traceable to the lack of cohesiveness and teamwork among people's organizations and weak local leadership. Examples of government assistance programs in the area are those standard programs provided by the DOH through rural health units such as prenatal health care, infant immunization campaign, and food supplementation.

Oral history

The oral history or timeline of Brgy. Dioyo, is shown in Appendix Table 5.

Network analysis

Figure 11 shows the result of the participatory network analysis. Low farm productivity is the major problem identified by the residents consisting of informants, members of people's organizations, and officials of the barangay.

c. Cultural setting

Indigenous practices, beliefs, and rituals

Brgy. Dioyo is a traditional fishing and agricultural community. The Subanons observe the season of the year and time of planting. They feel the climate and listen to the birds around them. *Lihi* for fishing is made to get a good catch, which is also made for use on land, especially for planting and harvesting. People follow indigenous medical practices using herbals.

Manifestations of cultural beliefs and norms

Religious rituals in planting and fishing are still practiced in the locality. The residents use *lihi* in the *pokot* or fish net to catch more fish. They kill a chicken to drive away the evil spirit from the river and avoid using *tubli*, a poisonous plant in the river, to prevent pollution and fish kill.

Farmers' traditionalism

People in the locality feel that the traditional practices help promote the conservation of the environment. They believe that wildlife (flora and fauna) have the right to live in the midst since they provide a "balance" in the environment. For example, the eagle eats the rats that eat corn in the fields. So without the eagle, more corn fields would be consumed by rats. Trees are needed to maintain the earth's temperature and avoid flooding or extreme heat.

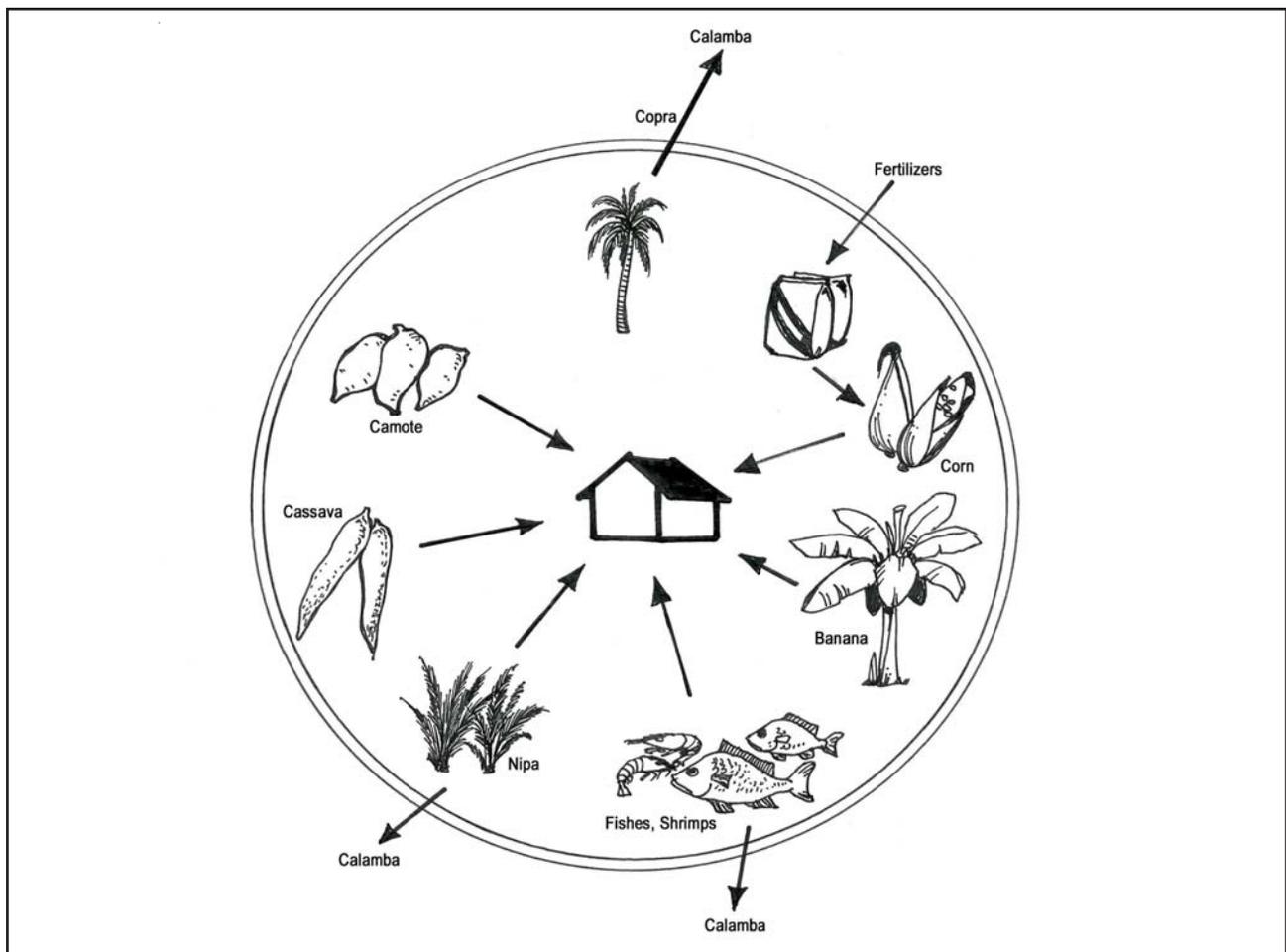


Fig. 10. Commodity flow in Barangay Dioyo, Sapang Dalaga, Misamis Occidental.

Traditional forms of labor cooperation

The family members are the major providers of labor. People do not practice *hunglos* or exchange labor. In the fish port of Dioyo River, one form of labor arrangement that is commonly used is *pangarga* or hauling. Sometimes, the *kargador* is paid in cash or is given free food or both food and money by the owner of the stocks hauled. In some cases, labor services rendered by kins and relatives are free and often reciprocal.

Desire for change/aspirations

Parents have high aspirations for their children but a few are financially constrained to send their children to school outside the locality. The Subanons have high aspirations - to develop professionals and community leaders from among the members of their tribe. However, most of them are expecting educational support from the government through scholarships.

Support services

Some of the most needed support mentioned during the interview were:

- a. Support in the form of loans for fertilizers.
- b. Loans to purchase fishing gadgets.
- c. Aquatic resources are depleted due to gold mining in a nearby locality. The government should order closure of the mine.
- d. More support for river transport business (pump boat, etc.).

Decision-making patterns

The barangay captain in this locality is old (83 years old) and sometimes leaves decision-making to his council and secretary. Mr. Teofisto Paundong, the new *Timoay* (tribe leader), decides on community affairs especially those affecting the Subanon group. Local ordinances and policies against illegal fishing are not well implemented. The barangay council, through a participatory process, makes decisions affecting the community.

Role of the tribal leader

The *Timoay* plays a major role in conserving biodiversity in Dioyo. He emphasizes some conservation practices to promote biodiversity in the locality. Among these practices are planting of trees to prevent soil erosion and conserve

wild birds (Abucay, Perico, Galansiang); pollution control (stop gold mining) and no dumping of garbage into the river; and increasing soil fertility (green manuring, composting, etc.). He suggests controlling the use of water resource for fishing (overfishing and dynamite fishing should be stopped). The *Timoay* feels the need to secure the cooperation of the residents to conserve the environment.

Leadership patterns and conflict resolutions

Most of the conflicts prevalent in Brgy. Dioyo arose out of:

- a. violation of tribal codes (Subanon tribe)
- b. trespasses on private properties
- c. conflicts with landlords (sharing arrangements)
- d. inherited landholdings (based on assumed agreements with sufficient documents)

These conflicts are settled through confrontation of offended parties or those involved in the conflict.

Communication flow and village network

Communication within the barangay is largely interpersonal in nature. Events and significant information are circulated within the barangay by word of mouth. However, the local council and officials are responsible for disseminating matters relevant to government policies and laws.

On matters that have to do with Subanon culture and tradition, the *Timoay* plays a central role in making the communication flow reach the desired Subanon group.

Communicating organization

Organizations in Dioyo are outlets for expressing the people's collective action on a particular problem or situation. For example, one organization works on agrarian reform beneficiaries. There is also the fisherfolk organization designed to promote and protect the interests of fishermen and fish vendors of Dioyo. The Subanon organization was organized to put together all the Subanon inhabitants and to draw plans for their activities. All these organizations help promote biodiversity conservation in one form or another.

Conservation policies and laws

Barangay ordinances and conservation policies include the following:

- planting of trees to prevent flooding and soil erosion at the side of Dioyo River
- no killing of wildlife (monkey, snakes, and wild pigs)
- no dumping of garbage into the river
- no collection of Mt. Malindang forest orchids

Ethnicity and migration

Several migrants in Dioyo are from the province of Siquijor. They came to live with their relatives and to engage in income-generating activities such as selling, business, etc.

The Subanon tribal group has occupied Dioyo for a long time since these people used to occupy areas near a river. The term "Subanon" actually means a "dweller near a river".

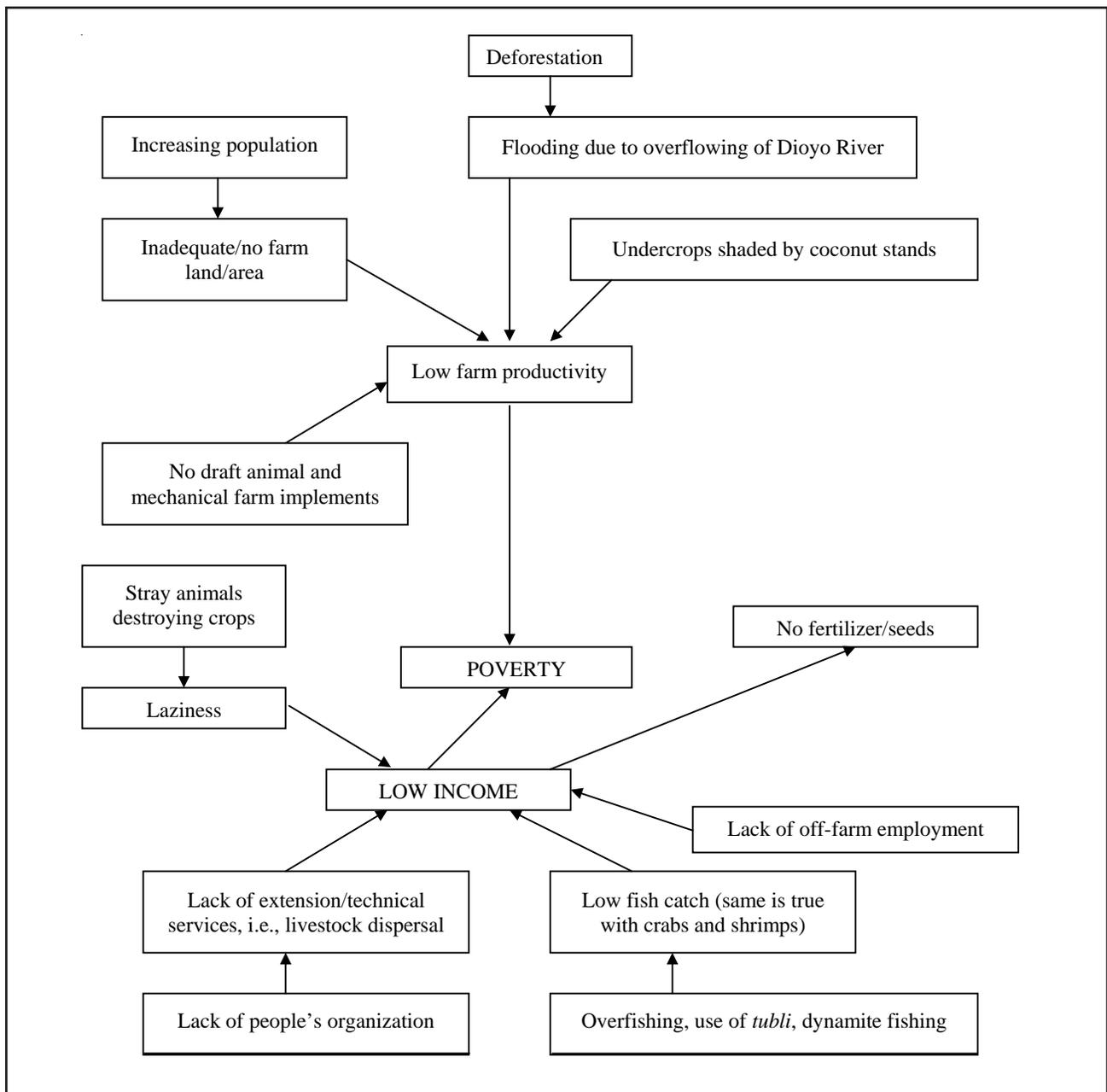


Fig. 11. Network analysis in Barangay Dioyo, Sapang Dalaga, Misamis Occidental.

Barangay Unidos (Plaridel, Mis. Occ.)

Barangay Unidos used to be named after a local leader called Aquino. Migrants from Luzon came to Unidos in the early 1900s and started with what the early settlers call “land grabbing”. The early settlers, however, exerted a united front to drive away the migrants. This effort proved to be partly successful and inspired the settlers. They then agreed to change the name of the place to “Unidos” as a reminder for their concerted effort to protect and hold on to the lands they inherited from their parents and ancestors.

a. Biophysical environment

Area and location

Brgy. Unidos is one of the western barangays of the Municipality of Plaridel, Misamis Occidental. It is bounded in the north by Ducaling Creek and Brgy. Bato, in the south by Langaran River, in the east by the National Irrigation Authority (NIA) canal, and in the west by Brgy. Calaran in the Municipality of Calamba (Fig. 12). Brgy. Unidos has a total land area of 524 ha. The barangay is located at coordinates North latitude 8°36'36" and East longitude 123°40'35".

Topography/slope and elevation

Barangay Unidos has a relatively flat terrain. The elevation is from 40 to 45 m asl with an average slope of 0 to 5%.

Road access

The national highway from Plaridel to Calamba traverses the barangay of Unidos at the southern portion. A provincial road connects the highway to the northern barangay of Bato. Barangay roads are wide.

Land use pattern

Land uses in the barangay are grouped into three major categories: settlement (15%), agriculture (80%), and reforestation areas (5%). Crops grown include coconut, corn, cassava, and sweet potato. Coconut is the major crop, followed by rice and corn (Fig. 12).

Soil conditions

A soil sample was analyzed for pH, N, P, and K using STK. The analysis showed an acid soil condition with a pH of 6. Nitrogen is medium, P is low, and K is sufficient. Soil color and texture were also tested. Soil color is brown and soil texture is heavy.

Climate

Brgy. Unidos falls under Type IV or Intermediate B type using the Corona System of Classification. This means that rainfall is more or less fairly distributed throughout the year. There is no pronounced dry season and the wet season months are in November and December, the latter being the rainiest. The dry months are in March to April, April being the driest month.

Drainage, river systems, and water availability

The Langaran River is the major river system in Brgy. Unidos. Ducaling Creek connects to the NIA irrigation canal in the eastern part of the barangay.

Transect

A transect of Brgy. Unidos runs in the northwest direction. The transect starts with tree plantations of large leaf mahogany, Gmelina, and ipil-ipil. Coconut, sweet potato, and corn intercropping follow. Rice fields dominate the northern portion of the barangay (Fig. 13).

Biological conditions

There is low production of coconut (*sandaw sa lubi*). This can be attributed to the long drought brought about by the El Niño phenomenon. The local residents also reported a significant decline in fish catch of native species.

Plant pests and diseases

Very few farmers use commercial pesticides and insecticides to control tungro, leaf blight, and black bug.

Cropping patterns/fertilizer use

The farmers also practice intercropping and crop rotation. Corn and cassava are intercropped with coconut. Production is low because farmers cannot buy fertilizers and other farm inputs for lack of capital. However, PCA provides fertilizer subsidy for coconut production.

b. Socioeconomic analysis

Demography

Population. The barangay population is 1,814 (1998 Census) with a male-female distribution of 911 and 913, respectively. Population density is 3.5 persons/ha. There are 418 households and the average household size is 4.4. Majority of the population belong to the 15-64 age bracket.

Fertility rate, mortality rate, and longevity.

Family planning is not popular to most married couples. Women do not stay long on pills and Intra Uterine Device (IUD), and condoms are not used by men. Attempts at rhythm often fail and was discarded. Tubal ligation is only appreciated by couples who have at least five children. Only one male had vasectomy. While younger women (ages 15-24) have less children (2 to 3, with 2-yr spacing), the number of children increased to 4 to 7 as they approach the age of 30. Thus, fertility rate remains unchecked.

Key informants said that the efforts of barangay health workers (BHWs) to provide health services such as prenatal health care, and vitamin and food supplements have resulted in very few infant deaths. Mean longevity for men is 70 and 80 for women.

Outmigration. Outmigration is frequent. Residents move to commercial areas like Oroquieta and Ozamiz, neighboring cities of Iligan and Cagayan de Oro and inter-island to Cebu and Manila. Some even go abroad. Outmigrants are young people between 15-25 years old. Most are women who look for jobs in the service sector. These women are generally more educated than their male counterparts. Push factors are unfavorable conditions in the farm such as hard labor, low income, and almost none in farm employment opportunities. On the other hand, pull factors are favorable conditions in urban

areas such as better employment opportunities and higher salaries and better prospects for growth.

Health. Potable water is readily available. BHWs are committed to ensure less health and sanitation problems. Since Barangay Unidos is near the coastal area and barely five kilometers away from the municipal center of Plaridel, it enjoys a Level III water system. However, households situated in the interior have to be contented with the existing Level II and Level I water systems.

There is a barangay health center near the barangay hall. Barangay health workers claim that common illnesses such as cough and fever prevalent among adults and children may be due to respiratory tract infection. Children using Level I water supply sometimes suffer from diarrhea and are treated with herbal concoctions. Cases of hypertension and diabetes among adults have been reported.

Ethnicity. There are few Subanons in the area who have already been acculturated. Many residents are in-migrants from the Visayan islands of Siquijor, Bohol, and Cebu. The most affluent ones come from Luzon. Others come from the different parts of the province of Misamis Occidental who settled in the area as a result of intermarriages.

Education. Majority have either reached or finished high school in Brgy. Looc, a neighboring barangay. There are more who finished vocational school than those with college education. Children go to school hoping to improve their lives, but most fail to earn a degree due to poverty. Those who failed to finish school help in the farm instead or outmigrate.

Livelihood

Ninety-five percent of the population engage in copra production. High-value fruits such as mango, lanzones, jackfruit, and marang are grown, but only about 20-25% is brought to the market because the rest are consumed by the households. Rice and corn are grown basically for subsistence. Cassava and root crops are also planted to supplement the staple crops. Residents also fish along the Langaran River for subsistence.

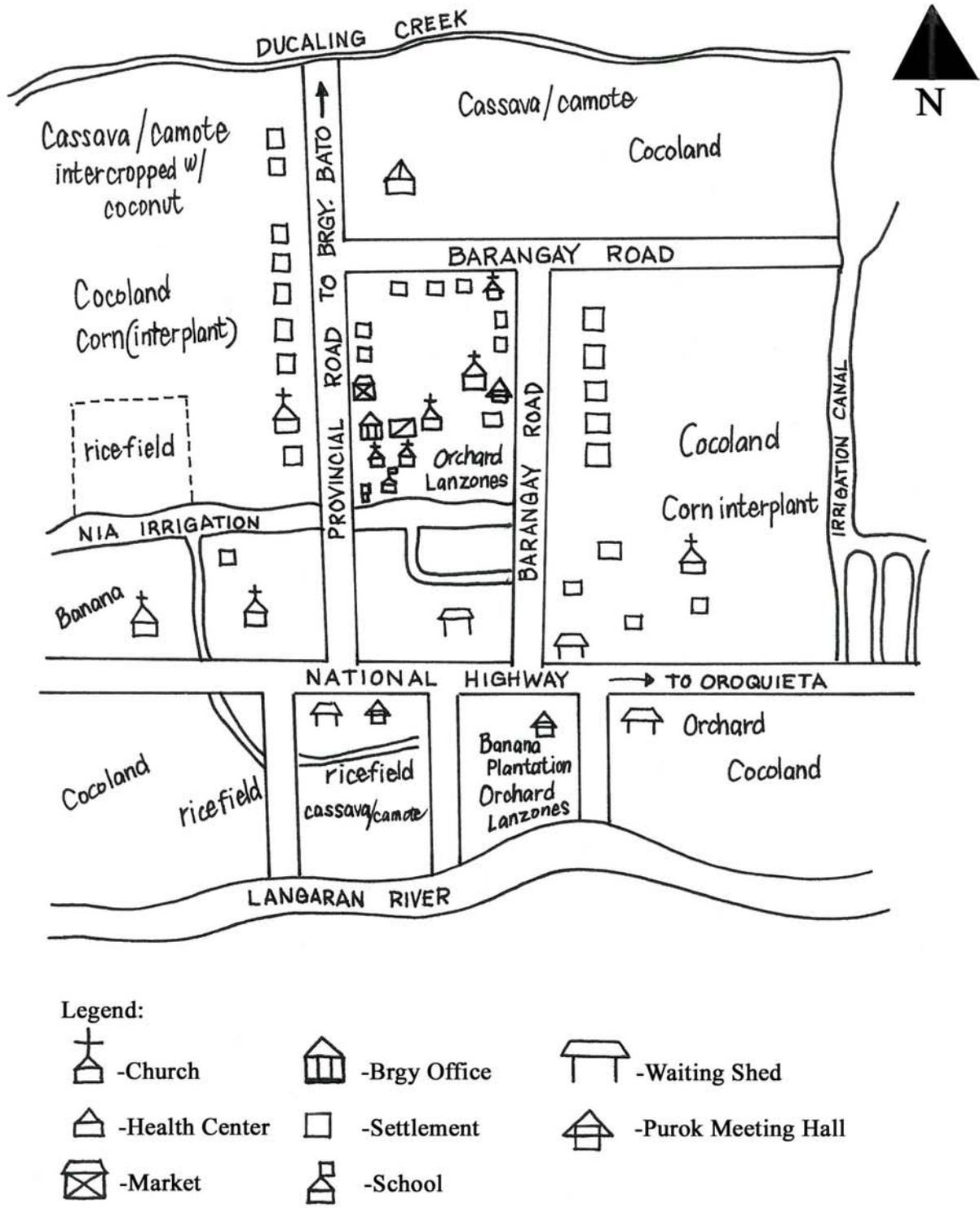


Fig. 12. Village and land use map of Barangay Unidos, Plaridel, Misamis Occidental.

Other sources of income include carpentry work or employment in construction projects. Some work in the quarry of a neighboring barangay. Few own *sari-sari* stores. Baking is also another source of income.

Cropping pattern and gender relations in labor use

Figure 14 shows the cropping pattern for major crops produced as well as the division of labor in planting these crops. The lean months and peak months of labor utilization are also indicated.

Labor availability and distribution

Labor is abundant due to age structure of the population. Family labor is the most common type where the heavy load usually goes to the men. Hired labor is increasing in the community, so is labor exchange or *hunglos*. Farm workers' income is low (P80/day) because of the abundant supply of labor and low farm production. Unemployment and under-employment before and after planting and harvest seasons are high because of limited job opportunities resulting to forced idleness and/or outmigration.

Level of living and income

Semipermanent houses are made mainly of Gmelina, tanguile and coconut lumber and G.I. roofing. Houses made of concrete and wood indicate that some residents are of better economic standing in the community. Electricity is present in the area and many residents have acquired appliances such as electric fans, radios or karaoke, refrigerator, and television sets.

Although Barangay Unidos has a flatland terrain, and residents complain of impoverished conditions, their conditions are relatively better compared to other barangays. In fact, three families are owners of haciendas planted to coconut. There are households earning a joint income of more than P10,000 a month from farming and employment in private and government sectors. Most households, however, have income below P3,000 a month. These do not include the farm produce that they consume.

Biodiversity in Unidos is low because there are no longer forests as sources of income to help support consumption needs. Old fruit and coconut trees are cut for timber and cashed-in.

Participatory rural appraisal in the lowland ecosystem

Commodity flows

Copra is the prime crop sold to oil mills in Ozamiz, Oroquieta, or Iligan. Coconut is also purchased by middlemen for Cocogold. Small quantities of high-value fruits find their way in the municipality markets and nearby cities. The same is true with fruit trees cut for timber and some livestock sold for income. Only the basic consumption needs such as rice and corn, clothing, house construction and/or repair materials, and farm inputs come from nearby municipalities or cities (Fig. 15).

Land tenure and landholdings

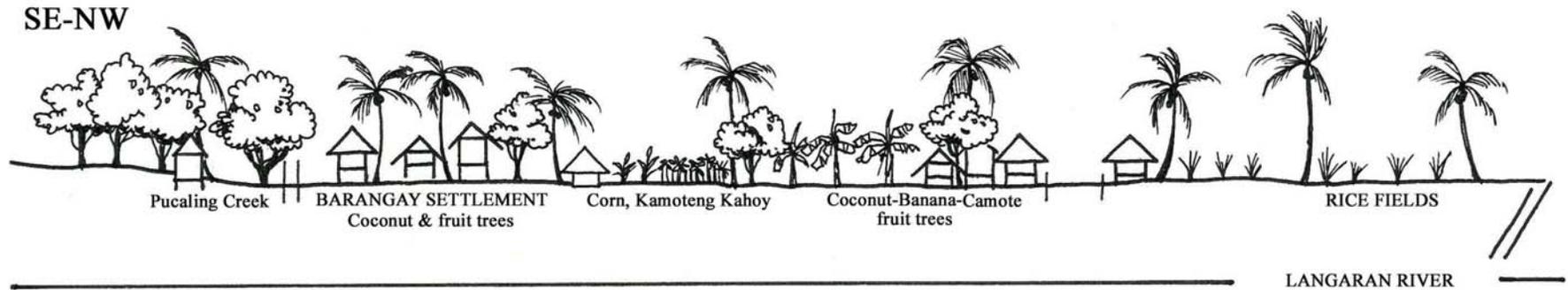
Large landholdings still belong to the original migrants. The Comprehensive Agrarian Reform Program (CARP) is slowly changing the landscape because of land redistribution. Many former tenants in two out of three haciendas – about 50 ha each – in the barangay are now classified as amortizing landowners under the CARP.

Most farmers own the land in Unidos. They build their homes and have small farm lots of about one-fourth to two ha. Some share their farm lots with others, a practice known as *sukob*. The farm lot has to be sizable for this arrangement to be feasible.

Government assistance

The DOH, DA, DAR, PCA, DSWD, and the Philippine Carabao Center (PCC) are the lead government institutions providing assistance to the barangay. Assistance programs include skills training for livelihood, cooperative development, cheap credit, establishment of a day care center, animal dispersal, artificial insemination, four-year fertilizer subsidy for high-yielding variety, agrotechnology transfer, establishment of demo farms, planting of reforestation species for ecological well-being and livelihood, and integrated pest management (IPM).

Many assistance programs require the forming of people's organizations (POs) for self-help. Examples of these are the Rural Improvement Club, the Women's Club, and the Small Coconut Farmers' Organization.



LAND USE: Tree Plantation (Gmelina and mahogany)

PHYSICAL PROPERTIES:

Latitude - 8°36'36" N
Longitude - 123°40'35" E
Terrain - Relatively flat

SOIL PROPERTIES:

Texture - Heavy
Color - Brown
pH - 6.0
Nitrogen - Medium
Phosphorus - Low
Potassium - Sufficient

PROBLEMS

- Low coconut productivity due to conversion of coco land into rice land
- Illegal fishing such as poisoning and electrocution
- Loss of native fishes/shellfish due to introduction of new species

OPPORTUNITIES

- Presence of excellent varieties of plants
- Knowledge of sustainable farming by the people (organic farming, use of nitrogen-fixing plants, integrated pest management)
- Comprehensive Agrarian Reform Program (CARP)
- Presence of rare species

Fig. 13. Transect map of Barangay Unidos, Plaridel, Misamis Occidental, highlighting land use: tree plantation.

Oral history

The oral history or timeline of Brgy. Unidos, focusing on changes in the environment and agricultural landscape is found in Appendix Table 5.

Network analysis

Figure 16 shows the participatory network analysis. Low farm yield is the main problem identified by the residents consisting of informants, members of people's organizations, and officials of the barangay.

c. Cultural setting

Indigenous practices, religious beliefs, and rituals

Residents of Unidos and Plaridel are superstitious. Rituals are practiced during planting of root crops (sweet potato and cassava) and cereals. They observed rituals to drive pests away from their farms and perform the *lihi* during planting and harvesting. The movement of the tide and the moon also influence their farming decisions. Because production is very low, post harvest practices are limited to traditional milling (*galingan*) and storage of seeds for next planting.

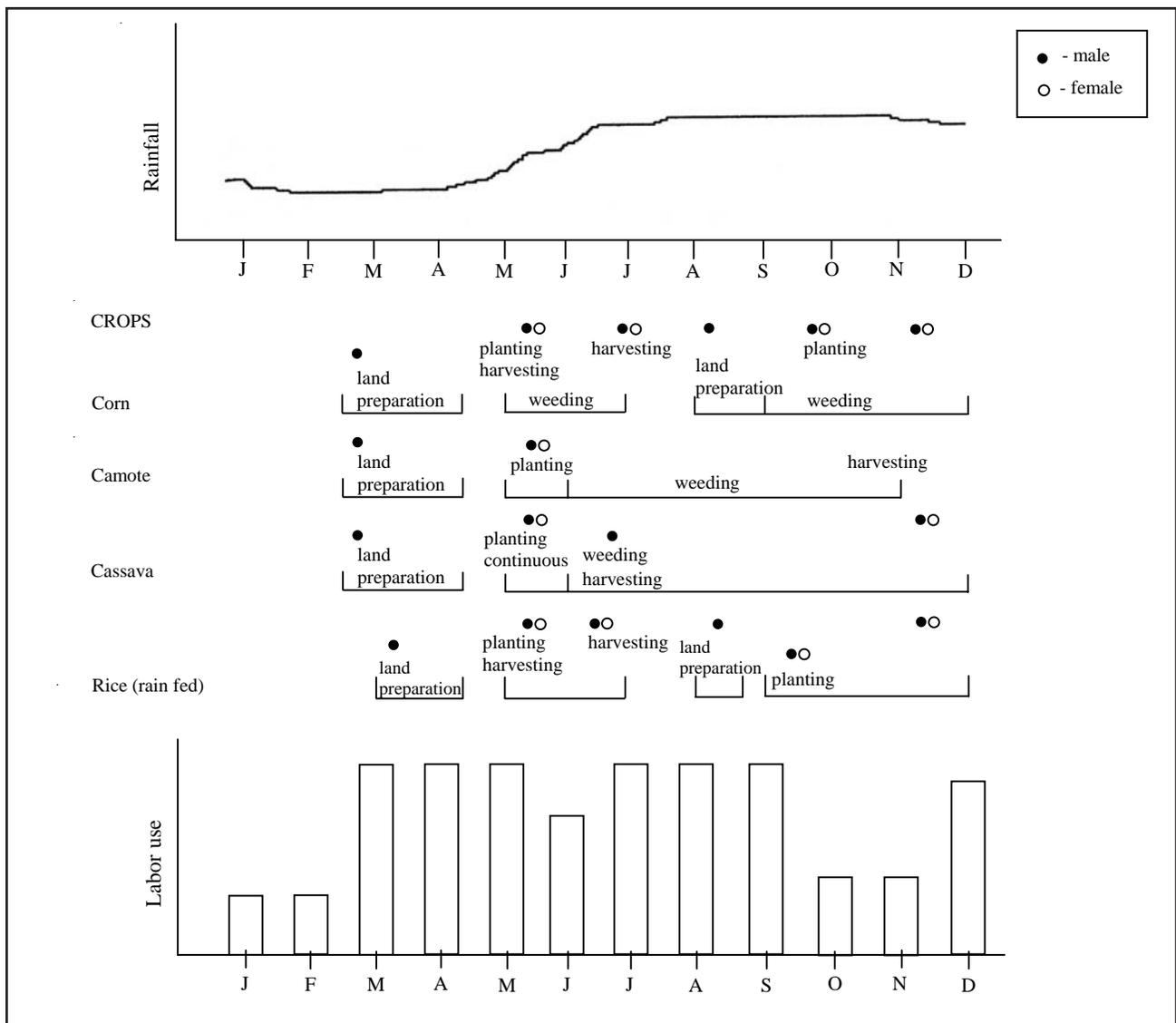


Fig. 14. Cropping calendar and gender relations in labor use in Barangay Unidos, Plaridel, Misamis Occidental.

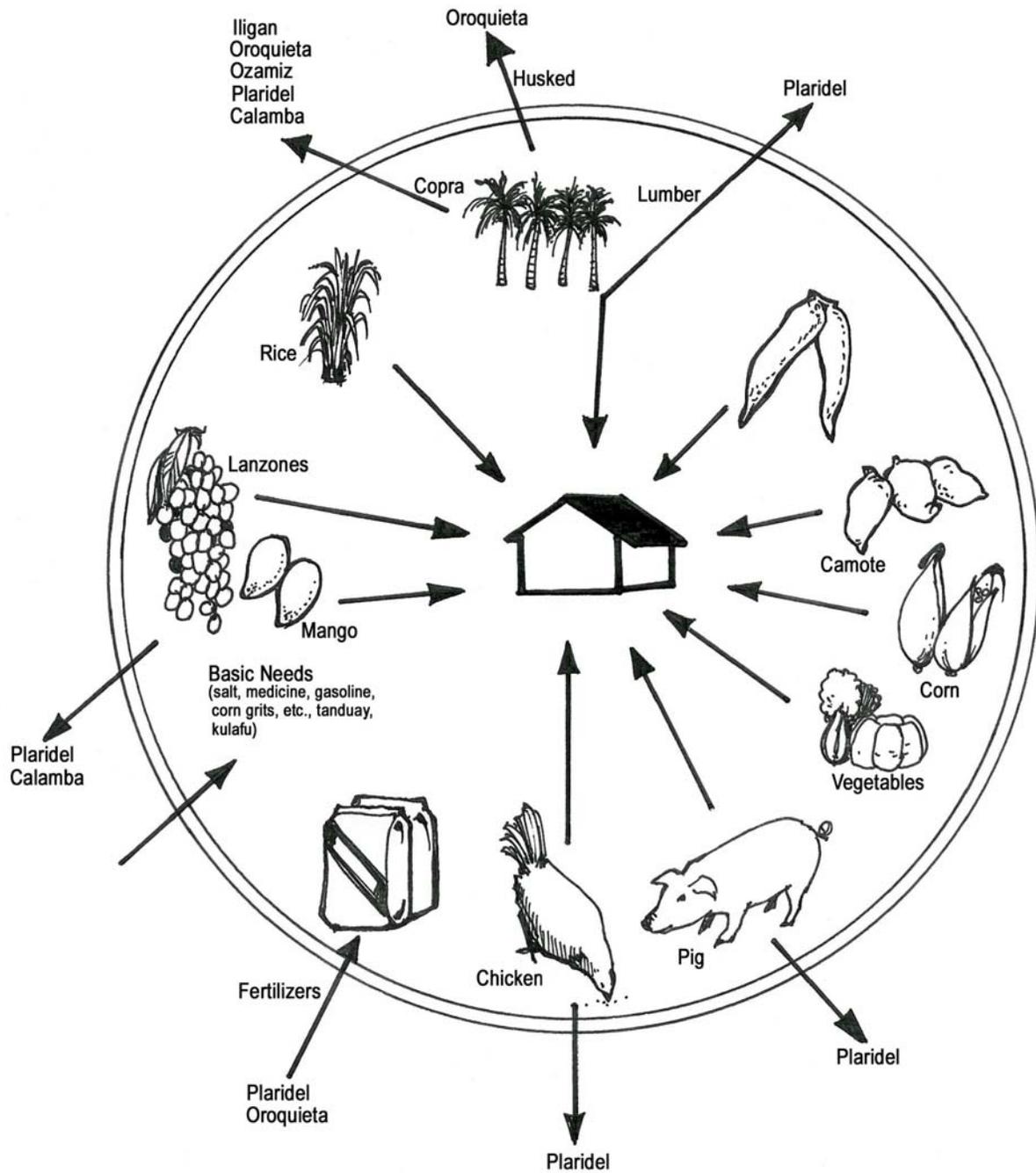


Fig. 15. Commodity flow in Barangay Unidos, Plaridel, Misamis Occidental.

The indigenous medical/health practices make use of herbals from plants locally available (e.g., *kukog banog*, *kanding-kanding*, etc.). Because of scarcity in the production of staple food, oftentimes their corn grits for meals are mixed with root crops and cooked as *sinaksak*.

Manifestation of cultural beliefs and norms

They believe that the sound of certain birds means difficulty for the barrio people. The planting of sweet potato should be done by men only; pest control is done by *pangaliyopo* (prayer); and trees with sour taste like lemon and those that bleed, like papaya, should not be planted in front of houses.

Farmers' traditionalism

Unidos residents still adhere to traditional beliefs and practices because they believe that old practices promote conservation of the environment, and that soil and river should be conserved. They are willing to adopt new technologies in farming but are constrained by limited resources.

Traditional forms of labor cooperation

There is high dependency on family labor in farming activities where the father does the land preparation; the mother does the marketing of products and purchase of inputs; and the children assist in weeding and cleaning the field.

Labor cooperation is in the form of *hunglos* or labor exchange, *alayon* (request with no payment), and *song-ay*, a group of 4 to 5 members working together in the field.

Desire for change/aspiration

Parents have ambitions for their children to become professionals but most families could hardly send their children to college for lack of money. They also wish to adopt the new technologies in farming but the major deterrent is their lack of resources. However, data from interviews revealed that loans through their cooperative were not properly used for agricultural activities.

Support services

Services from DENR, DOH, DAR, and other NGOs provide assistance on barangay concerns such as reforestation, health, agrarian problems, cattle dispersal, and establishment of plantation on certain crops like banana. Two of the major support services that they need are on credit and post harvest facilities.

Decision-making patterns

Farming activities and other concerns are decided by the father as head of the family. He decides for the household and the wife and children follow. However, the wife takes care of child rearing, home management, and buying food and household needs. The decision-making process in the barangay is paternalistic although women are still accorded with respect.

Role of the tribal leader

The head of the Subanon group is the *Timoay*. He conducts rituals and ceremonies such as marriages and baptisms, but he has limited influence on their economic activities. Moreover, children who were baptized by the *Timoay* encounter problem in entering public schools because of the absence of baptismal certificates. This problem can be coordinated with the local civil registrar since the issuing of birth certificates do not conflict with any tribal code.

Ethnicity on crops and livestock raised

Unidos farmers still adhere to the beliefs on what plants to raise and what animals to domesticate in the neighborhood. They consult the old people about these before engaging in any farm activity.

Leadership patterns and conflict resolution

Most often conflicts in this barangay result from:

- a. massive cutting of trees
- b. agrarian problem (land boundaries and land disputes)
- c. violation of local ordinances and laws/policies
- d. strained tenant-landlord relationships

These conflicts are settled by the *Timoay* if the conflicts are among Subanons; otherwise these are brought to the attention of the barangay captain for appropriate settlement or action from higher authorities. Confrontation and mediation are the most common settlement processes adopted.

Community organization

Residents organized themselves for the purpose of expressing their views collectively on significant issues. Among these groups are the Coconut Farmers' Organization, the Women's Group, a cooperative, and others. Meetings of these organizations are periodic and these are organized to support local activities especially those relating to community welfare (tree planting, reforestation, livelihood, and health promotion activities).

Conservation policies and laws

Most of the inhabitants are aware of the prohibitions on swidden or slash and burn farming (*kaingin* system). However, the implementation of laws on conservation of biodiversity resources is weak. More political will is needed to enforce these policies.

Local ordinances in the barangay include the following:

- a. no poisoning of the river
- b. no cutting of trees
- c. coconut lumber may be cut with permit from local officials

Ethnicity and migration

Most residents of Unidos come from either Siquijor or Bohol. They migrated to this barangay for economic reasons.

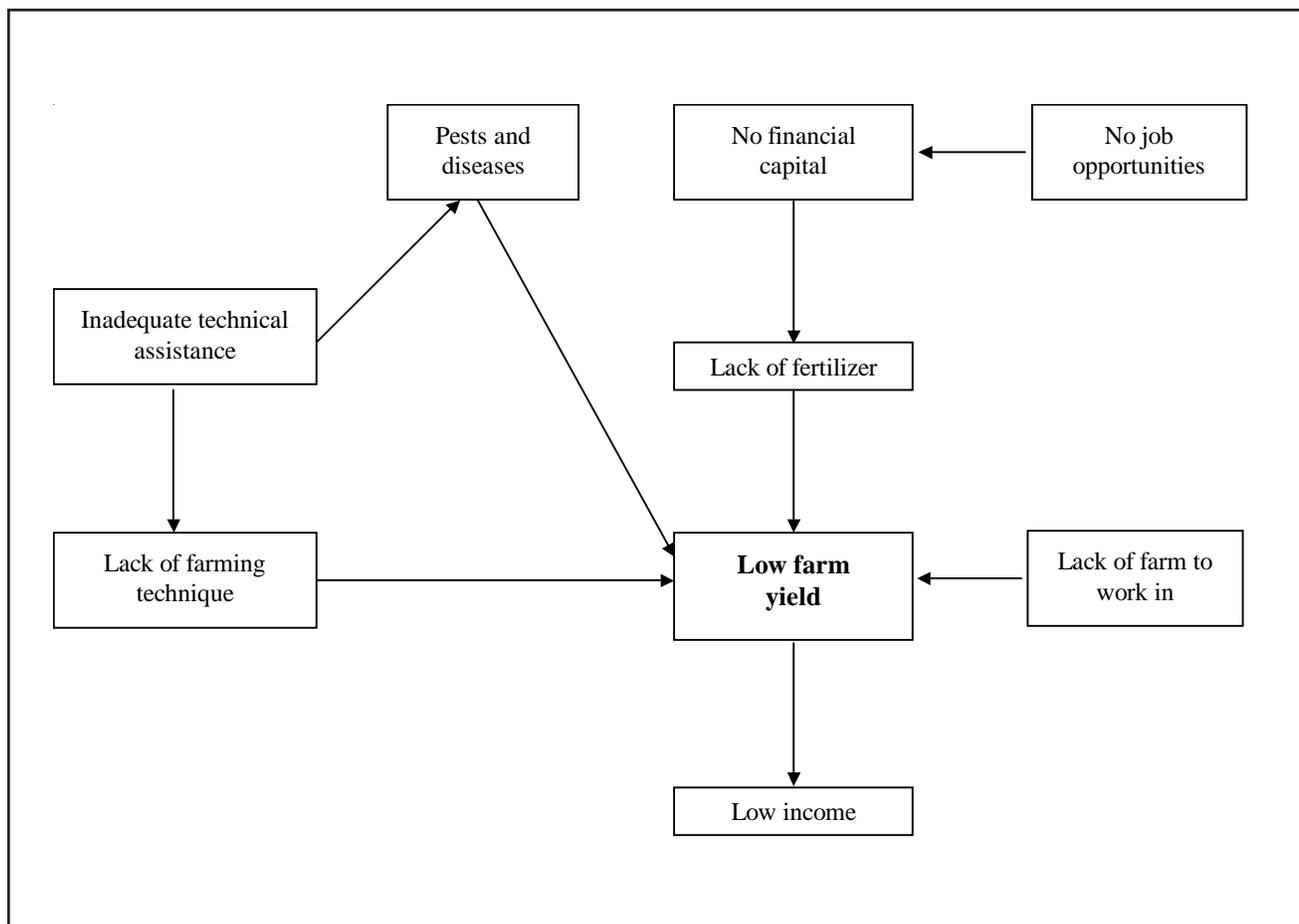


Fig. 16. Network analysis in Barangay Unidos, Plaridel, Misamis Occidental.

Barangay Tipolo (Plaridel, Mis. Occ.)

