BALANCING BIODIVERSITY CONSERVATION AND INCOMES OF UPLAND COMMUNITIES: APPROACHES AND EXPERIENCES OF THE UPLAND DEVELOPMENT PROGRAMME IN SOUTHERN MINDANAO[1]

Ben-Hur R. Viloria[2], Dashiel P. Indelible[3], Wiebe van Rij[4], and Alexander U. Tabbada[5]

Key Words: *Diversified Farming Systems, dualistic cropping systems, agroforestry, soil and water conservation, Slope Treatment Oriented Practices, Farmers' Learning Site, Barangay Extension Worker, and Farmers' Training Group*

ABSTRACT

This paper presents the experiences of the European Union-assisted Upland Development Programme in Southern Mindanao (UDP) in balancing natural resource conservation and sustainable agriculture in the uplands by promoting diversified farming systems (DFS). DFS encourages the planting of forest and fruit trees together with short and medium term crops, integration of soil and water conservation measures and use of appropriate technologies that increase production without increasing the area cultivated. The system uses the Slope Treatment Oriented Practices (STOP) approach where crops, trees and contour hedgerow technologies are properly matched with slopes and soil conditions. It is supported by parallel UDP projects on resource management, marketing and enterprise development, rural financing, infrastructure and community and institutional development. Significant initial impacts of DFS and the parallel programmes include increase in tree and other vegetative covers, increase in farm productivity and income, increase in the adoption of organic farming technologies, and the passing of local ordinances promoting soil and water conservation and resolutions providing support to local extension systems. Sustainable and community-managed extension systems are being developed to bring the DFS to a wider reach and adoption. Moreover, efforts to assist local governments in mobilising Upland Barangay Associations and communities for forest protection and planting of more trees along roads and riverbanks and in spring sources are on-going.

I. INTRODUCTION

Southern Mindanao is made up of six provinces: Davao Oriental, Compostela Valley, Davao del Norte, Davao del Sur, Sarangani and South Cotabato. The area straddles the south-easternmost tip of the Philippine archipelago, occupying a quarter of the total land area of the island of Mindanao. Numerous and large chains of mountain ranges (including a portion of the Philippine's highest peak, Mt. Apo), extensive areas of rolling hills, plateau, large areas of swamps and lowlands characterise the topography of the region. About 2,229,472 hectares are classified as upland, areas having more than 18% slope and situated above 100 meters above sea level. They occupy 82% of Southern

[1] Paper presented during the 14th Annual Philippine Biodiversity Symposium of the Wildlife Conservation Society of the Philippines held on 05-09 April 2005 at Crown Lodge, Tuguegarao, Cagayan.
[2] Sustainable Agriculture Development Coordinator of the Upland Development Programme in Southern Mindanao (UDP)
[3] National Co-Director of UDP
[4] European Co-Director of UDP
[5] Team Leader of the UDP-ICRAF collaborative project on Enhancing the Upland Extension System in Southern Mindanao

Mindanao's total land area (UDP1997). The region benefits from a generally uniform tropical climate and is not greatly affected by tropical depressions or typhoons because of its southern location and the extensive mountain ranges found near the coastlines. However, large scale flooding has been more frequently experienced over recent years owing to increased deforestation within the upland area.

Due to its favorable location with well watered and fertile soils, Southern Mindanao has a very diverse and productive resource base. The lowland areas adjoining the coastlines and alluvial plains are important growing areas for agricultural crops and trees. The highlands within the fringing mountain ranges near Mt. Apo experience a semi-temperate climate and opened as growing sites for high value and specialty crops.

The animal resources are as diverse and productive. There are prime areas for pasture and livestock development. Small livestock also thrive well because of the primacy of corn, Southern Mindanao being the country's largest corn producer. Fish production from inland and coastal fisheries supplement the protein needs of the region's populace and is also considered to have export potential. All of these make Southern Mindanao a prime area for agribusiness industries.

The agriculture sector is a major contributor to Southern Mindanao's economy, employing 70% of the region's population, providing jobs for about one half of the total labor force and accounting for more than one fourth of the regional Gross Domestic Product, thus being a net contributor not only to the regional but also national trade balance (UDP 1997). Southern Mindanao is a net exporter of fruits, vegetables and also of fish to Manila especially during typhoon months. However, benefits of these agricultural gains have not been extended to upland farming communities. Increasing population pressure, reduction of cultivable land per farmer and limited rural livelihood opportunities have heightened the income disparity between rural upland communities and their lowland counterparts.

Within the Philippines all land with slopes 18% or above slopes is classified as Public Forest Land and has been under the nominal control of the Department of Environment and Natural Resources (DENR) since 1975. In the country as a whole, it has been estimated that Public Forest Land occupies 55% of the total land surface reflected in the study conducted by Sajise et.al. (cited by Watson, 1995). As of 2000, it was estimated that in Southern Mindanao alone, Public Forest land occupied 58% of the total land surface with a population of over one million. These inhabitants are primarily farming families conducting subsistence level of agriculture. It has been estimated that indigenous cultural communities constitute 70% of the population living in the uplands of Southern Mindanao in areas which traditionally have been their homelands.
Originally most of the public forest land in Southern Mindanao consisted of old growth dipterocarp forests and open grasslands. Until forty years ago the uplands were only populated by tribal communities carrying out a limited amount of *kaingin* (slash and burn agriculture) cultivating subsistence food crops and harvesting forest products for their own needs.

In the post World War II era, two major events occurred in the Philippines which were to change the prevailing land use pattern in the Mindanao uplands. Beginning in the late sixties, there was a major increase in the amount of logging, both legal and illegal, in Southern Mindanao. At that time, Mindanao was viewed by the rest of the Philippines as a frontier area with unlimited natural resources waiting to be exploited. As logging

activities increased, selective logging took place reducing primary forest to secondary. At the same time roads and trails were constructed further into the upland forest areas to assist logging activities. In very little time hardly any primary forest remained and that which did remain was not easily accessible to loggers or suffered from a peace and order problem (UDP1997).

Since World War II, the Philippine population has expanded rapidly as one of the highest population growth rates in Asia. By 2000, the population was estimated at 76.5 million and the birth rate is increasing by 2.36% per annum. The current population density of 255 persons per sq km is the highest in Asia except for Singapore (NSO, 2000). The population increase has led to an ever decreasing farm size and limited opportunities for off-farm rural employment. Most agricultural activity was undertaken in the lowlands where land is more easily cleared and developed for irrigated ricelands, rainfed corn and coconut production. As shortage of available land began to occur in the Visayas, landless farming families began to migrate to the less densely populated island of Mindanao and towards main urban areas, particularly to Metro Manila.

In time, as available land became scarce in the Southern Mindanao lowlands, landless farming families began to move into the uplands where rent-free land could be readily obtained. This push into the uplands was encouraged by large agri-business groups leasing fertile lowlands in Southern Mindanao to produce export commodities like banana and pineapple.

At first the upland migrants followed existing logging roads and farmed the more accessible as well as less steep land. As migrants were trying to escape poverty and engage in subsistence agriculture, the land cleared for farming was either grassland or degraded secondary forest. The aim of the settlers was to maximize their food production from their available labor and therefore the land needing the least labor for clearance was utilized. As more lowland migrants moved into the uplands the tribal communities tended to retreat further up the mountains into their ancestral domains in an attempt to maintain their culture and way of life.

