TAKING ROOT

Proceedings of the Third UPWARD Review and Planning Workshop

UPWARD

...ectives With Agricultural Research and Development

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Proceedings of the Third UPWARD Review and Planning Workshop

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UPWARD is a network of Asian agricultural researchers and development workers dedicated to the involvement of farming households, consumers and other users of agricultural technology in rootcrop research and development. It is sponsored by the International Potato. Center (CIP) with the funding from the Government of the Netherlands.

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FOREWORD

TAKING ROOT is a very appropriate title for the proceedings of the third UPWARD Review and Planning Workshop for the UPWARD network has grown some "roots" from the time "seeds" of the users' perspective approach were sown in 1990. A rich harvest of reports from projects has added substantial value to our knowledge base about the role and function of sweetpotato in different agro-ecological niches and socio-economic circumstances. As we say, sweetpotato is a secondary crop performing primary functions. In fact, this ubiquitous crop has proven to be an excellent "venue" for validating the substance and philosophy of the UPWARD approach.

The network projects characteristically start from diagnostic studies and then move on to action research to explore doable solutions to problems identified in the diagnosis. This special feature of the UPWARD approach enables researchers to proceed creatively and interactively with users- thus contributing to, rather than "extracting" knowledge and experience from, the community where the projects are located. At the same time, young researchers learn from the dynamic social processes taking place as user knowledge, user practice, user response and exposure to opportunities for new resource linkages are "played out" in real life.

Production systems from urban household gardens to post-rice sweetpotato from slash-and-burn fields to micro-niches, from seasonal subsistence to cash crop production to pigs' feed have been elaborated upon and are better understood.

Studies on root crop genetic resources conducted in different countries are efforts to pursue bio-diversity issues of conservation and use at the community level. They are pioneering efforts because on-the-ground operationalizations of Agenda 21 are not all that numerous despite vigorous rhetoric and passionate advocacy.

Researchers are introduced to a rich menu of participatory methods including rapid appraisal, to historical transect and the like, but always with a user perspective implemented with interdisciplinarity in concept and practice.

UPWARD's transition to a Phase II expands the focus to include other actors in the diagnostic framework thus recognizing multiple perspectives not just the farmer perspective. This shift is essential as research expands into marketing, processing, and consumption and as institutionalization of the approach comes to maturity.

Participatory monitoring and evaluation within the projects themselves is another interesting development. Finally, the UPWARD network as a network of researchers has remained an open system composed of female and male participants from different countries, different disciplines and different institutions with a common focus on users. The interactions between researchers and projects look promising in terms of horizontal learning and sharing across countries. As the UPWARD approach "takes root", the fruits cannot be far behind.

Gelia T. Castillo

PREFACE

A Brief History of UPWARD

UPWARD is both a social entity - a network of agricultural researchers and development workers - and a research and development philosophy or methodology. It therefore really has two histories, one a record of network development, the other, part of a much longer history of ideas. The history so far of the network in supporting, disseminating and attempting to institutionalize the users' perspective approach to agricultural R&D will be discussed in a later section of these Proceedings. In this Preface I would like to offer some backward-looking context to the forward-looking thrust of the papers in this volume by briefly tracing some of the currents of ideas which contributed to UPWARD's user perspective methodology and the sequence of events which led to the establishment of the network.

The remarkable decision to modernize agricultural production worldwide in response to rapid population growth and increasing food shortages, especially in Asia, was only one of the many manifestations of the tremendous developments in science and technology since the second world war- "the white heat of technology" as one British Prime Minister called it. The establishment of "centers of excellence" in rice research in the Philippines and wheat research in Mexico led, together with very significant efforts by national research teams, to the development of "miracle rice and wheat varieties" and to the so-called Green Revolution.

The reaching outwards and downwards by the hand of science and the centers of excellence during that period was ironically mirrored by the upward-reaching hands of independence movements, civil rights movements, grass roots movements and the women's movement. The academic community around the globe also began to look more critically at the concepts of "modernization" and "development" which underpinned the technological initiatives. Whilst these initiatives were tremendously successful in increasing national output and thus contributed significantly to the modernization and development of recently independent states, many studies showed that poor peasant farming households, who make up the majority of the developing world's agricultural population, had yet to have their Green Revolution. The rootcrops, coarse grains and legumes which are the common crops in the peripheral farming systems where such households are mainly located were not initially a major focus of scientific interest and besides, such resources constrained systems were not economically set up to take advantage of the high input orientation of this research.

The failure of the first Revolution to offer benefits to so many farmers was a clarion call for a second, a revolution more of attitudes than technology, that could turn upside down the conventional perspectives, philosophies, and methods of the agricultural development community. These reversals have been nourished by the grass roots and rights movements described above, but have also drawn on some less conventional approaches to development pioneered during the 50s and 60s, such as Integrated Rural Development, Community

Development, and some of the activities of anthropologists and enlightened colonial administrators.

This second revolution, of which UPWARD is a part, has been building over the last decade under such banners as FSR, Farmer First, Farmer-back-to-Farmer, Diagnosis and Design and PRA. It turns from a unique dependence on Western scientific thought to an adaptive logic which is sensitive to skills, opportunities, and constraints on the farm, in the market place and amongst consumer as well as producer households. It has shifted from a short-term focus on productivity at any cost to a more holistic, longer-term appreciation of the "user" (the person or group that will utilize the technology or management practice), the "non-user" (the person or group who may not have access to the technology but will nevertheless be affected by its use), and the "used" (the natural resources on which production depends).

Despite the many important reversals of thinking ushered in by the client orientation of the second revolution, there remained a strong production focus and a determined attachment to 'the farmer' - frequently the middle-aged male farmer at that - as the user participant of natural choice. A key element of the original proposal which launched UPWARD was the household, with its web of gender and other role divisions and relations. In the vast majority of agricultural enterprises in the developing world it is the household which is the principal social unit involved rather than the individual male entrepreneur. Households and complex agricultural systems in general, involve interactions and interdependencies along the food chain, linking production, conservation, distribution and consumption activities and the food system was therefore a second key concept for UPWARD's program.

Though focused on a philosophy and approach, UPWARD is also an offspring of the International Potato Center (CIP), whose commodity-oriented mandate is to solve priority problems that limit rootcrop production and consumption in developing countries. Many of the international agricultural research centers are often referred to as 'germplasm centres' to highlight their production orientation and commodity focus. Together with a stress on commodity production, many centres have also been closely associated with the "outwards and downwards" transfer-of-technology model typical of Green Revolution agriculture which was mentioned earlier. Yet as early as the late 1970s, CIP, along with several other centres had recognized that there was more to the solution of the world's food problems than high-yielding varieties. Post-harvest, consumption and nutrition issues were beginning to be taken much more seriously. Centres devoted to livestock research, policy and management issues had been formed, and a farming systems approach to research, including social science disciplines, had been widely adopted. These concerns led in turn to much closer working contact with women and with households as a whole, and to the realization that most of the target groups of production-oriented research consisted mainly of men. These were the internal shafts of light which led to the preparation of a proposal on "Improving the Food Systems of Asia: the role of the farm household in potato and sweetpotato research and development" in the 1987, the embryo of the UPWARD program. Of course, the new perspective behind the proposal reflected or refracted issues already being well aired in the wider world as we have seen, such as the grassroots movement and particularly the women's

movement which was already fully established by the mid-70s. The concept of a food system had also became a radical analytical tool in Latin America during the same decade.

The possible contradiction between a participatory philosophy and a commodity focus dissolves when one looks at the crops themselves. Rootcrops are some of the developing world's most widely distributed and versatile crops, adapting relatively easily to a range of cropping systems, including those in marginal areas. In fact, rootcrops are especially associated with poor marginal areas and complex, "knowledge intensive" farming systems. Sweetpotato in particular is often associated with very low levels of external inputs and frequently identified as a good candidate for diversifying and sustainably intensifying crop production systems. Many types of rootcrops are commonly found as alternative staples in upland systems and home gardens as well as diversification crops or "niche" crops in lowland systems. The bulk and perishability of root crops and their vegetative reproduction raise a whole series of questions and problems related to household storage, processing, marketing and the maintenance of planting material. The roots and/or leaves of rootcrops are also important nutritionally. Sweetpotato has a significant production of edible protein and important quantities of micro-nutrients, and is thus potentially important for improved household nutrition. With the exception of potato, rootcrops have received relatively little research attention, when compared to the grains.

UPWARD was formally launched in April 1990 in an inaugural meeting attended by actual and prospective network members. The participants represented what could be called a cross-section of the world of agricultural research and development. The bulk consisted of researchers based at national agricultural research institutions, doing applied or adaptive research or both in the natural or social sciences. There were also professors, research administrators, representatives of nongovernment organizations (NGOs), cultural funding agencies, and policymakers. They came from all over Asia, bringing along their distinctive and intellectual orientations.

The inaugural conference activated the network. The funding from the Government of Netherlands allowed UPWARD to bank on the promise and interest of young researchers without any established track record through a small grants program. The network sought to encourage innovative research and new approaches to agricultural problems, unhampered by mainstream premises and assumptions. As a consequence, the network had, and still has, a vitality and enthusiasm which are tremendously important assets.

During the inaugural conference, participants helped shape the general orientation of UPWARD through working groups on organizational structure, research projects, methods development, and training and information dissemination. Their deliberations and recommendations distilled through subsequent discussions and meetings, led to a mission statement, three major goals and some core statements on methodology.

Mission

To make sweet potato- and potato-related agricultural research and development responsive to the needs and circumstances of "users" by building user-sensitive, food systems research capacity among young Asian professionals and by supporting the integration of this research within technical programs.

Three major goals....

1. develop research methodologies which integrate the perspectives of technology users within the R&D process
2. support user-sensitive agricultural research which analyzes the needs and problems associated with sweetpotato and potato production and utilization, identifying and exploiting opportunities for improvement.
3. build the capacity of Asian researchers to conduct user perspective research and support the integration of the approach within technical programs.

Five key elements to the methodology.....

- *a new vision and practice of agricultural R&D that starts from below, with the perspectives of the ultimate users of agricultural technology.*
- *a partnership between local users and different research and development specialists working together within interdisicplinary teams.*
- *an involvement by women, as well as men, by households and communities, as well as by individuals, by consumers and other users as well as by producers.*
- *a focus on the roles, relationships and technical linkages of the entire "food systems."*
- *a core of respect for indigenous knowledge and a desire to work with and build upon local agricultural practices.*

These have helped guide the coordinating office, both in reviewing research project proposals and developing a training program. Other guidelines relating to research retained considerable flexibility, so as to maximize innovation and experimentation.

A second conference, held in April 1991 reviewed research progress. The major concerns which emerged from the work of the researchers from six Asian countries allowed the network to identify Production Systems, Genetic Resources and Marketing Processing and Consumption as the three key areas for focusing research, and the areas where methods issues should be addressed.

Three years passed between the 1991 conference and the Review and Planning Workshop to which these Proceedings relate. This was UPWARD's "lean time" during which limited interim funding did not permit us to organize annual meetings. During that period research did continue and several methods workshops were also able to take place. The papers presented in the volume show that though a lean period in some respects it was

also fruitful. With a five-year second phase again funded by the Government of the Netherlands now in place, we look forward to building on the achievements of the previous years. These Proceedings with their recommendations on research framework and priorities, on methods issues and evaluation procedures, and on the guidelines for network development, will be an important guide.

Gordon Prain,
UPWARD Coordinator and
Proceedings Editor

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III. CAPACITY BUILDING AND INSTITUTIONALIZATION THROUGH NETWORK DEVELOPMENT

SWEETPOTATO IN ASIAN PRODUCTION SYSTEMS: AN OVERVIEW OF UPWARD'S FIRST PHASE RESEARCH

Gordon Prain

The initial phase of UPWARD was mainly a users' perspective diagnosis of sweetpotato in Asian food systems and this overview therefore tries to provide an overall synthesis of what we have learned about production systems in Asia, the role of sweetpotato in those systems and the research opportunities perceived by users and researchers. The synthesis is therefore also a kind of evaluation of achievements. Some production system projects have already developed a second phase, action or focused component (Table 1) which makes their achievements more visible. But if any project contributes to our overall understanding of the role of sweetpotato in different systems, that also is an achievement. As part of the evaluation I have tried to identify a number of areas which have not been adequately addressed thus far and which should be the subject of future research and development attention.

Table 1. Research as a process: second phase development in UPWARD projects.

Diagnostic	Action or Focused Phase
Production Systems	
Nepal	
Analysis of significance and future prospects of sweetpotato in food system and hill	Importance of sweetpotato in household economy and consumption: Case of two villages: plain and hill
Philippines	
Integrated sweetpotato homegarden project	Sweetpotato home gardening technology development
Interhousing financing networks and other credit support systems in sweetpotato producing upland communities	Understanding and evaluating farmer's approaches to soil management
The Aytas world view of sweetpotato culture: Guide to their resettlement and rehabilitation	Cropping systems and rootcrop adaptation under emergency resettlement conditions

AGROECOLOGICAL PERSPECTIVES[1]

Climatic zones of the region

In order to get a preliminary feel for the conditions under which rootcrops are grown in Asia and to identify some of the key parameters determining production systems, it is useful to look at the major climatic zones of the region.

Climate zonation in the Koeppen classification, which is the basis for the International Potato Center's so-called agroecology classification and the one used here, is based on three variables: temperature, altitude and rainfall (Figure 1). The continental area of importance for present purposes stretches from about 40° North - the temperate climate covering China's most important potato-producing area - to about 10° South latitude.

There are several highland areas in Asia (i.e. above 1500 m.a.s.l.), important for rootcrops: the Himalayas, which includes parts of eastern Pakistan, India, Nepal, large parts of western and southern China; the southern flanks of the Himalayas, which stretch into Mayanmar, Laos, northern Thailand and the north western part of Vietnam; further south, one finds the hill areas of southern Vietnam, peninsular Malaysia, western Sumatra and down into Java; to the east, there are the mountain areas of the Philippines, though relatively little agriculture is practiced there above 1500 m.a.s.l. and the islands of Sulawesi and New Guinea, where mountain farming, especially in the latter island, is extremely important (see Map). As far as we can tell at present, there is no significant arid and Mediterranean zone in Asia, except in western Pakistan which is not an important area either for potato or sweetpotato.

In terms of agrarian systems and population dependence, crop productivity and Asian rootcrop production, the most important zone is the belt of sub-tropical lowlands stretching from parts of eastern Pakistan to the whole of eastern and central China south of the Yellow river and as far south as central Vietnam. In fact, there is an important distinction within this zone between those areas such as northern India, Nepal and northern Vietnam to some extent which experience a dry winter (Cw) and those areas further east in China where rainfall is spread more evenly throughout the year. (Cf)

The semi-arid tropics (Aw) are located mainly in central India, central and eastern Thailand and the drier Indonesian islands east of Java and including the southern most tip of New Guinea.

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[1] Agroecology is a quite specific term for describing the way human action modifies ecological systems for agricultural purposes. The complexity of interactions at the level of "Asia" are overwhelming and the use of the term in this overview is preliminary, but expectant. The discussion in this section really deals with the effects of climate parameters.

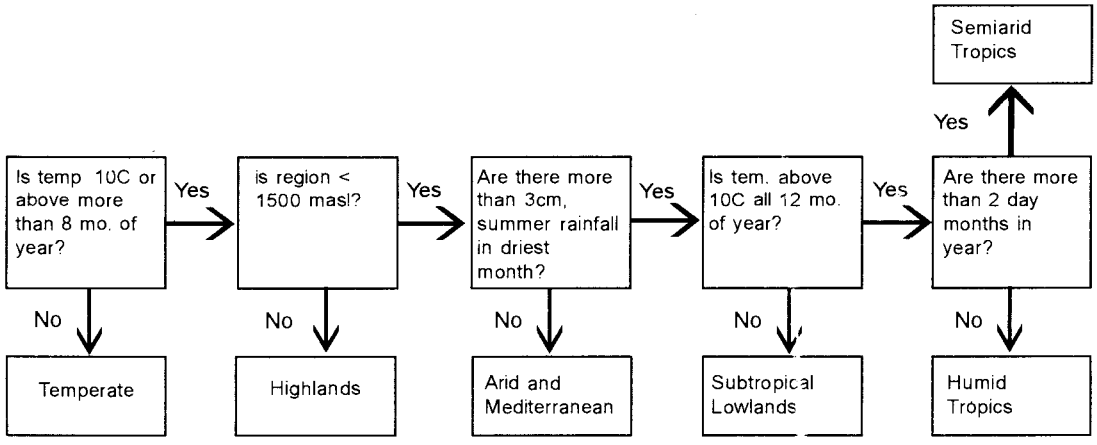
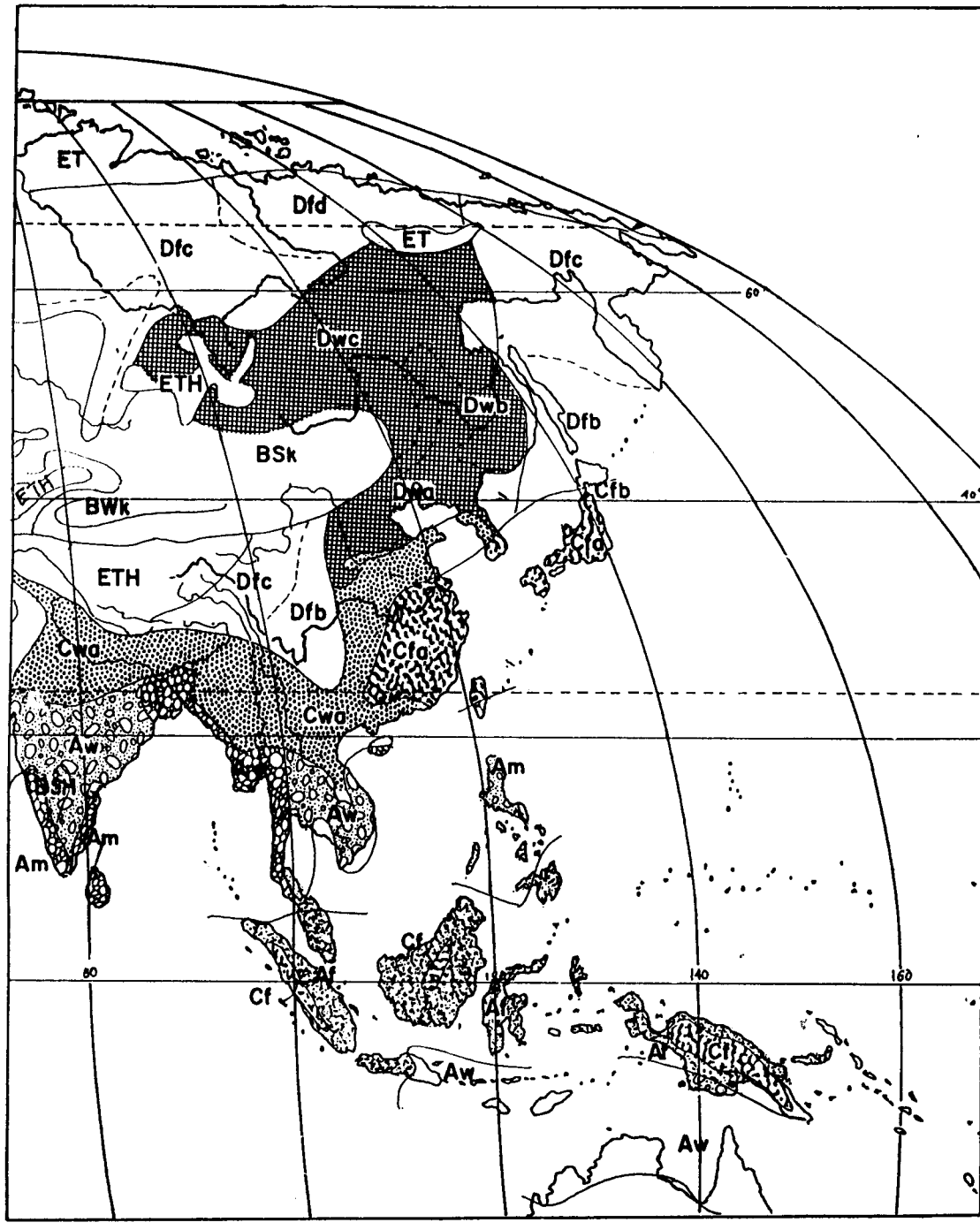


Fig. 1. Classification criteria used to define CIP's agroecologies.

Finally, there are the "humid tropics", which are divided by Koeppen into the rainforest (Af) and the monsoon zones (Am). These two climate zones present important differences for the management of sweetpotato, and this difference will therefore be maintained. The rainforest agroecology covers a relatively small geographic area in low elevation Sumatra, western Java, lowland Borneo, Sulawesi and lowland New Guinea and the southern part of Mindanao in the Philippines. The monsoon agroecology is more widespread and important for rootcrops, including southern India and low elevation areas of Sri Lanka, the Ganges delta area in India and Bangladesh stretching down into coastal Mayanmar, western Thailand and northern peninsular Malaysia. Most of the Philippines is also included.

Sweetpotato production by climate zone

As is well-known, China dominates the production of sweetpotato in Asia. In terms of climate zones, the majority of Chinese production is in the sub-tropical lowlands (Figure 2 and Figure 3), the highlands - which may be overestimated - and a smaller area in the semi-arid regions in the west of the country. The right side of Figure 2 indicates the percentage contribution of each climate zone to total national sweetpotato production, whereas the left side shows the contribution each country makes to the total sweetpotato production in each climate zone. As mentioned already, the subtropical lowlands is the most important zone, contributing approximately 77 million tons or 71% to continental production. Next comes the tropical and sub-tropical highlands with about 21 million tons or about 19% of production, though this may be somewhat overestimated. The semi-arid tropics accounts for 7.9 million tons or 7% of production and the humid tropical lowlands accounts for 2.8 million tons or 3%.



Temperate

Sub-tropical lowlands

Semi-arid tropics

Humid tropics - monsoon

Humid tropics - rainforest

Tropical and sub-tropical highlands and sub-tropical lowlands (no dry season)

Principal agroecologies of Asia (based in Koeppen classification)

Production systems with sweetpotato across climate zones

What do we mean by a production system? A production system can be defined by the physical conditions of the farm such as elevation, by the way soil, water and other resources are combined with particular techniques for particular crops, or, finally, by the economic and social orientation of the farm. Reports from Indonesia[2], Nepal, Philippines, Sri Lanka and Thailand tend to converge in identifying three or four broad types of production system in which sweetpotato is produced, but researchers differ somewhat in how these are defined (Table 2). One type is clearly the homegarden and/or other marginal niche such as a riverbank or rice bund etc. with subsistence and/or special function associations. A second type is basically rainfed upland, frequently sloping often fragile and associated with small farms, complex livelihood systems and an important though by no means exclusive subsistence component; except in Nepal, other types have been identified in Thailand, Philippines, Indonesia and Sri Lanka and defined both economically, in terms of increased intensification and commercial orientation, and in cropping systems terms, as frequently post-rice or as rice crop substitute[3]. Rather than semi-commercial and commercial types what we see here is a process of increasingly intensive diversification of riceland within the limits of available resources. A similar process is also at wok in upland production with the great diversity of systems reflecting a changing resource base and differing degree of engagement with capitalist markets: they range from classic swidden systems in remote areas producing exclusively for subsistence, to intensively farmed permanent fields with an exclusive commercial focus.

SWEETPOTATO

AGROECOLOGY	Total	Laos	China	Vietnam	Thailand	Philippines	PNG	Indonesia	Sri Lanka	India	Bangladesh
Semiarid Tropics	100		77	7	1			7	1	7	
Humid Tropics	100				2	26	3	50	1	1	18
Subtropical Lowland	100		97	2						1	
Tropical and Subtropical Highlands	100		97				2	1			

Contribution by country to agroecology

AGROECOLOGY	Laos	China	Vietnam	Thailand	Philippines	PNG	Indonesia	Sri Lanka	India	Bangladesh
Semiarid Tropics		39	75	26			60	30	6	25
Humid Tropics	85	3	25	66	15	100	40			
Subtropical Lowland	15	58						70	74	75
Tropical and Subtropical Highlands				8	85				20	
	100	100	100	100	100	100	100	100	100	100

Contribution of agroecology to country

Fig. 2. Percentage distribution of sweetpotato in Asia by country and agroecology.

[2] Production systems research in Java, Indonesia, though not funded by UPWARD, involved close cooperation with the researchers involved (Watson et al. 1991; Dimyati et al. 1992).

[3] This lowland pre or post-rice system is also common in both north and south Vietnam.

Table 2. Characterization of "production systems" growing sweetpotato in selected Asian countries.

Indonesia (Java)	Nepal	Philippines	Sri Lanka	Thailand
Yard Garden	"fruit garden"/ homegarden/ marginal land (bunds, terraces, river banks)	Subsistence homegarden	Homegardens (few)/rice field bunds	Homegarden
Upland, rainfed	Rainfed uplands	Subsistence hillside, open or partially shaded	Highlands/upper lowlands, small - scale	Extensive (mostly rainfed)
		Semi-commercial	Moderately intensive, lowland	Extensive, irrigated, mostly post-rice and larger scale (Eastern zone)
Lowland, irrigated post-rice or rice substitute		Commercial rolling/Commercial flat/Post-rice	"Intensive", lowland post-rice or rice substitute	Intensive mostly irrigated post-rice

Sources: Indonesia, Watson et al. (1991); Nepal, Koirala and Shah (1991); Philippines, Francisco et al. (1993); Sri Lanka, Balasuriya (1993); Thailand, Pituck (1991)

With the above complexities in mind, we can produce a simplified matrix of major production system types across the climate zones (Table 3).[4]

THE PRIMARY AND SECONDARY FOOD CROPS OF ASIA

Wheat is the sub-tropical belt and rice in tropical Asia are the two staples which dominate Asian food culture. In only a few cases, primarily the island of New Guinea and some other mountain areas, can sweetpotato, or other rootcrops for that matter, be described as primary crops. Nevertheless, the characteristics of sweetpotato make it an extremely flexible secondary crop and its adaptation to heat, drought, wet and cold conditions from 45°N to 40°S

[4] Table 3 is based on information of UPWARD projects and thus offers only a provisional characterization.

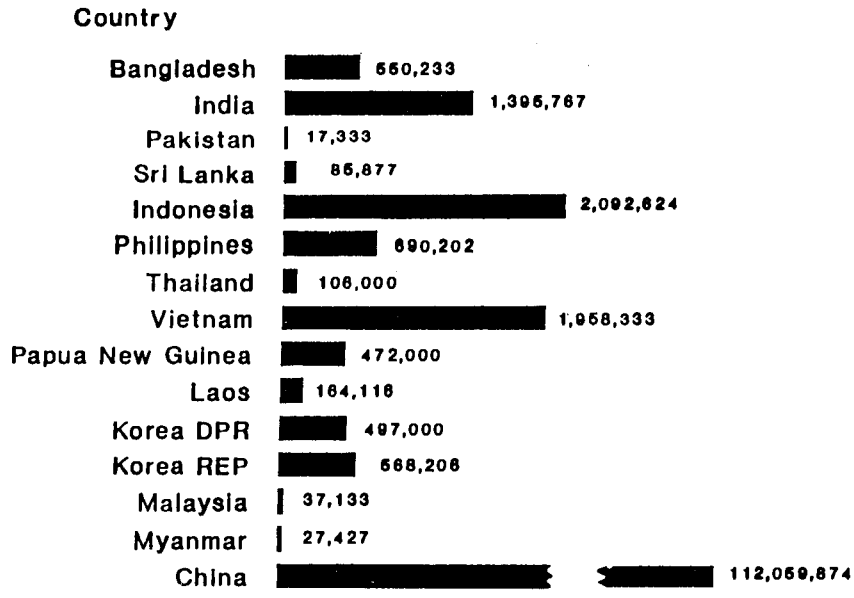


Fig. 3a. Sweetpotato production in selected countries of Asia (1987-89 running average)

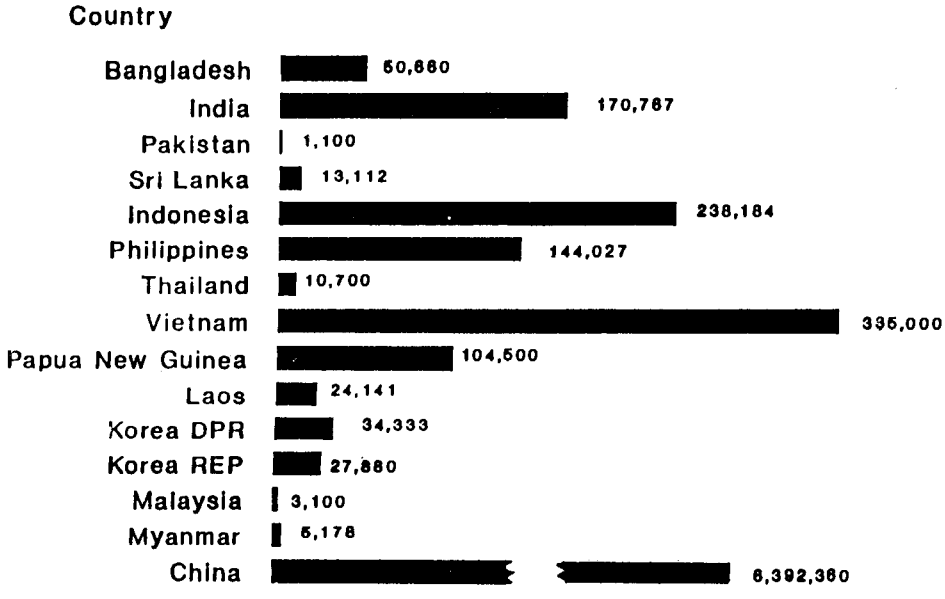


Fig. 3b. Sweetpotato area in selected countries of Asia, 1987-1989 (ha)

and from sea level to 2500 m.a.s.l. has resulted in its cultivation in over a hundred countries worldwide and in most countries of Asia (Figure 3, developing countries only). Despite this great flexibility and obvious advantages, an FAO study has found that sweetpotato in Asia is increasingly being grown on unsuitable, marginal land (FAO 1980) and the official statistics indicate a stagnation in general and, in the case of China, which accounts for the vast majority of Asian sweetpotato area and production, an overall decline (Figure 4). These changes can be accounted for in various ways. Certainly one important factor is the extremely low level of research attention dedicated to a crop with such a large distribution. A second factor is the overall shift away from starchy staples towards other types of foods as incomes increases. A third factor is the generally lower status attached to starchy rootcrops compared to rice by many dominant lowland culture in Asia (Horton et al. 1989 for more details).

Table 3. Simplified matrix of production systems across agroecologies of Asia.

	Humid Tropics		Sub-tropical Lowlands		Semi Arid	
Homegardens	Rainforest	Monsoon	Dry winters (CW)	No dry season (cf)	Tropics	Highlands
	-High diversity -Commonly occurring -Household food and medicine as main uses Java	-High diversity -Commonly occurring -Household food, medicine -Plant. material maint. ("nursery") Mindanao, Sri Lanka	-Lower diversity -Relatively less common -Nursery function Nepal, N.Vietnam	-Lower diversity -Relatively less common -Nursery function -Change to market gdn. Eastern China		-Moderate diversity for household food -Pigfeed, medicines -Nursery function Irian Jaya, Philippine Cordillera, Himalayas
Upland Systems	-Long-term swidden sys. with rootcrops +maize+legumes -No fallow rotation sys. with rootcrops/ maize/legumes. Java -Lowland Irian Jaya	-Swidden systems rootcrop+maize+ legumes -Sometimes monocrop -Often single season -Drought problems N. Philippines	-Sweetpotato/ maize/peanut/ fallowing -Also potato/spring vegetables/fallow -Planting materials shortage -Hand irrig. of veg. Nepali terai	-Wheat/+maize/+SP /+alfalfa/+soybean -Maize/SP but tea more common Eastern, South-eastern China	-Maize/rootcrops/ soybean/peanut/ tobacco -Rootcrops as monocrop depending on moisture and land type (N.E. Thailand)	-Long-term swidden systems rootcrops+legume +squash/vegetables (at second stage) -Potato/wheat/barley/maize + fings-millet in mid-hills -Potato based systems in high hills Nepal
Lowland, r ice-based system	-Rice/rice in well irrigated areas -Rice/maize+/SP -Rice/SP/SP x Rice/ SP/vegetables West Java	-Single cropping of rice common. Water supply problematic in some areas. -Rice/vegetables x SP -SP/vegetables replace rice Southern Sri Lanka	-Rice/winter wheat -Rice/potato/wheat -Rice/rice/SP x rice/SP depending on irrigation North and Central Vietnam Nepali terai	-Many different systems, based on rice. -Rice/vegetables x forage crop. -Rice/vegetables/ potato -Rice/rice/rice -Rice/rice/spring potato x vegetables Eastern China	Rice/late wet-season planting of SP/dry-season rice (where sufficient irrigation) -Rice/SP Thailand C & E	-Rice/fallow/potato in *khet* lands in Nepal

Note: + = "intercropped with; / = "rotated with"; +/ = "relay cropped"; x = "or"

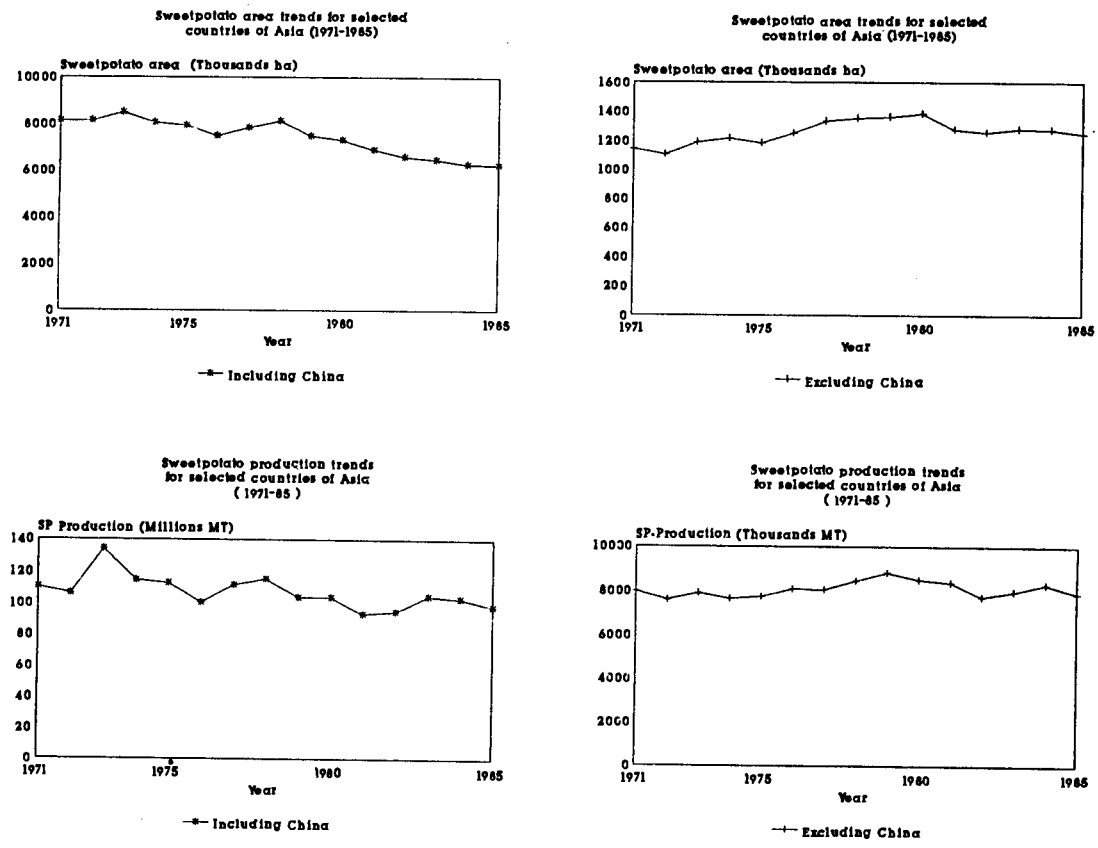


Fig. 4. Sweetpotato production and area trends in Asia (1971-1985)

Yet sweetpotato continues to be grown widely in many countries of Asia, and to be expanding in some countries and regions (Figure 5). One way to understand farming household rationale for continuing to cultivate the crop, the social and economic benefits which production brings and also the reasons why some households reduce or cease their production, is to use the concept of "primary functions" of secondary crops developed by Gelia Castillo (1992).