The place is used to be called "Orayaw" but because of the abundance of Tipolo (short for Antipolo) trees in the area, the people changed its name to Tipolo in 1934.

a. Biophysical environment

Area and location

Brgy. Tipolo is 4 km SW from Plaridel poblacion and is located at 8°36'06" N and 123°40'51" E. It has a land area of 227 ha.

Topography/slope and elevation

The study site is relatively flat to rolling. Flat lands are mainly planted to lowland rice, coconut, lanzones, banana, and vegetables on a commercial scale. Its elevation is from 50 to 65 m asl.

Roads/access

Tipolo has access to concrete road facilities as it is traversed by the national highway. Farm-to-market roads of the interior sitios are also relatively developed.

Land use patterns

Land use is mainly agricultural (48%), planted to coconut with lanzones and banana as intercrop. Wet season rice occupies the northwestern portion of Tipolo. Commercial vegetable growing has also taken some parts of the rice paddies and areas once planted to coconut. Settlement and army reservation occupy 20% each of the area. The army reservation is slowly being converted to settlement and agricultural area (coconut with corn-sweet potato-cassava intercrops). Secondary forest is gradually disappearing because the area is planted to coconut with sweet potato-cassava intercrops or to reforestation species like Gmelina and mahogany. Other portions of the reserve have become brush lands (Fig. 17). There is also quarrying in the Langaran River. Some key informants identified three concessionaires who are allowed to extract sand and gravel of about 5,000 cu meters per year.

Soil conditions

Five soil samples were tested from Tipolo representing areas of different land uses. Samples were analyzed for pH, N, and K using the STK. Colors and texture were also tested. The analysis showed increasing soil acidity as the soils were used in intensive agriculture (commercial vegetable fields and rice fields). Sample #4 taken along the riverbanks where sea water enters during high tide, showed a pH of 7. Nitrogen and K are low and deficient, while P is medium to high; soil colors are brown to very dark brown to dark grayish brown (the latter indicative of soil waterlogged condition). Soil texture is light to medium, indicative of the influence of river alluvial deposit in the landscape. There is serious soil erosion on sloping areas along the army reservation and on riverbanks. Local residents expressed strong concern on the effects of erosion and flashfloods on the stability of the bridge.

Climatic condition

Following the modified Corona Climatic Classification, Brgy. Tipolo is classified as Type IV. Type IV is characterized by a more or less evenly distributed rainfall throughout the year. The wet months are from November to December while the dry months are from February to March. In November 1997 until mid-1998, Brgy. Tipolo suffered a prolonged drought brought about by the El Niño phenomenon.

Drainage, river systems, and water availability

Tipolo drains NE to the Langaran River. An abundant water supply comes from a spring in the army reservation area where water is pumped up the reservoir with a capacity of 216 m³. Water is distributed to the households by gravity.

Transect

The transect in Tipolo runs from NW-SE directions (Fig. 18). In the NW, is the army reservation area. This is where the spring (source of potable water), big water reservoir, reforestation species

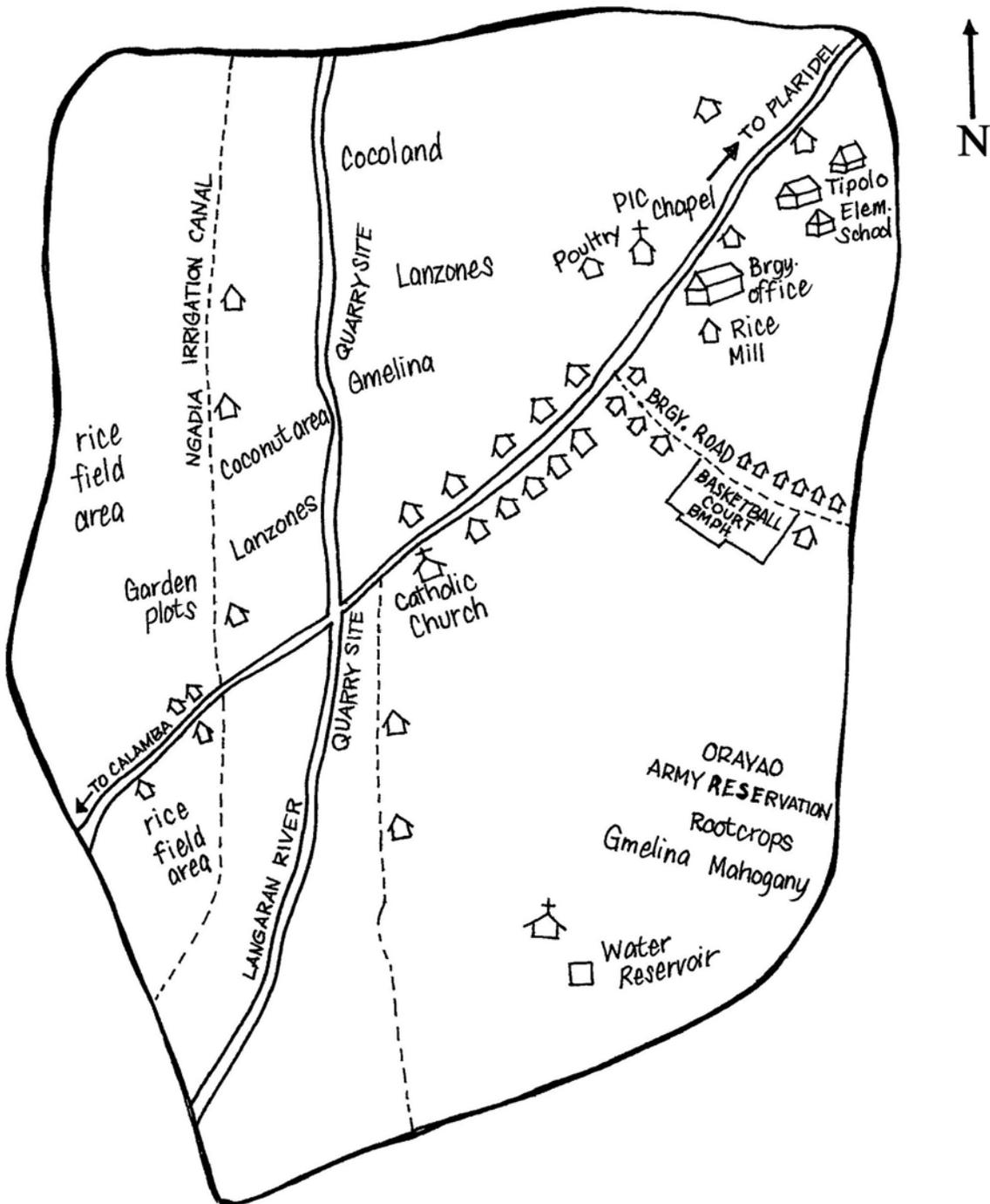


Fig. 17. Village and resource map of Barangay Tipolo, Plaridel, Misamis Occidental.

(Gmelina and mahogany), remnants of forest, quarry sites, and immigrant squatters are found. Seen in the SW direction, is the settlement center, poultry farm, commercial vegetable gardens, rice paddies, coconut-lanzones orchard, and quarry site. From the transect, quarrying is an extensive operation, water supply is abundant, and soil acidity is markedly different in various parts of the landscape.

Biological conditions

Present agricultural, forest, and reforestation species, medicinal plants, non-timber forest products, lumber/construction materials, and fauna in the area were listed. Habitat destruction, overhunting, and more sighting of wildlife was observed. Rare, economic, threatened, endemic and endangered species were also reported. Sea water during high tide (3.5-4 km inland), brought a number of marine fishes and other fauna in the Langaran River in Tipolo (Figs. 19 and 20).

Plant pests and diseases and control

According to informants, there was an attempt to grow cooking banana on a large scale in the past. However, this was discouraged because of the *bunzalo* problem. Rats are common problem in rice fields and coconut farms. Tungro and black bug attack rice resulting in low production. IPM is adopted by a few rice farmers, while chemical control is very popular in vegetable farms.

Cropping patterns/fertilizer use

In Tipolo, lanzones, other fruit trees, and banana are usually planted under coconuts. Along slopes, coconut is intercropped with corn and root crops. Wetland rice is usually a monocrop (Fig. 21). Very few farmers practice crop rotation or fallow their rice fields. The presence of MAKAMASA Techno-Demo Farm has somehow raised consciousness among rice farmers to practice IPM and to use not only inorganic but also organic fertilizers. In commercial vegetable fields, however, many farmers are still using a lot of inorganic fertilizers. Some are still reluctant to use organic fertilizers because of the fear that it won't work so they resort to using pesticides at a dangerous rate and interval. Some farmers were found to spray pesticides twice a week and harvest their crops, just three days after spraying.

b. Socioeconomic analysis

Demography

Population. The barangay has a population of 1,659 (40% male and 60% female). There are 332 households with an average of six members per household. Population density is 7.3/ha. A large portion of the population belongs to the 6 to 14 age bracket.

Fertility rate, mortality rate, and longevity. A family planning program is implemented in the area as elsewhere, but it appears to be more successful here since the average number of children is three to four. There are two infant mortality cases for the year which is quite low compared to previous years because of better health practices and services and better nutrition. Infant mortality rate was low in nursing mothers who attended school for more than 10 years. Longevity for men is 60 years old and 80 years old for women.

Outmigration. Outmigration usually takes place because of intermarriages with non-residents. There are occasional outmigration cases for those who seek for greener pastures.

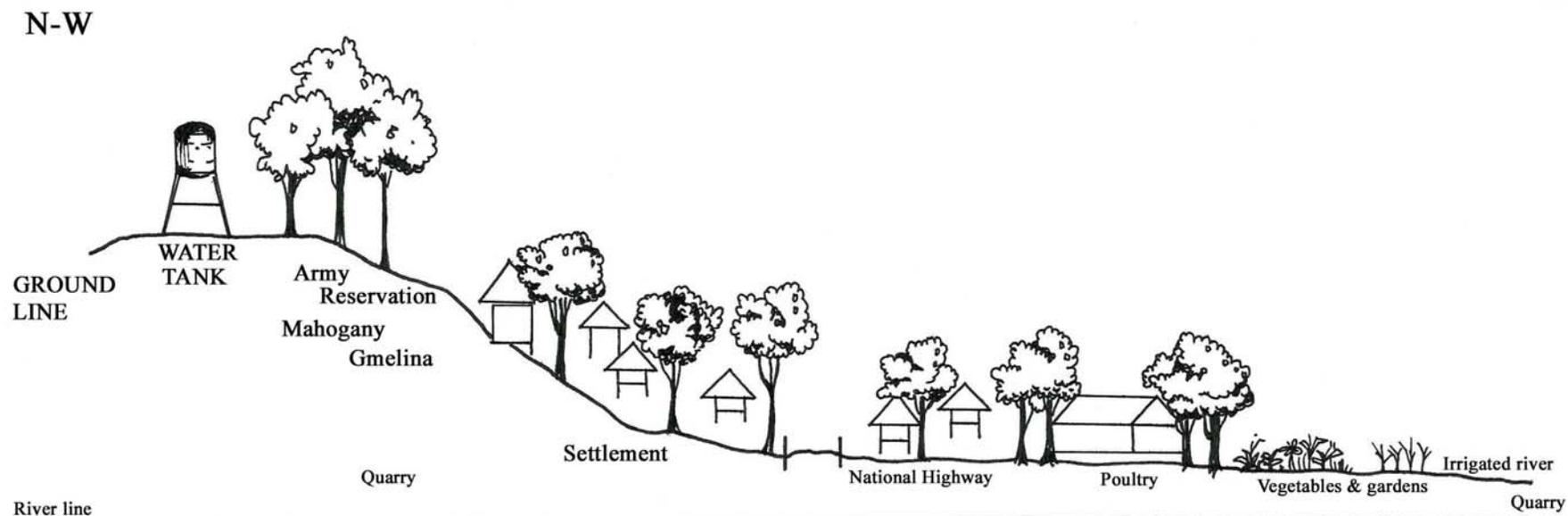
Health. Common illnesses among children are fever and flu. There are also reported cases of dengue among children and adults and tuberculosis affecting some residents.

Ethnicity. There are no Subanons in the area. Majority of the residents are in-migrants from the islands of Bohol, Cebu, and Siquijor.

Education. Because of accessibility to nearby schools, majority of the residents have attained either secondary or tertiary education. Residents attend school to acquire knowledge and avail of future job opportunities in order to improve their living conditions. They consider education as investment for the future.

Livelihood

The means of livelihood is primarily coconut-based but commercial quantities of rice, mango, and banana are also produced. Other crops are planted under coconut trees such as root crops, but these are mainly for subsistence. Off-farm income sources include quarrying, factory employment, and the operation of a *sari-sari* store.



SOIL PROPERTIES

Color	Dark grayish brown	Dark brown	Very dark brown	Dark brown	Dark brown
pH	6.0	5.8	6.8	7.3	5.8
Nitrogen	Low	Low	Low	Low	Low
Phosphorus	Medium	High	High	Medium	High
Potassium	Deficient	Deficient	Deficient	Medium	Deficient

Fig. 18. Transect map of Barangay Tipolo, Plaridel, Misamis Occidental.



Fig. 19. Quarrying area in Barangay Tipolo, Plaridel, Misamis Occidental.



Fig. 20. Langaran river with a hanging bridge in Barangay Tipolo, Plaridel, Misamis Occidental.

Cropping pattern and gender relations in labor use

Figure 21 shows the cropping pattern for major crops produced as well as the division of labor between men and women in the planting of crops. The lean and peak months of labor use are also shown.

Labor availability and distribution

The high underemployment level and the age structure of the population result in surplus labor. *Hunglos* or labor exchange is commonly practiced in the barangay and those who help in planting are given first priority to help in harvesting (*dumdom*). Those who can afford to pay normally hire farm workers. Family labor is the last resort in performing farming activities.

Level of living and income

Tipolo is the most prosperous barangay of all the study sites. Residential houses are made of semipermanent or permanent structures, of good quality wood, concretes, with ceiling, and G.I. sheet roofing. These houses have areas for the living room, bedroom, dining room, and toilets with waterclosets. Water is supplied through the Level III system. Household income ranges from P7,000 to P10,000 a month for most households. The children all go to school.

Commodity flows

The major crops that are sold outside the barangay are coconut, rice and lanzones. Coconut is mainly sold as copra but some are sold as nuts. They are either marketed in Plaridel

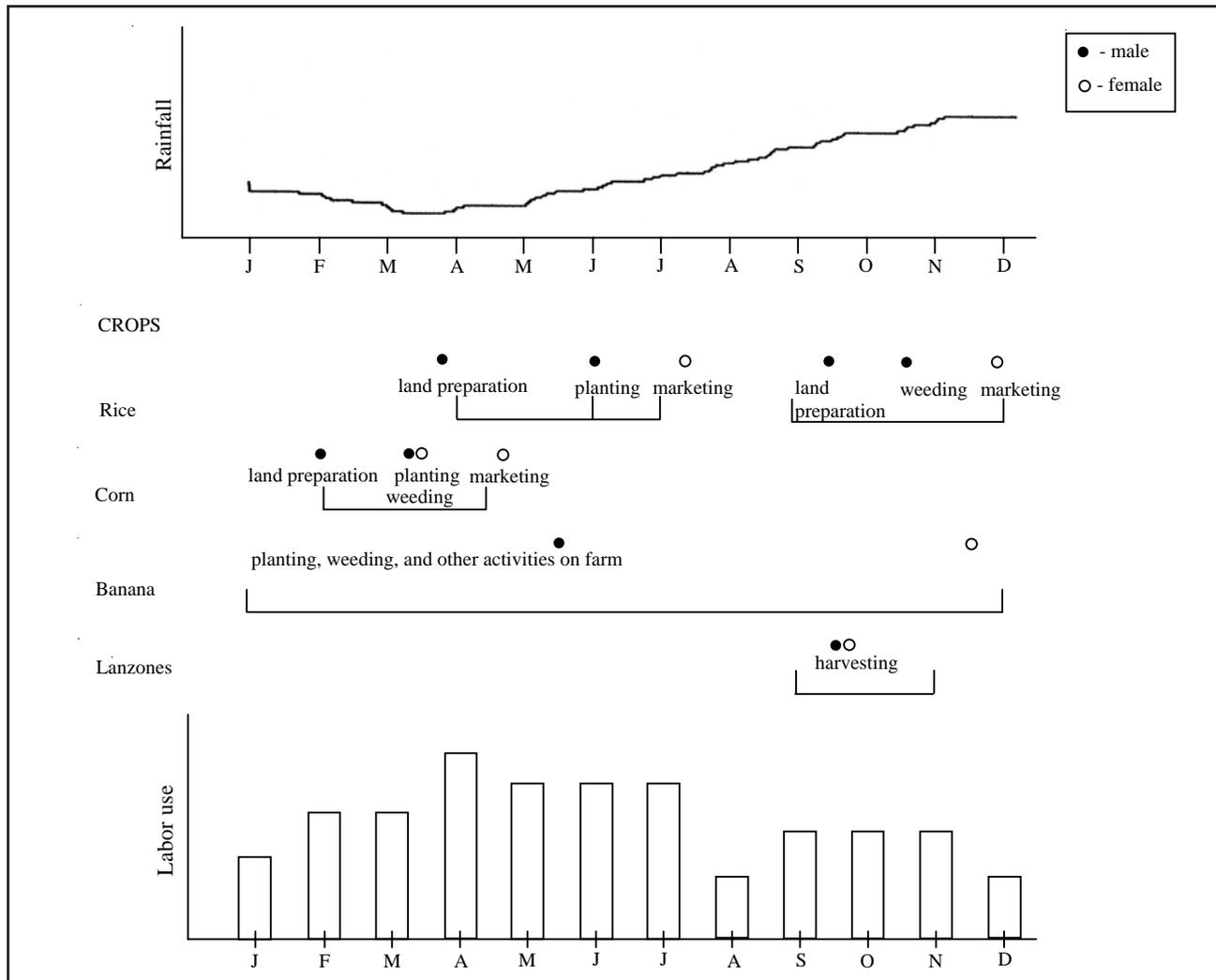


Fig. 21. Cropping calendar and gender relations in labor use in Barangay Tipolo, Plaridel, Misamis Occidental.

or Oroquieta and the rest is reserved for household consumption. Lanzones is shipped to Dumaguete, Pagadian, Cebu, Ozamiz, or Manila. Products purchased from outside the barangay are not only basic consumption and farming needs but also include appliances (Fig. 22).

Land tenure and landholdings

Majority of the farmers own the lands they till (less than one hectare). There are, however, few sizable landholdings ranging from three to five hectares. Several owners acquired the land through land reform and others by direct purchase.

Government assistance

The barangay avails assistance from the DA, PCA, Bureau of Soils and Water Management (BSWM), and DAR. Assistance program include coconut fertilizer, skills training, agrotechnology transfer training, and credit.

Oral history

The oral history or timeline of Brgy. Tipolo, focusing on changes in the environmental and agricultural landscape is shown in Appendix Table 5.

Network analysis

The participatory network analysis is shown in Fig. 23. Low farm productivity is seen as the major problem of the barangay as identified by the residents, informants, members of people's organizations, and barangay officials.

c. Cultural setting

Indigenous practices, religious beliefs, and rituals

Generally, the community observes some religious beliefs and rituals in agriculture and other activities. In planting and harvesting, they use the *lihi*. Organic farming is practiced at least once a year. Indigenous processing of products (meat, corn or rice) is done with family members. They prefer to use herbal than synthetic medicines.

Manifestation of cultural beliefs and norms

Norms, beliefs and rituals are manifested during planting and harvesting. The community sets its norms on cutting of trees and the *kaingin* system.

Farmer's traditionalism

Generally, people adhere to their traditional practices because the results prove to have good effect and impact on their lives.

Traditional forms of labor cooperation

The local community labor pattern is in the form of the *bayanihan*. To them, *bayanihan* means love, sharing, and cooperation among the residents for the common good. While the *dumdum* method of labor allows the people to work during planting, in return, these same workers do the harvesting. Participation of family members in farming activities is also common as a traditional form of labor. The community can be considered as a work-oriented community.

Desire for change and aspiration

The local residents have high aspirations for their children. They are willing to accept new practices combined with their own tradition. However, some of them appear contented as long as they eat at least 3 meals a day. They become discontented when they could not send their children to school to get a higher education. They have the desire to improve their children's lives through education.

Support services

The community is assisted by some government support services such as the DA, PCA, and BSWM. New rice technologies were introduced in the area, hopefully would create an impact on the community. Mass planting of trees was observed that shows their concern on biodiversity conservation.

Decision-making pattern

Domestic affairs are handled by the father as the head of the family. Community affairs such as the use of local resources (water spring) are decided by the barangay captain.

Role of tribal leaders

Tipolo has no tribal organization, however, there are ethnic groups like the Boholanos and Siquijodnon who are migrants to the place.

Leadership patterns and conflict resolution

There are conflicts concerning land boundaries and areas within the army reservation. These conflicts are magnified during harvest of crops near the boundaries. There is also the problem on squatting within the army reservation. The barangay captain is tasked to resolve these conflicts through face-to-face confrontation and mediation.

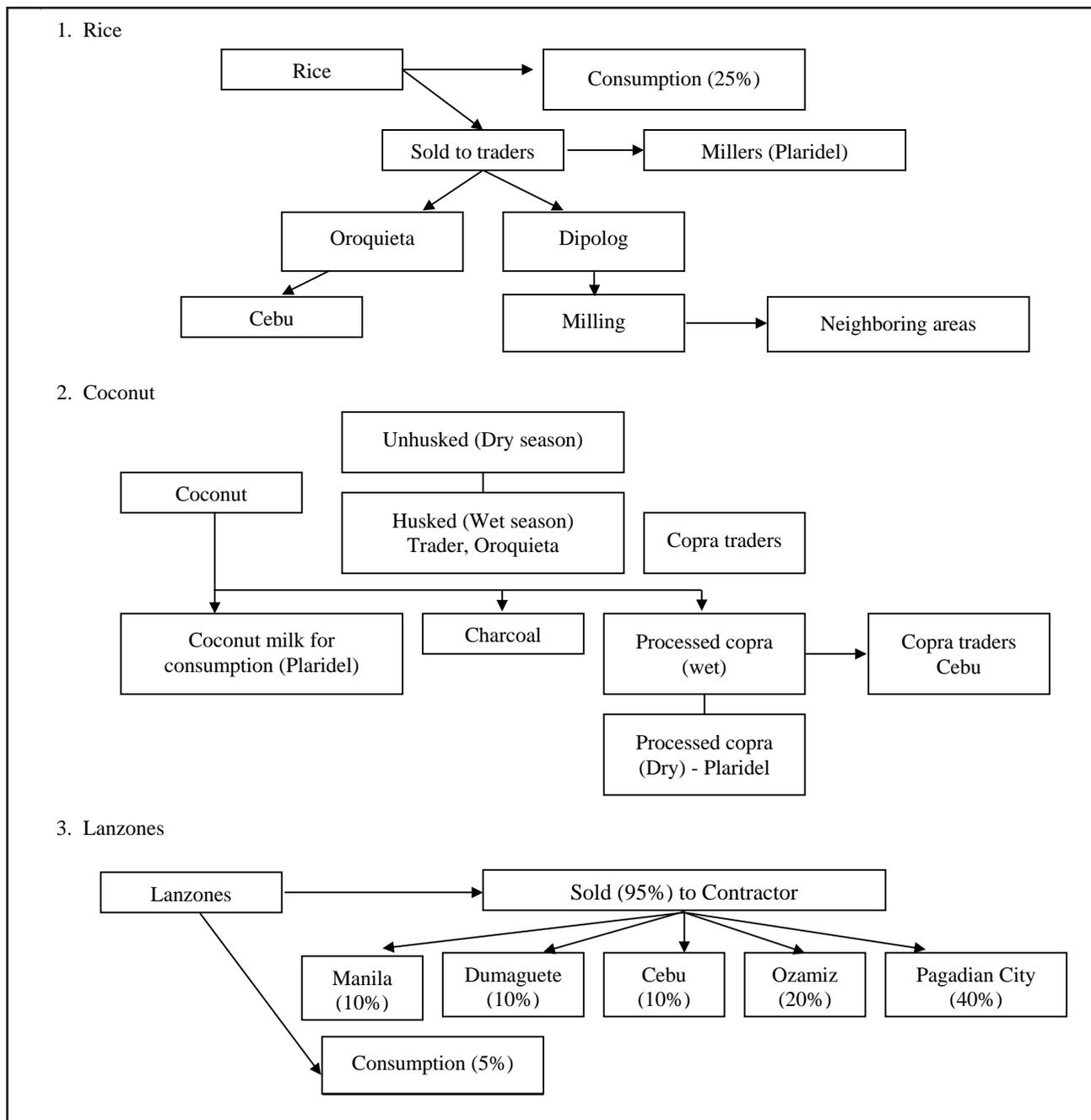


Fig. 22. Commodity flow in Barangay Tipolo, Plaridel, Misamis Occidental.

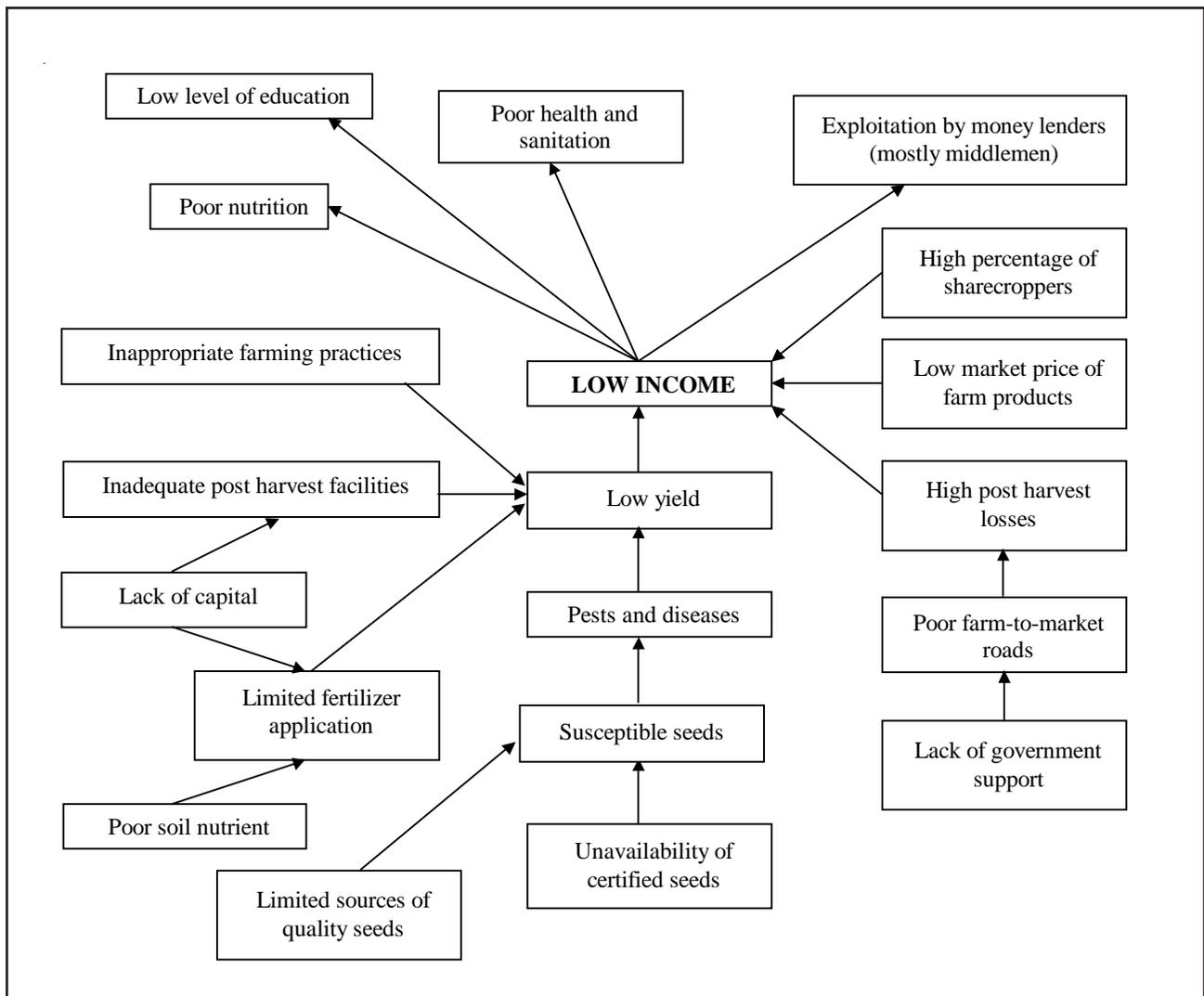


Fig. 23. Network analysis in Barangay Tipolo, Plaridel, Misamis Occidental.

Communication flow and village network

The flow of communication starts with the barangay captain, to the secretary, the Purok president and finally to the residents of the barangay through general assembly meetings. Generally, barangay leaders act as channels of information.

Membership in community organization

There are four organizations in the community, namely: Nazareno Gamute Irrigation Association, Tipolo Multipurpose Cooperative, Women’s Association, and Farmers’ Cooperative. Some of these also promote biodiversity conservation.

Conservation policies/laws

Ordinances on biodiversity conservation in this barangay include policies against illegal fishing and illegal cutting of trees. Generally, these policies are fully implemented.

Ethnicity and migration

Majority of the population are Cebuanos. Other ethnic groups like Boholanos and Siquijodnon also reside in this barangay. These ethnic groups are considered migrants in the area.

Barangay Lumipac (Baliangao, Mis. Occ.)

The origin of the name “Lumipac” is believed to have been derived from the Subanon word Lumipac, which means the sound and echo of the falling water from the Baga Falls. This waterfall remains beautifully surrounded by thick foliage.

a. Biophysical environment

Area and location

Brgy. Lumipac is on the central northwestern portion of the Municipality of Baliangao, Misamis Occidental. It is bounded in the north by Dioyo River and Brgy. Macabibo, in the south by Napisic River, in the east by Brgy. Mabini, and in the west by Brgy. Dioyo (Fig. 24). It has a total land area of about 559 ha. The barangay hall is located at coordinates North latitude 8°36'00" and East longitude 123°36'13".

Topography/slope and elevation

The barangay has a relatively flat terrain and the elevation ranges from 90 to 95 m asl. The average slope ranges from 10 to 20%.

Road/access

Lumipac is accessible from the provincial road linking Calamba to Baliangao. It has access to the coastal barangays via the Dioyo River in the north.

Land use pattern

Land uses in Brgy. Lumipac are grouped under three major categories: settlement (20%), agriculture (65%), and secondary forest (15%) which is dominated by nipa. A variety of crops are grown such as coconut (dominant crop), rice, corn, cassava, and sweet potato (Fig. 24).

Soil conditions

A representative soil sample was taken from the area and analyzed for pH, N, P and K using STK (Fig. 25).

Climate

Brgy. Lumipac falls under Type IV or Intermediate B type using the Corona System of Classification. This means that rainfall is more or less fairly distributed throughout the year. There is no pronounced dry season. The wet months are in November and December, the latter being the rainiest. The barangay is dry during March to April.

Drainage, river systems, and water availability

Lumipac and Baga Falls drain to the north via the Langaran River.

Transect

A northeast transect runs in Lumipac: mangrove, coconut plantation, barangay site, fruit orchard, and remnants of natural forest (Fig. 25).

Plant pests and diseases

The *bunzalo* problem in cooking banana was reported and there was no mention of effective control measure to solve the problem.

Cropping patterns/fertilizer use

The farmers of Lumipac practice intercropping and crop rotation. Corn and cassava are intercropped with coconut (Fig. 26). Fertilizers are applied to coconut trees with available subsidy from the PCA.

b. Socioeconomic analysis

Demography

Population. The barangay population is 814 (432 male and 382 female). The barangay has 167 households and the average household size is 4.9. The 15 to 64 age bracket comprises the majority of the population.

Fertility rate, mortality rate, and longevity.

Women bore an average of seven children by the time they reach 40 despite the campaign for family planning. This indicates that family planning does not contribute to control the fertility rate in the area. An isolated case of infant mortality was recorded. Meanwhile, women live longer (80 years) than men (70 years).

Outmigration. Most of the population cannot be supported by the farm, thus a need to look for work and income elsewhere. Migrants are characterized as in their teens up to mid-twenties and more educated than those who stayed behind to work in the farms.

Health. Fever and cough known as upper respiratory tract disorders are prevalent among adults and children. Herbal medication is supplemented by drugs bought from the pharmacy.

Ethnicity. The population is composed of a good mixture of Subanons, Siquijodnons and Boholanos. They coexist peacefully with each other, although the Subanons do not frequently socialize with other groups.

Education. Most residents finished elementary education, some reached and finished high school. Only a few finished a college degree and others enrolled in vocational courses.

Livelihood

Majority of the residents are engaged in coconut production. However, because of the decrease in coconut production, it is not sufficient anymore to meet the needs of the family. Thus, farmers plant some other crops such as cassava and root crops – which are also sturdier and can survive climatic changes – to meet the basic needs of the family. Corn is also grown for subsistence. Off-farm activity like taking odd job in the construction industry is resorted to.

Cropping pattern and gender relations in labor use

Figure 26 shows the cropping pattern for major crops produced as well as the division of labor between men and women. The lean and peak months of labor use are also indicated.

Labor availability and distribution

Those who are in their prime comprise the working force of the population so there is an abundant labor supply. About 30% of the labor requirement on the farm are being performed by men and women members of the family. Those who can afford to pay hired labor. Small land size for cultivation rendered labor exchange insignificant or unnecessary since family members can manage to work on their farms.

Level of living and income

There are very few well-to-do farmers in the area. The majority have as low as P3,000/month income as reflected in the Minimum Basic Needs Survey.

Commodity flows

Copra is the major product sold out of the barangay. It is usually sold through middlemen to Calamba, Dipolog, and Jimenez. While farmers also plant other crops such as sweet potato, cassava, gabi and corn, they are consumed locally usually for subsistence. High-value fruits are also sold in Calamba in small quantities. Meanwhile, product inflows from nearby municipalities for basic consumption include fish, farm inputs like fertilizers, and construction materials (Fig. 27).

Land tenure and landholdings

Most people in Lumipac are related, hence majority of farmers inherited their small farms. Majority cultivate less than one hectare of farm land. There are few who own between 4 to 6 ha of farm land.

Government assistance

The barangay receives assistance from various programs of government institutions such as the PCA, DOH, and DSWD. The PCA assistance comes in the form of coconut fertilizer subsidy. Lumipac is a CIDSS area where the DSWD acts as a lead agency in providing assistance such as credit, skills training, two-year free high school or vocational education, and the establishment of the health and day care centers.

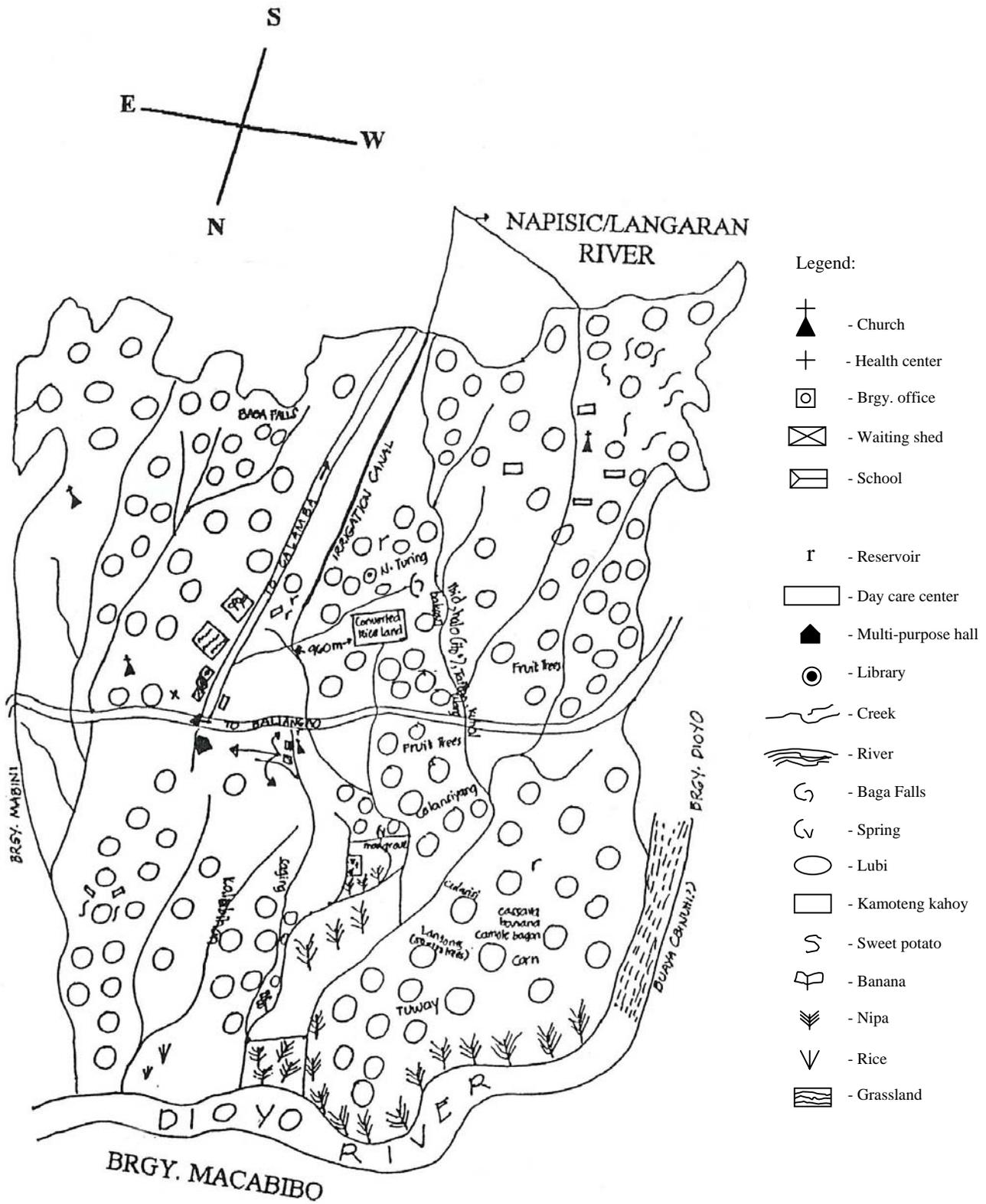
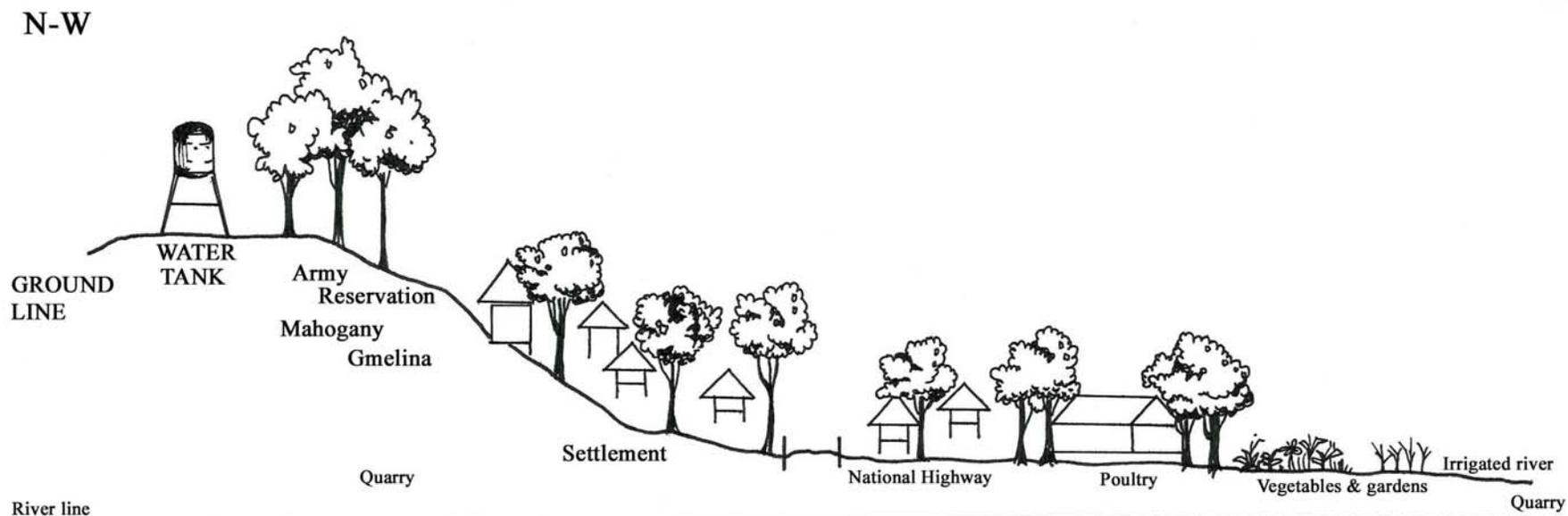


Fig. 24. Village and resource map of Barangay Lumipac, Baliangao, Misamis Occidental.



SOIL PROPERTIES

Color	Dark grayish brown	Dark brown	Very dark brown	Dark brown	Dark brown
pH	6.0	5.8	6.8	7.3	5.8
Nitrogen	Low	Low	Low	Low	Low
Phosphorus	Medium	High	High	Medium	High
Potassium	Deficient	Deficient	Deficient	Medium	Deficient

Fig. 18. Transect map of Barangay Tipolo, Plaridel, Misamis Occidental.

Oral history

The oral history or timeline of Brgy. Lumipac focusing on changes in the environment and agricultural landscape is shown in Appendix Table 5.

Network analysis

The participatory network analysis is shown in Fig. 28. Low farm productivity is seen as the major problem by the residents as identified by informants, members of people's organizations, and barangay officials.

c. Cultural setting

Indigenous practices, beliefs, and rituals

The farmers practice *lihi* in planting corn and root crops such as camote and cassava. Rituals are conducted before planting to obtain bountiful harvests and to protect against farm pests and diseases.

Their indigenous post harvest practices include:

- the use of a stone grinder to mill corn into grits
- corn is processed into *binlod* or *tiktik*
- sweet potato and cassava are cooked into *pintos* or *suman*
- sweet potato is cooked and mixed with corn (*sinaksak*)
- the *tiktik/binlod* is cooked as *sinakol*

Manifestations of cultural beliefs and norms

Rituals and indigenous practices are still adopted in farming and fishing activities. People perform rituals and *lihi* to obtain good harvests and drive away pests from their farms. In case of calamities, they usually attribute these to the evil spirits inhabiting their farms.

Farmers' traditionalism

People in Brgy. Lumipac still follow the traditional practices because their resources are limited to adopt new farming technologies with expensive inputs. Their practices follow age-old traditions and actually help in the conservation of biodiversity (e.g., no killing of birds and wildlife, nonuse of chemicals, etc.).

Traditional forms of labor cooperation

Residents in Brgy. Lumipac use family labor. Other forms include *hunglos* or cooperative labor exchange. Sometimes a *hunglos* could be hired and paid for labor extended.

Desire for change/aspirations

Although most of the farmers are receptive to change and willing to adopt new technologies, they are hindered to do so because of low income and lack of resources. Fishing activities for example could be expanded, but capital is scarce and insufficient.

Children of families in Lumipac who have earned college degrees find themselves working outside their barangay because of the absence of job opportunities in their hometown.

Support services

From interviews, some residents perceived the inadequacy of government support on the marketing of local products. In addition, assistance from concerned agencies such as the PCA, DA, DENR are also lacking in providing the much needed support on coco-tree planting, reforestation, and technical advice from DA technicians and field workers.

On the use of herbal medicine, there is a need for training in the proper extraction and commercialization of medicinal plants which are in abundance in the area.

Decision-making patterns

The barangay captain is influential in local affairs and administers the community through a participatory approach. Decisions in many activities are made in consultation with the barangay council.

Women members of the council participate actively in running the local administration. Meanwhile, the *Timoay*, leader of the Subanon, seldom represent his group in the barangay administration.

