RELATIONS BETWEEN AGROECOLOGICAL BIODIVERSITY AND CONDITIONS FOR ALTERNATIVE ENTERPRISE IN THE URBAN PERIPHERY

(THE POSITION OF ROOTCROPS AS AN INDEX TO CHANGE)

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Research Report on Sablan, Benguet
with
Comparison to Previous Findings in Barlig, Mt. Province

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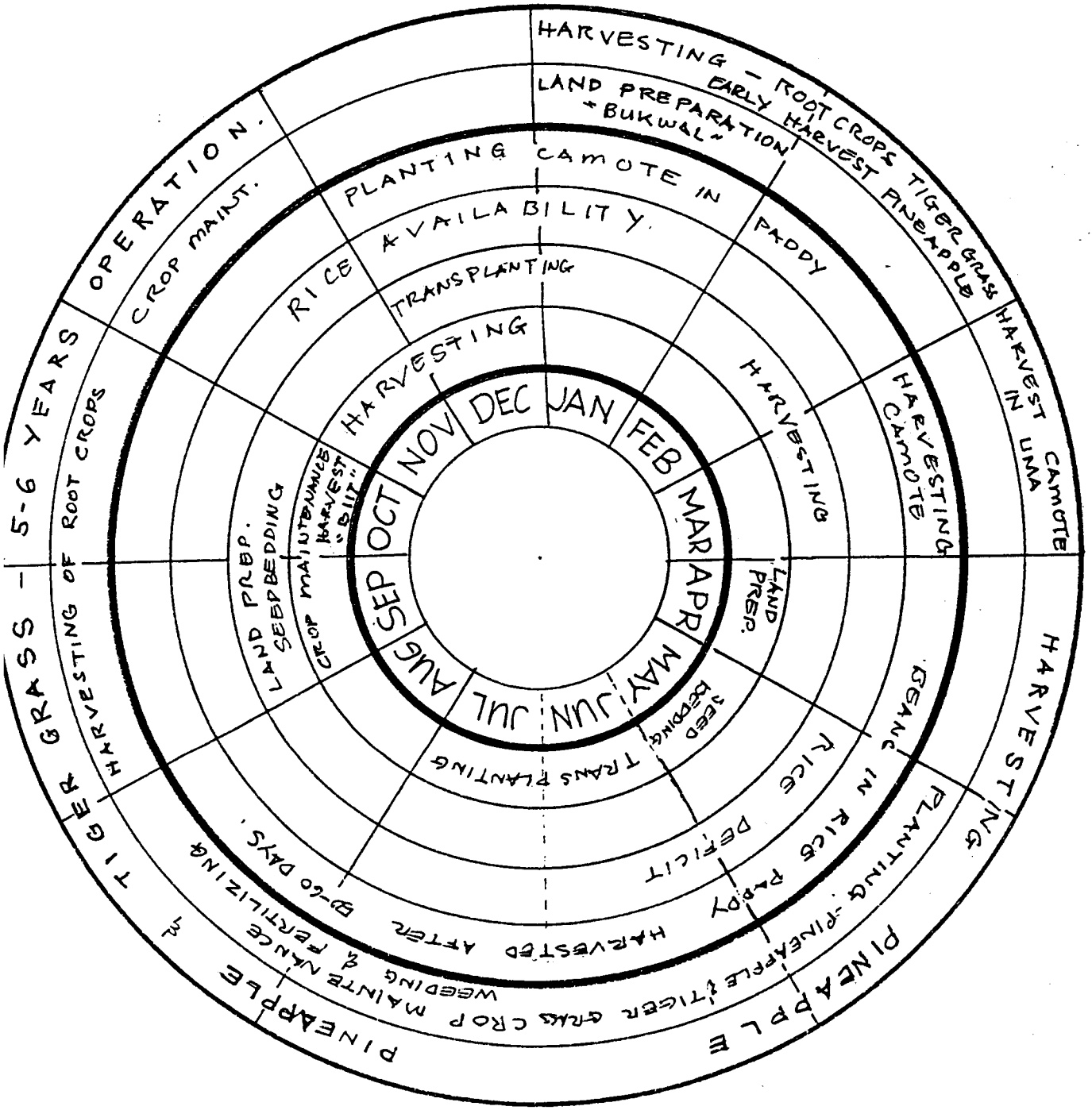
SABLAN CROPPING CALENDAR



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The Project

The action-research project for which this report is submitted was proposed as a study of "the effects of informational, organizational and economic change on agroecological biodiversity in upland communities with a rice/sweet potato staple."

Two key research questions focused on:
How land-based producers manage biodiversity in subsistence agriculture on fragile uplands and

What management factors influence changes in biodiversity.

The research interest was in delineating possible relationships between decreasing productivity -- and decline in cropping -- of the former staple crop of sweet potato and changes in production orientation with associated shifts in such activities as labor allocation, crop choices. use of forest resources, and establishment of enterprises.

Sites

The main research site was the municipality of Sablan, in particular the poblacion (Sablan Central) and the sitios of Palali, Bayabas, Sawili and Pappa. The production system in these areas was traditionally based on swidden cultivation with dominant sweet potato and limited pond-field rice cultivation. Sablan Central is a trade node on a major highway, while Palali -- also on the highway -- has remained agricultural. The other sitios are agricultural with different access to feeder roads (Pappa accessible with an hour's hike).

Work on an ongoing IDRC-funded project in Barlig, Mountain Province (to develop a proposal for renewable-resource-based enterprises and forest management) was adjusted to provide a contrasting case. The Barlig study was done mainly in Barlig Central, where population and rice fields were concentrated, and Chatul, which was the traditional swidden area for Barlig Central residents and where shifts from subsistence crops to commercial vegetable production were starting.

Methodology

Agroecosystems Analysis (AA) provided the structural base for data generation and synthesis, focusing on interactions between biophysical relationships and social and cultural organization and processes. However, the analysis used in this work assumes that productivity is basically a social phenomenon, associated with the intent of producers to meet life requirements. While biological and physical processes exist outside of the objectives of producers, they are subject to human management and use, with intended or inevitable consequences.

The major tool used was an iterative Resource Systems Appraisal (RSA) series. The process started with secondary sources synthesis, field observations and free interviews of community residents, on which a baseline transect and diagram of existing relationships was developed. Field RSAs were conducted in Sablan, Benguet as follow: 19 November 1993; 7-10 and 13-17 December 1993, 20-22 January and 23-26 August 1994; and 9 January 1995.

Key interactions and issues surrounding the nature and processes of production were elicited from various resident sectors -- including both the indigenous and the nationally-oriented segments, Developments through time in response to environmental conditions and social forces within and outside the community were defined through key informant interviews. The key questions were cross checked with community residents and key respondents within and outside the community. Questions and issues were discussed by the research group in preparation for the next field session. Finally, cost and returns assessments were constructed from household cases selected for variation in cropping pattern and resource use.

Transects were developed with respondent farmers to define the biophysical base, then the resource use systems, successive impacts, and subsequent effects and responses. These are essentially descriptive tools. Analysis is taken largely from the perspective of political economy -- in its simplest terms, the logic of community resource management and use under bounded conditions. Field data at local levels was related to national events and processes as part of the community's context.

Fifty respondents selected purposively for their economic engagements and location of residence were dealt with in iterative interviews. From these the most detailed cases were used to develop cost-returns assessments. Unstructured interviews were conducted informally and at random on special topics as they arose (with some spontaneity) in the field process.

The action components of the project were discussed with possible participants but, unfortunately, not completed as planned, largely due to constraints on the time and land availability of Sablan residents. The same constraints worked against full implementation of participatory research, as did the time constraints of almost simultaneous research management in two widely separated and diverse sites.

The Municipality of Sablan

Sablan Poblacion lies on the western slopes of Benguet Province, the southern segments of which are the indigenous homeland of the Ibaloi. Halfway between the highlands of Baguio City and the lowlands on the China Sea coast, Sablan is bisected in by a major national motorway, the Naguilian Road which links Baguio to the lowland provinces of La Union, Ilocos Sur and Ilocos Norte.

Biophysical sketch

Sablan is generally hilly with a maximum elevation of 1,200 meters above sea level in barangay Banangan and 600 meters above sea level in the lower fringes of sitio Palali and valleys in the Poblacion. In the upper slopes where the swidden farms are located, the gradient is between 30% and 60% while in the areas where semi clustered settlements are found, the modal slope is 40%.

Dry season in Sablan like Baguio starts in late November and ends in early May. Rainfall is heaviest during the months of July, August and September when the daily average reach 50 mm. The cold season sets in by the end of October and normally lasts until late February with mean temperature approximately at 19 ^{o}C and as high as 25 ^{o}C.

Topographically and climatologically, Sablan is a transition zone (ecotone) between the highland and lowland environments. Temperature drops radically at night while days are humid and markedly hotter. Vegetation is a diverse mix of highland and lowland species.

There are multiple spring sources in the mountain slopes of Pappa, which is only remaining forest near Sablan Central (poblacion). Three major domestic water systems were constructed over the last 15 years, but water supply is insufficient for both domestic and irrigation uses during the dry months. This is partially due to lack of maintenance of developed water sources, probably also partially due to deforestation, and aggravated to some extent by subterranean shifts after a major earthquake in 1990.

Before the construction of Naguilian Road (1910-1920) the central settlement of Sablan (the poblacion) was a resting place (ap-afonan) for Ibaloi who traveled from various western upland settlements to coastal towns to procure commodities and tools. Today, it is most notably a bus stop for the traffic and transport between busy Ilocos cities and the Cordillera gateway. Otherwise, it is a conundrum for agricultural development and a striking example of biodiversity dear only to the hearts of entomologists, bacteriologists, and virologists.

Chart 1: 1994 Sablan Population by Barangay

BARANGAY	POPULATION
Poblacion	1,979
Bayabas	1,602
Banangan	1,086
Banengbeng	747
Kamog	881
Bagong	716
Pappa	690
Balluay	456
T o t a l	8,157

Source: Municipal Health Office, Sablan, Benguet, January, 1995

Note: 60% of the municipal population is concentrated along the Naguilian road

Sablan before World War II

Settlement and Migrations

The modal Ibaloi settlement pattern of the colonial period was dispersed, most probably as a response to the development of large private cattle herds in the 1700s and to the intrusions of Spanish garrisons and forays. Before World War II, only a few of Sablan's indigenous Ibaloi families were settled near the road. Most households pursued swidden clearing and cultivation, spread out among the hospitable hills of the mid-elevation regime. Lands were held through rights of usufruct.

The construction and subsequent opening of the road between Baguio and La Union (one-way access opened from 1910-1915 and two-way in 1920-1925) brought in contracted road workers and settlers from both the lowlands and highlands. One of the first immigrants arrived in lower Palali (at the La Union border) in 1924 from Luna, La Union. Since then Ilocanos as well as Ibaloi and Kankanaey flocked to Sablan, apparently attracted by the agricultural potential of the mid-elevation climate and the relative availability of land.

Migrations from Ifugao, reportedly related to wood-carving resources and the expansion of pond field rice agriculture, started in the 1930s, when larger-scale commercial logging also began. Timber was supplied to construction firms and mines in Benguet and Vizcaya.

An elementary school was established in 1925, and older youth were sent to Baguio and Trinidad for secondary and tertiary courses, or to work in the Benguet mines and in La Union. IN the post-war period many males went into military service, leaving the women to care for fields and families -- in an early domestic version of overseas contract work.

From 1930 to the end of World War II, the indigenous Ibaloi population periodically became involuntary refugees, fleeing from taxes, brigands, and -- during the war -- from the impact of occupation and liberation forces. Tax collectors frequented residences near the highway so that many native residents transferred away from the road.

Local officials, government employees and their relatives -- mostly migrants from the lowlands -- executed tax declarations over lands near the highway that were temporarily abandoned by the Ibaloi who did not know of taxes, official declarations or land ownership. Many areas were not continuously occupied by indigenous residents with permanent fields when cadastral surveys were conducted by the Insular Government of the American colonial administration.

Tenure

This condition permitted a few immigrant families with mainstream access to obtain title over large areas through the new national legal procedures. Through the mid-1930s cadastral survey, one family of Spanish descent titled 120 hectares, later corrected to 80 hectares in the 1946 and 1947 resurveys. Though the later surveys redistributed some of the lands, indigenous rights under customary law have only recently been recognized, and are still largely unimplemented. Indigenous residents to date still represent a minor fraction of those tenured by law in Sablan.

The majority of the present Sablan population - particularly those residing in clusters near the road -- are squatters who may have ancestral claim to farm lands in the interior sitios. Modal size of swidden lands claimed (but not necessarily operated) by residents is 1/2 hectare (5,000 square meters).

Throughout the Cordillera region, swidden lands were traditionally held through right of usufruct rather than as private lands. When land use, however, became of a more permanent nature or required permanent tenure (as for the pasturing of large herds in southern Benguet Province or the construction of terraced pond fields), private ownership became dominant. With the increased importance of cash cropping, privatization of swidden areas is common.

Land in Sablan is rented out through four types of rental schemes:

a. "kanong" - an arrangement in which a third 30% of sales revenue from production is paid to the landowner;

b. "bingay" - a 50-50 sharing of production output between owner and user;

c. "contrata" - term arrangement of 5 years where owner and farmer agree on a crop and the farmer makes sure that on the sixth year the owner collects the entire production output (normally done for long term crops like fruit trees) and;

d. Fixed rental at rates from P500 to P 1,500 per hectare per year for swidden fields but much higher for rice land, which is rented by the cropping season and by pond field rather than area.

Post-war (1946) rental rates were from 150 to 200 pesos per hectare. In the 1990s rentals have ranged from 500 to 1,000 pesos per hectare for swidden areas. Given monetary devaluation, land rentals have actually decreased.

With low diversification of the local production system, economic stratification in the municipality is directly related to land tenure and subsequently to wage employment in government or private offices. The poor are those available for daily wage

labor in agriculture, construction, or hauling, not having enough land for food sufficiency and not educated enough to secure permanent employment.

The history of Sablan relates the stunting of the urban periphery. Its indigenous population has been displaced, its lands privatized and consolidated, its agriculture beset by crisis after crisis, and its production system unmarked by technical or economic alternatives. The convergence of migration, tenure, and cash cropping appears to have led to the constriction of the present economy.

Pre-war exchanges

Before World War II, Sablan residents had a limited trade system with people from the neighboring barrios of Bilis and Burgos in La Union. Lowlanders would bring in sugar, salt, milkfish (bangus), and fish products (salted and dried fish, fish sauce), and tools (bolos or machetes, sickles, and whetstones, 'sanggap') to trade for camote, palay (P.40/ganta) and cash. Less frequently, groups from Sablan would take corn and bananas to Naguilian, La Union to exchange for tobacco, salt and sugar.

By 1942, banana and sweet potato were being brought to the Baguio market in wooden carts under human draft power. With 4 young girls pushing and 2 boys pulling the trip took 4-5 hours uphill along Naguilian. Money earned from the sales was used to buy blankets and clothing.

Rice lands were limited to pond fields along valley streams, and the small harvests were not for household consumption but for sale or for feeding visitors. Sablan residents and their domestic animals had a staple diet of sweet potato cassava, taro, and yam.

Road construction work provided some additional cash. Women would also add to household cash by occasionally selling cooked tubers to road workers.

Sablan after World War II

Movement of Ibaloi households towards the road started with the cash cropping of pineapple, which required better market contact and transport efficiencies. Public transport which was initiated in 1946 by Benguet Autolines, followed by Dangwa in 1947 facilitated trade. At present, about 40% of the houses in the poblacion are clustered along the road alignment.

By 1950, traders from Sablan were buying banana, pineapple and other fruits from Sablan farmers for sale in Manila. Key respondents observes an increase in the volume of items traded and the addition of tiger grass, and tubers like gabi, yam, and cassava. Even this early, sweet potato cropping was less frequent and intense, reportedly due to declining yield.

Chart 2: Post-War Flow of Sablan Goods

Products from Sablan Farms	Market
Pineapple, baguio beans, cucumber, chinese cabbage, pechay, camote, taro, yam, santol, mango, ginger, guapple, lanzones, papaya, guyabano, tiger grass and soft brooms	Baguio and Sablan
Taro, yam, beans, ginger, cassava, santol, mango	San Fernando, La Union
Pineapple, tiger grass, brooms	Angeles, Pampanga
Tiger grass	Bataan
Pineapple, banana, santol, yam, guapple, mango, brooms	Manila
Pineapple, banana	Quirino
Banana (before the Panama virus)	Nueva Vizcaya
Products brought into Sablan	**Source**
Lowland vegetables, tobacco, fish and fish products, commercial grocery items (brought in weekly on Wednesday market days)	La Union
Commercial grocery items and snacks; upland vegetables (potato and cabbage)	Baguio
Banana (var. lacatan)	Isabela, Vizcaya, and Quirino traders; thru Baguio or directly

Shifts in the Production System of Sablan

Shift in Cropping: Swidden Fields

In the pre-war setting, households relied on a system of swidden farming which involved a widely diverse selection of root crops and perennials. These included sweet potato, upland rice, taro, ginger, cassava, banana and cow peas. Bananas and sweet potato were then considered the main crops in the swidden fields

with bananas regarded as a commodity for surplus trade and sweet potato as the basic staple.

Domestic animals included chickens and from 5 to 8 pigs per household, all fed mainly on sweet potato tubers and leaves. Carabao for draft power were pastured on the hillsides and dry rice fields.

Rice was never grown extensively in Benguet. Pond field construction and wet rice technologies were apparently introduced in the 18th century from the northern Cordillera.

In Sablan, rice farming is concentrated only on the valley floors along river banks and creeks and only five percent of the land owners maintain paddy fields. The extent of the rice farms vary in size from a fourth of a hectare to eight hectares (2-20 "kelleng"). The present rice crops are the IR varieties after referred to as "miracle" rice. Before these varieties were introduced by the Department of Agriculture, farmers claim to have been planting more than nine varieties in paddy and upland fields.

Swidden cultivation had earlier provided the majority of households with access to subsistence crops. The swidden now has become the main source of cash income for those with restricted access to land, and to on-farm and off farm economic alternatives.

Swidden fields formerly for subsistence crops are now under relatively permanent (fruit tree) or longer-cycle and sequential cropping (tiger grass and pineapple or temperate vegetables). Swidden fields are utilized for as long as six years, as required by the long cycle of crops like pineapple, and then fallowed for 2-3 years or planted to a different crop..

Land use became more extensive as settlers opened up new swidden areas and pond fields. But the intensity and composition of the swidden cropping did not change very much until 1948 or 1949 when traders started bringing bananas and pineapple to the Baguio market. The demand for Sablan bananas had little effect on sweet potato cropping but the increase in pineapple demand impinged upon areas previously planted to rootcrops.

Bananas had occupied the dominant position in the swidden fields until 1975, when the Panama virus ("bunchy top") spread through Sablan. By 1985, the banana industry was virtually eradicated, except for a lower value and poorer quality cooking variety called **dip-pig**.

Tiger grass (**boiboi**; buybuy) which currently enjoys the dominant status in the upland fields was introduced around in the mid-1950s as a raw material for broom-making, but did not become pervasive until 1964 when traders brought in planting materials from Benguet and La Union. The incentives for growing tiger grass are not only the stable market demand for brooms, but also the

crop's semi-perennial character, low input requirements, long storage life and facility of transport. Like the banana, it is compatible with sweet potato as an intercrop in the swidden.

Pineapple was perhaps the highest cash earner for the farmer after the banana industry failed. It was a monocrop in many upland fields circa 1975-1985. Its income-generating potential after 1985 was decreased due to competition from superior and cheaper fruits from Laguna, Cavite and Viscayan and due to plant diseases affecting the quality of planting materials and fruits. The national road made it easy for small traders to bring in commodities from Baguio and San Fernando La Union at wholesale prices competitive with locally grown commodities.

Rootcrops have always been an important part of the upland field. In the early days sweet potato (camote), ranked even higher than upland rice in the priorities of the Sablan farmer because it was a more secure staple and required less labor input. Through the years however the camote's importance diminished because its role as a main or alternative staple was supplanted by rice and other foods that were steadily becoming available. Presently camote is planted by Sablan farmers infrequently and on a negligible scale. The two reasons consistently given are; it's inability to generate cash and it's tendency to grow rampant and overwhelm cash crops.

Taro has replaced camote in the swidden fields. Formerly grown in connection with rituals performed during tribal festivities, taro has now become part of the farmers food and income base. Taro petioles, leaves and rhizomes all enjoy a stable market demand and relatively high prices. The crop is compatible with most other cash crops grown in the upland fields: tiger grass, pineapple, yams, and ginger.

Respondents observe a significant decrease after 1970 in the number of farmers planting traditional swidden crops, particularly roots crops. The main reasons cited are:

Yield has decreased in overall volume and tuber sizes, attributed to pests and soil infertility (although a viral complex has been suggested by professionals as the culprit);

The incidence of pests has increased: a worm locally called "batar" is eradicated only by burning infected plants; rats, rice-eating birds, and weeds are rampant;

Residents prefer wage employment either within or outside of Sablan to household farming;

Non-traditional crops grown on a larger scale have displaced traditional swidden crops;

Farmers were discouraged and economically shocked by the banana epidemic which wiped out the most marketable varieties (lacatan and canton) of banana;

Price fluctuation affected the feasibility of traditional swidden crops;

Requirements formerly based on interhousehold exchanges now have to be paid for: hauling, transport, extra labor at planting and harvest; planting materials.

Fruit Trees

Before 1960, mango, santol (bangkok and native varieties), native cherry, starapple, pomelo, jackfruit, guyabano (soursop), mandarin and other oranges, and papaya were abundant in the Sablan. Fruits were prone to attack by fruit worms and were eventually decimated by termites. Large plantations of cacao were eradicated by termites as early as the 1950s.

Recently, hybrid guava ("guapple"), rambutan, and lanzones were introduced as cash crops. One farmer has reportedly sold his crop of lanzones on a contract basis at P1,500-2,000 per tree, the wholesale price averaging P55.00 per kilo. Coffee is still grown as a cash crop.

Chart 3: Current Agricultural Resources and Use

CROP	USE	LOCATION	PRIORITY/ RANK
rice	household	paddy	mid
sweet potato	household	paddy and swidden	low
taro	cash crop	paddy and swidden	mid
yam	cash crop	swidden	mid
cassava	cash crop	swidden	mid
ginger	cash crop	swidden	mid
tugui	household	swidden	low
pineapple	cash crop	swidden	high
tiger grass	cash crop	swidden	high
banana	cash crop	swidden	low
coffee	cash crop	backyard	low
corn	household	backyard	low
beans and cucumber	cash crop	paddy and swidden	high
santol	cash crop	backyard	low
lemon	cash crop	backyard	low
LIVESTOCK			
pigs	cash		
chicken	household use		
carabao	draft power		

Rootcrops

Sweet Potato (Ipomoea batatas; local name camote)

Sweet potato is no longer an important crop in the Palali area. When asked to identify in order of importance all the crops they are planting, camote was either not mentioned or identified the least important crop. At least part of the decline in its significance is the decline in the population of native pigs which are fed mainly on tubers and leaves.

Landowners plant camote for household use and sell any surplus. Farmers who rent parcels larger than .5 hectare may plant plots of a few square meters either in the uma border, backyard, and, if household labor is available, in pond terraces after the rice harvest.

Farmers make the following observations on sweet potato:

There has been a significant decrease in size and quantity of tubers harvested, despite the robust growth of leaves and vines;

Kalbooy variety, grown in ricefields, yields more tubers than in the swiddens while the Manila variety yields less in ricefields than in swiddens;

Worms infest tubers and they become hard and bitter during dry season while worm infestation in leaves occurs during the rainy season;

Crop damage from rats and domestic animals has worsened;

Hauling and transport are difficult and increasingly costly;

Market price is low in comparison with other crops.

Key informants reported the following general picture of yield decline through time. Harvests in 1940 yielded an average of 7 large tubers per plant. From the 1960s to 1970s, tubers were smaller and fewer per plant. Starting in the 1980s, new planting materials in newly opened or well-fallowed swiddens most often produced one "petite" tuber or none at all.

Farmers note that old varieties were not sustained because the miracle (biit or "quick") varieties harvestable in 3-4 instead of 6-7 months were preferred when introduced in the 1960s and 1970s.

Most respondents do not report observing any particular varietal selection technique but choose any planting materials from robust plants with mature vines that have big leaves and short shoots.

Planting materials are selected and set aside during harvests. Vines are kept in a shaded area and watered or kept moist or planted in a plot near the house or along the swidden field borders. until the next season's planting. New planting , materials can be secured without charge from neighbor-relatives or bought from neighbors at about P 5 per 3"-6" diameter bundle.

Optimally, sweet potato is planted in December and harvested, optimally, in March before the rains. A second crop may be planted in a different field in March for a smaller harvest in June. Planting is timed so that roots can be harvested before the height of summer season to prevent root damage from worms. Farmers advise against planting after the first half of June since soils are waterlogged and too dense.

Planting technique

Two foot-long or three two-foot vines are planted 2' apart at a 2- to 4-inch depth. Some farmers fertilize e with triple 14 (NPK) for bigger and more roots. Tubers are harvested twice at a month's interval. One-fourth hectare reportedly yields 240 kilograms (4 kayabang baskets). Yield from one field of half hectare from which no foliage was harvested was estimated at 1,500 kilos (30 cavan or sacks).

Market prices differ with variety and season, optimal prices being paid for violet-fleshed varieties and peak prices obtained in August. The short time gap between then and low prices in June and July indicate that demand quickly exceeds supply.

Sweet potato processing

Peeled tubers are sliced thinly and sun dried for storage. (Bakul or bekong is the local term dried slices). Storage for as long as 3 months is possible if slices are well dried. and wrapped against exposure to moist air, mold and weevils. When needed for cooking, bakul is pounded into powder, mixed into a thick paste with water, and steam cooked in banana leaf wrappers.

Taro (Colocasia esculenta)

Galiang (Xanthosoma sagittifolium) is a large, wild taro, rarely planted. Leaves, stems, roots and the white sticky flesh of tubers are fed to hogs, and tubers are good for meat and vegetable stew (sinigang). Galiang may be sold.

Dem-an is the indigenous, white, glutinuos variety planted in the swiddens and irrigation canals and drainage areas in rice pond fields. Maturing in 1, it is the preferred variety for rituals and community ceremonies but is rarely planted now. tubers are elongated if planted in pond fields and round if grown in the rain-fed swiddens. Daptingan is another indigenous variety with big, dry, yellowish roots. This was formerly grown for ordinary consumption by households and domestic animals.

The first harvest from taro is foliage, a bundle consisting of about 5-7 plants usually weighing one kilo and sold at P3 to P5 pesos farmgate. The second harvest, of cormels, is in the crop's second year during early summer and is usually the source of planting materials for the next season. Less mature cormels may be harvested earlier about four months after the foliage harvest if cash needs are pressing. Overgrown taro is susceptible to root worms and eventually dies and is replaced by its cormels.

Uninjured cormels and roots are stored unwashed in any shaded area in the house, backyard or swidden and usually just spread on the floor or ground for aeration. Roots stored in this manner may last from 6 months up to a year. Cormels may be planted when they develop at least 3 leaves of 4" length.

Excena (Colocasia spp), popularly known as "chinese gabi" or pitik is a relatively new crop of higher market value than indigenous species of taro. The crop is grown for both subsistence and commercial objectives. Tubers have white flesh with shades of violet and give off an aromatic smell when cooking. Tubers are planted in April and May and can be harvested in 6 to 12 months after planting for two succeeding years. First year harvests yield more and bigger tubers and are normally sold. Smaller tubers from plants in their second year are for household consumption. Farmers estimate yields at 10,000 kg of foliage and tubers per hectare. Stalks with or without small tubers bring good prices and are valued as household food.