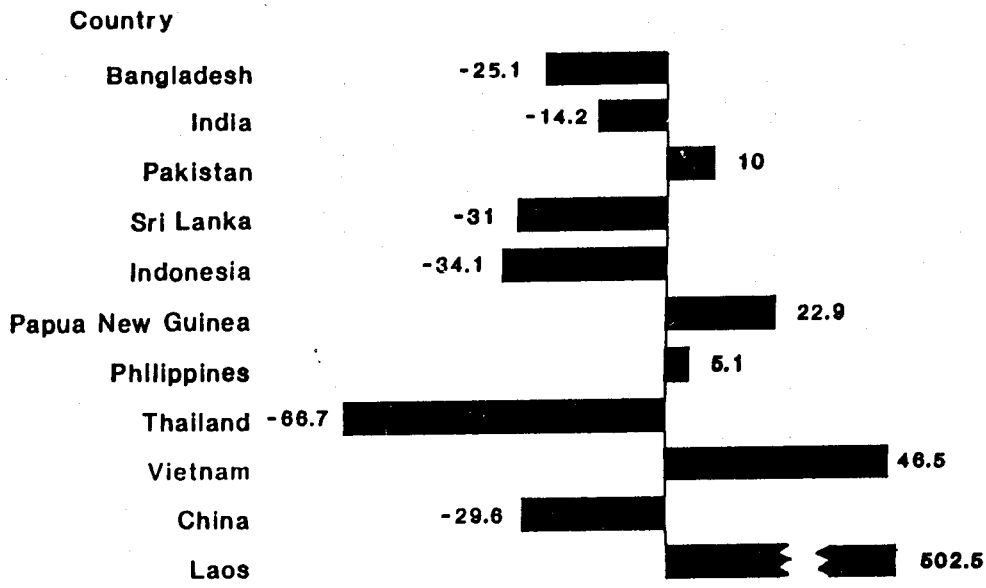


Fig. 5a. Percentage change in sweetpotato area in selected countries of Asia (71/73-87/89 running ave.)

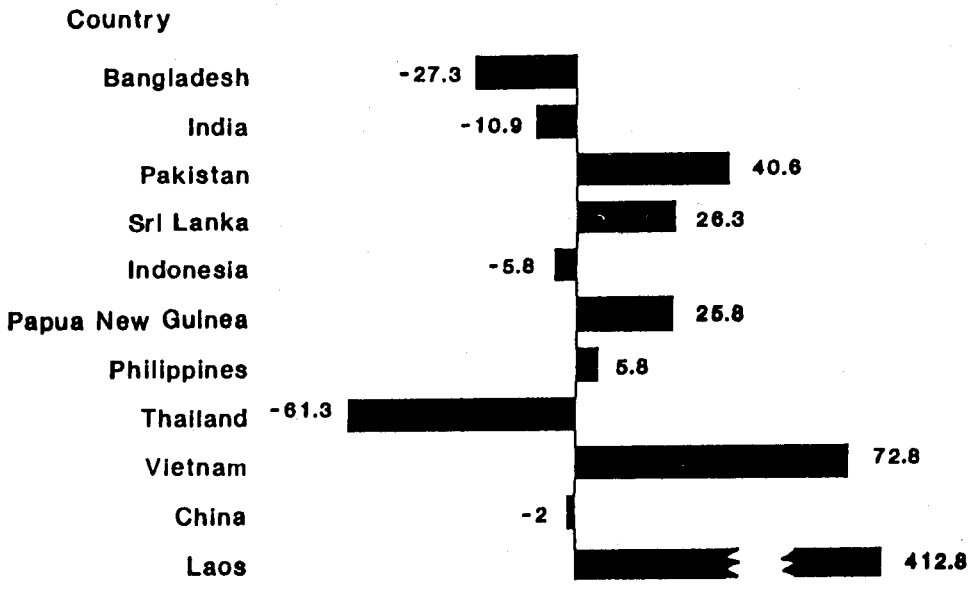


Fig. 5b. Percentage change in sweetpotato production in selected countries of Asia (71/73-87/89 running ave.)

Our previous way of understanding the function of particular crops within farming systems has been very crude. Practically speaking, only two notions have been available: either a crop is a "staple" or it is a cash crop. But as Castillo points out there are a range of much more complex possibilities for secondary crops.

PRIMARY FUNCTION OF SECONDARY CROPS

UPWARD-supported research on sweetpotato conducted during the past few years highlights four kinds of primary functions:

- a consumption/nutrition function
- an income and employment function
- a sustainability function
- an equity function

Sweetpotato as nutritional and emergency food

"When you have rice to eat, don't forget sweetpotato"

Traditional Chinese saying.

"If you have a good harvest rice, don't betray sweetpotato"

Vietnamese saying.

In many of the cultures of Asia, sweetpotato has been an emergency food crop of first importance. Memories of this role from the Second World War are still fresh for many people and these emergency situations must have been a common pattern during the past few hundred years considering the level of colonial and dynastic conflicts which have characterized the region and disrupted the fragile hydraulic and human production requirements of rice. An UPWARD project recently examined this emergency food function in the aftermath of the earthquake in 1990 that devastated the northern Philippines mountain city of Baguio (Sano et al. 1991) and showed the rapidity with which people reverted to an old consumption practice and began to produce sweetpotato when the lowland supply of rice was blocked by landslides.

But this emergency or survival function is only the extreme case of a much more common and continuing function: <u>seasonal subsistance and a complementary nutritional role</u>. This function is highly dynamic in most cases. In rice-based cultures such as the Ifugao of northern Philippines, the size of the rice terraces in relation to household food needs is what has determined the size of the swiddens which are planted. With changing circumstances, including growth of the family, reduction of water availability as well as disruption of rice

production through conflicts so the contribution of the swidden and the sweetpotato crop varies.

Household production systems and family nutrition

Probably because of its low nutrient requirements, hardiness and perennial habits, sweetpotato is a favorite householdgarden crop in tropical regions of Asia where gardening is very widespread. Though region-wide data seems to be almost non-existant, a detailed study in one city in the Philippines found that of the approximately 30,000 households, 7740 households had gardens. The estimated area covered by the main crops grown was just over 100 ha., or an average of 131 m^2 per household. These same gardens contained 22,754 banana plants, just over 16,000 coffee trees and 13,240 fruit trees. Extrapolated to the Asian developing countries as a whole, this implies over 350,000 ha of cultivated land with millions of fruit trees. Were the area of sweetpotato found in the Philippines study to be replicated region-wide (which is unlikely), it would cover 27,000 ha. UPWARD has supported several projects which have both analyzed the dynamics of garden and the role of sweetpotato and also explored means to improve the contribution of gardens to household livelihood. The primary contribution is via nutritional supplements rather than through income generation[5]. Results from the collection of a Philippines-wide "minimum data set" on sweetpotato production and use, show that over 90% of sweetpotato grown in household garden is destined for household use (Francisco et al. 1993). A detailed survey of both rural and urban household gardens in the northern Cordillera region of the Philippines found that gardens functioned primarily as a supplementary food source, as feed source and only occasional income earner (Mula and Gayao 1991). More focused nutritional research into the contribution of sweetpotato to vitamin A needs of pre-school children showed how variable its role is depending on the season and the location (Verdonk and Vrieswijk 1995). In central Philippines, neither roots nor leaves make a contribution to vitamin A needs whereas they are of great importance in the northern highlands where the sweetpotato root is one of the major foodstuffs. Though sweetpotato leaves were not consumed in any quantity, probably because of the large choice of other green vegetables, the roots contributed more than 10% of total retinol equivalent score for some children.

Though lacking quantitative data, the results of surveys in both Sri Lanka and Nepal corroborate the finding that sweetpotato produced in household gardens is predominantly for home consumption, either by humans or animals.

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[5] Following Midmore et al. (1993), householdgardens are defined as "mixed croppings of fruits, vegetables, trees and condiments that serve as supplementary sources of food and income. They have a functional relationship with the homestead but are also found in pots, along fields and in strips along trail tracks, highways and canals (hence 'household' and not 'homegardens')" They are distinguished from "market gardens" which are increasingly common in the accessible parts of the northern Philippine mountains and on the outskirts of Chinese and Vietnamese cities for commercial production of vegetables for the urban markets.

Nutritional importance of sweetpotato in upland system

Generally, sweetpotato is not a large farm crop in any of the production systems in Asia. In the Philippines, commercial sweetpotato production tends to occur in farms about double the size of subsistence production, whereas cultivation area available in household garden systems for sweetpotato is understandably smaller (Figure 6)[6]. As can be seen in the figure, there is a slightly larger difference in the average size of area planted to sweetpotato in the upland and commercial systems in the Philippines, a situation also found in Thailand (Figure 7). In Thailand, whereas subsistence-oriented farms can be found, especially in the western part of the country, with more than 11 rai under sweetpotato, nearly two thirds of these type of farmers have five rai or less.

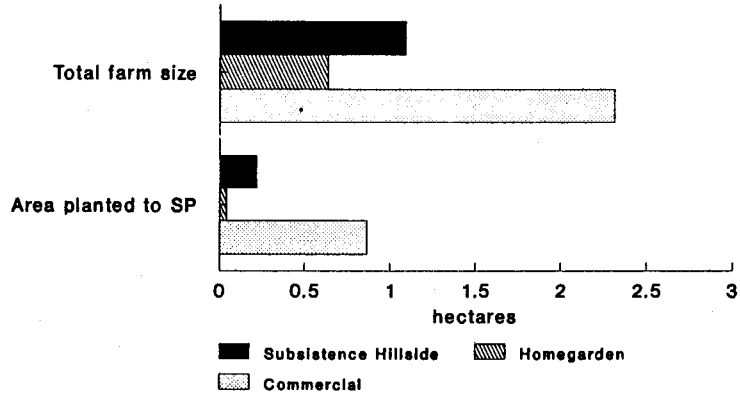

Fig. 6. Farm size and area planted to sweetpotato in different production systems in the Philippines

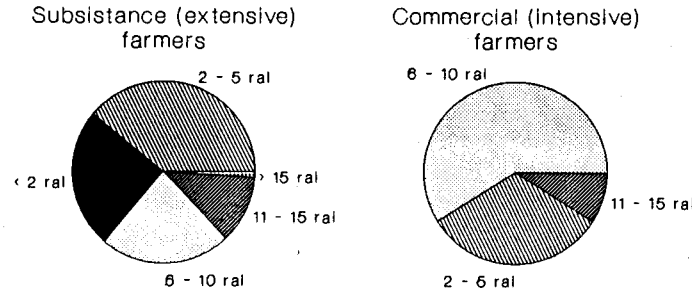

Fig. 7. Area of sweetpotato planted by different types of farmers in Thailand

[6] The high area shown here for total household garden size may reflect the inclusion of a number of very large rural gardens in this Philippine wide study.

In the humid tropical zone covering much of western Indonesia and the Philippines, common type of upland system which has been strongly associated with a subsistence function is swidden farming or shifting cultivation. As Emmanuel Lleva says of the northern Philippine hill areas, "Ifugao swiddens are an important expandable subsistence option when wet rice production is limited or threatened and rootcrops rather than rice provide the bulk of the daily diet in some areas" (Lleva 1991).

Balaki and Solimen also examine this substitute subsistence function in the context of northern Philippines swidden agriculture and like Lleva, their analysis recognized that this function is essentially flexible. They examine how the changing socio-cultural; and economic landscape has differentially affected this function. They show that in the pre-war period, rice was the ideal, not the real staple for many Ifugao households, because available rice terraces could only satisfy a variable but often small proportion of household food needs. Swidden farms represented the flexible response to the deficit and sweetpotato was a main swidden crop. Three main factors caused this situation to change significantly. One was the opening up of the area to vehicular traffic and hence to the arrival of rice imports from the lowlands. The second was the new income-earning opportunities from the road construction and other government schemes which injected cash with which to buy the newly available rice. Third, there was the arrival of new rice technologies, especially the opportunity to grow two rice crops in one year, thus increasing the productivity of the local rice terraces.

Growing rural population density, shifting demographic balances (less males for land clearing), a reduction in forested land and legal restrictions have all made swidden agriculture an increasingly difficult option for farming families and swidden crops including sweetpotato have become part of short-fallow upland rotation systems in many areas (Lleva 1991). From the point of view of household nutritional issues, these transformed systems have much in common with permanent upland rotation systems in sub-tropical areas such as the north Indian and Nepali terai, where sweetpotato is one of several secondary crops grown in upland areas for specific culinary niches (for example, as a breakfast food) and for contributing greater diversity to main meals (Koirala and Shah 1992).

A final, important aspect of the role of sweetpotato in household nutrition concerns not food but feed. As Peter Vander Zaag has pointed out, there is a very strong correlation in Asia between the cultural and culinary importance of pigs and the importance of sweetpotato (Vander Zaag 1991). The "pig belt" stretches through temperate and sub-tropical Korea, China, Taiwan and northern Vietnam; across humid tropical mountain Philippines, and right across Melanesia and Micronesia. Rosana Mula's study of sweetpotato production in northern Philippines shows that in some communities, sweetpotatoes are grown primarily for production of tops for the pigs Though pigs are consumed within the household, especially on special occasions the main purpose of pig-raising is almost always to earn income. This will be further discussed below, under the income function.

Consumption and nutrition in lowland, post-rice systems

Increasing commercialization of sweetpotato in countries such as Thailand, Sri Lanka and the Philippines appears to lead to the virtual disappearance of household consumption of the crop (Pituck 1991; Bautista and Vega 1991). Vietnam, however, is an exception, with quite intensive production in post-rice systems being associated with up to 25% of the harvest going for household consumption in some areas (Dang 1991).

The stagnation or decline in area planted to sweetpotato over the past twenty years (Figure 4), reflects a reduction in the role of the crop as a food staple in countries such as China, the Philippines and Indonesia as a result of increased productivity of grains, urbanization and other causes (Yen 1991; Vander Zaag et al. 1991). In China there has been a massive shift of use to pigfeed as economic development has made rice and wheat more widely available and increased demand for meat. Around 50% of total production is now estimated to be used in this way.

Research and development actions to enhance the nutritional and emergency food function

For enhancing the capacity of household gardens to contribute to household nutrition needs, there are several options. The homegardening project in northern Philippines (Mula and Gayao 1991; Gayao et al. 1993) is an excellent example of a research process: first understanding <u>how</u> householdgardens function then <u>improving the way they function</u> to contribute to household nutrition. Joint diagnostic activities between users and researchers led to a characterization and typology of householdgardens in the Cordillera and a documentation of functions and potential improvements. This led to formation of a partnership between women homegardeners and an interdisciplinary team of researchers to test some of the innovations which emerged from their dialogue, especially short-maturing, higher yielding and high-content Vitamin A sweetpotato varieties, new homegarden species and new techniques for multi-cropping, improved, low cost fertilization techniques and diversification of uses (Table 4). Details of the results of these activities after nearly two years are separately presented.

In another householdgardens project in central Philippines, user-based understanding of the needs of poor slum dwellers also led to the identification of a potential solution and thereafter to simple joint evaluation of alternative ways for improving soil fertility in sweetpotato "pot" gardens so as to give better yields of tops for vegetables. Treatments tested included human urine, household refuse and fish scrapings, with human urine proving to be the most effective (Villamayor 1992).

A number of the technologies found relevant for householdgardens can be applied also in subsistence-oriented upland production. This is especially the case with sweetpotato varieties and another project of Northern Philippines Root Crops Research and Training Center (NPRCRTC) is receiving technical support from UPWARD.

Income/employment function

A second primary function of secondary crops such as sweetpotato is to provide either direct income through commercial sales of the crop, or provide agricultural employment and hence access to an income.

Householdgardens and income

As already indicated, UPWARD studies of homegarden systems in northern Philippines have shown them to be mostly subsistence oriented particularly with regard to sweetpotato use. What remains unclear is whether food produced for subsistence in householdgardens can release money otherwise used for purchasing food, for disposal in other ways. Some results suggest that householdgardens may increase the range of foodstuffs eaten more than replacing basic foodstuffs that are normally purchased, although the Cordillera study referred to above did find that sweetpotato was sometimes substituted for expensive potatoes (Mula and Gayao 1991). Results from a consumption and nutrition study also in the Philippine Cordillera show that sweetpotato is often used as a rice "extender", when rice stocks are low (Verdonk and Vrieswijk 1993). However, it seems more likely that this is due to lack of money to buy additional rice rather than releasing money to buy other things. The work on pot gardens among impoverished slum-dwellers in central Philippines referred to already showed that some income was saved for other use. The results after five months indicated that several families became self-sufficient in sweetpotato tops (Villamayor 1992), presumably releasing money for purchasing other foodstuffs, though the amounts involved were very small (from as little as 4 U.S. cents a week to a maximum of $1.5). The author does not pursue this aspect, seeing the major issue, rightly, as the opportunity for increasing the intake of green leafy vegetable for a nutritionally at-risk population.

Income generation in upland production systems

The set of complex decisions about what to sell and what to keep from the harvest will be influenced by the complete interconnecxions involving climatic, agronomic and socio-economic conditions associated with risk, investment potential, family situation etc. and even historical events specific to the local area. UPWARD has encouraged researchers to understand how the users themselves perceive climatic variables and socio-economic conditions and how these perceptions lead to the particular decisions they make. As we have seen, there is considerable variation in types of upland systems both within and between climatic zones and research has so far been carried out on only a fraction of this diversity. There is also variation in the type and quality of documentation achieved by different researchers for the few systems studied. This means that any synthesis will of necessity be very tentative.

Table 5 compares perceptions, practices and outcomes of four different types of upland production system. The Philippine Cordillera swidden system is typical of the subsistence end of the upland production spectrum. Very similar circumstances can be found in other parts of highland Philippines (e.g. amongst Aytas in the hills of central Luzon as

documented recently by Mendoza (1992), and in elevated areas of the humid tropics and mountain agroecologies outside the Philippines, in Malaysia and Indonesia (cf. Schnieder 1993). In northern Philippines and Irian Jaya sweetpotato is the predominant swidden crop. In other areas upland rice or corn is the major crop with sweetpotato and other rootcrops following the rice or sometime intercropped with it. The major investment in swidden agriculture is the initial clearing of the farm. Thereafter, very few input are used. As the table indicates, sales are sporadic but important, used to purchase needed household goods such as salt, oil and sugar.

The other three cases compared in the table are of semi-subsistence farming situations where sweetpotato is undergoing some significant degree of commercialization, In the sub-tropical lowlands of western Nepal, sweetpotato is perceived as a relatively low-input, potentially profitable crop (Koirala and Shah 1991; Shah 1992). It is most commonly planted towards the end of the rainy summer season, always in upland areas and often after maize. It is fairly labor-intensive crop, especially in areas that have been fallowed and developed a thick grass cover. To avoid weeds overwhelming the crop, a seven or eight centimeter sod is turned in the manual land preparation.

Planting material is a problem in the sub-tropical zone where harvest is followed by a dry, cool winter. In the Nepali terai, nurseries are sometimes planted using storage roots, or planting material is purchased, a clear indicator of commercialized production. Nevertheless, there is frequently insufficient available, limiting planted areas. In parts of the terai areas of prepared land are left unplanted, for want of planting material. Apart from the planting material no other purchased inputs are used and no farmers commented on degraded soils. It appears that fallowing and perhaps also rotations with peanuts maintain fertility.

The main harvests coincide with two important festivals in which sweetpotato features as one of the offerings to the festival god and this provides considerable seasonable demand. Nevertheless, the non-acceptability of the crop as vegetable limits its forms of utilization. Though an average net annual income of $35 from sweetpotatoes in Nepal may seem very modest, with a national per capita GNP of only $170, it actually represents a surprisingly significant portion of rural income.

Northeast Thailand lies in the semi-arid region of Asia also covering southern Laos, Cambodia and large parts of central and southern India. The study of this area was conducted in a more conventional survey-based manner, with a focus on the <u>what</u> rather than the <u>why</u>, so that perceptions of users are less easily identified (Pituck 1991; Wongsamun and Ayuwatana 1988). This is one of the poorest areas of Thailand, with limited rainfall (about 1000 mm per year) and rather poor soils. Sweetpotato needs less rain than many other crops and is liked for that reason. It is most frequently planted toward the end of the rains in November, after maize, soya, vegetables, peanut or tobacco in the uplands and after rice in the lowlands. Some farms only plant sweetpotato.

Though these are relatively poor farmers and sweetpotato is considered low input compared to other crops, more than half of farmers nevertheless apply fertilizer and over a

quarter insecticide. Preparation of ridges by the majority and weeding by about one third of farmers makes it also labor intensive for some families and seems to be perceived as "hard work", with labor shortage cited as one problem. Production persists into the dry season leaving the crop very vulnerable to sweetpotato weevil, considered the major problem. Though pesticides are primarily used against the weevil, the more effective strategy here as in the northern Philippines is early maturing varieties and early harvesting.

It appears that the degree of commercialization of the crop is quite variable from locality to locality. The UPWARD study records that 96% of farmers sell all their crop, whereas a regional University study suggests that from 30-90% of the crop is sold, depending on the area. For the type of production system, with piecemeal harvesting and local sales, variability in marketing seems most likely.

In both the Nepali terai and northeast Thailand, sweetpotato is one of a number of secondary crops being commercialized in different degrees. In the last example in central Philippines, which is again located in the monsoon-type humid tropics, sweetpotato is a secondary crop from the point of view of subsistence, but has become the major commercial crop. In contrast to the swidden system described earlier, the upland area in southern Luzon, Philippines has become permanent field agriculture, with banana and coconut-based agro-forestry mixed in (Orno 1992).

The main perception of the crop is its low risk, high return character, attributed to low inputs. Yet this situation is changing, mainly due to the continuous cropping which is rapidly degrading the upland soils. Use of inorganic fertilizer is recent and its purchase is leading some farming families into indebtedness and unprofitable market tie-ups (Bagalanon 1992). Average earnings of ten case households was $565 in 1991, with a range of from $305 to $1280. Per capita GNP in the Philippines at the same time was $730. Yields are considerably better than in Nepal or northeastern Thailand.

Cost/benefit data was only collected for the Thai case. Averaging the differing costs and prices in different parts of northeast Thailand, costs of production of one hectare of sweetpotato is estimated to be $309. On the basis of average yields of around 8MT/ha and a farmgate price in 1990 of 12 cents/kg, profit per hectare is about $650 per ha. Per rai (1 hectare = 6.3 rai), which is fairly common size of sweetpotato farm in the area, profit is about $106. It gives a high benefit/cost ratio of 3.2 according to these figures.

Table 5. Sweetpotato in upland production systems.

	Cordillera, Philippines swidden system	**Nepal *terai* annual rotation**	**Northeast Thailand annual rotation**	**Southern Luzon, Philippines upland continuous cropping**
Agroecology	Humid Tropics/ Highlands	Sub-tropical Lowlands (Cw)	Semi-arid Tropics	Humid Tropics
General Perception of sweetpotato crop	A traditional crop, a subsistence crop. Supplement to rice. A seasonal staple.	No other crops competes on benefit/cost ratio, especially under sandy rainfed soil conditions	Takes a lot of work	Like saving in a "piggy bank. With family labor, nothing to lose but more to gain. Less chance of losses; less inputs.
Perceptions of problems	Weevil, Rodents, Scab	Supply of planting material; rodents, quality of varieties. Demand (SP not acceptable as vegetable).	Weevil and worm; labor shortage; costs of production, soil quality	Cost of fertilizer. Low incidence of other constraints
Cultivation style	Minimum tillage; use of ash from tree burning as fertilizer; some use green manure (sunflower); intercropping; hand weeding; wide range of varieties	Mostly manual land prep.; hand harrowing; ridging; no fertilization; hand hoe weeding one time; intercropping; only two varieties used	Land prep. with animal (63%) or machinery; ridging; use of basal fertilizer 15-15-15 (63%); hand weeding (34%) or zero weeding; monocrop (?); wide range of varieties	Land prep. first by hand then with animal; two ploughings; harrowing by hand; all manual preparation in steep areas; use of inorganic fertilizer (21-0-0) plus urea; monocrop mostly, some intercropping; two varieties
Responses to problems	Early harvesting to escape weevil; rat poison in some areas, but other consider bad omen; removal of diseased leaves; rituals	Maintain nursery; purchase vines (100 kg $2-10)	27% apply insecticide; early harvesting; use of fertilizer for soil quality; no vine turning to save labor; though recognize benefit of this.	Credit for fertilizer
Yields	Low yields attributed to variety, depleted soils and changing climatic conditions	Average 9 MT/ha Range 2-15 MT/ha	Lowest in country average = 7.8 MT/ha	8-13 T/ha
Income	Only when there is surplus. During lean months, to purchase household necessities.	Single harvest 60% sold. Average gross income $45/annum from sweetpotato (NS per capita GNP $170)	Piecemeal harvesting for consumption and sale. 30-90% of production sold to market. Average annual gross income = <$20.	Two to three staggered harvestings. Most sold as main income source for 84% of sample. Average earnings of cases households $565 per annum from SP.

Income generation in lowland, post-rice systems

Sweetpotato is grown post-rice in the humid tropics of the Philippines, Indonesia and Sri Lanka, in the semi-arid tropics of central Thailand and south Vietnam and in the sub-tropical lowlands of northern Vietnam. It is almost always grown commercially in this system, except in Vietnam where some production is semi-subsistence or primarily for domestic pig-raising. Since no UPWARD projects have as yet studied the systems in the Philippines or Vietnam in detail, the discussion here will concentrate on central Thailand and central and southern Sri Lanka (Table 6).

Cost/Benefit

In Sri Lanka, sweetpotato is perceived as a low-cost, relatively high return alternative to rice in areas where irrigation water is only available for rice in alternative seasons or more rarely, where the economic attractions of the crop are regarded as superior to rice. Intensive cultivation of sweetpotato in central Thailand is clearly related to the relatively high returns expected, but no specific comments of farmers were recorded. In Sri Lanka, apart from the use of animals in land preparation, other preparations such as harrowing and the preparation of high ridges out of green manure (in Rajangana) are manual operations and very labor intensive. Despite the costs of ridging (labor costs are about 80% of total costs) they are needed to avoid danger of flash flooding experienced in both central and southern Sri Lanka. In Thailand a high percentage of farmers use machinery for land preparation, perhaps reflecting the labor shortage experienced there. Hand-weeding occurs in both areas and both apply quite high levels of inorganic fertilizer. Two varieties dominate sweetpotato agriculture in Sri Lanka and in central Thailand, though five distinct varieties were identified in the area, two occupied over 90% of the area.

In response to the problem of weevil, which was reported by more than two thirds of farmers in one area of Sri Lanka to reduce yields by 15% or more, there is quite heavy investment in pesticides, though with reportedly poor results. Other management measures appear to be more effective, such as the careful screening of planting material and the flooding of fields when water is available. The worst infestation occurs in those fields which are continuously cropped, even though farmers also take care to remove old vines from the field and do not incorporate them as green manure. In Thailand there is also heavy use of a range of pesticides by all of the sample farmers and there is also flooding of fields before planting. To overcome the problem of shortage of planting materials, a great deal of attention is given in both areas to cutting and preparing vines. Long vines are taken from the field and both terminal and intermediate pieces used, even though the latter are recognized as likely to yield less. Purchasing of vines can occur in both main lowland areas, though sales may be restricted to farmers within the immediate vicinity, in central Sri Lanka, to limit commercial competition for markets.

In both sites there is very little if any use made of the harvest for household consumption. Single harvesting is practiced, in Sri Lanka organized and paid for by the trader and in both cases part of a metropolitan marketing system.

Table 6. Lowland post-rice system.

	Central and Southern Sri Lanka	Central Thailand
Agroecology	Humid tropics (monsoon)	Semi-arid tropics
General perceptions of crop	Low production cost compared to rice or vegetables, low water requirement	
Perceptions of problems	Weevil infestation; scarcity of planting materials; scarcity of water	Weevil infestation; labor shortage; planting material shortage
Cultivation style	Rotated with rice and vegetables in 3-4 year cycle under water shortage conditions, or continuously cropped as alternative to rice. Land prepared using animals. Manual harrowing and ridging. Two main varieties: Fertilizer (basal, top dressing) commonly used. Hand weeding	Machinery for land prep. (76%) Ridging in paddy fields. 70% irrigated. High use of fertilizer (76%). Hand weeding, Five varieties, 2 occupy 90% of sample area.
Response to problems	Sweetpotato planted to overcome water shortage. Against weevil use pesticide. Take care in selecting insect-free vine for planting also flooding field. Careful selection and cutting of vines to maximize quantity of planting material. Purchase of planting material. Double use of irrigation water (rice-sweetpotato).	Flooding of fields before planting to reduce weevil. 100% use of insecticide. Use of intermediate as well as terminal cuttings. Three quarters hire labor.
Yield	Variable by season and areas. Highest after rice crop = 17 MT/ha	Majority less than 10 MT/ha
Sales/Income	No farmer kept more than 5 kg for consumption. Harvest sold to trader who arranges harvesting and sale. Average net income of $1175/ha	Almost all sold at single harvest to wholesale traders for Bangkok. Average gross income from sweetpotato over $1200/annum

Rural employment through sweetpotato farming

Householdgardens, almost by definition, involve only family and usually female household labor and therefore make no contribution to the generation of salaried employment in either rural or urban areas. Women (and children) commonly combine gardening activities with collection of foodstuffs for cooking, often in the late afternoon. The implications of householdgardens and their development for household labor allocation and the position of women will be discussed in a later section.

Agriculture is still the main form of rural employment in Asia, but labor utilization in particular crops is variable through the cropping season. Sweetpotato is considered by some upland farmers to be a crop demanding relatively little labor, compared for example to rice. Nevertheless, certain activities such as clearing of swiddens in shifting systems and land preparation, ridge-making and even irrigation[7] in lowland systems make quite high labor demands.

Upland systems usually involve predominantly household labor and this is especially the case in the Philippines. In Thailand upland, extensive farms are more likely to hire labor (Figure 8). This suggests that greater commercialization brings with it increased demand for hired, labor, but other, country-or-region-specific factors which could be cultural or demographic, can accelerate or impede this process.

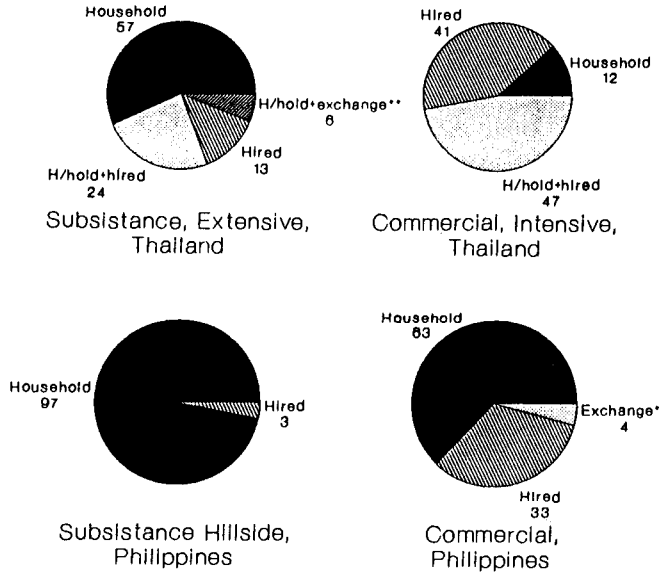

Fig. 8. Type of labour utilized in different sweetpotato production systems in Thailand and the Philippines*

* Note, different categories of labour were used in two studies
**Reciprocal exchange between households

[7] In south Vietnam, hand-watering of the sweetpotato crop during the dry season makes sweetpotato more labor-intensive crop than rice (Bottema 1991).