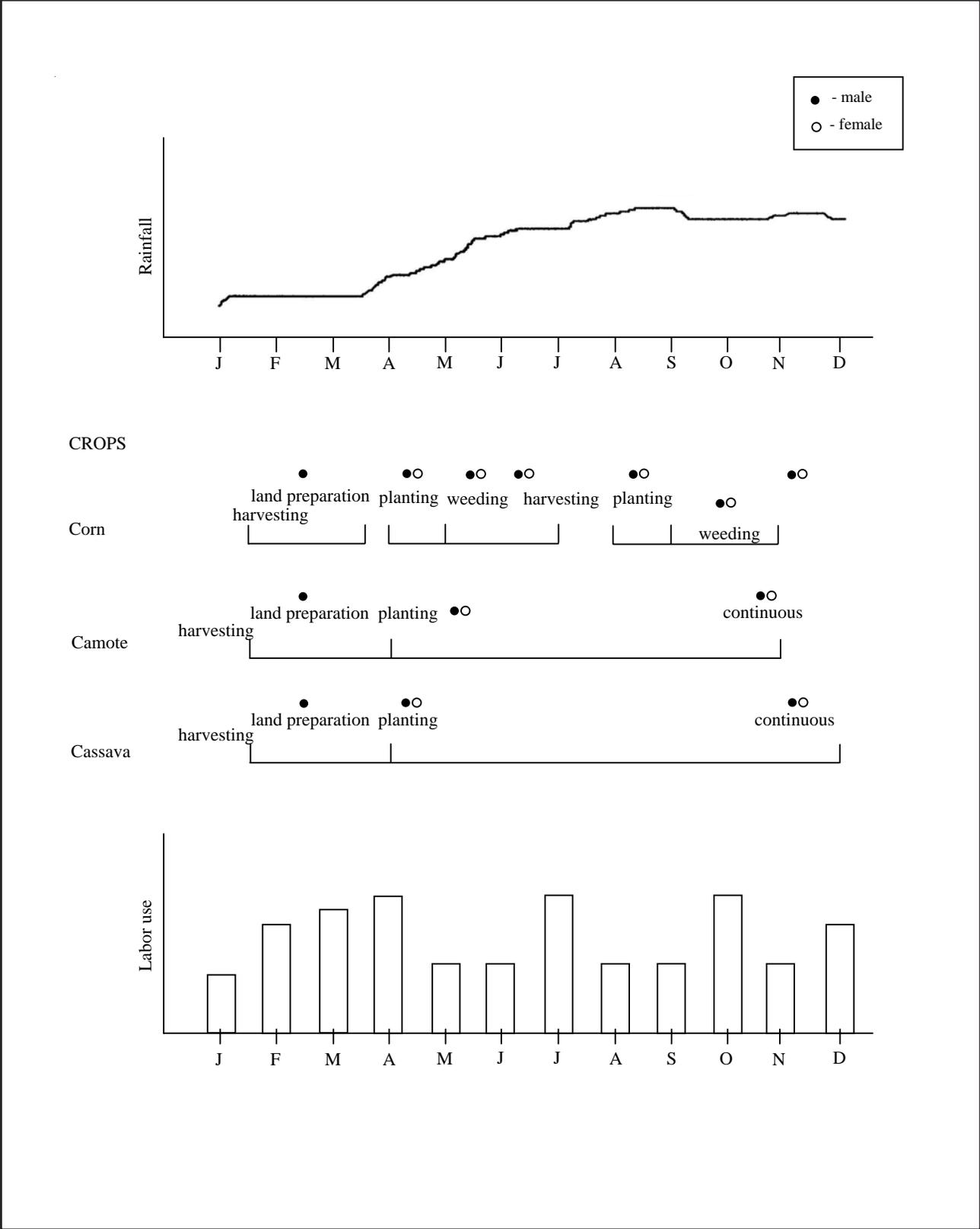


Fig. 26. Cropping calendar and gender relations in labor use of Barangay Lumipac, Baliangao, Misamis Occidental.

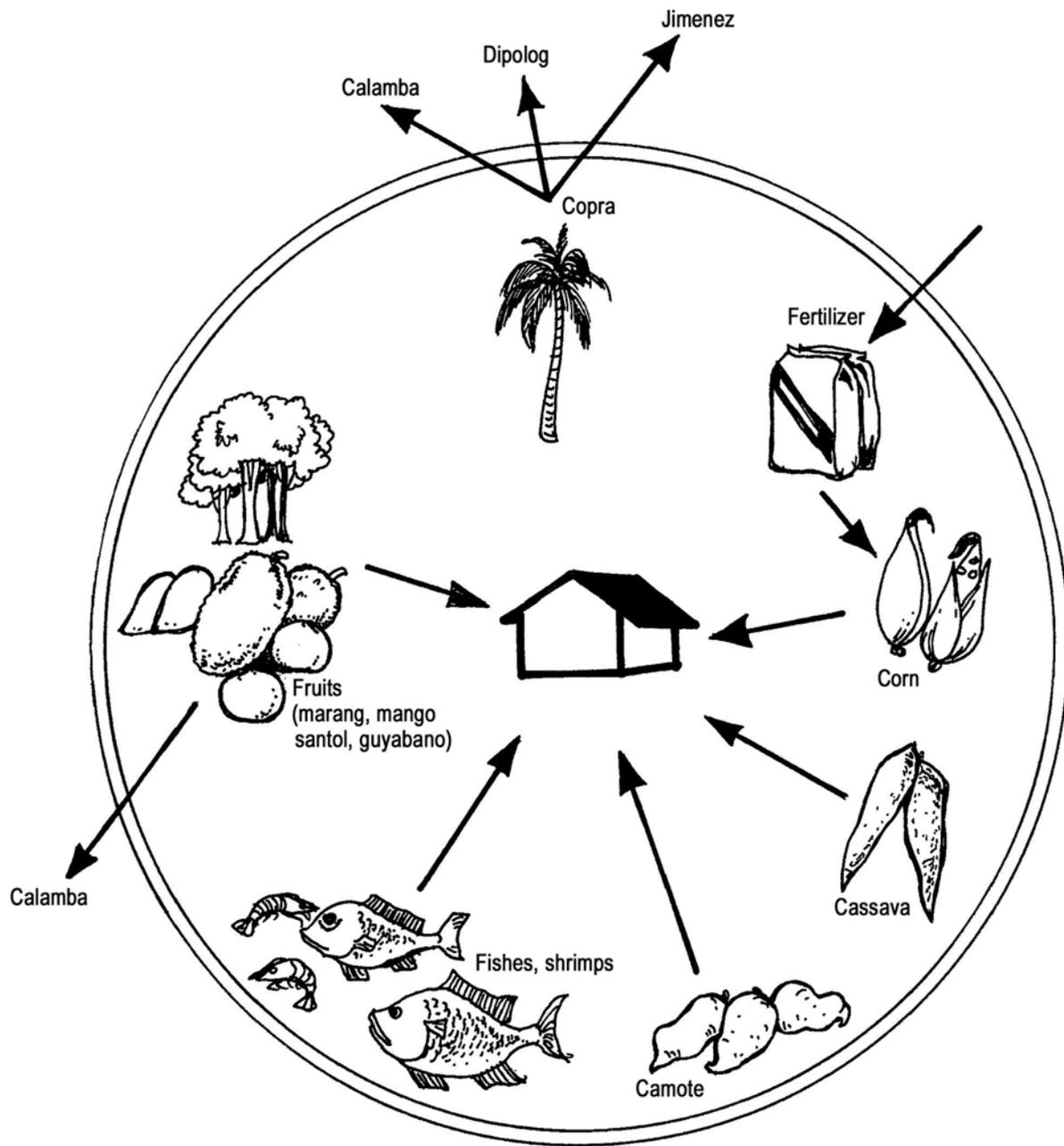


Fig. 27. Commodity flow in Barangay Lumipac, Baliangao, Misamis Occidental.

Leadership patterns and conflict resolution

Conflicts result from illegal practices in fishing and cutting of trees. Some people also violate local ordinances and policies.

The barangay captain settles disputes through meetings with the aggrieved parties and the offenders.

Communication flow and village network

Elders, retired teachers, and government employees are credible sources of information in the barangay. In most cases, these sources are familiar with pressing problems on the changing ecology of the barangay brought about by cutting of trees, poisoning of fish and dynamite fishing, and spread of chemicals and pesticides

in irrigation canals resulting in the death of carabaos as draft animals. But despite the credibility of these sources of information, observation shows that occurrence of these problems still persists.

Community organization

Most of the organizations in the barangay are for mutual aid or benefit. Very few organizations promote agricultural activities. The elder members of these organizations are conscious of conservation practices in the barangay.

Conservation policies and laws

Local ordinances prohibit the cutting of trees, dynamite fishing and improper garbage disposal. Polluting irrigation canals is also prohibited because of death incidence in carabaos.

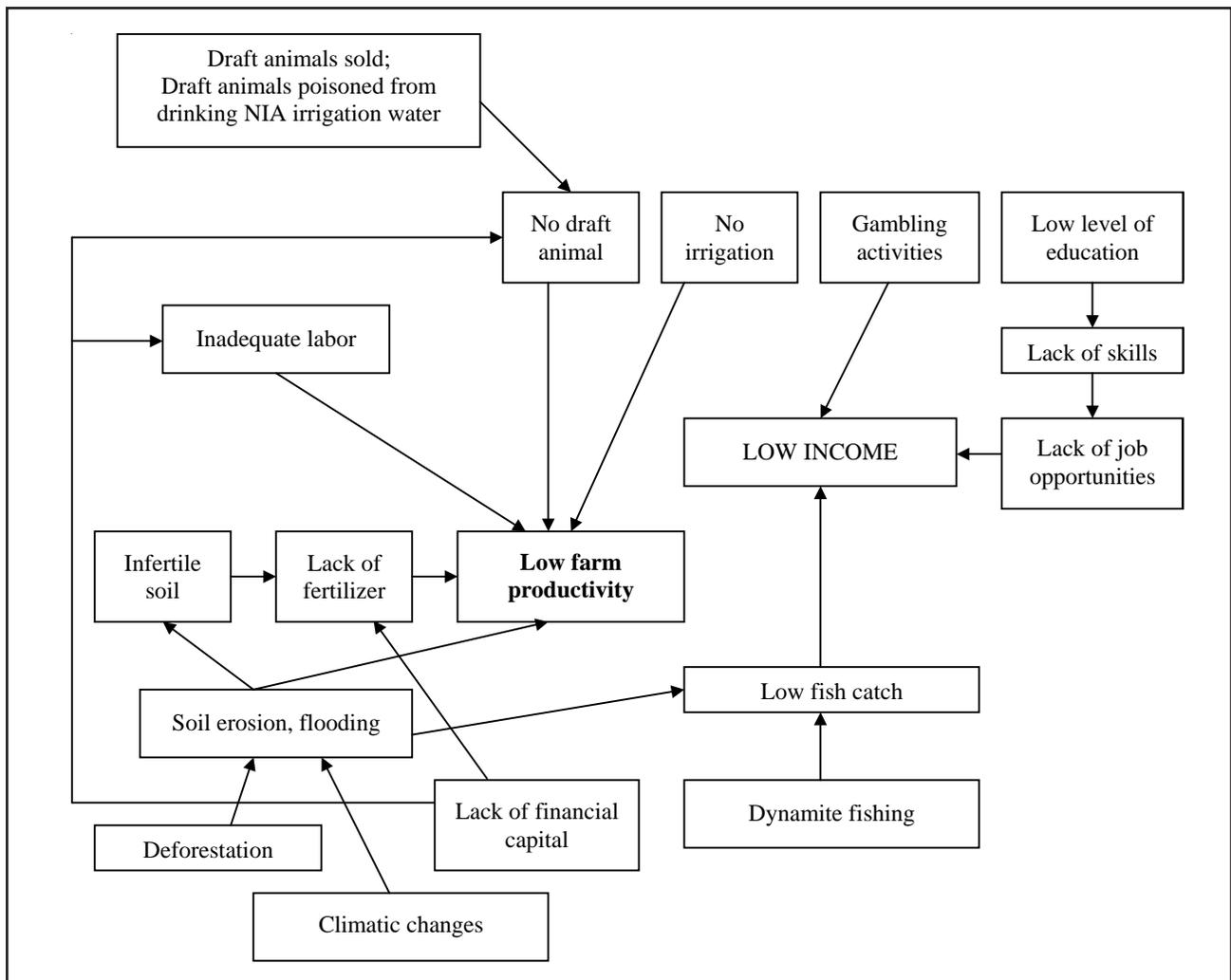


Fig. 28. Network analysis in Barangay Lumipac, Baliangao, Misamis Occidental.

Barangay Calaran (Calamba, Mis. Occ.)

The place was named Calaran after a Subanon lady named "Clara" which means a "fast runner". The name implies rapid growth and development, twin goals which the residents of the barangay aim for their place.

a. Biophysical environment

Area and location

Driving through the national highway going northwest from Plaridel, Calaran is the first town of Calamba one would reach. It lies 8°36'00" N and 123°39'35" E, bordered in the north by Langub Creek, in the east by Brgy. Unidos, Plaridel, and in the south by Langaran River (Fig. 29). Its total land area is 316.4 has.

Topography/slope and elevation

The study site is a plateau with a few hilly to rolling terrain that leads to the Langaran River. Its elevation ranges from 80 to 110 m asl.

Roads/access

Calaran is cut into two equal parts by the concrete national highway from its east border to the west. Access to its sitios is rather easy with nearly all flat terrain.

Land use patterns

Brgy. Calaran has four major land uses: agriculture (75%), settlement (15%), and reforestation and secondary forest-riverines (5% each) (Fig. 29). Coconut ranks first among the agricultural crops followed by rice and corn. Farming is coconut-based and has suffered tremendous set-back from its land use conversion. As the coconut became a popular and cheap alternative lumber and as irrigation facilities became available, big hectareage of coconut were cut and converted into rice paddies. The paddies are now planted to corn as the NIA canals are undergoing repair for one year. There is quarrying operation in the Langaran River. The key informants mentioned two concessionaires.

Soil conditions

A total of five soil samples were tested and analyzed for pH, N, P, and K using the STK. Colors and texture were also taken. The analysis showed an increasing soil acidity in sloping areas, N and P are both low while K is still generally sufficient except in the slopes. The soils in Calaran are uniformly dark brown with no drainage problems and heavy-textured (clay loam).

Climatic conditions

Calaran falls within the Type IV climate following the Modified Corona's Climatic Classification. It is characterized by a more or less evenly distributed rainfall all year through. The wettest months are November to December, while the driest are February to March. Calaran's coconut production was hard hit by the effects of El Niño, a prolonged drought that beset the country this decade.

Drainage, river systems, and water availability

Calaran drains to the south of the Langaran River. Its rice fields are watered by the NIA canals which are temporarily undergoing repair for one year. Water for drinking and other domestic uses come from a nearby spring. The water distribution are of Levels II and III systems.

Transect

The Calaran transect cuts in the NW-SE direction (Fig. 30). In the NW is the Langaran River with an abandoned hog farm. Climbing SE leads to a vast plateau dominated by coconuts as a monocrop or intercropped with corn, sweet potato, and cassava. Dried-up paddies converted to corn growing are also common. There is a commercial mango orchard at the SE end of the transect. Quarrying, soil erosion, low coconut productivity, and *bunzalo* are the problems in the area.

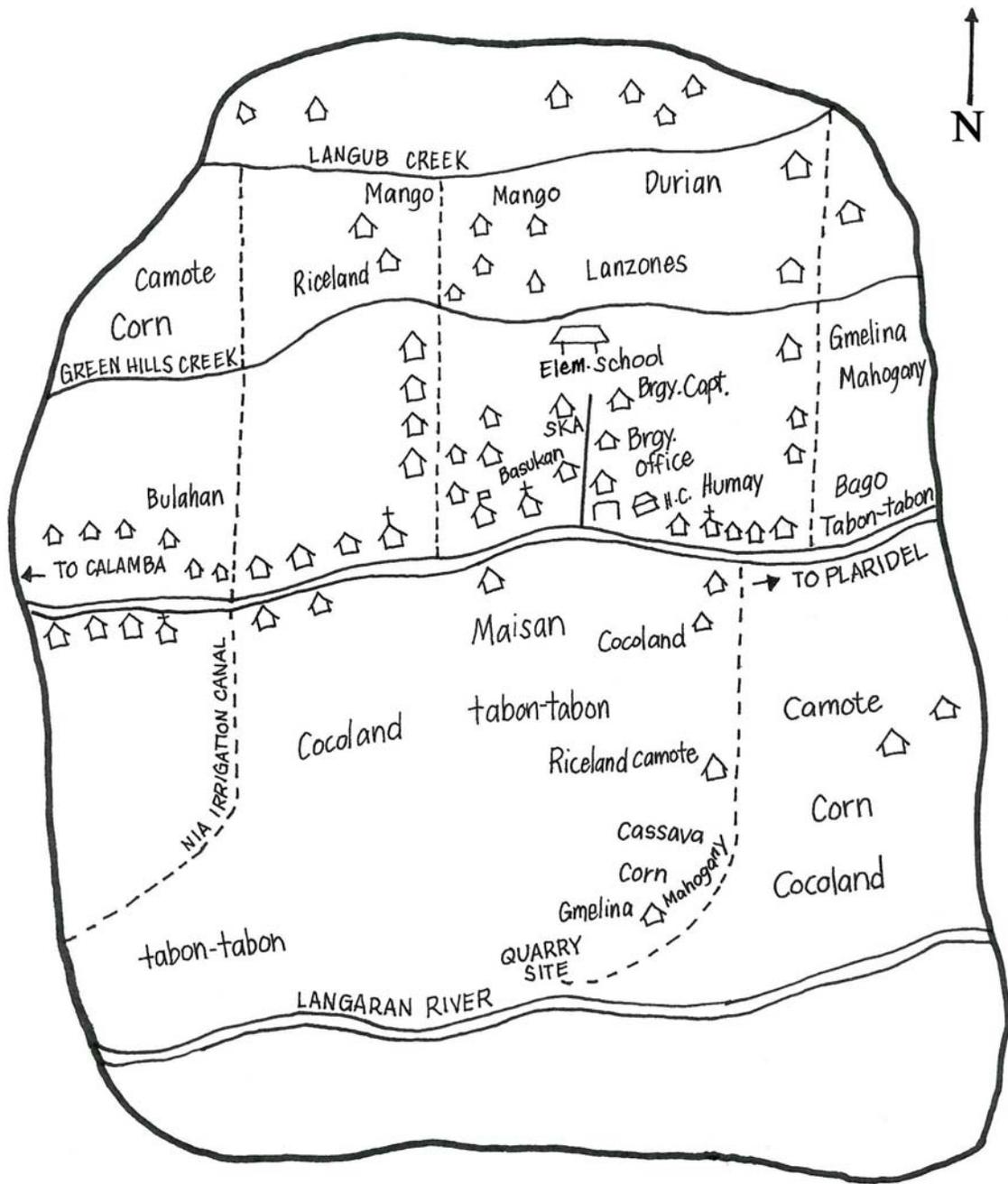


Fig. 29. Village and resource map of Barangay Calaran, Calamba, Misamis Occidental.

Biological conditions

All throughout the transect walk, a listing of reforestation species, medicinal plants, nontimber forest products, lumber materials, and fauna was made. The presence of rare, economic, threatened, endemic, and endangered species like palao (*Alocasia* spp.), bago (*Gnetum gnemum*), and kuyamis (a rare and endangered coconut cultivar) was noted. Calaran has an abundant botanical species with various medicinal uses as described by key informants. Also present are nontimber forest products like romblon, nito, and bamboo, which can provide alternative sources of income for the people. Although most of Calaran is relatively exploited, it is interesting to note that wild fauna like milo, singalong and python are still found.

Plant pests and diseases and their control

Since most of Calaran's rice paddies are now converted to corn fields (while waiting completion of the repair of the irrigation canal), the most prevalent pest infesting their farms is corn borer. IPM has been practiced by many but when incidence of pest is rather severe, chemical control is always resorted to. Rats remain the major pest in the coconut industry.

Cropping patterns/fertilizer use

Most of Calaran farmers practice multiple-storey cropping, that is, planting corn, banana, and root crops under coconut trees. Many farmers do not practice crop rotation. Farming which is mainly coconut-based, rarely incorporates legumes in the cropping. Although farmers are slowly informed about the importance of using organic fertilizer, very few are using it.

b. Socioeconomic analysis

Demography

Population. The total population of Brgy. Calaran is 906, comprising of 48% males and 52% females. There are 212 households with an average number of six members. Population density is 2.9 persons/ha. The age bracket that has the most members belongs to the 21-35 year-old range.

Fertility rate, mortality rate, and longevity.

Despite the campaign for family planning the fertility rate has remained steady. The average number of children has remained within the range of 4-6 according to informants. Infant mortality is rare and longevity is 60 years for men on the average, while for women, average lifespan is 70 years.

Outmigration. Outmigration is common among both professionals and undergraduates. The outmigrants go to big cities like Iligan, Cebu, and Manila or to countries abroad like Japan, Malaysia, Thailand, Hong Kong, and the United Arab Emirates in search of greener pastures.

Health. The practice of herbal medication is prevalent in Calaran. Common illnesses among children are fever, flu and cough. Among adults, hypertension, and upper respiratory tract infection are common.

Ethnicity. There are no Subanons in the area. The population consists of in-migrants from the islands of Bohol, Cebu, and Siquijor.

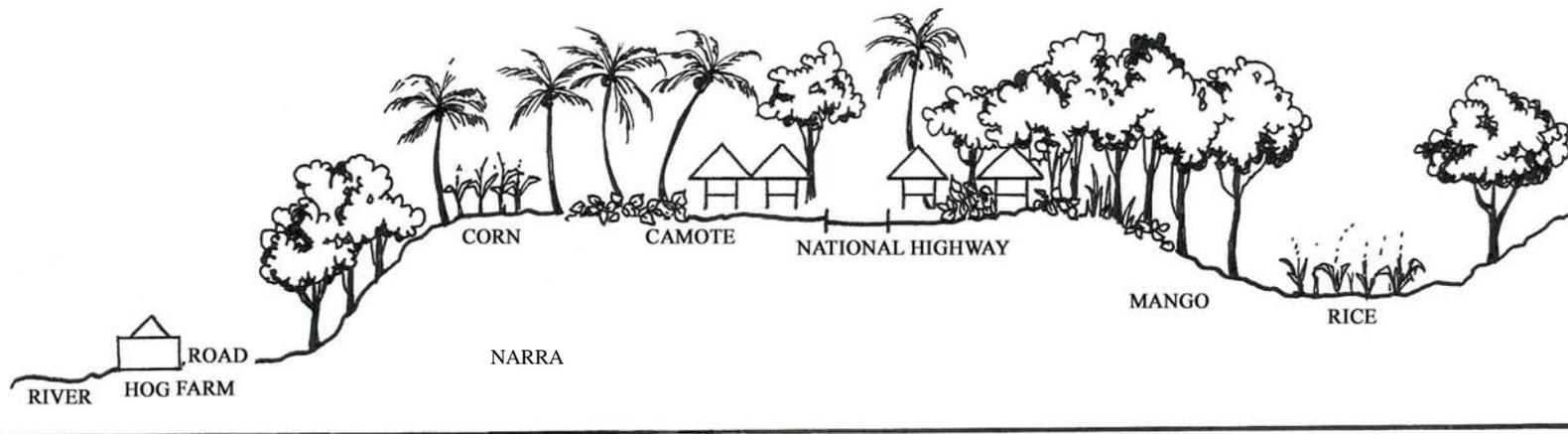
Education. Most members of the population have elementary education, followed by a sizable number who have secondary education. More people have some college rather than vocational education.

Livelihood. Farming is the main source of livelihood of the people of Calaran. Coconut, corn, livestock, and high-value fruit production are sources of cash. Cassava and sweet potato are interplanted for subsistence to supplement the staples. Off-farm sources of income include quarrying, odd jobs in the service sector, factory employment, and *sari-sari* store operation.

Cropping pattern and gender relations in labor use

Figure 31 shows the cropping pattern for major crops produced, as well as the division of labor between men and women in the planting of these crops. The lean and peak months of labor use are also shown.

N-W



SOIL PROPERTIES

Texture	Heavy	Heavy	Heavy	Heavy	Heavy
Color	Dark brown				
pH	5.4	5.4	6.0	5.4	5.9
Nitrogen	Low	Low	Low	Low	Low
Phosphorus	Low	Low	Low	Low	Low
Potassium	Deficient	Sufficient	Sufficient	Sufficient	Sufficient

Fig. 30. Transect map of Barangay Calaran, Calamba, Misamis Occidental.

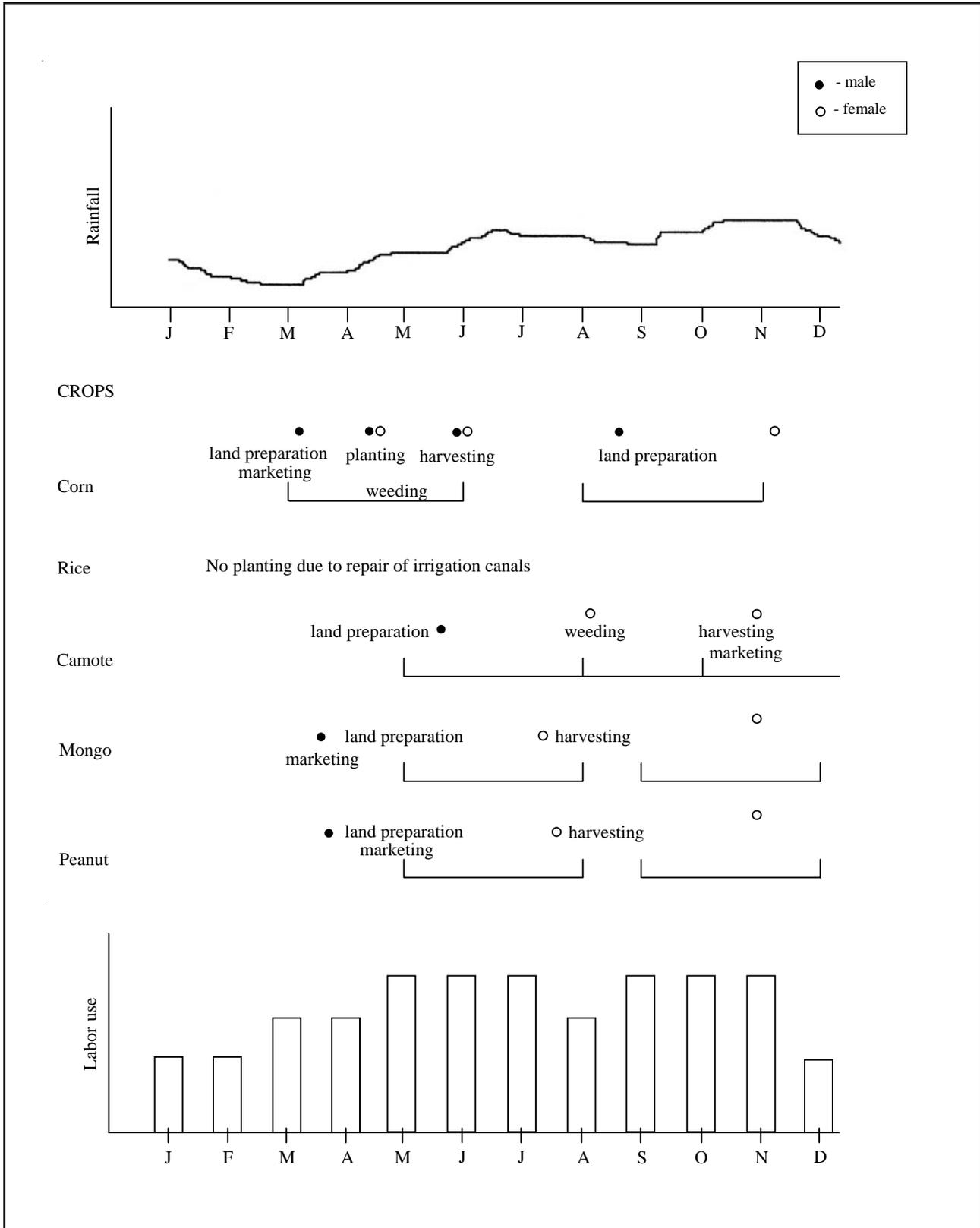


Fig. 31. Cropping calendar and gender relations in labor use in Barangay Calaran, Calamba, Misamis Occidental.

Commodity flow

The barangay's primary crop is coconut, and this is sold either as copra or as whole nuts in Calamba and Oroquieta. Coco lumber is brought to Calamba market as well as high-value fruits such as lanzones, santol and mango, and even corn. Livestock is occasionally sold (Fig. 32).

Labor availability and distribution

Hired labor is common. The high unemployment level makes labor available and abundant. Those who can hardly afford to hire labor employ family labor instead. *Hunglos* is still being practiced but only by very few because of the small farm/landholding which can be managed by members of the family.

Level of living

Most houses are of semipermanent materials, with access to Levels II and III water supply systems and water-sealed toilets. Income ranges from P6,000 to P8,000/mo. The children all go to school. Household appliances are also common in most homes.

Government assistance

Government institutions providing assistance to the barangay include the DA, PCA, and DSWD. Assistance extended include credit, coconut fertilizer subsidy, and skills training for livelihood.

Oral history

The oral history or timeline of Brgy. Calaran focusing on changes in the environment and agricultural landscape is shown in Appendix Table 5.

Network analysis

The participatory network analysis is shown in Fig. 33. Low farm productivity is seen as the major problem of residents as identified by the informants, members of people's organizations, and barangay officials.

c. Cultural setting

Indigenous practices

The indigenous farming system (use of organic fertilizer, contour farming, etc.) is practiced as it is the farmer's belief to continuously improve soil porosity. Similarly, the folks observed some rituals through the use of blood from slaughtered carabao when using the river. Through this flow of blood, it is hoped that there will be sufficient and continuous flow of water in the river.

In planting and harvesting corn and sweet potato, the farmers still practice the *lihi* method. Post harvest practices are combined with traditional and modern methods such as natural sun drying and storage practices such as *dumyang sa salog* for processing rice, and the use of the milling machine for corn. Generally, the folks practice indigenous knowledge.

Manifestation of cultural beliefs and norms

Norms, beliefs, and rituals are manifested during planting, harvesting, and control of pest and diseases. Specifically, indigenous control of pests and diseases is done through gathering of three pieces of *ulod* or *dangan itusok sa suwa* and burning them. This practice is believed to cause minimal infestation of insect pests and diseases.

Farmers' traditionalism

The barangay folks adhere to traditional practice as they want to preserve cultural beliefs perceived and proven to be effective.

Traditional forms of labor cooperation

The community observes local traditional labor pattern such as *pahina* and *tampuhanay*. *Pahina* is time spent for cooperative undertakings which benefits everyone, while *tampuhanay* is participation of the member in labor activities through contributions of food, labor, or cash.

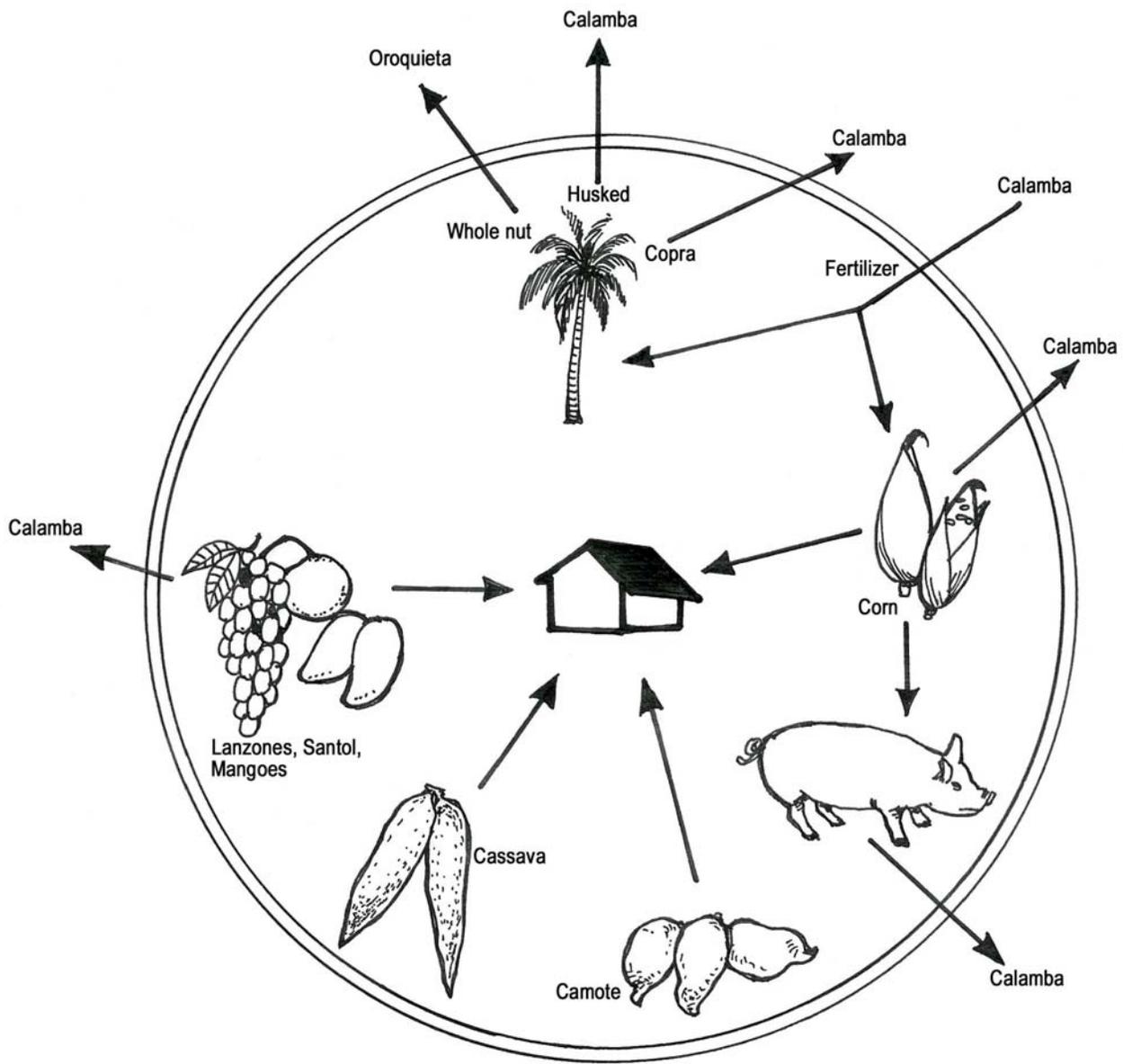


Fig. 32. Commodity flow in Barangay Calaran, Calamba, Misamis Occidental.

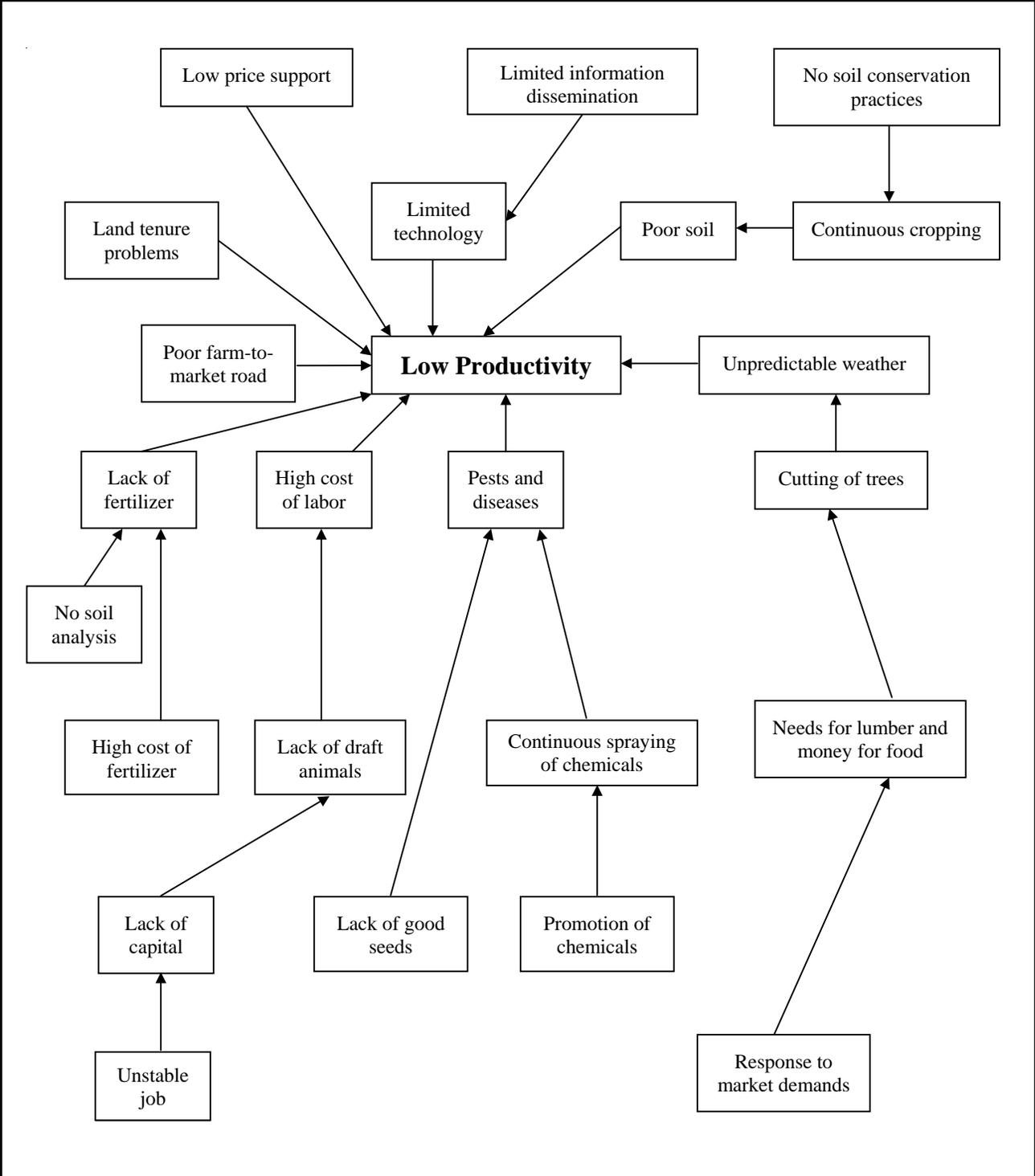


Fig. 33. Network analysis in Barangay Calaran, Calamba, Misamis Occidental.

Desire for change and aspirations

The people have high level of aspirations to improve their living conditions. The community strives to have harmonious relationship with one another. However, they are discontented when the source for drinking water is insufficient. Generally, they desire to have the collective decision on matters that provide a good direction for their future.

Support services

People are empowered through the strong support services from the CIDSS program. This agency extends financial support (loans) to the barangay without any interest to strengthen the livelihood program in the area. DA and PCA also extend support in terms of agricultural technical services. The barangay needs the support of the government in the improvement of their drinking water supply.

Decision-making patterns

On family affairs, the head of the family, the father or husband, is consulted as the direct decision-maker for domestic problems. The barangay captain, on the other hand, decides on the use of local resources such as spring water. The barangay has no tribal organization (e.g., Subanons) and authority rests on the barangay captain and his council.

Leadership pattern and conflict resolution

In this barangay, the major sources of conflicts are settlement of boundaries and land ownership. These conflicts are sometimes resolved at the barangay level if not brought to other arbiters like the DAR within the locality.

Communication flow and village network

The flow of communication regarding barangay matters is from the barangay captain to the secretary, to councilmen, to Purok presidents, and to the people. The general assembly serves as an effective barangay network.

Membership in community organization

People in Calaran are well organized because most of them are active members of several organizations or cooperatives such as: (a) Langaran Coco Charcoal Coop; (b) Farmers' Association; (c) CASAMA or Calaran sa Kaugnayang Magsasaka; (d) Calaran Irrigation Association; (e) Lateral B Farmers Association; (f) Women's Association; (g) Rural Improvement Club (RIC); and (h) Self-Kaunlaran Association.

Generally, all of these organizations are promoting agricultural production. Only a few organizations (RIC and Self-Kaunlaran Association) promote biodiversity conservation.

Conservation policies/laws

The residents are aware of the policies on biodiversity conservation in Mt. Malindang. These include policies against illegal fishing and illegal cutting of trees. However, these policies are sometimes ignored due to farmers' needs.

Ethnicity and migration

Most of the people are inland migrants who come from other ethnic groups like the Boholanos, Siquijodnons, and Leytenios.

Attitudes and beliefs related to biodiversity

People in Calaran have the desire to change their attitude in relation to biodiversity conservation. They are increasingly becoming aware of the environmental destruction brought about by the indiscriminate cutting of trees, timber poaching and "kaingin" method of farming.

Barangay Dapacan Alto (Calamba, Mis. Occ.)

During the Japanese occupation of Misamis Occidental, a guerilla group headed by a Tagalog stationed itself in the place now known as Dapacan. In one encounter between the guerilla forces and the Japanese Army, the guerilla leader commanded his men to lie low on the ground. "Dapa!" he shouted. This was how the place came to be called "Dapacan". Because the place was so big for efficient political governance, it was later divided into two: Dapacan Alto (the higher part) and Dapacan Bajo (the lower part).

a. Biophysical environment

Area and location

Brgy. Dapacan Alto is located on the southern portion of the Municipality of Calamba. It is bounded in the northeast by Brgy. Salvador, in the southwest by Brgy. Mauswagon, in the northwest by Brgy. Dapacan Bajo, and in the west by the Municipality of Sapang Dalaga. Brgy. Dapacan Alto has a total land area of 834 ha. The barangay hall is located at coordinates North latitude 8°31'40" and East longitude 123°37'41" (Fig. 34).

Topography (elevation and slope)

The barangay has a plateau like (more flat than rolling) terrain. The elevation of Dapacan Alto proper is from 200 to 205 m asl. The slope of the land ranges from 15 to 20%.

Road/access

Dapacan Alto is accessible to Calamba in the north through the provincial road.

Land use pattern

Land uses in the barangay are broadly grouped under three major categories: settlement (10%), agriculture (80%), and secondary riverine forest (10%).

Soil conditions

Five soil samples were taken from Brgy. Dapacan Alto representing areas of different land uses. The samples were analyzed for pH, N, P, and K using STK. The analysis showed increasing acidity as the soils were put into intensive agriculture (pH 5.4-5.8). Color ranges from light brown to dark brown. Soil texture is heavy. Erosion of soils is relatively high at the hilly part of the barangay near the Dioyo River.

Climate

Brgy. Dapacan Alto falls under Type IV or Intermediate B type using the Corona System of Classification. This means that rainfall is more or less fairly distributed throughout the year. There is no pronounced dry season. The wet months are in November and December, the latter being the rainiest. The barangay is dry in March to April, with the latter being the driest month.

Drainage, river systems, and water availability

The two river systems in Brgy. Dapacan Alto are Dioyo River and Bunawan River. Kawayan Creek connects to Dioyo River in the northeast portion which subsequently drains to the Murcielagos Bay.

Transect

A transect of Brgy. Dapacan Alto runs in the northeast direction. From the left is the Bunawan River and on the right is Dioyo River. A dam was proposed for construction in the Dioyo River (Fig. 35).

Biological conditions

Those who fish in the Bunawan and Dioyo Rivers noticed the loss of native "Pantat" and attributed this to the introduction of the Taiwan catfish. Many lands are underutilized and idle. It is here where *Wedelia trilobata* weeds are abundant, which encroach on farm lots.