Taro as a cash crop

Taro leaves with tubers attached are sold from the farm for P3.5 to P5 for a small bundle and P7 to P10 for larger ones. The latter are retailed at highway stalls at P10 to P15. Tubers fetch a farm gate price of P3 to P5 per kilogram, and are sold by dealers wholesale at P6 and retailed at P8 per kilogram.

Chinese gabi prices peak in summer. Wholesale for bundle of 5-7 large or 10-12 small plants is P12 to P15 pesos, depending on the diameter of the bundle. Tubers sell for P3 to P 15 pesos per kilogram, the price increasing with the size of tubers.

Cassava (Manihot esculenta, local name camote muru)

The preferred variety is an indigenous white-fleshed variety than can be intercropped with pineapple and taro since it is tall and gives less shade compared to the miracle variety. Native cassava can be planted anytime and is usually harvested in 12 months. It requires minimum labor, has a flexible harvest period, and is a cash crop as well as a household consumption item.

The yellow-tuber "miracle" variety must be planted when the rains start in May or June and are harvested any time from 3 months to 2 years after planting. This variety normally fetches higher market prices than the local type and also allows the farmer to harvest when prices peak, usually during the rains.

Marketing of unwashed roots can be delayed for 2-3 days. Roots are stored in any shaded and well aired area of the house. No chipping and drying is done.

Yield estimates for the miracle cassava are about 45 cavan (sacks), or 270 kilos from .5 hectare. Pick-up price is 100 per sack if the buyer harvests, otherwise, from P110 to P 130 per sack, and P 120 to P150 per sack delivered to San Fernando. LA Union. Prices in Baguio tend to be lower.

Yam (Dioscorea alata/Dioscurea rotundata; local name ube)

At least six local yam cultivars are grown in Sablan, of which a dark violet (tuhira/pogiit/tuwiran) similar to the commercial kinampay cultivar of Bohol is preferred. The variety is comparatively high-yielding: 70 plants in .5 hectare yielded 6 baskets or 540 kilos of tubers.

Yams are planted in May to June and harvested from October or December through March. November is the peak of harvest season. Harvesting may be delayed for 6 to 12 months in anticipation of better market prices if grasses are left to provide shading. Prices range about P7.00-P10.00 per kilo in November and December to P15.00-P20.00 per kilo from August thru October.

Planting materials may be secured from neighbors or bought at P2 per piece or P7 per kilo in Baguio. Two sprouted tubers or tuber pieces are planted in holes 4 meters apart. Some varieties need trellising on bamboo poles or tree trunks left during kaingin clearing.

Not all sitios of Sablan produce good quality yams. Aside from the usual problems of leaf and tuber worms, farmers have noted hardening of tubers, drying of vegetative growth before tubers mature, leaf rot which kills the plant.

In 1990, the private development agencies PLAN International and Jaime V. Ongpin Foundation distributed new planting materials of the kinampay variety at P 10/kilo to be paid after the harvest, in anticipation that Magnolia Corporation would buy the tubers. A strong typhoon damaged all the yams planted that year. One informant commented that farmers planted tubers without waiting for the roots to develop. Several have not paid the planting materials they got while others are still paying (installment) although the agencies have not collected regularly.

Tugui (Dioscorea esculenta) is a subsistence rootcrop with two cultivars: a smooth-skinned upland variety and a thorny lowland variety. These are now seldom planted because of low market demand.

Ginger

The small but spicy indigenous ginger is preferred to the large but mild **camao** introduced to Sablan farmers in 1920 by relations in Viscaya or the brittle Batangas variety introduced in 1980.

Ginger is planted in May for an early September harvest or a harvest of matured roots in January. Price trends in the San Fernando, La Union market are per kilogram lows in November of P10-15 for mature and P7-8 for young roots, and highs in January of P20 for mature and P10-12 for young ginger. A fourth of a hectare is reported to yield from 30 to 50 kilos. An average yield of 100 to 150 kilos is obtained per 50 kilos of planting materials. Planting materials are purchased in Baguio at P10-15 per kilogram.

Ginger has been subject to aphids and worms. Only recently, one farmer tried aluminum sulfate application as a remedy. The Department of Agriculture recommended treating planting material with fungicide but results from Bureau of Plant Industry lab tests were not received as of the last follow-up interview.

Land tenure and the system of land rentals dictate the terms and the nature of the cropping schemes to a large extent. The concern for long term development and sustainability of the land takes the backseat to the need of generating cash income so that land use is intensified as indicated by shorter fallow periods, increase in inputs and the preference for cash cropping rather than upland field balance. Related to this is the labor requirement for maintaining biodiversity as opposed to that of monocropping in which maintenance and harvesting activities enjoy economies of scale and are perceived to be less complex. Two causes of erratic labor resource availability are intermittent employment in road construction and rehabilitation projects and the increase in overseas employment.

CHART 4: SHIFTS IN CROPPING PATTERN AND PRIORITIES: SABLAN, BENGUET

PRE-WAR	EARLY POST WAR	1960-1980	1981-1990	PRESENT
sweet potato	sweet potato/	banana	pineapple	tiger grass
	banana			
tugui	taro	pineapple	tiger grass	pineapple
banana	upland rice	tiger grass	taro	taro
taro	cowpeas	sweet potato	yam	yam
cow peas	cassava	taro	beans	ginger
upland rice	pineapple	ginger	ginger	beans
cassava	yams	yam	cassava	cassava
	tiger grass	beans	sweet potato	sweet potato
		cassava		
		cow peas		

CHART 5

CAMOTE YIELD THRU TIME (per 100 sq. m.)
Sablan, Benguet

YEAR/VARIETY/SITE	TOTAL HARVESTED (kilogram)
Japanese Time /"bayag"/swidden farm	8 - 14
Japanese time/"bayag"/swidden farm	60 - 80
1972 / "biit" / Swidden farm	
with tiger grass	60 - 72
1980s/"biit"/swidden farm	40
1988/"miracle"/after beans	98
(violet)	
"miracle"/paddy field	50 - 60
"biit"	30
1993/"biit"	10

CHART 6

1994 PESO SELLING PRICE PER COMMODITY PER KILO
Sablan, Benguet

COMMODITY	SABLAN ROADSIDE STALLS	
	Low	High
Camote - white/yellow	5.00- 7.00	8.00-10.00
violet	6.00- 8.00	10.00-12.00
Ginger	10.00-12.00	15.00-20.00
Taro (Gabi)		
- tubers: Small-Medium	5.00- 8.00	9.00-10.00
Ubi - violet	6.00- 8.00	8.00-10.00
Cassava - white/miracle	4.00- 5.00	6.00-10.00
Pineapple - small	4.00- 5.00	5.00- 6.00
medium	10.00-12.00	12.00-15.00
large	15.00-20.00	20.00-25.00
X-large	25.00-30.00	30.00-35.00
Tiger grass - 3" dia	25.00-30.00	35.00-50.00
2" dia	22.00-28.00	30.00-35.00

Stall owners and farmers observed that 1994 prices are comparatively low from the past years

Summer: 25%-30% increase on retail/selling price

CHART 7

1994 PESO BUYING PRICE PER COMMODITY

COMMODITY	UNIT	F A R M		SABLAN ROADSIDE STALLS		BAGUIO MARKET		LA UNION
		Low	High	Low	High	Low	High	
Camote - white/yellow	kilo	3.00	5.00	4.00	6.00	4.00	6.00	-
violet		4.00	5.00	5.00	7.00	6.00	7.00	-
Ginger	kilo	6.00-8.00	8.00-10.00	7.00-8.00	8.00-10.00	7.00-8.00	8.00-12.00	10.00-20.00
Taro (Gabi)								
- corm w/ leaves: small	bundle	3.00	5.00	5.00	8.00	3.00	3.00	12.00
medium		7.00	10.00	5.00	8.00	5.00	12.00	15.00
- tubers: Small-Medium	kilo	-	-	-	-	4.00	6.00	-
Large		3.00	5.00	8.00	8.00	8.00	10.00	-
Ubi - violet	kilo	4.00-5.00	6.00-8.00	5.00-6.00	8.00-15.00	7.00-8.00	12.00-15.00	-
white		-	-	-	-	2.00	4.00	-
Cassava - white/Miracle	sack	80 - 100	100 - 110	100 - 120	100 - 150	100.00	120.00	120 - 150
Pineapple - small	piece	1.00-1.50	2.00-5.00	2.00-3.00	3.00- 5.00	3.00- 4.00	5.00- 6.00	-
medium		6.00	7.00-8.00	8.00-9.00	9.00-10.00	6.00	8.00	-
large		12.00	13.00	14.00	15.00-16.00	10.00-13.00	14.00-15.00	-
X-large		15.00	22.00	22.00-25.00	25.00-30.00	15.00-15.00	17.00-20.00	-
Tiger grass - 3" dia	bundle	20.00-25.00	25.00	25.00	30.00-45.00	-	-	-
Beans	kilo	-	-	-	-	4.00	25.00-30.00	-
Cucumber	kilo	-	-	-	-	1.00-3.00	10.00-15.00	-
Cutflowers: White gladiola	dozen	-	-	-	-	3.00-5.00	7.00-15.00	-

Cash Crops

Banana

The Bureau of Plant Industry of the Department of Agriculture and Benguet State University in 1990 recommended the removal and burning of all banana plants bearing the Panama virus. In an attempt to revive the industry, virus-free suckers were distributed at six pesos per sucker to 30 Bayabas residents in three episodes: 12 suckers each twice then 23 suckers each. A number of suckers died in June, 1994 and were replaced. Farmers may obtain fertilizers and insecticide from a resident technician (Mr. Busay) who monitors the progress of the plants. All suckers and inputs are to be paid after fruiting.

In free interviews, several respondents have cited two major reasons for relatively slow revival of banana cultivation. One is inaccessibility of planting materials. The other is that insecurity of land tenure and tenurial arrangements, discourage any but short-term agricultural investments.

Taro and yam are two major cash crops in the swidden field, often intercropped with pineapple and tiger grass. For the intercrop, taro and yam are allowed one growing cycle after which the intercrop dominates the swidden.

Pineapple

Apart from its status as a cash crop, pineapple is attractive because one planting is harvested over 2 to 3 years, though the farmer waits a year for the plants to bear fruit. The first harvest yields one large fruit while successive harvests yield 2-3 smaller fruits per year. At an average of 2 plants per square meter (12,000 to 28,000 per hectare), a farmer can gross a minimum of P 20 and maximum of P50 per square meter as compared to P 3.6 per square meter for cabbage (at a farmgate price of P 2.00 per kilo, and average yield of 1.8 kilo per square meter). Mature plants can also yield 2-4 suckers (si-i) for replanting after the second year of growth.

Suckers about 1 1/2" in height are taken either from the pineapple fruit (to be planted after a month) or from the base of the plant (to be planted after a week or two). Suckers are stored in a dry, shaded airy portion of the house to root. The sucker from the fruit takes about 3 years to bear fruit while the sucker from the roots would take only one to two years;

The pineapple industry has been weakened since 1989 by competition from pineapple brought in from Laguna and Vizcaya. The incidence of diseases affecting yield and the health of plants has also led to decreased pineapple cropping.

Chart 8: Pineapple Prices at Sablan Stalls

	Buying	Retail
X-big	P 25-30/pc	P 30-35/pc
big	20	25
medium	15	20
small	10-12	13-15 or 50/ 3-4 pcs.

Tiger grass

Rental for .5 hectare of land planted to tiger grass is P2,000.00 for the entire growth cycle, while the same area planted to rice for one season rents at about P1,000.00.

Cultivars (seeds and suckers) for tiger grass were introduced to Sablan from Taloy, Benguet (along the Marcos Highway) and from Bilis and Bagulin in La Union Province. Farmers planted increasingly large areas to tiger grass in the 1960's and it came to be regarded as a replacement for the disease-stricken banana.

Currently, cultivars sell for as much as P1.00 - P2.50 per sucker. Suckers are preferred to seeds, which take longer to mature for harvest. Suckers planted in April and May have harvestable panicles in about 23 months. Yearly harvests are then possible for an indefinite period, as the crop ratoons to replace itself.

Plants are spaced about 3 meters apart, allowing a density of about 2,220 plants per hectare. The harvested flowering pannicles can be stored without rot for a year in a dry, shaded area.

Fifty plants will yield from 1,000 to 2,000 bundles of 3" diameter. A 1,000 square meter area would yield a low of about 40,000 bundles at 55-65 pesos per bundle. A bundle can make 3-4 brooms.

Tiger grass and brooms are sold to local traders as well as ion in Baguio, Bataan, La Union, Vigan (Ilocos) and Angeles (Pampanga). Traders from other towns and provinces often advance money to local trader-assemblers who purchase and accumulate the tiger grass for them. During the harvest period from February to March, market price drops, but better prices are realized from April until January.

Crop maintenance is fairly low. Weeding is done yearly to improve plant growth and so increase successive harvests. Post-harvest processing involves stripping of the leaves, cutting stems to even lengths, sun-drying before storage, classification by size and quality, and bundling.

Since the area cropped to tiger grass has increased, farmers have started to experience the effects of pests and diseases. Among these are large "white grubs" that attack the roots, eventually killing the plant; leaf wilt, and stunted and shriveled pannicles.

Market prices of tiger grass started to rise in 1991, when exporters began buying from Sablan.

Broom manufacture.

Soft brooms (as distinguished from the hard brooms made of coconut leaf ribs) are made mostly by tiger grass farmers themselves during the slack labor period of the rainy season. Materials needed are fine wire, nylon and plastic thread purchased in Baguio or Naguilian and locally obtained wooden handles of about 1" diameter. Although some farmers find the broom-production process time consuming, others realize extra household income by selling the finished product.

Chart 9: Tiger Grass Price Trends in Sablan
(Pick-up price per 3-inch diameter bundle)

1988-1990	P 25-30	
1991	P 40	
1992	P 40-50	
1993	P 50-55	(P70 at the highway)
1994	P 25-45	

Chart 10: Soft Broom Price Trends in Sablan

Type of Design	Current Wholesale Prices Ordinary Days	Holy Week/ Summer	Prices before 1990
Senorita 1	18-20	23-25	12-15
Senorita 2	22-25	28-30	18-20
Solas			
Retail price			
Senorita1	- 30	35	
Senorita2	35	40	

Designs:
Senorita1 - wooden handle without design
Senorita2 - wooden handle with woven design (e.g "Baguio City")
Solas - handle made of tiger grass stalks

The broom-making process, is as follows:

Laslas -- stems are separated and trimmed
Rokod -- stalks are classified and measured into bundles then tied
Putan -- buybuy stems are tied into a handle or wooden handle is attached with wire to shortened stems
Dait -- the bundles is fanned out by sewing or tying off strands of fiber with nylon and plastic thread

Commercial Vegetable Gardening

Vegetable gardeners are mostly single young men. The relatively short-term crops are suited to farming combined with intermittent or contractual wage employment. Seasonal variations in the Sablan climate allow a choice between crops suited to either temperate or lowland conditions. The crop may be planted in dry pond fields after rice or on former swidden fields. Above all, farmers "gamble" on the chance of a lucky harvest in the radical price fluctuations of the vegetable market.

Land may be leased at 1/3 of the net profit from a crop; Cash rental for an irrigated farm is P15,000 per hectare per year but less for rainfed and swidden areas.

Most vegetable farmers operate on a supply system in which a supplier provides all cash and/or material inputs needed and buys all produce at price 10-30% lower than the price prevailing at the time of harvest. Cost of supplied items is deducted. Wholesale prices of vegetables usually go up after typhoons;

Not all temperate vegetables can be grown in Sablan. The most frequently planted crops are: baguio beans, cucumber, chinese pechay (flowering and non-flowering); and sweet peppers. Less frequently planted are edible pod peas, mustard greens, and cabbage, and lowland vegetables: eggplant, sitao, okra, ampalaya, lima beans and black beans. Gladiola are grown for the cut flower market and anthuriums have recently been introduced.

Other Livelihood Activities

Lumbering

As in many other Cordillera communities, small-scale lumbering is an intermittent though illegal livelihood. Chainsaws are used for felling trees and cutting timber. A tree is sold for P300 to P500 depending on the size and type. Cutting timer costs from P5 to P10 per board foot, depending on whether food and fuel are provided to the chain saw operator. Planks are sold for P20 per board foot, with a hauling charge of P1 per board foot per kilometer.

Daily wage labor (por dia)

Intermittent daily wage employment is the most common -- though unreliable -- source of cash for the young, for school dropouts, or those between contractual jobs.

Chart 11: Average Daily Wages

Swidden field clearing and land preparation - 100		
Other agricultural labor		
Female	lunch provided	P 50
	w/o lunch	P 60
Male	lunch provided	P 70
	w/o lunch	P 80
Government projects		P 98
Contractors		
Road/field riprap		P 80-90
House construction		
Skilled	lunch provided	P 120
	w/o lunch	P 150
Unskilled		P 90-100

Small sundry (sari-sari) stores

These stores service the through traffic and local residents in the poblacion and sitios. Softdrinks, canned goods, commercial snacks and bread are bought in La Union or Baguio, while brooms, rootcrops, and fruits are bought from Sablan farmers.

One roadside stall owner averages daily net sales of P200 to P500 (higher nets obtained during the summer season when tourist traffic is heavier). Mark-up on cigarettes and commercial snacks ranges from 40-70% and for fruits and vegetables from 30-60%.

Piggeries

Backyard piggeries have always been a part of Sablan household production, but the native black have been crossed with breeds introduced for faster growth and better meat quality. One to three heads per household are common. Commercial growers have 6 to 15 head of either crossbreds or new hybrids.

A combination of rice bran (purchased) and commercial feeds (starter, grower/fattener) is the usual feed for all hog growers. Pigs may be sold directly to Baguio or to traders from Sablan. Wholesale prices are about P 37 per kilo liveweight and from P55 to P62 dressed. he local retail price for pork is P70 per kilogram.

Two-month hybrid piglets are sold at P1,500 to P2,000, with crossbred piglets selling somewhat lower, while 5-month native piglets are sold (usually for rituals) for P2,500.

Woodcarving

Few cottage or other industries involve added value, particularly as a result of postharvest processing. Wood carving is one, but unlike tiger grass, is resource-depleting.

Almost all of the 15 carvers working in the Sablan area came from Ifugao starting in the 1950s. Most are transients. Residents of Sablan allowed the carvers to cut trees from the forest without charge at first but cutting was eventually prohibited and trees are now sold to them.

Tree species for carving are acasia (2nd class); lawa-an (3rd class); bayukan; lupteng; narra; santol; and daleppaweng. Camagong which is considered 1st class wood for carving (dark & hard) is imported from Olongapo.

Sablan wood sources are depleted and carvers now their wood (acacia) from La Union. he biggest trees cost about P1,200. and medium trees cost P800.

Carvings are roughed out at the cutting site, often with chain saws, and then are taken to Sablan for fine carving. Sanding and varnishing are done on Asin Road, the adoptive domain of Ifugao carvers in Baguio City.

Orders from Manila arrive through the carver enclaves from Km. 3 to Km. 5 in Asin. Design is mostly based on a catalogue provided by those making orders, these include: carabao, eagles, firemen, bears, American Indians devil masks and "sunka-an" or hollowed tray for a local game. Designs originated by more creative carvers are rare.

Orders Asin or Ifugao carvers cannot accommodate are referred to Sablan. Orders peak from July to December. During the low season, carvers look for other work in Sablan and Burgos.

Starting a carving business requires basic skill and at least 24 carving tools. Among these are: **lokong** (concave chisel), **dipya** (flat chisel), **borda** (sharp-edged flat chisel for bas relief carving), **kudip** (sharp-edged, scalpel-like instrument), hammer, ax, **bolo** (machete), saw, and mallet.

Forest Resources and Use

Pre-war Sablan was thickly forested with abundant bamboo resources and wildlife. Open access for house timber and for swidden clearing prevailed until lands were privatized. Forest areas were then rapidly logged over by immigrant landowners for

timber sold in Lupao, Nueva Ecija and to mining companies in southern Benguet. Plantation cropping of pineapple and banana followed.

Five communal forest areas were identified by the local DENR, none significant in size or indigenous species composition. The sole forest area near the poblacion is in Pappa on Mt. Busiw and there are one each in Banangan and Triple-B (the intersection of three barrios) and two on Mt. Polis and Mt. Sakwid. Permits for cutting within these communal forests follow the general requirements of the Department of Environment and Natural Resources (DENR): certification from the barangay captain, municipal mayor and provincial governor, final approval at the Forestry Department of the Regional DENR. The individual who is granted a permit is enjoined to plant 15 seedlings to replace each tree cut. In 1994 about 4 cutting permits were issued.

The effectivity of forest protection or conservation in Sablan is doubtful. In the absence of assigned municipal forest guards/rangers, barangay officials and police officers are obliged to report illegal cutting. The migration of woodcarvers from Ifugao into Sablan, La Union, and areas around Benguet has created a market for wood from fruit trees like santol as well as for whatever remains of forest species like lawan.

Sablan Poblacion has a tree nursery. The lone technician (Mr. Braulio Tayan), collects and propagates wildlings and seedlings. The main forestry offices in Tuba and Tublay picked up most of the seedlings in 1994 (mahogany, pine tree, narra, fruit trees and coffee). An individual may obtain 50 seedlings for free at the local nursery if there are extra seedlings available. Fe local residents are interested in tree planting as most are not landowners who would benefit over the long-term, and as the needs for immediate revenue are pressing.

Depleted forest species

Tree species depleted by the woodcarving industry include: acacia, a mahogany-like but brittle resinous hardwood called apitong, white lauan, a brittle resinous hardwood called panantulan, a fibrous species similar to betelnut called amuan, with cotony gray bark used as tinder, narra, fast-growing dalipaweng with reputed to relieve malaria symptoms, and lupting and bayukan (undescribed). Few birds and animals are now found in Sablan. Among the species that disappeared with deforestation are the kalaw (bird), monkeys; wild boar, deer; civet cat and large edible lizards.

Natural Food Resources

Three species of edible fungi are gathered from forests during the rains. From creeks, Sablan residents harvest several aquatic species: mudfish (dalag), catfish (bunong similar to paltat, and now rare), crayfish (udang), and crabs (agatol), eel (kiwit) and a large fish called kamba. Shrimp used to abound but

are no longer found due to the post-war use of cyanide and agri-chemicals. Four types of edible mollusks (liddeg, basikol/busi-kol, birabid and luso/suso) from streams and pond fields add to the year-round supply of proteins.

Chart 12: Forest Resources and Use

SCIENTIFIC NAME	OFFICIAL/ LOCAL NAME	USES
Bischofia Jaranica	Tuol	hardwood
Toona Calantas	Calantas	woodcraft
-	Dalepaweng	medicinal/ woodcraft
Etherea salumbrans	Sabdang	leguminous/ agroforest
Ormosia calandorsis	Bahai	leguminous/ agroforest
-	Makapil	leguminous/ agroforest
Pinus kesiya	Benguet Pine	timber
Willistroemia lanceolata	Salago	fiber and paper
Vaccinium myrtoides	Gutmo	edible fruit
Fraxinus griffithii	Lapachikon	fuelwood
-	Alinho	fiber and paper
Lithocarpus spp.	Palayon/oak	hardwood
Pterocarpus Indicus	Narra	hardwood
Alnus maritima	Alder	erosion control
-	Bamboo	multiple-weaving handicrafts
-	Katide	vegetable/viand
-	Busidak	vegetable/viand
-	Biscan	fruit
-	Panalayapen	vegetable/viand
-	Balete	woodcraft
-	Ticom	fuelwood/charcoal
-	Litalit	Diarrhea remedy and dewormer
-	Subosob	antipyretic
-	Tuon-tuon	antiseptic
-	Kakabroy	antiseptic
-	Kidis	antiseptic

CHART 13: UPLAND RICE VARIETIES

EXISTING VARIETIES	DESCRIPTION
"Salimbua"	red grain; whitish hull with black hair "ibu"; supposedly came from Asin, Tuba
"Galong"	tall upland variety introduced from La Union

NO LONGER PLANTED	DESCRIPTION
"saranay"	hard red rice with spotty brown hull and hairy panicles
"imang"	brown husk; white grain and takes 3-5 months to mature
"kalangiking"	red glutinous rice; grains fall off easily; can be planted in the paddy
"saigorot"	also planted in the paddy; big round dark red grains, aromatic and soft when cooked; violet husk striped with black; seeds supposedly originated from Mountain Province
"gin-awa"	"biit" white reddish like the "k "kintuman" but hard and tasteless when cooked and specially served for workers "trabahadores"
"uwak"	black hull and tail; aromatic red grain with hairy panicles
"kintoman"	red, round and soft when cooked; reddish husk with tail
"bagsat"/"bagset"	maybe planted in the swidden; sticky red rice; good for rice wine; with brown husk and tail
"pinyas"	small white grains, hard when cooked

CHART 14: PADDY RICE VARIETIES

EXISTING VARIETIES	DESCRIPTION
Los Banos or Miracle (IR 42; IR 45; IR 36; IR 10; IR 64; IR 56)	4-5 months maturity period; Yields 20-25 % lesser if planted in the swidden area
"Sinagapan"	white soft grain with no tail
"Antipolo"	short white grain; smaller than C4; no tail and considered as native variety
"Asusena"	white soft tasty grain with hairy panicles; hulled grains are normally mixed with glutinous rice before cooking
"mantika"	white round shiny grain (cooked and uncooked) with no hairy panicles (normally harvested in December)
	white grain

NO LONGER PLANTED	DESCRIPTION
"mabolo"	white husk; hairy panicles; long grain; hard white-reddish grains; difficult to hull and hard when cooked
"ballohoc"	white and soft grain with hairy panicles;
"binmayabas"	glutinous, used in making rice wine;

CHART 15

SWEET POTATO "CAMOTE" EXISTING VARIETIES (Ipomea batatas)
Sablan, Benguet

VARIETY (Local Name)	SOURCE OF PLANTING MATERIAL (who/place) [1]	COLOR AND SHAPE OF ROOTS	COLOR AND TASTE OF FLESH (cooked)	COLOR AND SHAPE OF LEAVES	REMARKS
kalbo-oy	Ifugao - brought in by early migrants	violet skin	yellow-orange, sweet and dry	violet shoots, round leaves (good for pigs)	more stress tolerant like 'Kapangan'; undamaged tubers storable up to 5 months
bukagan		white skin	yellowish, very dry	big, round leaves whitish shoots	
sampero					most saleable and most expensive
1		violet skin, smaller than sampero 2	violet, sweeter than sampero 2	finer and smaller leaves than sampero 2	
2		violet skin, bigger roots than sampero 1	violet, not so sweet	bigger leaves than sampero 1	
kupungan		white skin	whitish flesh, dry		
violet		white skin	violet flesh	light green	
sep-at		white skin	yellow-orange flesh (like squash)	reddish stem and leaves	can be cooked dry or watery
manila	Kapangan, Benguet - neighbors	yellowish skin	dark yellow or orange flesh dry and hard	reddish (palmsize) pointed leaves with bitter shoots, whitish vine	harvestable in 5 months
mindanao		red skin, elongated	white flesh	yellowish shoots	harvestable in 3 months
kami'pong		white skin	white flesh, dry		harvestable in 3 months
kapangan	Kapangan, Benguet - neighbors	almost white skin	yellowish tuber flesh; sweet and dry; sweeter and more moist when stored	light green leaves	uninjured roots storable up to 5 months, more tolerant to pests and climate/field conditions, 3 months gestation period
negro	La Union - neighbors	violet skin	violet flesh, sweet and dry	violet (leaves and vine)	
pag-ibig	La Union	yellow skin	yellow flesh, dry and sweet	green, roundish	harvestable in 3 months

[1] Planting materials are either obtained free from neighbors and relatives (visiting or not) or bought at P 5.00 per 3"- 6" diameter bundle

CHART 16

SWEET POTATO "CAMOTE" NON-EXISTING VARIETIES (Ipomea batatas)
Sablan, Benguet

VARIETY (Local Name)	SOURCE OF PLANTING MATERIAL (who/place) [1]	COLOR AND SHAPE OF ROOTS	COLOR AND TASTE OF FLESH (cooked)	COLOR AND SHAPE OF LEAVES	REMARKS
bakuag		red skin	white -inside tuber; violet - outer layer dry "kuspag"	reddish-violet shoots	
ambacuag		brown skin	violet flesh, sweet and dry		
dalsa-ak		red skin	white inner portion, outer- with violet stripes, dry	whitish shoots	
tambaling		red skin	yellow flesh, sweet	heart-shaped leaves violet shoots	
tambulin		red skin	yellow flesh, dry		
_____	climbing variety				

Potentials for Economic Diversification and Restoring Bio-diversity

Since most Sablan farmers have to rent land, they prefer to allocate area to cash crops. Rental for a portion of the crop encourages cash cropping. Sweet potato appears to be less productive of cash than other root crops, and far less productive than the plantation crops of tiger grass (for broom making) and pineapple.