Together, these two events of an expanding population seeking rent-free land, and logged over uplands providing areas accessible by roads and tracks, have changed the whole upland land use pattern. It has created an upland farming community whose first priority is to produce enough food to supply its subsistence needs. As the majority of the new settlers are from the Visayas, their traditional rainfed crop of corn predominates.

With the objective of producing food and obtaining maximum return on their available labour, as well as no security of land, upland farming families have traditionally resorted to the rotational agricultural land use utilizing the slash and burn system or *kaingin*.

The *kaingin* system consists of clearing and burning degraded secondary forest and planting annual crops until the soil becomes exhausted or the land becomes too weed infested to be easily cultivated. When this stage has been reached, the land is rested and allowed to return to secondary forest growth. The farming family then moves on to clear other land areas, which again are cultivated until the land becomes exhausted. Overtime, if the land is fallowed long enough, the soil becomes replenished and the family is able to return and farm the original piece of land it cleared.

With long rotational cycles of over 15 years very little environmental damage occurs and the amounts of soil loss are minimal. However, if over time the need for land increases and the length of rotational cycle is reduced, lower soil fertility results and poor regrowth during the fallow period occurs. Slow re-growth of secondary forest trees occurs and unproductive grasses such as *Imperata cylindrica* (cogon) begin to dominate. With greater population densities, fallow-rotating the field within permanent farm boundaries becomes the norm. As farm size decreases, permanent annual cropping evolves with, in many cases, extremely low comparative returns as a result. When more exhaustive *kaingin* farming is practiced, environmental damage occurs from uncontrollable burning from land being cleared, reduced tree cover and more exposed soil, resulting in higher soil losses.

The biggest constraint to the present upland farming system is the historical set of circumstances which have pre-determined the type of farming now being practiced. The type of farming family which has migrated into the uplands are those trying to escape the poverty in the lowlands. They are families who without enough land to provide for their subsistence needs, also came to the uplands looking for rent-free land. Their choice is either to migrate to the slums of the big cities of the Philippines or move into logged-over Public Forest land in the uplands. Most of the migrants have moved from overcrowded islands in the Visayas and have come to the Mindanao uplands looking for a better way of life.

Often overlooked is the fundamental point that a majority of the migrants to Mindanao have not come from areas in the Philippines where sustainable upland farming practices are being followed. Most of the migrants come from areas where annual rainfed cropping systems are practiced in terrain where soil erosion is not a problem.

The indigenous tribal communities of Southern Mindanao are in a similar condition of poverty to the migrants. Although most of them are farming within their traditional ancestral domains, development in the Philippines as a whole has tended to bypass them. Of those who have not migrated down into the lowlands looking for work, the remainder stays in the uplands as subsistence *kaingin* farmers supplementing their needs from harvesting forest products such as rattan and abaca. Traditionally the tribal groups looked upon land as common property of the tribe and when it became exhausted they could move on to new land. While the population numbers of both tribal and migrant communities remained low, the land had time to rejuvenate and little environmental damage was done.

A situation has now been reached where both migrant and tribal communities are barely living at a subsistence level of farming. They are mainly mono-cropping corn on land where the opportunity to leave it fallow is becoming less. Only a few permanent trees, mainly coconut and banana, have been planted around the homesteads. Legumes, mainly mungbean or cowpea, are grown in rotation but normally not enough to have any beneficial effect on the overall soil fertility.

Over time the cropping pattern is becoming more permanent with the continuous mono-cropping of corn. The result is declining levels of soil fertility as less time is given for resting the soil. The proliferation in land being cultivated with annual crops on ever increasingly steeper land is resulting to an increase in soil erosion (with 2-3 cms depth of soils loss each year) and water run-off. The effect of this has been the growing incidence of flash floods causing severe scouring and destruction of crops and

infrastructure in the lowland flood plains. This is of major economic concern. It also causes grave siltation, decreased water levels in rivers used for irrigation during drought, and drying-up of spring sources that communities depend upon for drinking water. Downstream effects include a deterioration of water quality through pollution. Nationally and in Southern Mindanao, this is having a destructive effect on the coral reefs and the country's fishing stocks as a whole.

The upland catchment areas of the watersheds in Southern Mindanao are now facing an ecological crisis. For the last forty years, the Public Forest Lands in the uplands have been considered a frontier territory and a safety valve for the poor and dispossessed. Now in one generation, the forests once considered inexhaustible have all but disappeared, to be replaced by a non-sustainable form of subsistence farming.

The institutional framework needed to overcome these major constraints in the uplands are either weak or not in place. While the Public Forest Lands remain the prerogative of the DENR, the *de facto* upland agricultural system remains outside the domain of the Department of Agriculture (DA) or its devolved staff in the Local Government Units (LGUs). Limited policing of the Public Forest Lands has meant that the uplands have become an open access resource (UDP1997).

While the uplands remain classified as Public Forest Land, the development efforts of the government have continued to tackle the problems of the lowland and the rapidly expanding urban areas. In the context of regional opportunity, upland farmers are one important group which is increasingly being left out. A huge income disparity is becoming evident between those who are well placed to take advantage of change, and those who are not.

Very few of the upland farming communities are in a position to take advantage of the change affecting other parts of Mindanao. With ever decreasing corn yields from lower levels of soil fertility, poverty stricken upland farming families are becoming more reliant on credit from traders. This credit is used to purchase agricultural inputs of seed and fertilizers and quite frequently to purchase rice for family consumption while waiting for the corn crop to mature. As farmers become more indebted to traders, their options for change become reduced. To pay off their loans, farming families need to plant and harvest quick short term annual crops. At the rates of interest charged by traders, subsistence farmers can not invest in long term maturing crops such as fruit trees, coffee and other suitable tree crops.

At present the most reliable crop to achieve the objectives of the upland farming families and the traders is corn. However this situation will not continue. Quantitative restrictions on corn imports have already been lifted and replaced by tariffs, as part of the Philippine commitment to the World Trade Organization. The move to a low tariff policy for corn is likely to result in a lower domestic price and will rapidly render marginal upland corn farmers uncompetitive. Unless changes can be made soon poverty in the uplands will increase. In the past, the uplands were the refuge for insurgents. Unless equity in growth and reduction in upland poverty is achieved, the unsettled peace and order situation could return.

II. APPROACHING THE PROBLEMS

If the upland problem is to be responded to, the first task to be tackled is helping upland farming communities to break out from their bondage of poverty caused by the practice of mono-cropping corn on land which is becoming even more depleted. However, the primary emphasis of the upland farming family is rightly placed on subsistence food crop production. Therefore the first aim must be to increase subsistence food crop production to a level where surpluses will result. This will allow the farming family to sell surplus crop to reduce the grip of the trader and create financial security.

While encouraging subsistence upland farmers to grow surplus grain on less land than before, the aim must also be to move the farm enterprise activities towards more profitable perennial crops. A gradual expansion in home gardens, confined livestock production and fruit and forest tree crops should be aimed for. As improvements in methods for greater sustainable food crop production per unit area are attempted, then land and labor will be released to pursue more cash generating activities.