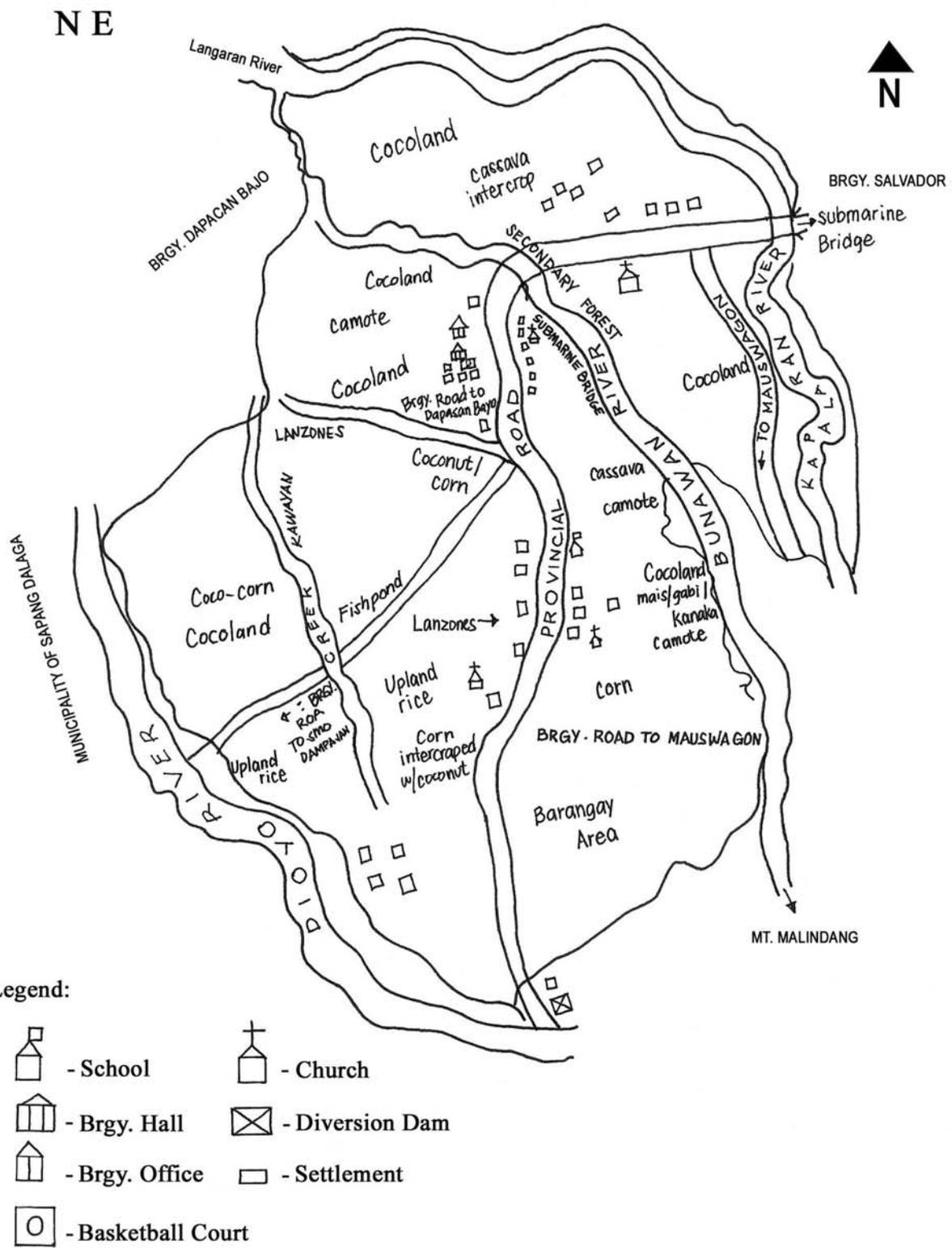


Fig. 34. Village and resource map of Barangay Dapacan Alto, Calamba, Misamis Occidental.

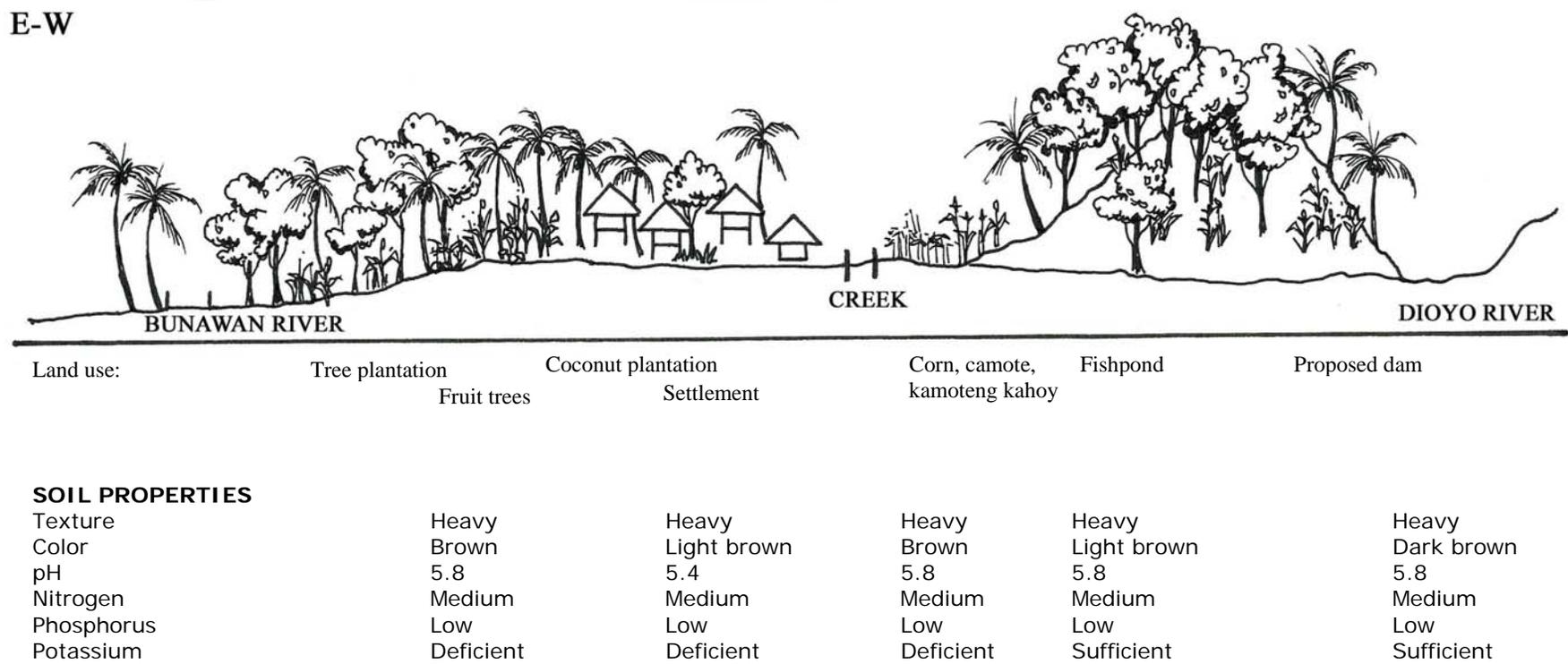


Fig. 35. Transect map of Barangay Dapacan Alto, Calamba, Misamis Occidental.

Plant pests, diseases, and control

The farmers are worried about the *bunzalo* problem that plagues cooking bananas. They mentioned that they try to remedy the situation by applying salt and/or ash to the roots.

Cropping patterns/fertilizer use

The farmers practice intercropping and crop rotation. Upland rice was planted under coconut plantation. Corn and cassava were also intercropped with coconuts.

b. Socioeconomic analysis

Demography

Population. Barangay records show that the population (1998 census) is 1,047, with the proportion of the male population slightly higher than that of female: 528 were males and 519 females. There were 205 households and household size was 6.3, the highest in the study sites. The age structure showed a very high number in the prime working age group, the 15 to 64 years old.

Fertility rate, mortality rate, and longevity.

Family planning is not popular in the barangay due to the absence of a barangay health center where residents can go to ask for information or initial supplies of contraceptives. The result is high fertility rate. It is not unusual to find married women in their early thirties to have 8-9 children. There are, however, couples who consciously limit their family size due to poverty. Some members of the Women's Club say that families no longer think of a newborn as one with "one mouth to feed and two hands to work". It is just unfortunate, they say, that there is limited access to institutional support for family planning.

As in the other study sites, improved health services afforded by the local health unit through the BHWs have resulted in isolated cases of infant mortality and a declining death rate. Mean longevity is about 65 years for men and 75 years for women. Exhaustion, lower health consciousness, and vice have been identified by key informants as the major reasons why men die younger than women.

Outmigration. Outmigration is a common resource in the effort to improve the family's lot especially because job and income opportunities

are scarce. Outmigrants are generally young men and women who have finished high school or have had some college education. The outmigrants move as far as Metro Manila. The men work mainly in factories while women work in the service sectors where they are employed as salesgirls.

Health. Although there is no health center in the barangay, there are health workers as in other barangays. A midwife makes house visits weekly. Drinking water come from springs and there are two open wells serving the community. In areas where water is a problem, rampant cases of diarrhea, especially among children were observed, while respiratory tract diseases are common among children and adults. Adults suffer from hypertension due to high-salt and high-carbohydrate diets. Vegetables and fruits are rarely included in their daily diet.

Ethnicity. There are many Subanons in the community and there is a Subanon organization headed by a young *Timoay* college graduate. Many residents originate from Bohol and Siquijor and there are several coming from other parts of the province.

Education. Majority of the residents finished elementary education since the barangay is only 9 km away from an elementary school. Only children of families with higher income have had or are attending high school. There are also college graduates. There are more who attended college than vocational courses. Those who did not go beyond secondary education feel there is no need for higher learning since there are very limited employment opportunities.

Livelihood

Dapacan Alto is coconut-based. Ninety percent of the coconut yield is being processed into copra and is sold to middlemen; the remaining 10% is sold as nuts. Corn is grown, but mostly for subsistence. Root crops and cassava can be found under the coconuts. Shredded cassava is being sold to a factory in the province which is producing powdered cassava.

The soil is infertile and empty spaces are invaded by a weed called locally as *burikat*. This weed is difficult to control such that the farmers have to burn it to be able to use the land. The weed grows again, however, after some time.

Some high-value fruits like lanzones and jackfruit are grown which result in a small surplus for the market. Livestock is sold when additional income is needed to meet emergency needs.

Off-farm sources of income include cutting of non-bearing coconut fruit trees for lumber, operating a *habal-habal* (motorcycle commonly used as a public vehicle in high elevation areas), operating a *sari-sari* store, dressmaking, carpentry, furniture-making, and factory employment.

Cropping patterns and gender relations in labor use

Figure 36 shows the cropping pattern for major crops produced as well as the division of labor between men and women in planting. The lean months and peak months of labor use are also indicated.

Labor availability and distribution

Sources of labor are family, hired, and *hunglos* or labor exchange. Consistent with the populace's age structure and the community's limited capacity to employ human resources, surplus labor abounds, resulting in unemployment and underemployment. This condition is aggravated before and after the planting and harvest seasons. Many young people outmigrate to find work to help their families.

Level of living and income

Housing materials come from the forest. Trees such as Gmelina, bagalna, nipa, and coconut are used. G.I. sheets are favorite roofing materials.

Water is classified as Level I, the lowest classification, where no communal faucet can be found. Water is the foremost problem in the barangay. Less than P2,000 is the average monthly income among a large number of households, living below the poverty threshold.

Farming activities were disrupted way back in the 1980s due to the insurgency problem. It appears that many residents have become sympathizers, if not members of rebel groups due to their miserable living conditions.

Commodity flows

The inward and outward flow of commodities are limited to basic household and farming needs. These reflect the low level of living and subsistence farming in as far as the staples and root crops are concerned. Coconut and copra flow outward, including high-value fruits, coconut lumber, and occasionally, some livestock. Proceeds from the sale of these commodities are used to buy basic food and clothing needs, fertilizers, pesticides, and seedlings (Fig. 37).

Land tenure and land holdings

Farmers are generally owner-cultivators of cocolands ranging from 1 to 3 ha. Borrowing of land or *ulos* is popular and appears to be a strategy employed by absentee owners to avoid land distribution.

Government assistance

Assistance programs in Dapacan Alto come from the DA, DAR, DSWD, DOH, and the DENR. These agencies actively support and augment livelihood efforts, while introducing measures in environmental conservation. However, services are inadequate mainly due to limited government funds. While people's organizations such as the Rural Improvement Club, Women's Club, and the Small Farmers' Organization exist, there is a need for active participation and commitment of most members to make each organization a potent force in bringing about rural development.

Oral history

The oral history or timeline of Brgy. Dapacan Alto, the environmental and agricultural landscape, is shown in Appendix Table 5.

Network analysis

The participatory network analysis is shown in Fig. 38. Low farm productivity is seen as the major problem of residents as identified by informants, members of people's organizations, and officials of the barangay.

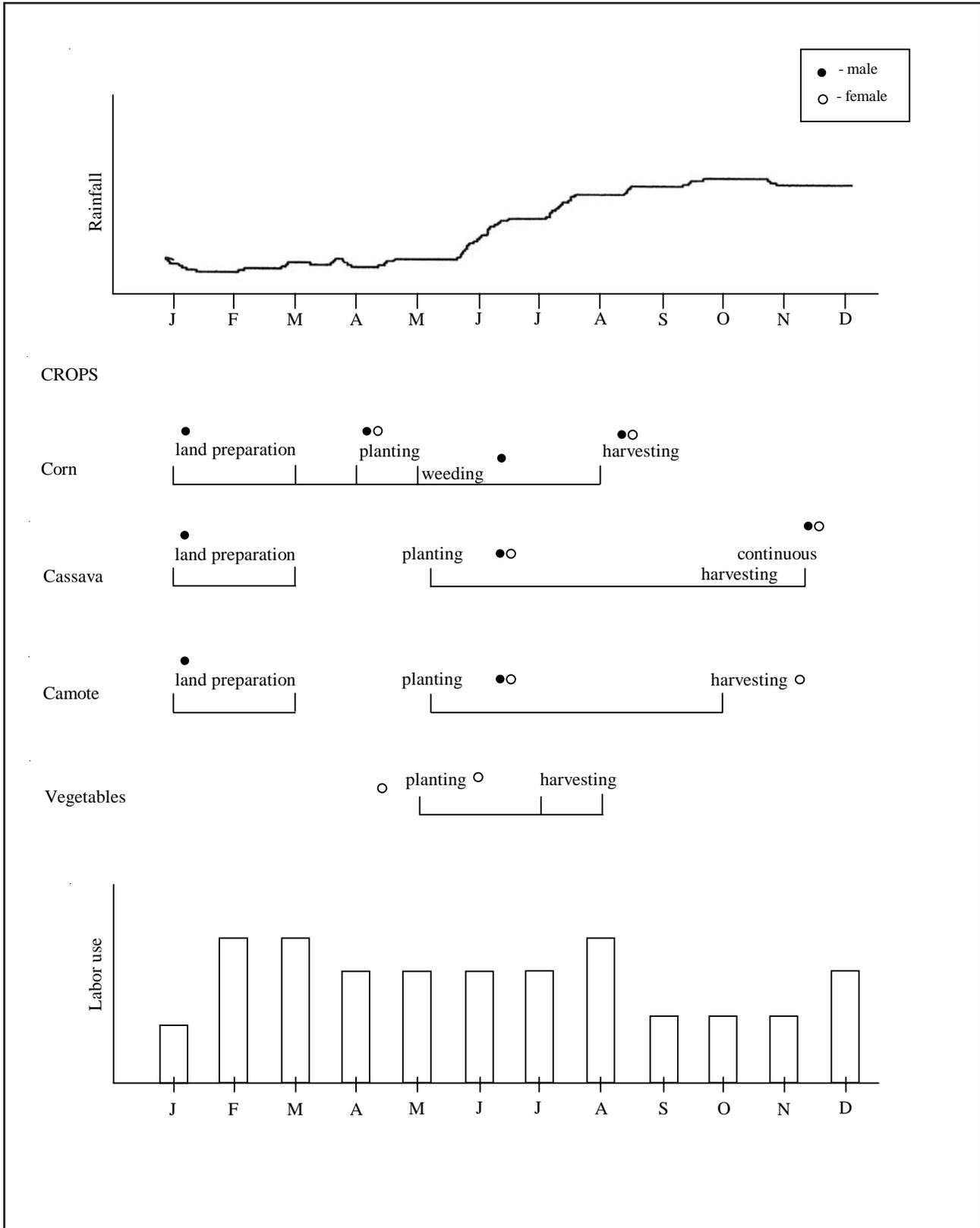


Fig. 36. Cropping calendar and gender relations in labor use in Barangay Dapacan Alto, Calamba, Misamis Occidental.

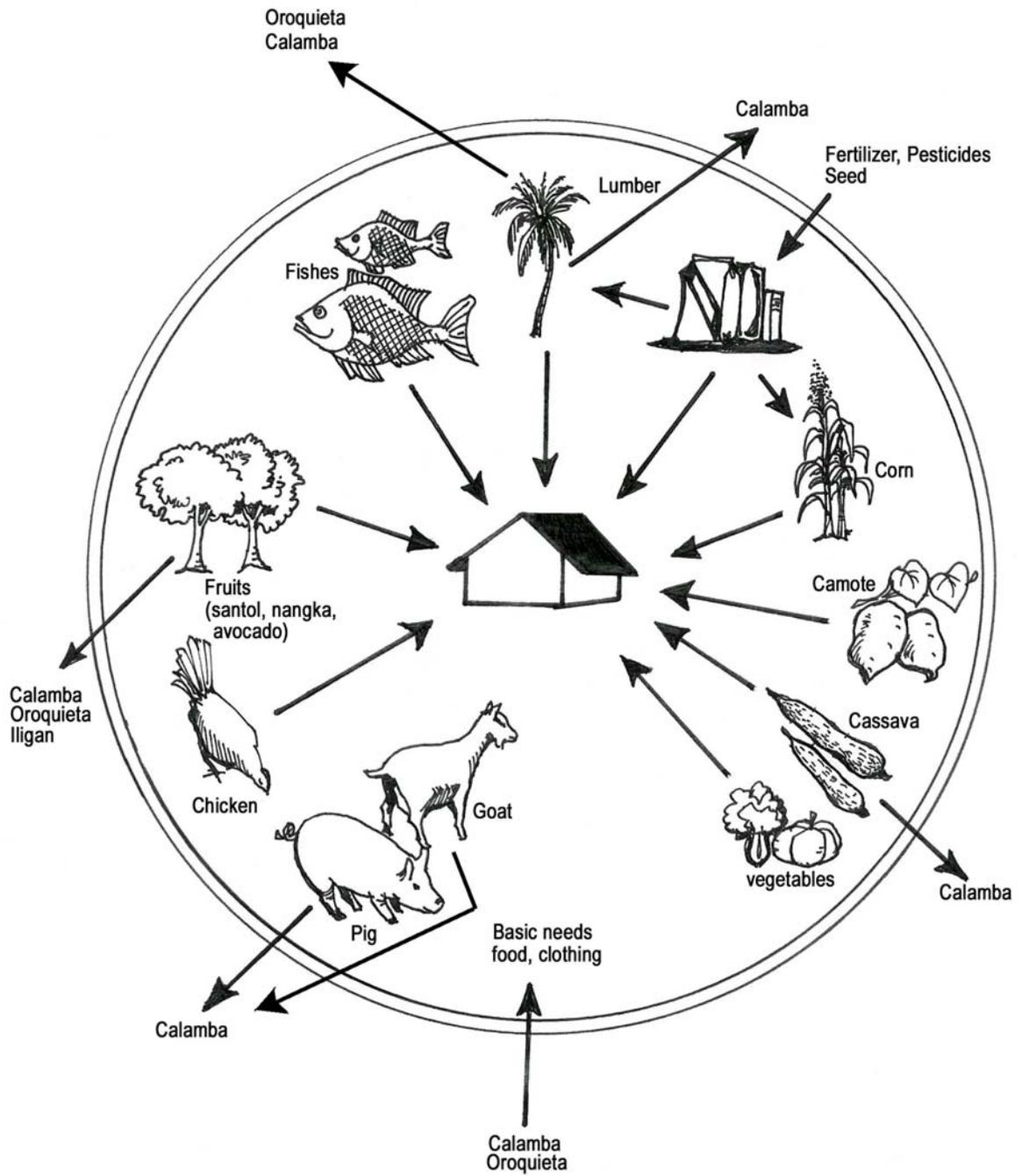


Fig. 37. Commodity flow in Barangay Dapacan Alto, Calamba, Misamis Occidental.

c. Cultural setting

Indigenous practices and rituals

Beliefs and practices are usually associated with the planting of camote, corn, coconut, and banana. Rituals are conducted to control pests and to avoid strong rains. The farmers kill a chicken to drive evil spirits away, and also to serve as an offering to recover soil fertility.

The residents use medicinal plants as herbal medicine to cure specific ailments (e.g., *kanding-kanding* and *tukog-banog* for kidney trouble, and *tabon-tabon* for ulcers). These ethnobotanical practices on the use of herbal medicines are prevalent in Dapacan Alto because they believe that herbals have curative values. Another reason for using herbal medicines is due to the absence of a drugstore or hospital nearby.

Manifestations of cultural beliefs and practices

The beliefs of the people in this barangay influence their agricultural practices. For example:

- a. Planting on the day before full moon.
- b. Never leave work unfinished when planting camote.

Some rituals are also practiced to drive away evil spirits and pests. Some examples are:

- a. Planting before sunrise so that the pests will not see you.
- b. Not scolding rats and other pests and sharing your food with them.
- c. Placing tubers on ash before planting.
- d. Placing grated coconut at the side of the field for pests to eat.

Farmers' traditionalism

Due to scarce and limited resources, farmers in Dapacan Alto are still traditional. They believe that the new technologies in farming require the use of inputs which are not readily available nor affordable to them. Their adherence to traditional practices is also anchored on their belief that their age-old practices support environmental development.

Traditional forms of labor cooperation

There is reliance on family members for labor needs. Paid or hired labor is rare in the barangay. Moreover, people bond themselves together and form working groups to accomplish a particular task. This is called *hunglos*, which is similar to the *bayanihan* where no payments are involved.

Desire for change/aspirations

Both the Subanons and the Christians in Dapacan Alto hope for change and improvement in their lives. They have high aspirations for their children. However, most of them could hardly send their children to school.

It is, however, very gratifying to note that the *Timoay* of the Subanon, Cesar Totong, has completed a college degree under the teacher-training program of a local university. He is still looking for a teaching job, but the Subanon community in Dapacan Alto looks up to him as a model and successful Subanon.

Support services

Water is a major problem in this barangay, thus, also waste disposal. From personal experience, interviews, and actual survey, very few households have sanitary toilets with adequate water supply. Other support services, like a barangay hall, a reading center, and a health center are absent in the area. There are no existing programs for livelihood projects.

Decision-making patterns

Decision-making is paternalistic where the head and chief decision-maker is the father. In community affairs, it is the barangay captain that plays a central role. At the helm of the barangay organization is the lady barangay captain, Luzviminda Dalagon. She decides on projects in the barangay and has succeeded in her administrative function. She encourages people to conserve the environment to avoid floods and excessive soil erosion in Dapacan Alto.

Role of tribal leader

No rituals or ceremonies are conducted by the *Timoay*. The *Timoay* is a young, aspiring teacher who is actively involved in barangay affairs because he is an elected member of the barangay council. The *Timoay*, together with the barangay captain, encouraged planting of trees and other biodiversity conservation practices.

Leadership patterns and conflict resolution

The *Timoay* is the tribal head but he has no authority over the Subanons. Local leaders (the barangay captain and members of the local council) are consulted on significant problems in the locality.

Most of these problems and conflicts stemmed from sharing of farm products between the landlord and his tenant, land ownership, and violation of local ordinances.

The council of elders of the Subanon group also plays a significant role in resolving conflicts among the Subanons.

Communication flow and village network

The barangay leader and the *Timoay* are central in the local communication network. They are also looked up to as sources of information from

the outside and as local leaders in their respective communities. The village network is basically interpersonal although the barangay captain can communicate with the municipal office and neighboring barangays through her handheld radio.

Community organization

A number of organizations have been formed to meet certain needs of groups such as the Subanon group, the women's organization for specific livelihood undertakings, and the RIC for civic projects. In these organizations, people have the opportunity to voice out their ideas and participate in organizational planning.

Conservation policies and laws

Soil conservation measures have been employed in this locality because of very poor soil condition. Vegetative conservation through tree planting is being adopted, although few farmers practice intercropping under coconut trees with cassava, corn, and other root crops. Barangay ordinances prohibit the cutting of trees and promote conservation measures that would conserve and sustain biodiversity (such as no clearing of trees for swidden farming, restricted cutting of "yakal" and other first class tree species, composting to restore fertility, and nonuse of chemicals in springs to avoid pollution and water contamination).

Barangay Mamalad (Calamba, Mis. Occ.)

Barangay Mamalad is a valley surrounded by rivers, streams, and creeks. The early settlers thus referred to the place as “dili mamad-an”, literally means “will never dry up” and was deemed very good for agriculture. Eventually, the name evolved to become Mamalad.

a. Biophysical environment

Area and location

Barangay Mamalad lies 8°27'56" N and 123°38'52" E. It is a valley that is bounded in the north by Brgy. Bonifacio, in the east by Lopez Jaena, in the west by Brgy. Siloy, and in the south by the foot slopes of Mt. Amparo (Fig. 40). Its total land area is 250 ha.

Topography

The study site has a narrow strip of relatively flat area, with a predominantly sloping, hilly to rugged mountainous terrain. Slope of the land ranges from 6 to 10%. Slopes of more than 20% are mostly planted to coconut, sometimes intercropped with corn and root crops.

Roads and access

The barangay roads leading to Mamalad are rough and poorly graded. Even four-wheeled drive vehicles could sometimes not make it to the barangay during the rainy season because of slippery roads. Public transport going to and from the place is very limited.

Land use patterns

There are four major land use patterns in Brgy. Mamalad: agriculture (72%), settlement (8%), reforestation area (10%), and secondary forest-riverine (10%). Agriculture is coco-based, followed by wetland rice, then corn/camote/cassava. Many coconut trees in the river delta of Mamalad had been cut and the area has since been growing lowland rice. Some portions of the delta, however, are flooded resulting to soil erosion and deposit a lot of sediments to the river (Fig. 39). The quarry operation is supervised by the barangay. Boulders, sand, and gravel are brought to Siloy for the government dam project for irrigation.

Soil condition

Four soil samples were collected and analyzed for pH, N, P, and K using the STK. Color and texture were also measured using the same method. Analysis of the pH showed that the soil slopes (samples 1 and 4) of Mamalad are more acidic than those of the river delta (samples 2 and 3). Soil acidity is also affected by land use and farming practices. Sample 2 is less acidic than 3 simply because the former is under coconut, untilled, and not receiving a lot of inorganic fertilizers. The latter is a rice paddy and received more N fertilizers that made the soil acidic. N in all the samples is low, while K is sufficient in soils on slopes and deficient in the river delta. This loss could be due to the frequent flooding in the delta which may have caused the vertical or horizontal loss of K. The soil becomes redder on slopes indicative of high iron (Fe) in the oxidized state. The texture also showed lighter-textured soils in the delta because of the river flooding there.

Climatic conditions

Barangay Mamalad belongs to the Type IV level using the Modified Corona's Climatic Classification. The wet months are November to December while the dry months are March to April.

Drainage, river systems, and water availability

Mamalad has four creeks, namely, Tugaya, Mamalad, Catipa, and Magkawayan. It has also many springs which provide abundant source of potable water and water for other domestic uses. All these water drain to the Langaran River. The river also provides irrigation water to the rice paddies in the river delta. The potable water system in the barangay is categorized as level II. However, with just a little more funding, the abundant and delicious spring waters of Mamalad will soon find their way to the households. The Langaran River finds its primary water source from the Mount Balabag range.

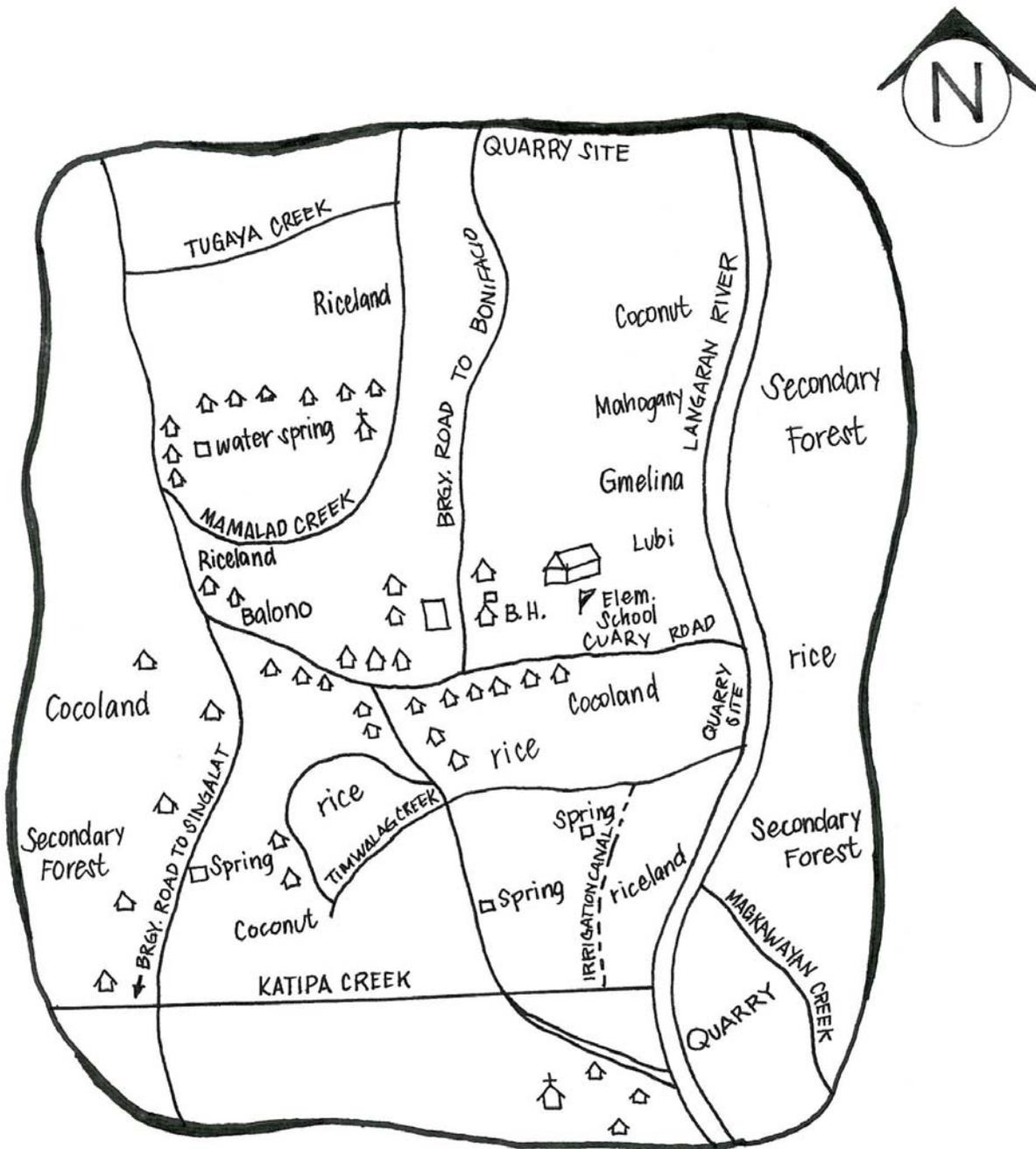


Fig. 39. Village and resource map of Barangay Mamalad, Calamba, Misamis Occidental.

Transect

The transect map of Mamalad (Fig. 40) runs from the NW-SE direction. From one end of the transect to the other, one can see the importance of proper and appropriate farming techniques to make agriculture in the area sustainable. The transect also shows remnants of forest and several springs and creeks, which when properly managed will enhance biodiversity in the area.

Biological conditions

Mamalad offers a more diverse flora and fauna with more sightings of wild fauna and the presence of Dipterocarp species such as "lauan" and "tanguile". Premium species like "narra" and "molave" are also observed. There are also a great number and variation of reforestation tree species.

Plant pests and diseases and their control

Black bug is the most important pest in rice farming in the area, followed by the green leafhopper, the carrier of tungro. Although farmers practice IPM and organic farming, they wish that the DA could help them more.

Cropping patterns/fertilizer use

Monocropping and intercropping are both observed in Mamalad. However, crop rotation particularly with legumes is yet to be appreciated by many to get a cheap source of nitrogen. Organic farming is practiced only by a few.

b. Socioeconomic analysis

Demography

Population. Mamalad has a population of 538, with 92 households, and an average size of six members per household. The population density is 2 persons per hectare. The 15-64 age group comprises the majority.

Fertility rate, mortality rate, and longevity. Fertility rate is described as steady by the women informants, as the average number of children of women through the years reaching a certain age remains the same. There are four reported cases of infant mortality during the year,

but generally, infant deaths are less among mothers with relatively higher education than those with less education. Longevity is 80 years on the average among men and 90 years among women.

Outmigration. Outmigration is not common in Mamalad in as much as the concentration of IPs in the place is very large.

Health. Flu, fever, and cough are common illnesses among children. Hypertension and cough are common among adults. Herbal medication is popular in Mamalad.

Ethnicity. Majority have elementary education. The low level of income makes it difficult for children to attain higher education. Moreover, Mamalad is about 10 km away from the municipality and the road network is very poor. Many parents, however, wish to send their children to school to gain knowledge and earn a degree as they perceive education to be a lasting legacy.

Livelihood

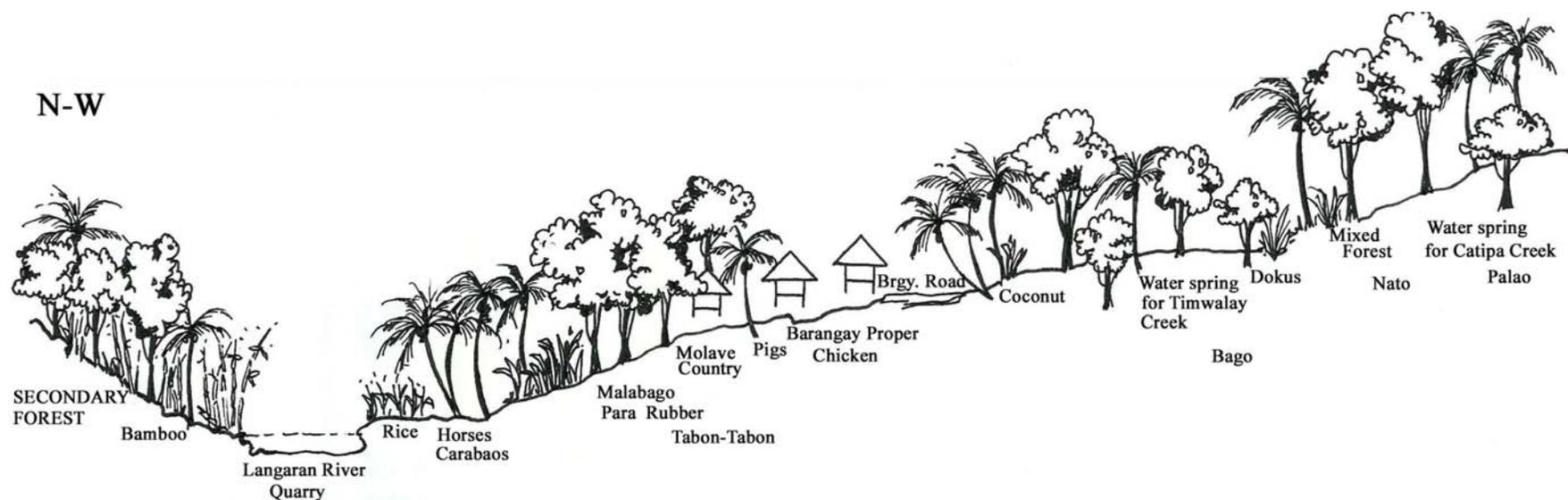
Farming is the main source of livelihood for many residents. Most farmers are engaged in copra and rice production as main sources of cash. Crops like cassava and camote are interplanted with coconut for subsistence or to supplement the staples. Other sources of income include carpentry or employment in construction, quarrying, and operation of a *sari-sari* store.

Cropping pattern and gender relations in labor use

Figure 41 shows the cropping pattern for major crops produced, as well as the division of labor between men and women in the planting of these crops. The lean months and peak months of labor use are also indicated.

Labor availability and distribution

Limited employment opportunities have created a large surplus of farm labor. Most farmers hire labor to prepare their farms for planting. In farming activities which are lighter, family members are involved. A few farmers who cannot afford to hire labor, participate in *hunglos* or labor exchange.



SOIL PROPERTIES

Texture	Medium	Medium	Heavy	Heavy
Color	Dark brown	Dark brown	Dark brown	Yellowish red
pH	5.8	6.4	5.2	5.4
Nitrogen	Low	Low	Low	Low
Phosphorus	Low	Medium	Low	High
Potassium	Deficient	Deficient	Sufficient	Sufficient

Fig. 40. Transect map of Barangay Mamalad, Calamba, Misamis Occidental.

Level of living and income

Most houses are made of lumber from trees farmers cut from the forest or from their farms. Houses are semi-permanent, with G.I. sheets as roofing. Level I and Level II water systems are available. Majority earn a monthly income of about P3,000 a month. Some households can afford to buy a few appliances such as radios and television sets.

Commodity flows

Major products sold outside of Mamalad include copra, rice, banana, coco lumber, and lanzones. These products are usually sold in Calamba. Basic household commodities including construction materials and some farm inputs such as seeds are brought in from nearby municipalities (Fig. 42).

Land tenure and landholdings

Most farmers inherited their farms. Some are tenant farmers under a 25-75 sharing arrangement. Majority cultivate less than a hectare of land.

Government assistance

Extension services from government institutions include the artificial insemination program of the PCC and technical services from the DA. The DSWD and DOH also extend support to the area.

Oral history

The oral history or timeline of Brgy. Mamalad, focusing on changes in the environmental and agricultural landscape is shown in Appendix Table 5.

Network analysis

The participatory network analysis is shown in Figure 43. Low farm productivity is seen as the major problem by residents as identified by informants, members of people's organizations, and officials of the barangay.

a. Cultural setting

Indigenous practices, religious beliefs, and rituals

People in Mamalad are generally very traditional, observing religious rituals when using their resources in the form of "pahinungod" or "pangamuyo". This is done by preparing two eggs and *tuba*, a local wine, and placing them in the river to pay tribute to the owner of the place. The farming system is organic-based. The planting, harvesting, and controlling of pests and diseases are very indigenous, as shown by the use of the *lihi* method. They usually plant root crops during high tide to have a vigorous growth of smooth, sweet, and palatable sweet potato. In harvesting corn, they take three ears first before harvesting the whole area, to give thanks for the bountiful harvest. Indigenous practices in the processing of corn and rice are also observed. The LGU, however, still provide the barangay with a milling machine. A way of storing food like "dumyang sa salog" is also practiced.

Generally, people in Mamalad also use herbal plants as medicines.

Manifestations of cultural beliefs and norms

Beliefs, superstitions, and rituals are manifested in their farming systems. Farmers have standard norms/beliefs regarding the minimal cutting of trees and the *kaingin* system which they believe will destroy some organisms present in the fertile soil.

Farmers' traditionalism

The majority adheres to traditional practices because to them, "kinaraan" (the traditional) proved to be more productive.

Traditional forms of labor cooperation

Local labor pattern such as *hunglos* is generally observed because this system does not morally require one to return the services of other people, although he may do so if he likes. However, the service is usually reciprocated. On the other hand, members of the family, relatives, and kin also get involved in some cooperative labor activities.

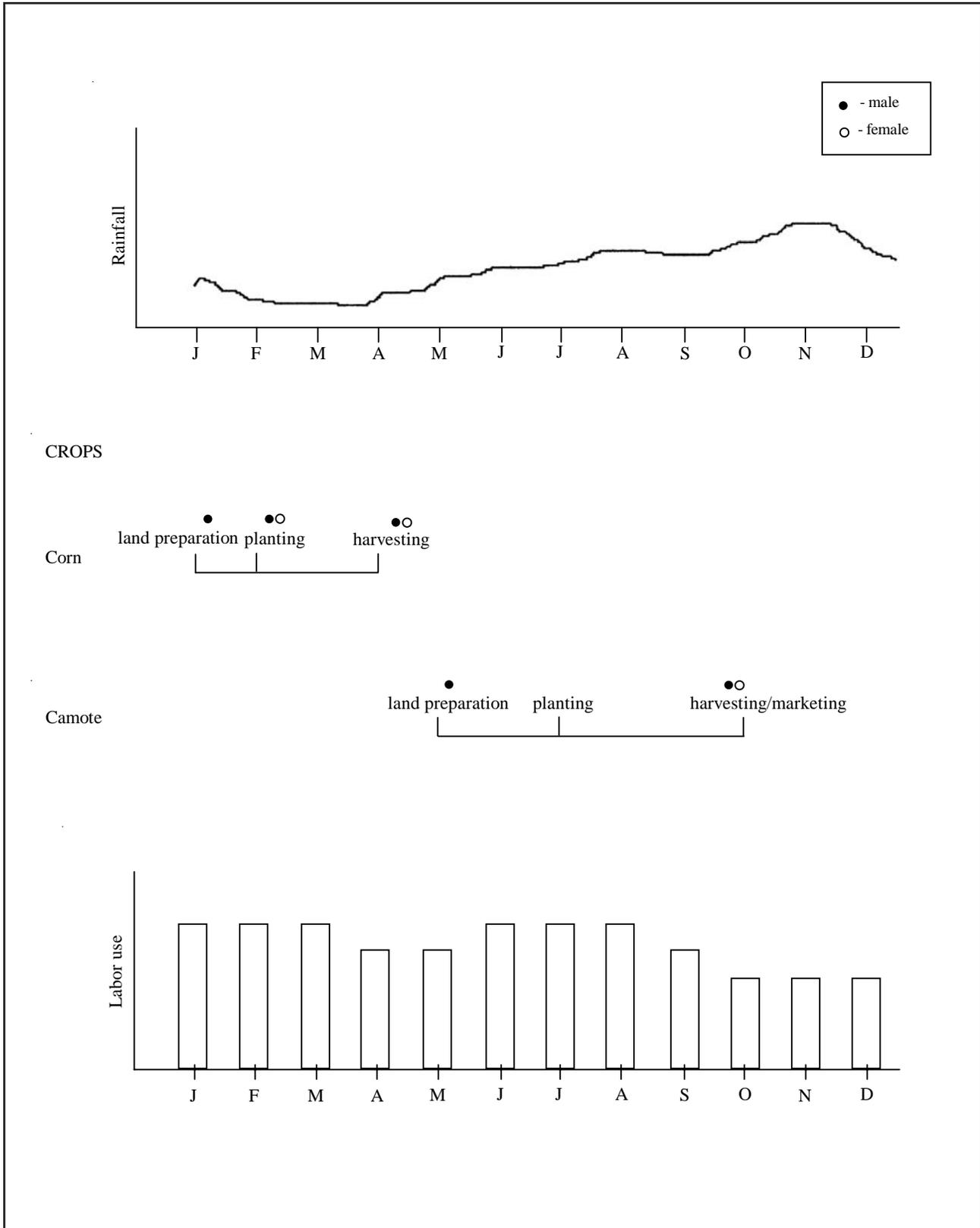


Fig. 41. Cropping calendar and gender relations in labor use in Barangay Mamalad, Calamba, Misamis Occidental.