Sweet potato maintains a continuing presence in upland swiddens and as a fallow crop in irrigated pond fields. But it is no longer considered a major buffer for the household rice supply. In Sablan (as in Barlig, Mountain Province), sweet potato is considered important mainly as a supplement for animal feed. In Barlig, it is also planted by students and teachers boarding at or near the agricultural high school to supplement their food supply.

Given the higher costs of rice land rental as compared to rental of rainfed fields, as well as the limited availability of pond fields, most farmers have chosen to plant cash crops and buy rice. Cash cropping further provides the added option of hiring labor in order to engage in alternative business or wage employment and periodic contractual work locally or abroad.

The decreased planting of rootcrops has of course led to a decrease in the diversity of available cultivars. In some areas, there has also been decreasing diversity in the cropping mix of individual farmers and across farms. Where diversity has continued, there has been a reported decrease in the area devoted to rootcrops, or a decrease in the frequency that rootcrops appear within crop cycles of several years.

Tiger grass and pineapple are harvested in significant amounts only from the second to the fourth years after the crop is planted. Some Sablan farmers used rootcrops in the first year cropping as a key to solving the need for shorter-term returns. Tiger grass or pineapple were intercropped with taro and yam so that the harvest after a year would cover costs and provide some income. The root crops were then removed to yield space to the main crop which then took over as the base for household income. The intercrop blends short and long-term economic values, graduating to a more stable income, and allows the farmer to optimize labor input and land use. (Case 1 and Case 2)

The cycle involves economically effective shifts in what we may call "temporal crop biodiversity". Case 3 illustrates an added dimension. in exchange for planting and maintaining a landowner's papaya plantation, the farmer uses part of the 1 hectare farm for his own bananas, pineapple and tiger grass. That investment was buffered in the first year by the returns from yam and taro, which provided 60% profit over all initial costs (without imputation of family labor). The longer-term crops

continued to provide a supplementary income with minimal input over a term of 4 years and upwards, but also allowed the farmer to maintain an annual rice cropping on his own farm elsewhere. There are cases, though, where small farm area and low prices result in far less than adequate returns to the household (see Case 3).

The potential for "spatial crop biodiversity" which is already inherent in intercropping and using field border crops is of course higher for areas where there is more land availability. Spatial diversity can provide other options for enterprise development. Broom production, for instance, can possibly be supplemented and made less seasonal by planting an area to a crop such as broom corn which has a gestation period of 70 to 90 days and can be ratooned for two more harvests. Broom corn produces a superior fiber for broom making, involves the same basic culture and craft skills with minor processing modification, and its seeds can be reproduced on-farm.

A comparison (Case 2 Series) of tiger grass production and the value added from broom making demonstrates the potential effects of even simple economic diversification. Post-harvest processing can increase either household incomes or across interacting households. The case is a producer-user adaptation. Broom-making utilizes household labor time during rainy months, when work intensity on farms and infrastructure projects is usually low. The materials are storable until labor is available, and the market is consistent as brooms are used everywhere and replaced periodically.

It is clear that root crops have an economic significance within the commercial cropping system. They are productive in biomass -- sweet potato yields in 1989 were reported in Mountain Province (Municipal Agriculture Officer of Mayaoyao: pers. com.) at 10 tons per hectare -- and require relatively little maintenance during the growing period. The issue of rootcrop production is one of relative utility as a cash crop. Whether or not they will continue depends on whether they can achieve a new and competitive market position.

Root crop processing for food products has been seen as a way of adding value to a historically productive traditional crop with excellent nutritional qualities. NPRCRTC (1989) data records several constraints perceived by farmers. Roughly a fourth of possible producers (multiple responses) noted, separately, lack of technical knowledge or simple tools, and also the tediousness of processing as factors.

Of these, the first two appear easy to resolve. The same proportion of responses cited a lack of supply of sweet potato as a problem. Is this a case of post harvest processing being hampered by lack of harvest as well as lack of information and simple assistance? If so, the declining significance of sweet potato is not a real user perspective but a user constraint.

Processing was also perceived as tedious work. In any enterprise development effort, the standing commitments of farmer-producers will make any addition to their production portfolio something of a burden. But what is tedious for the individual producer or household may not be impossible if producer networks are possible.

Enterprise components are better distributed across households than into probably overcrowded household labor schedules. The potential for specializing then networking aspects of processing is a major applied research area to be considered. In this regard the potentials for simple, farmer-accessible mechanization of processing would contribute to rationalizing parts of the production system and would provide a further prospect for diversifying local production.

The acceptability of sweet potato and its products has been an issue. Adequate market studies have yet to be conducted with the caveat that demand can be influenced by information. Most studies have taken for granted the idea that sweet potato is a staple buffering the more prestigious rice staple -- which was true of the Cordillera. Sweet potato for snack foods is the typical consumption form in the lowlands. An informant from La Union notes that sweet potato grown in the lowlands is inferior in taste to highland tubers, which may partly account for the less favored status.

Sweet potato as feed for domestic animals is cited more often than as a cash crop. Use as animal feed connects sweet potato to a higher value commodity, returning to the pre-1980 importance of the domestic animal-sweet potato complex that has been traditional in the Cordillera. The return is most likely associated with the purchase of rice staple, higher meat prices and also higher prices and transport costs of commercial feed.

This indicates the need for focused work on the potential of using sweet potato in production of **feed mixes** as a viable household or village enterprise. (It is of great interest to our group to see that papers at this conference attend to this use of sweet potato.) This may differ somewhat from sweet potato in an "integrated farm" in competition with cash crops for household labor and land area. The sweet potato would take position as a component for a marketable product and increase the value of rice bran byproducts. Impacts on the diversity of the farming system might include the production of soybean, sunflower and sorghum for feed formulations.

Feed formulations in any event require protein additives such as bone or fish meal. We are unaware of how extensive or thorough studies have been on rootcrops in feed formulation. One comparison of sweet potato and corn nutrient contents appear not to be significantly different, while effects on meat product quality are not convincingly covered (see Baucas-Atinyao 1994, ms.)

Forest resources were under stress in the 1950s and are now almost totally exhausted. The migration of wood procurers and carvers from Ifugao has intensified the sale and use of wood in the last ten years. A large proportion of Sablan's population also still uses wood fuel culled from the remaining forest

Sablan's mid-elevation climate and history of commercial monocropping appear to have contributed to a concentration of pests and diseases that affect everything from rootcrops and vegetables to fruit trees. Little has been done to address the pest and disease issues for present crops, though new crops, like mid-elevation coconut, have been recommended.

The utilization of renewable forest resources is a significant way out of the threat to forest areas. It is also a way of relieving stress on an existing agricultural production system. In areas like Sablan, these options are not open because of the privatization of large tracts of land. The Pappa communal forest (about 10 hectares) is the only remaining public forest area in Sablan and is too small an area to support significant forest-based enterprise without severe damage.

The resource base would have to be re-established, at some effort and cost not likely to be supported either by small farmers or by government-assisted projects. The establishment of bamboo and rattan resources and the timber and fiber species in plantation systems would provide support for existing (broom-making) and new industries. But necessarily long gestation period of such efforts as against immediate household needs for income would also militate against this possibility for most residents. Fruit tree cropping, for instance, is only an option for those few who have the cash reserves and land required.

Sablan soils were assessed in a mid-1980s study by the Metals Institute Research Development Center (pers. com) as consisting largely of first grade, high-firing ceramic clay. With adequate technical and financial support for a relatively short period, a quality ceramics enterprise would seem feasible. However, the extractive nature of the enterprise is likely to have negative environmental impacts. Apart from the costs of installing such an operation, the economic need and the environmental concern would have to be traded off.

Requirements for Realization

The Sablan case has potentials for enterprises based on forest and farm biodiversity: crop mixes based on bio-organic farming; expansion of the farmer-developed intercrop of short and long gestation products; food processing; animal husbandry linked to feed production; development of nurseries for propagation of useful mid-elevation forest species; mixed fruit, woodlot and substrate plantations; small machinery manufacture, augmentation of broom production and (perhaps) ceramics as a pressure valve enterprise. Whether potentials can be realized in the Sablan case depends on a strong and fairly long-term commitment of

funds, attention and energies of the residents, government and private entities to solve tenure and resource degradation problems.

A Comparative Note on Conditions in Barlig, Mountain Province

Barlig at a a maximum elevation (from the municipal hall) of approximately 1670 meters above sea level, is a municipality with densely clustered settlements oriented to the distribution of rice fields on lower slopes (estimated gradients of 20% to 55%). Pine forest occupies the upper slopes (estimated gradients of about 60%), and above the pine line at about 1,700 meters above sea level, the oak forest margins are found.

Barlig differs from Sablan in several respects. It is a traditional and continuing rice-based production system. Revenues from overseas contract work are apparently more significant than those in Sablan.

The natural resource base of mossy oak forest is largely intact in Barlig. The forest has been under indigenous forest management for centuries with minor impacts from migrant intrusions or the interference from legal authorities of the Department of Environment and Natural Resources. Apart from timber species, rattan, and specific ornamentals, the value of forest resources has not invited severe commercial exploitation as yet.

The greatest impact on the forest has been clearing for new agricultural crops. Resource extraction has been buffered to some degree by a focus on economic opportunities well away from the communities.

Sweet Potato as an Indicator of Shift in Orientation of Consumption and Production

The shift in cropping priorities of Sablan farmers typifies the transition from a subsistence system to that of a cash oriented one. Sweet potato traditionally occupied a dominant spot in the production system because it was the staple in an area where rice cultivation was traditionally not pervasive. When the trade through Sablan progressed, rice became readily available to those who could pay for it. Farmers altered cropping priorities in order to generate cash to buy the preferred rice staple and later, other essential commodities. Gradually consumption of sweet potato as a staple decreased until it was totally replaced by rice. It also lost ground in its traditional domain of the swidden field which was increasingly committed to cash crops: first to banana then later to tiger grass, pineapple and root crops with superior market value.

As in Sablan, the shifts in the significance of the sweet potato crop in Barlig demonstrates the adjustment of producer objectives to changing needs and conditions. Seven varieties of sweet potato are reported as indigenous to Barlig (within memory) but are less often grown now, allegedly because of the long

gestation period (up to one year) and relatively low yield (2-4 tubers per plant), attributed to lower soil fertility.

Seven varieties have been introduced from other Cordillera provinces over the last 20 years. These varieties take 7-8 months from planting to harvest, except biit (which means "quick"), which is planted mostly in rice paddies to be harvested in 4 months, before the next rice cycle. New varieties and planting materials are exchanged among neighbors and between neighboring villages. (Some varietal names are derived from the name of the person from whom the planting material was obtained.)

Camote tubers planted in the swiddens are mainly fed to pigs. It should be noted that the harvesting of leaves and young shoots is reported, in many places in the Cordillera, to affect the tuber production of the sweet potato. Better quality roots from the swidden fields are normally consumed immediately by the household. Roots harvested from the dry ricefields are preferred for household food and stored for later consumption.

Leaves and tubers (tuki) are boiled plain (linukmog) or cooked with rice (sinaprak) for household food. Leaves and small low quality tubers are fed to pigs and may be sold for pig feed.

Few Barlig households now maintain swiddens, reportedly because of the current preference for faster-growing hybrid swine which need commercial feed, because of the increasing labor shortages, and since those with cash prefer to purchase rice. Not mentioned by respondents but certainly apparent in a labor distribution assessment is that outmigration has left agriculture mainly to the elderly and very young.

Labor time constraints have impacted first on the commitment to swidden cropping. Priority is apparently higher for any cash-generating activity.

However, interest in sweet potato has re-emerged on two counts. In both cases, the interest reflects a concern with reducing cash expenditures. The first is for supplementary hog feed, and is associated with an increase in the cost and inaccessibility of feed, and with the move to commercial, rather than household-level, hog production. The second is as a non-cash food source for persons on fixed salaries that have been eroded by inflation.

From subsistence production to a consumption system

An adjustment of crop choice or crop use is in itself not a real or significant change. Long before the opening of the road from Barlig Central to Bontoc Central, the introduction of new consumer goods from urban centers such as Baguio had started. Road access only expedited the development of a pervasive outward focus of the economy without catalyzing the internal production system or supporting existing exchange networks.

Remarkably few investments from external earnings have been made into off-farm production and these few are oriented to consumption and a limited number of basic services. These businesses meet real local needs but are not productive in themselves nor do they generate further economic diversification. Instead they are replicated to levels of internal competition within a restricted economic space and under conditions of low and sporadic internal cash flow. They appear mainly to circulate a limited amount of cash within the community without increasing production but rather accumulating money in sectoral mini-pockets within the community. Virtually no significant products are traded from Barlig Central.

Barlig has become a consumption economy, fueled by external remittances and intermittent daily wage earnings. These enterprises meet real local needs but are not productive in themselves nor do they generate further economic diversification. Instead, they are replicated to levels of internal competition within their bounded economic space, and they further operate mainly to circulate a limited amount of cash within the community -- accumulating cash in sectoral mini-pockets within the community..

Assessment of Enterprises in Barlig

The gains from enterprise efforts did not translate to savings or capital for local investments for the majority of households. In many cases, cash incomes are still adequate only to meet basic expenses, and individuals have a limited ability to meet emergencies such as illnesses or crop failure. In at least one case, a major household crisis took up savings that might have been invested in the business. For households with savings, investments were made outside the community and in urban areas where clientele, the support environment, and a broader range of opportunities presented better business potentials. Investments in Barlig are predominantly in housing, or in the preparation of household members to migrate elsewhere for education or work.

At a general level, it appears that the outward orientation of production, consumption and exchange has been responsible for the lack of investment and subsequently for the continued constriction of opportunities and of the support environment. The outward orientation is a natural response to the economic and political dominance of national centers in decision-making and action that has resulted in the marginalization of rural, hard-access communities like Barlig. The response itself reinforces the inability to respond to opportunities of enterprise and investments when and if they arise.

Various particular constraints related to marginality have apparently militated against the establishment of productive local enterprises and also against the productive and sustainable use of forest resources. One set of constraints involves the basic elements that contribute to enterprise sustainability and to the degree or type of benefit accruing to producers.

Another set of constraints involves the economic support environment, which includes infrastructure and communications, services delivery, credit and financing, and national and local institutions that contribute to the effectivity of political and economic decisions or actions. Naturally, this dominant external environment conditions community capabilities as well as the ability of marginalized sectors to establish internal and external relations.

Potentials for Renewable Resource Use in High-elevation Mossy Forests

Barlig has indigenous domain over a biodiverse ecology that is virtually intact. Logging, clearing for commercial vegetable production and intensified hunting within and around the forest have led to deforestation and the depletion of fauna. Rattan harvesting for an export-oriented basketry industry from 1960-1980 led to exhaustion of that resource. (See Figure 1: Estimate of mossy forest remaining in the Cordillera.)

But considerable expanses of the forest still contain most of the major water conserving plant species of the Philippine archipelago and scores of indigenous and migratory birds (Veracion, pers. com.; Mamanteo et als 1979; Viray et als. 1992; Viray and Penafiel 1992). This comprises a range of renewable resources for production alternatives: natural substrate for high value edible fungi, ornamentals including ferns, mosses, lichens and orchids and many species for the production of fiber, natural dyes, herbal medicines, and essential oils or aromatics.

Strategies for assisted natural regeneration, for controlled harvesting rates, and for ensuring non-damaging extraction would support innovative enterprises that optimize the use of renewable resources. Such enterprises are potential alternatives to current unregulated extraction of timber, sphagnum moss and ornamentals, and can provide incomes higher and more stable than those from current agriculture in cleared forest.

Encouraging enterprises that increase the value of forest resources may incur definite negative impacts (as the rattan industry has already shown) from a wider and more intensive use of forest resources. However, a forest which presents only the economic potentials of timber extraction, commercial cropping or out-migration of the productive population is most probably more at risk.

A network of innovative enterprises based on renewable resources is expected to motivate conservation by increasing the significance of the biodiversity and natural conditions on which the network would depend. Spin-off support enterprises are expected to develop, further relieving the pressure on individual resources. The propagation of forest species and mushroom spawn, using tissue culture for instance, is itself an enterprise and at the same time would contribute to renewing forest resources.

Other sites, however, do not have the almost ideal conditions found in Barlig for alternative production. Depending on site conditions, the identification of a workable nucleus enterprise (or more than one enterprise) is critical. Applying the model to Sablan, for instance, would involve much more work on enterprise feasibilities and regeneration of the resource base.

Applications to Sablan

In the Barlig case, development of the enterprise would require relatively little seed funding, provided that producers would be willing to invest part of their labor time. In other cases, like Sablan, the degradation of the natural resource base would mean fairly heavy and consistent subsidy for resource regeneration and enterprise set-up. In Sablan. also, the problem of land tenure would militate against such regeneration efforts as tree-planting and even nursery development.

It will not be possible to test community forest management and enterprise development without effective linkages among government agencies, NGOs, and community residents. Each has diverse capabilities and authorities as well as limitations. Each in an action project must be functionally interdependent but independently capable. Without that structural mix of development responsibilities, the incredible genetic bank of the Barlig mossy forest will very likely yield to cabbages and the battered ecology and economy of Sablan will evict its residents.

Site-specific differences in environmental and social conditions (or agroecosystem interactions) of course call for different approaches to enterprise development and biodiversity concerns, with different component elements. But there are generic requirements for success in the linkage between biodiversity and income generation.

Development is a natural process that encompasses error and success (or profit and loss), that requires effort as well as optimized conditions, and that considers the capabilities and the constraints of groups and their resource base. Systems and interactions are rather more important than discrete components or isolated activities. The assessment of commodities is significant only in the context of production, exchange and use systems.

The value of biodiversity has a counterpart in the value of economic diversity. Developing enterprises that use different forest resources should relieve the pressure on any one resource. The pressure from use and demand is further relieved by efforts to propagate, regenerate, or regulate specific resources based on how renewable they are and what levels of use they may be subject to. Yet another pressure valve is expected from spin-off enterprises that support each other -- e.g. nursery development is a business that enables forest regeneration as a business that enables still another business that depends on a forest resource.

Agricultural development so far has stressed monocropping of identified marketable commodities. Agricultural research has been commodity research. Monocropping has benefits to the farmer such as rationalizing labor and other economies of scale, or allowing some degree of marketing control. Agricultural research has also been largely packaged research, developed for the modal farm and environment and marginally applicable to the microecologies that are so variable in mountain areas.

The Sablan cases as well as the story of commercial vegetable farming (De Raedt 1991) illustrate the possible drawbacks of monocropping. Initial successes like banana and even tiger grass production have eventually become subject to increased impacts of specific pests like Panama virus and stem borer. Apart from increased incidence of pests and diseases in a monocrop system, the farmer cannot hedge against price fluctuations or otherwise spread risk and optimize such aspects as land use.

Generic management and enterprise models cannot address the conditions that exist in places like Barlig or Sablan. In both cases, there is the need to install an opportunity structure based on local control of resources and on balanced production, use and exchange systems. Appropriate concepts of "productivity" and "efficiency" require an orientation to producers' objectives and to time-phased improvements in capacity.

Yet there is little buffer time in which to set up an entire system which in urban centers is taken for granted, its processes and relations automatic. Psycho-fixes have developed among community residents, NGOs and government entities -- e.g. a preference for contract labor or overseas employment; the idea that forest dwellers are inherently forest destroyers; the idea that projects are personal responsibilities or commitments.

The Restoration of Natural Capacity and Control

The constraints on the development of enterprises in Barlig can be summarized as a problem of locus of control, The conditions that support and constitute a sustainable enterprise are not adequate, given the current orientation of the households'-- subsequently the community's -- economy, and considering the assumptions of the community's external economic and political context.

The result has been a progressive denaturalization of both the forest and the resident people. The potential of the forest as a resource base has been either overlooked or distorted in relation to two opposing preconceptions: forests as national resources to be protected from the use of residents and for the national welfare (in cash or kind); and forests as a raw materials source for residents or corporations. This has displaced the active concept of the forest as a sustainable common pool resource base under conditions of resident management.

Residents have been denaturalized as residents -- becoming economically vital and relevant mainly as outmigrants or as brokers of external resources and commodities. The natural progression of their economic efforts is negated by the lack of both internal and external support factors. They then have become denaturalized with respect to their role as forest residents -- or in Poffenberger's (1990) term "keepers of the forest" who are then also kept by the forest. They are residents in exile from traditional relations, from traditional social supports and from the current national mainstream. This condition has led to and perpetuated several tendencies that run counter to a vital local production system.

The continuous extraction and sale of raw materials means a stress on basic resources with little or no value added -- that is, no production, as it were. The opportunity for continuing enterprise and stable incomes is limited in degree and duration, and the spin-off benefits of production in the form of employment are also not significant or lasting.

A household and community economy which are driven by external demands and supplied by goods that originate outside the community, without internal production other than raw materials extraction or subsistence, has no basis for exchange that even approximates equitability. Barlig may be said to have a problem of imbalanced trade. Without internal production, Barlig cannot participate in the national economy except as a consumer or as a labor force segment, and has become more and more unable to exercise options to secure favorable terms of exchange.

Externally driven demands for raw materials and a few special products insure that the economic focus will remain outside Barlig. Focused attention to long-term resource access (possibly with the exception of pinewood as a family and intergeneration resource) is impractical in immediate financial and social terms. The de-regulation of use rates for minor forest products is understandable under such conditions.

If the downstream flow of biophysical and social resources is to stop, internal capacities for production and effective decision-making will be required. The objective is to transcend dependency by establishing reciprocity among autonomous producers, both within and outside of Barlig. Exchange can then occur on the basis of equitable values and evaluations. This is the empirical reference for "empowerment."

Local initiative: the basic development requirement

The national economy is an individualized economy and responsibilities are expected to be individual, with the state as a putatively objective force guaranteeing national welfare through its authoritative balancing of discrete individual interests. In fact the state -- particularly in a multiethnic society with poor

transport and communications infrastructure and generally weak social access -- is certain to carry the ethnically central and economically corporate biases of dominant sectors.

Communities, no longer in their pre-contact state of autonomy, have developed a most debilitating form of dependency -- a reliance on development projects channeled to them by the state through agencies and local governments, or through NGOs. The ethical or socially beneficial choice between self-reliance and state control is not so much at issue. The dependency relation is a relation of reciprocal abuse and a rationalization for irresponsibility -- basically, a development malaise.

Several effects were noticeable among residents of Barlig in the course of the action-research:

Unwillingness to undertake risks that were mutually judged to be tolerable or provide counterpart in project initiation (to the point of not meeting project schedules even after the need for integration and timing is explained);

The tendency to form cooperatives without clear bases or objectives and in direct response to opportunities to secure loans;

Expectations of full assistance in simple endeavors, such that all materials -- even those which are locally available with normal effort -- are expected to be provided without cost or on "deferred" payment;

A focus on short-term project benefits -- like interim employment -- rather than on the longer term and more permanent impacts (which require consistent effort); and

Interest in the funding levels rather than objectives of funding.

Environmental resources are significant globally if we must keep ourselves alive as a species on this planet. They must become significant locally in an effort to support and better the immediate living conditions of specific families and communities.

CHART 17

NEW [1] SWEET POTATO "CAMOTE" VARIETIES (Ipomea batatas)
Barlig, Mountain Province

VARIETY (Local Name)	SOURCE OF PLANTING MATERIAL	COLOR AND SHAPE OF ROOTS	COLOR AND TASTE OF FLESH (cooked)	COLOR AND SHAPE OF LEAVES	REMARKS
finanawor	Banaue	brownish to yellowish skin	-	reddish-viloet shoots	-
karfooy	Benguet	white skin	-	light green	susceptible to "fiatang" ¤
bayani	Benguet	round	white, soft, sticky	light green	-
kenawi	Buka, Talubin, Mt. Province	oblong with light brown skin	-	-	tubers harden easily, not storable
biit	Benguet and Western Bontoc	red skin	white, can be cooked dry or watery	-	harvestable in four months, most preferred variety at present planted mosty in the paddies before land preparation for rice planting
samperu	-	elongated tubers	violet flesh	leaves - pointed toward the top	hard shoots not edible
violet	from Ampusongan, Bauko, Mt. Province	round and oblong	violet flesh with white streaks	-	-

[1] Varieties planted from the late 60s or early 70s.

¤ Characterized by browning of the flesh making it bitter to the taste. Sometimes larva is found inside the camote with "fiatang".