Research development to enhance the income-generating function of sweetpotato

Given the stagnation in sweetpotato production trends and the well-documented income in elasticity of the crop, it may seem curious that only in Nepal did farmers perceive market demand as a problem associated with sweetpotato production. In fact, most of the production areas studied in both upland and post-rice systems satisfy a local, regional or metropolitan market niche. Even in Nepal, the convergence of the main harvesting time with two religious festivals in which sweetpotato is used offers a particular demand niche, at least for some producing areas.

The swidden and permanent field systems of the Philippine Cordillera described by Rosana Mula are the exception among the cases studies in their lack of market orientation, but they may be the rule in large parts of Asia. Secondary crops have the potential for different primary functions, but only some of those functions may be realized under particular circumstances. As we saw above, sweetpotato, because of its agronomic and adaptive characteristics is a high appropriate emergency or supplemental source of nutrition. In the same way, the crop can be successfully exploited as an income earner. The fluctuations in macro-level production trends over the past twenty or thirty years may well reflect the opportunistic way the crop is utilized for commercial purposes. Of course, the gradual erosion of demand for the fresh product with growing urbanization and income levels, means that the long term potential for commercial exploitation will be through processing rather sale of the fresh roots.

What can we do to improve the potential the crop already enjoys as an income earner? A major problem encountered in the sub-tropical lowlands, the semi-arid tropics and even in parts of the monsoon-type humid tropics concerns the maintenance and multiplication of planting material from season to season. As already mentioned, fields planted to sweetpotato in the Nepali terai have sections left bare because sufficient planting material could not be produced or bought. In Sri Lanka, intermediate cuttings are used though their quality is regarded as inferior. There are several opportunities for more focused, participative research on this problem. Two UPWARD projects are beginning to study in detail the conservation and generation of planting material by sweetpotato producing households, both in terms of the conservation of genetic diversity from one season to the next and in terms of the maintenance of productive capacity over time.[8] More studies of this type are needed in the sub-tropical lowlands. In China, farmers are spontaneously adapting the use of plastic covered seedling beds used by vegetable growers to increase the volume and velocity of production of sweetpotato slips (Prain 1993).

At the same time, results coming out of studies done by both CIP core projects and SAPPRAD evaluating different clones on performance of different kinds of cuttings planting

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[8] Maria-Luz Fang-asan and Rosanna Mula, The dynamics of the household "seed bank" in seed supply and variety maintenance in Bayyo, Mountain Province. Belita Vega and Joe Bacusmo, Community-based sweetpotato genebanking and distribution system. Micro experiences in managing Philippine local resources for sustainable development.

density should be included with households who have already been involved in these focused documentation studies.

A second research and development opportunity exists in "learning to live with the weevil" as farmers in southern Philippines have put it. No plant host resistance to weevil is as yet on the horizon, so we should pursue more vigorously the same multifaceted management strategy which farmers themselves have been using. A focused study in the Philippines led by Dr. Manuel Palomar has already been studying in detail the local knowledge of pests and diseases and local control measures where they have been taken as an essential prerequisite for action research.

A number of options are available, including the introduction of short-maturing varieties which would be particularly appropriate for sub-tropical lowland and semi-arid areas where sweetpotato is planted at the end of the rainy season, and weevil vulnerability increases the longer the crop remains in the ground. Other IPM components need to be combined with local practices and evaluations made by researchers and farmers.

Finally, almost no attention has been given in UPWARD project so far[9] to the use of sweetpotato roots and vines as livestock feed. Meat consumption is growing rapidly in many Asian countries at the same time as consumption of starchy staple declines. There are obvious opportunities for rural income growth through use of sweetpotato in this way, and we urgently need to address the issue.

Sustainability function of sweetpotato

The contribution of sweetpotato to income generation and employment discussed in the previous section also involves its contribution to the sustainability of agricultural systems, since system sustainability depends on socio-economic as well as environmental resilience. This section looks at the contribution of sweetpotato to maintain system productivity in the face of environmental shocks or stresses (cf. Conway and Barbier 1990). More broadly it considers how a particular combination of a secondary crop, production system and the knowledge and practices of different users and other actors contribute or not to the sustainable use of particular environments for agriculture.

Householdgardens and sustainable agriculture

Householdgardeners in the Philippines have cited several physiological and agronomic characteristics of sweetpotato which make it a common choice for gardens in Asia: a low nutrient requirement means it can adapt even where soil cover is thin and of poor quality; its perennial habits also means that it can be maintained over several months or even years with occasional priming and very little tending, providing there is sufficient moisture year round (Mula and Gayao 1992). Resilience and ease of growing seem to be crop attributes

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[9] A project began in September 1994 in Vietnam with an explicit focus on use of sweetpotato for feed.

particularly sought after by urban gardeners, but in addition the combination of crops is important to maximize use of horizontal and vertical space. Sweetpotatoes are favored by some gardeners because of their adaptation to microniches: they can grow on stone walls and under certain kinds of trees and shrubs (Mula and Gayao 1991). The adaptation of sweetpotato is also related to its duel purpose, as source of green vegetable or forage and source of carbohydrate. When it grows on stone walls it can provide a good supply of tops for human or animal consumption.

Rural gardeners who also own farmland exploit the microniches to maintain planting material of distinct varieties for future planting and this is where the production system and crop characteristics combine with the ingenuity of farmers to sustain the biodiversity of several production systems.

The sustainability of upland production systems

The contribution of sweetpotato to sustainable production practices is so far contradictory, according to evidence accumulated by UPWARD projects. The three issues about which controversy still persists are: the low nutrient requirements, low moisture tolerance and high salinity tolerance of the crop; the capacity for soil erosion prevention; the capacity of sweetpotato for "soil conditioning".

User comments on the relatively low input needs of sweetpotato have been recorded in several projects and were referred to in Table 5 and in the previous section. The history of swidden agriculture indicates that with minimum fertilization, using natural fertility plus the ash from burnt trees and undergrowth, normally fallowed swiddens yield acceptably (Conklin 1957). However, more recent evidence from upland areas which have been converted from shifting agriculture to permanent field systems, continued planting with sweetpotato will certainly deplete the soils and lead to reduced yields (Orno 1992).

Sweetpotato has also been cited as a useful defense against erosion. This claim is relative of course. A number of UPWARD studies in the northern Philippine mountains have commented on the contribution of sweetpotato farming to large scale erosion through the clearing of forests for slash and burn agriculture (Lleva 1991; Balaki and Solimen 1991). In the context of already deforested cropland, however, sweetpotato appears to have a more positive role. Campilan, in an UPWARD-supported study on natural resource management in the Philippine uplands (Campilan 1995) examined the use of sweetpotato and other practices in erosion prevention and fertility management in a community in central Philippines. He identified a range of indigenous and introduced practices (Table 7). The study shows that those practices which have been fairly consistently applied as a response to the fertility problem have been indigenous - particularly those based on use of sweetpotato - whereas the recently introduced practices have had little adoption. The study analyses the technical, communicational and institutional issues involved in these local choices, finding that technical advice and communication is mainly farmer-to-farmer, with the official agencies working through a small and rather unrepresentative cooperative. Joint validation of these practices via on-farm trials would be a logical next step.

In the study by Orno (1991) 87% of farmers claimed that sweetpotato protects the soil from erosion. The study used a crude erosion measuring device based on a calibrated post located where soil erosion was to be expected. This itself is a version of farmers' own means for estimating erosion (Figure 9). Rainfall measuring equipment was also installed. On the basis of measurements, a one hectare field of newly planted sweetpotato on a 15 to 45% slope could lose up to 200 tons of top soil, equivalent to the top 2 cms. After establishment, (about six weeks), this erosion was reduced by half. Unfortunately, this study did not compare the effects of other crops on soil erosion, so that it is not possible yet to cite the specific advantages of sweetpotato as compared with other crops.

A final point concerns the claim that sweetpotato can act as a "soil conditioner". A number of UPWARD studies have reported the observation of farmers on the capacity of sweetpotato to improve the "condition" of the soil (Sano 1991). However, there seems to be two meanings of "conditioning": the first refers to texture and the second to fertility. A number of the studies, for example the work conducted in Irian Jaya, reports that sweetpotato cultivated before vegetables helps to produce a well broken down soil in which the vegetables thrive (Sawor et al. 1993). Sweetpotato is also associated with reduction of weed growth which could also be regarded as improving soil condition.

Effects on soil fertility are more ambiguous, and farmer observations can sometimes be misleading. Campilan reports, for example, that farmers in southern Leyte, Philippines considered sweetpotato as more effective than peanuts in "conditioning" the soil, but it turned out than the peanut plants were removed from the field at harvest, thus removing much of their potential for adding fertility. Uncertainty also exists among the same group of farmers in the central Philippines. Whereas 85% felt that the reincorporation of sweetpotato vines returns a large amount of nutrients to the soil, 70% of the same group also felt that declining sweetpotato yields signified that the crop was depleting the soil. A recent edition of ICRAF's newsletter (TELICRAF 1992) reports the potential of sweetpotato to "enrich" the soil and some literature is cited. Though unresolved, this issue certainly merits further attention, and seems particularly appropriate for a combined user-researcher approach.

The sustainability of lowland, post-rice systems

The addition of low-input short-maturity crops to rice-based systems is now considered a major priority by many Asian countries and sweetpotato is expected to play an important role in this (Manwan and Dimyati 1989). In rainforest climate areas such as Indonesia, where diversification is sought as Government policy but where irrigation gives farmers considerable flexibility, at least in many parts of Java, farmer interest in sweetpotato as one of the diversification crops will only be sustained if there is either a household demand for the crop as food or feed, or there is a market. Given relatively low demand for the fresh root as food (Watson et al. 1991), the identification of a processing niche for sweetpotato may be a necessary precursor to its spread and adoption as a diversification crop.

Table 7. Indigenous and introduced practices for soil fertility management and erosion control, Matalom, Eastern Visayas, Philippines.

Practices	Description	Benefits	Problems
Indigenous practices			
Contour grass strips	Strips of soil left unploughed and grass (esp. *Imperata cylindrias*) allowed to grow	Soil erosion control on slopes. Labor saving. Adapting "weeds"	Degree of efficiency?
Fallowing	When production is observed to decline and is left uncultivated for 4-6 years	Renewal of fertility disappearance of diseases and pests	Land shortage
Guano Fertilizer	Collection and use of the dung of birds and bats which accumulates in caves	Cheaper than commercial fertilizer easier to apply than compost	Extraction is time consuming. Access to caves difficult and dangerous
Rock walls	Use of limestone rocks to build wall to impede the loss of top-soil via erosion	Cheap	Efficiency not fully understood. Labor intensive
Crop rotation	Planting of different crops in determination sequence between fallow periods	Control of pests and diseases through elimination of hosts plants. Exploits crop interdependence	
Intercropping/ relay cropping	Combining particular crops - especially upland rice or corn with sweetpotato and corn with peanuts - in the same plots	Optimizes land use. Maintains soil cover to avoid erosion. Increases absorption of vegetative matter	
Indigenous Sweetpotato-based practices			
Cover-cropping	Planting of sweetpotato at onset of rains, as relay or intercrop	Barrier to sheet erosion during heavy rains. Protects soil surface. Prevents moisture loss. Less tillage. Weed suppressant	Effectiveness is limited by slope and extent of rains. Cannot totally eradicate erosion
Mulching	Use of high level of biomass for incorporation as green manure or use as compose	Cheap and abundant source of organic matter	Sweetpotato weevil can be propagated from season to season
Nutrient Pump Function	Deep roots of sweetpotato help recover nutrients leached from topsoil and make available for succeeding crops	Improve the returns from cash crops planted after sweetpotato. Revive soil fertility at the end of a cropping cycle	
Introduced Practices			
Composting	Collect (not burn) vegetative waste, Gather in one place for decomposition	More efficient use of vegetables wastes. Cheap source of fertilizer	Process slow and long-term. Labor intensive. Need for high volume compared with inorg. fert.
Tree Planting	Planting of ipil-ipil, yemane and madre de cacao for long-term use as timber and firewood	In short/medium-term, erosion prevention, aesthetic improvement, and ag. use	Short-term food needs not met by trees. Trees planted in public areas what benefit to households? Insecurity tenure makes farmers unwilling to plant perenials
Contour hedgerows	Planting of leguminous tree species as hedges along contour lines	Slow down flow of water. Trap eroded soil. Enhance formation of terraces. Contribute N to soil	Hedge species recommended not useable as food. Practice complicated, laborious and time-consuming. Difficult and expensive to obtain tree seedlings.
Mura Grass	Use of mura grass (*Vetiver* sp.), common in lowlands on rice bunds. Can use instead of legum. tree species for hedges	Plant materials more readily available than legum. species	Time needed to obtain planting material from lowlands. Cannot be used as food. Needs plenty of pruning

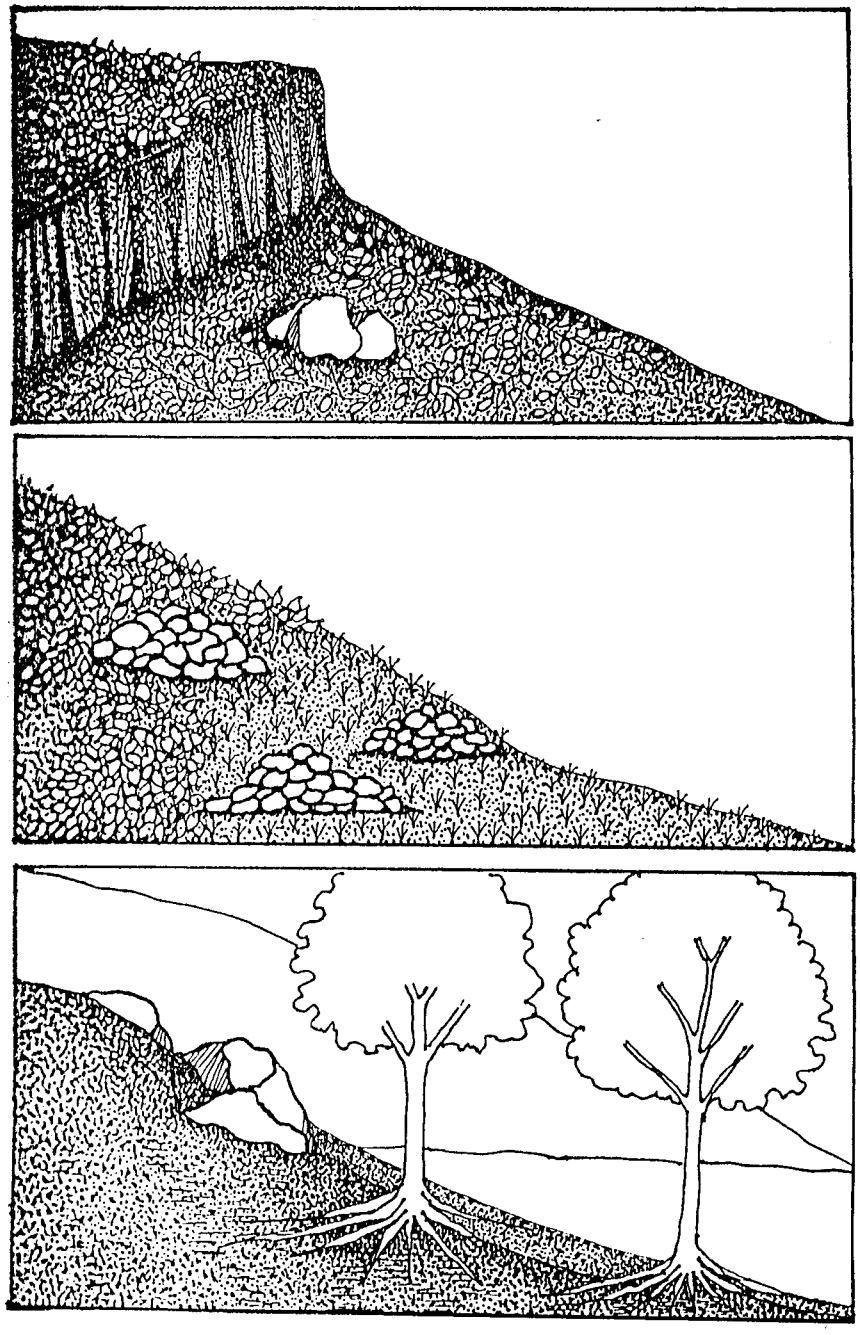

Fig. 9. Indigenous indicator of soil erosion and soil losses
a) formation of "kantil" or soil cut in a slope,
b) surfacing of stones c) root of trees

In semi-arid and monsoon climates where irrigation is less secure, the characteristics of sweetpotato may make it more attractive for planting towards the end of the rains, though the issue of a market will still arise. In sub-tropical lowland areas such as Vietnam and China where agroecological factors also make sweetpotato an attractive option from a cropping systems perspective, household demand for pig feed of which sweetpotato is a major source is an added economic incentive to include the crop. The incentive is likely to rise in the future as increases in urban salaries lead to increased demand for meat.

There are several other less encouraging elements in these systems which raise questions about their sustainability. Even though sweetpotato is a low-input crop, there seems to be increasing use of both fertilizers and pesticides with greater intensification of the system, as in central Thailand and central Sri Lanka. In Thailand farmers express worries about the health effects of some of these pesticides - Furadan, now banned in many countries, was the most popular brand, with up to ten applications made in the central region (Pituck 1991).

In Sri Lanka, the intensive cultivation of sweetpotato in the central region is dependent on a currently buoyant metropolitan market. But the farmers themselves seem to recognize the possible inelasticity of that market by the practice of limiting the exchange of planting materials to within a very narrow, close kin circle, thereby limiting the supplies reaching the market. A research initiative which addressed the problem of shortage of planting materials may eventually contribute to depressing prices and making the crop non-profitable.

Enhancing the sustainability of production systems

One of the advantages of a user perspective approach is the possibility it offers of a complex, holistic understanding of problems and therefore a better chance of identifying appropriate solutions which mobilize the interest and skills of those directly involved.

Loss of soil fertility in the uplands of central Philippines under continual cropping with sweetpotato was found to be doubly unsustainable: the natural resource base was being depleted and attempts to arrest that depletion using fertilizers often led farmers into the credit trap: cash advances from traders in return for guaranteed, reduced-price sales of the harvest. Reduced profits from the harvest led to increased dependence on credit or reduced ability to purchase adequate quantities of fertilizer. The second, action phase of the UPWARD project working in this area has two components (Bagalanon 1992): a focused documentation of local concepts and perceptions of soil fertility issues including documentation of indigenous conservation techniques now largely abandoned; the engagement of local farmers in participatory trials to evaluate alternative, cheaper fertilizer practices, including use of green manure and biofertilizer. The aim of this phase is not simply to "transfer" the novel technology of biofertilization. It is to attempt, through both components of the project, to develop an alternative perspective on soil fertility which resuscitates some of the local practices now abandoned.

The sustainability of upland production systems can also be enhanced through looking more carefully at the communication aspects of technology development (Campilan 1993). Enhancing the sustainability of particular ecosystems can mean different things to different actors and be valued differently. By examining the "knowledge systems" of actors involved in a particular problem situation can help to clarify different options for change and to build a consensus about what changes are needed and how to implement them. These "soft systems" aspects of sustainalbe agriculture are at least as important as the biophysical aspects and should be pursued in other projects.

Other initiatives needed include more detailed study of the effects of sweetpotato on erosion, in comparison with other crops and a more systematic look at the claims that sweetpotato is a soil conditioner.

The equity function of sweetpotato

Sweetpotato, in common with other secondary crops can be important additional resources for marginal, low-income families and as such contribute towards reducing inequalities within the rural population. In other words secondary crops can be a modest source of power to less powerful segments of the society. In the following discussion, we will focus attention on the implications of secondary crops for women, though there are other segments of the population, for example the rural landless, which need also to be addressed.

Householdgardens

Householdgardens are the preserve of women in most parts of Asia and those close to the residence are tended almost as an extension of the kitchen[10]. Their contribution to a woman's position seems to be mainly in terms of greater flexibility and independence in provisioning the family. In some cases they may also offer some financial flexibility in that some of the products from the garden can be sold. This seems to be more likely in rural than in urban gardens where the area is usually so small that there is little income-generating option. Tree crops such as jackfruit, pomelo, cashew and coffee seem especially important as a seasonal source of cash for women. Other advantages which gardens offer women is social, psychological and aesthetic space within the household, her own area in which to be with her children, her friends and herself. Thus, the garden itself as well as particular crops can potentially enhance the power of women. The efficiency and popularity of the crop for use in householdgardens makes it an indirect contribution to greater equity.

Upland systems

The benefits to women of upland farms, especially swiddens and of sweetpotato as one of the commonest swidden crops was very clear in the past. Priming of the fields was usually done by women, giving them the option of obtaining small amounts of cash from occasional sales to

[10] It is not clear whether women are also primarily looking after the crops growing on rice bunds, riverbanks and other farming margins which are also included in the notion of "householdgarden".

purchase household needs (Mula 1993). Unfortunately this "upland empowerment" has been pushed to unsustainable extremes in many situations through demographic and socio-economic changes. Male outmigration in some parts of the Philippine Cordillera has led to loss of labor for land clearing and the adoption by the women who remain of the only alternative to cultivate the upland plots: reoccupying farms after a short fallow period where regrowth is very limited and clearing easy. This leads to declining yields, increased likelihood of erosion and a decline in the cash-earning potential of the field.

Increased levels of market integration can result in fields being transformed from swiddens to permanent upland, with continuous production or rotations and greater levels of purchased inputs, as with the appearance of vegetable farming in many hill areas of the region. In these situations there is a clear pattern of increasing male control of farm operations.

Enhancing gender equality through R&D on secondary crops

The partnership developed with women gardeners in northern Philippines to test new technology and now the cooperation with other agencies to multiply the potential benefits of gardens to poor households and to women in particular, can serve as a model for other research actions.

With the shift to male control in more commercially oriented farm operations, one option for supporting greater gender equality is not on the production side but through stimulating and backstopping the establishment of small household processing enterprises. Experiences both in the Philippines and in Vietnam suggest that women are as quick or quicker to take up the challenge and the potential benefits of such an activity. These issues are discussed elsewhere in this volume.

CONCLUSIONS

This paper has attempted to summarize the rich trawl of reports which UPWARD projects have generated on the role of sweetpotato in the production systems of developing Asia. Stretching from the eastern parts of Pakistan across the Himalayan mountains to the temperate north of China and as far south as the island of New Guinea and eastwards to the Philippines, this is a vast and vastly variable region. Using simple climatic paramaters to help order this variability and the evidence from UPWARD studies to cluster the data further into three major production systems, it has been possible to look in some detail at the differing role of sweetpotato within and between these systems in different climatic zones of the region.

Though my focus has been on the agricultural production side, our concern is always with the perspectives which the users of agricultural technology have on production. This means we must ask about the purpose or function of production and of the crops involved in the production system. Using the fertile suggestion of Gelia Castillo about the primary functions which many so-called secondary crops fulfil in different production systems, the reports of UPWARD researchers have shown us the tremendously flexible role which sweetpotato plays in the systems and zones of the region. One particularly important finding is

that this flexibility exists in both space and in time. Over time, depending on emergent stresses, disturbances and shocks to the existing system, sweetpotato can be called into greater or lesser play in one or other of its various functions. This makes it a very sustainability-friendly crop, if by sustainabilty we understand the ability of a system to withstand stresses and shocks.

But research has also shown the association of sweetpotato with deteriorating upland systems and an ambiguousness in the relation of the crop to soil fertility. We have also noted the declining demand for starchy staples making its income-earning function less dependable in the long term. These findings underline the need for further participatory assessment of the sustainability function of sweetpotato under different systems and agroecological conditions and they also emphasise the need for expanded attention to the potential for processing both roots and vines into alternative forms of food, feed and industrial products so that sweetpotato can continue to be a flexible resource for generation of rural incomes.

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FROM DIAGNOSIS TO ACTION RESEARCH: THE CASE OF SWEETPOTATO HOMEGARDENS IN NORTHERN PHILIPPINES

Betty Gayao

Five years ago urban sweetpotato homegardens were never thought of as a research and development area of Benguet State University and the Northern Philippine Root Crops Research and Training Center. Gardening in the city or urban agriculture was unknown or merely taken for granted. However, the results of an agricultural barangay profiling survey conducted in Baguio City (1989) pointed out the importance of backyard food production.

Backyard food production has been practiced in the Philippines for a long time. It is clearly one of the most enduring forms of cultivation. This long history, the changes in location, function and the kind of crops grown have given rise to a diverse nomenclature in English - "kitchen gardens", "mixed gardens", "backyard gardens" - and in local languages - "baeng" (Ibaloi), "ba-angan" (Kankaney), and "minayungan" (Ilocano), which suggests a high regard for homegardens.

Homegardens can consist of just a few square meters or a fairly large area, which traditionally has involved mixed cropping of fruit trees, vegetables, condiments and ornamentals that serve as supplementary sources of food and income. In addition, their role in providing food security, improving nutrition, generating savings and employment, as well as in the inculcation of good habits and values such as self-reliance, cooperation, patience, industry and humility, cannot be overemphasized.

Urban Agriculture in Baguio City

More or less 27% of the total household population (36,533) in Baguio City is engaged in backyard agricultural activities, such as vegetable gardening and swine raising (Table 1). Almost all of those engaged in swine raising and backyard gardening have sweetpotatoes planted in 5 to 2,000 sq m lots. Sweetpotato (*Ipomoea batatas*) is second to chayote (*Sechium edule*) in the list of the most common backyard crops grown by 3,420 households in the area. Sweetpotato covers an aggregate area of 29.43 ha (Table 2). These homegardeners also face production problems similar to their counterparts in the rural areas such as pests and lack of planting materials (Table 3). To understand these issues better, a study documenting rural and urban sweetpotato homegarden systems was conducted with support from UPWARD (Gayao et al. 1991).

The Sweetpotato Homegarden System

In both rural and urban homegarden systems, sweetpotato is seldom grown as a monocrop. It is usually planted with legumes and some trees. It is also commonly planted in ripraps, along fences, pathways/roadsides, or along drainage/irrigation canals, or even in piles of garbage or mounds of soil. It is not necessarily limited to the backyard but may refer to a part of the unutilized commercial garden or rice field, hence, the change to 'household' and not 'homegardens'. Its ability to survive in marginal conditions enhances its popularity as a homegarden crop despite low yields during the first 6 months. The tops, roots, and herbage are rich sources of nutrients for both humans and animals and provide an occasional source of income for households. As a dependable food item, sweetpotato can sustain life through difficult times. However, results of the study showed that backyard cultivation is threatened by the lack of space

Table 1. Number of households engaged in agricultural activities in Baguio City (1989).

No. of Households	Agricultural Activities	Total Area Cultivated (ha)
268	Commercial farming	113.98
7,740	Backyard gardening	-
2,851	Backyard animal raising	-
		-

Table 2. Top ten root and vegetable crops grown in the Baguio City homegardens (1989).

Crops	Households (No)	Area (ha) per crop
chayote	7,431	35.03
sweetpotato	3,426	29.43
galiang	627	2.33
taro/gabi	529	2.16
garden pea	141	6.60
beans	107	9.76
potato	74	13.39
pechay	69	2.90
broccoli	42	8.44
wongbok	51	2.22

Table 3. Constraints in crop and animal production in Baguio City (1989).

Crop/Animal	Constraints
Chayote	- lack of space/expensive posts/thievery
Sweetpotato, taro and galiang	- lack of space/posts/lack of water/lack of planting materials
Vegetables	- high cost of inputs/limited water supply/limited capital
Guava, avocado, citrus/others	- pests/old age/lack of space and water/fruit rot/non fruit bearing
Banana/coffee	- pests/viruses
Swine	- drainage/expensive feeds/lack of space/lack of capital/prohibited

for planting, lack of water for year-round crop maintenance, very low yield and low economic returns. These are, in turn, attributed to the growing population, the presence of other cash rewarding livelihood opportunities, the continuous use of the land without fertilization, shading and, to some extent, varieties that are low-yielding or have degenerated. Further, it was noted that many of the sweetpotato household gardeners are elderly women and majority of them had no actual knowledge of the contribution of sweetpotato to human dietary requirements.

Sweetpotato Household Gardening Technology Development

The results of the diagnostic stage suggested the need to encourage sweetpotato-based household gardening since more and more families were facing rapid increases in food prices, poverty, pollution, and other health hazards. The first year of implementation (1992-1993) started with a series of seminar-workshops conducted among households and school children. Partnership in developing a user-friendly sweetpotato-based gardening technology also began.

This participatory user-oriented approach is a learning process for an interdisciplinary group of researchers, with the target group providing immediate feedback. It provided opportunity for the researchers to do more in a very short span of time, such as: (a) introduction of different sweetpotato varieties and processed food products and recipes; (b) documentation of the activities of household gardeners, such as variety selection and maintenance, traditional management practices, and sweetpotato characteristics desired by the household and children; (c) assessment of acceptability and adoption of sweetpotato-based products; (d) performance of the introduced varieties in varied garden microniches; (e) verification of recommended garden management methods; and (f) impact assessment of the project.

On the overall impact, the promotional efforts in sweetpotato-based gardening had paid off in terms of: (a) number of households and school children participants who availed themselves of sweetpotato planting materials for their own use; (b) additional knowledge gained on the nutritional contribution of sweetpotato; (c) increased crop diversity in their gardens; (d) increased knowledge of other uses of sweetpotato; and (e) growing interest shown by neighbors and other institutions.

Inter-agency cooperation evolved during the second year of project implementation (1993-1994). Nutrition workers (Baguio Health Department) and teachers [City Schools Division and La Trinidad District, Division of Benguet, Department of Education, Culture and Sports (DECS)] participated in the evaluation workshop at the end of the first year (March 1993) of implementation and supported the promotion of sweetpotato-based household and school gardening. On the part of the Health Department, the activity was in line with its strategy of attaining better nutrition through household food production. For the DECS, integrated sweetpotato-based gardening fitted well in the work education subject, *Edukasyong Pantahanan at Pangkabuhayan*.

Out of the 21 household garden cooperators active in the first year, 16 continued with evaluations during the second year; another 14 new sweetpotato homegardeners voluntarily joined the project during the second year, as a result of gardener diffusion.

During the second year, 12 "model" household gardeners were identified by the Health Department nutrition workers as part of the interagency expansion of the project. These gardens were then used as venues to "echo" knowledge and planting materials to other women. A total of 201 women were involved in this way of whom 106 received sweetpotato planting materials and vegetable seeds. Over the two years, demonstration plots were set up in a total of 17 school gardens, 5 initially and 12 in the second year. Seminars and meetings were held with 224 children and/or parent-teacher association members. All in all, 57 health workers and teachers have been given training in homegardening in two separate training of trainers courses.

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A COMMUNITY APPROACH TO THE MANAGEMENT OF POTATO BACTERIAL WILT IN THE WESTERN HILLS ÖF NEPAL

P.M. Pradhanang, B.K. Dhital, S.R. Ghimire
T.B. Gurung and K.J. Gurung

Potatoes are grown throughout Nepal from the southern plain lowlands (100 masl) to the northern high mountains (4000 masl). Potato is a particularly important crop around 2000 masl, where it is the major staple food because other crops like rice and maize become less productive with increasing altitude. Seed potatoes are produced mostly in *bari* land (rainfed unbunded upland) at these high altitudes and are exchanged or sold at lower altitudes. This is a major income generating activity. In the high hills potato is planted in March and harvested in July, whereas in the mid and low hills (below 1500 masl) the operations are carried out in November and April, respectively, in a rice-potato cropping pattern.

The national average yield of potato is estimated at 8.6 t/ha (DFAMS, 1992). The main biotic reasons for this low productivity are occurrence of late blight (*Phytopthora infestans*) and bacterial wilt (*Pseudomonas solanacearum*) diseases. Chemical control is not a feasible method because of the subsistence nature of farming in the hills. Moreover, the commonly used fungicide, Mancozeb, is easily washed off by rain since late blight occurs with the onset of the rainy season. Therefore, research effort concentrates upon screening varieties for resistance or tolerance to late blight.

In the last few years seed production in many previously important seed producing villages such as Sabet, Ghandruk, Mauja, Ulleri and Jhilibarang has been markedly reduced. The main reason for this decline is the severe intensity of bacterial wilt (BW) in these areas. A survey in 1987 reported BW incidence of 5-10% (Pradhanang et al.1987) but a similar survey in 1990 found the incidence to be as high as 70% in some farmers' fields at Sabet and Ghandruk (Dhital et.al. 1990). Neither reliable genetic resistance nor chemical means of BW control are available. However, there is possibility of eliminating BW of potato in Nepal because the prevalent race is race 3 biovar II (Pradhanang, 1989; Shrestha, 1988). Therefore, a trial BW control programme was initiated in 1990 at Sabet and Ghandruk using a farmer participatory approach. Farmers were requested to adopt a three-year crop rotation in their infected lands using different non-host break crops. The programme also aimed to increase awareness on the causes of BW, and farmers were provided with clean seed potatoes.

The hypothesis set was that a farmer participatory programme is necessary to implement a BW control programme. Further, a three-year crop rotation with appropriate break crops and potato volunteer-free conditions can clean the infected land. The final results are not yet known but the programme has been successful at Sabet with respect to

implementing the crop rotation. However, it has not been successful at Ghandruk due to the lack of farmer cooperation, large size of the village (500 households), and the scattered potato growing areas which made programme monitoring difficult (Pradhanang et al. 1993). Ghandruk village is also a major tourist center, thus farmers have numerous off-farm interests and they are not willing to cooperate fully in the programme.