The objectives should be to create a sustainable smallholder farming structure in the uplands which is highly diversified with a broad mixed farming system. Corn growing in steep tropical uplands is agriculturally unsound and in a few years will also be economically unwise. Instead, the goal should be to develop a farming system which resembles as closely as possible the original forest canopy. The planting of mixed fruit trees, quick growing leguminous tree species, medium term crops like coffee and banana where appropriate and valuable forest tree species is an important opportunity. Within mixed woodlots, rattan, black pepper and traditional medicinal plants can be planted. While the permanent tree crops are at a young stage of growth corn can be intercropped until the tree canopy closes provided soil depths are more than 60 cms. Where soil depths are less, farmers are urged to immediately shift to tree crops after current corn crops have been harvested. Wherever possible multi-storey cropping and agroforestry must be encouraged.

UDP's Objectives

The twin objectives are to achieve sustainable development in the upland areas of Mindanao with emphasis on preservation of the natural resources by strong community organisations and secondly to achieve higher incomes for the upland folks specifically those that make a living out of farming. These will be reflected in well-protected remaining forest pockets; in reforestation/ agro-forestry of fallow lying non-agricultural lands; in diversified farming on already farmed land, following an agreed barangay land use plan that delineates what areas are for agricultural development and what areas for protection and reforestation. Furthermore this is reflected in farmers applying appropriate soil and water conservation measures and in strong community organisations taking the lead in sustainable upland development.

UDP's Key Approach to Solve the Problems: Diversified Farming Systems (DFS)
Much of the uplands are dominated by very steep slopes and infertile, shallow, highly erosive soils unsuitable for the sustainable production of annual crops. There are also distinct climatic differences between the northern and southern parts of the project area.

Diversifying farming helps promote viable smallholder livelihoods in poorly endowed biophysical and socio-economic environments. However, it also requires recognition that the land itself imposes limitations on what is ecologically sustainable.

In the year 2002, UDP started developing a model farm for integrated farming systems in each of the municipalities covered. The model farms influenced neighbouring farms and in 2003, UDP's Sustainable Agriculture Development Component embarked on its Diversified Farming Systems (DFS) program emphasizing the balance between productivity and profitability on the one hand, and biodiversity and environmental protection on the other hand.

The **Slope Treatment Oriented Practices** (STOP, or STOP Erosion) approach was introduced in October 2003 by K.R.S. Proud, the Tree Crops Consultant of UDP, as a basic technology for DFS. Proud concluded that an effective model for sustaining the upland resource base would be to confine arable crop production to the less steep slopes, and grow perennial crops separately. In addition, he identified the need for a menu of models to cover a wide range of combinations of slopes and soils occurring in the uplands. In other words, farm planning requires identifying site-specific slope management practices. This supports the view of Garrity *et al* (cited by Cramb 2000) that the experience of the past 15 years (in the Philippines) with alley cropping and contour hedges suggests that appropriate solutions must be uniquely tailored to diverse soil and environmental conditions, farm sizes and labour availability.

STOP has been developed to assist extension workers identify appropriate site-specific solutions that take into account the wide range of soil and environmental conditions, farm sizes and farmer objectives. With STOP, crops, trees and contour hedgerow technologies are properly matched with slopes and soil conditions. For example SALT Hedgerows are restricted to short lengths of slopes below 25% where the volumes and velocities of run-off are low.

The following strategies were used by the Programme to encourage the adoption of the Diversified Farming System:

1. Lessen dependence on a single crop by encouraging a mixture of short-term, medium-term and long-term crops.

2. Move towards dualistic cropping systems where the area under perennial crops is increased, while the area under annual crops is reduced. UDP recognizes that self-sufficiency in food is a more important consideration to many upland farmers than the higher income provided by cash crops. Farmers are encouraged to produce sufficient food to feed their households until such time as tree crops produced regular and reliable incomes sufficient to purchase household staples.

3. Switch from crops with weak market prospects to ones for which the demand is likely to increase.

4. Encourage the production of crops that have an assured local market, but discourage high-input of labor low-output cash crops, such as cassava and corn, which also cause severe erosion.

5. Encourage crops that can be processed by local industries (bananas, mangoes), excluding corn, which gives a low ROI and cassava, which hastens soil erosion.

6. Include small animal production units in the farm that includes goats, chickens, and even fish.

By increasing the profitability of farming and by reducing the areas of land required to meet the demand for staple crops, both the need for and the possibility of diversification of agricultural production can be increased.

A simple way of increasing farm income is to grow crops that produce a high value per unit area. Table 1 shows the areas needed to generate one month's income (N.b. *not* monthly incomes) for a range of crops. Cassava and corn produce low incomes from large areas, while fruit trees and vegetables generate high incomes from small areas.

The advantages of diversifying into medium- and long-term crops are obvious. A combination of one unit of lanzones, four units each of bananas, mango and durian, with 6 units of pineapple, and a vegetable patch of one unit each of egg plant and okra, earn the farmer PhP 100,000 (the equivalent of 21 months' income that can be achieved even within one year) compared to PhP 4,800 (one month's income per year) from the same area of 8,300 sq m if he grows cassava. (N.b. the income from mangoes is reduced by 60-70% if a contractor's services are used for spraying, bagging, harvesting etc. Nonetheless, with the right mix of crops, and optimum spacing of plants, an annual income of PhP 100,000/ha/yr is realistic.)

Table 1. Crop yields vs prices and areas needed to generate one month's income of PhP 4,800 (production costs not included).

Crop (year of data)	**Ave. Yield Mt/ha/yr**	**Farmgate price (PhP/ kg)**	**Av. Yield (kg/10m^2/yr)**	**Income (PhP/10m^2)**	**Area of UNIT needed to earn one month's income of PhP 4,800 (sq m)**
Cassava (2000) [1]	6.42 *	3.55	1.93 (dry roots)	5.78 (SMC price)	8,307
Cotton (2003) [2]	0.9	19	0.9	17.1	2,807
Corn (2004) [2]	4.0 (from 2 harvests)	7.0	4.0	28.0	1,710
Lanzones (2003) [1]	3.04	20.53	3.04	62.41	769

Eggplant (2000) [1]	8.31	8.34	8.31	69.31	693
Papaya (2003) [1]	14.67	5.85	14.67	85.82	559
Okra (2003) [1]	9.00	9.58	9	86.22	557
Banana (2003) [1]	13.1	6.70 (lakatan)	13.1	87.77	547
Mango (2003) [1]	6.42	18.55 (carabao)	6.42	120.02	400
Durian (2003) [1]	3.45	42.65	3.45	147.14	326
Pineapple (2003) [1]	35.61	6.73 (Hawaiian)	35.61	239.66	200

[1] Source of Data: Bureau of Agricultural Statistics (BAS), DTI-BETP Online Database, FAO Stat Online Database
[2] UDP field observations
* Average yield for Camarines Sur, fifth highest yielding province

Okra, eggplants and bananas can become monthly income generators. Adding goats, pigs, and Tilapias for backyard fish ponds, etc. will give the farmer extra income. The wider the range of production units, the less the impact on the household's income should there be a drop in the price of several of the products.

Farmers with only very steep slopes to cultivate are being encouraged to switch from corn to bananas and fruit trees. Widespread and continuous cultivation of corn and cassava on steep slopes is reducing soil depths by 2-4 cm per year. If this continues, there is a danger that there may be insufficient soil left to support any crop.