CHART 18

OLD [1] SWEET POTATO "CAMOTE" VARIETIES (Ipomea batatas)
Barlig, Mountain Province

VARIETY (Local Name)	COLOR AND SHAPE OF ROOTS	COLOR AND TASTE OF FLESH (cooked)	COLOR AND SHAPE OF LEAVES	REMARKS
enadsay	red skin, elongated	white, very sweet when "nakling" (ripe) or stored for at least a week	small leaves, whitish shoots	-
lopessak	elongated tubers	yellowish (like egg-yolk), sweet and dry "fukag"	small leaves, reddish shoots	no longer planted
fiakachan	dark brown skin	grayish, dry and soft	small and semi-round, soft shoot	-
lapngao	about 8-10 inches, twisted (like intestine)	soft	small leaves and shoots	-
sorsokian	round (like orange)	hard and dry	small and light violet shoots	-
linawngan	round	white, hard and aromatic	light geen and big (palm size)	-
kapuyan	oblong and small	light violet	-	planted in drained rice paddies or "fialiling"

[1] Varieties planted before the late 60s or early 70s, seldom planted now and mainly for pigs

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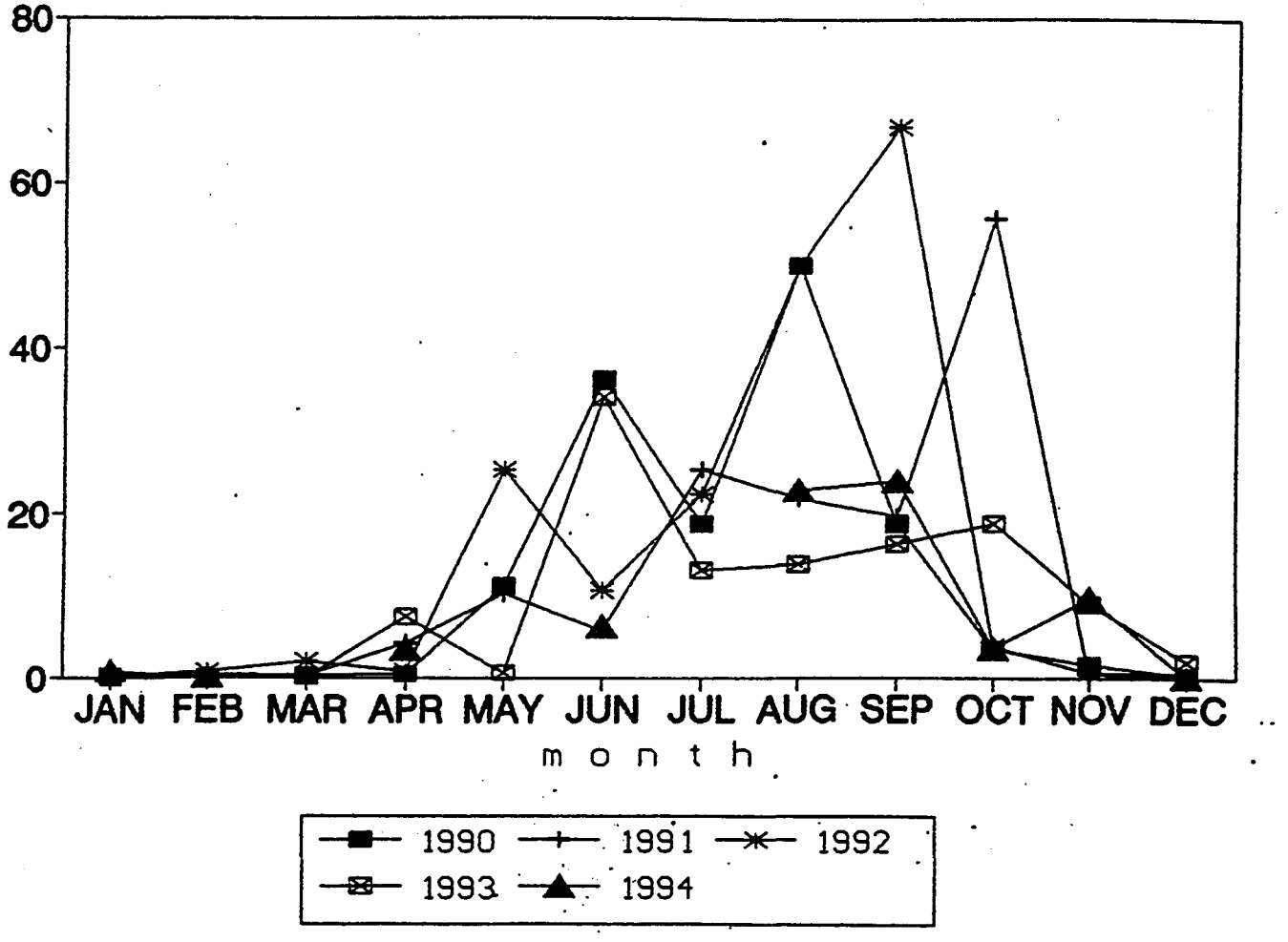
1990-1991 Northern Philippine Rootcrops Research and Training Center (NPRCRTC) Research Results Presented in a Series of Working Papers. Vols. I and II. La Trinidad, Benguet: Benguet State University.

APPENDIX A

1990-1994 Average Rainfall by Month in Baguio City

1990-1994 AVERAGE RAINFALL BY MONTH
BAGUIO CITY



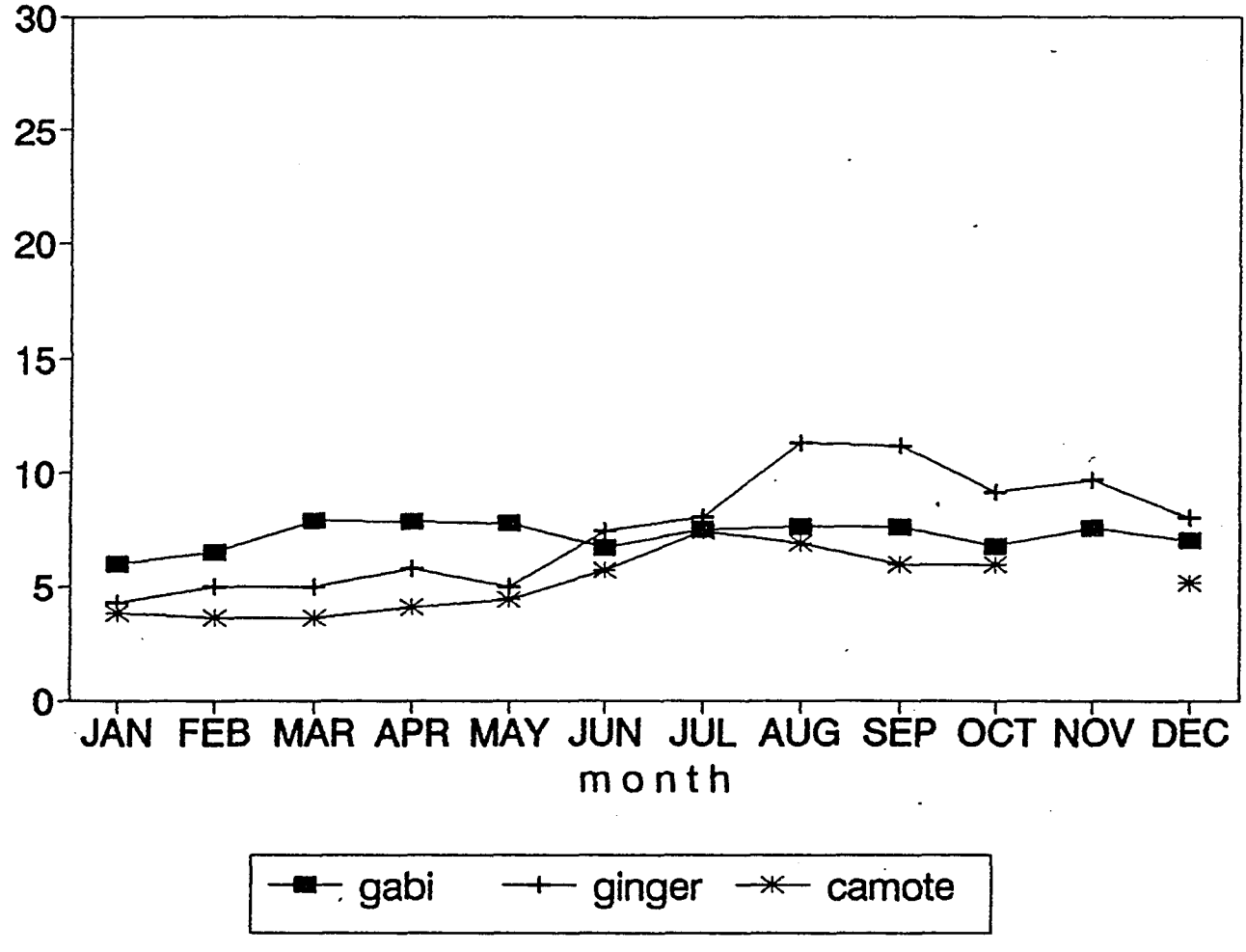
Source: PAG-ASA, Baguio City, February 1995

APPENDIX B

Retail and Wholesale Prices of Selected Rootcrops and Vegetables in Baguio City, Philippines

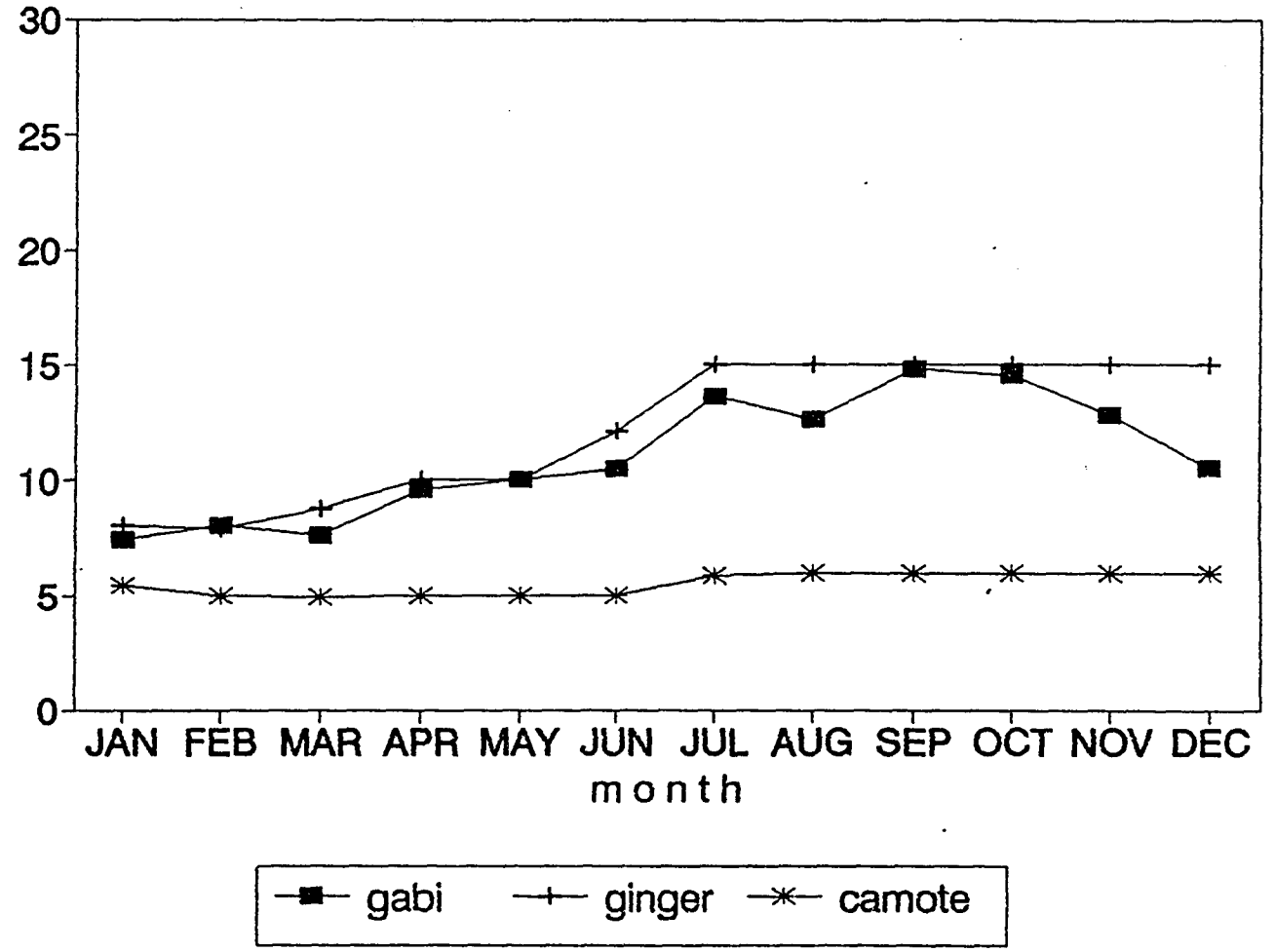
ROOTCROPS AVERAGE RETAIL PRICE

1986, Baguio City

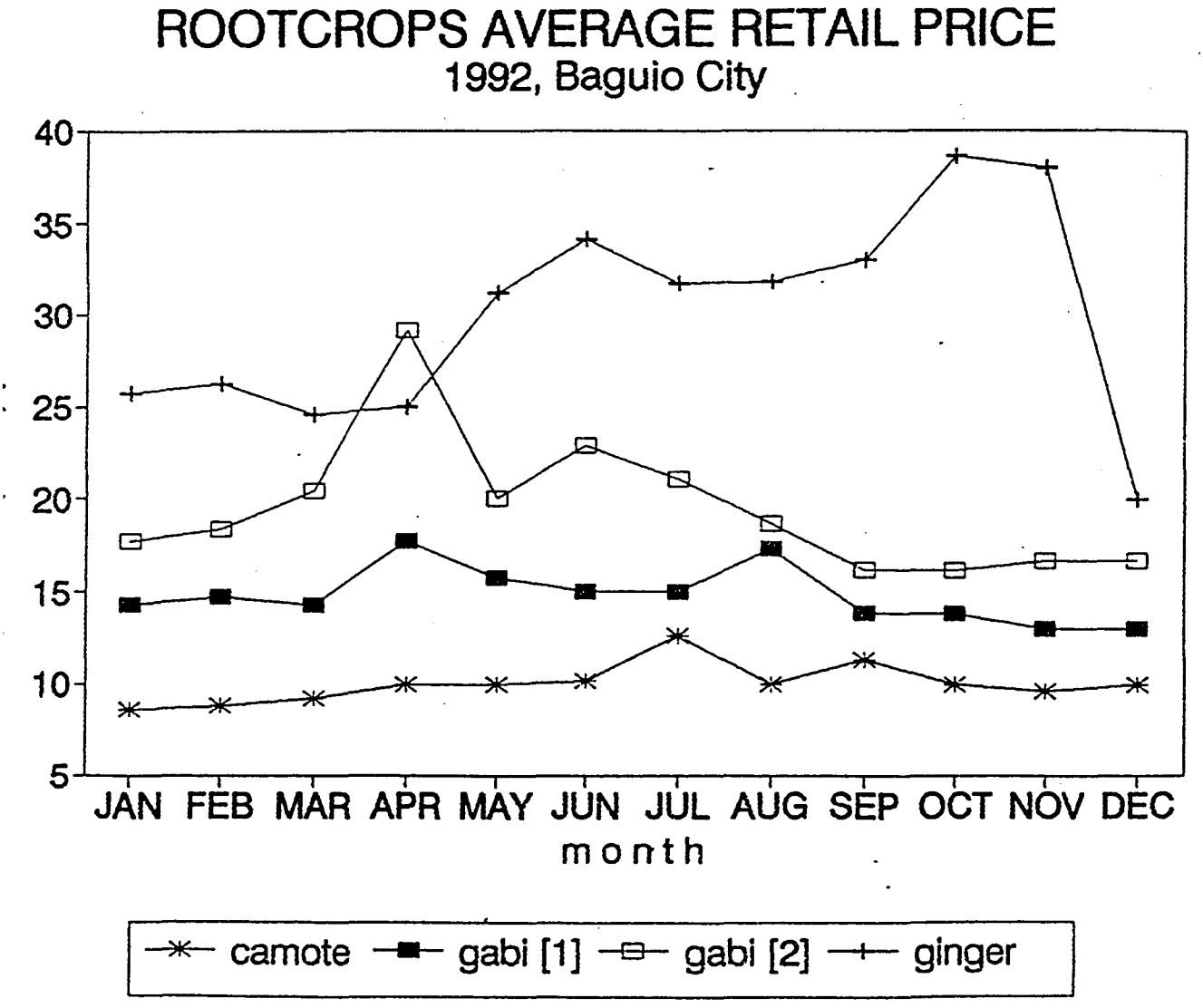


Source: Bureau of Agricultural Statistics, 1994, Baguio City

ROOTCROPS AVERAGE RETAIL PRICE
1987, Baguio City



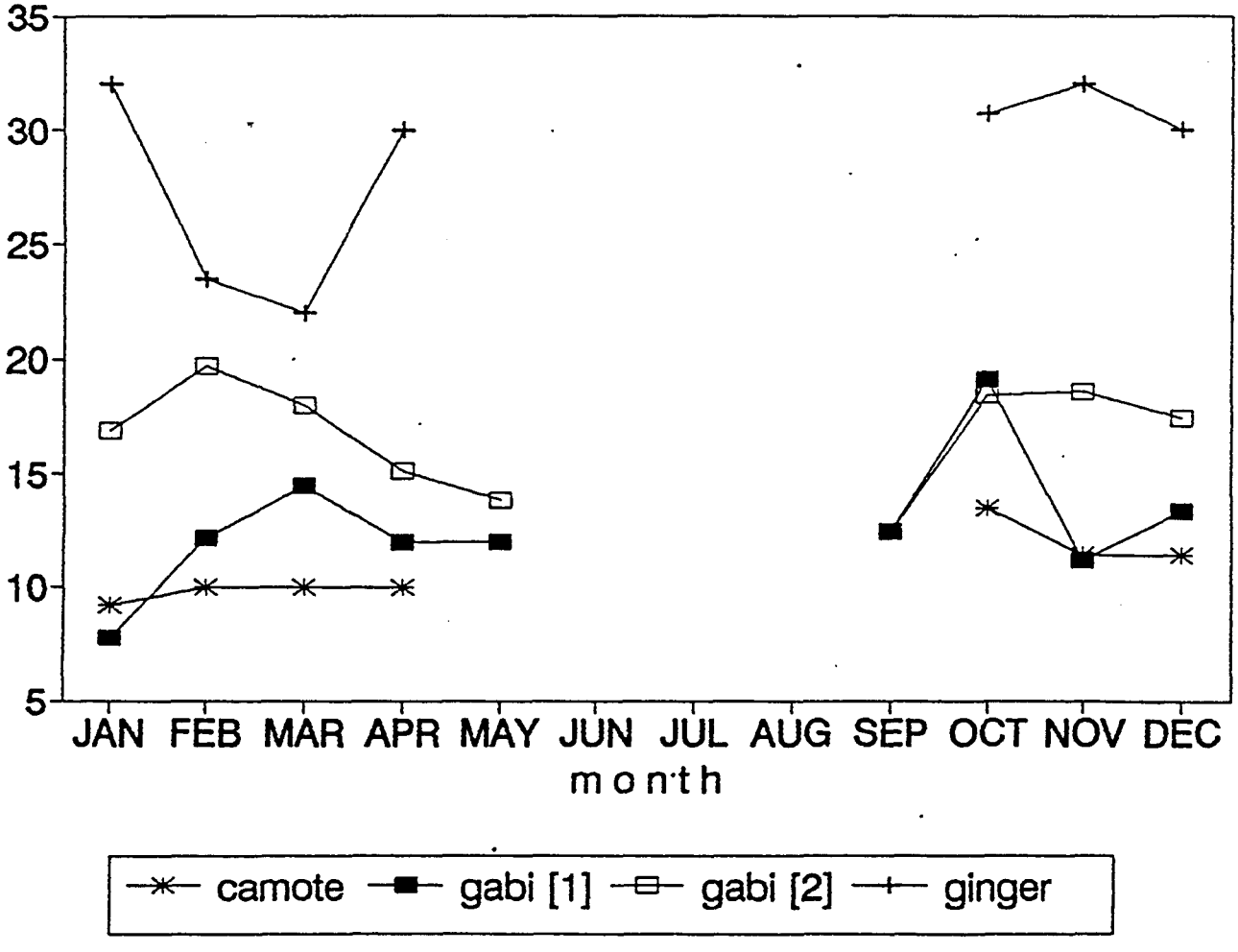
Source: Bureau of Agricultural Statistics, 1994, Baguio City



Source: Bureau of Agricultural Statistics, 1994, Baguio City

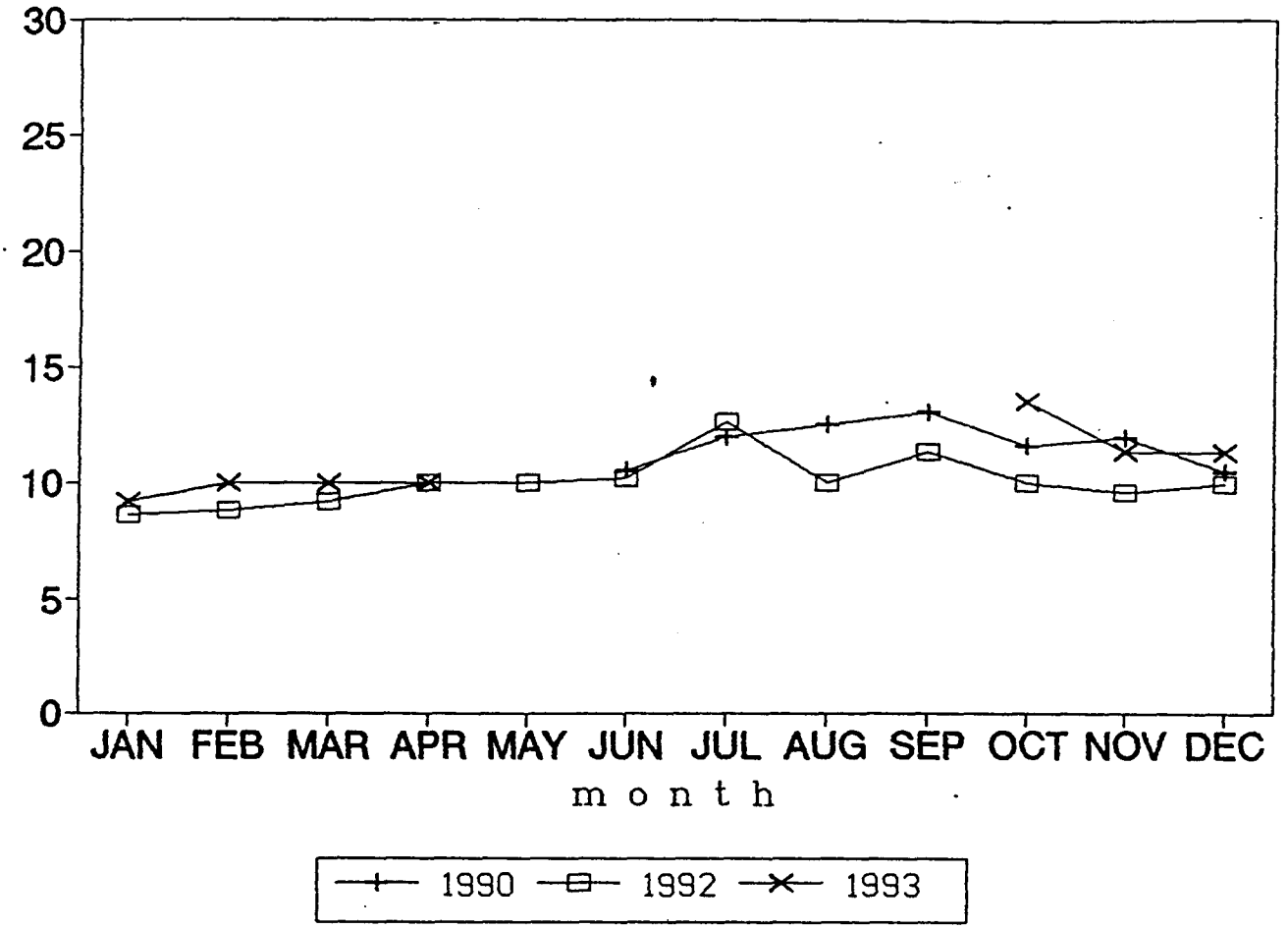
ROOTCROPS AVERAGE RETAIL PRICE

1993, Baguio City



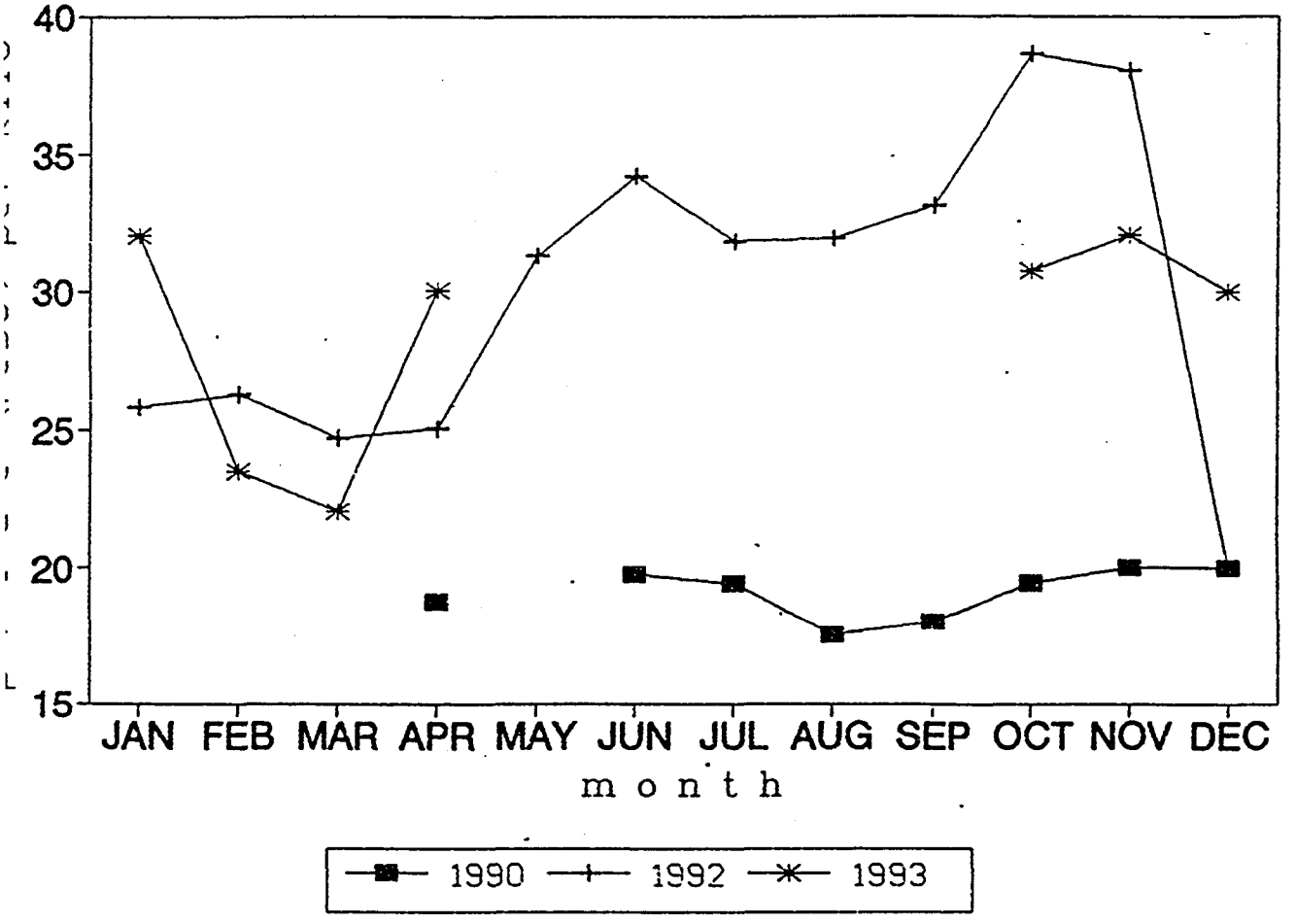
Source: Bureau of Agricultural Statistics, 1994, Baguio City