It was not possible to initiate management programmes in other infected villages, such as Mauja, Jhilibarang and Ulleri at the same time (1990) due to lack of adequate resources, although these villages are situated close to Sabet and people knew about the control programme. By 1992, farmers at Ulleri, Jhilibarang and Mauja realized that their losses from bacterial wilt were severe, and they expressed willingness to participate in a similar control programme. Accordingly, Lumle staff visited these villages to discuss control programmes with farmers (Pradhanang et al., 1992). Finally, with partial funding from User's Perspective with Agricultural Research and Development (UPWARD), a control programme was initiated in July 1993.

The objectives of the projects are: (a) to assist the villages of Ulleri and Jhilibarang to control and manage BW in their potato crop, and (b) to research and develop methods of community action to control BW over a wider area in the future. This paper describes (1) the BW management programme and experience of Sabet, (2) the socioeconomic situation of the new test villages, (3) the management approaches and planning processes adopted, and (4) the progress made in the implementation of the project.

BACTERIAL WILT MANAGEMENT PROGRAMME

Elimination of infected planting material

The first objective was to eliminate all infected planting materials intended for planting either in infected or clean soil to avoid further soil contamination. All infected planting materials from the previous season (1989) was either eaten or discarded from Sabet.

Clean seed multiplication

The second objective is to supply 'clean' seed tubers to all households and for them to multiply this seed in uninfected land. This will allow them to grow potato in *khet* land (irrigated bunded terraced lowland) during the winter season. This approach has worked well at Sabet for three years (Pradhanang and Basnet, 1994). Its limitation has been to determine a suitable alternative strategy where *khet* land is not available, like at Ulleri. For such situation there must be sufficient clean *bari* land at high altitude.

Crop rotation

The third component is the prohibition on growing potato and other solanaceous crops for at least three years in fields known to be infected. The break crops can be maize, finger millet, or upland rice in summer, and wheat or barley in the winter.

Volunteer rogueing

The vital component of the programme is complete elimination of self-sown potatoes by ensuring that farmers rogue out the volunteers a number of times. Previous experience at Sabet has shown that three rogueings, in November, March and July, are necessary to control the volunteers.

Farmers' education

Finally, farmers were educated about the symptoms of BW in the fields and in storage, and the means of its spread. Potatoes taken as gifts at marriage were confirmed as a major cause of disease spread between villages at high elevations (Pradhanang et al.1993). A recent Participatory Rural Appraisal (PRA) found that marriage of people from the Gurung villages of Jhilibarang and Sabet are frequent. It is quite possible that BW may have been introduced at Jhilibarang from Sabet by exchange of potatoes as gifts.

THE COMMUNITY APPROACH

Landholdings in the hills of Nepal are fragmented, and it requires the total participation of all the people in the community for a successful outcome in resolving the BW problem. In many other agricultural technology extension programmes if less than 100% of the community adopt the new technology then it can still be considered as successful. By contrast, for a BW control programme to be successful, the minimum unit of operation is one complete village. This has its problems, because apart from the scale of the operation, it is also necessary to convince the whole village to participate, in particular to accept a moratorium on potato growing in infected lands for three years. A further problem is the need to continue producing potatoes during the moratorium because of their importance as a food source.

It was hoped that the experience gained from Sabet would enable the community action programme at Jhilibarang and Ulleri to be established more easily.

REASONS FOR FARMER COOPERATION IN SABET

Heavy losses due to storage rot

Storage losses have exceeded 50% on the average and some farmers had changed their seed. However, the problem was not resolved due to the contamination of soil in the fields. This convinced the farmers that some other control measures are required.

Prospect of acquiring clean seed

All households were supplied with clean planting material transported from BW-free areas. The transportation costs were subsidized.

Availability of an alternative BW-free site for planting potato

It was important to have clean areas to multiply clean seed, and to produce ware potatoes. Normally in the high hills of Nepal, there is an adequate supply of land abandoned for a long time due to lack of labor. Since the history of BW in the Lumle Agricultural Center's Extension Command Area (LACECA) goes back only to the 1970's, these abandoned lands can be considered as free of BW.

Equity

To ensure equity among participating farmers, an equal area of BW-free land was distributed on a temporary basis to all households by a Cropping Pattern Improvement Committee on a lottery basis. There was then no bias in land distribution among the people of wealthier or poorer groups, or different caste group. Also differences in the fertility and other physical characteristics of the plots were seen by farmers to be a result of luck.

Potato in *khet* land

Potatoes cannot be grown at altitudes >2000 masl during winter season due to frost and frequent snow. *Khet* lands (1200-1500 masl) are normally located in valley bottoms and usually remain fallow during the winter season after the rice harvest. At Sabet, farmers were encouraged to grow potatoes during the winter season in *khet* land. Since farmers could eat the potatoes produced in *khet* land, the program was successful, and winter potato planting has become a common practice at Sabet.

Peer pressure to cooperate

For any community programme, it is virtually impossible to obtain total commitment from the people. At Sabet, some farmers did not like the programme in the beginning. However, as 98% of the people agreed to the programme then the rest of the farmers can become involved through peer pressure.

Re-establishment of farmers' income generating activity

The control of BW in the infected land will enable the programme villages to re-establish seed potato production.

Support programme

During the break period of three years where potato is not grown in the infected lands, farmers could grow other summer crops such as maize and finger millet. Since hill farmers exchange their seed potatoes mainly for rice paddy, the technology of growing a cold tolerant variety of rice in upland conditions was demonstrated at Sabet. This was well accepted by the farmers since rice is a high status food crop in the hills.

Regular visit by the team of BW control scientists

The Lumle Agricultural Research Center (LARC) has been providing agricultural extension activities at Sabet for the past 25 years, and the farmers have good faith in LARC scientists. Therefore, regular visits of researchers not only made the people more aware about the activities but also helped to convince other farmers belonging to the risk group to cooperate in the control programme.

Role of cropping system improvement committee (CSIC)

A voluntary committee composed of socially influential people of the village implemented the programme. It is easier to convince farmers through the local "reference farmer" approach, to whom most farmers normally go to seek technology or advice. In this way a reliable farmer-to-farmer diffusion of BW control technologies takes place. This approach was successfully exploited at Sabet (Pradhanang et al. 1993).

DESCRIPTION OF NEW PROGRAMME VILLAGES

Ulleri

Ulleri village is located between 1900 and 2100 masl with 110 households. This village is a homogeneous ethnic group of the Magar community. The livelihood of the people is based on agriculture and livestock products and tourism, with British or Indian Army Service pensions as the major cash income. Some villagers are more interested in a short term programme with direct economic benefit, such as from tourism (Pradhanang et al., 1993).

BW was introduced sometime in the mid-1970's but severe yield loss occurred only in the past three years. Major crops grown are potato, maize and millet in summer, and barley in winter. Although potato is considered one of the most important crops, production has declined sharply due to rotting of tubers in fields and in storage, and late blight epidemics at the crop bulking stage.

The Sabet programme had proposed, as well as crop rotation for three years in infected land, that farmers should grow potato in BW-free *khet* land during winter season. Ulleri does not have *khet* land where winter potato can be grown (Pradhanang et al., 1993). However, there is abundant fallow upland above the village where potato has not been grown for the past 25 years. This land was used to grow ware and seed potatoes.

Jhilibarang

The village covers an area with altitudes ranging from 1200-2000 masl. Rice is a major crop at lower altitudes while potato, maize, finger millet and barley are important crops in mid and higher altitudes. Jhilibarang has 122 households of mixed ethnic groups of Gurung (36%), Biswakarma (blacksmiths, 27%), Magar (9.8%), Brahmins (19.7%) and Damai (tailor master, 5%). The Gurungs live in clustered groups, while the other ethnic groups live in scattered individual households. The livelihood of the people is based on agriculture and army service, as in Ulleri.

Farmers recalled that potato cultivation was concentrated at a place called Chhebe Kharka (1800 masl), about one hour uphill walk from the present village. Jhilibarang village used to be situated closer to Chhebe Kharka but villagers moved to the warmer south east facing slope of the hill. As a result, farmers started growing potatoes at lower elevations (1700 masl) in much larger areas around the village.

BW was first reported in 1987 in Jhilibarang. Wilt incidence was observed in seeds transported to a lower altitude village from Jhilibarang (Pradhanang et al. 1987). In the beginning, farmers thought that wilting was due to insect damage. Although the cultivated areas was increased, production continued to decline every year, in particular during the past three years due to the spread of BW in all areas. During the summer season of 1993, losses were as high as 95% in some fields and 100% in storage. Some farmers changed seed sources, but the problem was not resolved as entire areas were affected by wilt.

EXTENSION OF THE PROGRAMME TO JHILIBARANG AND ULLERI

The positive lessons learned during the previous control programme at Sabet and Ghandruk, particularly the cooperation between the committee, farmers and researchers, were used to implement the new BW programme at Ulleri and Jhilibarang.

Initial visit of LARC researchers and Sabet's resource farmers

In 1992, a multidisciplinary team visited Mauja, Ulleri and Jhilibarang to estimate yield losses and to discuss with farmers the possibility of extending the control programme (Pradhanang et al. 1992). Farmers' meetings were held in all villages to determine whether it was possible to implement a three-year crop rotation to manage the disease. The programme being carried out at Sabet had made a positive impact on the farmers of these villages.

Discussion between Sabet's resource farmers and the farmers of Mauja, Ulleri and Jhilibarang encouraged farmers to cooperate in the BW control programme. Although the pressure on land is intense at Mauja, farmers still wished to have the control programme. However, it was suggested to the local village leaders that a farmers' meeting involving the whole village be held because all the people must endorse the programme.

Survey of BW at Jhilibarang and Ulleri

Potato stores of farmers at Mauja were monitored in November 1992 to assess the magnitude of the brown rot (Pradhanang et al., 1992). BW in the standing crop was assessed in July 1993 (Basnet and Panta, 1993). The results are presented in Table 1.

Table 1. Incidence of bacterial wilt in stores and in the field at Mauja.

Villages	Infected stores (1992)	BW in field (1993)
	----------%	----------
Mauja	55	8.5
Ulleri	63	14.0
Jhilibarang	56	19.0

The survey of brown rot in November 1992 showed that potatoes in more than 50% of the stores were infected. Although losses due to brown rot in each store was not quantified, the loss was as high as 75% at Ulleri and Jhilibarang according to farmers. The field survey in 1993 showed that the average intensity was higher at Jhilibarang (19%) followed by Ulleri (14%). The intensity was lowest at Mauja (8.5%).

Second visit of LARC researchers and Sabet's resource farmers and formation of cropping system improvement committee

In 1993, all the proposed villages were visited again to finalize the control programme (Ghimire et al., 1993). Despite a long discussion and efforts of the resource farmers from Sabet, about 30% of the farmers at Mauja did not like the idea of a three-year crop rotation. The possible reasons for this were (a) intense pressure on the land because of limited land holdings, (b) lack of opportunity for off-farm income, (c) lack of effect of BW infection on seed quality at the time of sale to lowland farmers, and (d) lack of sufficient land to multiply and grow clean seed within the village area.

Farmers of Ulleri accepted the BW control programme and decided to grow clean potatoes in a block of land called Dhikuche, about half an hour uphill walk from the village. During the farmers' meeting, the CSIC was formed to implement the programme. Farmers themselves nominated fourteen members to the CSIC, including three women. Farmers were also interested in growing different vegetable crops and upland rice in place of potatoes within the proposed cropping pattern.

In Jhilibarang, the major difficulty was the physical distance and inaccessibility of the seed potato multiplication site called Nardung Kharka. It takes some four hours uphill walk to reach Nardung from Jhilibarang. Moreover a small river between the village and Nardung which flows during the monsoon season necessitated the construction of a bridge. In addition, leadership of the village was politically divided.

The consensus was that if the programme could help construct a bridge over the river, it would be possible to grow potatoes in Nardung. However, despite an assurance about financial assistance for bridge construction not all the farmers were interested in the programme. At this point, the role of the resource farmers of Sabet was vital. They were able to motivate and convince farmers of Jhilibarang through their informal ties and relationships. They also explained their experiences of the BW programme at Sabet and the prospect of reclaiming clean seed production from previously infected land. Eventually, all the farmers agreed on the programme. As a result, the farmers themselves nominated members of the CSIC as in Ulleri. There were fourteen members including two women farmers.

PROGRAMME ACCOMPLISHMENTS

BW workshop to train CSIC members

CSIC members of both the programme villages were given a two-day training at LARC to discuss and formulate the practical implementation of the BW programme. The members were given thorough information about symptoms, mode of transmission, the importance of rogueing volunteer plants, clean planting materials and crop rotation.

At a joint meeting with LARC researchers and the farmers' committees, options and rules and regulations were agreed upon to support and operate the programme.

Options. LARC agreed to (1) supply non-infected planting materials at a subsidized rate, (2) supply limited amounts of subsidized fertilizers, and (3) distribute free fungicide to control late blight in seed multiplication plots. The center provided a staff member based in the village for day-to-day supervision of the programme.

Rules. Villagers were (1) prohibited from growing potato for at least three years in plots known to be infected, (2) required to rogue volunteer potato plants, and (3) required to plant potato crops in wilt free land. Regulations were formed to penalize individuals who failed to abide by the crop rotation programme. Since the project was developed with the consensus of the farmers, it is expected that farmers of both villages will abide by the rules drawn by their committee.

Seed management

About nine tons of clean seed potatoes were supplied to Jhilibarang and Ulleri (Table 2). The varieties supplied were a local variety, White Long, and an introduced variety NPI/T-0012. The seed had to be transported using mules from a clean production area, which is two days walking distance from the villages. Seed procurement, storage, transportation and distribution to each household of Ulleri and Jhilibarang was difficult part of the planning phase, although the CSIC members of the both villages actively helped at the time of seed distribution.

Table 2. Quantity of seed supply in Ulleri and Jhilibarang.

Village	Total seed supply (t)	Total households	Households receiving seed	Summer planting (no. of households)	Winter planting (no. of households)
Ulleri	4.7	110	106	106	-
Jhilibarang	4.5	122	88	100	66

Distribution of land at Nardung and Dhikuche field

The land at Nardung and Dhikuche were divided into 100 and 106 plots of equal sizes. Each plot was given a number and distributed to each household of the village on a random basis. The members of CSIC provided assistance during this phase of the programme.

Potato in *khet* land

Khet land was available only at Jhilibarang. In the beginning only twelve farmers showed interest to grow potatoes during the winter season, although many households had *khet* land. However, at the time of planting, 30 farmers planted clean seed in *khet* land. Since this was the first year of planting potato in *khet* land at Jhilibarang, more people will grow potato if the 1994 season harvest is good. Farmers were deliberately asked to grow cv NPI/I-0012 because the production potential of this variety is much higher than the local variety White Long.

Although there is no *khet* land available at Ulleri, the programme has progressed well.

Volunteer rogueing

In Nepal, potato volunteers are not normally uprooted or rogued, but rather intercultural operations are practiced to harvest the potatoes from them (Pradhanang et al. 1993). This practice allows long term soil survival of *P. solanacearum* in infested areas. Therefore, the

crucial component of the BW control programme is to organize a mass campaign to uproot and destroy volunteer potatoes.

Most farmers grow barley after harvesting potato in July. Barley is sown at the end of September or during the first week of October. Therefore, large populations of potato volunteers grow in barley fields in October and November. It was decided that volunteers should be uprooted in December (Pradhanang, 1993b), yet despite this cultivated fields at Ulleri were full of volunteer potato plants in December. Uprooting these volunteers in December was not a usual practice and farmers suggested March as an appropriate time. Therefore, the CSIC members were asked to uproot volunteers immediately, otherwise the crop rotation programme would not be effective. It was again decided that volunteers would be uprooted immediately on a block-by-block basis as a campaign (Pradhanang, 1993a). The CSIC requested a Junior Technical Assistant (JTA) to motivate and supervise the uprooting campaign.

The uprooting or rogueing programme was only partially successful in both villages inspite of the continuous efforts of the JTA. The reasons were as follows:

1. The early planted barley/wheat in September was already at the heading stage and uprooting of volunteers might have damaged the crop.
2. In some fields, mustard was sown after potato and again the crop was at flowering stage hindering the rogueing programme.
3. Some farmers still wanted to rogue volunteers in April/May.
4. A few farmers were against the BW programme.

Since this time one JTA has been posted permanently to supervise the programme at Ulleri and Jhilibarang. He is tasked to motivate the farmers to rogue volunteers according to the agreed scheduling and with the support of CSIC members.

Identification of the risk group

Although all households of Ulleri and Jhilibarang know about the BW control programme and majority of them are cooperative, two hotel owners of Ulleri showed no interest and did not plant potatoes at Dhikuche. One of them is a former village political leader. The reason was that production from small plots of land is not adequate for their hotel requirements. They are considered as a risk group but they did not plant potatoes in their infected lands. They were asked to buy potatoes from uninfected areas for ware purpose. It is quite likely that intra-village politics is involved between this risk group of farmers and the members of CSIC.

The other risk group identified was women who marry out of or into Ulleri from other BW-infested areas. The tradition of giving potato gifts could cause transmission of infected tubers. Therefore, the women's group will have to be identified and individually contacted to make them aware of the programme.

Activities of the risk groups such as those identified above will be targeted for monitoring through informal interaction with the JTA.

Support programme

Besides rice technology, a range of off-season vegetable seeds are being provided at cost. This will partially fill the absence of the potato crop between April and July. Moreover, vegetable seed production programmes are planned to provide an alternate income generating activity. Farmers interested in growing off-season vegetables and upland rice have been selected.

Construction of suspension bridge in Jhilibarang

The construction of the bridge is part of the BW control programme; without this bridge Nardung site would be inaccessible from Jhilibarang. The bridge is being constructed with community participation. Money will be spent on materials, like cement and iron rods, and on skilled labor while locally available materials will be provided by villagers (Pradhanang and Gurung, 1994).

Monitoring and evaluation

A detailed case study will be undertaken in six households of each village. Farmers will be selected by wealth ranking within ethnic groups. The impact and the loss or benefit due to the programme will be analyzed by the field JTA through the use of structured and semi-structured questionnaires. If there is loss with respect to income or production, assessment will be made on how the losses are to be compensated. At the end of the project, estimates will be made of the economic return from BW control.

Activities of the CSIC members

A data base for community roles in managing the BW problem will be developed by recording qualitative data during CSIC meetings by members or with LARC research team, or with fellow villagers. The agreements or disagreements raised at the meetings will be systematically recorded, and analyzed. The contributions or the major concerns of all members of CSIC will be noted by making profiles of individual members. Views of women and other interest groups, for example hotel owners, former military personnel, disadvantaged or rich groups will also be recorded. Problems and how these are resolved will be analyzed. All the important components leading to the success or failure of the programme will be systematically noted.

Sustainability

The assumption made is that BW will be controlled after three years of crop rotation with non-susceptible crops and good farmers cooperation. After this, the major issue will then be the danger of possible re-introduction of the disease. This problem can be best handled by

educating women about the means of disease transmission. After three years, the only risk village will be Mauja. Therefore, farmers should be made aware of the dangers of transporting planting materials from Mauja. In the event that there is scarcity of seed supply within the village, funds of the CSIC will be used to subsidize transportation costs of seed potatoes from BW-free areas. The CSIC will be made responsible for vigilance against possible re-introduction of BW. In return, LARC will consider including some of them on farmers' tour programmes to different parts of the country to encourage them to work on the voluntary committee. Seed production programmes in Dhikuche and Nardung should be continued to produce clean planting material.

CONCLUSION

The cooperation so far received from farmers of Ulleri and Jhilibarang for the management of BW is encouraging. The two significant achievements to date have been the destruction of infected seed lots and planting of clean seed tubers in clean land in both the programme villages. However, the volunteer rogueing programmes were only partially successful.

A detailed case study, and monitoring and evaluation of the programme is planned.

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UPWARD AND ROOTCROP GENETIC RESOURCES 1989-93: AN OVERVIEW

Jurg Schneider

I was invited by the UPWARD Coordinator to prepare this overview on projects related to genetic resources issues and as documentation, I received a pile of papers, many of which were later will be published in the Proceedings of UPWARD's genetic resources workshop. I am going to present my overview mostly through the eyes of a reader, and as somebody with has gained a limited experience in this field of research over the past two years.

Since the late 1970s, the Call for integrated or participatory research has been heard, and has led to adjustments in many areas of agricultural research. What it meant, of course, is more participation by farmers, and more integration of so-called "formal research system" results with results of the "informal knowledge system" of farmers and farmer communities. Behind this, there is the broader concerns of an agricultural development that benefits all groups of society, not only consumers, and all groups of farmers, not only the better equipped. In genetic resources research, there is the additional issue of ownership of genetic resources. How practical research should relate to these issues remains an important matter for discussion, although in this brief overview, I will not attempt to discuss it.

Figure 1 (from Prain 1994) projects an ideal type of genetic resource research which recognizes the expertise of farmers in this area, and tries to mobilize it as a resource in R&D, especially for peripheral farming systems and for small farmers. This has, I think, been the basic philosophy of UPWARD's work in this area.

In the same article Prain distinguishes three roles that farmers may assume, each with a different degree of participation in the "formal system": farmers as germplasm consultants; as germplasm evaluators and as research curators. My overview of UPWARD research activities will follow this useful distinction of roles. To a certain degree, these labels reflect the way we are doing business: germplasm collection, evaluation, and maintenance.

FARMERS AS GERMPLASM CONSULTANTS

Farmers are consulted because we seek their knowledge and expertise on varieties that are part of their everyday work. A substantial part of UPWARD research has explored how to "consult", and in what detail. I will take the concepts <u>indigenous knowledge</u> and <u>memory banking</u> as examples of such "farmer consultation" and its outcome.

Even somebody with little education in biology nowadays has some idea of the way information is stored in the DNA-sequences, or what we use to call the "germplasm". But germplasm of agricultural crops is not only "nature". There is not only information encoded

in crop varieties, but also information in human minds, indigenous knowledge that is part of "culture".

"(...) the minds of local farmers (...) are repositories of cultural information: coded, time-tested adaptations to the environment" (Sandoval 1994).

There is adaptive value in the cultural information, and this has been the main reason put forward for documenting this knowledge and trying to "store" it alongside the germplasm itself. There are gene banks, and there are memory banks. "Memory banking" is a term that consciously plays with these two sides of crop germplasm of which one has often been ignored. This cultural information is part of "indigenous knowledge", but the term IK of course covers a much broader range of phenomena than just knowledge of plants.

We may distinguish the following three aspects which are of importance to genetic resources (Prain 1994): the genetic make up of the plant; the cultural knowledge about the plant; the contextual information (about the plants' environment)

What is the relevance of this knowledge? The materials I have read mention a number of reasons:

- there is a great lack of information on variety characteristics and uses in germplasm collections
- collections are easier to utilize if there is an accessible database describing it
- indigenous characterization contains valuable information for crop development (evaluation aspect)

How have these assumptions been acted upon? The main problem is composing the right mixture of methods and techniques that are individually known already. Part of the tools have been borrowed from PRA. For example, there might be a phase of immersion to orientate research and to gather information about general aspects of the farming system as well.

Case 1: The memory banking project in Bukidnon, Philippines

In the methodological protocol developed for the "memory banking" project in Bukidnon (Sandoval 1994a) , we probably find what I would call the maximal approach to documentation of indigenous knowledge. This was a study over more than a year where a range of methods were used to thoroughly document the sweetpotato cultivars (29 in Intavas, 25 in Salvacion) of two locations in the Bukidnon province of Mindanao. The more palpable results:

- farmers characterization plus morphological characterization of each local variety;
- scientific drawings and farmer drawing;

- files on indigenous beliefs and practices associated with sweetpotato;
- local evaluation criteria;
- an archive of tapes and transcribed life histories based on interviews with farmers;
- agricultural calendars.

The study concluded that "there is still a long way to go in terms of both theoretical and applied aspects of memory banking" (Sandoval 1994 b)

The theoretical aspect could, I think, be summarized as the absence of uniformity in local knowledge. There is plenty of variation between individuals, for example in the description and criteria given for local varieties Are these differences idiosyncratic or are they patterned? In both cases, this would have implications for the way we treat information in "memory banks".

The practical aspect is the influence of researchers personalities, through their interaction with informants, on the information. The information should be, ideally, comparable among researchers, or replicable by other researchers.

Case 2: Collection of Associated Knowledge in Ifugao, Philippines

In Ifugao, Lleva (1994) tried to follow the way pioneered by the Memory Banking project in Bukidnon but found it difficult, in terms of time and finances. Eventually the method was changed to the simpler and cheaper way of collecting associated knowledge, along with collection of the germplasm.

Case 3: Collection of Associated Knowledge (Irian Jaya, Indonesia)

This was a training cum-collection exercise in an area of Irian Jaya where sweetpotato is the staple with high varietal diversity, and thus knowledge has developed to a higher level of sophistication than in other places. The "collection of associated IK" is certainly less comprehensive then the maximal memory banking approach, but shows, I think, that even in a very short period of time, quite substantial information on local practices and local knowledge can be gathered.

What are the characteristics of this approach?

- Conventional collecting is combined with ethnobotanical elicitation.
- Interdisciplinarity is a key ingredient. A technical agronomic approach is not enough.
- Evening team sessions to establish a daily record structured by topics and collected specimens. "Each specialist was expected to take the lead in his own area of specialization while participating in all types of cultivar and data collection." (Sawor et al. 1994)
- The PRA component is used to obtain information on sample plots and the wider farming system. The topics for the survey are listed in a topic guide sheet. As a "rapid but not so

dirty" technique, the PRA is stronger than in the Memory Banking approach, but the anthropological component weaker.

- Data were stored in a computerized database (three linked databases), covering passport, ethnobotanical and contextual data. The database is, however, a medium with limitations:
  - knowledge even if cultivar specific comes often not in units that can be digitized easily, thus they do not fulfill the requirements of common databases. This is so for two reasons:
  - "farmer knowledge seems to be strongly focused on the generic level" (Prain, et al 1995: 704, citing Berlin).
  - knowledge on crops often has a fuzzy or expedient character.

FARMERS AS GERMPLASM EVALUATORS: *GOING BEYOND DOCUMENTATION OF KNOWLEDGE*

One of the results of the Memory Banking project was the analysis of farmers' criteria to describe and select varieties. If we systematize these criteria, we get a rather complex framework, that is not entirely coherent, but characterized by "fuzziness". This can mean that the output from the IK studies in which farmers are only consulted on criteria, and do not assume a role as active partner can be quite difficult to use. To address this problem, the potential of cooperation by researchers and farmers in variety evaluation has to be explored.

One of the objectives of farmer evaluation, seen from an R&D perspective, is to get a reliable knowledge of farmer preferences helping "breeders in preliminary selections to maintain the kind of variability likely to be of interest to certain farmer groups in a range of similar environments" (Prain, unpublished).

Two potential instruments are group assessment of harvests on experimental stations and participative trials (PAT). The PAT allows researchers to identify criteria used by farmers, and to assess performance of cultivars according to these criteria. These criteria often tend to be different and more complex than criteria commonly used in experimental trials (e.g. the disaggregation of a notion such as yield).

Case 4: Sweetpotato household gardening in Baguio, Northern Luzon (Gayao et al. 1993)

In the household garden project in northern Philippines new varieties were given to women to be grown in their household gardens and also to schools for utilization in school garden projects . The first objective of this project was not variety evaluation, but nutrition among urban dwellers with low income and little land. Sweetpotato is very popular as a backyard crop in the mountain city of Baguio and there seemed to be a potential to increase its productivity and contribution to household consumption. Women did evaluate the cultivars introduced, and this was documented. High yield and good taste were characters with a high score. On the basis of the women's evaluations, the researchers expected them to replant the

preferred varieties. However, they replanted everything for which planting material was available, underlining the fact that evaluation and selection can be two distinct activities under a situation of unstable supply of planting material.

Case 5: The Aytas under emergency resettlement after the Pinatubo eruption (Mendoza, 1994)

The Aytas are an indigenous people that were settled on the slopes of Mt. Pinatubo volcano until 1991, and who had to be resettled after the eruption of that volcano to a new site at some fifty kilometers to the north of Mt. Dueg. For the Aytas sweetpotato is a traditional crop; not only had they lost their traditional cultivars, but they had also to adjust to different environment after the resettlement.

To support their re-establishment of sweetpotato agriculture hill-adapted sweetpotato varieties from the Memory Banking Project in Bukidnon were provided by UPWARD for multiplication by the Tarlac College of Agriculture. A group of Aytas were invited to inspect the cultivars in the field and to participate in a taste test. On the basis of the visual and taste evaluations farmers were invited to select planting material for further evaluation and multiplication in their homegardens. This material was used for planting in their upland fields when these were allocated by the Government.

This case is a nice example of integrated research in genetic resources: the native varieties from Bukidnon; the technical assistance by the agricultural college, and the preselection of new cultivar material by the Aytas, with the result that this material now has some similarity in characteristics with their traditional cultivar in Mt. Pinatubo.

Conclusion

Farmer evaluation behavior may be extremely variable, depending on the complexity of the agroecology, the degree of marketing or subsistence use of a crop. Evaluation criteria in a subsistence environment tends to be more complex and numerous than in a commercial production setting (#39 criteria for potatoes in the Peruvian Andes; only a few for commercial sweetpotato in the coastal desert Prain et al. 1994).

The selection itself can assume different forms, and we have to be careful not to identify the "farmer" with just one type of "selection" as it may be defined from a technical agronomic point of view. Selection can be an "elimination by aspects", or a formal decision-making, as it usually is in "scientific" plant breeding. For farmers it may be a kind of "muddling through" meaning that there are definite criteria, but there are also the exceptions (Sandoval 1994b:5). Not the least important of these is the need for cultivars to perform, the need to maintain continuous production, in most farmer situations. Selection therefore cannot be a procedure with the same rigor and "absoluteness" as exists on an experimental plot.

FARMERS AS RESEARCHER-CURATORS: *COMMUNITY CURATORSHIP, ON-FARM CONSERVATION*

Evaluation by farmers, for example in participative trials, involves some degree of formalized research. There is an additional function where participation by farmers goes much further than in the previous two types of genetic resources work: that associated with conservation. Although the term on-farm conservation is increasingly fashionable, there is hardly any agreement about the practice it relates to, both actual and projected. Is there a reason to talk of curatorship rather than on-farm conservation? There is, I think. Farmers do not want to conserve per se, it has been said, thus definitions of "on-farm conservation" tend to emphasize the dynamic nature of germplasm in farmers fields.

"Our own conception of local genebanks is as a genetically dynamic rather than static process in which novel material (...) is evaluated for its potential (....) and where some material will inevitably disappear." (Prain and Piniero 1994:214)

Whether change should take place or not, is the wrong question. We should rather ask what roles farmers have as curators of their germplasm, and how their role can be strengthened rather than being weakened.

There is only one UPWARD activity that I could group under this heading. It starts from the two concepts: Community and local genebank.

Case 6: Community curatorship in Bukidnon, Philippines (2)

Two communities were chosen as sites for community genebanks of local cultivars of sweetpotato and other rootcrop germplasm. The internal organization of those potential curator groups was quite different. The first one was an informal grouping of mainly migrant women (Maambong), the second a so-called tribal settlement (Dalwangan) represented by a number of male tribal elders. These differences were intentional, enabling the researchers to look at the importance or irrelevance of these sociological variables in the conservation activity.

In early discussions, it was emphasized that "the project would be an equal partnership between scientists and farmers aimed at the preservation of diversity of locally valued root crops in a mutually satisfactory way and sustainable in the long run."

The preliminary findings of this experiment with curatorship (Prain and Piniero 1994) provide a number of very useful insights, and illustrate the social and cultural process that each conservation or curatorship must be, because of interaction both inside the "community" and between researchers and community. The political discourse though important, has created an imbalance between the theoretical and the practical. Nevertheless, I would like to conclude with a few remarks on issues brought up in the political debate.

5. CONCLUDING REMARK

So far my discussion has been rather technical, reflecting the focus of the work that has been done.

The work of UPWARD has been conducted with the objective of exploring farmers knowledge in genetic resources and of making it a more significant part in agricultural R&D. How should we measure this success? The research was operating in a very small, crop-specific segment of agricultural R&D.

- It is already a large task to achieve greater participation by users in genetic resources R&D for one crop in one country. How can one impartially evaluate the approach and promote it for other crops, across other specific farming systems and in other countries? There has been little reflection on this problem so far.

- What does farmers' participation imply? The more participation the better of course, but I get the impression that we are still talking about this either in a very general, pragmatic way (about "recognition" by making farmers' knowledge a valued thing), or on the level of personal relations and research efforts that relate to farmers in a different way. Can we really stop at that in this world of formalized relations? In other words, do we not need better ways to institutionalize such an approach?

- Farmer's rights were one of the concepts proposed to explicitly recognize farmers' ownership of their germplasm and, possibly, also information associated with it. This is at least the implication of the following statement by a critic of international agricultural research:

> "Genetic information from the Third World is processed in the academic and corporate laboratories of the developed nations for the express purpose of producing new commodities for private profit" (Salazar 1994)

General statements of this kind leave me a bit puzzled, because what happens in genetic resources is presented in very simple terms (North and South, developed and developing). We are left without reference to the farmer, and his or her diverse relations to the extensionists, researchers and other agents from the centers of power and knowledge. Trying to put research on genetic resources into its political context, one has of course to take notice of the continuing public debate on ownership of genetic resources. In this debate, "the farmer" or "the rural community" has been a popular ideological figure who has created, and is maintaining genetic resources.

> "We should propose a system of recognition of the 'informal innovations system' to protect and equitably share the benefits that will be derived from the genetic materials identified, created and maintained by our rural communities" (Salazar, 16).