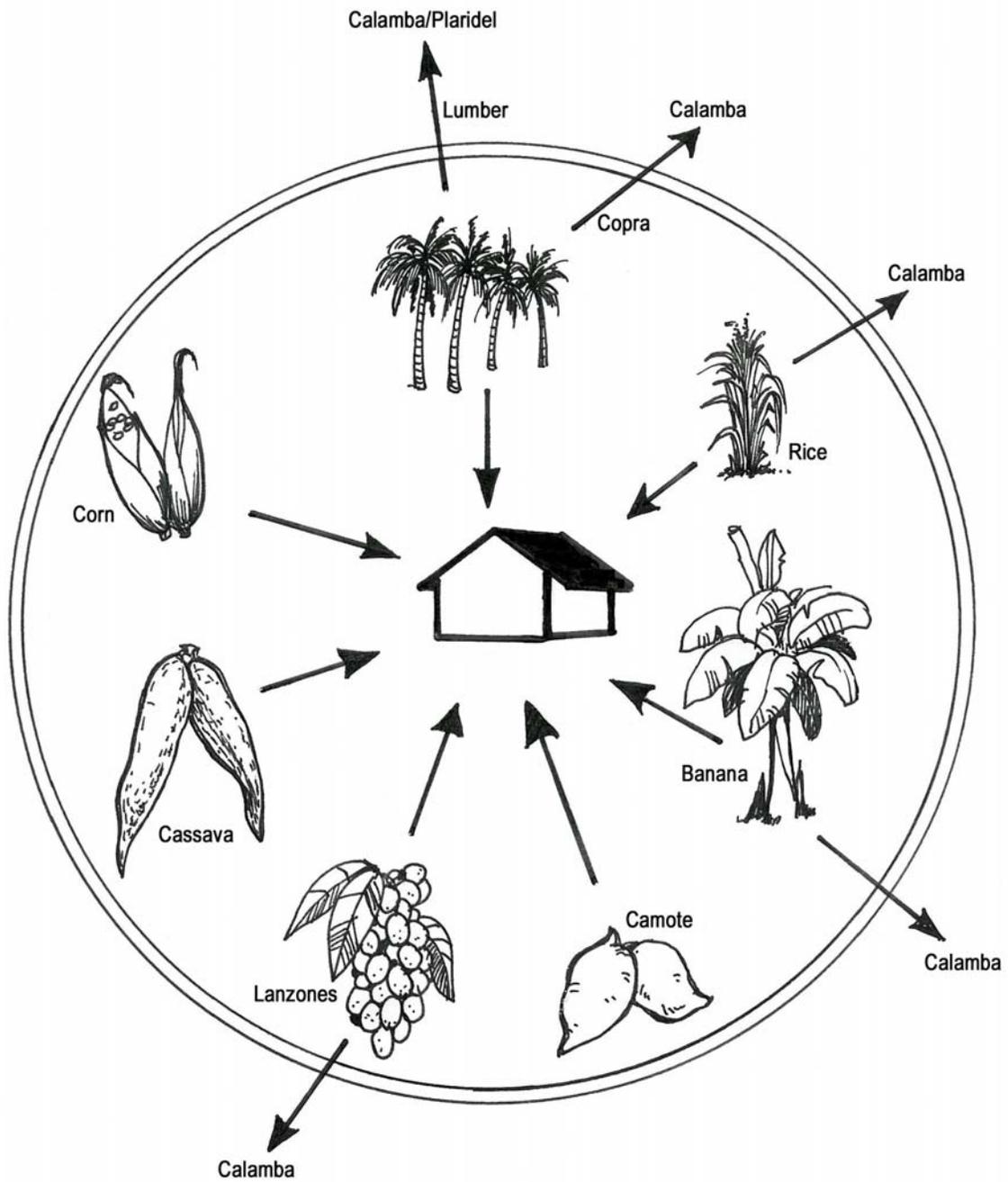


Fig. 42. Commodity flow in Barangay Mamalad, Calamba, Misamis Occidental.

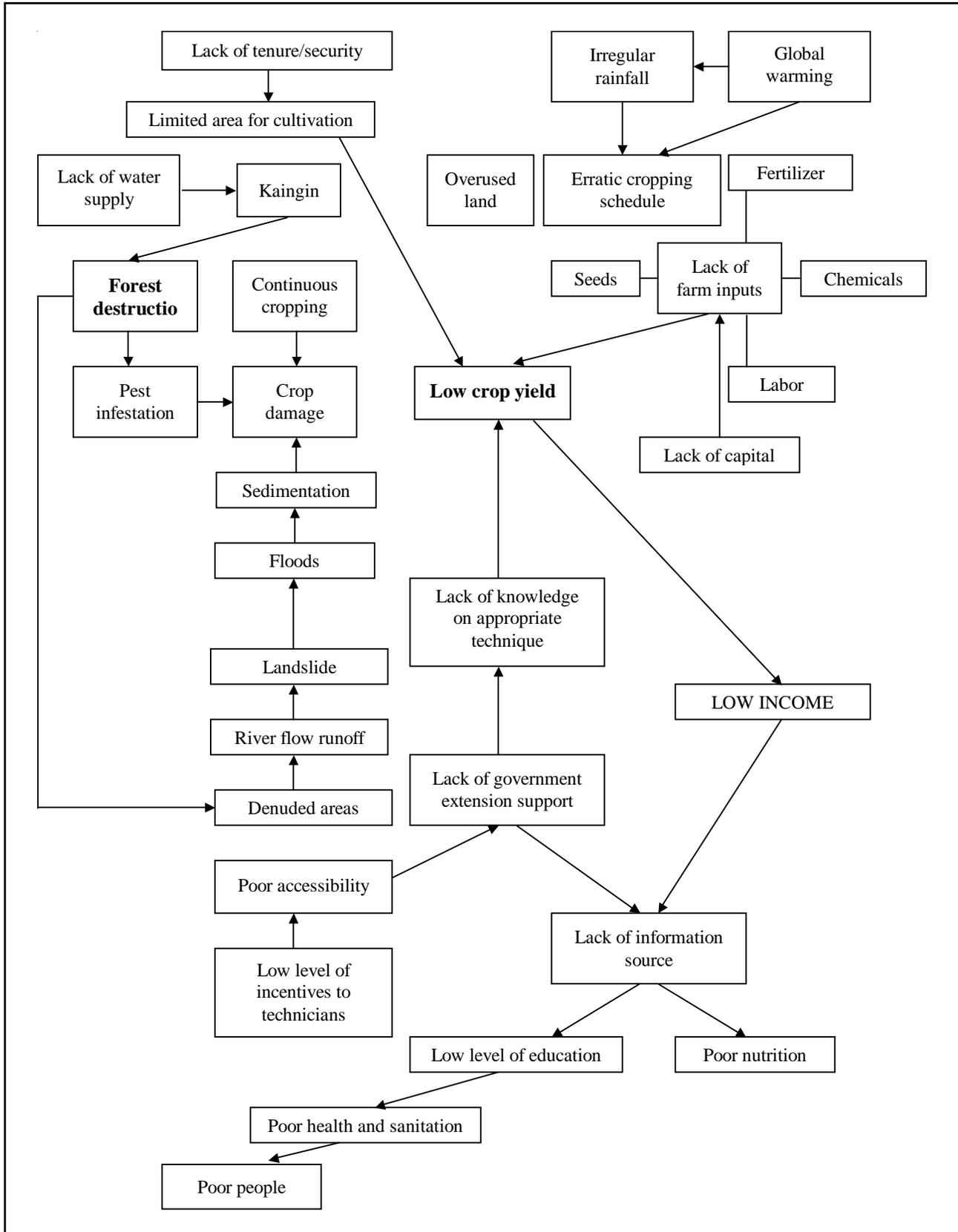


Fig. 43. Network analysis in Barangay Mamalad, Calamba, Misamis Occidental.

Desire for change/aspirations

Residents have high desire to improve their living conditions. They are even willing to adopt a combination of traditional and modern technologies for change, however, resources are limited to do so. Generally, poverty is a major constraint for change.

Support services

Barangay Mamalad has a strong support from the Zamboanga Peninsula Health and Extension Program (ZPHEP) because of the presence of specific herbal plants in the locality. Other government support extended are from the DA, LGU, and PCC, in the form of technical services.

Decision-making patterns

Decision-makers in the barangay are:

- a. Father/husband – as the immediate head of the family for domestic problems.
- b. Barangay captain – for the problems relevant to the community/barangay.
- c. *Timoay* – as head of the Subanons whose role also includes the conduct of religious rituals.

Leadership patterns and conflict resolution

There was no mention of any major source of conflict in the barangay since majority of farmers own their lands. The *Timoay* and the barangay captain have strong leadership in the community.

Communication flow and village network

Barangay communication flow starts from the barangay captain, to the secretary, to the barangay council through the Purok president, and finally to the people.

In the Subanon group, the communication flow starts from the *Timoay* and this goes through the barangay captain, and finally to the people. Generally, village network is done through the general assembly and the barangay captain acts as the channel of information.

Membership in community organizations

Brgy. Mamalad is a well-organized barangay as evidenced by the presence of POs, NGOs, and GOs. These are: Mamalad Farmers' Coop, Women's Organization, and the *Kilusang Samahang Nayan*. The major concerns of these organizations are to promote farming activities and proper use of resources.

Conservation policies/laws

Generally, the barangay has no tribal codes/rules on biodiversity conservation. However, barangay ordinances related to environmental protection are implemented such as policies against illegal cutting of trees and illegal fishing.

These policies are implemented by the barangay captain with the help of his council.

Ethnicity and migration

About 90% of the population is Subanon. Others may not be pure Subanon but are already mestizas or mestizos (locally called *libog*). This group of Subanons already adopt the local dialect known as Cebuano. Pure Subanons in the place could not be easily identified because they are already speaking the Cebuano dialect.

Attitudes and belief related to biodiversity

Barangay folks are receptive to biodiversity conservation in Mt. Malindang. Thus, they are willing to change their attitudes toward agro-ecological matters.

Barangay Sixto Velez (Sapang Dalaga, Mis. Occ.)

The barangay was named after its former municipal mayor, Mayor Sixto Velez, Sr. who was a former school teacher in Brgy. Medalyon Alto. Brgy. Sixto Velez used to be a sitio in Brgy. Medalyon Alto. As a school teacher, then later as mayor, the man was well-respected by the barrio folks.

a. Biophysical environment

Area and location

Brgy. Sixto Velez lies 8°27'48.96" N and 123°36'01.51" E. It is about 9 km south of Sapang Dalaga Poblacion. It is bounded in the north by Brgy. Medallo, in the east by Guinabut River and Brgy. Capundag, in the south by Brgy. Upper Salimpuno, and in the west by Tolon River. Its land area is 450 ha (Fig. 44).

Topography/slope and location

The barangay road from Poblacion Sapang Dalaga leading to Sixto Velez is very rough with slopes leading to the rivers. Its slopes range from 10 to 60%. Its elevation ranges from 430 to 450 m asl.

Roads/access

Access to the barangay from the Poblacion is very difficult due to rough roads. Because there are no drainage canals along the roadsides, gushing flood waters during downpours create erosion gullies on the road surface making it very rough and hardly passable. It takes about 45 minutes to drive the 9-km distance from the Poblacion to the barangay.

Land use patterns

Major land uses are: agriculture (64%), settlement (6%), reforestation area (10%), and secondary forest (20%). Coconut is the main crop grown. Corn is usually intercropped with root crops, but at the time of the PRA and the La Niña phenomenon, hardly any corn is grown. Some 10-15% of the corn fields was abandoned for some time and has become brush lands dominated by *malatungao*.

Soil conditions

Three samples were taken from this area and analyzed for pH, N, P, and K using the STK. Color and texture were also determined. The analyses showed that all soil samples were acidic although they have medium amounts of N and P and sufficient amounts of K. It was observed that the forced fallowing may have given the soil a chance to recover and accumulate more organic matter, the source of N and P. Soil colors are more oxidized indicating well-drained conditions. Soil erosion is also serious in some sloping and bare areas.

Climatic conditions

In the distant past, Sixto Velez had a rainfall that was evenly distributed throughout the year. Its wettest months are November and December, and the driest months, from February to March. Recently, however, the region experienced prolonged drought and unusually long rainy season which affected the farming activities of the barangay to a great extent.

Drainage, river systems and water availability

Barangay Sixto Velez drains to the NW to the Tolon River and NE to the Guinabot River. This barangay is very rich in water resources. It has five creeks and two springs in addition to the two big rivers. One of the springs has become the main source of potable water in the area. At PRA time, Sixto Velez has satisfied the level II category of water system availability. With a little more funding and initiative from the people, this abundant spring water will find its way to the different households of Sixto Velez.

Transect

The Sixto Velez transect runs from NW to SE direction (Fig. 45). In the NW end of the transect, the hilly and rolling terrain is dominated by coconut. Fruit trees like mango and mangosteen are common and in the opposite direction, rare and endemic plants like *tabon-tabon* and *tubli* are found. The transect showed

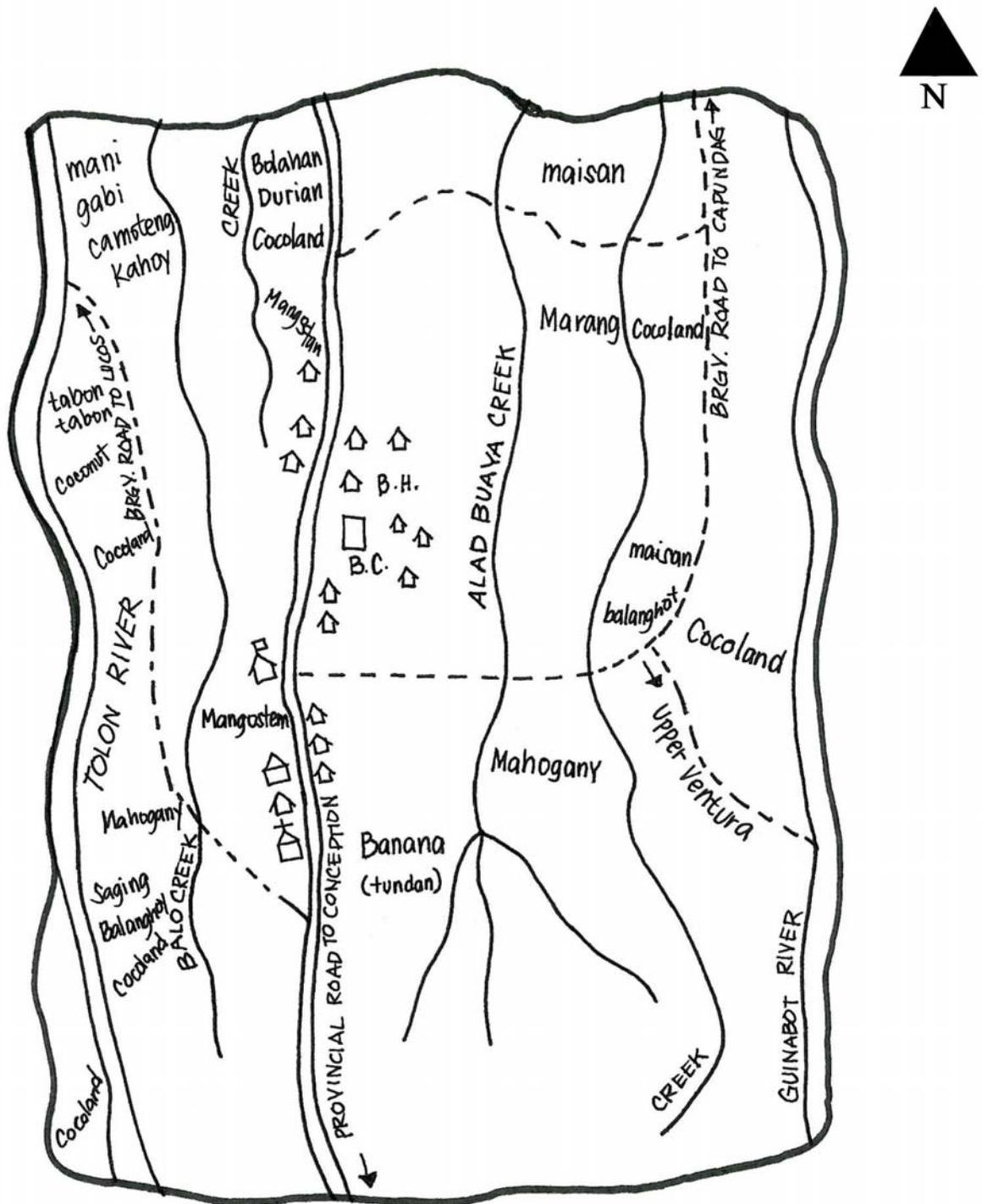
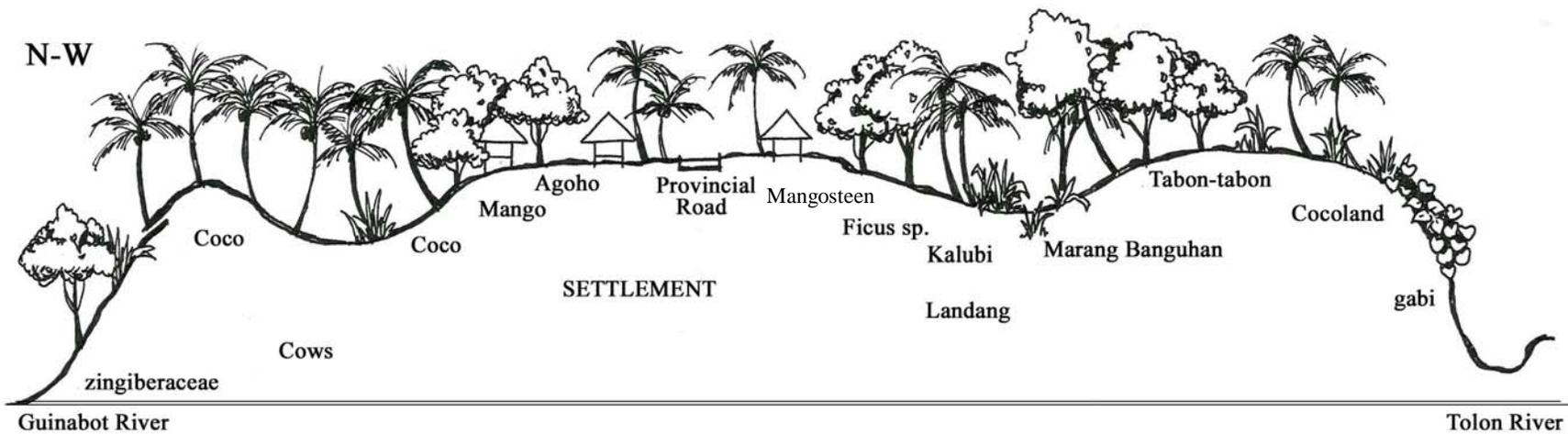


Fig. 44. Village and resource map of Barangay Sixto Velez, Sapang Dalaga, Misamis Occidental.



SOIL PROPERTIES

Texture	Heavy	Heavy	Heavy
Color	Dark yellowish brown	Dark yellowish brown	
pH	5.2	5.4	5.2
Nitrogen	Medium	Medium	Medium
Phosphorus	Low	Medium	Medium
Potassium	Sufficient	Sufficient	Deficient

Fig. 45. Transect map of Barangay Sixto Velez, Sapang Dalaga, Misamis Occidental.

the ruggedness of the terrain, the poor soil conditions and the absence of corn from one end of the barangay to the other. The rough topography highlighted the need for better and more appropriate practices that would make farming sustainable.

Biological conditions

Flora and fauna are still abundant in Sixto Velez. Rare species like *tabon-tabon* are still present. Occasional sightings of wild fauna like deer and chicken indicate that their habitat has not been completely destroyed and thus emphasize the need for protection and conservation. Lycopodium species are quite abundant as epiphytic ornamental plants.

Plant pests and diseases and their control

Among the plant pests and diseases identified are the coconut leaf miners and rats. The leaf miner eats on coconut leaves resulting in defoliation while rats eat the fruits/nuts which significantly affect yield. Control measures such as sanitation of the farm and mounting strips of plain G.I. sheets (about 25 cm wide) around the trunk to prevent the rats from climbing up the trees are taken.

b. Socioeconomic analysis

Demography

Population. Barangay Sixto Velez has a population of 430 people where 60% are males. The number of households is 74 with an average of six members. Population density is one person per hectare and the 0 to 14 age group dominates.

Fertility rates, mortality rates, and longevity. The average number of children is three and infant mortality rate is very low. Men have an average life span of 70 years while women have an average life span of 80 years.

Outmigration. Outmigration is high among men and women in their early twenties because of very limited job opportunities in the area. Outmigration pattern is towards the municipality of Calamba, the nearby cities of Oroquieta and Ozamiz and even to larger cities like Cebu and Manila.

Health. Fever, flu, and cough are common illnesses of children. Among adults, tuberculosis and other upper respiratory tract disorders, as well as hypertension are common illnesses.

Ethnicity. Most residents are migrants from Bohol, Siquijor, Cebu, Leyte, and from some municipalities of Misamis Occidental. There are no Subanon in the area.

Education. Majority finished only elementary education, while a few finished high school. A few were able to attend or finish college. Vocational training is not popular but there are those who opted to take vocational education than go to college.

Livelihood

People are dependent on coconut production for their livelihood. Corn and sweet potato are intercropped with coconut but these crops are generally for subsistence only. Alternative livelihood activities include employment as laborers in construction projects and carpentry. Some own and manage *sari-sari* stores.

Cropping pattern and gender relations in labor use

Figure 46 shows the cropping pattern for major crops produced, as well as the division of labor between men and women in the planting of these crops. The lean months and peak months of labor use are also indicated.

Labor availability and distribution

The lack of job opportunities and the scarcity of lands to cultivate led to unemployment, underemployment, and forced idleness. Farm activities are mostly done by members of the family. Hired labor is commonly resorted to especially during land preparation. Labor exchange or *hunglos* is still practiced but only by a few farmers.

Level of living and income

Most of the houses in the barangay are made of wood and nipa roofing. Electricity is present in the area and a few households own television sets, karaoke, refrigerator, and electric fans. Majority of the families earn income less than P3,000 a month and therefore live below the poverty threshold. Very few earn income of

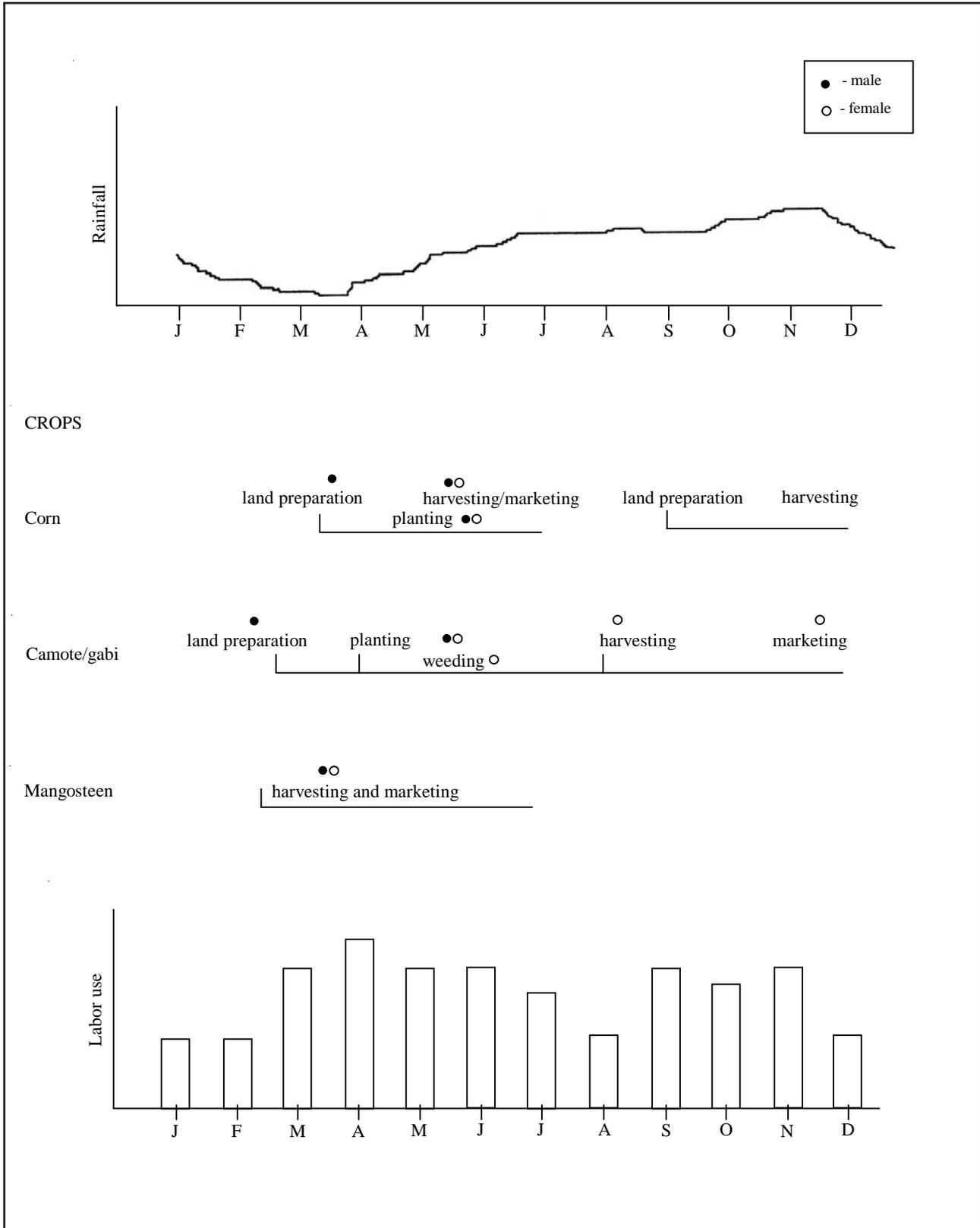


Fig. 46. Cropping calendar and gender relations in labor use in Barangay Sixto Velez, Sapang Dalaga, Misamis Occidental.

P8,000 to P10,000 a month. There are those who have larger lands or have off-farm employment.

Commodity flows

Coconut is the only product that moves out of the barangay. It is traded either through a middleman or directly to the nearby municipalities by the farmers. Basic commodities for consumption are main inflows to the barangays although some appliances are purchased by the relatively better off. Farm inputs also come in, particularly fertilizer, pesticides, and seedlings from nearby barangays.

Land tenure and landholdings

Most families inherited their farm lots while some are tenants of few absentee owners. Majority cultivate less than a hectare of farm land.

Government assistance

The barangay availed of a very limited assistance from DA and DENR in terms of technical and material support. As with the other barangays, the DSWD and the DOH also provide assistance.

Oral history

The oral history or timeline of the barangay, focusing on changes in the environment and agricultural landscape, is shown in Appendix Table 5.

Network analysis

The participatory network analysis is shown in Fig. 47. Low productivity is seen as the major problem by the residents as identified by the informants, members of people's organizations, and officials of the barangay.

c. Cultural setting

Indigenous practices, religious beliefs and rituals

Farming practice is associated with traditional and modern methods. Traditional method involves *lihi* in planting corn and sweet potato except for rice. In the use of resources like creek and spring, these traditional practices are

manifested through *diwatahan* or offering of food in the creek to pay tribute to the owner of the place.

Modern method of farming is associated with commercial fertilization. Storage and drying practices are done through *dumyang sa salog*, while milling is very creative and indigenous through the use of *galingan sa bato*. Some people ignore the use of herbal medicine, preferring to use commercial medicines.

Manifestation of cultural beliefs and norms

Cultural beliefs are manifested only in planting and harvesting through the *lihi* method, like they do in Tipolo and Calaran.

Farmers' traditionalism

Barangay folks still adhere to the old tradition in farming, but they are also receptive to new or modern methods.

Traditional forms of labor cooperation

Local labor pattern is in the form of exchange labor known as *hunglos*, *langkos*, or *balos-balos*. These practices are also common in Mamalad, following almost the same pattern.

Desire for change and aspirations

People in the community have high aspirations to improve their family living. They even aspire to have draft animals for continued cultivation in their land for subsistence. They wish for more improvement of road structures in their area.

Support services

Support services from the government are very inadequate. The barangay council confirmed that the support services have not been extended for the past five years. This problem is attributed to poorly maintained roads and inaccessibility of the barangay.

Decision-making pattern

On family matters, the decision is controlled by the father or husband as head of the family. The barangay captain makes decisions on the use of local resources such as water and spring.

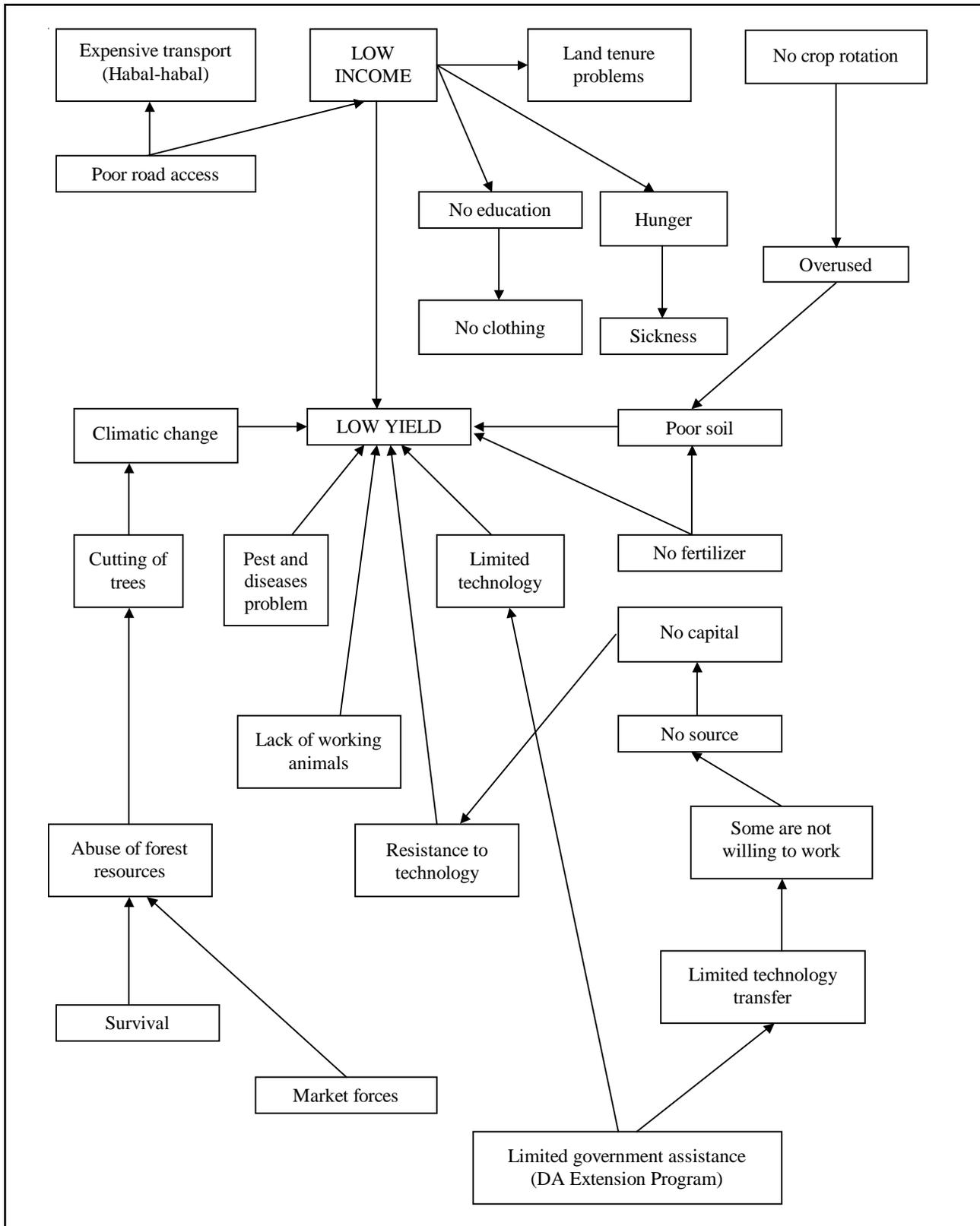


Fig. 47. Network analysis in Barangay Sixto Velez, Sapang Dalaga, Misamis Occidental.

Leadership pattern and conflict resolution

Major conflict usually arises from boundaries of residential lots. This is settled by the barangay captain. If not resolved, then this is brought to the DAR office.

Communication flow and village network

The flow of communication/information starts from the barangay captain to the secretary, then to councilmen through the Purok presidents, and finally to the people. Generally, the barangay captain acts as a channel of information.

Membership in community organizations

The barangay folks have a very limited number of organizations. They devoted themselves to one organization for women, to promote the livelihood program.

Conservation policies/laws

The community has its own barangay ordinances related to biodiversity conservation. These policies are common among the other barangays mentioned, such as policies against illegal cutting of trees and illegal fishing.

Barangay Siloy (Calamba, Mis. Occ.)

Official records show that the place was named after a well-known leader, Solito Apao, a Filipino-Spanish mestizo nicknamed Siloy. His leadership was recognized by the tribal leaders and he was said to have achieved a lot for the welfare of the settlers.

Moreover, some rural folks say that the place is home to a large number of birds locally known as *Siloy*. They say it is likely that Solito was nicknamed after the bird.

a. Biophysical environment

Area and location

Barangay Siloy is located on the southernmost part of the municipality of Calamba. It is bounded in the north by Brgy. Bonifacio, in the south by Mt. Amparo, in the east by Brgy. Mamalad, and in the west by Dioyo River. Brgy. Siloy has a total land area of about 973 ha. The barangay proper is located at coordinates N latitude 8°28'17" and E longitude 123°38'34" (Fig. 48).

Topography (elevation and slope)

The barangay has a hilly to gently sloping terrain. The elevation of Siloy ranges from 400 to 595 m asl. The slope of the land ranges from 15-20%.

Road/access

Siloy is accessible to Calamba in the north through the provincial road, which is not well maintained. Farm-to-market road is poor.

Land use pattern

Land uses are broadly grouped under four major categories: settlement (15%), agriculture (65%), reforestation areas (10%), and secondary forest (10%).

Soil conditions

Five soil samples were tested from Brgy. Siloy representing areas of different land uses. The samples were analyzed for pH, N, P, and K using

STK. The analysis showed increasing acidity as the soils were put into intensive agriculture (pH 4.4-5.8). Nitrogen ranges from low to high, P is low, K is deficient to sufficient. Soil color ranges from light brown to dark brown. Soil texture is heavy. Erosion of soils is relatively high at the hilly portion.

Climate

Brgy. Siloy falls under Type IV or Intermediate B type of the Corona System of Classification. This means that rainfall is more or less fairly distributed throughout the year. There is no pronounced dry season. The wet months are in November and December, the latter being the rainiest. The barangay is dry in March to April. The latter is the driest month.

Drainage, river systems, and water availability

Some creeks in Siloy drain towards the Dioyo River. The Mount Amparo range is the primary watershed catchment/source of Dioyo River. There is an on-going government dam construction project in Siloy.

Transect

A transect of Brgy. Siloy runs in the northwest direction. From left to right are the following features: Bunawan Creek, settlement, Loton Creek, Dioyo River, settlement, Momot Creek, Catipa Creek which flows to Mamalad and Candusan Creek. A dam project is undergoing construction in the Momot Creek (Fig. 49).

Biological conditions

There are rare and threatened species present such as the *Medinilla magnifica*, *Psilotum complanatum*, and *Tmesipteris lanceolata* (Figs. 50 and 51) near Mt. Amparo where a 50-ha reforestation project by NIPAP is established. Wildlife is also hunted near Mt. Amparo (Fig. 52).

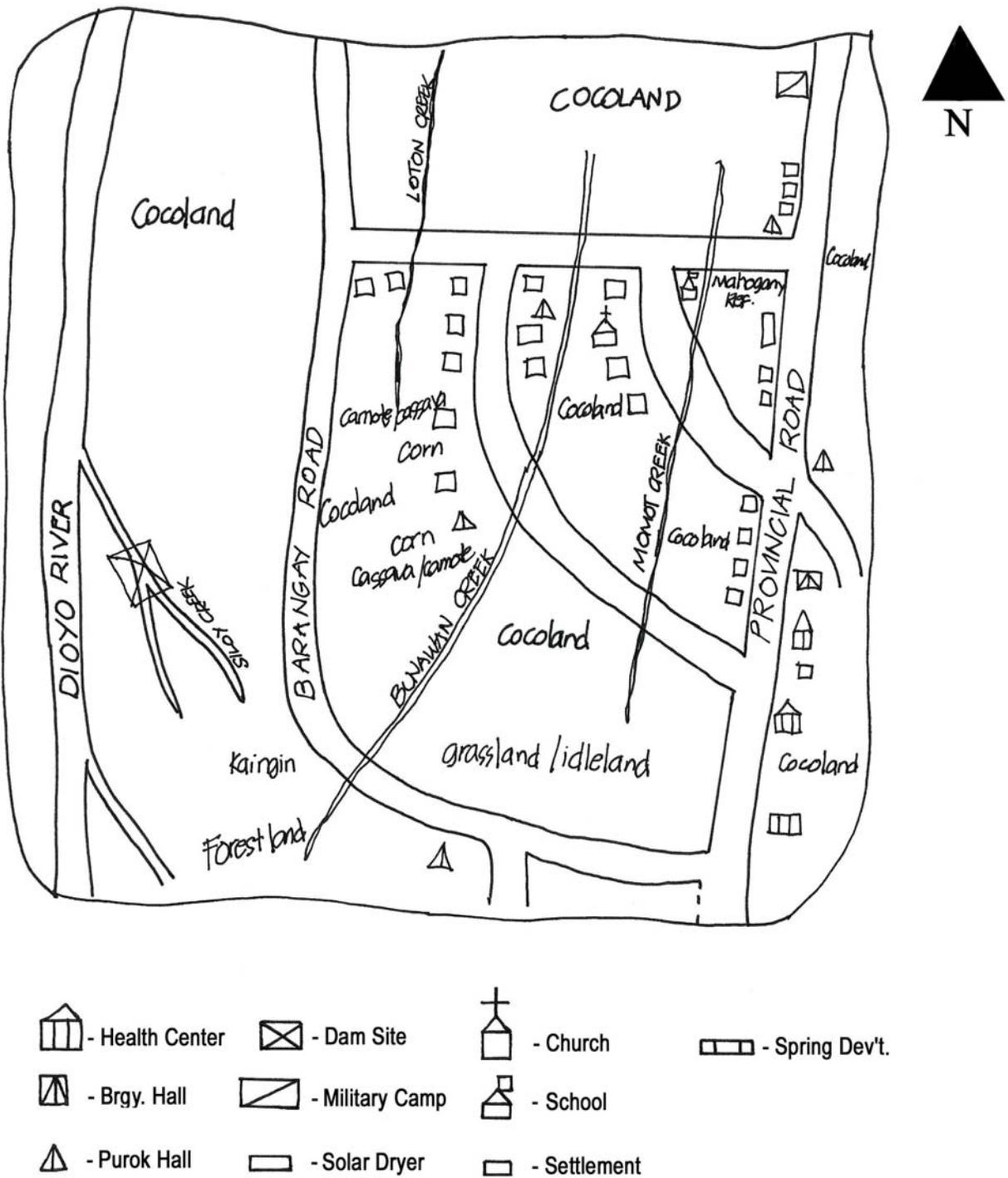


Fig. 48. Village and resource map of Barangay Siloy, Calamba, Misamis Occidental.

E-W

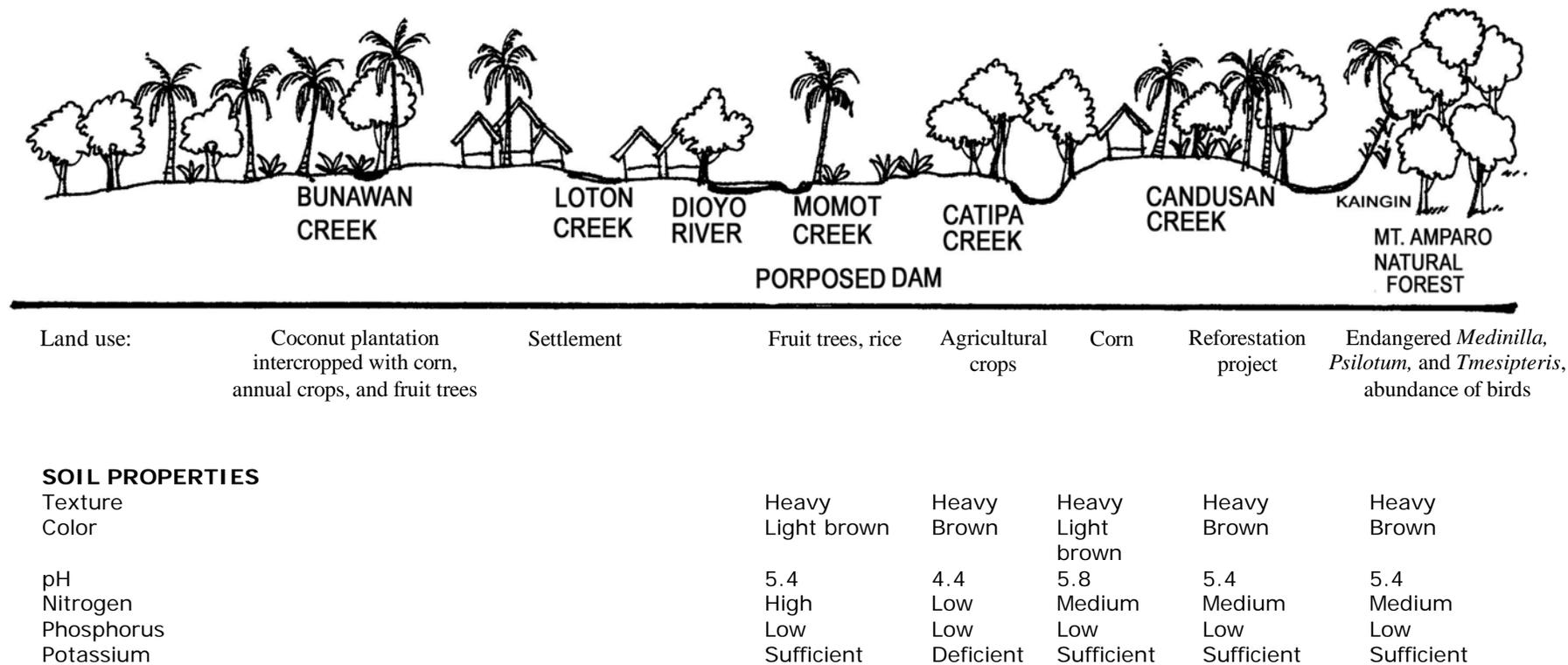


Fig. 49. Transect map of Barangay Siloy, Calamba, Misamis Occidental.



Fig. 50. Habit of the primitive, rootless vascular plant (*Psilotum complanatum*).

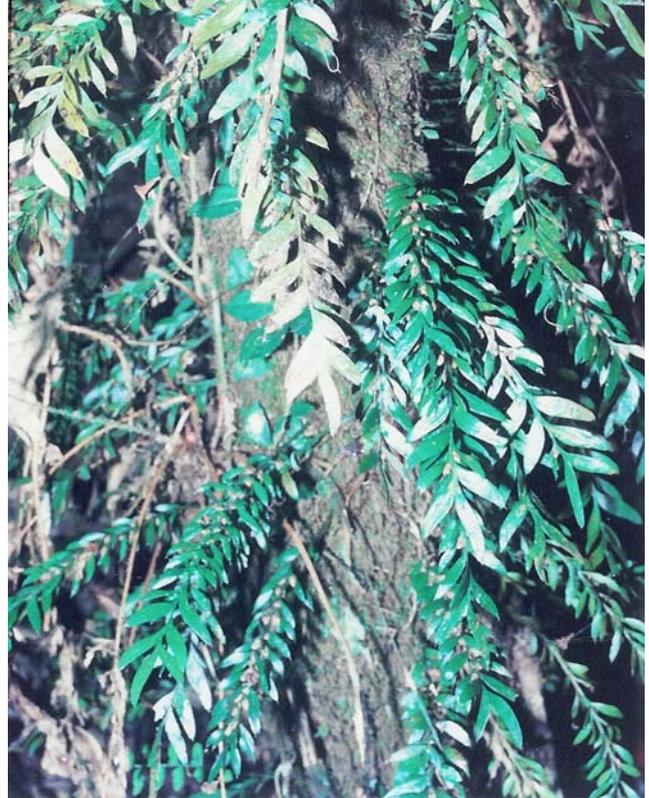


Fig. 51. Habit of threatened *Tmesipteris lanceolata*.