Diversification of crops is easier for farmers whose land includes minor valleys, where irrigated vegetable production is feasible, and gently sloping hilltops and ridges, which can be terraced. Unfortunately, the destruction of forests is reducing the potential for irrigated vegetable production annually as streams and springs dry up. Farmers who only have access to steep slopes are encouraged to adopt multi-storey tree crop production, in which a range of trees of various heights is planted to cover the slopes. Nonetheless, where slopes are too steep or soils too shallow, it is in the public interest that attempt to exploit these be curtailed.

UDP's Key Development Models

By the end of 2004, and as a result of several tests and trials during the past six years, UDP has come up with key upland development models that are deemed vital and highly recommended to achieve the goals of setting up a the diversified farming system within the farms and an sustainable development within upland communities. Complementary to each other, each of these models addresses particular concerns in the uplands. All the models share common features that:

1. provides methodologies for a sustainable management of natural resource and agriculture

2. emphasize an LGU-led and Community-based approach

3. highlights Institutions and Community capacity building inputs

4. considers Impact on the upland farming household's income

The models are presented accordingly:

In respect to sustaining the natural resource base in the uplands

1. A **Barangay Development Plan (BDP) cum Land Use Plan (LUP) Model** that hass been formulated through a participatory manner. The BDP and Land Use Plans are internalized and formally adopted by all stakeholders, especially the upland farming community and is the basis for UDP's support for upland development in the concerned barangay. It shows which areas are agreed upon for agricultural use, for forest protection and for other uses like settlements. The participatory way the land use planning is done should maximize the chance that stakeholders will stick to the agreed landuse and hence further destruction of the upland resource base may be prevented. This model is supported by a Geographical Information System (GIS) and Management Information System (MIS) for planning, monitoring and evaluation purposes.

   Salient Features of the Barangay Development Plan/ Land Use Plan
   - ?? Delineation of Agricultural use and Forest protection and other uses.
   - ?? Participatory planning process.
   - ?? With GIS and Management Information System (MIS) (surveys and mapping).
   - ?? Incorporated in the BDP.
   - ?? Land use incorporated in the sectoral BDP.
   - ?? Adoption of MLGUs of Barangay land use as a basic for sound development planning.

   UDP's Accomplishments So Far
   - ?? 72 BDPs formulated.
   - ?? Php 157,268,340.0 invested by LGUs.
   - ?? Installation and application GIS/GPS, MIS-BDP in 15 Municipal LGUs.
   - ?? Capacitated 33 Municipal LGUs in facilitating Barangay LUP and production of land use maps through GPS/GIS application.

   Lessons
   - ?? Barangay LUP provides the basic physical framework within the agreed and appropriate land uses.
   - ?? Barangay LUP integration in the BDP enhances local governance and assures investments for management of natural resource and agriculture.
   - ?? LGUs capacity on GIS/GPS is limited and needs further enhancement

2. Barangay Forest Protection and Management Model

This model was conceptualized and tested with success to address the destruction of the remaining forests in the uplands caused by the expansion of inappropriate farming and similar unsound practices in steep slopes. It aims to empower and assign responsibilities to the BLGUs and the communities in managing the natural resources within their barangays. Its guidelines are based on the devolved functions of the DENR to the LGUs on forest management.

This approach specifically works to mobilize the BLGUs and the community-based organizations in protecting and managing the remaining forests in the uplands. A key objective of this scheme is to empower the upland community in addressing their own, direct concerns and interests as well as to partner with their LGUs on equal footing.

The mechanics for the implementation of the model include the identification, delineation and declaration of a site as protected zone and the formation of a barangay forest protection and management team together with the deputization of representatives from the BLGUs and communities as barangay forest protection officers. Intensive and continuous awareness campaigns in the barangay and municipality as a whole are also seen as crucial in sustaining the forest protection drive. This scheme will result in preserved forests, improved water sources and river systems in the uplands and the increased commitment and enhanced capacity of the BLGUs.

Salient Features of the Barangay Development Plan cum Land Use Plan

- Barangay LGU and community-led
- Small-scale, site-specific and locally customized forest management plans
- Less cost and greater benefits
- Manageable and can be easily monitored and replicated to other sites
- MOA among the BLGU, MLGU, DENR, NCIP and local communities.

UDP's Accomplishments So Far

- Adopted by 24 Municipal LGUs
- Improved Barangay and municipal governance on forest protection
- 4 municipal level and 1 provincial co-management agreements signed involving 20 Barangays
- 3,732 has. of forestlands reforested
- Seedlings availability produced by 12 municipal and 48 Barangay nurseries

Lessons

- Encourages and empowers the BLGU and the communities for effective forest protection
- Bottom-up approach" creates strong partnership of the communities with LGUs and DENR and other Agencies in undertaking more improved forest protection and management.
- Roles of LGUs in forest protection heightened

3. **The Agriculture Extension Model.** This model consists of two sub-models:

   The ***Community Based Extension Network-*** It has the Municipal Agricultural Office (MAO) with its Agricultural Technicians (AT's), the barangay appointed Barangay Extension Worker (BEW) and at the end the Farmer Trainer Group with at least one member in each sitio. Then there is the Upland Barangay Association (UBA), a community based organization of farmers, which oversees a learning site for transfer of technologies, information dissemination and field days.

   The other network is the **Formal Agriculture Extension Network** into which the needs in terms of training and research from the community-based network are uploaded for assistance that cannot be addressed from within. This one, also starts with the MAO then goes up to the Provincial Agricultural Office (PAO) with its Subject Matter Specialists and ultimately, when relevant, it reaches the DA Regional Field Unit (RFU) and its affiliate institutions like of course the Agricultural Training Institutes (ATI's) for training and DA accredited institutions and related academe for addressing research needs from the community-based network.

   Clearly both systems are supposed to support each other with the MAO as the crucial link. This agricultural extension model would result in short and long term increased farm productivity through proper land care with an emphasis on tree planting, contour farming, hedgerow and natural vegetative strip applications and terracing, through diversified farming systems (DFS) that would prevent further encroachment into forest lands.

   This model implementation would need to be supported by the DA and the DENR and would require policy changes at the national level

Salient Features of the Community Based Extension Network

- Barangay-based extension networks: Agriculture Technician - Barangay Extension Worker – Farmer Training Group and Model Farmers
- Model farmers and networking schemes promote the Diversified Farming System
- Linking Barangay-based extension network to the Formal/ institutionalized network of LGU offices and line agencies (such as DA, ATI, etc.)

UDP's Accomplishments So Far

- 129 barangays with established extension networks (AT-BEW-FTG-model farmers)
- LGU led upland extension delivery system institutionalized by 30 Municipal LGUs
- 8,268 farming households practicing DFS at various levels
- Revitalized provincial and regional extension networks with the DA-Regional Field Units- Agricutlure Training Institute –Provincial Agriculturists –Municipal LGUs and State Universities and Colleges in Regions 11 and 12

Lessons

- Emphasized the balance in assistance provided for both upland and lowland development.
- Barangay-based extension network has mobilized the local resources (human, financial, etc.) of the BLGUs and communities for upland development

- ?? Barangay-based extension network have effectively facilitated fast dissemination and adoption of technologies
- ?? The scheme has uploaded the demands of the communities to the LGUs and concerned agencies
- ?? The Barangay-based scheme enables the existing formal extension system (LGUs and line agencies) to bring down (download) its services and resources to the barangay level.
- ?? Extension should not be confined to production technology only but encompasses institutional building, NRM and enterprise dev.