One way of truly recognizing local expertise is by respecting it for what it has achieved (diversity in agricultural crops), and by working with it under the guidance of farmers. But international policy aspects such as the current trend to more international trade in agricultural products which is likely to affect diversity of a number of crops in situ, should definitely be included as a key element of crop genetic resources R&D.

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SOCIO-TECHNICAL COMPLEXITIES IN COMMUNITY-BASED SWEETPOTATO GENEBANKING: THE LANAO CASE

Belita Amihan-Vega, Jose L. Bacusmo, Fernando A. Evangelio and Julieta R. Roa

It is common knowledge that among all biological resources, plants are the most crucial not only because of their direct link to food security but also because they comprise the basic raw materials used to clothe, cure, and shelter human beings. FAO data show that 90 percent of the rural poor's needs depend on biological resources. However, genetic diversity, that is, the sum total of varied genetic information that makes plants, animals, and microorganisms adaptable to ever-changing environments, is observably declining, thereby posing a real threat to agriculture. Thus, a move for decentralized conservation efforts has been stepped up especially in the LDCs.

While it is technically debatable whether genetic erosion is threatening sweetpotato in the Philippines, some UPWARD-funded studies reported that indigenous sweetpotato cultivars are fast disappearing. This is also reflected in the declining number of desirable cultivars being planted in various potato of the selected areas of Bukidnon, Lanao, and Mt. Province (UPWARD 1991). It is noteworthy that each year, more than 130,000 hectares of land in the country is devoted to sweetpotato, oftentimes called as the staple of the Philippines' "poorest of the poor". The need to probe and act on this concern is imperative.

This UPWARD-supported genetic resources project in Baloi, Lanao del Norte in southern Philippines analyzes the processes, interactions, strengths, and weaknesses of the indigenous community-based sweetpotato genebanking and distribution system. It also seeks to identify potential points of collaboration between the local and scientific knowledge systems in order to develop a framework for more effective project development. The study recognizes that community-based genebanking is potentially a local complement to more sophisticated *ex situ* initiatives (e.g., germplasm collection in cold storage) and can also be regarded as one version of the scientific concept of *in situ* conservation. In community-based genebanking, sweetpotato farmers, as a group, maintain their own localized sweetpotato cultivar collection in their farms and homegardens either for plantback or for exchange. One research hypothesis is that a village-anchored sweetpotato conservation and multiplication system is necessary to achieve agricultural progress at the local level, but is not sufficient for long-term sustainable development. An effective partnership with the global R & D system is needed to have a more dynamic and continuous conservation of the valuable cultivars and indigenous knowledge of sweetpotato farming.

This paper presents preliminary observations based on informal farm and market interviews, as well as consultations with local institutions within the research area and in particular, it discusses the social and technical complexities of and strategies required for setting up a community-based sweetpotato genebanking project in Lanao.

SOCIAL INTRICACIES OF COMMUNITY-BASED GENEBANKING

The municipality of Baloi was formerly one of the 15 royal Maranao sultanates of Lanao before it was split into Lanao del Norte and Lanao del Sur. Out of its 21 villages which are populated by 25,500 people only two villages are predominantly inhabited by non-Muslims.

Historical records indicate that the introduction of sweetpotato into Baloi coincided with the town's inception. Baloi's old name, "Momongan", was derived from an old sweetpotato cultivar called "Momohan" which was said to have been introduced by a Chinese trader during the 17th century. Since then, various sweetpotato varieties have been brought to the area but some of them are now extinct. Nevertheless, up to this day Baloi is always associated with its delicious local sweetpotato varieties which are highly preferred especially by average consumers in the nearby Iligan City.

Over the centuries the local sweetpotato has not only become an indispensable commercial crop of the town but has also been regarded by the people as a cultural symbol, "a source of pride". The observations and interviews tend to affirm that the cultural importance of sweetpotato is one of the underlying reasons why its production is thriving despite the loss of some cultivars. Unfortunately, up to the present time there has been no formal initiative in the area to minimize the loss of preferred traditional cultivars, let alone a specific sweetpotato program even in the province.

Praxis as a basis for change

This genetic resources project actually developed out of an earlier diagnostic study of indigenous knowledge systems in Baloi (Bautista and Amihan-Vega, 1991). The study pointed out, among other things, the declining production of sweetpotato in the area and the decreasing cultivation of preferred traditional sweetpotato cultivars.

In the context of a users' perspective approach, diagnostic research not only facilitates the appreciation of the complexity of the different socioeconomic, technical, and cultural systems but also improves our understanding of the local farmer knowledge and enhances interactions with farmers. However, we cannot dwell only on the diagnostic steam if we want action and change for the betterment of our ultimate users -- the marginal agricultural sector. Excessive concern over diagnosis has been perceived to have contributed to limited participation of farmers in other phases of the research process. Frankenberger (1993), citing Ashby et al. (1989), observed that:

> ...diagnostic research has become a hothouse of methodology development spawning sondeo teams, informal surveys, rapid appraisals, key informant surveys, and so on. The farmer has become an object of investigation just as plants, soils, insects, and viruses are objects of study to be measured...

Not discounting that diagnostic research is an important phase in the research process, the move towards an action research orientation is logical and practical given this specific research problem. On the part of local people, action research is an avenue to have their local knowledge valued and harnessed for self-empowerment.

There are various ongoing global initiatives on plant genetic resources. At its core are the issues of ownership (property rights), control, and access to genetic resources. Formal mechanisms are set up to address these issues in the global bodies like the UN but there is no concomitant action observed at the national and local levels. How these impinge on the prevailing informal and grassroots arrangements, like the farmer-to-farmer seed exchange which is not subject to rigidities of ownership and control but based on social obligations and community needs, remain a valid yet a neglected concern, particularly in the Philippines.

TECHNICAL ASPECTS OF COMMUNITY-BASED SWEETPOTATO GENEBANKING

Sweetpotato was introduced into the Philippines from South America probably in the 16th century. It is not known how diverse the ancestral plants were but it is often assumed that the variability was narrow. However, mutation, gene recombination, and subsequent introductions have generated enormous genotypic variabilities of sweetpotato in the Philippines. Today, different farming communities in the country cultivate and maintain cultivars as preferred in their localities. These are selected for their eating qualities, yield, resistance to pests and diseases, and tolerance to abiotic stresses.

Most of these cultivars are now conserved in the ex situ collections of the PRCRTC, UP Los Baños, Northern Philippine Root Crops Research and Training Center, and the Department of Agriculture/Bureau of Plant Industry. While the future use of this variability is somewhat assured by the *ex situ* collection, some biologists argue that the collections are not readily accessible to farmers, thus they cannot easily be used for production purposes. Even among plant breeders, the utilization of conserved germplasm remains problematic and only a small portion of the germplasm is used for the breeding activities. For vegetatively propagated crops like sweetpotato the germplasm has to be maintained in the field and it is not clear whether it will ever be used in breeding or production programs or not. The cost of maintaining this germplasm is increasingly taking much of the already limited budget of the national root crops program.

The concept of *in situ* conservation and community-based genebanking, either as an alternative or a complement to *ex situ* germplasm collections, is actually an old idea which is increasingly given serious consideration today. Originally, the concept signified the maintenance of genetic resources within the community to which it belongs, in the environment to which it is adapted. Genetic reserves are defined as dynamic units of conservation of the genetic variability of specific populations of species for present or potential use. They act as natural reservoirs of genes under constant selective pressure. *In situ* conservation has always been envisioned for the conservation of wild species, although lately it is being regarded as a viable option for conserving cultivated species.

In the following section, the physical and agricultural context of the research locale is presented with special attention to the factors relevant to the proposed establishment of a community-based sweetpotato genebanking project. The researchers found it important to review the issues on genetic erosion and in situ conservation in the light of these initial research findings.

AGROECOLOGICAL CONTEXT AND PRODUCTION SYSTEMS

Physiography and edaphic characteristics of Baloi

Baloi is located on the mid-slopes of the upper terrace in the eastern part of Lanao del Norte in northern Mindanao. It is bounded by Iligan City on the north, the province of Lanao del Sur on the south, the Tagloan municipality on the east, and the Matungao and Pantao-Ragat towns on the West. Traversed by the Agus River, it is situated at an elevation of more than 300m feet above sea level. It has a rolling to hilly terrain (slopes 25-60%) with more than 19% of the land area having 0-2% slope.

The soil in the area is derived from Andesitic parent material with rocks or boulder outcrops scattered over the landscape. It is brown to red-yellow clay loam Ultisols with the following chemical characteristics: pH -- 5.56; O.M.-- 4.95%; percent total nitrogen -- 9.248; exchangeable Ca -- 4.35 me/100 g; and exchangeable Mg -- 6.72 me/100g. These data suggest that the area is still suitable for good quality sweetpotato, but would require appropriate soil management practices to sustain the optimum level of productivity.

The sweetpotato production system

Baloi is northern Mindanao's major producer of sweetpotato for urban cities like Manila and Cebu. On the average, each grower cultivates a hectare of land for sweetpotato. The usual cropping sequence is corn-sweetpotato-sweetpotato or corn-corn -sweetpotato. Only a few farmers apply fertilizer to sweetpotato. In contrast, fertilizer application is considered a must for corn.

Planting materials used by farmers are apical cuttings from three to four months old sweetpotato crops. During long dry seasons, wilting and drying up of sweetpotato

vines occur causing the loss of planting materials for the next cropping. Farmers, in order to obtain cuttings for the next season, intentionally leave the roots unharvested under the ground. When rain starts, the dormant roots sprout and farmers use the sprouts as planting materials for the next cropping. Some farmers even plant storage root during long drought periods to avoid planting material drying up. Cuttings from sweetpotato crops that are about to be harvested are often given away free. Giving away cuttings facilitates clearing of the farm prior to digging of tubers. Availability of cuttings to some extent determines the size of the area for the next planting.

Carabao drawn plow/implements are used for land preparation and cultivation. Compared to corn, growing sweetpotato is labor-intensive; growing corn is more capital-intensive. Generally, the high cost of hired labor is the main limiting factor in expanding sweetpotato production.

Roots are harvested four to five months after planting. These are sorted into three grades according to size and damage. The grading of sizes varies since the intention is to come up with at least three grades rather than conforming to a definite standard. Market retailers are the ultimate decision-makers in terms of sweetpotato grading. Harvested roots are picked up by traders, or "viajeros", who take care of the trading in Iligan City, Manila, and Cebu City.

Sweetpotato cultivars planted

As a commercial area for sweetpotato, Baloi appears to show more change in varieties grown than subsistence farming communities. Farmers mentioned varieties such as *Iliganon* and *Order*. These varieties are known to have rapidly spread throughout the farms in Baloi and neighboring municipalities when they were introduced in the 1950s. The driving force for the rapid adoption of these varieties was the high market demand or market assurance. *Imelda* or *Balagatasa*, which is a more recent cultivar, also spread fast replacing the aforementioned traditional cultivars because of its high yield and the high acceptability in the market. It was observed that the choice of cultivar to plant is a function of both economic and environmental factors. Cultural factors were never mentioned by farmers who were interviewed.

The following is a preliminary list of the cultivars reportedly grown in Baloi:

Name of Local Cultivars	General Description	Status of Adoption
Malucamba	soft flesh	Planted by a few
Imelda/Balagatasa	white skin and flesh	Popularly planted
Mampuling/Macapuling	red skin, orange flesh	Popularly planted

Order/Chinese	red skin, orange flesh	Planted by a few
Corolao	white skin, white flesh	Planted by a few
Tai-aso	multi-colored roots	No longer found
Kinampay	purple flesh	Planted by a few
Iliganon	carrot-colored flesh	No longer found
Biyaka	red skin, long, vine,	Planted by a few
Culisaw	red/round leaves, short vines	Planted by a few

Only two of the cultivars listed above are widely grown in the area, six are planted by some farmers, while the other two cultivars are now locally extinct. Seven of these cultivars have been collected and propagated at PRCRTC-ViSCA for thorough characterization.

Genetic erosion of sweetpotato in Baloi: fact or myth?

Farmers in Baloi have reported losses of sweetpotato cultivars that were traditionally grown in the past. The following were stated as two major reasons for the loss of those cultivars:

1. genetic replacement of cultivars due to poor performance (low yield, decreasing soil fertility, susceptibility to pest and diseases) and low demand in the market; and
2. loss of planting materials due to drought.

Both these reasons could indicate genetic erosion in the area, but one should be cautious. Technically, genetic erosion from one point of view is the loss of genotypes to a "point of no return". In the case of Baloi, an indigenous variety may be lost or discarded by sweetpotato farmers but they may still be found in other areas where those genotypes are proven more productive. For example, *Mampuling* or *Macpuling*, a traditional cultivar that predominated in Baloi in the late 80's has now also become an important cultivar in another village called Parao. One possible explanation is that *Mampuling* performs well on fertile land. Its productivity declined after repeated planting in Baloi. Parao reportedly has more fertile farms and newly opened lands where the Mampuling yield is high.

Genetic erosion can also be viewed at the gene level. It could be equated with gene loss. Since the genetic base of sweetpotato in the Philippines is assumed to be narrow (sweetpotato being an introduced crop in the country) it can also be assumed that the

existing varieties are mostly related. Loss of genotypes may mean a loss of gene combinations but may not necessarily mean the loss of genes. With spontaneous mutation and natural outcrossing, it is also possible that genotypic variability has developed at equal or at a faster rate than the rate of loss.

It is interesting to note that the dissemination and, consequently, the adoption of Philippine Seedboard (PSB) recommended varieties of sweetpotato is minimal. Cultivar replacement generally involves introduction of indigenous cultivars from other places or is a product of farmers' selection in nearby communities. It is clear that farmers in Baloi are attentive to price, productivity, and seed availability, yet the total elimination of local cultivars may be minimal due to the informal exchange of cultivars between farming communities and unique market preference for the indigenous cultivars like *Order* or *Chinese*. On the other hand, farmers do adapt to changing conditions which can lead to shifts in genotypes locally available. The introduction and elimination of cultivars is a basic reality in any farming system and these have been going on in Baloi for several decades.

In situ conservation: A necessity?

The Baloi farmers were asked whether they wanted to grow again the traditional varieties that are no longer found in their areas but were dominant varieties before. Some responded that they will do so if the market is right i.e., the varieties will be in demand and will command higher prices. Others revealed their interest to re-try the traditional cultivars such as *Iliganon* but they could not do so due to unavailable planting materials. Probably out of curiosity, the younger farmers were positive about growing the cultivars their parents were growing before. Again, lack of planting materials has constrained them.

Although there is no concrete evidence of genetic erosion in sweetpotato, particularly in Baloi, the inability of the sweetpotato growers to access the market-preferred traditional varieties which they hope to plant again indicates the combined effect of environment and market pressure which have narrowed down their options on varieties to plant. This could be remedied by reintroduction of collections from *ex situ*, but a more effective approach will be by grassroots initiatives to conserve traditional varieties. But the big question is how, and/or is real *in situ* conservation effort possible? How effective will it be?

THINKING ALOUD: POSSIBLE STRATEGIES FOR IMPLEMENTING A COMMUNITY-BASED SWEETPOTATO GENEBANKING

A grassroots conservation effort is one that arises out of personal, family or community concern rather than from professional or government directives. Ideally, ecological concern rather than direct economic benefits derived from the genetic resources should be the moving force. However, for a commercial crop like sweetpotato and within the

farming community context like the Muslims in Baloi, ecological considerations are unlikely to be the overriding reasons for maintaining traditional cultivars of sweetpotato.

Farmers generally hold on to sweetpotato primarily because of the economic benefits they derive from it and not because of emotional, spiritual, cultural, and ecological reasons. Obviously, the market forces greatly influence the decision of the farmers as to the extent of sweetpotato cultivation and what varieties to plant. We are not capable of dissociating farming from marketing activities nor can we afford to keep the farming community traditional and poor. A strategy to encourage farmers to conserve genetic resources of sweetpotato must then be linked with the economic activities associated with sweetpotato. It should also be towards providing incentives for caretakers of these valuable indigenous varieties.

Establishing sanctuaries cannot be considered since sweetpotato is not indigenous in the Philippines, therefore it does not grow in the wild or protected habitat devoid of human management. It is also assumed that organizing village-level custodians and allocating land for this purpose will be inappropriate considering the physical characteristics of the area. The low economic benefits derived from maintaining a number of varieties in a piece of land which could otherwise be used for planting a single high yielding variety would make the approach non-sustainable. Village-level conservation in the Baloi farming system should aim to upgrade the productive capability of the Baloi farmers and must be attuned to their needs. From the initial research findings and team consultations, the following factors must be considered for a workable community-based genebanking project in sweetpotato:

Promotion of an extensive educational program

There are many economic forces that push farmers to accept newly introduced varieties. Their concern right now appears to be more on short-term survival rather than sustainability or long-term security. To instill public awareness and conscientisize concerned farmers of the importance of conserving genetic resources may be helpful in changing the ecological importance of sweetpotato growing. This could be reinforced by holding annual contests for those who can produce the most variability of sweetpotato roots.

Introduction of alternative and traditional uses of sweetpotato

Right now, the market has the greatest influence on the cultivar that will be planted and subsequently maintained. Introduction of alternative uses and revival of traditional uses of sweetpotato in the locality will minimize dependence on the market and will provide a better chance for the continuous use of traditional cultivars. Re-introduction of traditional sweetpotato products for home and market consumption might be a subtle way of encouraging farmers to maintain various traditional cultivars. Sweetpotato will then be grown for different goals and needs.

Establishment of linkages between/among local communities, the research and extension agencies, local government units and other relevant traditional organizations in the area

A strong, systematic, and active networking with the different local institutions is a must from the start of the project. This will not only assure shared financial obligations and accountability but also of the sustainability of the project beyond the project life.

Building local capabilities for conserving, maintaining, improving and sharing desirable and indigenous genetic resources

The value of farmers' indigenous knowledge is at par with scientific knowledge when it comes to plant genetic resources. However, we must accept the fact that while the former may know the rudiments of conservation, we need the latter's inputs to systematize the information especially with the changing ecological conditions of a given production system. Trainings and on-farm demonstrations would be helpful to bring together farmer-scientist partnerships in knowledge sharing and in the practical application of such knowledge.

Another variable option that could be subsumed under this broad strategy is the establishment of a system in which some farmers could specialize in seedpieces multiplication which will be sold to those needing cuttings.

CONCLUDING REMARKS

As implied in the preceding discussions, village-based conservation of sweetpotato in Baloi requires not only a sensitive users' perspective but, more importantly, active participation by the farmers and communities directly affected. The essence of this project lies in the establishment of an important piece of Maranao Muslims' long-term ecological, economic, and social legacy -- that of continuously conserving and maintaining desirable traditional sweetpotato cultivars for present and future generations. Indeed, this is a great challenge not only to the Maranao people but also to technical and social scientists.

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MARKETING, PROCESSING AND CONSUMPTION RESEARCH OF SWEETPOTATO IN ASIA: AN OVERVIEW

Julieta R. Roa

Using the two unifying concepts of food systems and users' perspectives in UPWARD, research has progressed on two fronts: from methods development towards more action-oriented and focused research and studies; and from mostly farmer or farm household production research to a focus on a broader spectrum of the food chain including traders, laborers, processors, consumers and other users of research results such as policy-makers and planners.

The first phase emphasized the development of user-sensitive, systems oriented and participatory approaches to research. Thus, early works incorporated diagnoses of sweetpotato food systems in Asia using a wide range of diagnostic tools to understand sweetpotato microniches (e.g. homegardens) and market-oriented production systems, integrating indigenous knowledge, gender-sensitivity and intra-household dynamics in the complex production-consumption functions of small farming households.

After the second UPWARD conference, the progression from diagnosis to action was explicit with several projects already moving towards focused studies in response to opportunities as well as technology innovation and dissemination. Three major fields were then identified where research can be focused and fitted to the specific countries' needs and opportunities. These were production systems, genetic resources, and marketing, processing and consumption.

This paper will focus on the third area of concern. What has been done in the spheres of marketing, processing and consumption within the context of each country's identified needs?

The present paper primarily seeks to highlight research results on a country basis rather than summarizing marketing and utilization systems on a regional basis, though a brief regional overview is including a country focus offers the chance that results can be used as a springboard for discussion for each country. Clearly, the situation and specific objectives differ to some extent from country to country.

METHODS AND CONCEPTUAL FRAMEWORKS

Sweetpotato can have a social, cultural and/or economic value. Its production can be linked to the market in varying degrees or used purely for subsistence. As such, studies on marketing, processing and consumption are aimed to achieve many different objectives, each seen as

relative of the role and function of sweetpotato in the farming systems or prospects for the local or national economy.

From the research undertaken in Asia in Phase 1, two distinct conceptual frameworks can be gleaned from the methods used and objectives stated. Understanding these frameworks will help researchers put our work in some kind of theoretical perspective which can serve as guide in enriching current or future research of similar vein. The same framework can help us to review and critique our work, evaluate gaps in information and weaknesses in methods.

Second, it helps a researcher to innovate by critically blending the lessons of field work experience with the conceptual basis and build on from this evaluation new methods or ways of thinking to address problems and needs of changing systems.

The two identified models are the food chain model with a variant we can call the two sector economy model and the product development cycle model. The crucial difference between these models is that the first is largely descriptive, whereas the second is prescriptive. Moving from description to prescription is one of the major issues for UPWARD, and this overview will examine which projects are sensitive to this transformation.

The food chain model

The exchange activities and use of sweetpotato cannot be investigated without taking into account other foods, sectors and processes. From the farm to the final user, a whole range of actors interact and are influenced by many factors in making decisions, which in turn influence the processes involved.

The factors that influence the links between production and consumption could include: stability and seasonality of production, storability of food, postharvest technology, marketing, preparation of food, distribution of food among household members, labor requirements, and land availability, among the important ones (Figure 1).

Vrieswijk (1992) used this model in integrating nutritional aspects in sweetpotato work in the Philippines. The expanded variant for this reflects the food systems perspective - the pervading principle behind all UPWARD research. Sweetpotato needs to be investigated in a broader context.

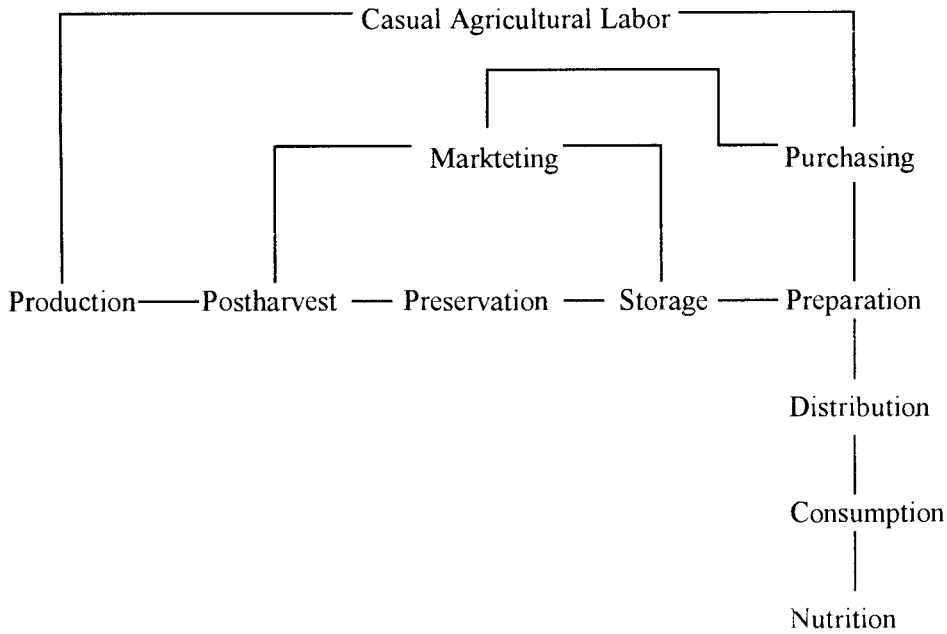

Fig. 1. The food chain model (Homboe-Ottesen et al. (1989) as cited by Vrieswijk, 1991).

The two-sector economy model is a narrower variant of the food chain model. Producers or sellers are linked to consumers or users by the process of exchange or marketing, where a monetary medium is involved. These activities benefit all sectors to a greater or lesser degree. Wages are due to labor; rent to land; profit to entrepreneurship; and interest to capital; thus, the distribution of the benefits of production. These relationships are shown simply in the following model (Figure 2).

The actors, processes and linkages are characteristics of each of the four basic functions: production, consumption, exchange and distribution. The analyses of the market and consumption systems, whether on a macro or micro scale can be gleaned from this model.

Rentian's analysis of the agricultural marketing systems in eastern China used this model. It looked at the components of the market systems to investigate the functioning of each of the actors, their linkages via trade, and analyze relative advantages and disadvantages of crops.

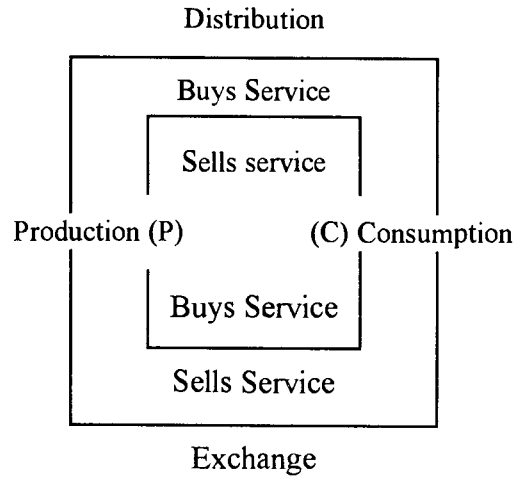

Fig. 2. The 2-sector economy model.

The product development cycle model

Systematic product development is achieved by integrating marketing and technical (i.e. both processes and engineering) research into one coordinated process which aims to develop a new product, process or marketing system. Knowledge of consumers' needs and knowledge of technological developments are major inputs to product development (West and Earle 1987).

Product development follows through a set of stages (first column, Table 1) from idea generation to commercialization. The description of the market and evaluation at each stage employ different types of market research strategies (third column, Table 1) and should therefore be used throughout the project.

At each stage, evaluations are made of costs, suitability and other aspects, and decisions are made whether to go on, modify or stop.

Table 1 illustrates the interface of three different types of market research, appropriate for each stage of the product development cycle, with the technical aspect. For example, in the formation of a product idea or concept, as in sweetpotato, consumer surveys and study of the product market structure will generate information that should be enriched with a review or inventory of similar and competing products. Brainstorming follows to screen off or evaluate from a large mass of product ideas and choose those with the best potential. The choice depends not only on technology but also on raw materials, pricing, input supplies and support systems. The UPWARD work in Vietnam on the development of the

sweetpotato transparent noodle approximates this process and in Thailand and Sri Lanka research has also attempted to work along these lines.

This model is not new, of course, and has been the practice of business firms engaged in product or service development

Table 1. Stages of product development with research interface.

Stage	Technical Research	Market Research
Idea generation	Technological literature research/review of experience	consumer surveys, market inventory, informal farm-market surveys
Screening/evaluation	Brainstorming	
Product/process development	Experimentation of product: concept tested continually at lab (product-process-raw materials)	Product profile and material specification from consumer/farm market survey
Product testing	shelf life-test packaging tests lab. acceptability test (sensory evaluation/test panel)	market research: distribution competitive consumer testing
Pilot testing	skills/hands-on training of technology beneficiary pilot runs	consumers test-feedback modifications, final market test, feasibility preparation
Commercialization	Final product developed and commercialization	market launching: product promotion, market monitoring

Source: Roa, J.R. 1992

HIGHLIGHTS OF RESEARCH RESULTS: REGIONAL OVERVIEW

In the 1980's, understanding of sweetpotato production, marketing and utilization systems was deficient in many Asian countries. This was due primarily to the low level of research investment in the crop and therefore to poor understanding of its role and potential (Horton et al., 1989). Guided by the principle of relevance and efficiency in research and the succintly coined "users' perspective" philosophy, research projects were identified in several countries in 1990 and 1991. The following section summarizes research results on sweetpotato marketing, processing and consumption. Table 2 presents a summary of the research by type of information or results gathered.

Research in Indonesia, Nepal and Sri Lanka has been quite broadly focused and has aimed to contribute to the elaboration of national sweetpotato research programs without, however, coming up with specific proposals. The project in eastern China was a systematic attempt to analyze potato within the context of an agricultural system. This allowed a comparative advantage analysis which provided a guide to research and some concrete project proposals. Researchers in Thailand and Vietnam used rather different market research tools which were combined with a food technology development approach. Vietnam had proceeded further in this direction by building the development and local testing of sweetpotato-based transparent noodles on the foundation of a good marketing study .

Vietnam and China are particularly interesting since not only are both transitional economies with rapid growth in entrepreneurial activities, but in both countries sweetpotato is a major crop which is already part of the food and/or feed processing sectors. Not only did the researchers attempt "novel" ways to analyze the crop within their respective systems but also reflected the attempts to blend both macro and micro-level analyses.

In the Philippines, several research projects addressed specific needs in different localities or regions. One project also attempted to develop a national minimum data set on the various links in the sweetpotato food chain to serve as a basis for research prioritization and policy decisions.

COUNTRY OVERVIEWS

China

Since the 1979 reforms, China has been in transition to a "socialist market economy" - one, where central planning still plays a key role in critical sectors of significant national impact (e.g. grains, state industries) but allows market forces to freely interact and Governance is gradually decentralized.

Clearly recognizing this context, the agricultural marketing research in Zhejiang province looked at markets as systems with the dynamic interactions of buyers and producers/sellers who are linked together by the trading mechanism (Rentian, 1993). Using this systems context, boundaries could be defined whether geographic (e.g. local, regional, the world), administrative (e.g. national, provincial, country) or economic (e.g. product or resource markets, sellers-buyers). A boundary perspective helps in clearly defining links and interactions among actors in the food systems. This also allowed desegregated studies of the market components: the producers, consumer, trade and the government.

An analysis of the interactions among market actors assessed the comparative advantage of agricultural commodities to situate the opportunities for sweetpotato and potato. Tea, vegetables and mulberry and late rice have a comparative advantage over wheat, corn, peanut, citrus, tomato, sugar, cotton and early rice. The latter, however, has a big potential for livestock feed. The same is true with sweetpotato since the price of sweetpotato and early

rice is less than corn which still comes from north China. Potato is favored for planting in early spring and has potential as cash crop especially in areas near urban centers where demand is increasing. Late harvest potato, however, is unprofitable to sell due to competition with summer vegetables where demand decreases and price falls. Potatoes could then be used for home food, feed and seed.

The production studies reveal the critical importance of timing of production vis-a-vis similar or competing crops from other areas, the level of technique, and the availability and costs of factors of production such as labor and capital.

Interestingly it was pointed out that unlike in the planned economy where the crops produced are eventually consumed (i.e. in a government-managed 'producers' market'), producing and trading in an open-market system needs to be consumer-oriented; thus, the importance of consumer research which looks into changes in consumer spending as incomes and food habits change. As incomes increase, people become more conscious of taste, nutrition and freshness. New ways of consuming potatoes (e.g. French fries, mashed potato in urban areas) and processing sweetpotatoes (e.g. as feed to swine/poultry/cattle) will guide crops research and development efforts.

An important contribution of the trading studies lies in pointing out key elements which could be used for market efficiency analyses: people (i.e. traders, users), the trade infrastructure (i.e. institution, equipment, facilities), market (i.e. wholesale-retail structure, links) and processing and storage (i.e. level of technique).

It would be certainly useful to follow through with a macro-view of agricultural marketing coupled with disaggregated but linked studies of market components such as means for analyzing the comparative advantage of sweetpotato and/or potato as a basis for future research or action.

Indonesia

Indonesia is the third biggest producer of sweetpotato next to China and Vietnam with Irian Jaya and Java as the areas of concentration. Sweetpotato is the fourth most important staple next to rice, maize and cassava. Sweetpotato then, is considered important in the government top priority food diversification program.

Since consumption, and hence production of sweetpotato, has been decreasing the strategy for improved productivity and expanded utilization in food and industrial processing was taken as the focus of research. Thus, the marketing, processing and consumption studies were undertaken to provide a baseline (Dimyati et al., 1995).

A combination of field surveys of processors and markets, and laboratory work on the physiochemical characteristics of existing processed sweetpotato products provided bases for analyzing their market opportunities and potential.

Surveys were conducted in Java where 45 per cent of sweetpotatoes are grown and most processing is located. It was found that at least ten sweetpotato products constitute a small-scale agro-industry using more than 2 thousand tons of sweetpotato annually. Sweetpotato is a preferred raw material because of its unique suitability for local products such as "Kremes", "Kripik", and "sao" (a sauce), as well as its better profitability. This sector, however, is plagued with problems of instability of supply and prices of sweetpotato, products quality control (owing to relatively crude processing techniques) lack of products standardization and deficient selling techniques (e.g. expiry date not provided, packaging).

The study suggested that R&D program give priority attention to the problems of existing products. Suggestions for future directions included: improvement and scaling up of existing processing, development of intermediate technologies as sweetpotato flour, utilization as feeds and other new products. Socioeconomic, market and policy studies need to be integrated for each specific technology development project. A mechanism for transfer of viable technologies could include a mixture of pilot projects, demonstrations and trainings.

Nepal

Sweetpotato is a culturally important crop in Nepal. Though neglected in the past, government has shown increasing attention due to its potential as food to sustain a growing population. Official statistics estimates production area to be 7000 hectares.

An overview study of sweetpotato was undertaken using micro-level techniques in selected districts to have a better understanding of production, marketing and utilization (Shah and Koirala, 1992).

Sweetpotatoes are grown largely in small farms and riverbanks in the plains, the hilly regions, and in subtropical zones up to about 1800 m.a.s.l..