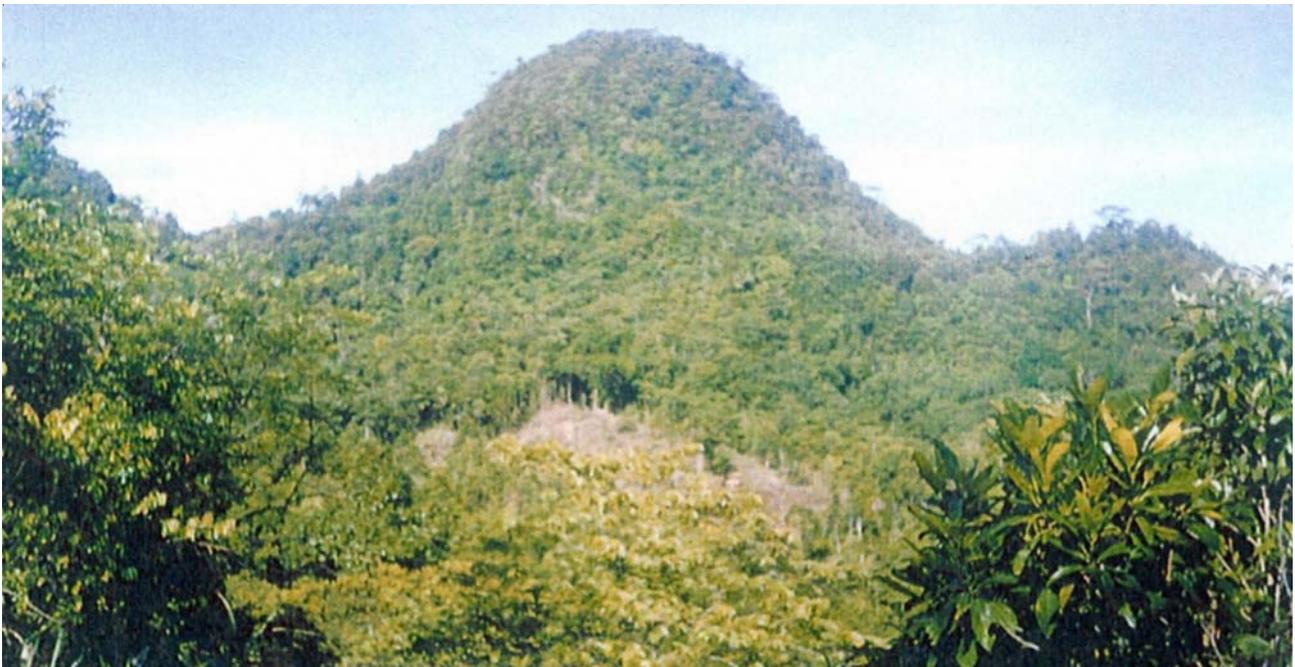


Fig. 52 . Mt. Amparo with its vegetation and range.

Plant pest and diseases control

For corn infestation, the indigenous farmer practiced the *lihi* system by planting *sagilala* plants in the field.

Cropping patterns/fertilizer use

The farmers practice intercropping and crop rotation. Corn and cassava are also intercropped with coconut.

b. Socioeconomic analysis

Demography

Population. Siloy has a total population of 775 during the conduct of the PRA. The number of households is 137 and the average household size is 6. Population density is about 1 person per hectare. The 15 to 64 age bracket also constitutes the highest grouping.

Fertility rate, mortality rate, and longevity.

By the time married women in the barangay reach 35, they already have 4-8 children, or an average of five. The mothers say this large number of children vis-à-vis poverty conditions are unintentional. The family planning program came rather late. Some practices have been reported to cause unwanted pregnancies and discomfort, and were therefore not well-accepted. Only isolated cases of infant deaths are reported. Men and women have more or less the same life span of 70 years. This is again a case of high birth rate and decreasing mortality rate, an explosive case of the use of space and resources if no interventions are made.

Outmigration. Outmigration is taking place but at a lesser rate, probably due to the very high percentage of Subanons in the area. Outmigration is mostly due to a marriage to an outsider, and occasionally to work elsewhere. Those who find jobs outside the barangay return to the place regularly.

Health. Respiratory tract infection is common in both children and adults. Potable water supply is currently difficult to access due to some problems with the pipes from the water reservoir. In the meantime, springs, creeks, and rain, have become water sources for both drinking and household needs. Due to this, diarrhea became prevalent. The Minimum Basic

Needs Survey conducted by the DSWD, meanwhile, reported that 63% of Siloy children have varying degrees of malnourishment. A food supplementation program is undertaken for intervention.

Ethnicity. Siloy is among the higher elevation areas of the study. As such, it is home to a large number of Subanons, comprising about 80% of the population. They have been acculturated, however, due to intermarriages and close interaction with in-migrants. The xenophobic attitude toward people not belonging to their group has apparently been eliminated. The rest of Siloy's population consists of people coming from Bohol and other municipalities of Misamis Occidental.

Education. Educational attainment is limited to elementary for most but there are those who were able to attend or are attending high school. High school education is quite expensive to them as Siloy is 9 km away from the Poblacion and the one-way fare is P9.00 (P1/km), with only the motorela, a type of motorcycle but with a larger capacity, serving as a public vehicle. The proportion of those who have attended and/or attending college is of the same number as those who chose vocational courses.

Livelihood

Copra is the main source of income. Some sell whole nuts. Game hunting is a source of income to a few remaining hunters of wild animals, but this has become an unreliable income source because of the diminishing wildlife and also because the area is now part of the NIPAP. The cutting and selling of unproductive fruit trees and coconut for lumber and furniture making add to the residents' meager income. Corn is the staple food and is grown basically for subsistence. Cassava and root crops are produced as food supplements. The potential for growing rice for commercialization is good due to the on-going construction of an irrigation dam.

Backyard piggery and poultry are being practiced. The residents consider livestock as a reliable source of contingent funds when the need arises.

Cropping pattern and gender relations in labor use

Figure 53 shows the cropping pattern for major crops produced as well as the division of labor done by men and women in planting these crops. The lean months and peak months of labor use are also indicated.

Labor availability and distribution

Labor is abundant and with skills that tend to match only the needs in the farms. Agricultural labor comprises 97%, leaving only 3% for the nonagricultural sector. Farm labor is mainly family labor. All able family members share in the work, thereby promoting intra-farm equity. *Hunglos* or labor exchange ranks second. The practice has become a moral obligation and ensures reciprocity and is therefore an important substitute for hired labor. Hired labor is the least preferred in the community because it requires money.

Level of living and income

Siloy is a depressed community with practically 90% of its population living below the poverty threshold and with income below P3,000 a month. Houses are made of timber from the nearby Mt. Amparo (but these have been stopped before Siloy became part of NIPAP), with the usual G.I. sheet roofing. Some houses are semi-permanent but many appear to be makeshift structures. Less than a handful have more than one bedroom and with defined parts of the house. While electricity and power lines have reached the area, only a few have connections. Radio is the most popular appliance and serves as a very good source of information and recreation. A few have television sets, electric fans, or refrigerators.

Commodity flows

Copra is the only product that flows out of Brgy. Siloy. It goes to Calamba either thru a middleman who collects it from the barangay, or the farmers directly sell it in Calamba. While farmers are also growing other agricultural crops such as corn, cassava, and sweet potato, these are generally for household consumption. Some residents use forest products, such as lumber

and wildlife, but not on a commercial scale. Important farm commodities such as fertilizers and basic household needs like corn, sugar, and other similar products enter the barangay from nearby municipalities (Fig. 54).

Land tenure and landholdings

Small landowners constitute the bulk of farmers. Their landholdings are mostly inherited, though a few bought lands. Tenants, likewise, consist of a large number especially that 60 ha of land, originally a sugarcane plantation and mill area, is owned by only one family. The number of tenants decreased, however, due to DAR's declaration of Siloy as an Agrarian Reform Community (ARC) in 1994, resulting in a change in status of some tenants to amortizing landowners.

Government and foreign assistance

Apart from being a protected area under EU-NIPAP and being an ARC, Siloy is also a CIDSS area. Environmental and human welfare are addressed at the same time in Siloy but it is not certain whether there is synergy created between and among the key assistance agencies. Landlessness which triggered the clearing of forests for settlements and agriculture is being addressed by CARP; poverty alleviation measures are being done by DSWD, the CIDSS program and other instrumentalities of government attacking low productivity issues like the DA and PCC. Environmental protection, with positive effects on livelihood and income, is the focus of EU-NIPAP and DENR.

Oral history

The oral history or timeline of Brgy. Siloy, focusing on changes in the environmental and agricultural landscape is shown in Appendix Table 5.

Network analysis

The participatory network analysis is shown in Fig. 55. Low farm productivity is seen as the major problem by the residents as identified by informants, members of people's organizations, and officials of the barangay.

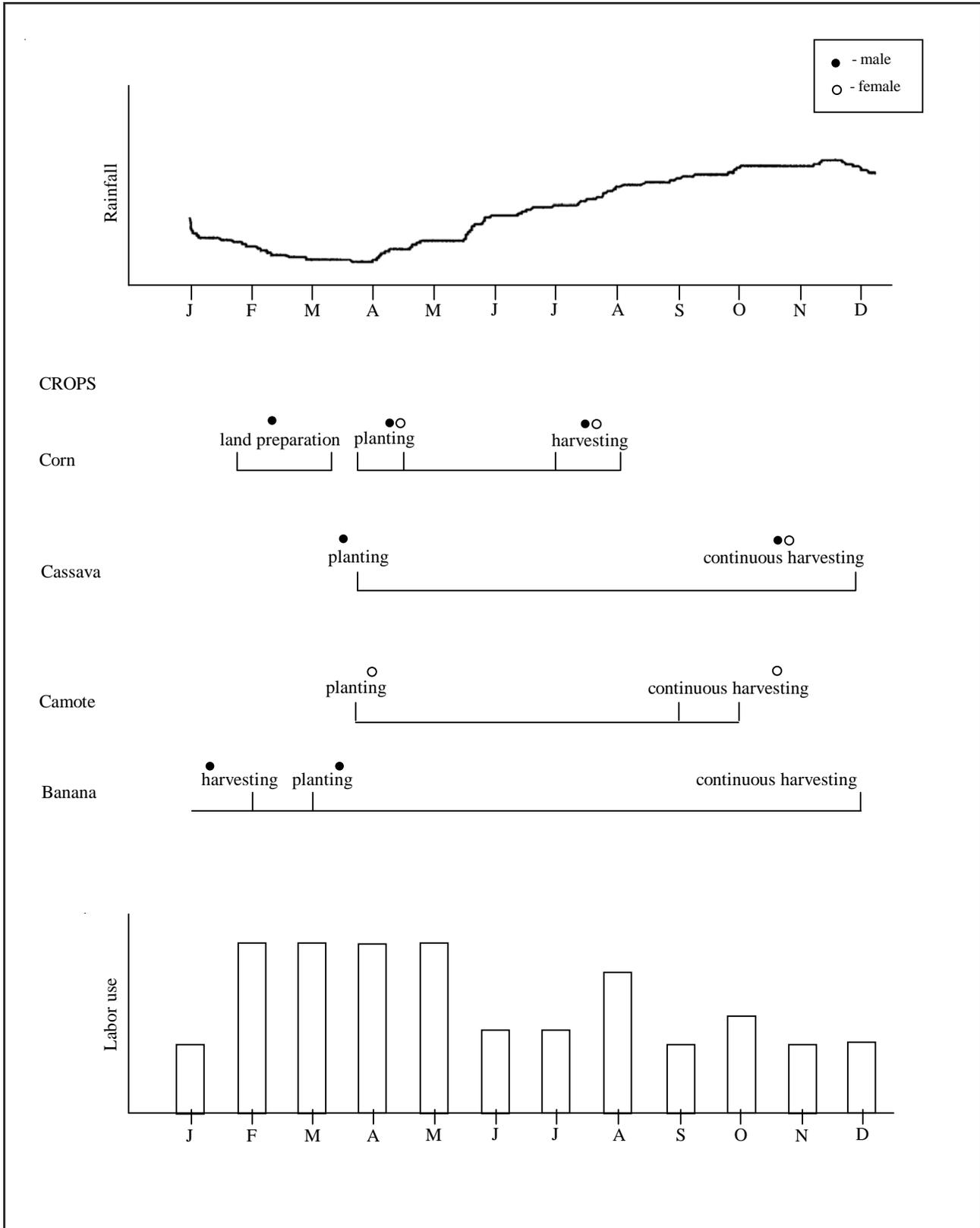


Fig. 53. Cropping calendar and gender relations in labor use in Barangay Siloy, Calamba, Misamis Occidental.

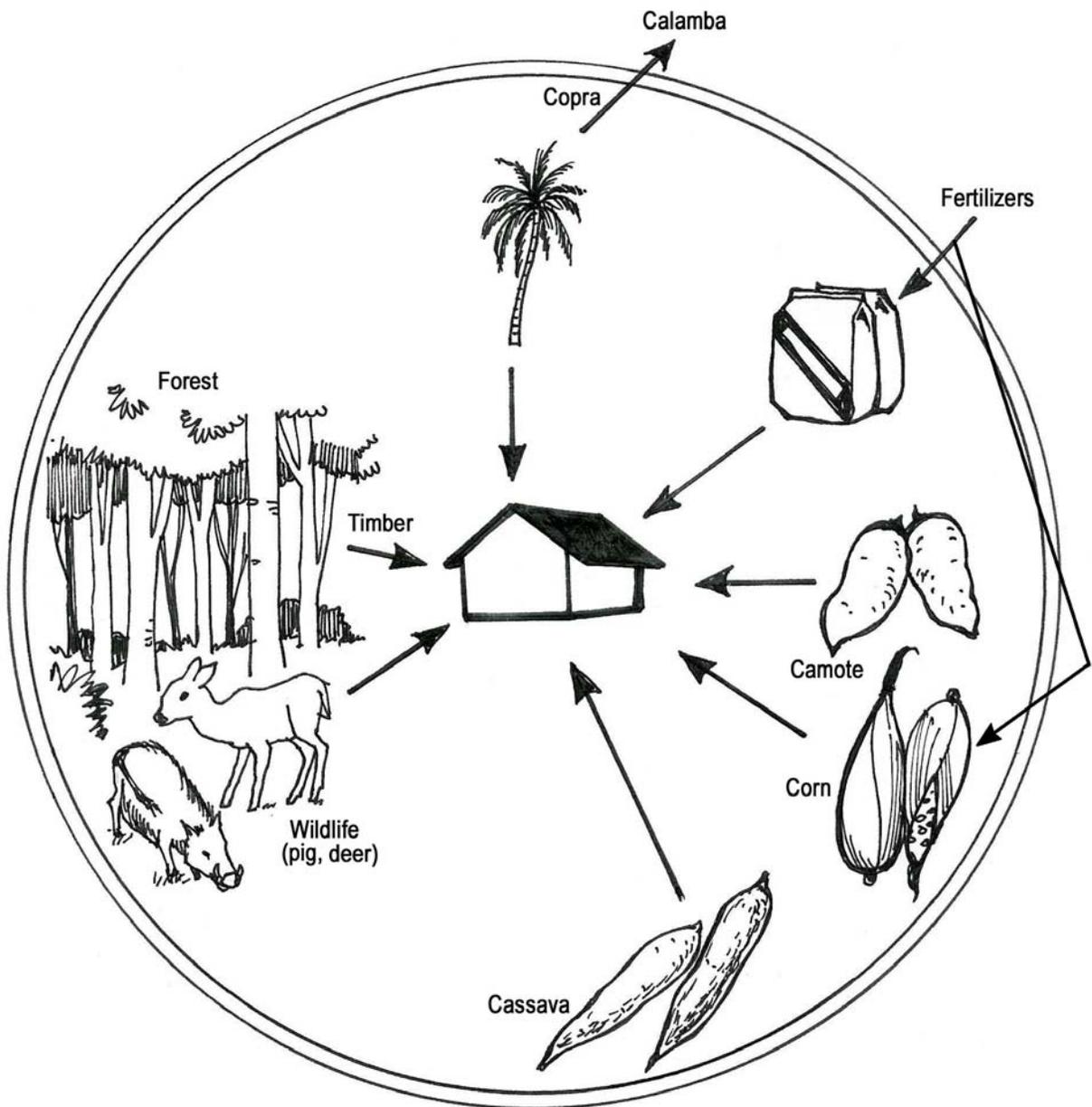


Fig. 54. Commodity flow in Barangay Siloy, Calamba, Misamis Occidental.

c. Cultural setting

Indigenous practices, beliefs, and rituals

Inhabitants of Brgy. Siloy still practice indigenous farming practices. This locality is a forested area, located close to Mt. Amparo within the vicinity of the Mt. Malindang range. People involved in agricultural activities produce crops on a subsistence level. Poor soil condition and lack of or limited resources are constraints to bigger production.

Rituals relevant to farming are conducted by the Baylan or Sorohano. However, these rituals have been minimized with the presence of several religious groups and the migration of local inhabitants to cities like Oroquieta and Ozamiz, and through marriages outside.

Manifestations of cultural beliefs and norms

Cultural beliefs and practices influence the farmers' agricultural activities. Local people still practice the *lihi* in farming to anticipate bountiful harvests and for pests/diseases not to infest their farms. These traditional practices and beliefs are also manifested in nonfarming activities. They have indigenous methods of storing vegetables and root crops and corn is milled using the traditional corn grinder called *galingan*.

Farmers' traditionalism

Inhabitants of Siloy are very traditional in their ways of living probably due to very limited resources and their Subanon orientation. This is one of the depressed areas that our team has gone into and observations would show that people here are impoverished.

Traditional forms of labor cooperation

Family labor is the most common type of labor arrangement in Siloy. Family members till the field and harvest the crops. Contribution of each member is significant to provide for the family needs.

Except on a few occasions, the *hunglos* (labor exchange) is not adopted. The *pahina* (community labor) is performed by local

residents when clearing or building their barangay hall, or constructing a service road in their locality.

Desire for change/aspirations

The inhabitants of Brgy. Siloy appear to be contented with life. From actual observations, it appears that they have no perception of a better future. A few families, however, send their children to nearby schools but hardly a few actually become professionals.

Support services

Brgy. Siloy needs support for a potable water supply. Drinking water is taken only from a spring. Roads are very poor and seldom traversed by available transportation. People often walk to the town center, Calamba. Market support for farm products is very minimal, hence, people in Siloy have difficulty transporting their products to the town center.

Decision-making patterns

Heads of the household decide on family affairs. However, the health and condition of children is the primary concern of housewives. The decision to buy food and medicine relies heavily on both the husband and wife. As mentioned earlier, their decisions are highly influenced by their financial condition and available resources. Among tenants, their decisions are largely made by their landlords.

Leadership patterns and conflict resolution

The barangay captain and the *Timoay* hold the rein of the village leadership. Their influence is largely manifested in the settlement of conflicts among their constituents. In terms of authority in implementing government laws and policies, the barangay captain is at the forefront of implementation. However, on matters related to tribal codes, values, and customs, the *Timoay* is the central figure.

Conflicts in Brgy. Siloy often arose from use of land resources (issues on boundary and ownership) and violations of the Subanon tribal laws and culture. These are, however, settled by the *Timoay* and the barangay captain following appropriate methods.

Communication flow and village network

The barangay council is the major source of information. The communication network is largely interpersonal.

Among the Subanons, however, information flows via the village influentials and the elders of the tribe. This information often pertains to customs and special traditions to observe. The barangay captain communicates with local officials at the town center via the handheld radio.

Community organizations

Like in other localities, people in Brgy. Siloy organize themselves for mutual cooperation, fellowship, or to express their collective views on issues affecting their community.

Siloy is an agrarian reform area and a number of the people are beneficiaries of the program. The beneficiaries have formed the Siloy Agrarian Reform Beneficiaries Association (SARBA). Other farmers' organizations are also present in addition to organization on the protected areas under the DENR, the NIPAP, and others. These organizations support the biodiversity conservation efforts of the government.

Conservation policies and laws

The inhabitants of Siloy are aware of the laws and policies prohibiting the practice of *kaingin* and massive cutting of trees. The DENR and the NIPAP have offices in Siloy and people are more or less exposed to the activities that the DENR is undertaking in the area.

The presence of hunters did not escape the researchers' attention. When asked whether hunting is allowed, people said they hunt for "wild pigs" and "wild monkeys" since these animals are detrimental to their cornfields and other vegetation.

Local ordinances and laws under the DENR have not been well implemented. There are still evidences of illegal cutting of trees, collection of orchids and wild plants for ornamental use, and selling of wild birds caught in the forest.

Ethnicity and migration

The population of Siloy is more than 80% Subanon. Interviews with local residents show that these Subanons actually migrated from the uplands near Mt. Malindang. They migrated for economic reasons and for the government's restriction on "slash and burn" or *kaingin* farming activities.

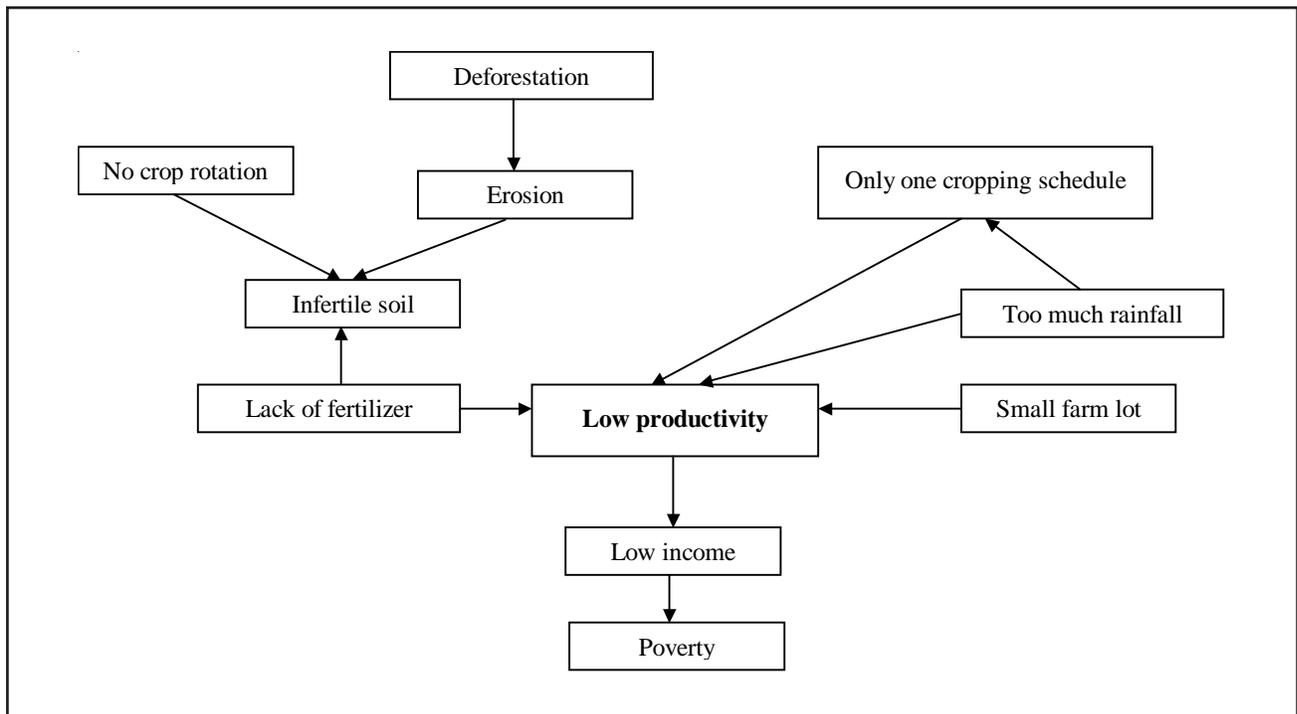


Fig. 55. Network analysis in Barangay Siloy, Calamba, Misamis Occidental.

Barangay Sinampongan (Aloran, Mis. Occ.)

Sampong means some sort of a cover. The place came to be called "Sinampongan" because it was covered by thick forest during earlier times. The place also served as a cover to a much thicker forest above it.

a. Biophysical environment

Area and location

Brgy. Sinampongan is 12 km southwest of Aloran Poblacion. It lies 8°23'30.69" N and 123°42'59.29" E. Its total land area is 1,500 ha.

Topography/slope and elevation

The study site is rolling to rough with slopes ranging from 10 to 35%. Its elevation ranges from 425 to 610 m asl.

Roads/access

The 12-km barangay road to Sinampongan from Aloran is very rough. Public transport going to and from Sinampongan is very limited.

Land use patterns

Land use for Sinampongan is grouped as follows: agriculture (40%), settlement (10%), reforestation area (10%), and secondary upland forest (40%). Agriculture used to be corn-based, corn being the people's staple food. However, due to poor soil, corn does not produce ears anymore and the people shifted to cassava and sweet potato. These root crops have now become the people's staple food. Through the help of PIPULI, a few farmers are now planting crops and adapting contour farming technology (Fig. 56).

Soil conditions

Four soil samples were taken from the selected areas of varying land uses in Sinampongan. The samples were analyzed for pH, N, P, and K using the STK. Color and texture were also determined. The analysis showed that all soils are very acidic.

The N content is low, the P is medium, and K is generally sufficient. Soil color is dark yellowish brown which means that the soil is well drained. Key informant said that farmers in the barangay are using the sloping agricultural land technology (SALT). The rest of the farmers adopt the "wait and see" attitude.

Climatic conditions

Sinampongan belongs to the Type IV climate following the Modified Corona's Climatic Classification. It is characterized by an evenly distributed rainfall throughout the year. The key informants said that the wettest months are in November to December, and the driest months are from March to April. Recently, however, the region experienced prolonged drought and prolonged rainy season which affected the farming activities of the barangay to a great extent.

Drainage, river systems, and water availability

The barangay has a very rich water resource. It has the Pines River, three creeks (Dumial, Atok, and Babag), and two springs. Water in the spring is collected and distributed to the barangay by gravity through communal faucets. Sinampongan drains to the southeast to the Dumial Creek leading to the Aloran River. It also drains northeast to the Pines River.

Transect

A transect runs following the northeast-southwest direction. The traverse was reckoned from the upper portion of the secondary forest (40%) passing by Atok Creek, Dumial Creek, and Gibon Brook. Reforestation species were planted in the settlement area. Heading towards Pines River, the traverse cuts across subsistence farms planted to sweet potato, cassava and mangosteen, and the SALT farm planted to high-value vegetables. Across the river is another secondary forest with very steep slopes (Fig. 57).

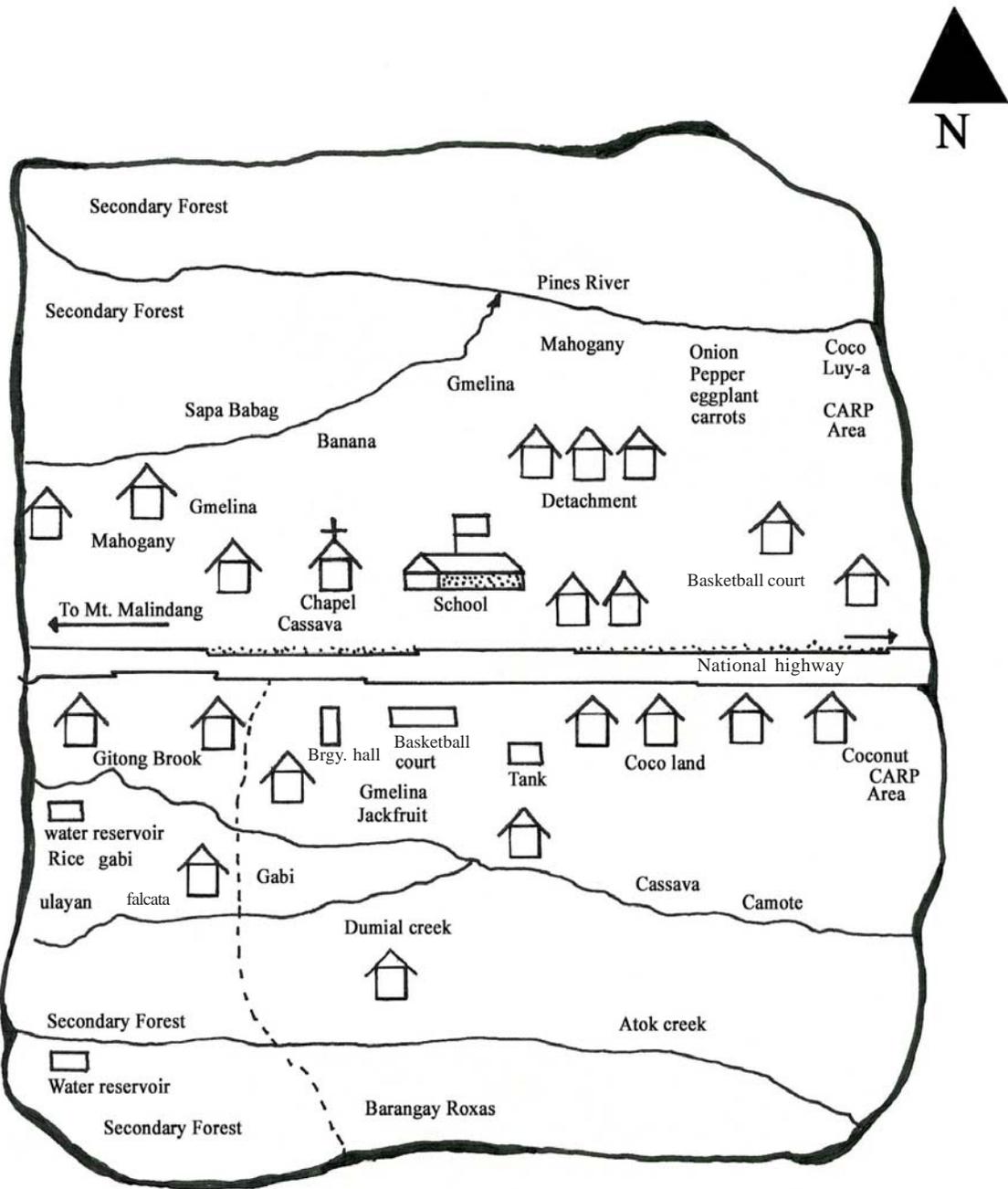
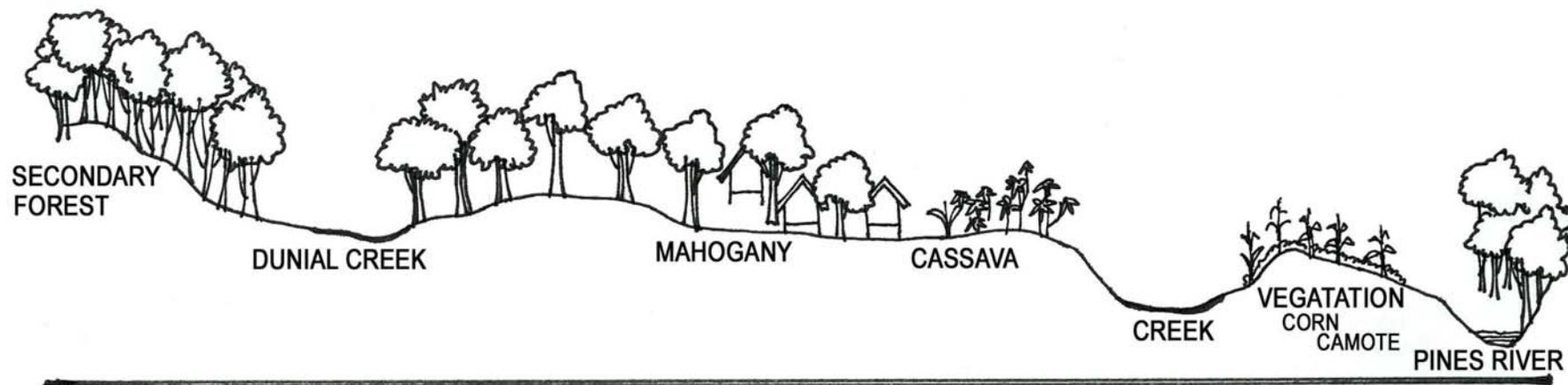


Fig. 56. Village and resource map of Barangay Sinampongan, Aloran, Misamis Occidental.

E-W



SOIL PROPERTIES

Texture	Heavy	Heavy	Medium	Heavy
Color	Dark yellow brown		Brown	Brown
pH	5.4	5.2	5.4	5.4
Nitrogen	Low	Low	Low	Low
Phosphorus	Medium	Medium	Medium	Medium
Potassium	Deficient	Deficient	Sufficient	Sufficient

Fig. 57. Transect map of Barangay Sinampongan, Aloran, Misamis Occidental.

Biological conditions

The reforestation species like Gmelina and large-leaf mahogany were growing well near the provincial roadsides and periphery. There is a very good reproduction and natural regeneration of primary forest species. This abundant growth is threatened primarily by firewood collectors who harvest young trees of *Anilao*. The establishment of SALT farms initiated by the PIPULI Foundation through the support of the Foundation for Philippine Environment (FPE) is a welcome development. It has improved productivity of their farms. In the lower portion of Sinampongan, coconut trees are slowly cut for lumber. The establishment of a Subanon settlement site in the buffer zone of the Park might influence the natural regeneration of the nearby secondary forest. Patches of land were burned or opened for agricultural production near the water reservoir. This unhealthy practice led to the emergence of grasslands within the periphery of the secondary forest. The barangay road leading to Brgy. Roxas provides open access to the secondary forest. Lumbering is very rampant along the upper slopes.

Plant pests and diseases and their control

Subsistence farmers are now planting cassava and sweet potato instead of corn for their staple food source. These root crops are relatively resistant to pests and diseases. A few vegetable fields that are planted to pechay, carrot, and bell pepper are using the IPM. Chemical pesticides are rarely used.

Cropping patterns

Majority of the subsistence farmers in the barangay practice monocropping and care less about crop rotation. At least, as of PRA time, two farmers are adopting the SALT as introduced by PIPULI.

b. Socioeconomic analysis

Demography

Population. There are 94 estimated households with an average of 6 members, an estimated population of more than 500. The population density is only 0.4 person per hectare. The population is composed mainly of very young people who belong to the 1 to 14 age bracket.

Fertility rate, mortality rate, and longevity.

Fertility rate is quite high. Couples seem unmindful of spacing their children. Only one infant died during the last two years and people live for 70 years on the average. There are more widows than widowers, implying that men die younger. Population growth rate is high, gauging from the high fertility rate and a low mortality rate. The rapid population growth can be expected to exert great pressure on resource use and space.

Outmigration. Outmigration is high due to the unavailability and/or relatively small farm sizes. The low farm productivity is another factor for outmigration. Outmigrants are mainly young men and women eager to have a better life in the cities. It is not unusual to find more than one member of the family who has left the place in search of the proverbial greener pasture.

Health. The barangay being partly a protected area, enjoys an abundant supply of water coming from the springs. The supply of potable water is more than enough to provide the domestic needs of the small number of people who share the Level II water system.

There are several cases of people with enlarged goiters in the area due to lack of iodine. This is largely attributed to the fact that the area is very far from the sea and the residents are financially constrained to avail of iodine-rich seafood. Moreover, respiratory diseases have also been reported to affect both young and old residents.

Education. Majority have finished only elementary education since the barangay is far from municipalities with secondary high schools. The residents send their children to school hoping that the children would gain more knowledge and widen their opportunities for future employment.

Livelihood

The residents are dependent on their farm products for consumption. Very few ventured into vegetable production for commercial purposes. Also, some gathered forest products such as small trees for fuelwood and rattan for furniture which are sold to nearby municipalities.

Cropping pattern and gender relations in labor use

Figure 58 shows the cropping pattern for major crops produced, as well as the division of labor between men and women in the planting of these crops. The lean months and peak months of labor use are also indicated.

Labor availability and distribution

Labor in the farm is commonly shared by members of the family. The predominance of Subanons sustains the cultural labor practices of the people while their limited financial capability constrained majority of them from hiring labor to work in the farm.

Level of living and income

Sinampongan is a young village. Its current residents are mostly in-migrants who settled there in the 1960s, 1970s and some as recent as the 1980s. Houses are made of good quality wood from the forests such as tanguile and G.I. sheets for roofing, but these are mostly for one to two rooms only.

Rice is eaten only during special occasions; sweet potato and cassava do not only serve as supplements but also substitutes. Compared with other barangays, Sinampongan has no electricity. Hence, one cannot find electric posts on the streets or electrical gadgets and appliances in the households. Instead, very young children are found everywhere. Water is sourced from a communal faucet located near the solar dryer which also serves as a basketball court. Communication with other barangays and with the municipal leadership is difficult. The barangay captain still has to go to the Poblacion to have his handheld radio recharged.

Commodity flows

Most of the agricultural products in Sinampongan are for household consumption. However, high-value vegetables such as pechay, bell pepper, and carrots are directly sold by farmers to Oroquieta to purchase other needs of the family. Small quantities of copra are also sold in Oroquieta and Aloran. Trees cut for fuel wood are sold very cheaply through the middlemen; rattan gathered from the nearby forest are made into pieces of furniture and

sold also in Oroquieta. Inflows consist of basic household consumption commodities like rice and corn, and construction materials. Farm inputs such as organic and inorganic fertilizer come from adjacent municipalities (Fig. 59).

Land tenure and landholdings

Many farmers are beneficiaries of the CARP. They cultivate lands ranging from one to three ha. There are a few absentee owners of more than 5 ha of land. Those who do not own land cultivate borrowed lands from the absentee owners without any crop sharing arrangement. Mutual advantage is gained by the absentee owner and the farmer cultivator in this type of setup: the owner need not worry about clearing the land or it being occupied by squatters; the cultivator, meanwhile, grows agricultural crops for family subsistence. Problems may arise, however, when the owner himself starts tilling the land and evicts the borrower.

Government and nongovernment assistance

Assistance programs extended by the government to the barangay consist of land redistribution thru CARP of DAR and the monthly visit of the midwife/health worker of the DOH.

The DENR also police the protected area. Nongovernmental assistance is provided by the FPE and the PIPULI Foundation. These NGOs introduce and support sustainable and environment-friendly farming technology such as SALT, use of organic fertilizers and pesticides. Credit is also being extended which is channeled through the people's organization/cooperative called Kahugpungan sa mga Mag-uuma sa Sinampongan or KAMAS. Loans are extended and repaid with trees. This is some sort of debt-for-nature swap. Moreover, a certain percentage of the loan is remitted to KAMAS for capital build-up so the organization will be self-reliant in the future and the community-based debt-for-nature swap becomes sustainable.

Oral history

The oral history or timeline of Sinampongan, focusing on changes in the environmental and agricultural landscape is shown in Appendix Table 6.

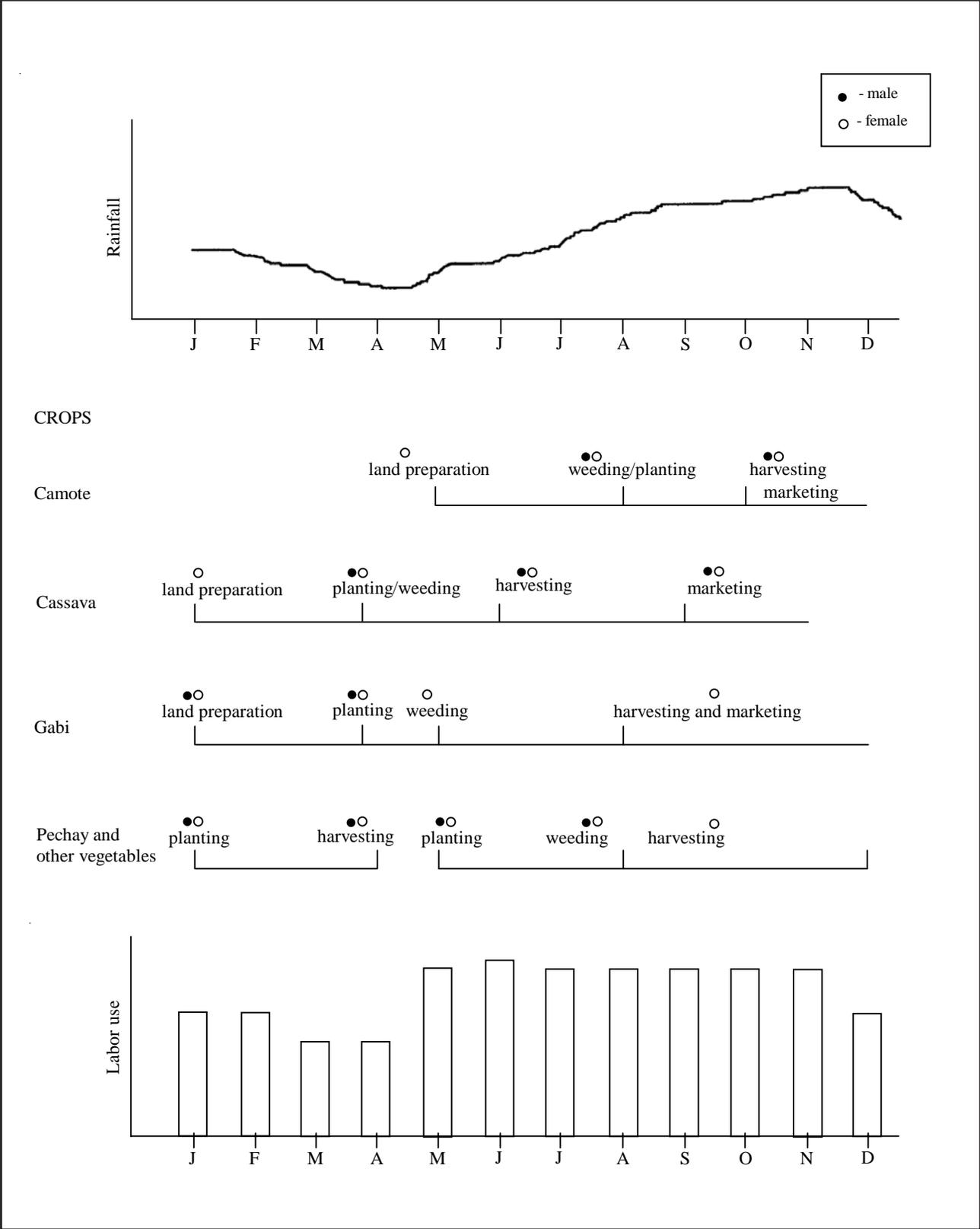


Fig. 58. Cropping calendar and gender relations in labor use in Barangay Sinampongan, Aloran, Misamis Occidental.