In respect to increasing farmers incomes

4. Labour-Based Routine Barangay Road Maintenance Model

The scheme for the model was developed in light of UDP's recognition of the benefits of well-maintained roads to the agricultural production and economic activities of the community. With budgetary constraints experienced by MLGUs, the maintenance of barangay roads is given low priority. Hence, there is a need for the participation and support among members of the community.

The primary objectives of this scheme are to institutionalize routine road maintenance of barangay roads by the members of the community and to provide them with the necessary skills to undertake the operational procedures for labor-based road maintenance. Also so here a key objective of this scheme is to empower the upland community in addressing their own, direct concerns and interests as well as to partner with their LGUs on equal footing.

Tripartite arrangements among the MLGUs, BLGUs and community-based organizations, such as the UBAs and cooperatives shall be formulated and implemented. These will include the formation of regular road maintenance work teams and training activities for these teams.

The communities will benefit from the resulting mobility to and from their barangays through these all-weather roads, increased agricultural production, improved access to economic opportunities and the increased commitment and capability of the MLGUs, BLGUs and community-based organizations.

Salient Features of the Labor Based Routine Barangay Road Maintenance Model

- ?? Barangay-managed and community-participated
- ?? Low cost
- ?? Support infrastructure facility to improve agricultural productivity
- ?? Supervised by Municipal and Provincial LGUs
- ?? Incentive-based for local income generation
- ?? Based on Batasang Pambansa No. 132 on labor-based road construction and maintenance technology

UDP's Accomplishments So Far

- ?? LGUs have maximized the use of allocated resources
- ?? 14 Barangay LGUs have implemented and have maintained 50 kms. Barangay roads

.

Lessons

- ?? Awareness of BLGU capability to carryout routine road maintenance is limited.
- ?? Awareness of the concept of road maintenance instead of periodic / emergency maintenance.

5. **The Rural Financial Services Model**. This model is implemented by Government Financial Institutions (GFI's) i.e. The Land Bank of the Philippines (LBP) and the Peoples Credit and Finance Corporation (PCFC). Both GFI's have similar programmes in terms of institution building and wholesaling of credit funds to their clients which are existing and potential cooperatives (UDP established Rural Financial Services Centers (FSCs) and Micro Finance Institutions (MFI's) respectively that are operating in the UDP upland areas.

Salient Features of the Rural Financial Services Model

- ?? Credit access support for enterprise development
- ?? Savings-based credit
- ?? Village level financial intermediaries
- ?? Credit facility for micro finance and commercial scale.

UDP's Accomplishments So Far

- ?? Business enterprises increased through micro finance 2,500 clients availed 10Million pesos.
- ?? Loan funds availability administered by the LBP 30Million pesos for Cooperatives member borrowers

Lessons

- ?? Viability of financial services in the uplands is anchored on viable and diversified farming and enterprise development activities.
- ?? Upland communities, therefore, needs a specially-designed financial services system to suit their capabilities and distinct situations.

6. **The non-farm upland Village Enterprise Development Model.** This model concerns business development services (BDS) support to promising community based enterprises in the uplands through helping these with preparing bankable business plans, entrepreneurship training and coaching, market strategizing and establishing market contracts and with getting financial services

Salient Features of the Village Enterprise Development Model

- ?? Community-managed small-scale farm enterprises
- ?? Market-led agri-based enterprise
- ?? Entrepreneurial oriented

UDP's Accomplishment So Far

- ?? Marketing agreement with local banana processors, traders, exporters and multi-national companies
- ?? 6 producers groups supported by financial intermediaries
- ?? 1,513 upland farmers developed entrepreneurial skills

Lessons

- ?? Sound enterprise plans can led to market access.
- ?? Developing entrepreneurial skills needs consistency and continuity of technical assistance.
- ?? Appropriate infra support = viable upland enterprise.

The concrete benefits from the application of these models are the increased on-farm and off-farm production and income for upland farmers and more revenues to the LGUs, minimized land degradation and the promotion of civic-mindedness among stakeholders involved.

III. INITIAL RESULTS AND IMPACTS

After six years of programme implementation, the Programme has been instrumental in enabling the upland communities to develop more appropriate and diversified farming systems. The DFS adopters are more aware now of conserving their soils, maintaining its fertility and are starting to see an increase in income without expanding and opening up forest lands thus preserving the natural resource base and biodiversity.

By supporting DFS, the community based and LGU extension network has demonstrated that a replicable upland farming system can be produced which is diversified, sustainable and environmentally sound.

As of this date, the DFS project that has already accomplished the following:

1. Promoted viable smallholder livelihoods by diversifying short, medium and long term crops as well as animal production in existing small farms.

2. Introduced the STOP as integral part of the farm planning activity which matches crops to slopes and soils and has also emphasized the need for establishing soil and water conservation (SWC) measures. With STOP, a site-specific farming system has been established that takes into account the distinct soil and environmental conditions and sizes of the individual farms.

3. Promoted change from low income, labor-costing crops that cause massive soil losses to ecologically friendly and high value fruits and vegetable production.

4. Established a network of model farmers who are now promoting the adoption of technologies such as the DFS and STOP. The DFS is supported and promoted by community-based Farmers' Learning Sites (FLSs), Farmers' Training Groups (FTGS) with Barangay Extension Workers (BEWs) at the helm. The FLSs and FTGs were developed through the collaboration of UDP and the World Agroforestry Centre (ICRAF) under the project "Enhancing the Upland Extension System in Southern Mindanao".

5. Linked barangay-based agriculture extension network to the formal/ institutionalized network of LGUs and line agencies (such as DA-ATI, etc.)

Specifically, the following gains after the first six years of project implementation were documented:

1. 8,268 farming households (covering about 7,528 hectares) have adopted DFS with appropriate soil and water conservation measures albeit at various levels of development.

2. 189 key farmers and Barangay Extension Workers trained in Korean Natural Farming now extending the technology to neighboring farms. The same farmers are engaged in organically producing vegetables and rice together with backyard piggery and poultry production.

3. Through 31 community-based Farmers' Training Groups and Farmers' Learning Sites DFS technologies to other farmers from other barangays and provinces have been disseminated.

4. 129 barangays with established agricultural extension networks are promoting DFS.

5. BLGUs have started passing and enforcing local laws on soil and water conservation, forest protection and other environment-related concerns.

6. 36 MLGUs are adopting the agriculture extension system with DFS as their main strategy.

7. Provincial and regional extension networks with DA-RFU, ATI, PLGUs, MLGUs and State Universities and Colleges in Southern Mindanao have been established to address the needs of the community based extension workers.

On Resource Management

UDP's support for Resource Management continued through the rehabilitation and protection of watershed areas. Watershed management schemes were implemented while capacities for sustainable upland development of the local government staff and communities were further strengthened. Protection and rehabilitation of degraded watershed areas involve various soil and water conservation projects namely: agro-forestry, reforestation, and riverbank protection.