MOTE AVERAGE RETAIL PRICE PATTERN
1990, 1992-1993, Baguio City



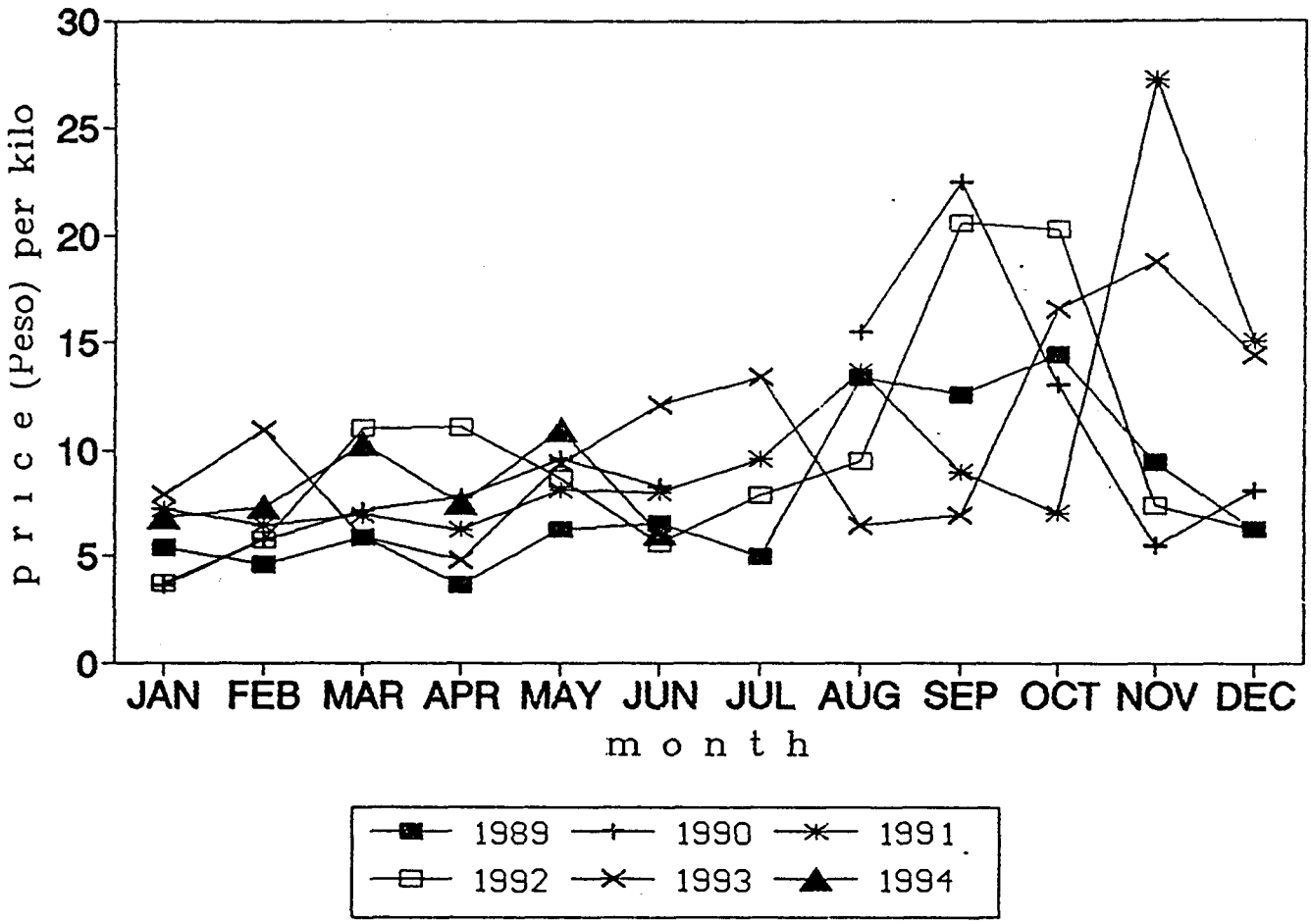
Source: Bureau of Agricultural Statistics, 1994, Baguio City

NGER AVERAGE RETAIL PRICE PATTERN
1990, 1992-1993, Baguio City



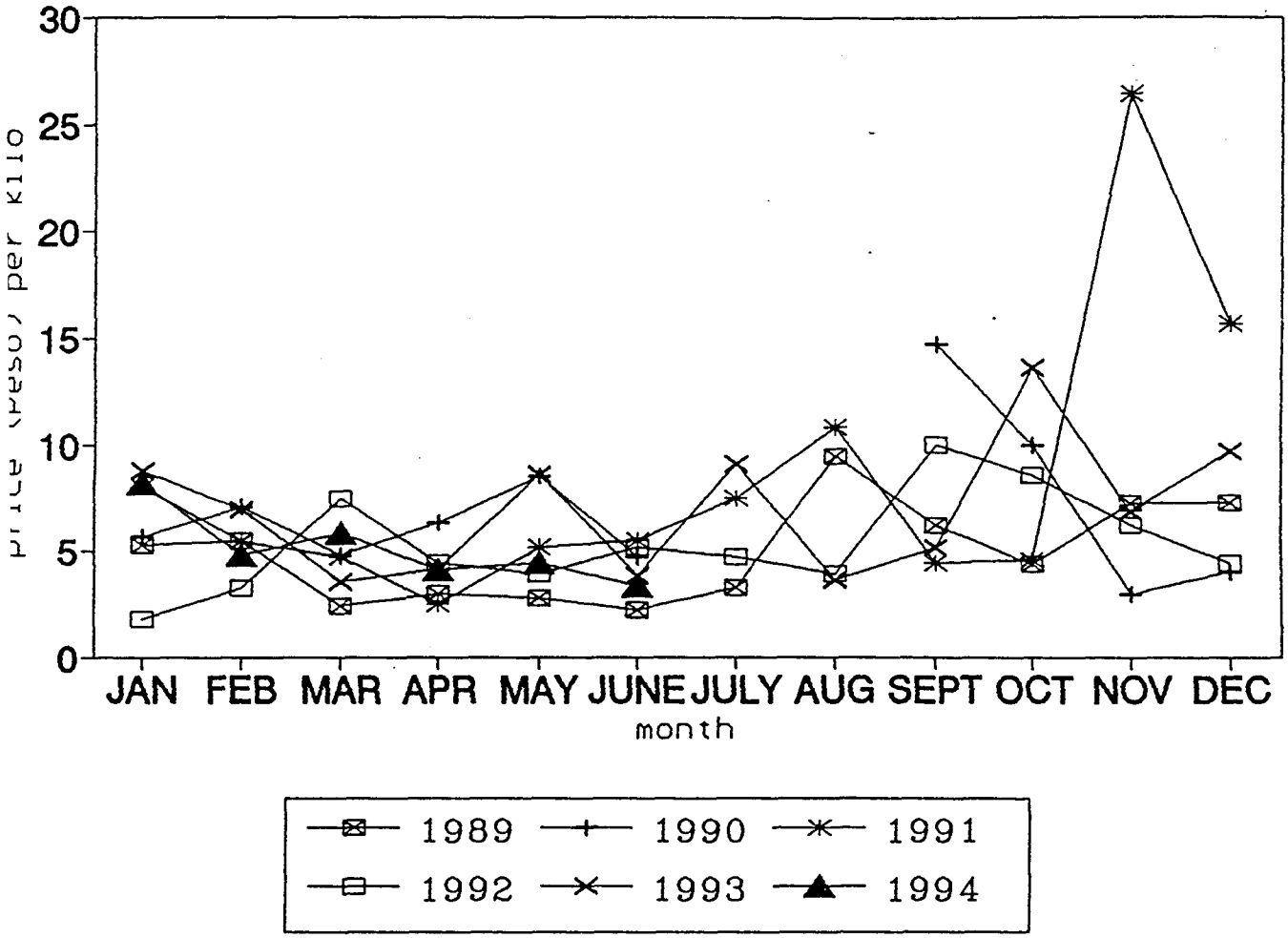
Source: Bureau of Agricultural Statistics, 1994, Baguio City

ANS AVERAGE WHOLESALE PRICE PATTERN
1989-1994, Baguio City



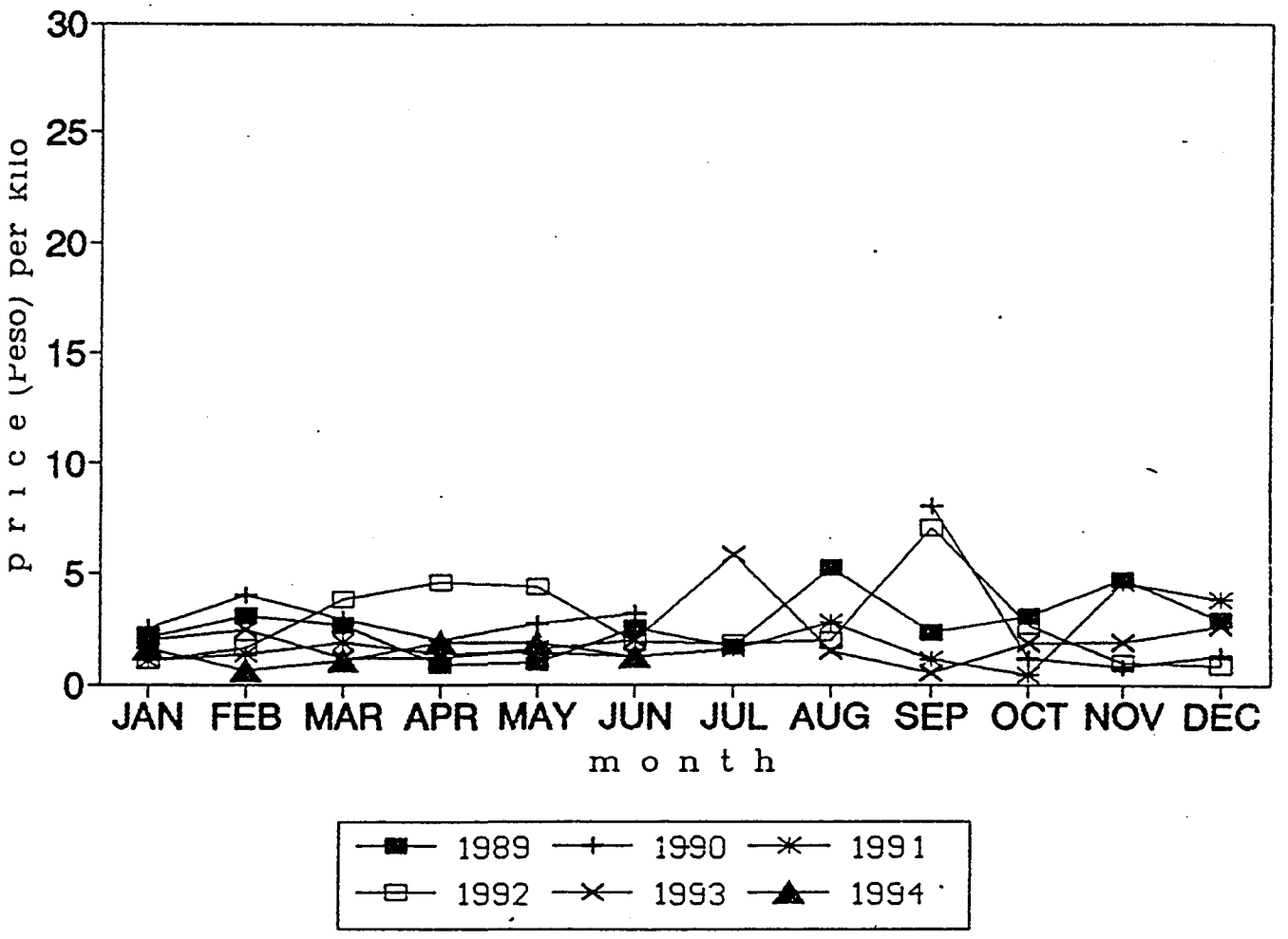
Source: Bureau of Agricultural Statistics, 1994, Baguio City

AVERAGE WHOLESALE PRICE PATTERN
OF CUCUMBER, 1989-1993, BAGUIO CITY



Source: Bureau of Agricultural Statistics, 1994, Baguio City

CHAYOTE AVERAGE WHOLESALE PRICE PATTERN
1989-1994, Baguio City



Source: Bureau of Agricultural Statistics, 1994, Baguio City

APPENDIX C

Cost and Return Cases in Mix Cropping,
Tiger Grass, Rice and Vegetables in Sablan, Benguet

Case 1

COST - RETURN ANALYSIS

Case on mix cropping: main - pineapple
border crops: taro, ginger, yam, tiger grass "tugui"

Area: 1 hectare

(Amount in Pesos)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
COSTS				
Labor input:				
clearing 30 mandays @ 75	2,250			
burning 0.5 md	38			
"bukwal" contrata @ 5,000				
plus 1 cavan rice	5,500			
Planting: p. apple 15 MD	1,125			
taro/ginger 25 MDs	1,875			
yam 1 MD	75			
tiger grass 1 MD	75			
tugui/galiang 2 MD	150		-	
Weeding 3x/yr say 30 MDs/yr @ 75	2,250	2,250	2,250	2,250
Harvest: p. apple		75	225	675
taro 10 MDs	750			
ginger 6 MDs	450			
yam 2 MDs	150			
t. grass (inc. post harv.)		900	1,800	1,200
Total Labor	14,688	3,225	4,275	4,125
Cost of Planting Materials				
pineapple: 28,000 @ 4	112,000			
taro 1 can	100			
ginger 240 kls @ 8/kl	1,920			
yam 10 kls @ 8/kl	80			
tiger grass 80 @ 1/sucker	80			
Planting Materials Total	114,180			
Land Rental	1,000	1,000	1,000	1,000
Actual Cash Cost	124,368	4,225	5,275	5,125
Imputed Cost	5,500	0	0	0
TOTAL COST	129,868	4,225	5,275	5,125

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
RETURNS				
TARO				
big: 10 sacks @ 60 kls x 10	6,000			
medium: 12 sacks @ 7/kl	5,040			
small: 8 sacks @ 5/kl	2,400			
GINGER : 7 sacks @ 60 kls x 8	3,360			
YAM : 80 kls @ 10/kl	800			
TIGER GRASS @ 25/bundle 2' dia.		12,500	25,000	17,500
PINEAPPLE				
1st gather: 27,500 fruits				
big say 70% @ 25/pc		481,250		
medium say 20% @ 17/pc		93,500		
small say 10% @ 7		19,250		
2nd gather: 70,000 fruits				
big say 10% @ 20/pc			140,000	
medium say 50% @ 15/pc			525,000	
small say 40% @ 5/pc			140,000	
3rd gather: 41,250 fruits				
medium say 40% @ 17/pc				247,500
small say 60% @ 7/pc				123,750
RETURNS TOTAL	17,600	606,500	830,000	388,750

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
GROSS INCOME	17,600	606,500	830,000	388,750
NET INCOME				
with imputed labor cost	(112,268)	602,275	824,725	383,625
without imputed labor cost	(106,768)	602,275	824,725	383,625

NOTES:

Does not account for spoilage and rejects
Tiger grass and pineapple planted on separate areas
Computation is based on current prices and projected harvests
Pineapple computation is based on the assumption that
first harvest 1 plant yields 1 fruit
second harvest 1 plant yields 2-3 fruits
third harvest 1 plant yields 1 fruit

Case 2-A

TIGER GRASS COST AND RETURN (sold as raw fiber)

Area - 1 hectare

(Amount in Pesos)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
COSTS				
Labor input				
'palaspas' 12 mdays @ 70	840.00			
cleaning 12 mdays @ 70	840.00			
'bukwal' 24 mdays @ 70	1,680.00			
planting 12 mdays @ 70	840.00			
weeding 30 mdays @ 70	2,100.00	2,100.00	2,100.00	2,100.00
harvest 12 mdays @ 70		140.00	840.00	840.00
Total labor cost (family labor)	6,300.00	2,240.00	2,940.00	2,940.00
Land rental	1,000.00	1,000.00	1,000.00	1,000.00
Planting materials @ 1/plant	2,222.00			
actual cash cost	3,222.00	1,000.00	1,000.00	1,000.00
imputed labor cost	6,300.00	2,240.00	2,940.00	2,940.00
TOTAL CASH COST	9,522.00	3,240.00	3,940.00	3,940.00

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
RETURNS				
HARVEST/yield (in bundles)	7	75	450	450
GROSS INCOME @ 60/bundle	420.00	4,500.00	27,000.00	27,000.00
NET INCOME @ 60 bundle				
with imputed labor cost	(9,102.00)	1,260.00	23,060.00	23,060.00
without imputed labor cost	(2,802.00)	3,500.00	26,000.00	26,000.00
GROSS INCOME @ 70/bundle	490.00	5,250.00	31,500.00	31,500.00
NET INCOME @ 70 bundle				
with imputed labor cost	(9,032.00)	2,010.00	27,560.00	27,560.00
without imputed labor cost	(2,732.00)	4,250.00	30,500.00	30,500.00

Note: Computation is based on 1992 prices (materials cost) and 1993 (labor cost)
Based on actual harvest

Case 2-B

TIGER GRASS COST AND RETURN (Sold as tiger grass broom @ 3 brooms/bundle)

Area - 1 hectare

(Amount in Pesos)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
COSTS				
Labor input				
'palaspas' 12 mdays @ 70	840.00			
cleaning 12 mdays @ 70	840.00			
'bukwal' 24 mdays @ 70	1,680.00			
planting 12 mdays @ 70	840.00			
weeding 30 mdays @ 70	2,100.00	2,100.00	2,100.00	2,100.00
harvest 12 mdays @ 70		140.00	840.00	840.00
Labor Cost Sub Total (family labor)	6,300.00	2,240.00	2,940.00	2,940.00
Land rental	1,000.00	1,000.00	1,000.00	1,000.00
Planting materials @ 1/plant	2,222.00			
Transport cost		209.50	1,235.00	1,235.00
Production cost				
materials		457.00	1,780.20	1,780.20
labor		675.00	4,050.00	4,050.00
Production Cost Sub Total		1,132.00	5,830.20	5,830.20
actual cash cost	3,222.00	2,341.50	8,065.20	8,065.20
imputed labor cost	6,300.00	2,240.00	2,940.00	2,940.00
TOTAL COST	9,522.00	4,581.50	11,005.20	11,005.20

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
RETURNS (sold as tiger grass brooms)				
NUMBER OF BROOMS				
@ 3 brooms/bundle of 'boiboi'		225	1,350	1,350
GROSS INCOME @ 20/broom	*	4,500.00	27,000.00	27,000.00
NET INCOME				
with imputed labor cost	(9,522.00)	(81.50)	15,994.80	15,994.80
without imputed labor cost	(3,222.00)	2,158.50	18,934.80	18,934.80
GROSS INCOME @ 30/broom	*	6,750.00	40,500.00	40,500.00
NET INCOME				
with imputed labor cost	(9,522.00)	2,168.50	29,494.80	29,494.80
without imputed labor cost	(3,222.00)	4,408.50	32,434.80	32,434.80

Note: Computation is based on 1992 prices (materials cost) and 1993 (labor cost)
Based on actual harvest
All labor cost imputed

* 1st year harvest sold as raw fiber

Case 2-C

TIGER GRASS COST AND RETURN (Sold as tiger grass brooms @ 4 brooms/bundle)

Area - 1 hectare

(Amount in Pesos)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
COSTS				
Labor input				
'palaspas' 12 mdays @ 70	840.00			
cleaning 12 mdays @ 70	840.00			
'bukwal' 24 mdays @ 70	1,680.00			
planting 12 mdays @ 70	840.00			
weeding 30 mdays @ 70	2,100.00	2,100.00	2,100.00	2,100.00
harvest 12 mdays @ 70		140.00	840.00	840.00
Labor Cost Sub Total (family labor)	6,300.00	2,240.00	2,940.00	2,940.00
Land rental	1,000.00	1,000.00	1,000.00	1,000.00
Planting materials @ 1/plant	2,222.00			
Transport cost		280.50	1,690.00	1,690.00
Production cost				
materials		587.20	2,338.05	2,338.05
labor		900.00	5,400.00	5,400.00
Production Cost Sub total		1,487.20	7,738.05	7,738.05
actual cash cost	3,222.00	2,767.70	10,428.05	10,428.05
imputed labor cost	6,300.00	2,240.00	2,940.00	2,940.00
TOTAL COST	9,522.00	5,007.70	13,368.05	13,368.05

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
RETURNS (sold as tiger grass brooms)				
NUMBER OF BROOMS				
@ 4 brooms/bundle of 'boiboi'		300	1,800	1,800
GROSS INCOME @ 20/broom	*	6,000.00	36,000.00	36,000.00
NET INCOME				
with imputed labor cost	(9,522.00)	992.30	22,631.95	22,631.95
without imputed labor cost	(3,222.00)	3,232.30	25,571.95	25,571.95
GROSS INCOME @ 30/broom	*	9,000.00	54,000.00	54,000.00
NET INCOME				
with imputed labor cost	(9,522.00)	3,992.30	40,631.95	40,631.95
without imputed labor cost	(3,222.00)	6,232.30	43,571.95	43,571.95

Note: Computation is based on 1992 prices (materials cost) and 1993 (labor cost)
Based on actual harvest
All labor cost imputed

* 1st year harvest sold as raw fiber

Case 2-D

ADDED VALUE FROM BROOM MAKING (Tiger grass brooms)
(Amount in Pesos)

COSTS: Raw Fiber Production				
Labor input				
'palaspas'	12 mdays @ 70	840.00		
cleaning	12 mdays @ 70	840.00		
'bukwal'	24 mdays @ 70	1,680.00		
planting	12 mdays @ 70	840.00		
weeding	120 mdays @ 70	8,400.00		
harvest	26 mdays @ 70	1,820.00		
Total labor cost		14,420.00		
Land rental		4,000.00		
Planting materials @ 1/plant		2,222.00		
TOTAL COST : Raw Fiber			20,642.00	
ADDITIONAL COST: Tiger Grass Broom Production				
Transport cost			2,679.50	
Production cost				
materials			4,017.40	
labor			8,775.00	
TOTAL ADDITIONAL COST : Tiger Grass Broom Production			12,792.40	
				33,434.40
GROSS INCOME				
Raw fiber: 982 bundles @ 70/bundle				68,740.00
Tiger grass brooms @ 3 brooms/bundle				
2,925 brooms @ 40/broom				117,000.00
NET INCOME				
raw fiber				48,098.00
tiger grass brooms				83,565.60

ASSUMPTIONS:
Estimates at high price of 70/bundle of raw fiber and 40/tiger grass broom
Computation is based on 1992 prices (materials) and 1993 (labor)

ase 3

OST - RETURN ANALYSIS

ase on Mix Cropping: gabi (chinese), ubi ("tuwiran" and "deking"), tiger grass, pineapple
papaya for land owner, banana not yet harvested

rea: 1 ha

Amount in Pesos)

Case 3, page 1

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
COSTS					
Labor					
Land Preparation - contract	10,000				
Planting (& fertilizing) @ 60					
Ubi 10 MD	600				
gabi 40 MD	2,400				
tiger grass 10 MD	600				
pineapple 8 MD	480				
Weeding - contract					
2x/year @ 5000	10,000	10,000	10,000	10,000	5,000
Fertilizing 8 MD @ 60	480				
Harvesting and hauling @ 60					
Ubi 18 MD	1,080				
gabi 14 MD	840				
tiger grass (20, 80, 100, 100)		1,200	4,800	6,000	6,000
pineapple (35, 90,)		2,100	5,400		
otal Labor Cost	26,480	13,300	20,200	16,000	11,000
ost of Planting materials and other inputs					
yam 300 kilos @ 10	3,000 *:				
gabi 10 cans @ 100	1,000				
tiger grass 1,000 suckers @ 1	1,000				
pineapple 2,000 suckers @ .5	1,000				
fertilizer "ammonia" 4 sacks @ 170	680				
"chicken dung" 4 sacks @ 60	240				
tal Cost of P. Matls. & Inputs	6,920	0	0	0	0
ansportation cost [1]					
fertilizer 4 sacks @ 12	48				
chicken dung 4 sacks @ 12	48				
yam 1,800 Kls. @ .35	630				
gabi 3,000 kls. @ .35	1,050				
pineapple (60, 132) baskets @ 2		1,200	2,640		
tal Transportation Cost	1,776	1,200	2,640	0	0
ctual cash cost	28,696	11,200	12,640	10,000	5,000
mputed labor cost	6,480	3,300	10,200	6,000	6,000
AL COST	35,176	14,500	22,840	16,000	11,000

yam/ubi planted not bought

	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
	Low Price	High Price	Low Price	High Price	Low Price	High Price	Low Price	High Price	Low Price	High Price
RETURNS										
Yam 1,800 kls. @ 6-20	10,800	36,000								
Taro										
1st gather:										
25 sacks*60 kls. @ 14-22	21,000	33,000								
2nd gather:										
30 sacks*50 kls. @ 5-7	7,500	10,500								
Tiger grass : 2" dia/bundle @ 25-40										
1st gather: 200 bundles			5,000	8,000						
2nd gather: 1,000 bundles					25,000	40,000				
3rd gather: 1,000 bundles							25,000	40,000		
4th gather: 1,000 bundles									25,000	40,000
Pineapple 2,000 suckers										
1st gather say 1600 fruits										
small say 10% at 4-5			640	800						
medium say 10% @ 7-10			1,120	1,600						
large say 70% @ 10-15			11,200	16,800						
X-large say 10% @ 15-20			2,400	3,200						
TOTAL RETURNS	39,300	79,500	20,360	30,400	25,000	40,000	25,000	40,000	25,000	40,000
GROSS INCOME	39,300	79,500	20,360	30,400	25,000	40,000	25,000	40,000	25,000	40,000
NET INCOME										
with imputed cost	4,124	44,324	5,860	15,900	2,160	17,160	9,000	24,000	14,000	29,000
without imputed cost	10,604	50,804	9,160	19,200	12,360	27,360	15,000	30,000	20,000	35,000

NOTES:

Computation is based on current prices and actual estimated harvest

Spoilage and rejects not accounted

[1] Transport Cost - Trader/buyer picks-up tiger grass

[2] All labor cost - imputed except "bukwal" and weeding
Gabi labor cost for harvesting- 1st yr- includes washing, cleaning and tying

	YEAR 1		YEAR 2		YEAR 3		YEAR 4		YEAR 5	
	Low Price	High Price	Low Price	High Price	Low Price	High Price	Low Price	High Price	Low Price	High Price
RETURNS										
Yam 1,800 kls. @ 6-20	10,800	36,000								
Taro										
1st gather:										
25 sacks*60 kls. @ 14-22	21,000	33,000								
2nd gather:										
30 sacks*50 kls. @ 5-7	7,500	10,500								
Tiger grass : 2" dia/bundle @ 25-40										
1st gather: 200 bundles			5,000	8,000						
2nd gather: 1,000 bundles					25,000	40,000				
3rd gather: 1,000 bundles							25,000	40,000		
4th gather: 1,000 bundles									25,000	40,000
Pineapple 2,000 suckers										
1st gather say 1600 fruits										
small say 10% at 4-5			640	800						
medium say 10% @ 7-10			1,120	1,600						
large say 70% @ 10-15			11,200	16,800						
X-large say 10% @ 15-20			2,400	3,200						
TOTAL RETURNS	39,300	79,500	20,360	30,400	25,000	40,000	25,000	40,000	25,000	40,000
GROSS INCOME	39,300	79,500	20,360	30,400	25,000	40,000	25,000	40,000	25,000	40,000
NET INCOME										
with imputed cost	4,124	44,324	5,860	15,900	2,160	17,160	9,000	24,000	14,000	29,000
without imputed cost	10,604	50,804	9,160	19,200	12,360	27,360	15,000	30,000	20,000	35,000

NOTES:

Computation is based on current prices and actual estimated harvest

Spoilage and rejects not accounted

[1] Transport Cost - Trader/buyer picks-up tiger grass

[2] All labor cost - imputed except "bukwal" and weeding
Gabi labor cost for harvesting- 1st yr- includes washing, cleaning and tying

Case 4

COST - RETURN ANALYSIS

CASE ON MIX CROPPING: pineapple, ubi, ginger

Area: approx. 300 sq. m.