In the plains, more than 90 per cent of the produce is sold in the local and urban markets. During festivals, about 70 per cent of those produced in the hilly regions also are sold in the markets since sweetpotatoes are essential food components in the festivities. They are used as "prasad", a sacred ingredient used as offering to God. Sweetpotatoes are also used to barter with rice (1:2 ratio) or with wheat/maize (1:1 ratio).

Sweetpotato is also sold either directly by the growers themselves or through the assemblers/wholesalers who sell to retailers in the urban markets.

Sweetpotato is used mainly for food as "tiffin" for children, sometimes for breakfast or dinner. The tender vines with leaves are fed to cattle and believed to increase the milk of milch animals. A few would make the roots into wine with a mixture ratio of 5:1, mixing sweetpotato with cereal.

Thailand

In terms of government policy, sweetpotato is a minor crop in Thailand. Area grown in 1988-89 ranged only between 7200-9300 hectares with yield of 11-12 tons/ha. Sweetpotato, however, is an important cash crop in the central-west and southern regions where most of the crop is grown (ca. 5100 has.). In this region, about 95 per cent of sweetpotatoes are sold to the fresh root markets and households which prepare sweetpotato into desserts, snacks and main dishes.

Harnessing the potential of sweetpotato processing is viewed as a means of increasing rural income particularly in central and southern regions. It was crucial then to study. Thai food habits and document existing sweetpotato utilization to analyze potential sweetpotato food products that would fit consumer needs (Soontornarurungsi, 1991).

There are 24 popularly accepted recipes for sweetpotato preparation which includes ten desserts, five snacks and nine main dishes. Preparation is simple with inexpensive kitchen equipment and done at the household level. The process can be grouped into deep frying (usually snack products), boiling, steaming and roasting; coating with heavy syrup; candying, frying (usually for main dishes) or used as ingredients for other food.

Most processors distribute their own products with other food to other regions. The benefits to them are sufficient and important additional income.

The study found out that sweetpotato products are consumed widely. This shows a potential for improved and expanded processing through technology development particularly in areas where sweetpotato can be produced at a relatively low cost and processing can have comparative advantage.

Sri Lanka

An increasing population and a stagnant production of the rice staple drove the government to embark on a diversified agriculture program. Sweetpotato became important as a diversification crop in many farming systems. Rice farmers preferred sweetpotato as dry season crop due to its greater adaptability to adverse climatic conditions and low input requirement.

Also, the Poverty Alleviation Program ("Janasaviya") addressed the energy and income needs of the increasing potentially at risk low income groups by encouraging the production of traditional crops. Sweetpotato was identified for this and included in the states' school feeding program.

The potential of sweetpotato for food processing and cottage enterprise (especially women farmers) was examined and demonstrated with several agencies and groups. A benchmark survey to determine food habits and case studies for the local testing of sweetpotato products were also undertaken (Rupasinghe, 1993).

Surveys showed no significant change in food habits and sweetpotato consumption over the years; but a growing awareness among the higher income class of health and fitness, nutrition, color, taste and palatability of food products.

The sweetpotato products (e.g. chips, doughnut, cookies and cake from flour, sauce, toffee) were introduced in the relatively urban districts of Kegalle and Kandey with the Janasaviya beneficiaries, women's groups, farmer organizations and the integrated rural development project group through trainings-demonstrations and fairs.

As a whole, the activities were not sustained. The lessons learned in setting micro-enterprises among the poorest of the poor were significant. It was realized that such factors as capital, hygiene-consciousness, skills development (both technical and entrepreneurial) and organization build-up must be achieved to a minimum adequate level for a start-up of a processing enterprise. Further, production, processing and market researchers must implement the project in a coordinated and integrated manner.

Vietnam

In Vietnam, sweetpotato is the third most important crop next to rice and maize, and traditionally a widely popular staple. It is cultivated in 4.8 per cent of total area devoted to food crops and figures 9.7 per cent of total food production. Area, production and consumption are notably decreasing since the mid-1970's. This has been attributed mainly to the lack of suitable processing technology and limited and inefficient utilization methods (Lan, 1991).

Research to increase utilization was advanced through the development of new processing technologies. Three potential products were studied, namely; chips, animal feeds and transparent noodles. A combination of macro-study on production, technical studies on markets, processing and consumption pointed to the greater viability of transparent noodles. This was in the linked areas of the central and north regions with Hanoi and other; urban centers as the main markets.

Transparent noodles were found to be favorite and widely consumed. They are traditionally essential food components in weddings and other special occasions paticularly during the Viertnamese New Year. Market studies showed the growing acceptability of transparent noodles from canna root instead of the more expensive mungbean. Three types of noodles were identified as preferred: the white transparent type treated with chemical, the less white but with good cooking quality, and the extruded type similar to mungbean noodle. Technical studies showed that sweetpotato starch can be successfully used instead of canna starch, which is a problematic raw material due to the single annual harvest of the canna crop.

Marketing studies of both starch and noodles were conducted to better understand the market linkages and to find the basis of developing small enterprise including the selection of promising areas to set up the sweetpotato noodle processing centers.

Surveys in three processing centers revealed the backward and forward linkages of noodle processing. Processing for both starch and noodles is household-based and some degree of specialization was observed. Some households do the grating and passed on to those which extract the starch. Assemblers collect the starch to sell to noodle processors. Another group of assemblers distribute the finished noodles to urban markets, mainly in Hanoi. A service network of local chemical supply, equipment and maintenance service, fuel and water supply was also well in place. In this system, both processors and traders got a good share of the profit pie.

As the processors are located around Hanoi, distribution costs to sell noodles to the central region increases the price of noodles by a bigger margin. The north central coast region is a sweetpotato area where the raw material price is low and this offered an opportunity for local testing of the new technology. Household production of sweetpotato starch in Thanh Hoa (a province on the north central coast) was tried out. This was linked with the noodle processor in Hanoi who was keen on the new technology and excited at the new prospects. A number of different kinds of noodle producing enterprises have now been piloted in Thanh Hoa, with direct involvement by the Hanoi processor, who acted as "participant-trainer" to the Thanh Hoa families. One of the main difficulties of the piloting has been matching supply of starch by starch processors to the demand for sweetpotato starch by the noodle processor, given the seasonal varieties in quality and price of roots on the one hand and the seasonal variation in the demand for noodles (highest at the Vietnamese New Year). Integration of the system is still being tested.

Philippines

Studies in the Philippines can be divided into hill regions (especially the northern Cordillera) and plains regions (i.e. Lanao del Norte in northern Mindanao, and other sweetpotato regions) which have different production systems and varying degrees of market orientation.

In the highlands of the Cordillera, sweetpotato is mostly grown for household consumption, either as primary or secondary food or as livestock feed mostly for pigs. Though some cultivation practices differ among different ethnolinguistic groups, forms of utilization are largely uniform and traditional.

Sweetpotato is often dried for household storage either as chips or as flour made from ground chips, especially in landlocked areas where surplus cannot be sold. But in the areas connected by a road network to local or urban markets (e.g. Mayoyao, Bayyu), marked changes in the agricultural system have been noted: from the traditional subsistence farming to commercialized farming. Less sweetpotato is consumed with the rice intake increasing due its availability and increased income to afford it. Sweetpotato is also an important feed source. The backyard garden systems are important sources of vegetables (i.e. sweetpotato tops) and seedbanks (Mula, 1992; Balaki and Solimens, 1992; Verdonk, 1992).

Sweetpotato as a survival crop was again observed in a post-earthquake study in Buguias where rice supply was cut-off by roadblocks. Increased sweetpotato consumption

was noted after the earthquake while those without sweetpotato were near starvation (Sano et al. 1992).

A systematic attempt at studying sweetpotato consumption and its role in the diet was undertaken in two systems: where sweetpotato continues as a secondary staple and where it has a diminishing role. Daily food recording, consumption calendars, food ranking, interviews and food diaries were used as research methods. Sweetpotato remains a staple for low income groups but consumption is strongly related to season, decreasing with availability of rice harvest. As income increases, the range of alternative protein and energy sources also increases, sweetpotato consumption decreases.

The consumption of sweetpotato also decreases as more rice is produced by the household (lasting longer though the "scarce season"); or when the mother gets a full-time job and can not look after the swidden fields (Verdonk and Vrieswijk, 1992).

The utilization and local distribution of sweetpotato and products were also documented in a hilly sweetpotato growing area in the provinces of Laguna (town of Nagcarlan) and Quezon (town of Dolores). In Nagcarlan, which is known for candy-making since the 1960's, 58 per cent of candies produced are sweetpotato-based. Preparation and equipment used are simple. Processing is done at the household level or in mini-processing units attached to or near the homes. Profits are reasonable for processors, distributors and the "kargadores" (i.e. handlers). The products are sold in the local (25%) or in the metropolitan (75%) markets. High demand is associated with the school season (Tubelleja, 1992; Colanta and Fernandez, 1992).

Likewise in other regions, sweetpotato is a popular snack food and processed into various native preparations. The damaged roots and vines are used as swine feeds; the tops are popular vegetables for soups or salad. Generally, sweetpotatoes are perceived to be good sources of energy and nutrients. They have in many cases become a supplemental or savior crop in slack food months, the waiting period before rice or maize harvest, or in times of severe food crises (del Mundo et al., 1991).

Lowland and upland sweetpotatoes are produced in diverse and complex farming systems. Marketing and consumption were then studied in relation to production typologies such as homegardens, semi-commercial upland and plain, and commercial rolling and plain systems. There was not much difference in the forms of processing (Francisco et al. 1992). Subsistence or tested farmers, obviously, tended to consume more sweetpotatoes whereas semi-commercial and commercial sweetpotato growers had wider food options due to greater purchasing power. They consume less of their produce.

Attempts to determine per capita food consumption and the nutrient contribution of sweetpotato in the household diet were done in Dolores, Quezon. Rapid rural appraisal, informal survey, case study methods and actual food weighing techniques were used.

The food habit survey showed that mothers had vague knowledge of the nutritional value of sweetpotato. Case studies revealed the need to improve consumption of energy, riboflavin, niacin and thiamine via increased consumption of sweetpotato tips and roots. Mean nutrient contribution of sweetpotato households away from the farm ranged from 3-28%; with non-sweetpotato farmers persistently low. Sweetpotato contributed a substantial amount of thiamine (10%) and ascorbic acid (23%) of the nine nutrients considered (Huelar, 1991).

It was also found that several sweetpotato distribution networks have long existed in areas associated with market-oriented zones. Sweetpotatoes are marketed locally or in the metropolitan areas through a distribution channel of assemblers/wholesalers and retailers. As it is with other commodities, the "suki" system (i.e. established trading relations; a patronage system) plays an important role in negotiations, supply assurance, credit and other privileges (Roa, 1991; Garzon, 1991).

New sweetpotato products still have to find their way to the market. Products tests of chips, soy sauce dried sweetpotato ('Delicious Sweetpotato') and other products from sweetpotato flour carried out in Bicol in relation to a technology transfer project in the area. The sweetpotato chips and Delicious Sweetpotato were found to have a market potential (Mojica, 1992).

On the whole, the Philippine studies represent several location specific market utilization-consumption concerns carried out for various purposes. An attempt was made for a nationwide coordinated minimum data-basing from production to consumption. A mechanism to effecitively work this out will need to be refined.

CONCLUSIONS AND RECOMMENDATIONS

The wealth of information on marketing, processing and consumption of sweetpotato in Asia gathered for the past three years should help forge national sweetpotato programs and research directions and there is evidence that this is already happening. For example, in the Philippines, data from some of the studies cited above have been used to target "best bet" options for expanding utilization. In Indonesia, while the marketing and processing study did not in itself lead to policy or research program changes, it did provoke interest in the user perspective approach and the potential this may have for stimulating alternative forms of utilization. Recently a new, more action-oriented research activity has taken up some of the findings and approach of the earlier work lending further weight to the evidence of impact. In Nepal, sweetpotato has now been added to the National Potato Development Program as a second commodity, signifying increased awareness of the potential of the crop.

In many cases integrated with production research, the wide-ranging application of user-oriented research using a holistic and participatory approach was applied to the study of market networks and interrelationships, including a consumption and nutrition component in sweetpotato research. Products were developed and tested with a view to the consumers'

needs and habits. A broader view of exchange relations brought out not only economic but also ecological and socio-cultural factors influencing rural and agricultural systems.

In general, the toolbox of research methods utilized in this work has included informal surveys with variants (e.g. key informant inteviews, focused group interviews, direct observation, participant observation, etc.) and focused formal surveys. The latter were used specifically with the objective of obtaining baseline information or a minimum data set. Specialized consumption-nutrition studies used food calendars, diaries, actual food weighing techniques and case studies (e.g. Philippines). Case studies were also used in pilot testing of food products (e.g. Vietnam, Sri Lanka).

From each of the countries' research results elements of an agenda can be highlighted. In Vietnam, processing of transparent noodles was locally tested in the central coast area and is showing good potential for viable expansion. Intensified efforts toward this end can have positive impact on sweetpotato farmers, processors and consumers. Having drawn lessons from unsustained transfer of sweetpotato products technologies among women and farmers, Sri Lanka will have to face the challenge of its own recommendations of an integrated and coordinated extension program.

In Indonesia, the sweetpotato processing industry needs the concerted efforts of the national program to resolve problems or raw material supply and non-guaranteed prices, products quality control and selling strategies. Industrial uses of sweetpotato as in flour, starch and feeds may need to be further researched to find which can have comparative advantage.

In Nepal, researchers will need to look more closely at how sweetpotato can be better utilized. It has already since it occupies a special role in children's food, the nutrition aspect in food improvement can be integrated. It can also benefit from a comparative advantage type of analyses expecially as the program is in its inception phase.

Marketing networks of sweetpotatoes were indentified in all countries studied. Incomes resulting from trade benefit several actors in two to three-tiered distribution channels. From the existing data, marketing efficiency could be analyzed to support some countries' recommendations of producers'/marketing association or cooperatives. Investigating on factors which influence degrees of commercialization will help policy-makers and planners to design research and support programs.

Food technology development is often a resolve to increase use-market and production. While sound and reasonable, support market research needs to explore beyond food habits and existing food products documentation. A knowledge of competing and complementing products, price-market structure of these products, preferences, farm-market linkages and efficiency of distribution systems are among the most important factors that need to be looked into in product development. Further, these need to interface with the technical aspects in process and engineering.

The directions in the cases of Thailand, Philippines, Indonesia, Sri Lanka and Vietnam may need researches (i.e. social science and market researchers, food technologies) to have a broader orientation in market research in product development. There is need to develop market research expertise.

Other than the initial efforts in the Philippines, the nutrition aspect still needs to be systematically integrated into the research process of most countries. From these, home gardens and home-processing technologies for nutrient enhancement especially with risk groups could be relevant action projects.

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Table 2. Summary of sweetpotato marketing and utilization research, by country.

Component Researcher	Countries						
	China	Indonesia	Nepal	Philippines	Sri Lanka	Thailand	Vietnam
Marketing Studies							
- marketing network	x	x	x	x	x	x	x
- marketing structure interrelationship	x			x			x
- product/market tests				x			
Processing							
- traditional/indigenous processing documentation		x	x	x	x	x	
- product/technology development							x
- pilot testing					x		
- commercialization/enterprise development consumption/ nutrition							x
- consumer surveys/food habits	x	x		x	x	x	x
- indigenous		x	x	x	x	x	
- nutrition/important in the diet				x			
- consumption trends				x	x	x	
Objective of research	China Baseline info. comparative analyses for research direction	Indonesia Information for national sweetpotato research program	Nepal baseline info. for research directions basis for action research	Philippines baseline information various location specific research to address specific needs	Sri Lanka baseline information for research direction	Thailand baseline info. for research food technology development	

POVERTY ALLEVIATION IN CHINA THROUGH POTATO MARKETING: FARMER EXPERIENCES IN SOUTHERN ZHEJIANG PROVINCE

Zhang Rentian, Ding Xianjie and Wu Jianhua

Rural development for poverty alleviation has gained considerable global attention. Yet many projects have few benefits for local people because of the development of technologies unsuitable for the community, or the environment. Recent thinking is proposing an alternative "bottom up" approach which builts on local experiences and needs, rather than the orthodox "top down" model. To enhance the use of the "bottom up" approach, one must first have a knowledge of farmer's conditions, problems, ideas, and needs. Rural surveys are necessary first steps to identify these issues. In this paper, farmers' experiences in changing from wheat-based cropping systems into potato-based ones, and thereby earning cash from selling potato, is presented and discussed. New possibilities are identified. Data in this paper come from the UPWARD-supported project titled "Potato Production, Marketing and Consumption in Zhejiang Province, P. R. China", conducted from 1992 to 1993.

CROPPING SYSTEMS AND POTATO MARKETING IN ZHEJIANG

Jingning She Minority County is located in the south of Zhejiang Province, about 400 km south of Hangzhou, the capital of Zhejiang province. Located in a mountain environment, it is one of the five poorest counties in Zhejiang province. Average annual income of farmers is only a quarter of that for the whole province.

Agriculture is the most important sector in the county, and its foremost role is to provide food. Since arable land is scarce, with only 400 square meters per capita, land use is very intensive. The main summer crops are rice and sweetpotato, with corn, soybean and vegetables occupying a small part of the land. Main winter crops are wheat, potato and pea with some alfalfa, rape seed and vegetables also grown. Cropping systems differ as elevation changes. In areas with elevation lower than 500 meters above sea level (masl), triple-cropping systems are practiced where winter crops are followed by two rice crops. In 500-800 masl areas, double-cropping of winter crops and rice is practiced. In areas above 800 masl, wheat, barley and rape seed can not be grown due to excess rainfall, and alfalfa or potato are followed by rice in a double-cropping system.

Among the winter crops, wheat has received the most attention from government. Almost all extension and research in the county for the last forty years or so have been for wheat. This was consistent with the government's earlier policy of producing enough food for farming households and for sale to the government. Farmers under this system were required to plant a certain acreage of wheat, regardless of whether they were willing or not. Part of the harvested wheat grain was sold at government set-price and the other part was left for farmers to either sell at free market prices or to use for home consumption. As land is scarce,

encouraging wheat meant neglecting other crops and in fact, often other crops were not allowed to be planted before sufficient wheat was in the ground. Accordingly, agricultural extension work focused on wheat, leaving other winter crops, such as potato and pea, untouched by modern technology. Yet, this county is not suitable for wheat production. Average wheat yield in the whole county is less than half the mean provincial yield, without mentioning the poor wheat grain quality due to excess rainfall. As the wheat price is low even in the free market, economic returns from wheat farming is almost zero. The result has been that although government's intention was to help farmers solve the food problem, the emphasis on wheat production was never likely to achieve that goal.

The economic reforms in China which began in the 1980s have led to a more flexible economic policy in rural areas. Since the late 1980s farmers have been given more freedom to select crops. After January 1993, the production quota and the mandate to sell to the government was canceled, farmers are now free to decide on the production and marketing of their produce.

Potato markets and marketing

Potato in Zhejiang province is consumed mainly as a vegetable, and in recent years this kind of consumption has become more popular. Potato is marketed fresh almost every day of the year. However, demand peaks are in April-May, July-August, and December-January. These are vegetables shortage seasons and potato becomes a substitute vegetable crop. April to May are months when summer vegetables have yet to be harvested and winter vegetables stocks are at an end. At this time, potato can be harvested from south Zhejiang, Fujian and Jiangxi provinces. The earliest harvested potato comes from Hangzhou at the end of March but in very small quantities, since it is intensively produced under plastic. Larger quantities come in the middle of April, from Jiangxi and Fujian provinces which have a warmer spring than Zhejiang. But market supply in April is still limited and the price can reach its annual peak, normally about 1.60 to 2.00 CNY/kg at the retail market in Hangzhou.* In May, because most areas of Zhejiang can start harvesting and supply increases, prices decline to about 1 00-1.60 CNY/kg at retail market, which in turn results to an increase in demand.

It is difficult to estimate the volume of potato sold in markets at this time, but market sources estimate that in mid-April to May, there are an average 20 trucks of potato (each weighing 10 tons) moving into Hangzhou, where the population is 1.2 million. After June, since almost all summer vegetables are in the market, vegetable supply is able to meet the demand. By this time, people have less interest in potato after two months of consumption and demand decreases. Potato harvesting in Zhejiang is finished in June so market potato is brought in from northern provinces like Shandong, Hebei, and Henan. Price remains at the same level as late May, about 1.00 to 1.20 CNY/kg at retail market.

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* Approximately CNY 8.2 = US$1.00.

A vegetable shortage again occurs from middle July to end of August because the hot summer damages and retards the growth of many vegetable crops. However, the vegetable shortage in this season may differ considerably from year to year. At this time, potato, cabbage, and white gourd are the three products that often fill the vegetable shortage. These are purchased nationwide with government subsidies, which puts the market price of potato at its lowest in a year, only about 0.80 to 1.00 CNY/kg at retail market. Potatoes also come from the northern provinces during this season.

After September the cooler climate allows other vegetable crops to grow well, until December and January when it is too cold. Variable climate makes the vegetable shortages differ from year to year. In years of shortage potato is used to "stabilize vegetable prices", and subsidies are again provided. Potatoes are purchased from Northeast China, where harvesting starts in September, the latest in China. These potatoes may continue to be sold in the market until early March of the following year.

With regard to marketing channels, in April to May season, only individuals and/or partners are involved in collecting potato from farmers. They hire a truck to carry the produce to urban areas and sell in the wholesale market, where they pay the amount of 3% of the total value of potato sold for the right to use the transaction center. Income for these traders is often good, although the risks are high and serious losses may occur. The survey revealed that on the average, at least CNY 1000 of net income can be earned from one truck of potatoes, which only needs six person-days for collecting, transporting and selling.

In other seasons, both government controlled vegetable companies and individuals are involved in hauling potatoes from production areas to market. As government gives subsidies through companies when vegetables are in short supply, individual activity is limited only when the vegetable market is normal. Vegetable companies use their own retail network for selling to consumers and ceiling on retail price is always established.

From the above discussions, it is concluded that:

1. In Zhejiang province, potato is sold in the vegetable market.

2. Potato demand increases as vegetable shortage occurs. Potato is always used to stabilize prices in the vegetable market.

3. Potato comes to the Zhejiang market from both southern and northern provinces, varying with the calendar. In April, sources are mainly from Fujian and Jiangxi. In late April to May, sources are south Zhejiang, Fujian and Jiangxi, in May, Zhejiang; and after June, from the north.

Farmers' initiatives in resource re-allocation through potato marketing

In 1989, some active farmers in Bohai district, Jingning county found that the market price of potato is highest in April. They were also able to supply potato during this season if they replace wheat with potato in their cropping systems. So they started potato farming and selling and the first year was successful. They also found that potato could give them much higher income than wheat. Table 1 shows the economic returns from wheat and potato production. As potato planting only needs farm manure and seeds, which are all produced in the farm, and involves no cash costs. Planting potato can provide almost ten times the net income of wheat. With cash from selling potatoes, farmers can purchase wheat and other foods, therefore the persistent food shortage problem can be addressed. Cash will also become available to purchase production inputs for the succeeding rice crop. At the same time, potato planting can improve soil fertility conditions. Survey and field experiments both indicate that rice rotated with potato can produce 10-20% more grain than when rotated with wheat or alfalfa.

Potato is therefore, a very promising component in farming systems in the poor mountain district of Bohai. According to a survey, in 1993, each household (3-4 people) on the average planted 1.0 mu (15 mu=1ha; 1 mu=666.67m^2) potato and got an income of CNY 400 or CNY 120 per person, about one third of per capita annual income of farmers which was CNY 348 in 1992.

Table 1. Economic returns from potato and wheat production (survey data).

	Yield (kg/mu)	Farm level price (CNY[1]/kg)	Revenue (CNY/mu)
Potato	1200	0.50	600.00
Wheat	120	0.82	98.40

[1] CNY8.2 = US$1.00

As potato has high economic value, farmers shift from wheat to potato in their winter crop land allocation. Before 1993 it was not so easy because of the government quota system. But even then farmers were not willing to sacrifice their own money to produce wheat and they planted potato on marginal land, on road sides and other areas which were not officially "arable land" and were not required by government to be planted to wheat. With the easing of restrictions, gradually, potato planting moved to the winter paddy field.

Figure 1 shows a comparison of wheat and potato areas in 1984 to 1992. It is seen clearly that potato planting increases much faster than wheat. This crop represents the farmers' own choice.

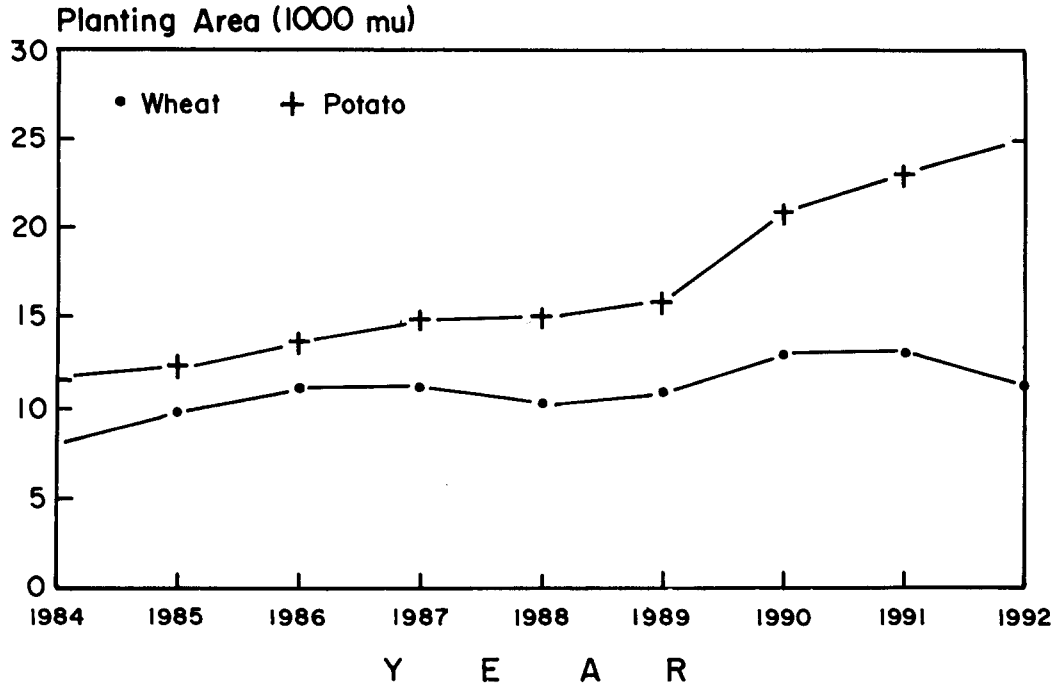


Fig. 1. Wheat and potato planting area in Jingning (1984-1992, in 1000 mu).

THE POTENTIAL FOR POTATO MARKETING EXPANSION

Seed potato marketing

As fresh potato has a good market, farmers seek ways of increasing potato productivity and for obtaining an earlier harvest (the earlier, the more profitable). Variety and seed quality are identified by farmers as two of the most effective ways to achieve this. Consequently, farmers are keen to look for good potato varieties. Seed potato marketing and exchange is the result.

The oldest potato varieties of Bohai district were from high mountain areas within the county and date from more than one hundred years ago. These were brought down by farmers who by chance saw good-performing varieties during visits to the area. After that, varieties were planted and selected by farmers, good ones being kept and locally multiplied for yearly planting. This process continued until better ones came and old ones were replaced. In recent years, two developments have contributed to direct seed marketing. The first is that farmers learned that seeds from high mountain areas are of better quality than locally stored ones, even if it is the same variety. This is because it is cooler in summer in the high mountain area than in Bohai. The second development is the selling price of potato which is at least 0.50 CNY/kg at harvesting time in Bohai, while potatoes can be purchased in high mountain areas in this county at 0.30 CNY/kg after June. About one third of farmers in Bohai find it preferable to sell all potatoes in April and then buy seeds again after June.

This also benefits farmers in the mountains, whose potato is harvested early June and has no chance to be sold in the vegetable market. They can earn a cash income from potato seed sales, which is otherwise used as pig feed. The Department of Agriculture of Jingning has developed seed bases in high mountains to supply lowland areas. Average potato yield in this high area is about 2200 kg/mu. If the seed potato price is at CNY 0.30/kg, then farmers could get CNY 660/mu by selling potato as seed. However, since less than 20% of potatoes produced are sold in the seed market, the actual income is less. The low percentage sold as seed occurs for several reasons, the first of which is variety. Presently, only one variety is predominant in high areas, which is Mongolian Big Potato, while demand in lowland areas is not just limited to this variety. The second reason is that seeds are currently only sold within the county and in Shounting county of Fujian Province, which borders Jingning county. As seed demand in Jingning and Shounting is limited, new seed markets must be found.

Since high mountain farmers are currently not using new introduced varieties as they are expensive, new varieties are evaluated only at lower elevation areas. In order to enhance the seed supply system, new varieties must be introduced in the high mountain areas. Also, local varieties need to be cleaned up if they are to be suitable in other counties. It has been seen that the local Mongolian Big Potato has been doing well in another county under experimental conditions. This suggests a way of expanding seed markets for a bigger farm area.

The Agricultural Extension Agency after testing in the last few years, finds Kexin No. 3, No. 4 and NEA 303, all from the Northeast, as early maturing, highly productive and suitable for the county. Since these varieties are currently not multiplied locally, seeds need to be introduced each year from Northern China, through the Agricultural Extension Agency.** Of course, these seeds are expensive, and the majority of farmers are not willing or able to purchase them. Less than 20% of the farmers in Bohai are involved.

Potato Processing

In the middle to high mountain areas (>500 masl) potato is harvested in late May to early June. This is a season of adequate potato supply in the plain areas of Zhejiang province so that selling potato in the vegetable market is not feasible. Of total high altitude production, 20% is sold in the seed market, about 10% is stored as own seed and for home consumption, and over 70% is used as feed for hogs, which has very limited economic value for the farm family. Seeking a good market besides seed is a key point to help these poor farmers.

One suggestion made by government is processing. However, the setting up of processing enterprises has not yet happened for several reasons. Farmers in the area are poor and hence risk-averse. Food processing not only needs large investment but also needs entrepreneurship, marketing skills, technology and sanitation control. Also, the county has poor transportation facilities and access is difficult. Although surveys have identified some

** In order to protect diseases and pests, long distance seed selling and purchasing are controlled by government

farmers in the county making potato or sweetpotato chips, these products are entirely for home consumption. This processing appears to involve high processing costs and it is not known whether products can be sold profitably.

However, a possibility for processing still exists in this area. The biggest advantage is the low production cost. No pesticide is used and the soil in the area is very good, with only farm manure and a small amount of chemical fertilizer needed to produce very good yields. Also, labor costs are very low. It is hoped that if farmers get technical, financial or marketing support, a small processing industry might be successful.

Other marketing possibilities

One most noticeable development in potato consumption in the past few years is the mushrooming of foreign-inspired fastfood restaurants. As these restaurants need special quality potato, it is yet to be seen whether Jingning county, one of the major potato producing counties in Zhejiang, can be a source of raw material. For this, variety development and introduction are the most important concerns.

Another marketing possibility is to try selling potato in July to August season when consumer demand is high. At the present time government-controlled vegetable companies purchase potato with subsidies from North China, making competition from local producers for a market for potatoes difficult. Potatoes from North China are also cheaper and of good quality. However, it is observed that potatoes in Zhejiang are superior in eating quality, and Jin-wen railway is to be finished in 1995, thus, transportation costs will be cheaper. Hence, it is still possible for the area to market potato in the future. To achieve this, several things must be done: improve production systems to save costs, produce good quality potatoes, and store for the July-August period. This needs important innovations in varieties and in field management.

Market information and risk

Since potato marketing involves high risk, market information is crucial. In a survey, it was found that marketing businessmen do not always know the market situation. Although some traders collect market information by telephone and other means, they get this information from the market itself. However, many potato suppliers from Jiangxi, Fujian and other counties of Zhejiang province may haul potato to the same market on the same day. Over-supply always occurs, resulting to a sharp decrease in price and losses for traders. Therefore, trader's risk is high and needs to be lessened through market system development.

Producers' risk is relatively smaller. This is because information for them is quite clear and arrives fast. Traders, either from local community or others, each day announce through the local broadcasting system what the price is and the assembling place. Producers can make immediate contract with traders if they agree with the price, and then just harvest the crop and sell to the traders. If farmers think the price is lower than their expectation, they can just wait and harvest later. Since potato crops are almost always harvested early in order to

get a good price, by waiting for several days they may get a lower price, but yield can be higher and total income unaffected.

CONCLUSION AND REMARKS

Rural development has attracted global attention. It has been recognized that agricultural research and development should be consistent with farmers' resources and environment. Only when farmers resources are fully used can it be possible to improve farmers' welfare. In a market economy, market transactions should be a very important component in development planning. Experiences in Jingning show that in order to alleviate poverty and food shortage problems, one should not just focus on staple food crops. Identifying food crops with market advantage may be a good alternative.

UPWARD emphasizes the users' perspective and participation. In order to stimulate farmers' participation, real benefits must exist and be foreseeable. Since potato production and marketing have been beneficial to farmers, our project gets considerable support from farmers, which in turn improves research and gives benefits back to farmers.

At the same time, researchers are also requested to "participate" in market development and post-harvest issues. Therefore, it is equally important to develop a "researchers' participation" philosophy. Researchers may help in information collection and product development and may be directly involved in marketing with risk-averse farmers. Since UPWARD is a non-profit institution, getting involved with businessmen and thus working for a profit, would contradict UPWARD's philosophy. We offer this issue for discussion.

UTILIZATION OF SWEETPOTATO STARCH FOR TRANSPARENT NOODLE PROCESSING IN VIETNAM: PRELIMINARY RESULTS OF A PILOTING STUDY

Dang Thi Lan

In Vietnam, transparent noodle is considered an ingredient essential in most ceremonial meals served during weddings, moon days, and or New Year's Day. Traditionally, it was made from mungbean starch but the raw material has become very expensive and complicated and time-consuming processing techniques required has increased further the price of the end-product.