Training activities on community-based land use planning were held for MLGUs through the assistance of UDP-contracted service providers. Several workshops were likewise conducted on SWC and GIS operations as well as study tours and visits to successful community-based watershed management programs. Overall, 136 BEWs and 136 ATs participated in various training activities.

Some 305 communities were touched base through a comprehensive environmental awareness campaign promoting SWC and watershed protection and management. To date, a total of 111 barangays were surveyed spanning 40,551hectares. Boundaries were surveyed for use in the management of the watershed areas and processing of land tenure instruments. By the end of 2004, 51 land tenure instruments were awarded covering 48,316 hectares while others are on process.

IV. INITIAL LESSONS LEARNED

Some initial lessons can be gleaned from the early experiences of UDP. These lessons indicate the significance of local institutions and community-based initiatives in promoting appropriate upland technologies and in sustaining gains, innovations and programs. The following are some of the lessons learned:

1. Increasing profitability and planting more trees on farms and on the landscape in the uplands minimized encroachment to forestlands.

2. Introducing STOP/SWC measures in existing farms minimized soil erosion.

3. Adoption of DFS is a move towards dualistic cropping systems where the area planted with perennial crops (tree crops) is increased, while the area planted with short term crop is reduced. This will gradually restore the vegetation of the lands in the upland barangays.

4. More research and extension undertakings still need to be done in developing more appropriate upland farming technologies that would consciously address both income generation and resource management.

5. Creating the barangay-based extension network has mobilized the local resources (human, financial, etc.) of the BLGUs and communities for upland development.

6. Localized extension activities in the barangays have effectively facilitated deeper understanding/appreciation and fast adoption and dissemination of agricultural technologies among the upland farmers.

7. The barangay-based schemes enable the existing formal extension system to download its services and resources to the barangay level.

V. CURRENT NEEDS AND PROSPECTS

The results of agronomic research on water and nutrient management need disseminating in the uplands. More attention is needed regarding pest and disease ecology particularly on crop combinations that minimize disease infestations. Machines need to be developed to handle mixed cropping systems, particularly as zero-tillage or no-till systems become essential on soils with depths severely truncated by soil erosion. The introduction of appropriate mechanization options into diversified farming systems will increase land and labor productivity to higher levels than currently achieved. Enhancing labor productivity requires special attention.

Farmers' Learning Sites need additional support to ensure the development and adaptation of technology options appropriate to the range of production systems in the uplands. The following programs' would benefit from government support:

- Farmers' field schools for
  - integrated nutrient and soil fertility management;
  - integrated pest, disease and weed management;
- Small-scale supplementary irrigation at specific places.
- Introduction of crops adapted to the bio-physical conditions in the uplands;

- ?? Introduction of alternative mechanized farm operations for smallholders to enhance labor productivity (e.g. improved harnesses for draught animals and hand tractors);
- ?? An information and communications technology program.

The eventual substitution of corn-based mixed cropping to perennial crops and agroforestry systems has some prospects, particularly in sloping lands where cultivation of short term crops is discouraged to reduce or prevent soil erosion. The following prospects are worth considering:

a) **Permanent upland cultivation**

Permanent upland cultivation in the humid tropics is generally considered by farming systems analysts to require substantial inputs of mineral fertilizers and herbicides to be economically viable (Ruthenberg,1983). The few economically viable examples of permanent upland farming in the humid tropics are to be found on very fertile alluvial or volcanic soils. For weathered, nutrient poor soils it is not enough to increase the level of organic matter. In such areas an integral approach is preferred that combines the application of chemical fertilizer with an increase in organic matter.

The allocation of land for cropping in the upland subsistence farms can be seen to take two slightly different forms: mixed cropping and dualistic cropping. One involves several short- and medium-term crops that cover the land most of the year, sometimes intercropped with trees. In the other system, the perennial crops are grown separately from arable plots as supplementary activities.
Mixed cropping, with stands of trees and shrubs of varying ages that have not been planted in rows, is an obstacle to applying yield-increasing interventions such as mineral fertilizers and pesticides for plant protection. In addition, mixed cropping and heavy intercropping of young plantations of perennial crops reduce the total yield of perennial crops, but bring about early returns.

As the soil degrades further, perennial crops are planted among the arable crops and eventually orchards replace cultivation. Unfortunately, the inappropriate cultivation of maize and root crops involving plowing on extremely steep slopes without adequate soil conservation measures has caused high rates of soil erosion and subsequent degradation. This encourages cogon-infestation that, in turn, makes tree establishment very difficult.

In dualistic cropping systems the perennial crops are grown separately from arable plots as supplementary activities. Husbandry techniques, such as flower- and fruit-induction and bagging, are often carried out by seasonal, paid labor. Cash cropping increases by reducing the land available for meeting food requirements. As soil fertility declines, maize is replaced by root crops. Eventually, the holding has two distinct (dualistic) operations: arable farming carried out in the traditional way by the family, often with declining yields; and plantations of perennial crops managed as a special undertaking with new husbandry and economic standards being applied.

In the UDP-covered uplands, the terrain is extremely rugged, dominated by land above 45% slope, cash cropping opportunities are few, and access to attractive markets is difficult. As a result, some farmers seem reluctant to reduce the area under arable

cultivation, though other factors may be involved. This suggests identifying the factors that favoured the shift and conversion to tree cropping in areas like Davao del Norte.

b) **Improving crop husbandry is the key**

Although upland farmers seem to have chosen the optimum crops and crop mixtures for their land, their husbandry is largely ineffective because they are often unwilling to cut down old trees, and seem unaware of the increases in production to be gained from weeding, fertilizing, mulching and pruning their trees.

If the Programme can get upland farmers to take better care of their crops, they will get higher returns from their land, labor and capital. A small but properly cultivated field of arable crops can yield higher returns per hour of work than larger, neglected fields. With less effort per unit of output, use of high-yielding varieties of arable crops, and combining organic and inorganic fertilizers, but with better management, more money can be earned.

If the required quantity of subsistence food crops can produce more economically on a fraction of the original land, the remaining land becomes available for growing a surplus for sale, or for perennial crops, woodlots, grazing, etc.

Poorly managed groves of fruit trees could indicate that there is neither the incentive nor the land pressure to get the upland farmers to practice proper husbandry. Farmers say there is no land shortage problem, but it is quite evident that in the extensive areas of steep sloping terrain there are only very small areas with the gentle slopes suitable for arable agriculture.

c) **Development pathways of farming systems with perennial crops**

With an effective extension services delivery system, interventions that can increase output per hectare of perennial, as opposed to extending the area under cultivation, include:

- The use of improved planting material, selected to give high yields of good quality produce, but possessing good secondary characteristics.
- Cheap and practicable methods of propagating the improved planting material.
- Efficient transplanting and early care of young trees, to obtain a full stand of plants that grow vigorously and reach the productive stage as quickly as possible.
- Good horticultural practices, in respect of such matters as spacing, shade management, windbreaks, pruning, etc.
- Better soil management, including soil conservation, cover crops, weed control, mulching, and manure application, that maintain soil fertility and sustain high yields.
- Control of pests and diseases.
- Improved methods for the exploitation of the crop, such as the use of synthetic growth substances to induce flowering and fruiting (e.g. in mangoes and pineapples).
- Use of appropriate herbicides properly can greatly reduce labor costs and improve bush and weed control.

d) **Developing networks of community institutions**

The establishment of municipal and provincial networks of community institutions such as the UBAs and FTGs need to be encouraged and supported. Such networks can enhance the exchange of strategies, information, germplasm and resources (Tabbada *et al* 2004).