(Amount in Pesos) Case 4, page 1

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
COSTS				
Labor Cost				
Cleaning and bukwal 20 MD @ 100	2,000			
Planting 10 MD @ 60	600			
Weeding (7, 4, 4, 4) MD @ 60	420	240	240	240
Harvesting @ 60				
Ginger 4 MD	240			
Pineapple (1MD, 2MD, 1MD)		60	120	60
Ubi 3 MD	180			
Fertilizing 1 MD	60			
Hauling @ 100				
(3 MD, 3 MD, 4 MD, 2 MD)	300	300	400	200
Labor Cost Sub Total	3,800	600	760	500
Cost of Planting Materials & Inputs				
Ginger 50 kls @ 7	350			
Pineapple 200 suckers @ 1	200			
Ubi 300 kls @ 12	3,600			
1 sack Triple 14	280			
Cost of P. Matls. & Inputs Sub Total	4,430 *	0	0	0
Transportation				
Ubi 1000 kls. @ .35	350			
Ginger 100 kls. @ .35	35			
Pineapple @ 12/basket				
(3.5, 8, 4 baskets)		42	96	48
Transportation Sub Total	385	42	96	48
Actual Cash Cost	7,115	342	496	248
Imputed Labor Cost	1,500	300	360	300
TOTAL COST	8,615	642	856	548

* All planting materials not bought (from old plantation, neighbors/relatives)

Notes: Computation is based on current prices and actual estimated harvest
Pineapple computation is based on the assumption that
first harvest 1 plant yields 1 fruit (not 100 %)
second harvest 1 plant yields 2-3 fruits
third harvest 1 plant yields 1 fruit
Spoilage and rejects not accounted

	YEAR 1		YEAR 2		YEAR 3		YEAR 4	
	low price	high price	low price	high price	low price	high price	low price	high price
RETURNS								
Ubi 1200 kls. @ 7-12	8,400	14,400						
Ginger 100 kls. @ 2-7	200	700						
Pineapple 200 suckers								
1st gather say 140 fruits								
small say 10% at 4-5			56	70				
medium say 10% @ 7-10			98	140				
large say 70% @ 10-15			980	1,470				
X-large say 10% @ 15-20			210	280				
2nd gather say 400 fruits								
small say 10% at 4-5					160	200		
medium say 50% @ 7-10					1,400	2,000		
large say 30% @ 10-15					1,200	1,800		
X-large say 10% @ 15-20					600	800		
3rd gather say 200 fruits								
small say 50% at 4-5							400	500
medium say 30% @ 7-10							420	600
large say 10% @ 10-15							200	300
X-large say 10% @ 15-20							300	400
TOTAL RETURNS	8,600	15,100	1,344	1,960	3,360	4,800	1,320	1,800

	YEAR 1		YEAR 2		YEAR 3		YEAR 4	
	low price	high price	low price	high price	low price	high price	low price	high price
GROSS INCOME	8,600	15,100	1,344	1,960	3,360	4,800	1,320	1,800
NET INCOME								
with imputed labor cost	(15)	6,485	702	1,318	2,504	3,944	772	1,252
without imputed labor cost	1,485	7,985	1,002	1,618	2,864	4,304	1,072	1,552

Case 5

COST - RETURN ANALYSIS

Rice variety planted: IR 42

Area: Rice Paddy: 1/2 hectare

(Amount in Pesos)

		YEAR 1
COSTS		
Labor Cost		
land preparation 13 MD @ P 100		360.00
seedbedding 1 MD @ P 60		60.00
transplanting 8 MD @ 60		480.00
cleaning/weeding 5 MD @ P 60		300.00
fertilizing 2 MD @ P 60	[1]	120.00
harvesting and hauling 12 MD @ 60		720.00
milling/hulling -53 cans @ P 8.5		450.50
Labor Cost Sub Total		2,490.50
Transportation 58 sacks @ P 12		696.00
Planting Material		
3 sacks rice @ 650	[2]	1,950.00
Rental: Manual thresher (1 sack rice for every 10 sacks) = 2.5 sacks @ 650		1,625.00
Actual Cash Cost		4,271.00
Imputed Labor Cost		2,490.50
TOTAL COST		6,761.50

[1] fertilizer used - ashes and leaves

[2] Computation for planting material is double the quantity borrowed

RETURNS	
50 cavans unhulled or 25 cavans rice @ P 650	16,250.00
rice bran 25 sacks or 75 cans @ P 15/can	1,125.00
GROSS INCOME	17,375.00
NET INCOME	
with imputed cost	10,613.50
without imputed cost	13,104.00

Note:
Computation is based on current prices and actual harvest
All labor cost imputed
Yield - enough supply for one year (4 members)

Case 6-A

COST - RETURN ANALYSIS

CASE ON MIX CROPPING (MINIMUM YIELD)
50 % of area - ubi, gabi, cassava (miracle variety), pineapple
50 % of area - beans and pechay

Area: 1/4 hectare

(Amount in Pesos)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
Labor @ 80/day except				
bukwal @ 100/day				
clearing/'palaspas' 15 MD	1,200			
bukwal 40 MD	4,000			
weeding 15, 10, 10, 10 MD	1,200	800	800	800
fertilizing 2 MD	160			
spraying 6 MD	480			
gathering sticks & trellising 4MD	320			
planting				
gabi 20 MD	1,600			
ubi 1MD	80			
pineapple (3,4,2)	240	320	160	
cassava 1 MD	80			
beans 2 MD	160			
pechay 1 MD	80			
harvesting				
gabi 3, 2	240	160		
ubi 2 MD	160			
cassava (+ hauling) 11 MD	880			
beans 14.5 MD	1,160			
pechay 1 MD	80			
pineapple 1st - .5 MD		40		
2nd - 1 MD			80	
3rd - 2 MD				160
Labor Sub Total	12,120	1,320	1,040	960

		YEAR 1	YEAR 2	YEAR 3	YEAR 4
COSTS					
Planting materials & Inputs					
gabi 10 cans @ 150		1,500			
ubi 10 kilos @ 10		100			
pineapple 2,000 sukers @ 2		4,000			
cassava 200 pcs. @ .25 for 2		25			
beans 2.5 gantas @ 250		625			
pechay 1 tbsp @ 7		7			
16-20 2 cavans @ 350		700			
tamaron 2 liters @ 465		930			
manzate 6 lbs. @ 250/3 lbs.		500			
P. Matl's. & Inputs Sub Total	*	8,387			
Transportation cost	**				
cassava 10 cavans @ 10/sack		100			
beans 200 kilos @ .5/kl		100			
pechay 30 kilos @ .5/kl		15			
Transportation Sub Total		215	0	0	0
Actual Cash Cost		12,602	0	0	0
Imputed Labor Cost		8,120	1,320	1,040	960
TOTAL COST		20,722	1,320	1,040	960

* all planting materials obtained free from neighbors except ubi

** Transport Cost - Trader/buyer picks-up tiger grass, cassava and gabi

Gabi labor cost for harvesting- 1st yr- includes washing, cleaning and tying

	YEAR 1		YEAR 2		YEAR 3		YEAR 4	
	low price	high price	low price	high price	low price	high price	low price	high price
ubi 70 kilos @ 5-10	350	700						
cassava 10 cavans @ 160-180	1,600	1,800						
gabi leaves: 400 bundles @ 5-7	2,000	2,800						
roots (1st): 200 kilos @ 8-17	1,600	3,400						
roots (2nd): 125 kilos @ 8-17			* 1,000	2,125				
pineapple								
1st harvest:								
Small - @ 5-7								
Medium @ 8-10								
1,000 Large @ 12-15			5,000	7,000				
2nd harvest:								
980 Small - @ 5-7					4,900	6,860		
280 Medium @ 8-10					2,240	2,800		
140 Large @ 12-15					1,680	2,100		
3rd harvest:								
3,000 Small - @ 5-7							15,000	21,000
1,000 Medium @ 8-10							8,000	10,000
1,000 Large @ 12-15							12,000	15,000
beans 200 kilos @ 5-20	1,000	4,000						
pechay 30 kilos @ 3-15	90	450						
OTAL RETURNS	6,640	13,150	6,000	9,125	8,820	11,760	35,000	46,000

ROSS INCOME	6,640	13,150	6,000	9,125	8,820	11,760	35,000	46,000
AND RENTAL (30 % of total produce)			1,800	2,738	2,646	3,528	10,500	13,800
ET INCOME								
with imputed labor cost	(14,082)	(7,572)	2,880	5,068	5,134	7,192	23,540	31,240
without imputed labor cost	(5,962)	548	4,200	6,388	6,174	8,232	24,500	32,200

)te: Computation is based on actual harvest for Year 1 & 2

Pineapple computation for Year 3 & 4 is based on the assumption that
first harvest 1 plant yields 1 fruit (not all 100%)
second harvest 1 plant yields 2-3 fruits
third harvest 1 plant yields 1 fruit

Spoilage and rejects not accounted

* farmer has the option to sell or keep 2nd harvest for planting

Case 6-B

COST - RETURN ANALYSIS

CASE ON MIX CROPPING (MAXIMUM YIELD)
50 % of area - ubi, gabi, cassava (miracle variety), pineapple
50 % of area - beans and pechay

Area: 1/4 hectare

(Amount in Pesos)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
Labor @ 80/day except				
bukwal @ 100/day				
clearing/'palaspas' 15 MD	1,200			
bukwal 40 MD	4,000			
weeding 15, 10, 10, 10 MD	1,200	800	800	800
fertilizing 2 MD	160			
spraying 6 MD	480			
gathering sticks & trellising 4MD	320			
planting				
gabi 20 MD	1,600			
ubi 1MD	80			
pineapple (3,4,2)	240	320	160	
cassava 1 MD	80			
beans 2 MD	160			
pechay 1 MD	80			
harvesting				
gabi 7, 3 MD	560	240		
ubi 2.5 MD	200			
cassava (+ hauling) 22 MD	1,760			
beans 16 MD	1,280			
pechay 1 MD	80			
pineapple 1st - 1 MD		80		
2nd - 2 MD			160	
3rd - 3 MD				240
Labor Sub Total	13,480	1,440	1,120	1,040

	YEAR 1		YEAR 2		YEAR 3		YEAR 4	
	low price	high price	low price	high price	low price	high price	low price	high price
ubi 90 kilos @ 5-10	450	900						
cassava 20 cavans @ 160-180	3,200	3,600						
gabi leaves: 500 bundles @ 5-7	2,500	3,500						
roots (1st): 250 kilos @ 8-17	2,000	4,250						
roots (2nd): 175 kilos @ 8-17			* 1,400	2,975				
pineapple								
1st harvest:								
Small - @ 5-7								
Medium @ 8-10								
1,400 Large @ 12-15			16,800	21,000				
2nd harvest:								
1,260 Small - @ 5-7					6,300	8,820		
360 Medium @ 8-10					2,880	3,600		
180 Large @ 12-15					2,160	2,700		
3rd harvest:								
3,600 Small - @ 5-7							18,000	25,200
1,200 Medium @ 8-10							9,600	12,000
1,200 Large @ 12-15							14,400	18,000
beans 230 kilos @ 5-20	1,150	4,600						
pechay 30 kilos @ 3-15	90	450						
OTAL RETURNS	9,390	17,300	18,200	23,975	11,340	15,120	42,000	55,200
ROSS INCOME	9,390	17,300	18,200	23,975	11,340	15,120	42,000	55,200
AND RENTAL (30 % of total produce)			5,460	7,193	3,402	4,536	12,600	16,560
ET INCOME								
with imputed labor cost	(12,807)	(4,897)	11,300	15,343	6,818	9,464	28,360	37,600
without imputed labor cost	(3,327)	4,583	12,740	16,783	7,938	10,584	29,400	38,640

TE: Computation is based on actual harvest for Year 1& 2
Pineapple computation for Year 3 & 4 is based on the assumption that
first harvest 1 plant yields 1 fruit (not 100 %)
second harvest 1 plant yields 2-3 fruits
third harvest 1 plant yields 1 fruit

* farmer has the option to sell or keep 2nd harvest for planting

		YEAR 1	YEAR 2	YEAR 3	YEAR 4
COSTS					
Planting materials & Inputs					
gabi 10 cans @ 150		1,500			
ubi 10 kilos @ 10		100			
pineapple 2,000 sukers @ 2		4,000			
cassava 200 pcs. @ .25 for 2		25			
beans 2.5 gantas @ 250		625			
pechay 1 tbsp @ 7		7			
16-20 2 cavans @ 350		700			
tamaron 2 liters @ 465		930			
manzate 6 lbs. @ 250/3 lbs.		500			
P. Matl's. & Inputs Sub Total	*	8,387			
Transportation cost	**				
cassava 20 cavans @ 10/sack		200			
beans 230 kilos @ .5/kl		115			
pechay 30 kilos @ .5/kl		15			
Transportation Sub Total		330	0	0	0
Actual Cash Cost		12,717	0	0	0
Imputed Labor Cost		9,480	1,440	1,120	1,040
TOTAl COST		22,197	1,440	1,120	1,040

* all planting materials obtained free from neighbors except ubi

** Transport Cost - Trader/buyer picks-up tiger grass, cassava and gabi

Gabi labor cost for harvesting- 1st yr- includes washing, cleaning and tying

ase 7

:OST-RETURN ANALYSIS ON BEANS

irea: 200 - 300 sq.m

Amount in Pesos)

		AMOUNT
COSTS		
Labor input:		
Cleaning 'sipsip' 6 MD @ 60		360
"Plowing" 1 MD @ 60		60
Plot preparation 2 MD @ 50		100
Fertilizing 2 MD @ 50		100
Planting 3 MD @ 50		150
Irrigating 25 MD @ 50	[a]	1,250
Spraying 3 MD @ 60	[b]	180
Weeding 2 MD @ 50		100
Harvesting 9.5 MD @ 50		475
Trellising 3 MD @ 50		150
Labor Sub Total		2,925
Seeds & Other Inputs:		
Seeds 4 chupas/cans @ 25	+	100
"Tamaron" 1 liter @ 250		250
"Chicken dung" 4 sacks @ 60	*	240
Seeds and Other Inputs Sub Total		590
Transportation Cost 250 kls. @ .5		125
Actual Cash Cost		715
Imputed Labor Cost		2,925
TOTAL COST		3,640

[a] if not rainy season, irrigating is done daily
[b] done on the 21st, 28th and 42nd days

* not transported

\+ obtained free from neighbors

RETURNS	NET INCOME [1]	NET INCOME [2]
TOTAL KILOS HARVESTED 250 kilos		
NET INCOME		
@ 1.5 per kilo	375	250
with imputed labor cost	(3,265)	(3,390)
without imputed labor cost	(340)	(465)
@ 2 per kilo	500	375
with imputed labor cost	(3,140)	(3,265)
without imputed labor cost	(215)	(340)
@ 5 per kilo	1,250	1,125
with imputed labor cost	(2,390)	(2,515)
without imputed labor cost	535	410

ote: Computation is based on current prices and actual harvest

[1] Net income before supplier gets share
[2] Net income after supplier gets share

Case 8

COST - RETURN ANALYSIS

Area: approx. 500 sq. meters

Crops: ubi (deking), pineapple, gabi (chinese), banana

(Amount in Pesos)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
COSTS				
Labor Cost @ 50/day [1]				
Cleaning/Land Preparation 6 MD	300			
Planting				
banana 1 MD	50			
gabi 4 MD	200			
ubi 3 MD	150			
pineapple 3 MD	150			
Weeding (10, 7, 7, 7) MD	500	350	350	350
Harvesting				
gabi 3MD	150			
ubi 1 MD	50			
pineapple (1, 2, 1) MD		50	100	50
Hauling (2, 2, 1, 1)	100	100	50	50
Labor Cost Sub Total	1,650	500	500	450
Cost of Planting Materials [2]				
gabi 1 can (16 ltrs.) @ 120	120			
ubi 80 kls. @ 10	800			
pineapple 150 suckers @ .5	75			
banana 100 suckers @ 6	600			
Cost of Planting Materials Sub Total	1,595	0	0	0
Transportation cost				
gabi 60 kls. @ .50/kl	30			
ubi 150 kls @ .50/kl	75			
pineapple (2, 6, 3) baskets @ 12		24	72	36
Transportation Cost Sub Total	105	24	72	36
Actual Cash Cost	1,700	24	72	36
Imputed Labor Cost	1,650	500	500	450
TOTAL COST	3,350	524	572	486

[1] All labor cost - imputed

[2] All planting materials free - from old plantation and neighbors except banana

	YEAR 1		YEAR 2		YEAR 3		YEAR 4	
	L. Price	H. Price	L. Price	H. Price	L. Price	H. Price	L. Price	H. Price
RETURNS								
Ubi 150 kls. @ 6-10	900	1,500						
gabi: tubers - 50 kls. @ 5-10	250	500						
leaves - 10 bundles @ 4-6	40	60						
banana			not harvested yet		not harvested yet		not harvested yet	
pineapple 150 suckers								
1st gather say 70 % - 105 fruits								
small say 10% @ 5-6			53	63				
medium say 10% @ 8-12			84	126				
big say 70 % @ 13-17			955	1,250				
extra big say 10% @ 18-22			189	231				
2nd gather say - 300 fruits								
small say 10% @ 5-6					150	180		
medium say 50% @ 8-12					1,200	1,800		
big say 30 % @ 13-17					1,170	1,530		
extra big say 10% @ 18-22					540	660		
3rd gather say - 150 fruits								
small say 50% @ 5-6							375	450
medium say 30% @ 8-12							360	540
big say 10% @ 13-17							195	255
extra big say 10% @ 18-22							270	330
TOTAL RETURN	1,190	2,060	1,281	1,670	3,060	4,170	1,200	1,575
GROSS PROFIT	1,190	2,060	1,281	1,670	3,060	4,170	1,200	1,575
NET INCOME								
with imputed cost	(2,160)	(1,290)	757	1,146	2,488	3,598	714	1,089
without imputed cost	(510)	360	1,257	1,646	2,988	4,098	1,164	1,539

Computation is based on current prices and actual harvest for rootcrops

Case 9

COST - RETURN ANALYSIS ON GLADIOLA (white)

Area: approx. 400 sq. meters
(50 plots x 8 m x 3 ft)

(Amount in Pesos)

	AMOUNT
COSTS	
Labor	
Cleaning 5 days @ 80	400
plotting 6 MD @ 60	360
fertilizing (holes) 1 MD @ 50	50
planting 10 MD @ 50	500
irrigating 10 MD @ 50 [1]	500
fertilizer 'sarado' 1 MD @ 50	50
harvesting 12 MD @ 50	600
Labor Cost Sub Total	2,460
Cost of Planting Matls. and Inputs	
Seeds: 1 tall evap. milk can @ 50 [2]	50
Triple 14 2 sacks @ 350	700
Planting Matl. and Inputs	750
Actual Cash Cost	750
Imputed Cost	2,460
TOTAL COST	3,210

TOTAL HARVESTED 90 dozens	
NET INCOME	
@ 5 per dozen	450
with imputed cost	(2,760)
without imputed cost	(300)
@ 8 per dozen	720
with imputed cost	(2,490)
without imputed cost	(30)

Notes:
Computation is based on current prices and actual harvest

[1] Irrigating is done daily if not rainy season
[2] First planting material bought

Case 10

COST - RETURN ANALYSIS

Area: 1/3 hectare

Crops: ubi,tiger grass, cassava (miracle variety), gabi
ginger and camote for household

(Amount in Pesos)

	YEAR 1	YEAR 2	YEAR 3	YEAR 4
COSTS				
Labor Cost				
bukwal @ 100/day				
clearing/'palaspas' 15 MD	1,200			
'bukwal' 10 MD	1,000			
Weeding 15 MD	1,200	1,200	600	600
50% 3rd & 4th year				
Planting gabi 5 MD	400			
ubi 2 MD	160			
tiger grass .5 MD	40			
cassava 2 MD	160			
Harvesting gabi 4, 2 MD	320	160		
ubi 3 MD	240			
cassava 5 MD	400			
tiger grass 1st gather 2 MD		160		
2nd gather 4 MD			320	
3rd gather 3 MD				240
Labor Sub Total	5,120	1,520	920	840
Planting Material and Inputs *				
gabi 2.5 cans @ 140	350			
ubi 600 tubers @ 2	1,200			
tiger grass 100 suckers @ 2	200			
cassava 450 stalks @ .50	225			
Triple 14 .5 sack @ 350	175			
Urea .5 sack @ 280	140			
Planting Mat'l. & Inputs Sub Total	2,290	0	0	0
Transportation **				
Ubi 4 sacks @ 10/sack	40			
Actual Cash Cost	3,330	0	0	0
Imputed Labor Cost	4,120	1,520	920	840
TOTAL COST	7,450	1,520	920	840

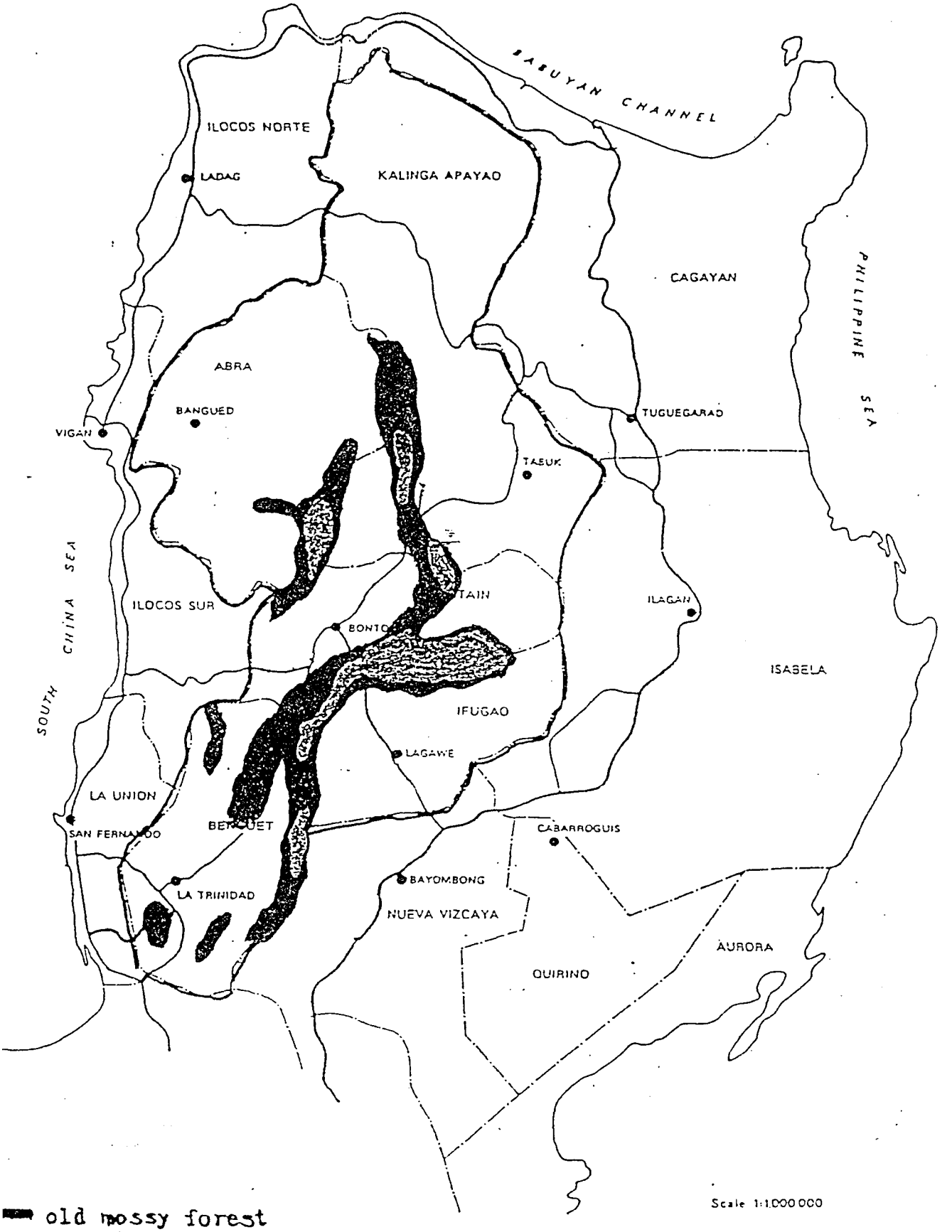
Computation is based on actual harvest except Year 3 and 4

* Planting materials not bought

** Trader/buyer picks-up tiger grass, cassava and gabi

Figure 1

ESTIMATED EXTENT OF OLD AND EXISTING MOSSY FOREST, CORDILLERA ADMINISTRATIVE REGION



	YEAR 1		YEAR 2		YEAR 3		YEAR 4	
	low price	high price	low price	high price	low price	high price	low price	high price
RETURNS (MINIMUM YIELD)								
ubi 200 kilos @ 7-15	1,400	3,000						
cassava 30 cavans @ 130-150	3,900	4,500						
gabi								
leaves: 200 bundles @ 5-7	1,000	1,400						
roots: 100 kilos @ 10-15			1,000	1,500				
tiger grass @ 60-80								
1st gather: 66 bundles			3,960	5,280				
2nd gather: 132 bundles					7,920	10,560		
3rd gather: 84 bundles							5,040	6,720
TOTAL RETURN	6,300	8,900	4,960	6,780	7,920	10,560	5,040	6,720
GROSS INCOME	6,300	8,900	4,960	6,780	7,920	10,560	5,040	6,720
Land Rental (30%)	1,890	2,670	1,488	2,034	2,376	3,168	1,512	2,016
NET INCOME								
with imputed labor cost	(3,040)	(1,220)	1,952	3,226	4,624	6,472	2,688	3,864
without imputed labor cost	1,080	2,900	3,472	4,746	5,544	7,392	3,528	4,704

CASE 11

COST - RETURN ANALYSIS

Rice variety planted: IR 42

Area: Rice Paddy: 1/2 hectare

(Amount in Pesos) Case 11, page 1

	YEAR 1
COSTS	
Labor Cost	
Cleaning 6 MD @ 60	360
"arado" 6 MD @ 60	360
"pasagad" 6 MD @ 60	360
transplanting 12 MD @ 50	600
cleaning/weeding 4 MD @ 50	200
harvesting 8 MD @ 50	400
threshing/hauling or "pagpag" 4 MD @ 50	200
milling/hulling 75 cans @ 8.5	638
Labor Cost Sub Total	3,119
Transportation: 45 sacks @ 12	540
Manual thresher rental - 1 sack rice for every 10 sacks = 2.5 sacks @ 650	1,625
Planting material 3 sacks rice @ 650 [1]	1,950
Actual Cash Cost	4,115
Imputed Labor Cost	3,118
TOTAL COST	7,233

[1] Planting material deducted; payment is double the quantity borrowed;

RETURNS	
Yield	
RICE: 25 cavans @ 650	16,250
RICE BRAN: 25 sacks or 75 cans @ 18/can	1,350
GROSS INCOME	17,600
NET INCOME	
with imputed cost	10,368
without imputed cost	13,485

Notes:

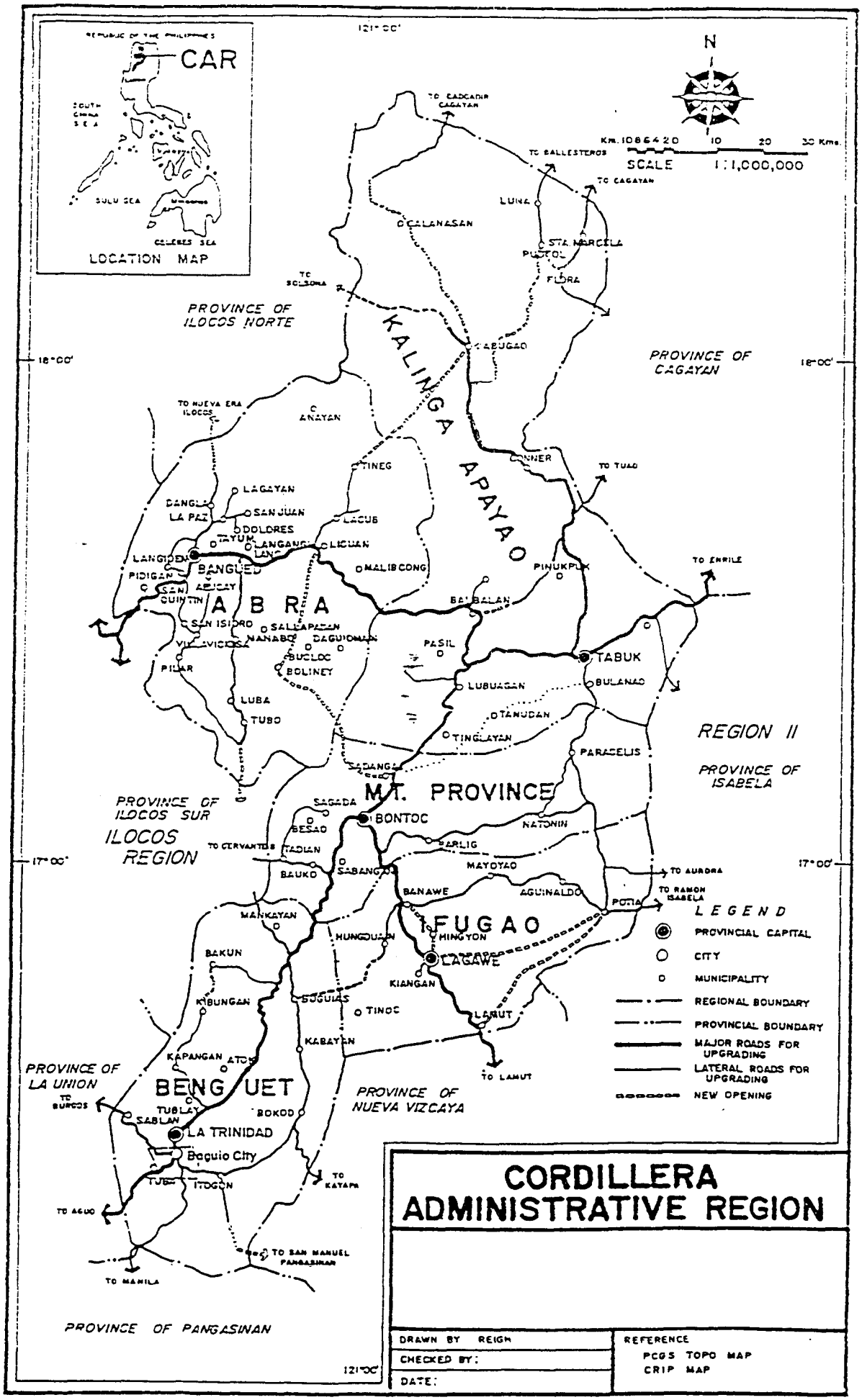
Computation is based on current prices and actual harvest
All labor cost imputed

Consumption:
2 cavans/month - for 8 members; starts buying in August

APPENDIX D

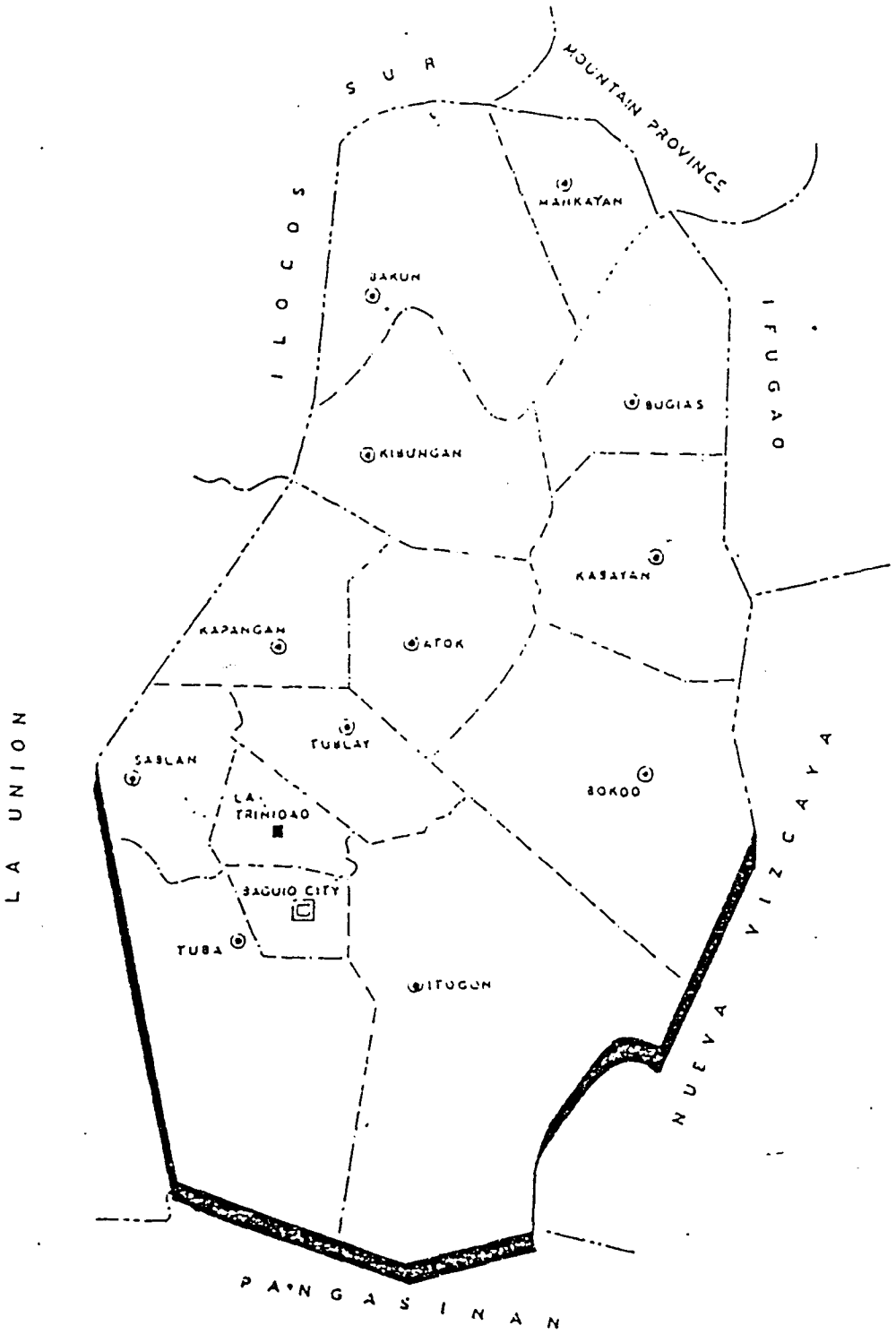
Maps and Transects

re2: Map of Northern Luzon, Philippines, showing the Cordillera Administrati
Region



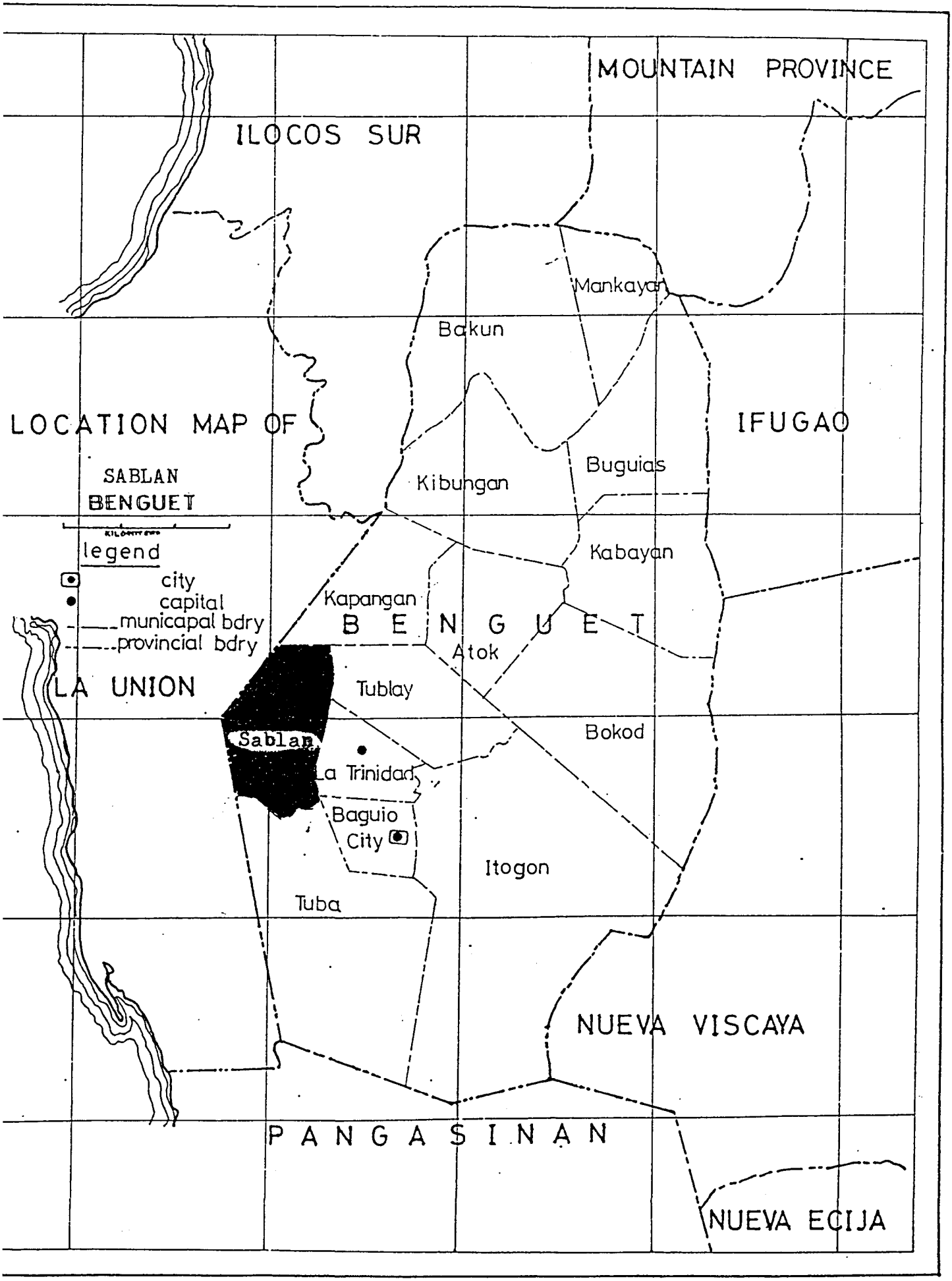
Source: National Economic and Development Authority, Cordillera Administrative Region, 1999

Figure 3

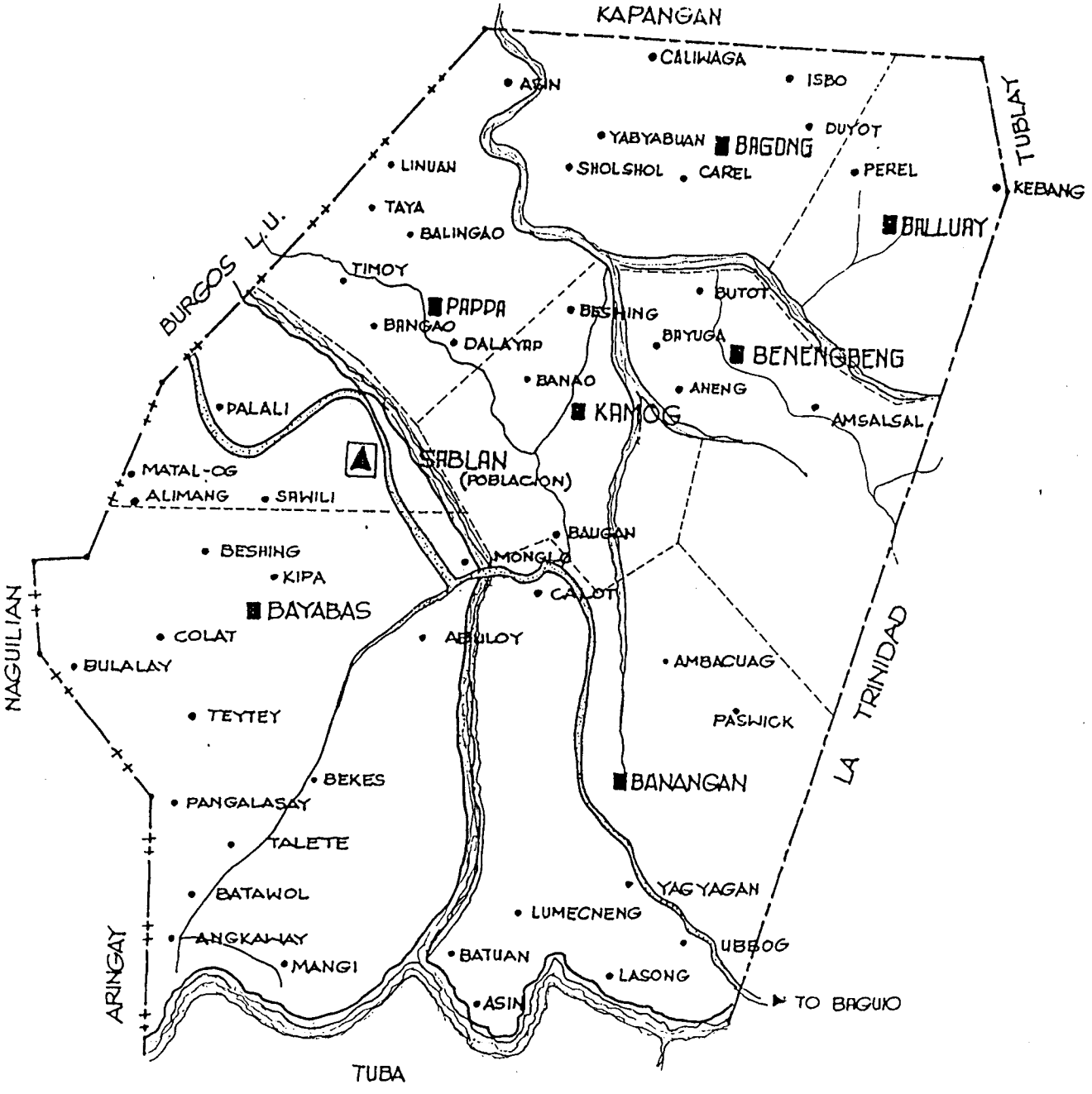


PROVINCE OF BENGUET

Figure 4



Source: Sablan Municipal Profile, 1989



MUNICIPALITY
OF
SABLAN
PROVINCE OF BENGUET
REGION ONE

LEGEND:

- PROVINCIAL BOUNDARY
- MUNICIPAL BOUNDARY
- BARANGAY BOUNDARY
- MUNICIPALITY
- BARANGAY
- SITIO

FIGURE 6

LOCATION MAP OF SABLAN, BENGUET

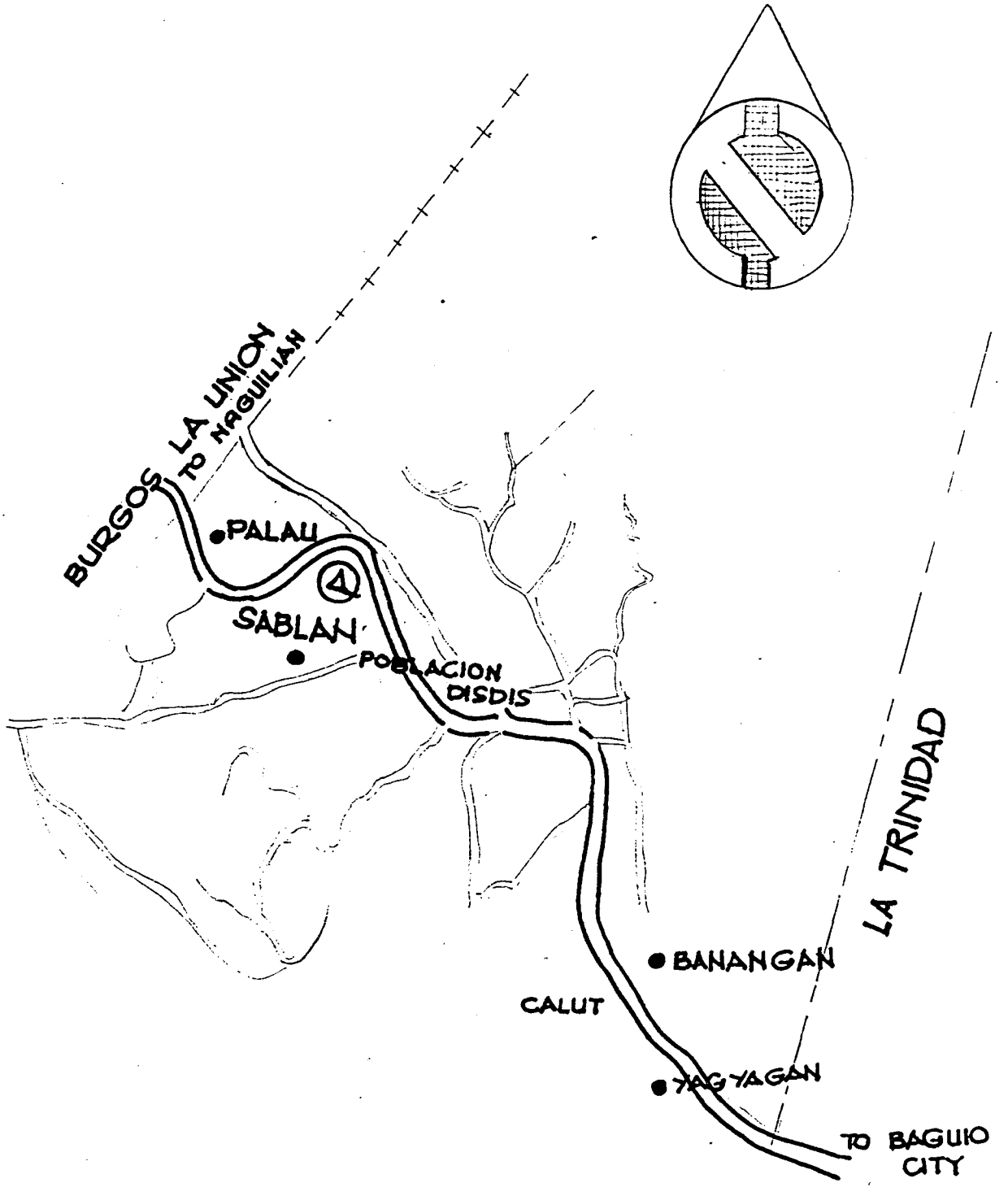


FIGURE 7
PRE-WAR TRADE NETWORK
SABLAN, BENGUET

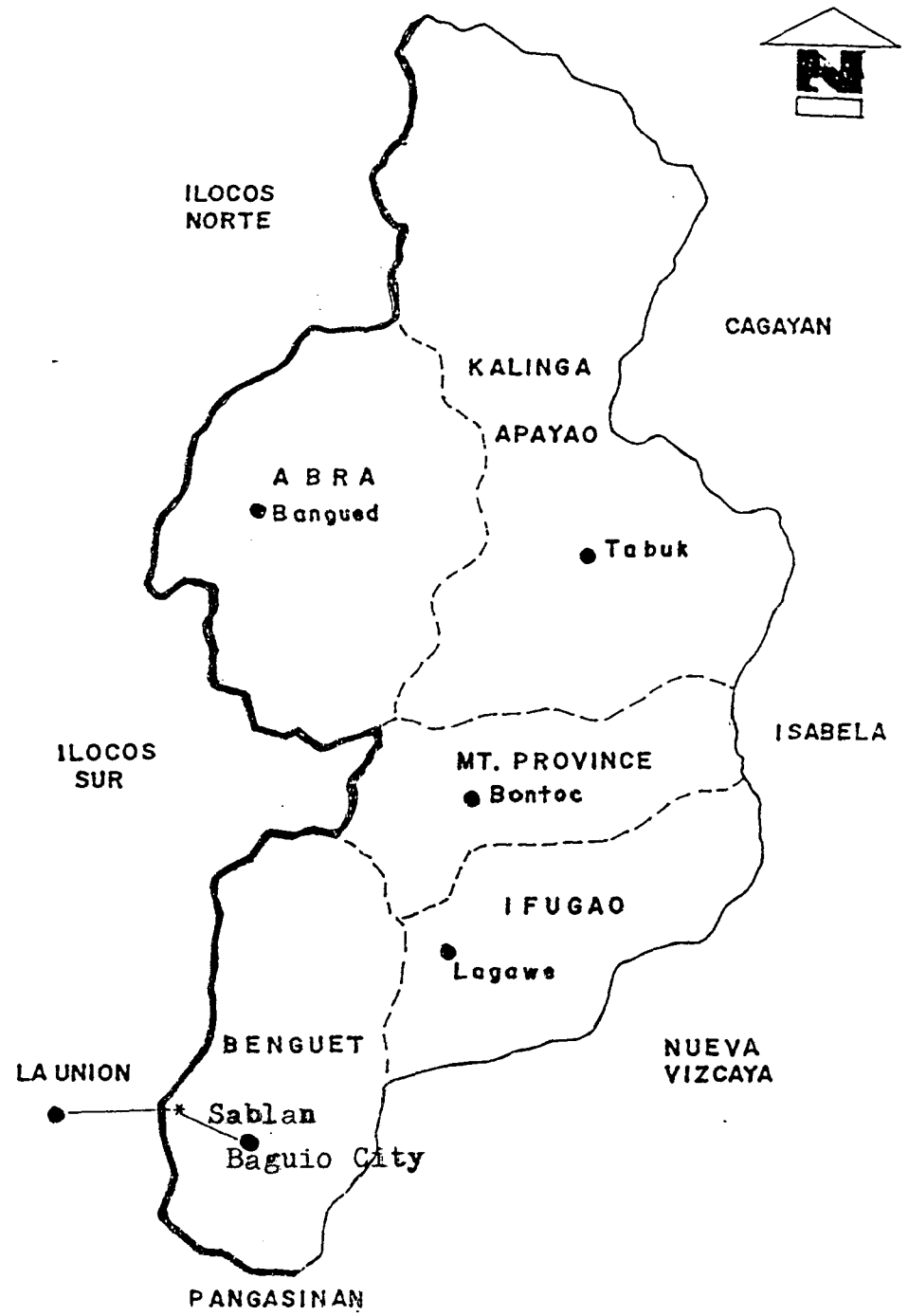


FIGURE 8

POST-WAR TRADE NETWORK

SABLAN, BENGUET

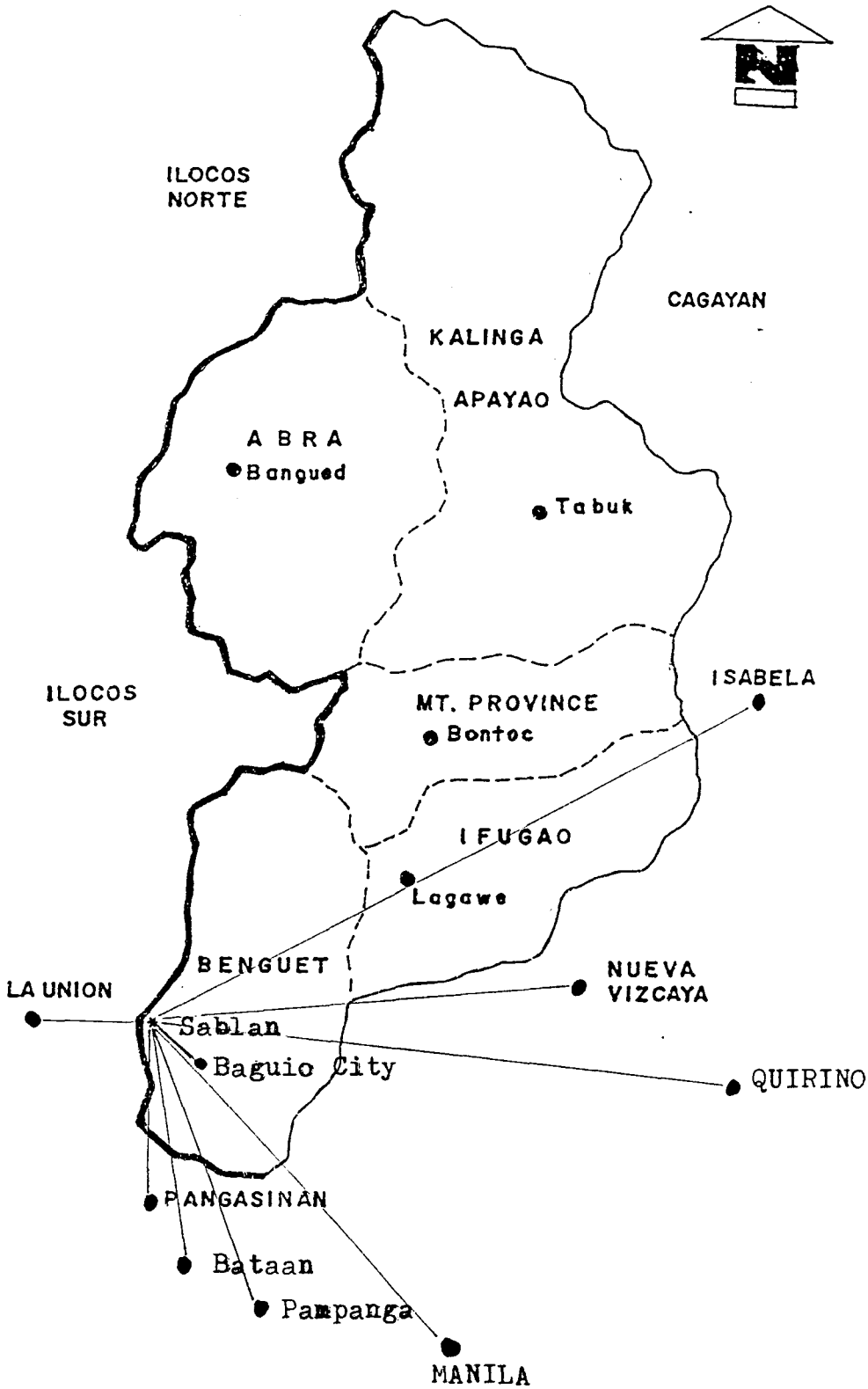
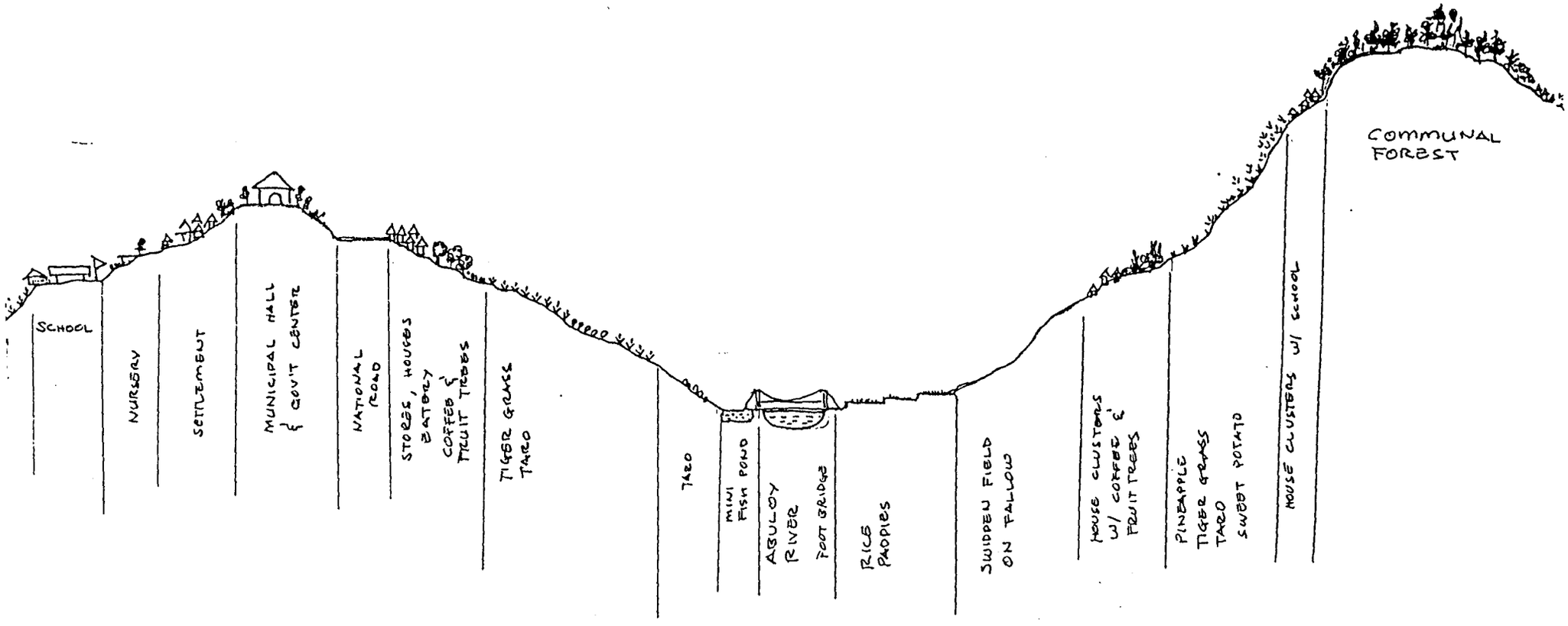
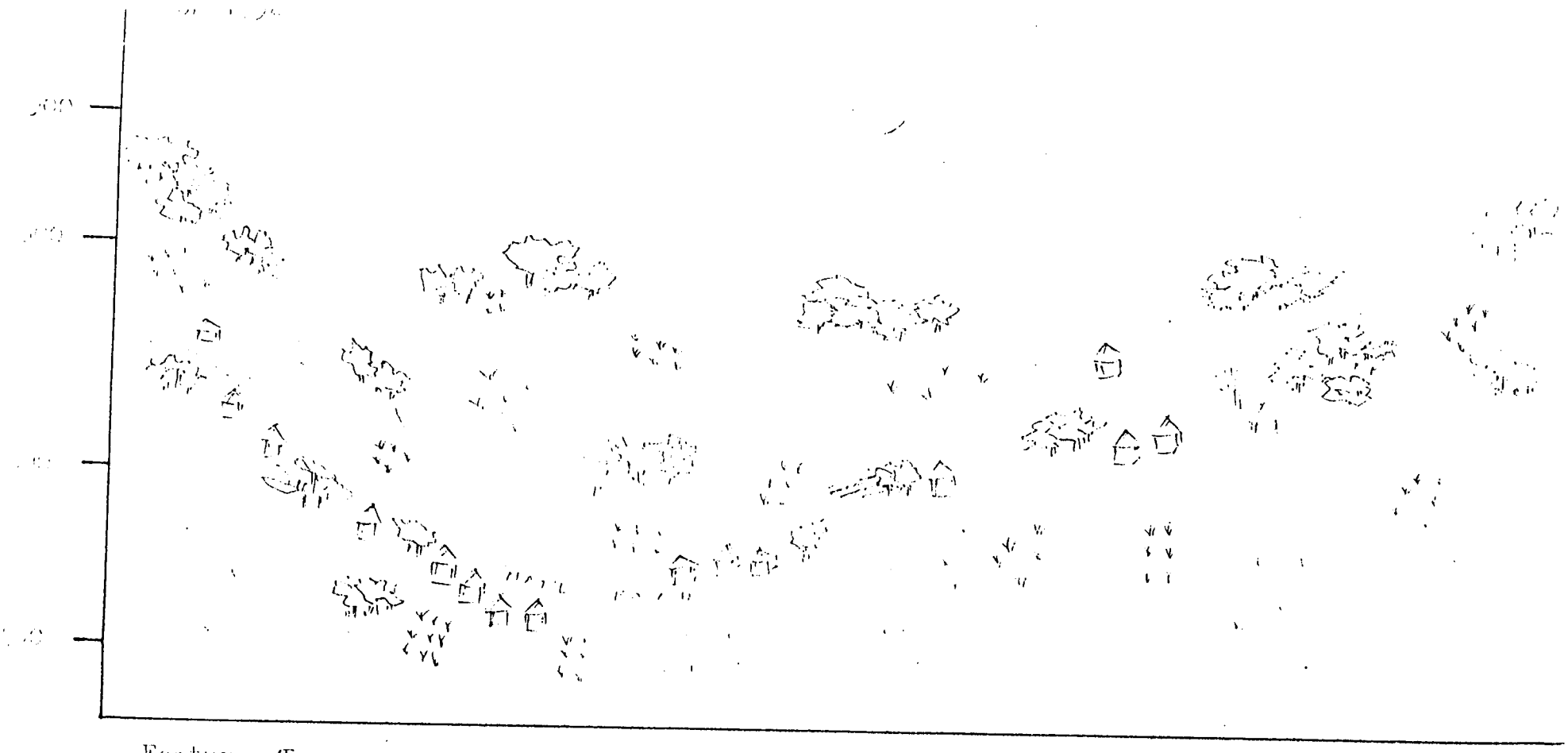


FIGURE 9: AGRO ECOLOGICAL TRANSECT

SABLAN POBLACION



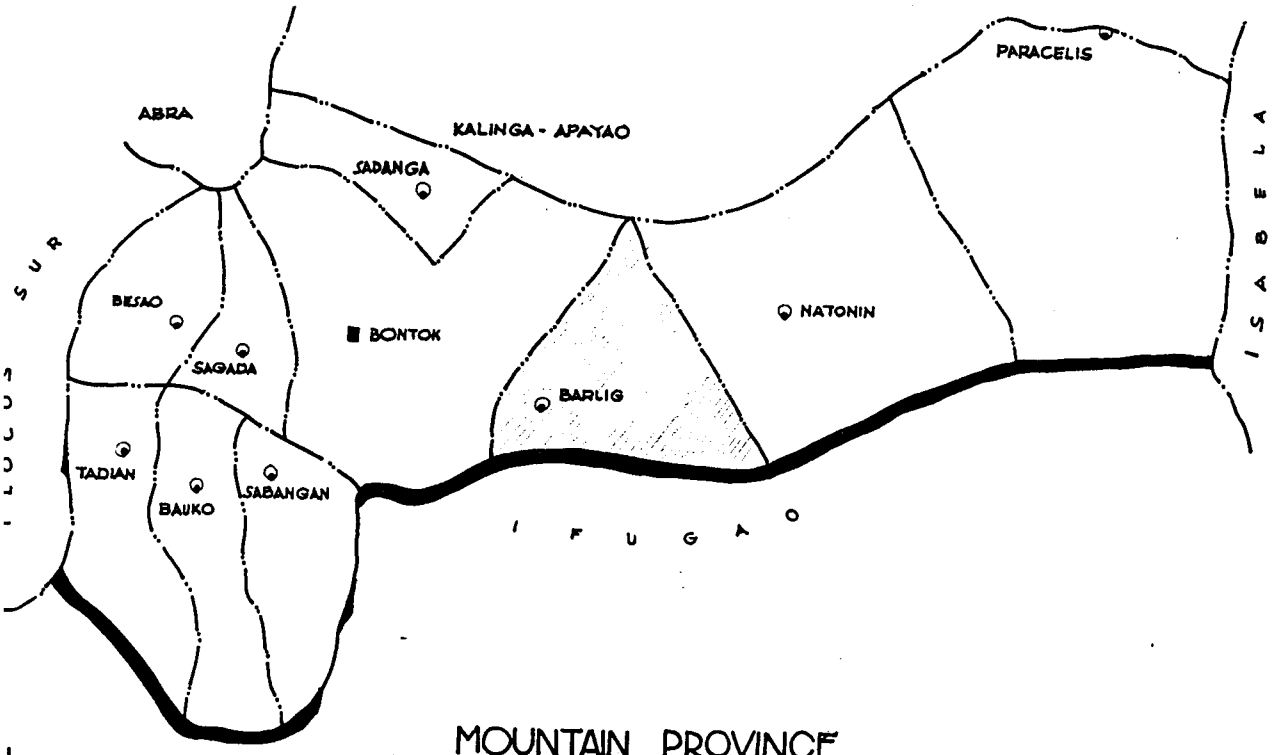


Features/Resources

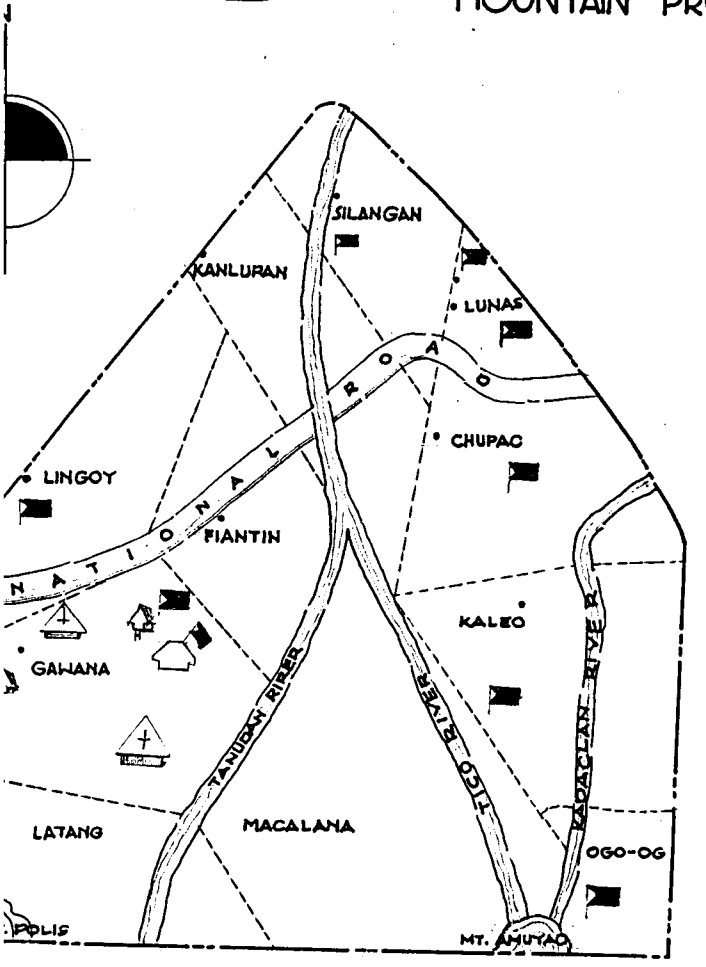
1. Private Forests: dipterocarp, bamboo, edible mushroom-fungi, wild fruits
   Problems/Issues: depleted timber & wild gene species; erosion
2. Swidden Areas/Vegetable Gardens: pineapple, cassava, Tiger Grass, camote, taro yam, beans, cucumber, ginger, rice, eggplant, okra, bitter gourd, mustard, etc.
   Problems/Issues: pest, soil infertility, decreasing yield, shorter fallow, tenureal issues (high land rentals), price fluctuations
3. Ricefields/Gardens: IR varieties, traditional varieties, beans, taro, mustard
   Problems/Issues: insufficient irrigation water, pest
4. Settlement Areas: semi-clustered houses, camkol, mango, pineapple, guave, jack-fruit, papaya, lemon, sourcop, coffee, cacao, livestock & poultry
   Problems/Issues: pest, insufficient domestic water supply
5. River-Creek: eel, catfish, mudfish, shell fish, shrimp

PALALI, SABLAN
1994

FIGURE 12



MOUNTAIN PROVINCE

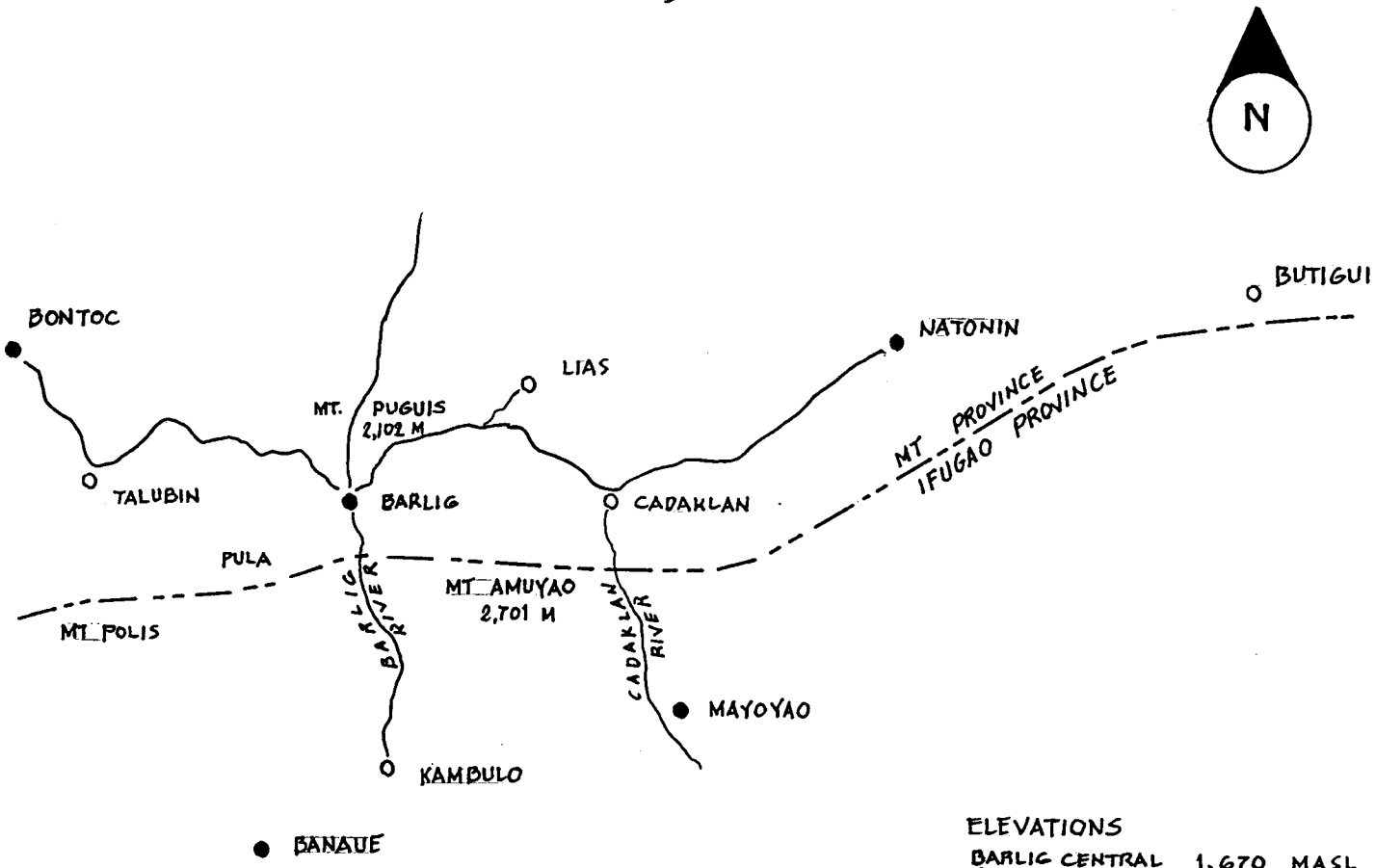


MAP OF BARLIG MUNICIPALITY

LEGEND:

- MUNICIPAL BOUNDARY
- BARANGAY BOUNDARY
- RIVER
- NATIONAL ROAD
- MOUNTAIN
- HOSPITAL
- CATHOLIC CHURCH
- MUNICIPAL BUILDING

FIGURE 13



ELEVATIONS

BARLIG CENTRAL	1,670	MASL
BARLIG CHATUL	1,850	
CAMBULO	1,000 ±	
CADAKLAN	1,000	
BANAUE	1,500	

SCALE 1 : 250,000

FIGURE 14

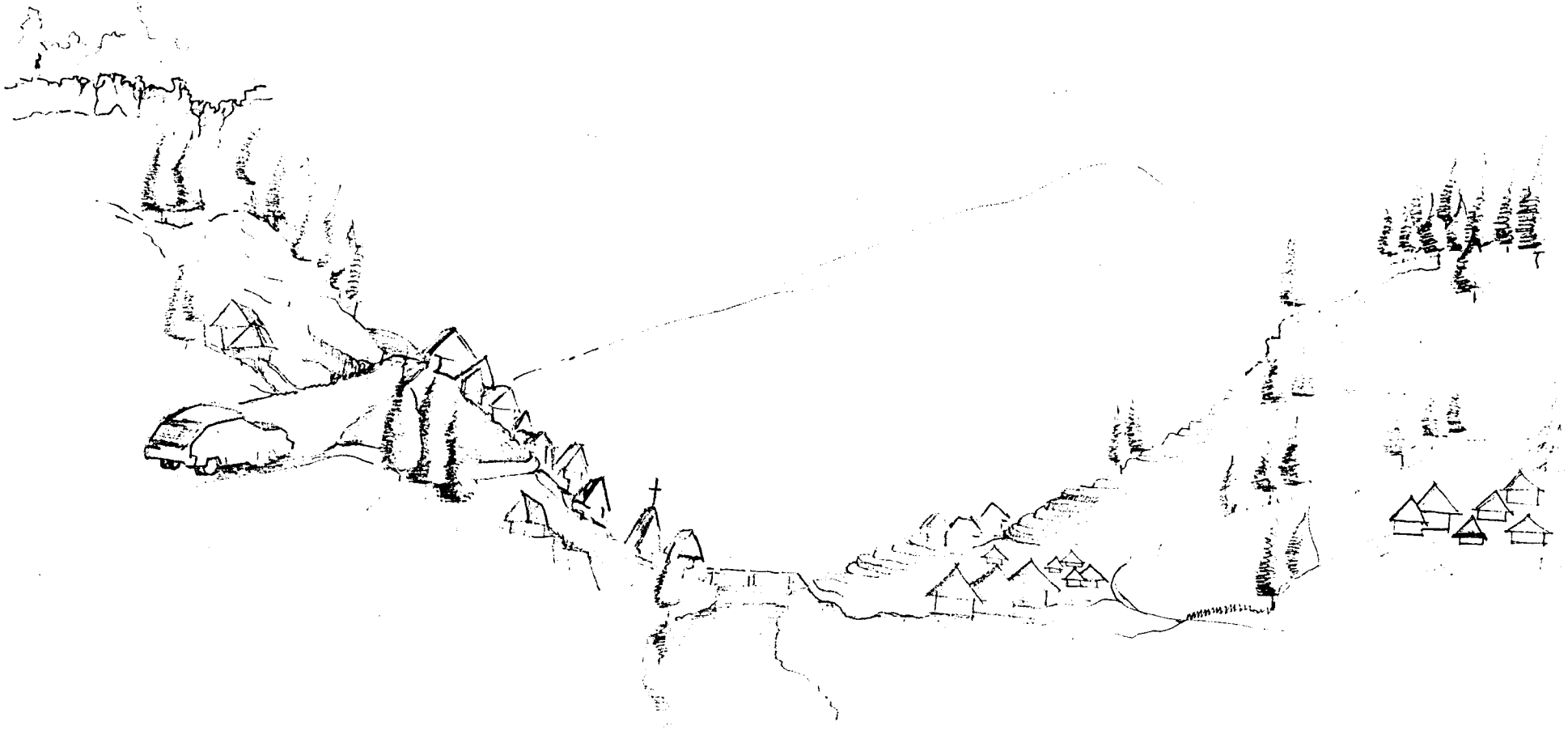
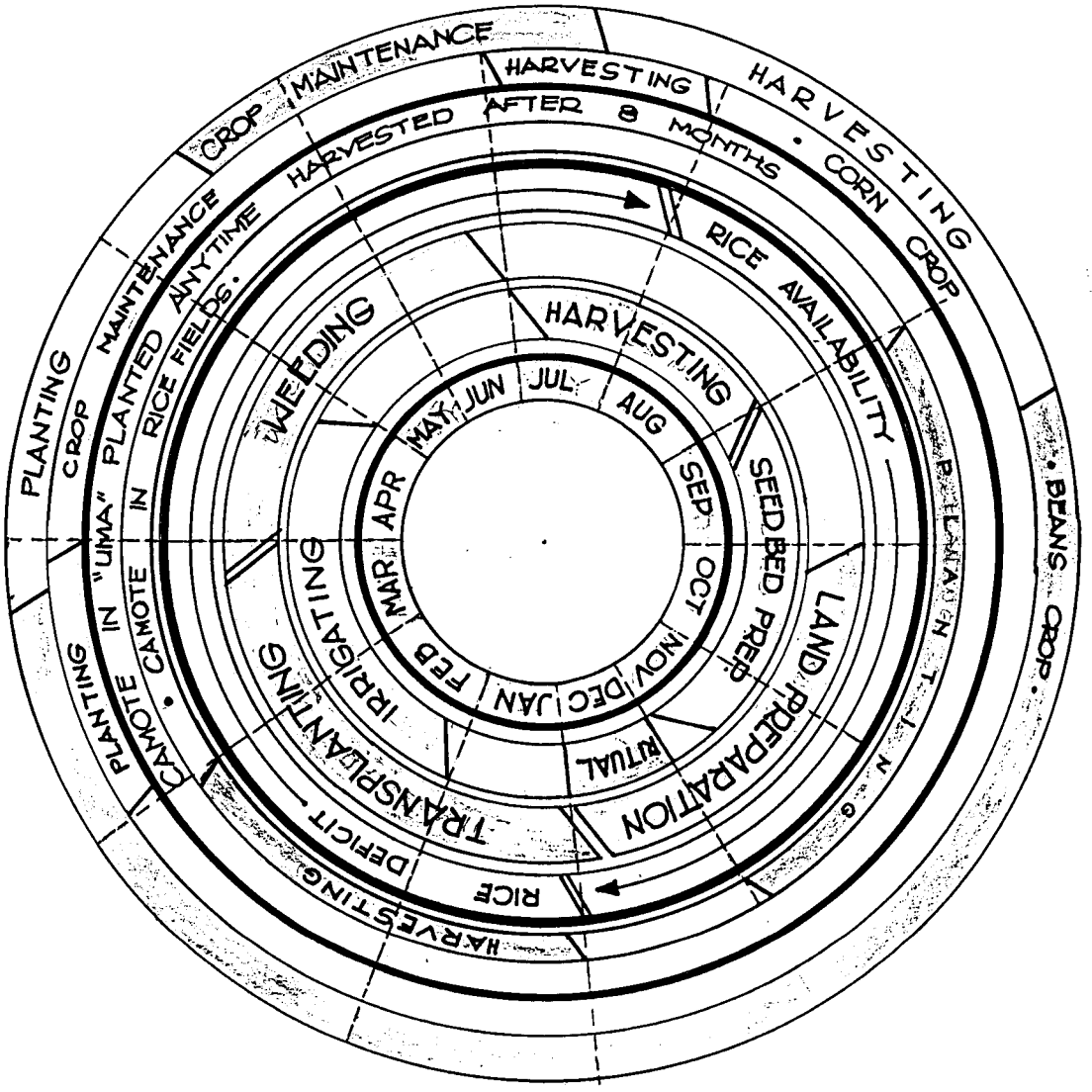
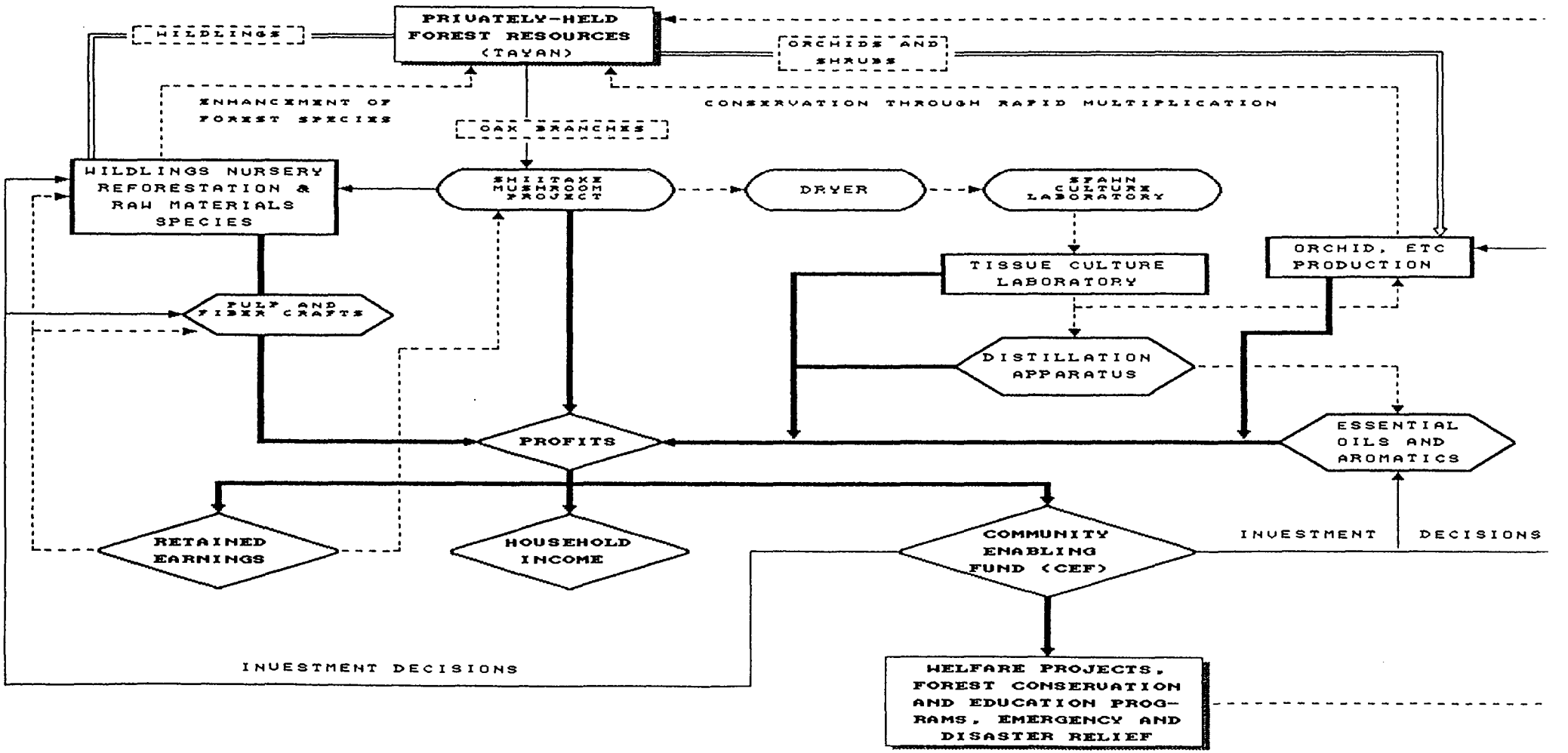


FIGURE 15



CROPPING CALENDAR
BARLIG CENTRAL

FIGURE 10: MODEL FOR NATURAL DIVERSIFICATION FROM A FOREST-BASED NUCLEUS ENTERPRISE



LEGEND:

- NUCLEUS ENTERPRISE
- FIRST SPIN OFF
- SECOND SPIN OFF
- PROFIT
- FLOW BACK OF BENEFITS
- PROFITS FLOW
- INVESTMENT DECISION