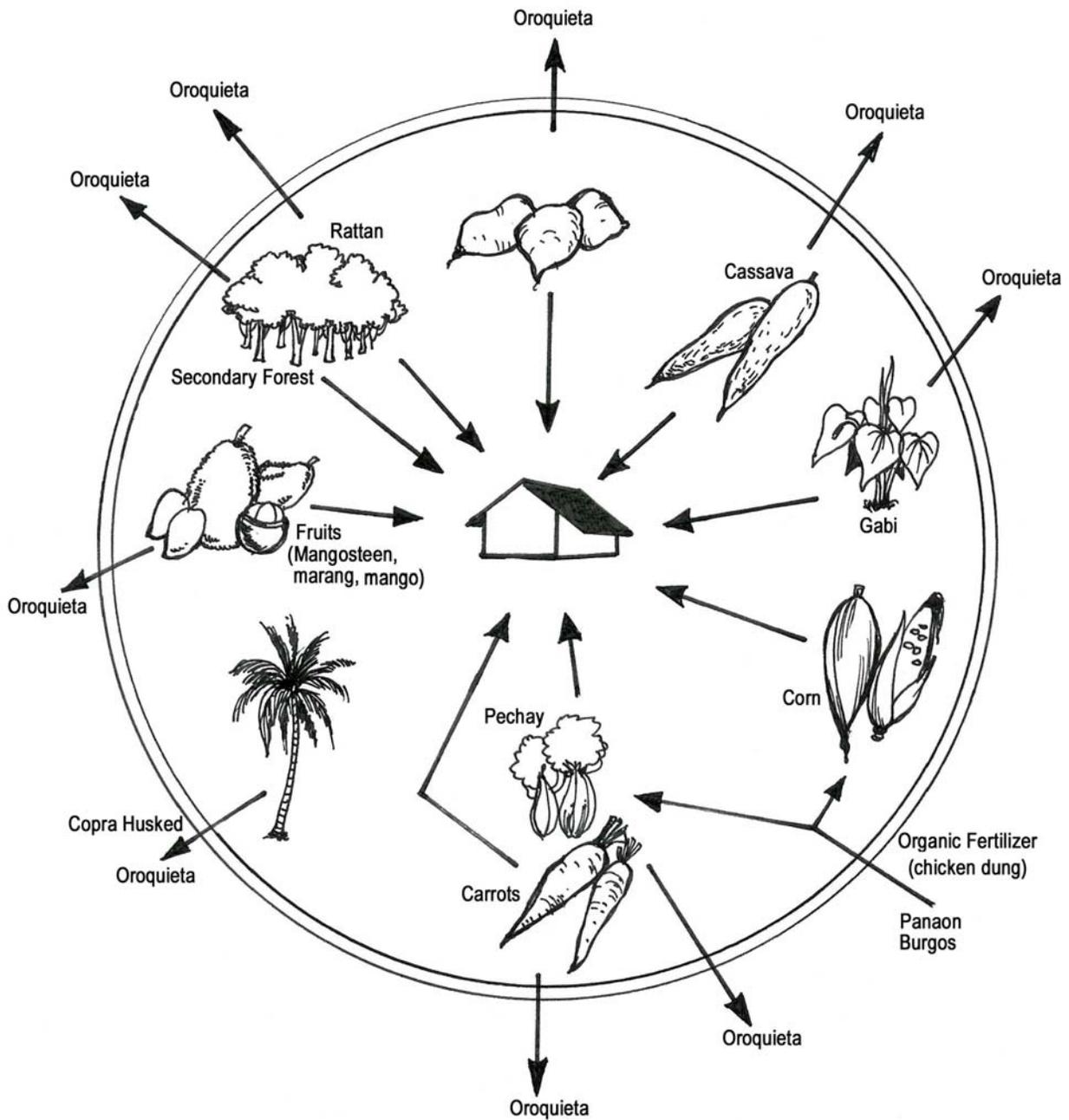


Fig. 59. Commodity flow in Barangay Sinampongan, Aloran, Misamis Occidental.

Network analysis

The participatory network analysis is shown in Fig. 60. Low farm productivity is seen as the major problem by the residents as identified by informants, members of people's organizations, and officials of the barangay.

c. Cultural setting

Indigenous practices, beliefs, and rituals

Beliefs and rituals form a major part of the agricultural life of the people in Sinampongan. An activity is preceded by a ritual called *lihi* in farming. This is done during low tide for good harvest and to drive the evil spirits away.

For post harvest operations, people in the barangay use the *dumyang* method wherein the products are simply spread on the floor of the *kamalig* (small hut) to avoid attack of pests, especially, weevil.

Manifestation of cultural beliefs and norms

Religious rituals in the form of *pangaliyopo* or prayer is done for a bountiful harvest. In controlling pests and diseases, their indigenous practices include *paasuhan* or *halingan* (smoking or building a fire). They do not use insecticides.

Farmers' traditionalism

People still adhere to the old practice since these traditional ways have been tested to have positive effects. People have been able to preserve their cultural practices.

Traditional forms of labor cooperation

Labor exchange popularly called *hunglos* is practiced. In addition, family members participate in all farming activities.

Desire for change and aspirations

People appear to be contented with their lives, as long as they could eat three meals a day. They appear not to have much aspiration to

improve the quality of their lives except for their children to have better education so they will have better opportunities in life.

Support services

The DENR and other agencies provide the much needed support program on biodiversity. However, there is still a need for the improvement of roads and adequate transport services in this locality.

Decision-making patterns

The barangay captain takes the lead in village administration, along with the *Gukom* who advises and leads the indigenous Subanon group. The father, as head of the family, is basically the decision-maker for household activities.

Leadership patterns and conflict resolution

The barangay captain is the arbiter of problems and conflicts that arise in the locality. In most cases, these problems revolve around violation of local ordinances and policies and property rights. On the whole, however, the *Gukom* and the barangay captain exercise full control in the settlement of disputes, except when there is a need to elevate the case to the municipal court for final action.

Communication flow and village network

The barangay assembly forms a network whereby people in the barangay receive relevant information from the outside. In addition, the barangay captain down to the Purok presidents are sources of information and are channels also for the dissemination of information to the people. Communication with other barangays and with the municipal leadership is difficult. The barangay captain still has to go to the poblacion to have his handheld radio recharged as the community has no electricity.

Community organizations

The KAMAS is an active organization in the barangay.

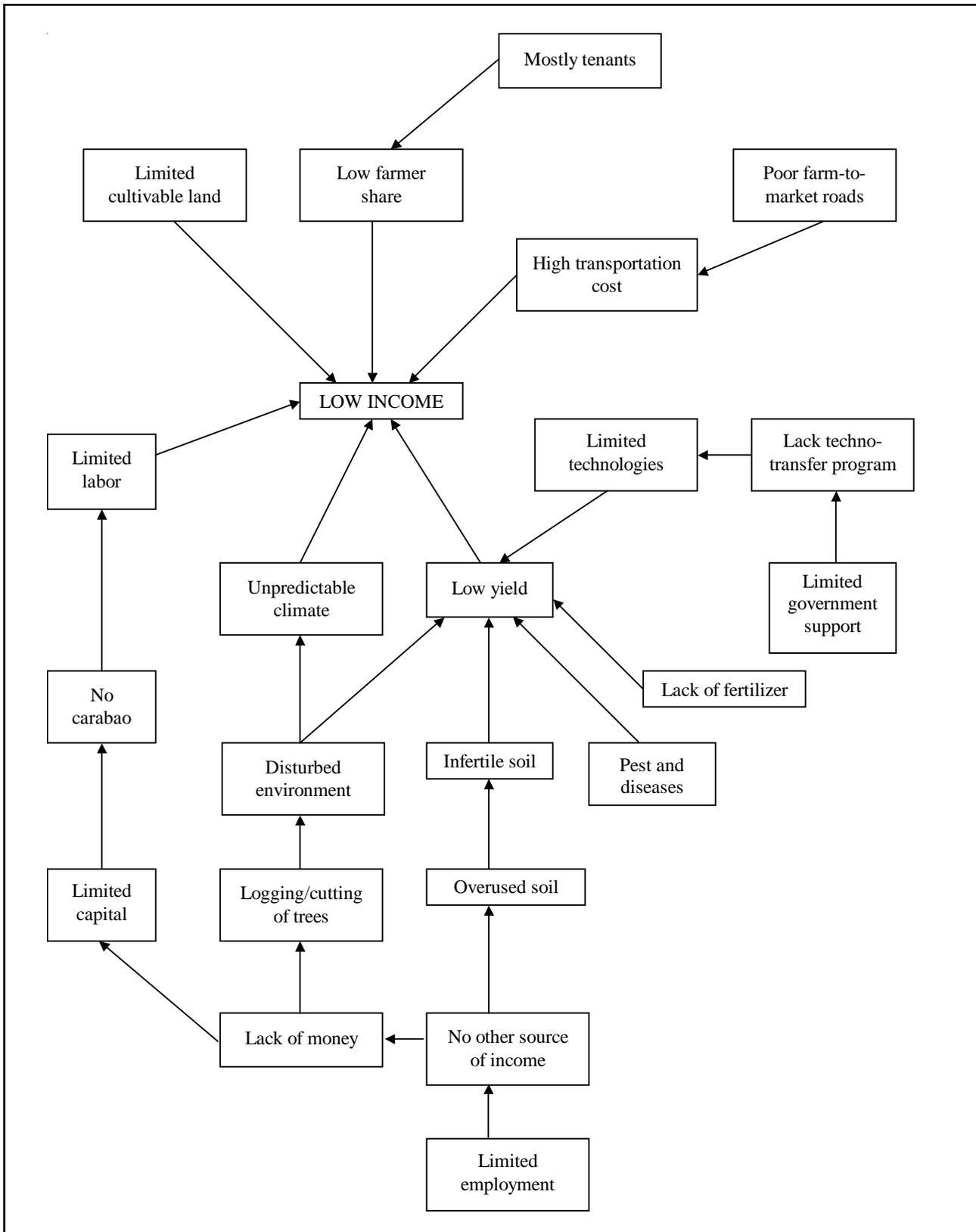


Fig. 60. Network analysis in Barangay Sinampongan, Aloran, Misamis Occidental.

V. Discussions

A. Biophysical environment

The 11 barangays for the PRA were grouped into three based on the altitude range and interfacing with the coastal and upland ecosystem.

The first group is composed of four barangays (Landing, Dioyo, Unidos, Tipolo) with altitude ranging from 25-65 m asl and interfacing with the coastal ecosystem as evidenced by the intrusion of salt water into the river.

The second group (Lumipac, Calaran, Dapacan Alto, and Mamalad) has an altitude ranging from 80-360 m asl, inland and without intrusion of salt water into the river.

The third group (Sixto Velez, Siloy and Sinampongan) has an altitude ranging from 400-610 m asl, characterized by the presence of primary and secondary forests ranging and interfacing with the upland ecosystem. The Langaran and Dioyo Rivers run through most of the barangays. Several creeks join these major rivers which eventually drain into the Murcielagos Bay.

Physical conditions

Slope/topography. Group 1 is characterized as generally flat to gently rolling. Group 2 or inland barangays tend to be relatively flat to rolling while the higher elevation barangays or Group 3 are generally rolling; rising gently and steeply towards the hilly and rough rolling lands westward to Mt. Malindang and Mt. Amparo.

Soil conditions. A total of 46 soil samples from major land use were collected and analyzed for pH, N, P and K using the STK. Physical characteristics like color, texture, and erosion potential were also determined in the field. The soil analysis showed increasing acidity with elevation and ruggedness of terrain. There is also a trend toward soil acidification in areas using high amounts of inorganic fertilizers. N is generally low particularly in barangays Lumipac, Tipolo, Calaran, Mamalad, Landing and Sinampongan. P is also low in barangays Lumipac, Dioyo, Calaran, Unidos, Dapacan Alto, and Siloy, while K is mostly sufficient except in

barangays Dapacan Alto, Tipolo, Mamalad, and Landing. Soil color is generally heavy (clay loam) except in a few near coastal barangays (Tipolo and Landing) where some soils are light to medium in texture. Soil erosion is serious along riverbanks that are put into agriculture and where quarrying is left uncontrolled. It is also a problem in cultivated *kaingin* and in many marginal slopes that are put into cultivation without using appropriate farming technology.

Land use patterns. The eleven lowland ecosystem barangays have four major land uses namely: settlement, agriculture (includes abandoned areas turned to brush lands), reforestation, and secondary forest areas which also include brush lands.

A fifth major land use, covering 54 ha is an Army Reservation area unique to Brgy. Tipolo, Plaridel. Agriculture occupies the largest segment (65%) with coconut as the number one crop followed by wetland rice, corn, and root crops, settlement (15%), secondary forest (12%), and reforestation area (6%). The reforestation area is dominated by mahogany and Gmelina. The agricultural and the secondary forest areas also include abandoned or logged areas, formerly *kaingin* areas, which have turned brush lands. The latter is dominated by malatungaw (*Melastoma malabathricum*), cogon (*Imperata cylindrica*), talahib (*Cryspogon aciculatus*), and agsam (*Dicranopteria lineais*), also common in higher elevations. All are indicators of poor soils.

Although all barangays are coconut-based, there is now a significant reduction in coconut hectareage because these areas have become a cheap alternative source of lumber. This condition has been aggravated by the development of irrigation facilities particularly in Groups 1 and 2 barangays. In addition to coconut, the secondary forest is the main source of firewood and materials for house construction and other nontimber materials (rattan and nito) which can generate additional income for the family.

Climatic conditions. All barangays fall under Type IV or Intermediate B type of the Corona System of Classification. This means that rainfall

is more or less fairly distributed throughout the year. There is no pronounced dry season. The wet months are in November and December, the latter being the rainiest. Near-coastal barangays are dry in March to April. The latter is the driest month. The average annual rainfall is 1,911 mm (1988-1993 data, PAGASA). Relative humidity is 85-86% during the rainiest months and 79% in the driest month. Cyclonic, northeast monsoon is the most prevalent wind system in the area occurring in November to February.

Drainage and major river systems. The major river systems in all 11 barangays are the Langaran and Dioyo rivers. The Langaran River traverses through four barangays: Mamalad, Calaran, Unidos and Tipolo, while the Dioyo River runs through four other barangays: Siloy, Dapacan Alto, Lumipac, and Dioyo. Sixto Velez is drained by Tolon and Guinabot Rivers, Sinampongan by the Pines River, while Landing drains to the Sinian River.

Transect. Transect lines were run each for the 11 barangays. The transects ran from either northeast or northwest directions.

Biological conditions

In the early 1930s, most of the barangays were densely forested with only a few patches of open grasslands. Dipterocarp species, such as white and red lauan, tanguile, yakal, and other hardwood tree species used to grow in the forests of Dapacan Alto, Mamalad, Sixto Velez, Siloy, and Sinampongan. Recently, however, only Brgy. Siloy and Sinampongan have patches of natural forest. These two forested barangays are still inhabited with some endangered, economic, and primitive vascular plants like kapa-kapa (*Medinilla magnifica*), whisk fern (*Psilotum complanatum*), and a fern ally (*Tmesipteris lanceolata*) (Figs. 50 and 51). These plants are highly threatened because of habitat destruction by the local people. Twenty-nine endemic species and 86 economically important species were listed in PRA sites (Appendix Tables 3 and 4).

Wild animals such as wild pigs, monkeys, deer, bats, and various bird species used to be abundant in the forest. However, except for a few sightings of wild deer, monkeys, and pigs in Siloy and Sinampongan, they have now disappeared because of overhunting and habitat destruction.

Except for Sinampongan, the major crop is coconut in all barangays. It is generally grown with corn, cassava, and sweet potato as intercrops. Coconut is basically sold as copra although some coconut farmers sell whole nuts. Rice and corn are the next major crops. Corn is grown for household consumption and usually grown under coconut (Fig. 61). Rice is grown in commercial scale and is a monocrop. It is irrigated by the Nazareno Dam and the NIA.

High-value fruits like mangosteen (*Garcinia mangostana*), lanzones (*Lansium domesticum*), mangoes (*Mangifera indica*), and marang banguhan (*Artocarpus odoratissima*) abound in many of the barangays (Fig. 62). Plantations of mango and lanzones can be found in Calaran and Tipolo while mangosteen is found in Sixto Velez and Sinampongan. In some barangays, these fruits are grown only in the backyard or planted with other crops in small farm lots.

Vegetable gardens are becoming an increasingly important feature of the landscape. High-value vegetables such as carrot, ginger, bell pepper, and pechay are grown and sold mainly for the Aloran market. Eggplant, ampalaya (bitter melon), okra (ladies' finger), squash, and string beans are also grown commercially in Tipolo. The incidence of pests and diseases have been observed and the most serious of which are tungro, green leaf hopper, black bug, rats, corn borer, leaf miner, and the *bunzalo* problem in cooking banana. The theft of young and old nuts also contributes to low yield and income.

B. Socioeconomic Analysis

Demography

Population. Population figures for 1998 in the 11 barangays range from 430 to 1,824 or an average of 910 persons per barangay. Average household size is 5.6. Males and females are generally proportional (Appendix Table 7). The population age belong to the prime working group (15-64) except in Sinampongan where 0-14 age group predominates. This is possibly because the barangay is the latest to become a settlement area among the study sites.

Population density and area elevation have been found to have an inverse relationship: the lower the elevation, the higher the population density which means more resource users and hence more biodiversity loss.



Fig. 61. Coconut and corn are the major crops in the lowland ecosystem.



Fig. 62. A high-value fruit tree (*Garcinia mangostana*) in Sixto Velez and Sinampongan.

Fertility, mortality rate and longevity. Fertility rate is high despite the introduction of family planning methods. The improved delivery of health services and increasing supply of potable water have drastically reduced infant mortality. Longevity is 70 years on the average, with women generally living longer than men by some 10 years. The high population growth rate will exert tremendous pressure on available and depletable resources.

Outmigration. Outmigration is quite common among young men and women between the ages of 15 and 25. The proportion of migrating young women is increasing especially because they have stayed in school longer and therefore see more opportunities in urban centers. The sizable outmigration rate, traceable to limited income and job opportunities in the study sites, plays an important role in keeping the population growth rate down and in preventing further reduction in biodiversity.

Health. The use of herbal medicine is common where medicinal herbs are found in abundance, although some commercial drugs are already available.

Common illnesses among children and adults are diarrhea, respiratory diseases, measles, and fever. Hypertension among adults is prevalent due to high-salt diet. Thyroid disorders have also been observed in higher elevation areas, especially in Sinampongan, where iron-rich food is scarce.

Ethnicity. Subanons and their descendants constitute 70% of the population in Mamalad, Siloy, and Sinampongan, these are higher elevation areas. Boholanos, Siquijodnons, and some Cebuanos and residents of nearby Mindanao provinces, populate the flat areas.

Educational attainment. Majority of residents in the study sites have had some elementary education. Easier access to secondary schools and relatively better economic standing enabled some to go to high school. Very few managed to attend to or finish college, and some vocational courses.

Young women generally spend more years in school since the young men are needed to help in the farm.

Livelihood activities

Farming is generally the source of livelihood with coconut as the primary cash crop. Coconut is preferably sold as copra because it commands a better price than the nut. Some sell the nut due to low harvest which makes it uneconomical to produce copra or due to non-ownership of a dryer. Corn and rice are the staple crops. Corn is rainfed and is grown in larger quantities, while rice is grown in areas with access to irrigation facilities. Sturdier crops like cassava and root crops are also grown to withstand pest infestation and bad weather. Livestock is also raised in the backyard to help meet the household needs.

Fishing is also a means of livelihood. Farmers also grow high-value fruit trees such as lanzones, mango, mangosteen, and banana. Off-farm employment in factories, construction, trading, quarrying, and nipa production, are also available in these areas. In higher elevation and forested areas such as Sinampongan, the growing of high-value vegetables of the semi-temperate crops like carrots, ginger, pechay, and bell pepper for the market is common. In addition, gathering of wood for fuel and rattan and timber poaching are also being done.

Labor force availability and distribution

Generally, labor for subsistence farming is abundant. Family labor remains popular where all able family members work in the small farm lots, which also means a zero marginal productivity for some members. The daily wage rate for hired labor is P80. *Hunglos* or labor exchange commonly practiced in the past is now being practiced by a few as the rural communities are increasingly drawn into the cash economy. Both men and women work in the farm, just as both work at home. Women in

these study sites have more children compared to their urban counterparts.

In flatter areas like Tipolo, more agricultural products are being grown for the market so that women rarely have to work in the farm because of higher income that makes hired labor affordable.

Level of living and income

The Minimum Basic Needs survey conducted in 1998 by the DSWD show a low income of less than P3,000 per/mo for most households with six members. Generally, poverty incidence increases as the area elevation increases. Poor soil quality, too much rainfall, less off-farm employment opportunities, and distance from the market have been identified as major reasons for this trend.

Houses are commonly made of light materials with G.I. sheet roofing but without ceiling, which provide the residents very little protection from the heat at daytime or from cold mountain breezes in the evening. Water supply is classified as Levels I and II in higher elevation areas while Levels II and III in the lower areas. All barangays except Brgy. Sinampongan have access to electricity. However, while electrification has already reached Brgy. Siloy, only a few households have electric power.

Water-sealed toilets are already widely used in both low and high elevation areas. However, problems associated with water supply in some barangays render the toilet bowl useless, thus the Antipolo toilet system is still more practical in most communities.

The low level of income and the very limited off-farm employment opportunities drive the farmers to the forests to cut trees for fuelwood or for timber, without replanting, or to gather rattan, primarily for the market to augment income. Survival inevitably sacrifice the long-term conservation goals.

Commodity flows

Copra is the prime commodity that flows out of the barangays through the middlemen or comprador. The coconut farmers are forced to sell through a comprador who dictates the price, because they cannot sell directly to the coconut oil mills because of lack of transportation facilities

and poor farm-to-market roads. Copra is brought to Oroquieta, Ozamiz, Iligan, and Cagayan de Oro.

Rice farming is generally for subsistence only, except in areas where there is irrigation such as Tipolo, Calaran, and Unidos. But even among barangays with access to irrigation, only 20 to 30% of rice produce finds its way to the poblacion market.

Ten to 20% shelled corn is also sold in the poblacion market or to the cities of Oroquieta and Ozamiz. This shows that corn production is far from self-sufficient as farmers still purchase corn grits from poblacion markets.

Among the high-value fruits, mangosteen and lanzones are sold in large quantities (80%), reaching as far as Cagayan de Oro, Iligan, and Cebu. Mangoes and marang are other high-value fruits sold in sizable quantities, or up to 60% of produce. These are sold in Calamba, Ozamiz, and Iligan. High-value vegetables (semi-temperate) such as carrots, ginger, bell pepper, and pechay grown in Sinampongan are mainly produced for the market. Tipolo sells eggplants, ampalaya, squash, and string beans, in Calamba.

Cassava, gabi, sweet potato, and bananas are also being sold, although in very small quantities in Calamba, Ozamiz, and Oroquieta. Occasionally, for emergency needs, livestock is sold in the market.

The small marketable surplus enables a farmer to earn cash to pay for nonfarm products to support the family or to improve his farm. Since cash is meager, commodity flows from outside the barangays are limited to the basic goods: salt, spices, kerosene, sugar, rice, and corn; clothing, materials for household construction and repair such as G.I. sheets and nails; fertilizers, pesticides, seedlings, and simple farm implements. There is also a sizable and steady inflow of goods for "vice" like the cheaper brands of cigarettes and alcoholic drinks.

Land tenure and landholdings

Most farmers are owners of very small farm lots ranging $\frac{1}{4}$ - $\frac{1}{2}$ ha. Several have farm lots up to 2 ha. Farm ownership is mainly through inheritance. Several tenants whose farms are under land reform such as Siloy, Sinampongan, Unidos, and Landing have become landowners

of redistributed lands which are generally 1.9-3.0 ha in size. Three hectares is the maximum land area allowable. One-third of the corn and rice produce of tenanted land goes to the farmers. For coconut farms, the tenants get 100% of the yield of crops planted under the coconut. There are also isolated cases of *ulos* or borrowing lands for cultivation.

Government and nongovernment assistance

To meet the rising food and income requirements of the growing population, high-yielding varieties of rice, corn, and coconut have been introduced by the government. These new varieties, however, are fertilizer-dependent and require more man-hours. While there is expressed willingness to adopt these technologies, the ability to do so is another issue. Majority of the people simply do not have the necessary funds to sustain these innovations. The innovations are feasible only to those with sizable land and money, with easy access to credit and the market, or those able to avail of limited government assistance. This may exacerbate existing rural inequities: the rich farmers get higher income while the poor farmers become poorer.

Construction of feeder roads for easier market access and irrigation of communal irrigation canals are ongoing. The DSWD and DOH invest in human capital through nonformal education and skills training for livelihood, and provide health facilities and services. Government assistance includes establishing day care centers and organizing of RICs and Women's Clubs for livelihood and welfare activities in the barangays. Barangays Lumipac, Calaran, Siloy, and Unidos have been classified as CIDSS areas where 25 beneficiaries at a time receive credit assistance for livelihood activities. Repayment problems have been reported, however, because of farmers' failure to pay back debts.

Artificial insemination, animal dispersal, and technical assistance are introduced and provided by the PCC and DA to address the problem of decreasing draft animals. The PCA grants a four-year fertilizer subsidy to small coconut farmers using high-yielding varieties. The DENR assists in social reforestation, simultaneously attempting to replace trees cut for timber and fuel and at the same time providing livelihood assistance because

reforestation species are fast-growing trees with high market demands.

Government assistance, however, remains limited because of scarcity of funds. Some government projects result in unintended setbacks because of the lack of education and information on the part of the beneficiaries. A case in point is the poisoning of the irrigation canal in one barangay because of farmers' practice of washing pesticide containers in the canal. This has reportedly caused illness and death of draft animals. This creek serves as catchment to the irrigation spill in the neighboring barangay of Lumipac.

Nongovernment assistance is provided by the FPE and the PIPULI Foundation, Inc. Both organizations promote environmental protection. They introduce and teach appropriate and adaptive agricultural technologies such as the sloping agricultural land technology (SALT) and engage communities in development programs. An example of the latter is cooperative development to encourage self-help through livelihood activities. Start-up funds are provided to local organizations which can be repaid through tree planting called a debt-for-nature swap. The higher the amount of loan, the larger the quantity of trees to be replanted.

Foreign assistance funding and establishment of protected areas such as Siloy and Sinampongan was made possible through the EU-NIPAP.

A list of assistance program and services are listed in Appendix Table 8.

Oral history

The oral history or timeline of each barangay is shown in Appendix Tables 5 and 6.

1890s. The lowland barangays were heavily forested up to the 1890s. The coming of the immigrants from the Visayan islands of Bohol and Siquijor changed the environmental landscape. The Subanons, in search of land, moved to the interior where they started the *kaingin* system. The migrant settlers on the other hand, cleared lands for settlements, and rice and corn farming. They also cut trees to build houses.

1930s. Coconut was introduced as a cash crop in the 1930s resulting in more clearing of lands. High-value fruits such as lanzones, mango,

jackfruit, and mangosteen were also planted.

1960s-1970s. The late 1960s and 1970s saw the intensification of coconut production, brought about by high demand for copra. This again resulted in the clearing of remaining patches of forest lands. The granting of logging concessions resulted in further environmental degradation. High-yielding varieties of rice and corn were also introduced during these periods to meet the food requirements of the growing population. This resulted in monoculture and decreased biodiversity. These varieties were heavily dependent on inorganic fertilizers and easily attacked by pests and diseases. To counter pest infestation, the farmers had to plant sturdier crops such as sweet potato and cassava for food supplements. These root crops were also found to stand bad weather and required no fertilizers. The farmers also started backyard raising of livestock to help meet the household needs.

The effects of deforestation also started to show—erosion and flooding have become a continuing feature of community life.

1980s. Efforts aimed at attaining sustainable forestry practices have led to the development of rapidly-growing species of trees such as Gmelina, mahogany, and falcata. These fast-growing trees have become attractive alternatives. Replanting was easily and cheaply done. Social reforestation or plantation forestry became popular in response to deforestation. This was not just an attempt to counter erosion problems, improve the watershed and control flooding, but also to serve as a means of livelihood for farmers. However, the single-species-type of reforestation was a poor substitute to lost wildlife habitat, thus the loss of biodiversity continued. Moreover, rice lands were converted to coconut plantations due to the rising demand for copra.

1990s. Awareness toward environmental rehabilitation and conservation increased. Integrated pest management was introduced through farm modeling by the DA. The presence of nongovernment organizations and people's organizations concerned in environmental issues such as the FPE and PIPULI Foundation started. In 1994, Sinampongan and Siloy were declared as protected areas. In 1996, PIPULI introduced the SALT in Sinampongan. Organic farming methods were revived and encouraged. Finally,

as the decade comes to an end and a new millennium is forthcoming, biodiversity campaigns have been launched.

Network analysis

The residents in the 11 barangays were asked to analyze their basic problems using the network analysis. The method was deeply appreciated because for the barangay folks it did not only allow some information to surface, but has in fact increased their awareness on their conditions. It even serves as guide to act on improving their situations.

Invariably, low farm productivity and low farm

income or poverty emerged as the primary problem in all 11 barangays (Fig. 63). Low productivity is seen as a result of infertile soil and poor farming techniques. Attempts to increase or at least sustain yields in small farms, resulted in continuous cropping rather than rotations, thereby worsening soil infertility. The poor soil quality could have been remedied by the application of fertilizers, organic or inorganic. However, farmers are constrained to buy inorganic fertilizers because of lack of funds. The lack of financial assistance from institutional sources to purchase fertilizer is also one of the problems, except for small coco farmers who enjoy a four-year fertilizer subsidy. Another reason cited for low farm yield is poor

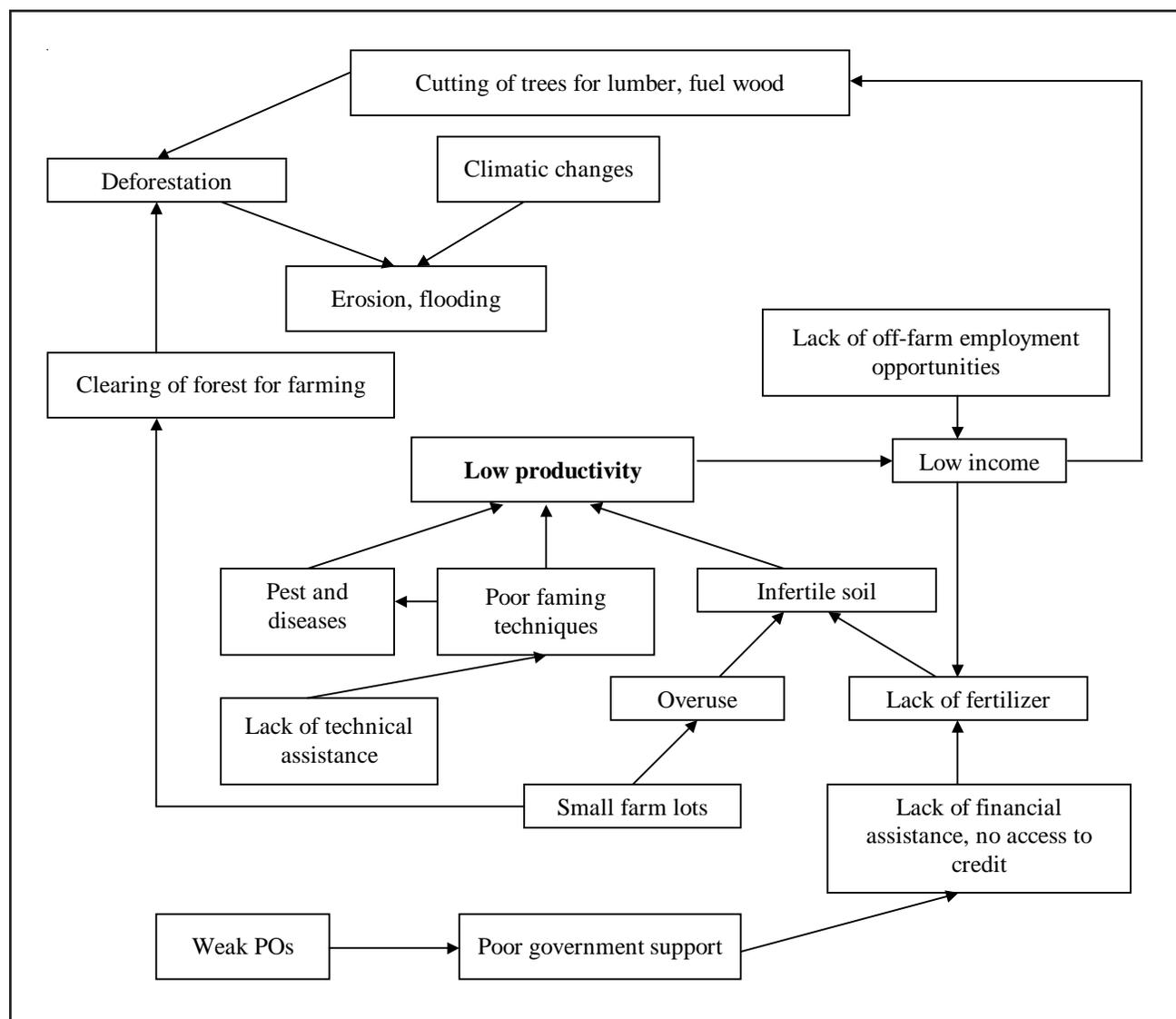


Fig. 63. Integrative network analysis.

farming techniques. This includes the inability to combat pests and diseases. Pest infestation in recent years has resulted in the use of pesticides. Very few adopted IPM, introduced by the DA. The communities feel that the government is too slow in delivering the necessary technical assistance, except for the IPM. Meanwhile, there is already growing concern about pesticide contamination of water supplies, making them unfit to drink for draft animals and for fish population to survive.

Low farm productivity is also seen as a result of climatic changes, erosion, and flooding, which the communities acknowledged to be due to deforestation.

While the benefits of the forests such as watershed maintenance, protection of wildlife, and prevention of erosion have not escaped the farmers' awareness, the farmers lament that not using the forest was to their disadvantage because the trees conserved would somehow be cut down by others anyway; forested lands left uncleared would likewise be cleared by others. This was because of the free access to the forest by just anyone before the establishment of the protected areas. For as long as forest resources were abundant, it was simply a matter of who staked his or her claim first.

C. Cultural Setting

Indigenous beliefs and farmers' traditionalism

Interviews with residents show that most of their farming practices are guided by their indigenous beliefs and rituals. They still practice *lihi* to start any activity deeply rooted in the culture of the inhabitants. For example, they plant coconut seedlings during full moon and high tide, and men, not women, plant sweet potato during low tide when the stones could be seen protruding from the sand surface.

Rituals are also conducted by some farmers to drive away evil spirits, and pests and diseases in their fields. Rituals in the form of ceremonies and offerings are conducted during planting and harvesting of their crops.

Generally, traditional beliefs influence agricultural practices. They listen to birds, observe the wind, the moon and the tide before deciding on farming

activities.

Since majority of farmers own small farms and produce crops for family subsistence, they hardly do post harvest practices except for seed storage. Farmers hang corn seeds near the kitchen stove to avoid corn weevil damage and other pests. Sun drying is done while corn milling is done with a *galingan* or corn grinder.

When asked why farmers have remained traditional, majority felt that shifting to new technology would mean more resources. A shift would also mean doing away with traditional farming practices which in effect would change their culture.

Decision-making pattern

Decision-making is neither the monopoly of the husband, nor of the wife. Decisions in borrowing money, celebrating special occasions, children's education, sale of property, and marriage of children are shared. The husband dominates when it comes to the development of the land and finding other sources of income. The wife is in charge in the preparation of food, family health, and buying of household needs.

Traditional forms of labor and sharing

Family labor is popular in both farming and nonfarming activities.

Other traditional forms of labor arrangements are practiced such as *alayon* or communal farming, *hunglos* or labor exchange, and the *pahina* and *tampuhay* which are similar to the *bayanihan* system where no payment or remuneration is involved.

A large number of farmers farm under a share-tenant system where tenants share their farm products or income with their landlords. In some cases, modifications were initiated by landowners in favor of the tenants.

Support services for indigenous groups

Majority of indigenous residents felt the need for government assistance. A more profound analysis of their situation would help understand how and in what way the government can help improve the quality of lives of residents. Although most are familiar with the functions of various

government agencies in their localities, no definite forms of help have been extended because of minimal contact with these agencies.

There appears to be a gap between residents and the government. In fact, from interviews with local residents, they seem to have a perception of the long history of government failures in government-initiated development programs.

Among the support needed in the localities are: income-generating activities such as extending loans for capital (i.e., for farm inputs) and providing scholarships for their children's education. Minimal government financial support or the lack of it in some areas influence residents' biodiversity conservation efforts because they are forced to do something detrimental to conservation (e.g., cutting of trees, hunting wildlife, and others) to survive.

Local and tribal leadership patterns

The barangay captain and the *Timoay* settle and resolve conflicts, set goals for the community and lead in achieving these goals. The barangay captain is looked up to in the local political system while the *Timoay* takes the lead in activities associated with beliefs, values, and kinship ties in the community.

In the traditional Subanon society, the village is headed by a *Gukom* or headman. He is considered an influential person by virtue of his wisdom, health, and abilities not possessed by an ordinary person. He enjoys the respect of the village people. However, among the lowland Subanon, the *Timoay* is more popular than the *Gukom*. *Timoay* means chief or leader and connotes both civil and religious authority.

The barangay council is the recognized leader in all community affairs and activities. Government projects and activities of different government agencies are carried out through the council. Elders of barangay councils also help in resolving domestic conflicts together with the barangay captain.

Conflict resolution in tribal organizations

Conflicts on customary laws, traditions, and culture of the Subanon are first brought to the *Gukom*. When the problem involves the barangay, the *Gukom* convenes the Subanon Council of Elders. When the conflict covers a wider jurisdiction, the house of *Timoays* is convened. In both cases, the members of the *Gukom* conduct the investigation then submit their findings and recommend the amount of money the offender shall pay. Conflicts usually involve stealing, petty quarrels, disagreements involving property and land, and other domestic disputes. Conflicts on land resources are usually related to access, ownership, or boundary issues and use.

Community organizations have served as conduits or venues for community expression and action. These organizations have been good training grounds for local leaders when people come together to discuss community problems and conflicts. These result in interactions and expressions of mutual interests and civic responsibilities in the locality. Some good examples are road buildings, construction of water tank/reservoir, and operation of a cooperative store.

Aspirations of the people in the villages

The aspirations of the indigenous people of Mt. Malindang are simple. They aspire for simple things such as being able to buy a carabao, to travel to other places, to eat three meals a day, and to provide good education for their children. Majority of respondents cited finance as their main obstacle in fulfilling these dreams.

Awareness of conservation laws and practices

Most residents are aware of the various laws and policies related to biodiversity conservation. However, they are forced to violate these policies because of their impoverished conditions and their desire to survive.

VI. Training Needs, Information, Education and Communication (IEC), Data banking, and Immediate Action for Biodiversity Conservation Research

A. Training Needs

The following groups can be trained to provide support to biodiversity conservation. The Protected Area Superintendent (PASu) and his staff could be trained to assist in the inventory and comprehensive assessment of the flora and fauna of Mt. Malindang. The local populace or indigenous people can also be trained to identify location and density of different species and provide their local names and uses.

Women's Clubs can be given basic training on micro-propagation and other horticultural techniques for the mass propagation of high-value fruits and other economically-important plants.

For the protection of high biodiversity areas from destruction and pilferage, organized groups such as forest guards, *barangay tanods*, and deputized guards of the DENR can be trained on the proper methods of protection and conservation of parks and ecotourism areas.

Agrarian reform is one of the major concerns in biodiversity conservation. There is a need to train staff of the SARBA on agrarian matters. Filipino and Dutch students could be trained to do field data collection in an area with high biodiversity. Other groups such as the Irrigators' Association, and others could also be trained to become partners in bio-conservation studies in Mt. Malindang. The training methods must show the interrelatedness of the ecosystems and provide skills needed for biodiversity conservation.

B. Information, Education and Communication (IEC), and Data banking

The campaign for the protection of flora and fauna can best be achieved through information materials using the print media (posters, pamphlets, brochures, wall news, etc.) to disseminate information on the proper use and conservation of the Mt. Malindang resources.

Radio is another viable tool for promoting biodiversity conservation practices to people in the upland, like the Subanon. Radio drama in Cebuano or any dialect familiar to the IPs may be used. A multi-media approach on information dissemination can be used in the conservation campaign for Mt. Malindang.

Biodiversity conservation efforts should be backed-up by a strong database from organizations and agencies such as the PIPULI, DENR, the LGUs, and the academic communities. These data can be collected and stored for use in biodiversity conservation efforts at Mt. Malindang.

C. For immediate action

Establishing a nursery for the 54-ha reforestation project in Siloy, Calamba, should be given first priority before an inventory and assessment of the flora and fauna in the research sites. This project will be participated in by the DENR, academic institutions, and organized groups like the SARBA. DENR can provide the funds for seedling production, and management experts from academic institutions can provide technical assistance. SARBA can manage the nursery whose members, including the Subanon group, can be trained to plant and monitor the seedlings. This ongoing development project is at the foot of Mt. Amparo which is considered a "hotspot". This will be the study site for the inventory, assessment, and in situ conservation of the threatened, endemic, rare, and economically-important flora and fauna.

VII. Problems, Opportunities, and Researchable areas

A. Researchable Areas in the Sub-ecosystems

Agricultural subecosystem

Coconut, mangosteen, and lanzones are the major high-value crops in the agricultural sub-ecosystem. These fruits are resistant to pests, and diseases, shading, and climatic changes. However, it takes longer to bear fruits and planting materials are limited. Micro-propagation and other horticultural techniques are necessary to mass propagate these high-value fruits.

Decrease productivity, conversion of land to rice and corn fields, and cutting old coconut trees without replanting have also become a problem. Improved cultivars of coconut for export (i.e., *makapuno* and *kuyamis*) were introduced to raise income of coconut farmers. There is a need to evaluate the use of organic and inorganic farming techniques to improve productivity, and to assess the environmental and socioeconomic impact of land use conversion.

Settlement subecosystem

Langaran River is the primary fishing ground, source of irrigation, and area for quarrying. Because of over quarrying, increased meandering, and river widening which makes the river shallower, the river bed topography changed dramatically resulting in flooding. A similar trend is also observed in Dioyo. Therefore, there is a need to conduct an impact assessment, limnological, hydrological, and siltation studies.

The introduction of the Taiwan catfish caused the scarcity of native fish species. Raising and protecting native fishes in ponds can be done. Studies on competition, rearing, and growth performance of the native fishes and catfish would be very timely.

The 54-ha army reservation in Tipolo is a resource development project with focus on reforestation and eco-tourism. The area has secondary forest with abundant potable water from a spring. However, in the last ten years, there is an increasing squatter's population

problem and deterioration of soil condition because of increased cultivation of sloping lands resulting in the disappearance of wildlife species. Possible researchable areas include impact studies on the pressure of squatters on the biodiversity of the area, policy studies on the military reservation, and evaluation of this resource for ecotourism.

The IPs are another resource in the settlement subecosystem. This group are easily exploited due to lack of education and has limited access to government support. The IPs, however, are receptive to biodiversity conservation and are willing to adopt new technologies. Their beliefs and practices are even consistent with biodiversity conservation. A study on the impact of leadership structures of IP communities in relation to biodiversity conservation could be conducted. A research program can be developed on the ethnobotany and indigenous technical knowledge of ethnic groups and their implications on the biodiversity of Mt. Malindang.

Forest subecosystem

Mahogany (*Swietenia macrophylla*) and Gmelina (*Gmelina arborea*) are the main reforestation species in all barangays. These are planted in big hectares and are becoming popular landscapes along highways. These are fast-growing trees and the wood can be used for fuel. Seeds are always available.

In Siloy, a 50-ha reforestation area of mahogany and Gmelina were planted at the foot of Mt. Amparo. The local people have cleared the foot of the forest before by *kaingin*, endangering the habitat of kapa-kapa (*Medinilla magnifica*), the primitive and rare plants such as *Psilotum complanatum* and *Tmesipteris lanceolata*. There is a need to monitor the survival and growth of mahogany and Gmelina. Furthermore, an inventory, in situ conservation, and biology of the endemic, endangered, rare, economic, and primitive vascular plants and other wildlife should be conducted.