VI. CONCLUSION

UDP is soon to end its seven-year existence. The initial accomplishments and observations of the Programme suggest some conclusions that can be drawn, as follows:

1. Upland farmers are beginning to appreciate better alternatives to the traditional mono-cropping systems by adopting a diversified farming system (DFS) which integrates not only additional crops and livestock but also soil and water conservation measures to address degradation problems. The introduced SWC technologies like contoured natural vegetative/grass strips and leguminous hedgerows are now being used at a wider scale. Crops are planted within the contour strips together with fruit trees while steeper areas are left planted to forest trees.

2. The use of a micro/farmer level land use system through the Slope Treatment Oriented Practices (STOP) is now a standard approach towards the practice of DFS. This is an improvement of the farm planning method wherein farmers and agriculture extensionists discuss and prescribe appropriate solutions based on the area's topography (steepness of land), soil characteristics, water availability and crop suitability.

3. The practice of the DFS has also led to more profitable farming as experienced by upland communities producing marketable volumes of bananas, pineapple, mangoes, durian, and other fruits alongside traditional crops like corn, peanuts and vegetables. This is because nutrient recycling and crop complementation are practiced. Also, farmers are now aware and some are practicing new organic farming technologies.

4. The protection and proper management of existing forests, plus the planting of diverse species of trees and other crops, promotion of environment-friendly technologies, and enhancing the dispersal of livestock in the uplands are contributing to biodiversity conservation and protection.

5. To promote and sustain improvements in the upland lifescape and landscape, the agricultural extension system run by the Municipal Agriculturist and his team of Agricultural Technicians is being reinforced by a community level extension system composed of the Barangay Extension Worker and a Farmers' Training Group. The system also utilizes the DFS model farms as Farmers' Learning Sites and serve as venues for farmer cross visits, farmer field schools, and technology verification/testing and demonstration activities.

6. Upland development initiatives and interventions need to be supported with local laws and mainstreamed into the permanent systems – the Local Government Units, for sustainability.

The premise underlying for all these interventions is that much of the uplands of Southern Mindanao has already been converted for agricultural use and seemingly it is already irreversible. Although it is important to preserve and enrich the existing forestland, this strategy alone will not solve the problems of environmental damage-increasing soil erosion, flash floods and decreasing water levels to name a few.

It is too late to try to move the more than one million people living in the uplands of Southern Mindanao on to other land. The migrants cannot return to their original islands and the tribal communities cannot be expected to leave their ancestral land.

The solution to the environmental problems in the uplands in Southern Mindanao can only be tackled by changing the inappropriate agricultural system being practiced to a more efficient, sustainable and diverse system while trying to preserve whatever remaining forest pockets (considering that these are essential not only for biodiversity purposes but as the major source of the life giving water resource). At the individual farm level, fundamental to this change is the conversion of the annual corn based mono-cropping system to an appropriate, permanent and more diverse cropping system, through which it can contribute to the arrest of the degradation of the upland environment even on a micro-scale level. On a wider scale, with upland communities working collectively, they could ensure biodiversity conservation and at the same time improvement in their incomes through the adoption of a diversified farming system. Only by balancing resource management and income generation concerns would this renewable resource base of the uplands be ensured for the benefit of future generations.

LITERATURE CITED

Bureau of Agricultural Statistics (BAS), *DTI-BETP Online Database*, FAOStat Online Database

Cramb, R.A. (ed.). 2000. *Soil Conservation Technologies for Smallholder Farming Systems in the Philippine Uplands: a Socioeconomic Evaluation*. Australian Centre for International Agricultural Research, Canberra. p 18.

National Statistics Office, 2005. *2000 Census on Population and Housing (Final Counts).* Manila.

Ruthenberg, H. 1983. *Farming Systems in the Tropics.* Third Edition. Oxford University Press. 424 pp.

Tabbada, A.U., D.P. Indelible, W.V. Rij, D.Q. Tabbada, B.H. R. Viloria. 2004. Developing and webbing local extension capacities for improved upland farming: Experiences in Southern Mindanao. Paper presented during the 1st National Agriculture and Fishery, Forestry and Natural Resources Extension Symposium, 02-03 December 2004, Oasis Hotel, Splash Mountain Resort, Los Banos, Laguna. 16 pp.

Watson, H. 1995. *The Development of Sloping Land Technology (SALT) in the Philippines.* Food and Fertilizer Technology Center

UDP. 1997. Project Preparation Team, *Programme for Sustainable Agriculture and Community Based Resource Management in the Uplands.* Volume 3. Upland Development Programme in Southern Mindanao. June 1997

UDP. 2004. *The Reduction in Soil Depths of Upland Soils in Southern Mindanao, their Causes and Consequences*. Report by K.R.S. Proud, Soil and Water Conservation Consultant, Upland Development Programme in Southern Mindanao. December 2004. 20 pp.

UDP. 2004. *Slope Treatment Oriented Practices 1 (STOP 1) Land Unit Farming Principles* Report by K.R.S. Proud, Soil and Water Conservation Consultant. Upland Development Programme in Southern Mindanao. December 2004. 5pp.

UDP. 2004. *Slope Treatment Oriented Practices 2 (STOP 2) Multi-Storey Cropping, Principles for Developing Productive Upland Agriculture in the Humid Tropics.* Report by K.R.S. Proud, Soil and Water Conservation Consultant. Upland Development Programme in Southern Mindanao. December 2004. 2pp.

UDP. 2004. *Slope Treatment Oriented Practices 3 (STOP 3)* Mulching and Zero Tillage on Shallow Soils, Principles for Developing Productive Upland Agriculture in the Humid Tropics Report by K.R.S. Proud, Soil and Water Conservation Consultant. Upland Development Programme in Southern Mindanao. December 2004. 20 pp.

UDP. 2004. *Problems With Cassava Production in the Uplands of Southern Mindanao* Report by K.R.S. Proud, Soil and Water Conservation Consultant and BH Viloria, Sustainable Agriculture Development Coordinator. Upland Development Programme in Southern Mindanao. October 2004. 5 pp.

UDP. 2004. Replicable Model For Sustainable Upland Development. Paper by W.V Rij, European Co-Director. Upland Development Programme in Southern Mindanao. March 2005. 22 pp

UDP. 2004. Key Upland Development Schemes for Integration to the LGU Activities. Brochure of the Upland Development Programme in Southern Mindanao. December 2004. 3 pp.

UDP. 2004. 2004 Annual Report Upland Development Programme in Southern Mindanao. December 2004. 77 pp.