To improve the opportunity for poor farmers in the provinces to benefit from processing as an alternative income source, an UPWARD-supported project has explored the use of sweetpotato starch as a new raw material for transparent noodle production. Transparent noodle produced from the starch of canna root (*Canna edulis*) has gained increasing market acceptance since the early 1970s. However, canna production also has its problems like the long vegetative period, as well as problems in drying and storage of the starch (Fig. 1).

Sweetpotato has several advantages, including a longer harvesting period, a much wider geographical distribution and the possibility of integrating it into production systems and the household economy, especially in north and central Vietnam. Furthermore, farmers' dependence on the crop is undermined by periodic over-supply and very low prices. Channeling some of that over-supply into noodle making could offer cheaper noodle in the low-income provinces and the chance of providing extra income for rural producers.

Thesis work in an earlier phase explored different techniques of producing transparent noodle using sweetpotato starch. To introduce the laboratory developed technology to the household enterprise, the project studied the existing marketing system of both canna starch and transparent noodle.

After field-testing the use of sweetpotato as raw material, which showed the feasibility of its use, the next stage was on-site participative testing under household enterprise conditions. Together with local cooperators, this stage explored the integration of the technology by subjecting it to existing household labor availability and skills, supply of raw materials, and market opportunity.

Because sweetpotato is not extensively grown in the Hanoi area (and is used especially as pig feed) it is an expensive raw material there (500-1100 dong/kg)* and therefore not appropriate for starch and noodle production. It is however, used as a quite high value snack food because consumers prefer the sweeter taste compared to other crops.

On the other hand, sweetpotatoes are extensively produced on the northern and central coast, for example in Than Hoa Province, where they are sold at a lower price i.e., 200-400 dong/kg. Sweetpotato is a staple food in the area and is often processed into dry chips. Farmers prefer varieties with high dry matter content to produce a good quality chip.

During peak months in this area it is possible to produce starch from sweetpotato much more cheaply than from root. Besides, survey data revealed that in Tinh Gia District, the price of transparent noodles made from canna is very expensive, with a price difference of as much as 1000 dong/kg to that in Hanoi. These factors show the potential of sweetpotato as an alternative raw material for noodle production.

A decision was made to pilot the use of sweetpotato as a raw material and likewise to test other factors such as price potential, processing technology, enterprise organization, and market connection.

SWEETPOTATO STARCH AND NOODLE PRODUCTION

The participatory testing and evaluation of sweetpotato starch and noodle making started in Tin Gia, Thanh Hoa in May 1992 and has involved, at various times, 6 local families.

Table 1. Household Capacity in Starch and Noodle Making

Name of Family Head	Capacity	Starch Making	Noodle Making
1. Mr. Dinh (Doi)	5 kg noodle/day	Yes	Yes
2. Mr. Dam	150 kg noodle/day	No	Yes
3. Mr. Duong	40-80 kg tuber/day	Yes	No
4. Mrs. Van	70-80 kg noodle/day	Yes	Yes
5. Mr. Lai	40-80 kg tuber/day	Yes	No
6. Mrs. Luu	150 kg noodle/day	No	Yes

* Dong 10,00 = US$1.00

Getting started in the first season proved to be difficult (From April 1992 to July 1992). The cooperating households were farming families without commercial land, with no marketing experience, and were understandably nervous about investing in the enterprise. Initial production of noodle was very small, around 5 kg a day, and starch filtration was 30-40 kg per two days, which in turn produced only a small profit margin. Any increase in the price of raw material easily led to abandonment of the processing operation. No amount of persuasion by the researchers to "persevere" was convincing.

The problem was solved by inviting the Hanoi processing household who had originally evaluated the technology to come to the village and act as "processor-trainer" in July 1992. The enthusiasm of the Hanoi processor for sweetpotato as raw material and his knowledge of the market was far more convincing for the local family than words of the Government scientist. The processor discussed the temporary nature of fresh root price fluctuation and explained the importance of building confidence with retailers by guaranteeing a continued supply of noodles. During discussion and training in starch and noodle making, some local families who were interested and willing to develop starch and noodle enterprises were invited. These included families Number 2, 3, 4, 5 and 6 (Table 1). Such was the confidence of the Hanoi processor that he became an equal partner with the Dam family (No. 2) in the sweetpotato noodle enterprise. During October/November 1992 production rose dramatically, reaching 150 kg per day, about the same output as the Hanoi enterprises. This level of production was maintained throughout the peak period leading up to the Vietnamese New Year. In all, from September 1992 to February 1993, with maximum production in December and January, these two families, consisting of 14 working members, produced 3 tons of transparent noodle. It is estimated that 150 kg noodle needs 4.5 man-days (i.e., 1 ton of noodle needs 30 man-day). For 3 tons of noodle they get a total of 2.4 million dong profit. This shows an average profit of about 800,000 dong/ton in Thanh Hoa compared with an average of 500,000 dong/ton in Hanoi. After the New Year, each family got an income of 1.2 million dong.

Table 2. The comparison of economic results of transparent noodle production.

Place	Weight (ton)	Man-day (x1000[a])	Profit (x1000[a]/day)	Income per Man-day
Hanoi	1	30	500	16.7
Thanh Hoa	1	30	800	26.7

At the same time, from August to February 1992, the second enterprise involved household production of sweetpotato starch to supply the local noodle production. Because of the uncertainty of the demand, the project worked with only one starch making family who could not supply sufficient starch once the sale of noodle production increased. They lacked access to raw material and labor that forced the noodle processor to buy canna starch from

Hanoi and mix with the sweetpotato starch. The starch making family of Mr. Duong produced starch from more than 4 tons of fresh root or about 600 kg of dry starch and sold to noodle making families. The family of Duong did not get much profit. But it was important for them that they were able to get the residues of starch processing for their swine. Therefore, each two to three days, they got one batch of 30-80 kg fresh roots for starch making.

The Duong family used the following formula in calculating the price of the sweetpotato starch they produced:

$$\text{Price of SP dry starch} = \frac{\text{price of root} + \text{grinding cost}}{\text{dry starch (kg)}}$$

Later, three more households were involved in sweetpotato starch and noodle processing. The first family (Mrs. Van) already had experience in noodle processing and owned a cooking oven and a rice cooker with diameter of 65 cm for transparent noodle production. With this instrument, the capacity of transparent noodle is only 70-80 kg/day (see Table 1).

Family no. 5 uses electricity for grating their own sweetpotato roots and those of family 4, charging 800-1000dong/100 kg of root. Upon extraction, they keep all starch residues themselves for pig keeping. From May 1993 to September 1993, concentrating on May, August, September, when sweetpotato roots were cheap (200-500 dong/kg), this family processed about 1.6 - 1.7 tons of roots. Mrs. Van processed about 400 kg of roots. Each batch they process is on average 40 - 50 kg of root. All in all, the two families were able to process about 250 - 300 kg of dry starch for five month period.

Family No. 4 (Mrs. Van) who had already been involved in rice noodle making, was able to produce and sell sweetpotato transparent noodle to the same buyers of rice noodles. The advantage was that rice noodle was done on a daily basis, whereas the transparent noodle was done in batches, repeated when all the noodles have been sold. During July, or Moon Day Festival every 3 September, and other days of the slack season, approximately 250 kg of dry sweetpotato starch and the same amount of canna starch obtained locally, were processed**

One interesting result of this situation is that the mixture of canna and sweetpotato starch turned out to be superior to both pure canna and pure sweetpotato based starch, and may well be the preferred composition in the future.

** Canna starch is bein brought dry from the processing village in Hanoi by the Hanoi processor which costs at 2200 dong/kg and additional cost of 300 d/kg for transportation.

Mrs. Van's family reckons that on a hundred kilos of sweetpotato/canna starch, they make about 50,000-80,000 dong profit, compared to 30,000 dong on 100 kg of rice mixture. However, whatever the price situation, they wanted at least 30% canna mix for better quality. Normally, they use 50% - 50% mixture. They use the same oven and cooker with 70 cm of diameter for rice and to make transparent noodle.

This family has reasonable market relationships, mainly the link with well-known rice noodle traders in the district market. They also sell from their house and to officers in the Agriculture Department where the wife works. The transparent noodles are sold on a consignment basis i.e. they receive money when the trader completes the sale. They mentioned that the family had limited capital for expanding their noodle processing scale and they are afraid that it would be difficult to get back money if they sold their products to other traders in other areas on consignment.

Both families no. 4 and no. 5 stopped processing starch for two months (October and November 1993) because of lack of sweetpotato roots and the high prices. They resumed only in December 1993 and January 1994. Family No. 5 who has an electric powered grinding machine and was specializing in rice and root grinding thought that it was convenient and more efficient to process both rice and roots. He was then looking for immediate cash sales. He said that he could not afford to build up a stock of starch as he had no capital.

Another family that became involved in sweetpotato transparent noodle processing more recently was Mrs. Luu in October 1993. Her family has a long experience in rice noodle making and enjoys an extensive set of market relationships with traders in the district market and in the vicinity. As part of the support for enterprise development, the project assisted the family to visit the Hanoi processor-trainers' enterprise to learn how to make transparent noodle, which is a different process and requires different techniques than rice noodle processing. They were then ready to prepare noodle for the main consumption season, especially for the National New Year Festival in 1994. About 180 kg of dry sweetpotato starch was bought from Family no. 4, and canna starch was brought from processing village. The Hanoi processor-trainer is also involved in noodle processing in this household, on a partnership basis.

As with the other transparent noodle processors they mention that noodle made from mixed sweetpotato and canna starch has very good quality, even better than noodle from 100% canna starch. They prefer a starch mix of at least 30% canna starch, and 70% sweetpotato starch although 50% is more usual because of lack of sweetpotato starch.

This enterprise achieved the same capacity as in Hanoi (150 kg of noodle/day). From November to February, they were able to produce 1.5 tons of transparent noodles for the local and Hanoi markets. Each 100 kg of transparent noodle cost 70,000 - 80,000 dong.

They mention that they can process and sell much more transparent noodles, but they have no more capital for selling on consignment basis. Before New Year they bought about 1.5 tons of canna transparent noodles from the processor-trainer on a consignment basis, for

their traders in local markets, in other words they acted as wholesalers as well as producers Each 100 kg of noodle sold meant a 30,000 - 40,000 dong profit.

HIGHLIGHTS OF A STUDY OF STARCH AND TRANSPARENT NOODLE MARKETING

Trade links of transparent noodle

Previously, transparent noodle made of canna starch was transported to local markets from Hanoi central wholesale market or from Hanoi to Thanh Hoa province central market and then to the local markets. From May 1992 up to the present, transparent noodle from sweetpotatoes and sweetpotato/canna starch mix are available in local markets. Transparent noodle made locally can directly satisfy local market demand reducing the number of intermediate traders thus lowering prices and offering profit to local processors

Two local processing households have organized good market connections with noodle traders (Table 3).

Table 3. Sweetpotato transparent noodle traders in Tinh Gia.

Traders	Type of Trader	Area of Trade	Quantity during New Year Feb. 1 - Feb. 15, 1994
1. Mrs. Tuan	Wholesaler	Hai Nhan	20-40 kg/day
2. Ms. Diem	Wholesaler	Nguyen Binh	10-30 kg/day
3. Ms. Huong	Wholesaler/Retailer	Xuan Lam	10-30 kg /day
4. Mrs. Thanh	Wholesaler/Retailer	Hai Thanh	10-20 kg/day
5. Ms. Dung (Dao)	wholesaler/Retailer	Cong Market	10-20 kg/day
6. Ms. Dung	Wholesaler/Retailer	Nguyen Binh	10-15 kg/day
7. Mr. Phing	Wholesaler/Retailer	Hai Hoa	10 kg/day
8. Ms. Thoa	Wholesaler	Vinh Town	2 times by 30 kg
9. Mrs. Chine	Wholesaler/Retailer	Diem Chau	2 times by 20 kg
10. Two girls	Retailer	Troung Lam	10-15 kg each several days
11. Mrs. Mien	Retailer	True Market	
12. Officers in Agriculture	Consumers	District Center	1-2 kg/person

Local noodle processors sell noodles to traders in local areas mainly on a consignment basis. They buy canna starch from Hanoi and spend average 300 dong/kg for transportation

expense. But noodles are more expensive in local market than in Hanoi so that local noodle processors get more profit (Table 4).

The studies on consumers preferences in Hanoi (February/March 1993) and in Thanh Hoa (July/August 1993) show that transparent noodle from sweetpotato starch was acceptable. Noodles made of mixed canna and sweetpotato starch have very good quality (30%-70% canna starch), and are even better than noodles made of 100% canna starch.

Results from the studies on seasonality of supply of canna and sweetpotato starch and peak season of noodle consumption are presented in Figures 1 and 2. The following conclusions were made:

- Sweetpotato starch can substitute for canna starch in transparent noodle making especially during the months of March and October when supply of wet canna starch is low.
- Good time for starch processing are April, May, August, September (harvesting time for Spring and Autumn varieties). During these periods, sweetpotato roots have high starch content, easy to dry and store, and commands a lower price.
- Sweetpotato starch can be used in wet form, which is better than dry form, when wet canna starch is not available in market.
- However, as Figure 1 shows, the potential supply gaps for sweetpotato occur in February/March, June/July and October/November.

CONCLUSIONS AND RECOMMENDATIONS

There are several bottlenecks limiting the expansion of both sweetpotato starch processing and noodle production.

- Supply of sweetpotato starch. A larger grinder would allow faster production of starch with less time. More limiting than grinder, however, has been the availability of sedimentation tank space. A filtration machine could alleviate this situation and accelerate processing.
- Demand for sweetpotato starch has been erratic and has led to reduced production. The starch producer wants to be sure that someone wants the starch. The noodle makers want to buy sweetpotato starch when sweetpotato starch price is lower than canna.
- To stabilize the system we could consider offering temporary minimum price guarantees to sweetpotato starch producers to off set the effects of a fall in canna starch price.
- Price of canna starch. Even though the tentative figures for cost of sweetpotato starch made it look very attractive, there seems to be a real interest to stick with canna starch if the price drops sufficiently.

- The transparent noodle side of the enterprise is still new, so production is limited by lack of skills and by the desire to "test the market". The slow development of skills is especially worrying. The Hanoi processor has been the main skilled processor in all the enterprises.
- There is a need to expand demand for starch to make starch making a more stable business which in turn will offer greater supply for expanded noodle production.

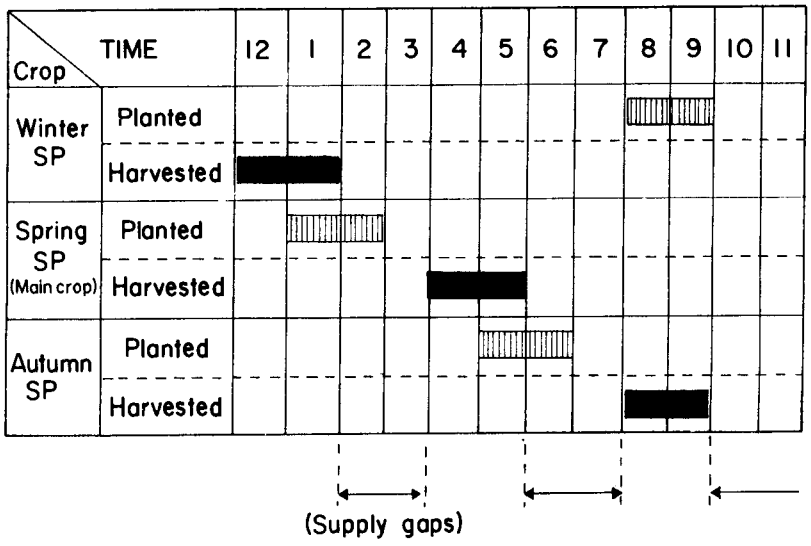
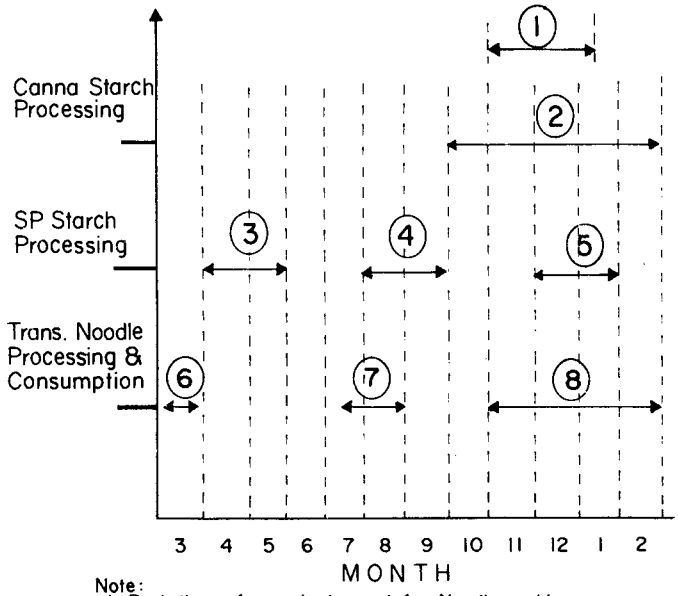


Figure I. Sweet potato supply calendar in Tinh Gia, Thanh Hoa



Note:
1. Peak time of starch demand for Noodle making
2. Canna processing time
3. Main crop of SP which has high starch content
4. Autumn SP which has good starch content
5. Winter SP harvested which has low starch content
6. March: Moon Day of January
7. July-August: Moon Day of July
8. Oct.- Feb.: Married season and New Year

Figure 2. Seasonability of supply and peak season of transparent noodle consumption and processing.

Table 4. Seasonality and price of starch and noodle.

Price (Dong/kg)	Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Price of canna starch in noodle processing (Hanoi)	1992	3800	4000	4000	3200	3200	3400	3500	3600	3700	3650	3350	2600
	1993	2600	2600	2500	2500	2500	2500	2500	2550	2300	2200	2200	2400
	1994	2300	2300	2200									
Price of SP starch in noodle processing area (Tinh Gia, Thanh Hoa)	1992				1800	1800	1900	2090	1800	1800	2300	2400	2400
	1993	2500	2500		1800	1800	2000	2000	1800	1800			2400
	1994	2500	2500										
Price of transparent canna noodle in processing area (Hanoi)	1992	5500	5500	5500	4600	4600	4600	4600	4500	4500	4300	4300	4100
	1993	4100	3600	3400	3300	3150	3150	3200	3300	3200	3200	3200	3200
	1994	3500	3500	3200									
Price of canna transparent noodle, retailer price (Consumer), (Hanoi)	1992	7000	6500	6500	5300	5200	5200	5200	5500	5500	5100	5100	5100
	1993	5500	5000	5000	5000	5000	5000	5500	5500	5000	5000	5000	5000
	1994	5500	5500	5500									
Price of SP mixed transparent noolde, wholesale price. (Tinh Gia, Thanh Hoa)	1992					5000	5000	5000	5000	4800	4800	4800	4800
	1993	4900	4200	4200	4100	4000	4000	4000	4000	4000	4000	4000	4000
	1994	4000	4000	4000									
Price of SP mixed transparent noodle, retailer price (Tinh Gia, Thanh Hoa)	1992					6000	6000	6000	6000	6000	6000	6000	6000
	1993	6500	6500	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
	1994	6000	6000	6000									

Production Systems Research: Commentary and Discussion

D. Midmore , Director, Production Systems, AVRDC-Taiwan

There is a general agreement that tne classification and characterization of the production systems based on different agro-ecologies is a good one.

Production systems research should not be limited to very specific locations but should also attempt to understand the principles that can serve as guide for broader application of knowledge and/or technology to a larger production domain.

Sweetpotato production as a whole involves not only the farmers but also the traders, producers and consumers. An involvement of the users can be further enhanced if they are motivated to do so. One of the motivating factors is profit. User goal should be to make sweetpotato production more profitable.

There appears to be a wide gap between global knowledge and local knowledge or sweetpotato production and processing. We must work hard to narrow or remove this gap.

On potato, the discussion centered on bacterial wilt and its control. The success story of a community in Nepal to eliminate BW caught the attention of the group, particularly the social control aspect. Peer pressure, personal interaction and intervention of local government are some schemes adopted to get the full cooperation of the community to contain the disease. However, the long term impact of the results of the project is still being studied, hence, no definite indicator of success can be cited at the moment.

Discussion/Open Forum on Production Systems Research

1. Many products have been developed but were not adopted because of the negative image of sweetpotato. Various strategies should be employed to improve the image of sweetpotato. There are: a) educational and promotional campaign activities b) development of processing technology: transform sweetpotato into new products like flour, starch, noodles, chips, etc. c) product development of high quality products for high status, income groups.

2. Expand market opportunities for raw and processed material, i.e. selling to flour and food industry.

3. Nowadays nutrients (Fe, Vitamin A) are emphasized in SE Asia: Sweetpotato R&D (leaf nutrition) should capitalize on this.

4. Are we able to accept the Nepal example as an excellent example of the need for a <u>holistic</u> strategy to address (sweetpotato) problems?

5. Production systems model is too complex.

6. Integrate production and processing/marketing projects to maximize impact.

7. Has environment and natural resources really over-taken equity and production considerations?

8. Sustainability: Researchers and farmers have the same goal.

Commentary on Genetic Resources Research

E.T. Rasco, Jr., SAPPRAD, Los Banos

I must agree that the commercial farmers are least or less equipped to at least handle this sort of job because they tend to draw away a lot of job. The first time they see it they do not have the inclination to save the varieties that they perceived to be unsuitable to their condition. But subsistence farmers have varied needs and they have varied criteria which can only be satisfied by growing a lot of varieties at the same time.

So to me the subsistence farmers are in a better position to handle genetic conservation at the community level.

What are the gaps? So far the work has been farmer-centered but I am sorry to say that sweetpotato industry involves more than the farmers. There are traders, there are processors and, of course, there are consumers. In a subsistence economy , the characterization does not exist because the farmer is himself the consumer. But in a commercial economy you have this varied sector to worry about. So I would like to raise the question: will we ever worry about the needs of traders, processors and consumers like when we did with genetic resources conservation and utilization under the UPWARD program?

It seems that we have more than sufficient knowledge about what we call global knowledge and , to some extent, local knowledge. But there's a big gap between local and the global knowledge. We are going to start to worry about filling this gap. I am referring specifically to what we call industry-level information which seem to be lacking in sweetpotato research.

The second gap is with regard the extent to which germplasm is needed among the farmers who are identified for germplasm conservation. There should be a more compelling need to utilize these germplasm if only to motivate people who are expected to conserve them. This leads me to the last point. After having said all these, I would like to ask exactly what intervention is needed to stimulate awareness and participation in the area of germplasm conservation and use. I'd like to go back to Mr. Rentian's presentation. I think he gave the answer, he gave the keyword "profit". This is what we need. Let us make sweetpotato farming profitable, and then people will be stimulated to do R&D to improve sweetpotato farming.

I think that the bottom line, and in terms of specific action, is a need to train the so-called partners or users in the field of use. Developing varieties or breeding is not that complicated. In fact it is done by farmers thousands of years and we are just learning from them and improving on their techniques. The ability to evaluate, the ability to breed is in the genes of farmers which we cannot take away.

Discussion Open/Forum - Genetic Resources

While there was a dynamic exchange of ideas on genetic resources research, discussion focused on the following major points:

1. distinguishing genetic evaluation from genetic conservation;

2. determining to what extent users can participate in genetic conservation and evaluation;

3. assessing the role of external intervention to support local genetic conservation and evaluation;

4. sorting out the complexities involved in farmers rights, particularly to establish ownership and ensure that farmers' rights are enjoyed by those who truly deserve them;

5. examining the impact of farmers' rights on the global community; and,

6. reviewing international and local policies regarding farmers' rights.

Comments

- Experienced sweetpotato growers do not limit their description of variety attributes to yield/taste but extend to their sustainability to soil types, seasons, cropping systems, etc.

- Market-driven production is the, farmers incentive to plant and produce more.

- Has there been attempt to utilize HYV of SP which are available in (centers which has been proven good)?

- Why is there no farmer evaluation as part of standard breeding procedures?

- Is the loss of one or two genotypes equal to genetic erosion?

- Genetic diversity is market-driven; buyers are not discriminating (feedback from Dolores).

- Conservation of a variety must be related to some beneficial attributes

- User perspective in variety evaluation
  - ideal choices, not actual selections?

- Does UPWARD have a comparative advantage or obligation to focus on farmer evaluation rather than conversation!

Discussion/Open Forum in Marketing, Processing and Consumption

1. Many products have been developed but were not adopted because of the negative image of sweetpotato. Various strategies should be employed to improve the image of sweetpotato. These are:

   a. educational and promotional campaign activities

   b. development of processing technology: transform sweetpotato into new products like flour, starch, noodles, chips, etc.

   c. product development of high quality products for high status, income groups.

2. Expand market opportunities for raw material supply, i.e. sell flour to food industry, (price should be right!) or for farm production of animals (livestock, feed using sweetpotato)

3. Assure supply of SP raw material in terms of quality, availability and price; production research to lower cost and improve quality

4. Storage technology for raw and processed products should be improved in terms of longer storage/shelf life and quality control. These will assure whole-year availability of sweetpotato as well as stabilize prices of raw and processed products.

5. There is a need to link micro-level data to middle-level and global concerns. Attention should be paid to the economic/marketing aspect of sweetpotato production. Research should be conducted on the industrial potential of sweetpotatoes.

6. Following the excellent market studies in China and Vietnam, marketing and processing research may consider including action phases.

7. There is a need to further explore markets/products that can lead to higher demands to stimulate increased production. This, in turn, may result in welfare improvement of farmers.

8. Suggest that we look into this gap between Global Knowledge and local knowledge e.g. processing technologies in China or Vietnam not generally known in other countries. This can possibly expand uses of sweetpotato.

9. Is sweetpotato really on the decline? Is there really a room for Sweetpotato commercialization. We need hard facts.

General Research Issues

1. Focus on the success of a project should change to success for the community.

2. Users Perspective. Household focus with gender perspective. Sweetpotato farmer and the other household members, especially men, women and children.

   - Users' perspective: does it make any difference in terms of rate of adoption of technology? This we have to find out.

3. Blending scientist objectives (information generation) and farmers goals and simple needs (profit).

4. Do we have to be "defensive about sweetpotato research? We sound that way.

5. In user-perspective research, do farmers "restrict themselves" to sweetpotato?

6. Focus more research attention on short-term/long-term perspective of users.

7. We have only looked at potato for food and feed. There are many potential uses for potato (e.g. industrial)

8. Practice as means for changing knowledge/attitudes.

9. Have we addressed the need to balance methodology-related goals with production-related goals?

10. Is it possible to develop the Lanao-Maranao area as a Huancayo-style participatory research site?

11. What is the appropriate way for the farm family households to have a chance to see, listen and think about the results of sweetpotato research?

12. What should be the balance the between research and development in UPWARD projects?

WORKING GROUP 1

RESEARCH FRAMEWORK/PRIORITIES

Chairman	:	Chris Wheatley - Processing Specialist, CIP-Bogor Tom Walker - Head, Social Science Department, CIP-Lima
Rapporteurs	:	Mariska Rimmelzwaan - DGIS, Netherlands Julie Roa - Head, Socio Economic Section, PRCRTC, ViSCA
Members	:	David Midmore - Director, Production Systems, AVRDC, Taiwan Nguyen Duy Duc - Engr., Post Harvest Technology Inst., Hanoi, Vietnam Maricel Piniero - UPWARD, Los Banos Mely Hoque - Entomologist, UPLB, Los Banos
Guests	:	Gordon Prain · UPWARD, Los Banos Gelia Castillo - Prof. Emeritus, Rural Sociology, UPLB Eufemio T. Rasco, Jr. - SAPPRAD, Los Banos Peter Schmiediche - Regional Representative, ESEAP, CIP-Bogor

Criteria to Evaluate Project Proposals

a) Potential impact

Short term: utilization
Long term: effects on environment, sustainability

b) Interdisciplinarity

- UPWARD management should be more proactive in eliciting proposals
- Linkages with other institutions

c) Time horizon : a longer time frame

d) Emphasis on small scale production/processing not only on minorities/subsistence farming, not excluding commercialization

Research Areas

1. Production Systems

2. Processing/Marketing/Consumption/Nutrition

3. Genetic Resources - some external funds available

Note: UPWARD Phase I has emphasized research area 1.
Phase II shifts from research area 1 to 2.

Research Priorities

1. Production Systems

- soil fertility by conservation
- agroecological classification
- IPM-community-based BW/potato
- IPM-community-based weevil/sweetpotato
- homegardens
- variety evaluation
  UPWARD-diagnosis with farmers in evaluation in collaboration with SAPPRAD's evaluation work
- planting materials
  - conservation
  - seed system
- variety diffusion (1-2 years project)
  - how fast
  - constraints
  - factors
- include other crops (e.g. taro)

Note: A database project - a synthesis of research results on production systems

2. Marketing, Processing and Consumption

- diversification of uses through processing
  - intermediate processing
    e.g. flour, starch
  - final products

- Sweetpotato for feed
  - directly to pigs (i.e. household pig production)
  - intermediate: chips to feedmilling
    e.g. household chipping and drying

- by-products utilization

Specific issues for processing research

- who benefits from processing and ways to achieve it should be clearly defined in the proposal

- technical and economic feasibility: processing in areas where production-processing will have advantage

- products and process should be more than locally specific

- ways of selecting from a range of opportunities (i.e. implication on phasing of project)

- production/marketing should be integrated to processing (i.e. raw material specifications --dry matter, etc. -- to processing)

- consumption linked with processing; marketing of fresh roots to urban consumers less emphasis, more on rural; nutrition downplay

Genetic Resources

- UPWARD should allocate small investments, outside funds sources available.

- incentives as treatments for community/participating households, i.e. compare different incentives/strategies

- synthesize experiences elsewhere of community based banking

- greater attention to links between in situ and ex situ

- study implications of conservation of seeds

- explore links between varietal evaluation and in situ conservation leading to community development

- promote other agencies to look at genetic side

- impact of in situ conservation measured from technical, economic and social feasibility.

- in situ conservation of other crops in the system, with emphasis on rootcrops.

- Gordon should prepare a position paper on ethics and ownership of property rights relating to UPWARD, in general, and in situ conservation and genetic resources, in particular.

General Issues

- Gender issues should be integrated in different research areas

- Level of participation as treatment

- Links with other crops implies extra funding.

- Linkages between production systems and processing/marketing/consumption projects where relevant

- maximize synergism and impact of research projects, network should encourage research at communal sites which are representative of recommendation domains.

- coordinating office should be more proactive in research project development

OVERVIEW OF METHODS DEVELOPMENT AND USAGE IN UPWARD

Cherry Leah P. Bagalanon

Starting in the late 1960's up to the mid-1970's the agricultural research system was able to develop technologies, mostly input intensive, that revolutionized agricultural production. During that period, research institutions get into full research activity to generate technologies in laboratories and experiment stations and package results into standardized set of technologies. These packages of technologies are then introduced to farmers through a delivery system composed of thousands of agricultural technicians fielded across the country. While these technologies benefited farmers who could shoulder input cost, these failed to benefit poor peasants.

The transfer of technology (TOT) paradigm was developed on the notion that technology is to be generated by researchers, transferred by extension agents, and finally adopted and utilized by farmers (Chambers and Jiggins 1989). The TOT conceptualizes knowledge as taking unidirectional path of technology leading downstream towards farmers while downplaying the essential contribution of feedback/feedforward activities (Campilan 1995). The limited feedback was the pitfall of TOT paradigm because it sees science as the sole source of knowledge while technology is taken as applied science. The model sees the need to deliver technologies as ready made commodities from single source to their intended users, who are conceived as passive receivers.

While TOT has demonstrated its usefulness as a tool in attaining food sufficiency in the third world, a closer examination shows that it has worked best only on high potential areas which approximates the growing conditions in research stations. The same favorable results were not obtained under less favorable circumstances.

With the evident inadequacies of the TOT, alternative approaches that seek to reflect more closely farm and household realities began to take shape in early 80's. The limitation of the Green Revolution agriculture prompted many individuals and agencies including UPWARD pioneers to look for alternative approaches to address the failure to benefit peasant farmers.

METHODS DEVELOPMENT OR METHODS ADAPTATION?

The first UPWARD conference held in 1990 (UPWARD 1990) gave an overview of the menu of innovative methods currently available under Rapid Rural Appraisal (RRA), Participative Rural Appraisal (PRA) and Participatory Method (PM). Based on the summary of methodologies used on projects presented during the first annual meeting methods such as collection of secondary data, informal interview, group interview and use of key informant

were already known (Table 1). Specialist papers were also presented and which outlined other methods on participatory data collection and generation. Alexandra Stephens discussed techniques including community mapping, resource matrix, educational games, and role playing as means of generating baseline information. The use of wall charts for participatory monitoring and case studies were also discussed as means of conducting in-depth studies of problem areas and in monitoring progress (Stephens 1990).

Another paper stressed the importance of field reconnaissance and informal surveys in the initial phase of market research. Market surveys through key informants and group interviews were shown as powerful tools in understanding marketing networks and market problems (Roa et al. 1990). Sandoval discussed a new concept of systematically documenting indigenous practices of local farmers associated with traditional varieties of staple and supplementary crops. "Memory banking" as she called it, should co-evolve or must complement genebanking. She further said that without this complementation the genetic information preserved in genebanks will be decontextualized in the sense that human and ecological forces which pushed for their selection will be largely ignored (Sandoval 1990). Rhoades also opened the "cafeteria", where less well-known techniques in participative research can be detained. These include the sack-of- seed technique, miniature construction of village landscapes, use of photographs, eagle-eye plotting and observation. He stressed, however, that these methods are flexible and interactive. The effective use of these methods depend on the researcher's creativity (Rhoades 1990).