B. Lowland Ecosystem Researches Interconnected with Upland and Coastal Ecosystems

1. Inventory and conservation studies of some rare, endangered, endemic, and economically-important species of flora and fauna in Mt. Amparo, Siloy, Calamba and other "hotspots" in the Mt. Malindang Range National Park
2. Influence of introduced reforestation tree species and local species on the biodiversity of Mt. Amparo, Siloy, Calamba
3. Micro-propagation and horticultural techniques of high-value fruits (mangosteen, lanzones, kuyamis) in Sitio Velez, Sinampongan and Tipolo
4. Ecology, morphology, and histochemical studies of kuyamis and macapuno
5. Biodiversity assessment in intact and degraded forests in Mt. Malindang
6. Evaluation of the impact of introduced fish species on the biodiversity of rivers
7. Assessment of development interventions that have impact on river ecology
8. Evaluation of the impact on biodiversity of FPE-PIPULI "debt-for-nature" scheme in Brgy. Sinampongan
9. Impact of CARP on productivity and biodiversity in ARCs of Sinampongan, Siloy, Unidos, and Landing
10. Acceptance, feasibility, efficiency, and sustainability of SALT in Sinampongan
11. Alternative livelihood system to reduce pressure and enhance biodiversity (e.g., ornamentals)
12. Gender roles in biodiversity enhancement, sustainability, and degradation in the Mt. Malindang community
13. Impact of high-yielding varieties (HYVs) of rice, corn, and coconut on biodiversity and equity in the selected areas of five municipalities in Misamis Occidental
14. Resource use and resource management
 - Practices
 - Resource control/access, tenure, and implications on biodiversity
 - Time use and income flows of farming and fishing activities
15. Traditional leadership pattern/belief systems (resource governance) in indigenous communities: role of Subanon *Timoays* in biodiversity conservation
16. Impact of IP dependency on Mt. Malindang resources: some policy implications
17. Rituals and resource utilization: an analysis of indigenous practices and their relationships to biodiversity conservation
18. Impact of conservation policies on the conservation practices of IPs: implications on policy changes at the local/national levels
19. Media support on biodiversity conservation: a study on media preferences, communication flow, and communication behavior of IPs in Mt. Malindang and the utilization of research-based IEC materials
20. Policy measures on the conservation and protection of endangered, rare, and endemic species of flora and fauna in Mt. Malindang
21. Community/co-management systems of research CADCs (e.g., abandoned fish pens, rattan, reforestation)

VIII. Landscape and Lifescape Research Themes

Theme 1: Conserving Biodiversity “hotspots” in Mt. Amparo and its Adjacent Environs through Appropriate Land Use Practices

The scenario at Mt. Amparo and its environs offer an ideal opportunity for biodiversity research. Its rich biological resources are now threatened and in a state where conservation and rehabilitation are badly needed (Fig. 64).

A major issue is the encroachment of the indigenous groups and other migrants in Mt. Amparo. Their activities for survival in terms of using the mountain’s resources have also made it crucial for the survival of both plant and animal species in Mt. Malindang.

There is massive destruction of biodiversity resources, especially forest resources and wildlife. For instance, in spite of the presence of reforestation projects in the buffer zone, residents still cut down trees for housing purposes. This results in the destruction of important biological species now considered as endangered, e.g., whisk ferns (*Psilotum complanatum* and *Tmesipteris lanceolata*). The whisk fern is botanically important as a primitive plant. In addition, the ornamental kapa-kapa (*Medinilla magnifica*) is also endangered.

The Subanons, a major resource user of the biodiversity resources at Mt. Amparo, could be trained to reinforce conservation activities through their indigenous knowledge system that supports biodiversity conservation. They are engaged in biological farming such as biological control of pests (specific insects are used to control agricultural pests in the farms). IPM along with organic farming can be used by indigenous groups to avoid the use of chemicals and fertilizers and could prevent the flow of these harmful chemicals into the Dियो River which could adversely affect the survival of plant/animal life, and even aquatic resources.

The Subanons’ use of herbals for medicinal purposes would also promote the conservation of plants with medicinal value and thereby help

control the spread of diseases in the locality. The BRP could be a tool for the proper propagation of these medicinal and other economically-important plants. A tissue culture laboratory and a Botanical Garden which could serve as venues for the ex situ conservation can be established.

The rich biological resources in Mt. Amparo, once conserved and properly managed, could showcase an environment of high biodiversity value.

The Agrarian Reform Policy in Siloy (near Mt. Amparo) should be evaluated in terms of the level of productivity among the farmer beneficiaries. If possible, the adoption of biological/organic agriculture should be encouraged since this indigenous practice supports biodiversity conservation through nonuse of chemicals.

Observations also show that farmers remain idle in between planting and harvesting activities. In this case, alternative livelihood activities should be envisioned to augment family income (establishment of a nursery for the reforestation project, plantation of medicinal and economic plants, and a tissue culture laboratory to mass propagate these economically-important plants).

Land use practices in the area do not favor soil conservation in hilly and rolling lands. Soil erosion is evident and fertility of the soil is very low. Organic farming technology and other indigenous practices (composting, etc.) could be introduced and promoted.

Mt. Amparo and its environs is an ideal biodiversity site where plant and animal life and other resources can grow in abundance and the endangered, endemic, and rare species found only in this part of the world can be protected.

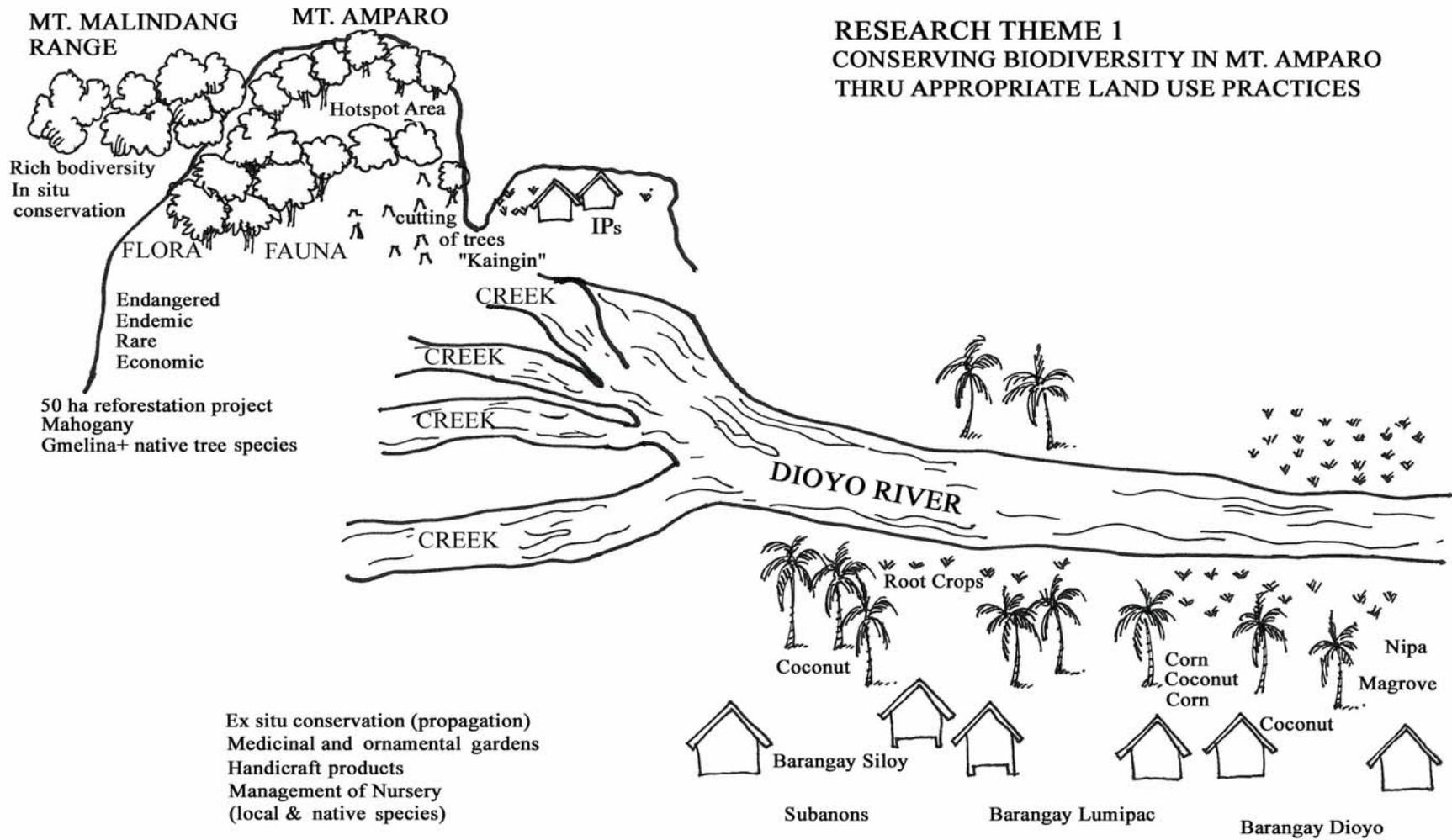


Fig. 64. Landscape and lifescape diagram of research theme 1 in the lowland ecosystem.

Theme 2: Reversing Land Degradation in the Langaran River Watershed

Water is a very important resource in the environment and as such the river system is a crucial element in the conservation of biodiversity. The Langaran River offers a vast resource to sustain our efforts in maintaining an ideal environment for both plant and animal life (Fig. 65).

The river supplies the much needed water to sustain life in these barangays. However, the river is in a state of degradation. To sustain its existence and quality to maintain the aquatic life is a challenge. Soil erosion and residues of chemicals in sloping areas make the river unsafe. Farmers who use high chemical inputs in their farms (pesticides, insecticides, fungicides, etc.) are often unconcerned about the effects of these chemicals in the river system. Fishermen are now moving away from fishing activities because of scarcity of fish. Some indigenous fish species have become extinct or are vanishing in these areas.

Another situation to reckon with is the intensive quarrying in the Langaran River which has resulted in the shallowing and widening of the river. With increased sedimentation, water meanders to other sources. The danger of flooding is so evident. The intensive quarrying activities near a bridge in Tipolo could cause this bridge to collapse.

Land use near the riverbanks is uncontrolled and tolerated. These areas are cultivated for agricultural purposes resulting in soil erosion and siltation. The transformation of these areas into agricultural lands has also brought about the dislocation of the sanctuaries of birds and other wildlife near riverbanks. The most serious effect of land use in areas near the Langaran River is the destruction of the aquatic ecosystem. This

is brought about by the physical-biological and chemical changes in water quality and the habitat of aquatic resources. The lives of native fish species and other aquatic resources on this river are endangered because of the situation.

Since fishermen shifted their occupational activities to agriculture, proper land use and better systems of farming should be adopted. The indigenous people like the Subanons, have farming practices that support biodiversity conservation. The practice of organic farming among the IPs and inhabitants near the Langaran River would spare the river from pollution and sedimentation. Studies on the hydrobiology of the Langaran River System should also be done to determine its water quality and the status of the living organisms present in the area.

In sloping areas, the technology on sloping agricultural land use can be adopted. Evidence of soil erosion in sloping areas and riverbanks are serious, a threat to the biodiversity of the river system.

From a landscape perspective, we can see the influence and effect of the Langaran River on the areas that it traverses. It supplies water for irrigation in agricultural areas and a ground for fishing activities for livelihood. Quarrying has been a good source of livelihood, however, overquarrying activities have adverse results not only on the river system but also on land use.

The Langaran River, as a major resource system, affects the different ecosystems (upland, lowland, and coastal). As the river flows from higher elevation areas to the coastal region, the effect on the biodiversity of these areas is very evident.

RESEARCH THEME 2
Reversing Land Degradation in Langaran River Watershed

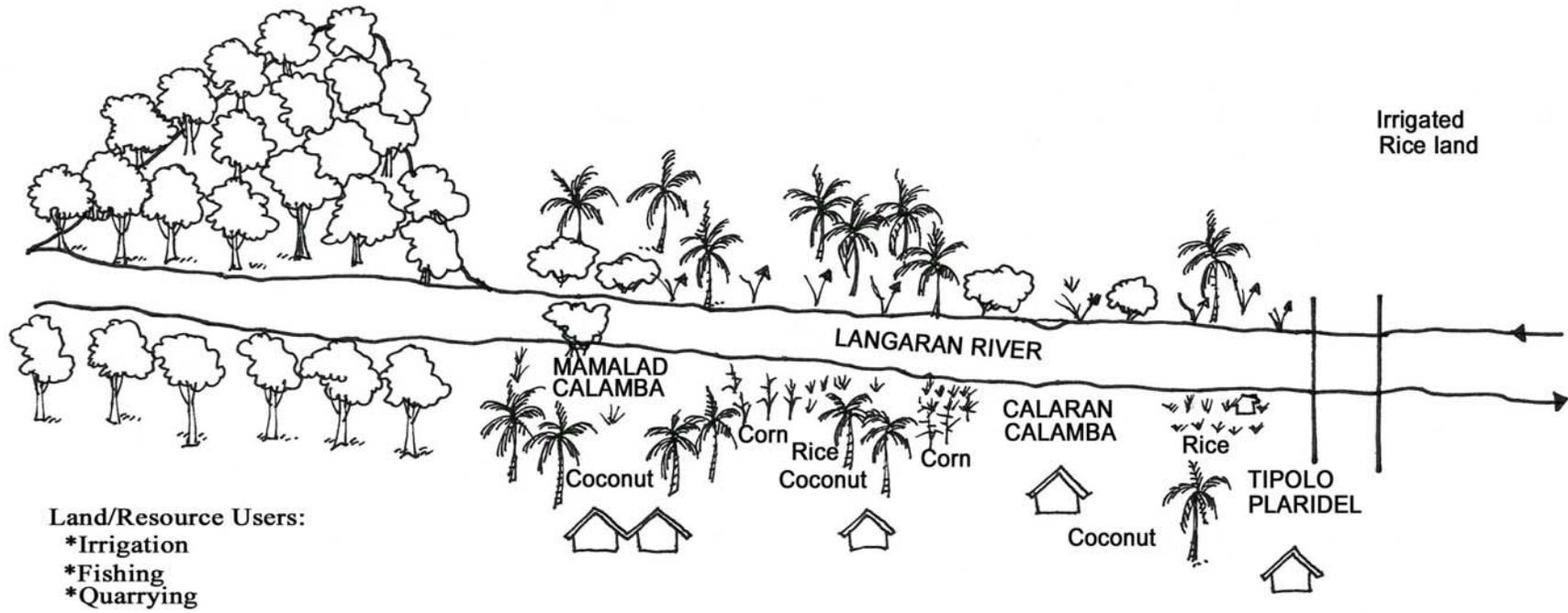


Fig. 65. Landscape and lifescape diagram of research theme 2 in the lowland ecosystem.

IX. Conclusions

1. Of the 11 barangays, only Siloy and Sinampongan have patches of natural forests. These forests are still inhabited by some endangered, economically-important, and rare primitive vascular plants and some wildlife. However, the lives of these species and wildlife are threatened because of habitat destruction. There is an urgent need to protect them.
2. Soil analyses show that acidity of soil increases with elevation and ruggedness of terrain. Moreover, an increase in acidification in areas using high amount of inorganic fertilizers was also observed.
3. Soil erosion is serious along riverbanks, in cultivated "kaingin", and in marginal slopes.
4. Agriculture occupies the largest segment in the lowland areas, with coconut as the primary crop, followed by rice, corn and root crops. The other subecosystems are settlement, secondary forest, and reforestation areas.
5. There is a significant reduction in coconut hectareage because it has become a cheap alternative source of lumber and indiscriminate conversion of coco lands into rice lands.
6. Intrusion of sea water into the two major river systems, the Langaran and Dioyo Rivers, has been observed. This situation may have some influence on the diversity of the aquatic ecosystems.
7. High-value fruits such as mangosteen, lanzones, mangoes, and "marang" abound. Micro-propagation and other horticultural techniques are necessary to mass propagate these crops.
8. Low yield in plantation crops is due to the incidence of pests and diseases such as tungro, green leaf hopper, black bug, and rats in rice; corn borer; leaf miner and rats in coconut; and the "bunzalo" problem in cooking banana.
9. Farmers are still traditional not only in terms of their agricultural activities, but also in their belief system. Rituals are still performed to get good harvest and counter pests and diseases.
10. Decision-making is shared between the husband and the wife. The kinship system plays a major role in making decisions for biodiversity conservation activities.
11. Traditional forms of labor cooperation is popular. The *hunglos*, *pahina*, *alayon*, and *tampuhay* are Filipino values of working together without financial remuneration. These cooperative efforts can be capitalized for biodiversity programs in Mt. Malindang.
12. Government support services provided are found inadequate or lacking. The government should take a closer look at these services and find ways to improve the quality of life of residents in the depressed areas of Malindang.
13. The *Timoay* as tribal leader could be an instrument to bridge and encourage support from members of the indigenous groups for biodiversity development programs.
14. Population density appears to decrease with elevation. This situation means a greater biodiversity loss in areas with high population density like the lower elevation areas.
15. Fertility rate remains constant, despite family planning efforts.
16. Infant mortality has declined significantly and the average life span of adults longer because of improved delivery of health services.
17. For most of the year, there is labor underemployment. Many farm workers are employed seasonally (planting and harvesting). In between periods, they are unemployed. This is exacerbated by the farmers' low educational attainment. Any investment in human resource by government/nongovernment organizations

can help farmers. Training and loans for livelihood activities can be extended. This is important in the effort towards biodiversity conservation as it will lessen the pressure to turn to the forests for survival.

18. Farm productivity is low because only land and labor are the principal capital for production. Capital investment is limited to the purchase of seeds, fertilizers, and pesticides, and sometimes the use of the simplest farm implement. Thus, agriculture is mainly for subsistence farming. Cash income is dictated by middlemen who set the price for farm produce. Farmers rely on them because of poor farm-to-market roads, lack of transportation, and distance to the market. Low income and poverty force farmers not to practice biodiversity conservation and turn to the forests for survival.

19. Landlessness also force the rural poor to turn to the forest, clear lands to make way for settlement and farm. Although CARP addresses this problem, its implementation remains limited. In some instances, there simply are no large parcels of land to redistribute.

20. It can be concluded that poverty, landlessness, and commercialization of the economy led to deforestation, biodiversity loss, and environmental destruction. Assistance programs aimed at addressing livelihood and landlessness problems may be coursed to protecting the environment as well. Assistance efforts towards biodiversity conservation are bound to succeed if poverty issues and the market forces are not ignored.

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Appendix Table 1. Criteria used in the selection of the 11 barangays for the PRA.

Municipality/ Barangay	IPs	Org'n	Access to services							Bio- physical resources	LGU parti- cipation	Remarks				
			Sc	HS	W	E	SF	Co	TA				CM			
Aloran																
Calube	/	/		X				X	X		/	/	bcd	/	-	
Tugaya	/	/							X				bcde	/	-	
Mitazan	/	/		X	X			X	X		/		bc	/	-	
Sinampongan	/	/					X	X	X		/	/	bcd	/	A	
Plaridel																
Calacaan	X	/	X	X				X	X		X	/	ad	/	-	
Clarín	X	/							X					/	-	
Puntod	X	/	X					X	X					/	-	
Tipolo	X	/												/	A	
Unidos	/	/											d	/	A	
Calamba																
Calaran	/	/			X								d	/	A	
Salvador	/	/						X	X			X	abcd	/	-	
Bonifacio	/	/						X	X			X	bcd	/	-	
Siloy	/	/		X				X	X	/	/	/	abc	/	A	
Mamalad	/	/	/	/	X			X	X	/	/	/	abc	/	A	
Dapacan Bajo	/	/	/	X				X	X	/	X	/	bcd	/	-	
Dapacan Alto	/	/	/	X				X	X	/	X	/	-	/	A	
Mauswagon	/	/						X	X	/	X	/	d		-	
Sapang Dalaga																
Sapac	/	/							X		X	/	/	bcd	/	-
Madalla	X	/						X	X		X	X	/	bcd	/	-
Sixto Velez	/	X						X	X		X	/	/	acd	/	A
Bitibot	/	/						X	X		X	/	/	abcd	/	-
Dioyo	/	/						X	X	X	X	/	/	abcd	/	A
Baliangao																
Misum	X	/							X			-	-	-	/	-
Mabini	/	/							X			X	/	-	/	-
Lumipac	/	/						X				/	/	-	/	A
Landing	X	/										X	/	d	/	A

Sc–school; HS –health services; W–water system; E–electricity; SF–storage facilities; Co–communication; TA–technical assistance;
CM–credit/market assistance

Special difficulties:

a- Flood; b- Erosion; c- Denudation; e- Typhoon; f- Subsistence farming; g- Salinization

A- Selected PRA site

Appendix Table 2. Description of the biophysical parameters, problems, opportunities, and researchable areas in the 11 barangays in the lowland ecosystems.

Description/ Barangay	Coastal Near coastal/intrusion of salt water				Inland		Flat and rolling	Valley	With forest		Upland	
	Landing	Dioyo	Unidos	Tipolo	Lumipac	Calaran	Dapacan Alto	Mamalad	S. Velez	Siloy	Sinam- pongan	
Terrain	Flat to rolling	Rolling to flat	Flat	Rolling to flat	Flat to rolling	Flat to rolling	Flat to rolling	Valley	Rolling to rough	Rolling to rough	Rolling to rough	
Soil	pH Color	5.2-6.0 Brown to dark brown	5.4-6.4 Light brown to dark brown	6.0 Brown	5.8-7.3 Brown to very dark brown	5.8-6.4 Brown to dark brown	5.4-6.0 Dark brown	5.4-5.8 Light brown to dark brown	5.2-6.4 Dark brown	5.2-5.4 Dark yellowish brown	4.4-5.8 Light brown to brown	5.2-5.4 Dark yellowish brown
	Texture	Light to heavy	Heavy	Heavy	Light to medium	Heavy	Heavy	Heavy	Medium to heavy	Heavy	Heavy	Medium to heavy
	N	Low	Low	Medium	Low	Low	Low	Medium	Low	Medium	Low to high	Low
	P	Mostly high	Mostly low	Low	Medium to high	Low	Low	Low	Low to high	Low to medium	Low	Medium
	K	Mostly sufficient	Sufficient	Sufficient	Mostly deficient	Mostly sufficient	Mostly sufficient	Deficient to sufficient	Deficient to sufficient	Sufficient	Mostly sufficient	Generally sufficient
Pests and diseases	Tungro on rice, green leaf hopper			Tungro on rice		Corn borer		Black bug, tungro	Coco leaf miner			
Water availability	Springs, NIA, wells	Creek	Ducaling creek	Creeks, dam, NIA	Falls	Communal, spring, dams, 4 creeks	Creeks, dam	Springs, 5 creeks	5 creeks	5 creeks	3 creeks, 1 brook	
River	Sinian	Dioyo, Bitibot	Langaran	Langaran	Dioyo	Langaran	Bunawan, Dioyo	Langaran	Tolon, Gilinabot	Dioyo	Pines	
Problems	Presence of mangrove	Widening of river due to flooding	Low coco production	Squatter Bank erosion	Irrigation	Low productivity	Loss of native Pantat due to Taiwan catfish	Low productivity	Low productivity	<i>Kaingin</i>	Cutting of trees for lumber and wood	
		Erosion of riverbanks	Illegal fishing	Immigration			Idle lands	Farm-to-market roads	Farm-to-market roads	Encroachment of settlement to public forests	Soil erosion	
		Lack of potable water	Loss of native fishes				Burikat weeds		Under-developed farms	Hunting of wildlife		
										Inaccessibility		

Appendix Table 2 continued..

Description/ Barangay	Coastal Near coastal/intrusion of salt water				Inland	Flat and rolling	Valley	With forest	Upland		
	Landing	Dioyo	Unidos	Tipolo					Lumipac	Calaran	Dapacan Alto
Opportunities	Presence of mangrove	Presence of Mt. Simulay (believed to be an enchanted mountain)	Presence of different varieties of plants	Livelihood Along the highway	Presence of high-value fiber plants and premium trees	Along the highway	Presence of many medicinal plants	Improved soil mgt.	Inter-cropping	High biodiversity	Presence of many rare and endemic plants and wildlife
		Diversion dam and new irrigation canals	Abundant water from irrigation	Scenic river and waterfalls for ecotourism	Accessible	Near the market	High biodiversity awareness, positive attitude toward gov't. prog.	Quarry available for road improvement	Improved soil management	Presence of rare and threatened wild species	Near Mt. Siatog
		Ecotourism	Knowledge of sustainable agriculture (organic farming, IPM)				Rare chicken breed (patani)		Economically-important plants		
			CARP				Availability of mother trees for reforestation				
			Rare spp.								
Researchable areas	Environmental, social, economic impact assessment of land conversion	Effect of nipa grooves as buffer to river-bank erosion	Ecology of catfish	Evaluation of quarrying in Langaran River	Ecology and phenology of salago and bagalungan (medicinal)	Evaluation of quarrying in Langaran River	Biodiversity survey of brush lands (Malatungro)		Propagation of high-value forest trees	Inventory & assessment of rare, endemic, endangered, economically important species	Diversity conservation and ecology of some endemic, endangered, and economically important flora and fauna
		Evaluation of quarrying in Langaran River	Ecology, morphology and phenology of kuyamis		Ecology and distribution of molave		Ecology and phenology of Burikat (<i>Wedelia trilobata</i>)		Inventory of economic, endemic and endangered flora and fauna	Growth performance of introduced tree species	Ecological analysis of farming systems and agro-forestry
			Propagation of high-value fruit trees		Ethno-botanical studies of medicinal plants		Assessment of growth performance of reforestation species			Ecological studies of natural stands of tree species	Economic analysis of farming systems and agro-forestry

Appendix Table 3. Some endemic plant species in the PRA sites.

Scientific name	Family	Local name(s)
1. <i>Alstonia scholaris</i> (L.) R. Br.	Apocynaceae	Dita
2. <i>Cryptosperma merkusii</i> (Hassk.) Schott.	Araceae	Palaw/palau
3. <i>Dillenia philippinensis</i> Rolfe	Dilleniaceae	Katmon
4. <i>Dillenia reifferscheidtia</i> Naves	Dilleniaceae	Katmon-kalabau
5. <i>Dipterocarpus grandiflorus</i> Blc.	Dipterocarpaceae	Apitong
6. <i>Shorea contorta</i> Vidal.	Dipterocarpaceae	White lauan
7. <i>Shorea negrosensis</i> Foxw.	Dipterocarpaceae	Red lauan
8. <i>Shorea polysperma</i> (Blc.) Merr.	Dipterocarpaceae	Tanguile/tangile
9. <i>Antidesma impressinerve</i> Merr.	Euphorbiaceae	Pag-uringon
10. <i>Bridelia minutiflora</i> Hook. f.	Euphorbiaceae	Subiang
11. <i>Macaranga bicolor</i> Muell. Arg.	Euphorbiaceae	Hamindang
12. <i>Macaranga grandiflora</i> (Blc.) Merr.	Euphorbiaceae	Takip-asin
13. <i>Pterocarpus vidalianus</i> Rolfe	Fabaceae	Prickly narra
14. <i>Flacourtia jangomas</i>	Flacourtiaceae	Seriales/governor's plum
15. <i>Lithocarpus ilanoisii</i> (A.DC.) Rehd.	Fagaceae	Ulayan/ulaian
16. <i>Garcinia mangostna</i> Linn.	Guttiferae	Mangostan/mangosteen
17. <i>Ocimum basilicum</i> L.	Labiatae	Bawing/balanoi/sweet basil
18. <i>Melastoma malabathricum</i> L.	Melastomataceae	Hantutuknaw/malatungao
19. <i>Artocarpus blancoi</i> (Elm.) Merr.	Moraceae	Antipolo
20. <i>Ficus nota</i> (Blc.) Merr.	Moraceae	Tubog-tibig
21. <i>Ficus septica</i> Burm. f.	Moraceae	Hawili/hauili
22. <i>Syzygium albayense</i> Merr.	Myrtaceae	Sambulawan/sambulauan
23. <i>Caryota cumingii</i> Lodd.	Palmae	Pugahan
24. <i>Psilotum complanatum</i> Sw.	Psilotaceae	Whiskfern
25. <i>Carallia brachiata</i> (Lour.) Merr.	Rhizophoraceae	Bakhaw-bakhaw/bakauan-gubat
26. <i>Parinari glaberrima</i> Hasskarl.	Rosaceae	Tambon-tambon/tabon-tabon
27. <i>Wikstroemia lanceolata</i> Merr.	Thymeleaceae	Sayapo/salago
28. <i>Colona serratifolia</i> Cav.	Tiliaceae	Sanilau/anilao
29. <i>Leea aculeate</i> Bl.	Vitaceae	Amamali

Appendix Table 4. Some common economic plants in the PRA sites.

Scientific name	Family	Local name(s)
A. Pteridophytes		
1. <i>Blechnum orientale</i> L.	Blechnaceae	Pakong alakdan
2. <i>B. fraserii</i>	Blechnaceae	
3. <i>Stenochlaena milnei</i> Underw.	Blechnaceae	Hagnaya
4. <i>Cyathea contaminans</i> (Hook.) Copel.	Cyatheaceae	Tree fern/anonotong
5. <i>Pteridium aquilinum</i> (L.) Kuhn.	Dennstaedtiaceae	Palang-palang
6. <i>Dicranopteris linearis</i> (Burm.f.) Underw.	Gleicheniaceae	Agsam
7. <i>Lycopodium cernuum</i> L.	Lycopodiaceae	Clubmoss
8. <i>L. carinatum</i> Desv.	Lycopodiaceae	Pamampay
9. <i>L. filiforme</i> Roxb.	Lycopodiaceae	Tagawili
10. <i>L. nammularifolium</i> Blume	Lycopodiaceae	
11. <i>L. whitfordii</i> (Hert.) Cope.	Lycopodiaceae	
12. <i>Angiopteris palmiformes</i> (Cav.) Chr.	Marattiaceae	Anampong
13. <i>Osmunda banksiifolia</i> (Presl.) Kuhn.	Osmundaceae	
14. <i>Crypsinus</i> sp.	Polypodiaceae	
15. <i>Platyterium grande</i> (J.Sm. ex Fee) Presl.	Polypodiaceae	Giant staghorn
16. <i>P. coronarium</i> (J. Koenig ex. O.F. Mull) Desv.	Polypodiaceae	Staghorn
17. <i>Psilotum complanatum</i> Sw.	Psilotaceae	Whiskfern
18. <i>Tmesipteris lanceolata</i> Dang.	Psilotaceae	
19. <i>Pteris</i> sp.	Pteridaceae	
20. <i>Lagodium circinnatum</i> (Burm. F.) Sw.	Schizaeaceae	Nito
21. <i>L. flexuosum</i> (L.) sw.	Schizaeaceae	
22. <i>Cheilanthes tenuifolia</i> (Burm.) Sw.	Sinopteridaceae	
B. Palms		
23. <i>Areca catechu</i> L.	Palmae	Bunga
24. <i>Caryota cumingii</i> Lodd.	Palmae	Pugahan
25. <i>Metrosylon sagu</i> Rottb.	Palmae	Sagopalm
C. Grasses/sedges		
26. <i>Thyanaolaena latifolia</i> (Hornem.) Honds.	Poaceae	Idyok/tiger grass/tambu
27. <i>Bulbostylis barbata</i> (Roxb.) Kunth.	Cyperaceae	
28. <i>Fimbristylis littoralis</i>	Cyperaceae	
29. <i>Scleria scrobiculata</i>	Cyperaceae	Sarat
D. Shrubs/herbs/vines		
30. <i>Desmos</i> sp.	Annonaceae	
31. <i>Cryptosperma merkusii</i> (Hassk.) Schott.	Araceae	Palaw/palau
32. <i>Polygala paniculata</i>		Bono
33. <i>Pseudoelepahntophys spicatus</i> (Juss.) Rohr.	Asteraceae	Kokog-bungog
34. <i>Gonocaryum calleryanum</i> (Baill.) Becc.	Icacinaceae	Lagtang
35. <i>Ocimum basilicum</i> L.	Labiatae	Bawing/balanoi/sweet basil
36. <i>Cassia alata</i> Linn.	Leguminosae	Akapulko
37. <i>Cordyline fruticosa</i> (Linn.) A. Chev.	Liliaceae	Tungkod-pare/kilala/bisol
38. <i>Donax</i> sp.	Maranthaceae	
39. <i>Medinella magnifica</i>	Melastomataceae	Kapa-kapa
40. <i>Melastoma malabathricum</i> L.	Melastomataceae	Hantutuknaw/malatungao
41. <i>Mentha arvensis</i> var. <i>piperata</i>	Verbenaceae	Boko-boko
E. Gymnosperms		
42. <i>Cycas circinalis</i> L.	Cyadaceae	Common pitogo
43. <i>C. revolute</i> Thumb.	Cyadaceae	Oliva

Appendix Table 4. Continued...

Scientific name	Family	Local name(s)
F. Trees		
44. <i>Parinari glaberrima</i> Hassk.	Amygdalaceae	Tabon-tabon
45. <i>Mangifera indica</i> Linn.	Anacardiaceae	Mangga
46. <i>Pometia pinnata</i> ssp. <i>Repanda</i>	Anacardiaceae	Malugai-liitan
47. <i>Cananga odorata</i> (Lam.) Hook. f. & Thoms.	Annonaceae	Ilang-ilang
48. <i>Papuclata landeolata</i>	Annonaceae	Takulao
49. <i>Alstonia macrophylla</i> Wall. ex. DC.	Apocynaceae	Batino
50. <i>Polyscias nodosa</i> (Bl.) Seem.	Araliaceae	Malapapaya
51. <i>Wedelia trilobata</i> (L.) A.S. Hatch.	Asteraceae	Burikat
52. <i>Durio sibethinus</i> Murr.	Bombacaceae	Durian
53. <i>Casuarina equisetifolia</i> Forst.	Casuarinaceae	Agoho/wild pine
54. <i>Clethra lancifolia</i> Forst.	Euphorbiaceae	Kamog
55. <i>Dillenia philippinensis</i> Rolfe	Dilleniaceae	Katmon
56. <i>Antidesma blancoi</i>	Euphorbiaceae	
57. <i>A. impresinerve</i> Merr.	Euphorbiaceae	Inyam
58. <i>Glochidion album</i> (Blanco) Boerl.	Euphorbiaceae	Malabag-ang
59. <i>Macaranga grandifolia</i> (Blm.) Merr.	Euphorbiaceae	Tula-tula/takip-asin
60. <i>Mallotus multiglandulosus</i> (Reinw. ex Blume) Hu	Euphorbiaceae	Alim
61. <i>M. philippinensis</i> (Lam.) Muell.-Arg.	Euphorbiaceae	Banato
62. <i>Phyllanthus reticulate</i>	Euphorbiaceae	
63. <i>Sandoricum vidalii</i> Merr.	Euphorbiaceae	Malasantol
64. <i>Pterocarpus cidalianus</i> Rolfe	Fabaceae	Prickly narra
65. <i>Flacourtia jangomas</i>	Flacourtiaceae	Serials/governor's plum
66. <i>Gnetum gnemon</i> L.	Gnetaceae	Bago
67. <i>Garcinia garciae</i> Elm.	Guttiferae	Kandis/bugalot
68. <i>G. mangostana</i> L.	Guttiferae	Mangosteen
69. <i>Celtis philippinensis</i> Blanco	Icacinaceae	Taingang-bato/malaikmo
70. <i>Cryptocarya paniculata</i>	Lauraceae	Malakape
71. <i>Derris elliptica</i> (Roxb.) Benth.	Leguminosae	Tubli
72. <i>Derris</i> sp.	Leguminosae	
73. <i>Lagonestemon speciosa</i>	Leguminosae	
74. <i>Chisocheton cumingianus</i> (C.DC.) Harms.	Meliaceae	Balukanag
75. <i>Melia ducia</i> Cav.	Meliaceae	Bagalunga
76. <i>Sweitenia mahogany</i> Jacq.	Meliaceae	Mahogany
77. <i>Dysoxylum decandrum</i> (Blc.) Merr.	Meliaceae	Colo, Igyo
78. <i>Lansium domesticum</i> Corr.	Meliaceae	Lansones
79. <i>Anamirta cocculus</i>	Menispermaceae	Ligtang
80. <i>Artocarpus odoratissima</i> Blanco	Moraceae	Marang-Baguhan
81. <i>Morinda bracteata</i>	Rubiaceae	Banghoro
82. <i>Neonauclea ovata</i> (Merr.) Merr.	Rubiaceae	Balod
83. <i>Sapindus saponaria</i> L. forma <i>microcarpa</i> Radlk.	Sapindaceae	Kusibeng
84. <i>Colona serratifolia</i> Cav.	Tiliaceae	Awit/anilau
85. <i>Vitex parviflora</i> Juss.	Verbenaceae	Molave/tugas
86. <i>Leea philippinensis</i> Merr.	Vitaceae	Amamali/pingka-pingkahan

Appendix Table 5. General timeline in the 11 barangays.

Year	Status
Up to 1890s	<ul style="list-style-type: none">* Heavily forested* High biodiversity
1890s-1930s	<ul style="list-style-type: none">* In-migration of people from Visayas and Luzon* Subanons moved to higher areas* Cutting of trees* Clearing of land for planting rice and corn
1930s-1940s	<ul style="list-style-type: none">* Planting of coconut and high-value fruits which became cash crops (i.e., lanzones, mango, nangka)
late 1960s-1970s	<ul style="list-style-type: none">* Logging concessions/timber poaching* Intensive coco planting due to demand for copra* Intensive corn and rice farming to feed the increasing population
1980s	<ul style="list-style-type: none">* Social forestry/reforestation (Gmelina, mahogany)* Rice gave way to coconut due to demand for copra (except in areas with irrigation)
1990s	<ul style="list-style-type: none">* Coco lumber (unproductive coconuts)* Coco lands to rice lands due to opening of irrigation system* Environmental conservation efforts: organic farming, IPM, SALT, NIPAS* CARP implementation

Appendix Table 6. Timeline of Brgy. Sinampongan.

Year	Event	Remarks
1940	Opening of foot path along the forested area	Passable by persons, carabaos, and carts
1963	Opening of provincial road to Sinampongan	In-migration and tree-cutting to build houses; passenger jeepneys started plying the Oroquieta-Sinampongan route and vice versa
1971	A logging concession was granted which continued until 1974	Road to upper Sinampongan was constructed to allow trucks to haul logs; concession stopped logging after a year
1972	Another logging concession was granted which continued until 1974	Forest disappeared due to indiscriminate cutting of trees; log transport by way of Aloran River, foreign vessels shipped logs abroad. Replanting done by logging concessionaire as mandated by DENR but trees died due to poor care and management
1974	Construction of provincial road to Brgy. Roxas (upper barangay next to Sinampongan to facilitate hauling of logs by land and bringing logging equipment Commercial logging ended during this year, reportedly due to NPA threats and taxation levied against concessionaires Planting of mahogany, Gmelina, falcata, pine trees and fruit trees such as guava and nangka by students and employees of LGU and other government agencies such as DILG	As Sinampongan forest disappeared, logging activities had to move to the interior; more public vehicle became available which facilitate transport of high-value vegetables such as carrot and bell pepper Loss of jobs among some residents working with logging company; others continued working with the company in logging concession elsewhere. Control of deforestation. Reforestation efforts; part of Green Revolution Program
1979	Imposition of total log ban	Government response to denudation of forest
1980	Bunzalo infection in cooking bananas	Resulted in poor banana harvest and low income from sale of bananas; locally treated by putting salt and ash on banana stump
1987	Wild monkeys and wild pigs attacked corn, coconut, bananas, and root crops	Poor harvest of crops
1988	Planting of mahogany and Gmelina by barangay residents	Social forestry efforts; trees also source of livelihood
1989	Sinampongan became an Agrarian Reform Community (ARC)	Implementation of CARP
1994	Organized Siya Kaunlaran Arso (SKA) which released loans for livelihood; Sinampongan became a protected area (NIPAP)	Poverty-alleviation measure provided protection to forest and biodiversity

Appendix Table 6. Continued...

Year	Event	Remarks
End 1996	Introduction of Sloping Agricultural Land Technology (SALT) by PIPULI KAMAS, a local cooperative, was organized; funded by FPE and PIPULI	Introduction of contour farming using organic fertilizers; IPM Loans made available to 22 members, repayment in terms of no. of trees planted in a year, KAMAS gets 10% of loan proceeds after 4 months as reinvestment
Dec. 1997	Release of CLTs to land reform beneficiaries	Land reform beneficiaries become amortized owners
End 1997- Apr. 1998	El Niño	Poor harvests
1999	La Niña	Too much rain affecting planting and production of corn and some vegetables

Appendix Table 7. Population dynamics in the 11 barangays of Mis. Occidental.

Elevation (m asl)	Barangay	Population			Land area (has)	Population density	No. of households	Household size
		M	F	Total				
50-65	Tipolo	747	912	1659	227	7.31	332	5.0
30-50	Dioyo	442	205	647	147	4.41	-	-
25-55	Landing	575	622	1197	630.25	1.90	248	7.0
90-95	Lumipac	432	382	814	559	1.46	167	4.9
40-45	Unidos	911	913	1824	524	3.48	418	4.4
80-110	Calaran	435	471	906	316.4	2.86	212	6.0
200-205	Dapacan Alto	528	519	1047	834	1.26	205	6.3
360	Mamalad	296	242	538	250	2.00	92	6.0
400-595	Siloy	390	385	775	973	1.00	137	6.0
430-450	Sixto Velez	213	217	430	450	0.95	74	5.0
425-610	Sinampongan	274	290	564	1500	0.38	94	6.0

Appendix Table 8. Assistance programs and social services.

Common

Day care centers
Operation Timbang (supplemental feeding)
Distribution of vitamin A and iron supplement
Infant immunization
Pre-natal health care
- distribution of iron and iodine supplement
- anti-tetanus injection

Skills training
- practical automotive/electricity
- hair science, manicure/pedicure
- slipper making
- herbal medicine preparation
Cattle, carabao and swine dispersal
Artificial insemination (AI): cattle, carabao

PCA → SCFO

HYV coconut seedlings
Postharvest facilities: Landahan solar dryer
Technical assistance

CIDSS area (Calaran, Siloy, Lumipac)

Day care center
Distribution of plastic toilet bowls and cement for construction of water seal toilet
Two-year free education (secondary/vocational)
P8,000.00 illness/hospitalization benefit

Integrated protected areas (EU-NIPAP)

Protection of forests and wildlife
Ecological awareness campaigns
Reforestation (Siloy, Dapacan Alto and other study sites)

Environmental

Sloping Agricultural Land Technology (SALT) in Sinampongan (FPE-PIPULI)
Integrated pest management (DA, FPE, PIPULI)
Organic farming (DA, FPE, PIPULI)
Loans for livelihood, payable with tree planting (FPE/PIPULI)

Appendix Table 9. Lowland ecosystem biodiversity research themes.

Researchable areas	Reversing land degradation in Langaran River watershed	Conservation of biodiversity hotspots in Mt. Amparo, Siloy through appropriate land use practices
Methodology	Modeling of sustainable land and resource technologies	<ol style="list-style-type: none"> 1. Comparison/validation of existing methods and inventory assessment of biodiversity 2. Determination of biodiversity indicators for local community and scientists
Knowledge	<ol style="list-style-type: none"> 1. Identification and assessment of land and resource use pattern 2. Revival and enhancement of indigenous knowledge system 3. Hydrobiology of Langaran river system 4. Access to and control over land and water resource 5. Impact evaluation of introduced fish species 6. Acceptance of SALT for sustainability of Mt. Malindang communities 7. Gender roles in land/resource use (i.e., biodiversity enhancement) 8. Ecology of <i>Wedelia trilobata</i> 	<ol style="list-style-type: none"> 1. Inventory and assessment of biodiversity (flora and fauna) 2. Introduction of reforestation species vs. indigenous species 3. Access to and control over land resources 4. Revival enhancement of IKS supporting biodiversity conservation 5. Rituals and resource utilization 6. Gender roles 7. Tenurial arrangement in agricultural reform communities (ARCs) 8. Biodiversity assessment in intact and degraded ecosystems 9. Traditional roles of leaders
Policy recommendation	Policy recommendation for critical sustainable land and resource use	<ol style="list-style-type: none"> 1. Policy recommendation for conserving/protecting endangered flora and fauna 2. Impact of IPs depending on Mt. Malindang resources 3. Impact of conservation policy on conservation practices of indigenous people
Others	<ol style="list-style-type: none"> 1. Management and control of weed encroachment on agricultural land 2. Action research on alternative livelihood <ul style="list-style-type: none"> - High-value fruits - Semi-processing of agri products 3. Action research on alternatives for land use (farming systems and farming practices) 4. Assisted natural regeneration of degraded land 	<ol style="list-style-type: none"> 1. Media support on biodiversity conservation 2. Action research on community co-management system 3. Action research on alternative livelihood 4. Action research on land and habitat restoration 5. Biodiversity monitoring

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