Annex I: Lists of the Different Plant Species That UDP Facilitated and Planted

Fruit Tree Species	**Common Name**
Durio zibenthinus	Durian
Lansium domesticum	Lanzones
Nephelium lappaceum	Rambutan
Mangifera indica	Mango
Garcina mangostena	Mangosteen
Artocarpus heterophyllus	Jackfruit
Artocarpus odoratisumus	Marang
Citrus maxima	Pomelo
Citrus reticulate	Mandarin
Citrus sinensis	Calamansi
Carica papaya	Papaya
Forest Tree Species	
Eucalyptus deglupta	Bagras
Acacia mangium	Mangium
Swietania macrophylla	Mahogany
Adenanthara falcate	Falcata
Pterocarpus indicus	Narra
Azadiracta indica	Neem
Casuarina spp.	Upland Agoho
Gmelina arborea	Gmelina
Tectonia grandis	Teak
Indigenous Forest Tree Wildlings	
Parashorea malaanonan	Bantikan
Shorea contrata	Lawaan
Shorea palosapis	Mayapis
Shorea guiso	Guiho
Vitex parviflora	Molave
Ficus minahassae	Hagimit
Calamus spp.	Rattan
Introduced Species	
Eucalyptus camaldulensis	Eucalyptus
Eucalyptus robusta	Robusta
Eucalyptus torriliana	Torriliana
Maesopsis eminee	
Leguminous Species	
Leucaena leucocephala	Ipil-ipil
Desmodium rensonii	Rensonii
Flemingia macrophylla	Flemingia
Gliricidia sepium	Madre de Cacao
Arachis pintoi	Forage Peanut
Pueraria phaseoloides	Kudzu
Calliandra callothyrus	Calliandra
Industrial/Permanent Crops	**Common Name**
Musa spp.	Banana (cardava, lakatan, tundan, cavendish)

Musa textiles	Abaca
Anacardium occidentale	Cashew
Theobroma cacao	Cacao
Coffea robusta	Robusta coffee
Coffea Arabica	Arabica coffee
Useful Grasses for SWC and Forage	
Vetiver zizanoides	Vetiver
Setaria splendida	Setaria
Citronella spp.	Lemon grass
Calapogonium muconoides	Calapo
Centrosema pubescens	Centrosema
Pennisetum purpureum	Napier
Panicum maximum	Guinea grass
Paspalum conjugatum	Carabao grass

Annex II: The Upland Development Programme In Southern Mindanao

From 1990 to 1997, the Department of Agriculture executed the Southern Mindanao Agricultural Programme (SMAP). Jointly funded by the Government of the Philippines (GOP) and the European Union (EU), SMAP was implemented in the selected uplands of Davao City, Davao del Sur and South Cotabato. Before the end of SMAP, the Upland Development Programme in Southern Mindanao (UDP) was conceptualised as a follow-up project that built on the experiences and lessons with its predecessor project.

Also executed by the DA and jointly funded by the GOP and EU, UDP is a seven-year programme which was established on October 20, 1998. The programme initially covered the provinces of Compostela Valley, Davao Oriental and Davao del Sur in Region XI, and the provinces of Sarangani and South Cotabato in Region XII. In 2003, it included Davao del Norte in its coverage.

UDP's overall objective is to develop a replicable model for sustaining the upland resource base and improving the living standards and prosperity of communities who derive most of their income from upland farming.

UDP is working with communities to rehabilitate approximately 480 small watersheds covering a total area of over 17,000 hectares in 120 barangays. An estimated 9,600 households will benefit from the Programme.

The Programme follows a participatory community based approach in upland development. This involves the active participation of partner agencies such as the Local Government Units (LGUs), People's Organizations (POs), Partner Financial Institutions (PFIs), Non-Government Organizations (NGOs), Line Agencies (LAs) and other community development partners in watershed management.

The 1999 *Planning Atlas* for Region XI considers the general land development suitability of much of the UDP project areas either as *forest conservation areas* or *not suitable for upland crops or for orchard development*. The land capability classification maps of the Davao Gulf Provinces classify over 90% of the UDP-covered barangay areas as not suitable for upland crops; with about 50% of the UDP area considered unsuitable even for orchard crops (JICA 1999). This information adds to the challenge of balancing subsistence and resource management for sustainable upland development.

Approaches to sustainability
In order to attain its objectives, UDP uses the following sustainability approaches:

1. Policy advocacy (adoption of development schemes) at the barangay, municipal, provincial, regional and national levels

2. Capability building (skills transfer) for Upland Barangay Associations (UBAs), Barangay Government Units (BLGUs), Municipal Local Government Units (MLGUs), Provincial Local Government Units (PLGUs), partner agencies, and service providers which are usually non-government organizations (NGOs)

3. Facilitating the linkage of the Upland Barangay Associations (UBAs) with BLGUs, MLGUs, PLGUs, LAs, financial institutions and business sector

4. Development and installation of systems such as GPS-GIS, MIS-BDP/AIP for MLGUs, PLGUs and partner agencies

5. Creation/revitalisation of working structures like technical working groups at the barangay, municipal, provincial levels

Programme Components
UDP operates with six programme components that focus on the development of the biophysical, human, institutional and economic resources of the uplands. The components support one another in responding to the issues of poverty and environmental degradation in the uplands.

1. *Community and Institutional Development and Extension (CIDE)*

CIDE endeavours to strengthen upland communities and community based organisations' capability to implement sustainable resource management systems, and to intensify the capacity of LGUs and other support agencies to promote and support watershed development and management.

2. *Resource Management (RM)*

   RM is designed to develop a model for sustainable management of natural resources, which will be adopted and supported by local government units (LGUs) and actively participated in by communities.

3. *Sustainable Agriculture Development (SAD)*

   SAD aims to secure food production and increase income of upland farmers through diversified on-farm integrated farming systems while safeguarding and improving the watershed resource base.

4. *Rural Financial Services (RFS)*

   RFS seeks to address the problem of poor access to financial services by upland communities. It is designed to implement this by setting up a savings based credit delivery system in partnership with rural financial institutions.

5. *Marketing and Enterprise Development (MED)*

   MED is in charge with generating information and developing marketing strategies and plans which will enable the upland communities to address their subsistence needs and new marketable surpluses.

6. *Agriculture Infrastructure Support (AIS)*

   AIS aims to respond to infrastructure needs for resource management and market led production in beneficiary communities by providing appropriate, sustainable and replicable structures.

Programme outputs

UDP is expected that after seven years, it will have achieved the following:

1. Developed and implemented a model for a sustainable management of natural resources in the upland covering 480 small watersheds with a total area of more than 17,000 hectares with an estimated 10,000 farmers in 120 barangays in 30 municipalities of 5 provinces in Southern Mindanao, resulting to:

   a) Improved community management of natural resources
   b) Tenure for upland communities
   c) Programmes for community-based watershed management established and implemented by LGUs

2. Upland communities with 10,000 farmers covering over 12,000 hectares have diversified farms producing new marketable surpluses through sustainable market-led agricultural development resulting in:

    a) Improved market linkages for upland farmers
    b) Strengthened farmers organizations
    c) Diversified on-farm and off-farm enterprises
    d) Improved access to finances
    e) Improved farm to market infrastructure and essential social infrastructure

The expected output can be summarized into three major achievements, which are:

1. Increased food production resulting in increased income of farmers in the uplands as well as ensuring food security
2. Improved living conditions in the upland communities
3. Sustainable resource management implemented by upland communities

Funding

The total project cost is about PhP 1.904 B. The Programme is supported by the EU with a grant of PhP 732 M and with a counterpart fund of PhP 265.7 M provided by the GOP. LGUs share PhP 384 M, while Partner Financial Institutions (PFIs) contribute PhP 22 M. The beneficiary upland farming communities have an equity contribution of PhP 500.8 M.