Many of these approaches stress the importance of interaction with local groups and individuals, as well as the involvement of men and women. The conference also underscored the need for more user-specific methodologies to better understand the dynamics of households and other groups as well as the roles and perceptions of women. This concern was partly addressed by the specialist paper presented by Poats and Fieldstein when they highlighted the importance of gender and household perspectives in agricultural research. They argue that the household must be the basic unit of analysis because it can be disaggregated in several ways. They stressed that gender has proved to be the most useful way to disaggregate the farm household and to analyze household relations and behavior. These relationships they said have a crucial bearing on farmers decisions and activities. An understanding of these relationships contributes to a more efficient and more equitable technology development and transfer (Poats and Feldstein 1990).

Table 1. Summary of methods used on projects presented during the first UPWARD annual conference.

	Focus group interview	Use of secondary data	Informal interview /survey	Formal survey	Laboratory analysis	On-farm experimentation	Interdisciplinary consultation	Agroecosystem analysis	Workshop presentation	Consumer taste test	Use of K
Gunawan	/	/	/								
Dimyati		/	/								/
Y. Widodo		/				/	/				/
S. Basuki	/		/			/					/
Manwan							/				
Pituck		/	/	/							/
Sumalee		/	/	/							/
Mula		/						/	/		/
Roa		/	/	/						/	
Hafi				/		/					
Total	2	8	6	4	1	3	2	1	1	1	9

The inaugural conference also inspired Filipino participants to form a network to document and analyze sweetpotato foodsystem in the Philippines. Their call was for an intensive training and exposure on the new user-sensitive methods especially as most of them are new practitioners of the concept. Their clamor was motivated by their desire to adopt the "user orientation" in research which UPWARD advocates (Francisco, In: In-country Training Manual, 1990). Furthermore, the group hoped that through the training, discipline biases are shed off and interdisciplinary work imbibed. Thus in September 1990, a Philippine in-country workshop was held.

The in-country workshop tapped Filipino specialists who had been actively involved in conducting user-sensitive researches. These specialists were given the opportunity to introduce household and gender-focused methods, anthropological techniques, and approaches to consumption research (In-country Training Manual, UPWARD 1990). To cite a few, Alviar of the College of Economics and Management at the University of the Philippines Los Baños discussed the case study technique in understanding small scale enterprises. She stressed that the conduct of case studies enables one to have an in-depth understanding the dynamics of an enterprise and be able to fully understand decision patterns made. Ledesma, then chairman of the Philippine Sociological Society now presented research results showing that a combination of case study technique and daily record keeping brings out relevant details of the problem area which results in deeper understanding of the problem situation. Cadelina, Director of Research of Silliman University, Philippines, presented various anthropological field methods in characterizing farming system. One of the methods he discussed is the agricultural calendar, which presents different agricultural activities and climatic conditions in a pie layer (Figure 1). Plotting the information on the diagram, one can vividly see the relationships of different agricultural activities to other conditions in a farm. Emma Porio of Ateneo University discussed gender based analysis in the production system. Her presentation was further enhanced by the use of case analogies based on previous research experiences. The four-day meeting discussed exhaustively relevant methodologies and research experiences focused on understanding resource allocation and decision making patterns with special attention to gender. It also became a forum where researchers actively discussed the advantages and disadvantages of each method presented. The meeting however, was not able to offer hands-on testing of the methodologies discussed through field exercises and exposure. This expressed need led to the organization of the second workshop, which included international participants.

The training of trainers workshop with international participants was conducted in November 1990, primarily to provide the fieldwork experience which the first conference lacked. It had mixed participants coming from various disciplines such as forestry, economics, human ecology, development communication, nutrition, sociology, agriculture, and anthropology. The variation extended as well to the organizations they represent as some are from government organizations, nongovernment organizations (NGO), state universities, and international agricultural research centers. Most of the invited participants were either handling their own research activities or were middle-level research managers The second workshop had become more conscious of the limitation of

the previous in-country meeting. Therefore, it included regular periods of fieldwork interspersed with classes. Interdisciplinary team effort was also explicitly addressed as an important methodological issue.

The novel methods presented and practiced in these two courses included many introduced in the inaugural conference and some additions, such as agro-ecosystem analysis (Lightfoot 1991). Most were designed for generalized diagnostic research which indeed, characterized the majority of projects conducted during the first phase of UPWARD. At the same time there have already been some innovative adaptations of these general methods in several projects, demonstrating the iterative and creative climate these methods stimulate. For example, the transect, which was developed with local users to understand current land-types and land-use, has been adapted to understand the environmental impact of changes in livelihood practices over time. "Historical transects" are built up for different periods in the past by interviewing older "key informants". These transects visually present environmental impacts of human livelihood activities (Figure 1).

The need for a more focused research activities called for additional specialized kinds of methods. UPWARD's move towards action type projects even more necessitated this need. An international course on Consumption and Nutrition held in November 1991 addressed this need in one area. Invited participants invited were not only nutritionists but also network researchers from technical fields who have considered the issue of consumption and nutrition in their own research projects. A number of general PRA methods were adapted for use in rapid consumption and nutrition studies. For example the cropping calendar was transformed into "consumption calendar" (Figure 2). These adapted general tools can even be combined with the simplified version of methods like food frequency lists commonly used by nutrition researchers.

Another area where methods have been adapted is rootcrop genetic resources research. Many broad diagnostic projects have attempted to document local knowledge associated with sweetpotato cultivars. Four projects focused specifically on the ethnobotany of sweetpotato. One example is a project on "memory banking". The project utilized various participative methodologies such as variety diagramming (Figure 3), sorting and ranking, transect drawing, life histories elicitation, loosely structured interview and collection, drying and preservation of herbarium specimens of local sweetpotato varieties. The combination of these techniques resulted in a rich repository of memory bank files containing the general characteristics of the crop, the documentation of technologies used, local crop characteristics and the local evaluation criteria generated and saved (Sandoval 1994). Another project dealing with community curatorship of rootcrop genetic resources in Southern Philippines led by Prain and Piniero, explored alternative ways to locate rootcrop germplasm collections with the actual users. New approaches were needed in this area, and the researchers drew on community organization methods and ideas on group dynamics as well as PRA techniques to help with the exhaustive community and group consultations and curator-researcher implementation the approach required (Prain and Piniero 1994).

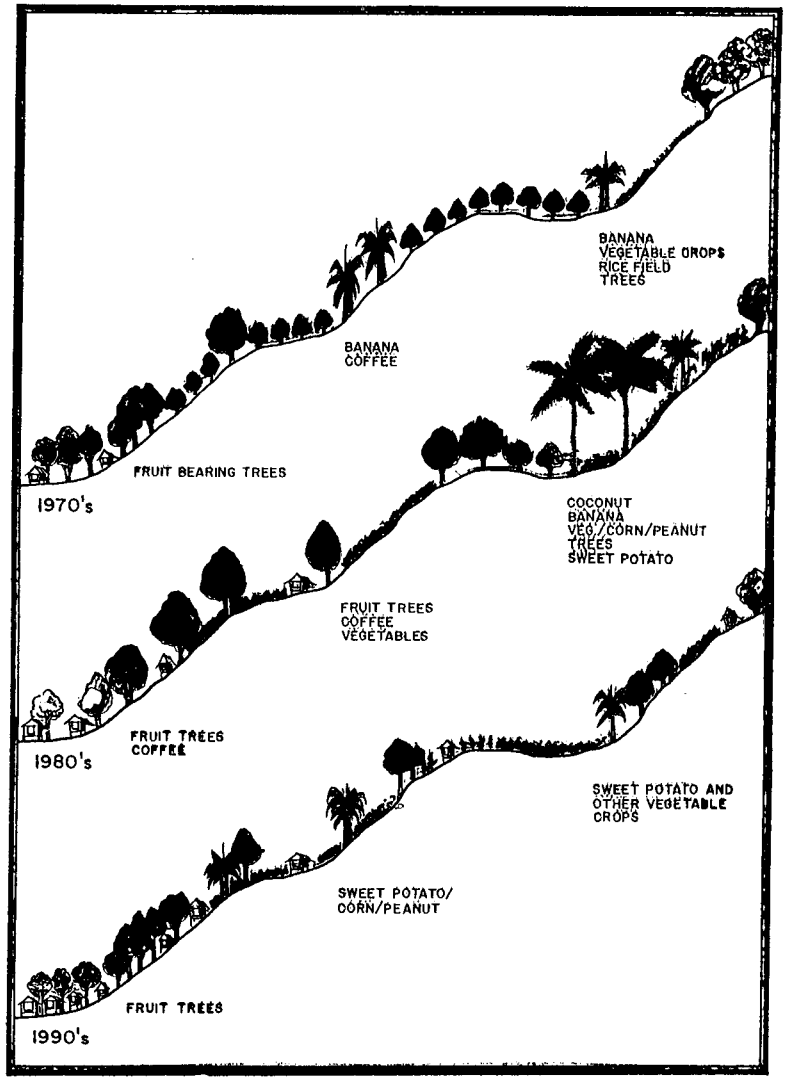


Fig. 1. Historical transect of brgy. Pinagdanglayan.

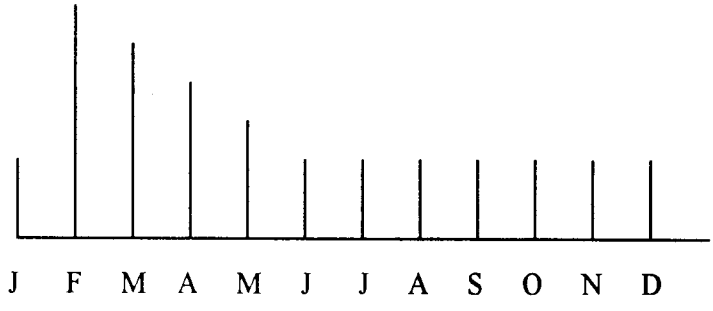


Fig. 2. Sweetpotato consumption calendar in Barlig.

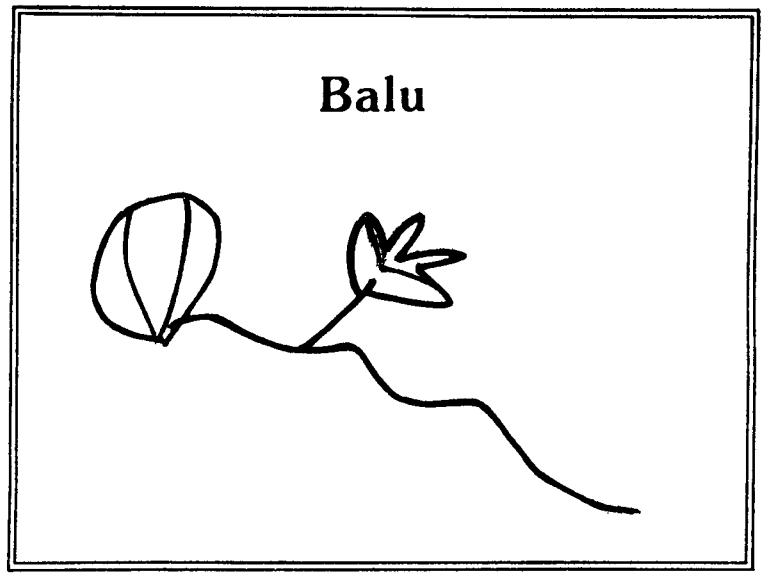


Fig. 3. Hand drawn diagram of sweetpotato variety by local folds.

Another project that dealt with the same subject matter concerned the interdisciplinary collection of *Ipomoea batatas* germplasm and associated indigenous knowledge in Irian Jaya, Indonesia. The project attempted to systematically collect both the wide range of sweetpotato germplasm and its associated indigenous knowledge which are present in Irian Jaya. It tested alternative modes of interdisciplinary work in germplasm collection and among other methods it explored alternative forms of ethnobotanical elicitation (Prain et al. 1995).

Based on these experiences and the desire of network researchers to be exposed to other user-sensitive methods in genetic resources research, an international workshop was held in May 1992 on user participation in genetic resources research. It was organized to review methods for the collection of germplasm and associated knowledge, for community-based conservation of biodiversity, and for participative evaluation of the use of the germplasm (Prain and Bagalanon 1994).

Another specialized methods development workshop was organized in coordination with the Asian Vegetable Research and Development Center (AVRDC) in Bangkok, Thailand in 1991 on the issue of homegardening (Midmore et al. 1992). The concern of enhancing interdisciplinary team building among project holders led to the holding of a workshop on "interdisciplinarity" in agricultural research. The network also benefited from methods development activities in other institutions and countries. UPWARD staff have also joined several methods workshops held in different countries. These include analyzing ethnographic data in Florida, USA and the use of "development market research" and social marketing techniques in the Philippines. A summary table of UPWARD-sponsored conferences and training events is presented in Table 2.

Though "methods development" is stated to be one of UPWARD's main goals, the review of what UPWARD had actually done in the past four years shows that the major effort of the network has been the dissemination of existing participatory methods of the type originally discussed during the inaugural meeting and adapting other specialized methods for more widespread use. Networks researchers themselves have also been adapting, selecting and modifying materials presented during UPWARD conferences, trainings and small group meetings depending on their particular needs, resources and circumstances.

An adaptive approach to participatory methods both by UPWARD staff and by network researchers is likely to be the most fruitful future direction with regards to methods. To recall the culinary analogies, we should promote the methods cefeteria, rather than the cookbook.

IMPACT OF UPWARD'S TRAINING AND CAPACITY BUILDING ACTIVITIES

As shown in Table 2, a total of 139 people attended the three major UPWARD conferences which offered young UPWARD researchers the opportunity to interact with senior practitioners in participative methodologies and learn from their experiences. Some 213 people, 59% of who were women, have participated in UPWARD organized workshops and courses. These events were designed to explore new methodologies especially sensitive to the inclusion of user's perspective.

Table 2. UPWARD-sponsored conferences and training events (as of June 1995).

Conferences		Participants			Resource Persons		
		Male	Female	Total	Male	Female	Total
1. UPWARD annual conference	No. %	69 (49)	70 (51)	139	10 (83)	2 (17)	12
2. UPWARD organized/ sponsored national/ international workshops and courses	No. %	87 (41)	126 ((59)	213	36 (55)	29 (45)	100
3. Echo-trainings	No %	19 (51)	18 (49)	37	12 (32)	26 (68)	38
4. Individual trainings*	No. %	11 (85)	2 (15)				
Total	No. %	186 (46)	216 (54)	402	58 (55)	57 (45)	105

*** Either UPWARD coordinated training or sponsored by other research organizations.**

Small grants were given to assist in the conduct of "echo-training". UPWARD trained individuals conducted small group trainings of their project partners and other people on user-sensitive methodologies. Individual trainings were also sponsored. Network researchers who needed trainings on specialized kind of methods were either trained at the UPWARD coordinating office or were sent to special courses sponsored by other research institutions. To date, 13 individuals have already been sent to various specialized courses such as Homegardening course, Indigenous Knowledge (IK) courses, ethnoecology training, and training on participative methodologies.

The methodology development activities described above have already some effects. Of the 127 people who have attended these methods development events (both conferences and training courses), 56 have implemented or will implement UPWARD supported projects.

A preliminary evaluation of methods being utilized in projects revealed both positive achievements and the obvious need for continued efforts. Based on a review of the 34 initial UPWARD projects it was found out that 85% of the projects utilized semi-structured informal interview with topic guides as one of their main diagnostic tools, nearly 40% of the researchers also used key informant interview either together with or as an alternative to an informal survey, just under 30% focused group interview, and 35% recognized participant observation as an important means of understanding the local situation. These are undoubtedly encouraging signs.

However, despite the wide exposure of UPWARD researchers to various workshops and trainings on participatory methods some researchers have remained loyal to the use of the formal questionnaire and many continue to use the interview mode as the only source of documentation. For researchers who continued using the formal questionnaire, the fear that their result will lack scientific soundness and will be unable to generate quantitative data remained. This fear continues despite knowledge that closed questions result in the inability to document answers to "why" questions thus imposing limitations on the inclusion of users' perspectives in the diagnosis. Only four projects relied exclusively on formal surveys as the main method, whereas 44% supplemented informal surveys with a formal questionnaire. A smaller number of projects took advantage of the many other innovative methods of understanding local perspective which were introduced in courses and workshops (Appendix A). There is thus a continuing need to better familiarize researchers with methods such as local resource mapping, historical and seasonal calendars and transects which permit local people to not only communicate their perspective but also facilitate decision making on research needs at the local level.

Moreover, a methodological gap is still common regarding the use of "interdisciplinary technique". Though emphasis on interdisciplinary efforts has been made in many workshops and courses, there is still a need to further elaborate the techniques, tricks and tips, which facilitate and heighten complementation among members of interdisciplinary teams. One observation on UPWARD projects is that research teams still work along the "my discipline approach" such that after having worked on a common

problem, differing views evolve -- each view is largely based on each member's expertise. This means that researchers, though they worked as an interdisciplinary team, sometimes work or think separately. Each member tries to contribute to the research by giving solutions based on his own discipline and experiences. This results in a compartmentalized view of the problem.

Assessment of methods used in UPWARD projects over the past four years clearly shows a need for more and better techniques of methods diffusion. It is clear that there is a huge difference between discussing and even practicing methods during meetings and workshops and getting people to use these methods during their own field work. The ideal approach is probably total emersion in small group training courses of several weeks duration as offered by some universities in Thailand. These are expensive and researchers are not always able to take off sufficient time. An alternative is to multiply the modes through which researchers are exposed to new methods: researchers should attend repeated short courses, have access to literature and, very importantly, should receive visits by resource people to project sites for hands-on practicals. Through such repetition, novel methods can be adopted and applied in an effective way.

Project Monitoring and Evaluation

Monitoring and evaluation (M&E) are essential ingredients if the network is to grow in quality and impact. However, to date UPWARD had not sponsored nor incorporated in its past training and meetings any module on monitoring and evaluation. Interestingly, the systematic attention that has been given to M&E within the network has been how to make "outsider" evaluations of project proposals and later, project progress..

Yet several UPWARD projects have evolved variable kinds of monitoring and evaluation techniques which are participatory in nature. One example is the urban homegardening technology development project in Northern Philippines in which homegardeners took an active role in project design and in monitoring homegardening technologies after assessing output of a diagnostic study with researchers.

Another example is a soil fertility management project involving an initial diagnostic study of an upland area under increasingly commercial production. Community validation of the initial phase identified the need for more action-oriented research on low-input means to prevent soil deterioration. A multi-sectoral task force made up of local community interest groups and concerned agencies evaluates on-going results and has implemented further actions.

A third case concerns a project biodiversity conservation and family food security in Southern Philippines. In the homegardening component of the project, a large workshop of women gardeners pooled their gardening knowledge and identified needed research support. Group-selected pilot gardeners provide more detailed analysis of garden management and ethnobotanical knowledge, test new technologies chosen by the group and monitor the project.

The task for the network as a whole is to examine in greater detail these and other participatory M&E experiences, in order to help ensure that the networks institutionalizes the involvement of users and network researchers as well as UPWARD staff in monitoring and evaluation.

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ENHANCING THE USER-ORIENTED DIAGNOSTIC FRAMEWORK THROUGH KNOWLEDGE SYSTEMS THINKING

Dindo Campilan

Conceptual tools are an indispensable guide to field workers when seeking to explore and intervene in complex real-world situations. A sound diagnostic framework lends "eyes" to researchers for them to systematically observe and gain a better understanding of social phenomena.

The first phase of the User's Perspective with Agricultural Research and Development (UPWARD) program offered significant formative experiences in developing a diagnostic framework guided by a participatory, user-oriented philosophy. Essentially, UPWARD advocates that users be actively involved in the R&D process. These users include any or all of the groups in the food systems who are targets of research, like farm household members, consumers, processors and traders.

This paper adopts knowledge systems thinking to amplify UPWARD's user-oriented diagnostic framework so that it becomes a more effective tool to guide field inquiry into newly emerging development issues and concerns.

The experiences and insights presented in this paper are drawn mainly from the UPWARD-funded research titled "Knowledge Systems Analysis of Sustainable Agriculture in the Philippine Uplands". The research is a set of case studies which seek to analyze how people view and act on problem situations in natural resource management in the Eastern Visayan uplands of the Philippines. The five case studies are referred to in this paper based on the names of the research sites, namely: Liloan, Matalom, Baybay, Matag-ob, and Pinabacdao.

KNOWLEDGE SYSTEMS THINKING

Recent years have witnessed a major shift in the dominant way of thinking about agriculture and rural development. Research, extension and utilization are now increasingly viewed as constituent elements of a larger, unified whole, rather than as discrete and independent blocks with very little need for interaction. At the same time, it is now widely recognized that in order to improve overall performance, these three components must behave and function as a system.

Put simply, having a knowledge systems perspective means that one considers farmers and their organization, extension services, technology developers, experiment stations, research institutes, policymakers, administrators, NGOs, and private commercial companies and consultants, as interlocking elements of a system, capable of fostering

innovation over and above what would be possible by the actors' disarticulated actions. The actual composition of a system depends upon the set of actors relevant to a given situation (Roling, 1992a).

A *knowledge system* can be defined as the articulated set of actors, networks and/or organizations expected or managed to work synergically to support knowledge processes which improve the correspondence between knowledge and environment, and/or the control provided through technology use, in a given domain of human activity (Roling and Seegers, 1991).

FROM *PERSPECTIVE* TO *PARTICIPATION*

The new directions that UPWARD has set for itself in the second phase reflect the program's continuing metamorphosis into a genuinely participatory model of the R&D process. Prain (1993) gave an overview of this transition phase:

UPWARD's move to a second phase is also a shift of emphasis from the user's perspective to user participation. The first phase involved predominantly diagnostic studies carried out with local user "consultants" who helped characterize systems and identify research needs and opportunities. We are now moving to build partnerships with users to jointly evaluate and adapt innovations and eventually to support locally based "research sites" run by local people to stimulate and introduce improvements in their agriculture.

The redefinition of the program's vision creates a multi-dimensional character for the letter P in the program's acronym. Whereas P used to stand for *perspective* to emphasize user's views in problem diagnosis, the same letter now embodies the new program thrust as well, namely: 1) *partnership* to denote an equal relationship between users and scientists in the R&D process, and 2) *participation* to underscore the users' capacity in developing and trying out solutions to their own problems.

The concept of user participation broadens UPWARD's view of the role that users can play in the R&D process. Among others, it emphasizes that users can participate in many other ways besides offering their perspectives of a given situation. It is also important to point out that the changing emphasis from perspective to participation does not imply a total shift but merely an expansion in program focus. Afterall, user's perspective remains at the core of participation. Secondly, there remains a continuous need to further improve and adapt the menu of diagnostic concepts and methods already developed by UPWARD in the first phase.

The rest of the paper dwells on the second point by attempting to show how UPWARD's diagnostic framework can be enhanced through the conceptual tools in knowledge systems thinking.

FROM *USERS* TO *ACTORS*

UPWARD's central concern on incorporating the perspective of technology users in the R&D process reaffirms the widely held view that for technologies to be relevant and useful, these must be tailor-fitted to the user's needs, preferences and circumstances.

Users though cannot be lumped under a single category since their heterogeneous character brings about differential responses to a technology. UPWARD, in particular, recognizes that for perspectives to be meaningful, users such as those in a food system need to be segmented into target categories, e.g. farmers, processors and traders. User segmentation has been mostly visibly applied by UPWARD in response to gender issues. By focusing on the key, but often underestimated, role of women in agriculture, significant variations in perspectives between subsets of male and female farmers have been exposed.

However, deconstructing the farmer stereotype through user segmentation need not be limited to gender concerns. It can be pursued further by exploring other segmentation criteria that may bear upon a particular situation. For instance, in Pinabacdao and Matag-ob -- areas with a history of insurgency-related problems -- deeper insights were drawn from farmers' perspectives on the importance of community organizing after segmenting them based on their previous involvement with the communist movement. A constrasting pattern was noted since those expressing negative views on collective action, e.g. labor pooling in farmwork, were generally the ones with unpleasant experiences as members/sympathizers of rebel groups.

User sensitivity intends to bridge the acknowledged large gulf between technology developers and users. Applying the same level of sensitivity to other actors, besides users, can further enhance the R&D process. UPWARD's study on credit support systems (Bagalanon, 1991), for example, has contributed to a better understanding of how farmers strategize to meet input requirements in sweetpotato production by highlighting the interactions between users and local financial institutions. While users may represent a key component of an agricultural or food system, any research approach can only be truly systemic if it pays adequate attention to the whole range of key role players in a given system.

In studying development interventions, it is worthwhile to look not only at the *intervened* but also at the *intervening* agents, as well as the interrelationships between the two parties. Implementation of integrated pest management, for example, has been seriously constrained by the fact that farmers' pest control decision-making was far more influenced by chemical sales agents and media advertising rather than by extension technicians (Escalada and Heong, 1993). After having focused on users in the first phase, it is high time UPWARD started examining the interface between users and other actors.

Since the R&D process does not occur in a vacuum, actors who may be external to a system but nevertheless influence its function also need to be considered. These *moving forces* (Kaimowitz et al. 1990), which include policymakers, donor agencies and private companies, often exercise focused external pressure on the system. In the

Philippines, the implementation of Republic Act No. 7160, otherwise known as the Local Government Code, saw the rise of political leaders as key influences in agriculture and rural development. Among others, the law provides local government units with administrative control over field personnel of key government agencies such as the Department of Agriculture (Box 1). In the light of these bureaucratic changes, Escalada, et al. (1993) have shown how institutional legitimization provides a favorable political environment for development interventions, such as the introduction of improved root crop varieties.

Box 1. From users to actors: emergence of local government units as key actor in agricultural development.

Under Republic Act No. 7160, local government units are conferred power and authority to perform agricultural extension and on-site research functions. Local government executives now take on major responsibility for setting priorities in agricultural development planning, and for exercising direct control and suspervision over agriculturists field personnel.

Prior to the devolution process, the main program of the Department of Agriculture municipal office (now called Municipal Agricultural Office) in Matalom were on the introduction of rice and corn production technologies, provision of veterinary services, artificial reef construction and cooperative development.

Given the current priorities of the municipal government, however, the agriculture staff anticipate that these programs may have to take the backseat. The municipal mayor has identified ceramics-making as the flagship project under his administration and has directed the agriculture staff to spearhead its implementation. Anticipating that the amount of support they extend to the mayor's "pet" project may be used as a yardstick of their performance, the staff consider the corresponding changes in their work targets and functions as inevitable.

Expanding the focus of UPWARD's diagnostic framework from user's perspective to actor's perspective, or from being user-sensitive to actor-sensitive, would enable fieldworkers to better appreciate *functional specialization* and *segmentation* (Engel, 1990) as fundamental system characteristics.

FROM *PROBLEM* TO *PROBLEM SITUATION*

A crop/commodity program focus can have a "blinder" effect on people as in the case of the Integrated Root Crops Program (IRCP) in Pinabacdao. It took a failed demonstration farm on improved root crop varieties for the field staff to fully realize that soil degradation, and not the use of traditional varieties, was the fundamental problem that had to be addressed first in improving farm productivity.

This and many other similar experiences illustrate that problem diagnosis is not as straightforward a task as it may seem to be. Identifying and defining a single problem can be difficult. Questions on the scope of the problem are hard to answer because it does not often have sharp boundaries.

In many agricultural and natural resource management situations, the problem itself is problematic -- complicated and ambiguous. Researchers are, thus, bound to encounter major difficulties if they attempt to immediately identify and isolate a single problem, or if they focus on seeking solutions without having clearly defined the problem. Instead, it is relatively advantageous to start the fieldwork by examining the problem situation -- the structures, processes and climates (Wilson and Morren, 1990) - that bear on the various feelings of unease and on themes of concern expressed by people. A broader view of the situation can help form the basis for the identification of common problems and ways to address them.

As such, fieldworkers can make more effective use of the menu of diagnostic methods made available by UPWARD if they immerse themselves in messy real world situations, not with the immediate aim of defining the problem but rather starting the field inquiry by painting a rich picture of the problem situation based on the variety of views provided by actors. In this way, fieldworkers are better able to grapple with and make sense out of complex human affairs (Box 2).

Box 2. From problem to problem situation: deforestation.

Defining a problem by setting its scope can be problematic itself. The boundaries of a problem can be *soft* rather than *hard*, as in the case of deforestation in Matag-ob.

Based on the terms of the contract drawn up between the Department of Environment and Natural Resources (DENR) and the Leyte Rural Advancement Program (LRAP), the reforestation project is to address the deforestation problem within the specified 100-ha area of denuded timberland in barangay Bulak.

In undertaking forest rehabilitation, the project planted trees over the entire area, making it no longer feasible for subsistence farmers to continue cultivating food crops inside the project site. Had fieldwork been limited to making diagnostic inquiries within the physical boundaries of the project, important aspects of the problem situation could have been excluded.

For instance, while deforestation activities were no longer observable within the project site, many of its former occupants were discovered to have moved to adjoining areas just outside the project boundaries where they resumed swidden agriculture by clearing the land of trees and cultivating staples such as root crops and corn. It appeared then that the project merely translocated, instead of totally putting an end to, deforestation activities.

FROM *HARD* TO *SOFT* SYSTEMS

People are referred to as users primarily because they use technology for technical control of or adaptation to their biophysical environment. Examples are the planting of new varieties to increase yield and application of chemicals to eliminate pests. Predictable outcomes based on natural laws enable human beings to establish an instrumental or technical relationship with their biophysical environment.

However, situations in which human beings are involved not only have a biophysical but also a human or social dimension. For instance, the Baybay farmers' decision to join an agroforestry group was not only prompted by the prospects of earning a higher income through optimized land use, but they likewise valued the opportunities of being able to establish and maintain social ties with other group members and the staff of the VISCA-GTZ Ecology program.

While the biosphere involves manipulating objects that operate with law-like attributions, the sociosphere involves interacting with other people. In the latter, intervening in problem situations through technology use is inadequate, if not inappropriate, because human beings as social individuals are not nomological. To be able

to deal effectively with problem situations in the sociosphere, one needs not only *technical knowledge* but also *social process knowledge* (Roling, 1992b).

The above consideration has led to the distinction between *hard* and *soft systems* (Checkland, 1989). The concepts of natural systems (wholes created by nature, e.g. corn plant) and designed systems (wholes created by man, e.g. computer) have been helpful in understanding biophysical problems. However they are not rich enough concepts to cope with the complexity of human situations (Wilson and Morris, 1990). There is a need therefore to set alongside natural and designed systems the concept of a *human activity system* which focuses on sets of purposeful human activities aiming to improve a particular problem situation.

Hard systems, i.e. natural and designed systems, are construed to exist objectively independent of observers, with clear and predetermined boundaries and goals. On the other hand, soft systems, i.e. human activity systems, do not exist in the real world. While the system is based on observable activities, soft systems thinking is essentially a mental construct or way of looking at the real world. It assumes that a systems-based view of human situations, that is facilitating actors to perceive themselves and behave as a system, is a potentially useful tool in planning and implementing change.

Agricultural and food systems are people-managed. Therefore, they cannot be viewed solely in terms of soil-water-plant-animal relationships. Even many of the so-called natural ecosystems have not escaped man's interference. While a hard systems view can be helpful in addressing their technological needs, a soft systems view can better bring to light complex social processes as people seek ways of working together. As a matter of fact, much could be gained by viewing inherently hard systems as soft systems, too. Take for instance the ordinary sweetpotato plant which is obviously a natural system. Through a soft systems view, the conflicting goals people assign to the plant become manifest, such as in breeding work (Box 3).

FROM *PERSPECTIVE* TO *MULTIPERSPECTIVES*

An effectively functioning system exhibits *synergy*, or that state wherein the different actors behave in such a way that their combined efforts exceed more than the sum of their individual contributions. While this is ideal, any situation in which human beings try to act together will be complex because individuals are autonomous (Checkland, 1989) -- epistemological and intentional.

Box 3. From hard to soft systems: sweetpotato breeding.

The Sweetpotato Improvement Program in the Philippines was launched in 1981 with the official objective of producing and releasing for cultivation new sweetpotato varieties possessing most, it not all, the characteristics preferred by farmers and consumers.

The breeding of new varieties through specialized techniques is essentially a hard systems task. Using the polycross hybridization technique, the research program produced 82,000 plant genotypes. The promising crosses were entered into regional trials in various agroclimatic locations in the Philippines, resulting in the approval by the Philippine Seedboard of the first set of VSP (ViSCA Sweetpotato) varieties.

However, actual breeding work can only proceed after the breeding objectives are already clearly defined. The researchers found out that this preliminary phase in variety development was rather complicated given the diverse and contrasting preferences of technology users. Obviously, a soft, rather than hard, systems view was necessary. Saladaga (1989), who headed the research program, described the dilemma in deciding on breeding objectives:

The first issue was on the breeding objectives. Farmers and consumers differed in preferences from province to province and even from one locality to another. There were two large groups with almost opposite needs, i.e. the farmers who grow sweetpotato for the market need varieties whose characteristics are markedly different from those required by farmers who plant sweetpotato mostly for home consumption in situations of highly sloping land in subsistence agriculture systems.

Then there were variations in preferences for taste, skin color, flesh color and root shape from locality to locality. One could therefore list more than fifty different breeding objectives even after classifying the target groups.

When people encounter concrete situations, they view, filter, sort out and give meaning to their experience using characteristic mental frameworks, usually referred to as *Weltanschauungen,* world views, cognized models, or fields of experience. Individuals and groups use different mental frameworks based on their unique experiences, feelings, emotions, attitudes, values, morals, beliefs, tastes and personalities of individuals, as well as their patterns of reasoning and intelligence and their store of knowledge (Morris and Wilson, 1990).

These different lenses for viewing the world give rise to different perspectives. This explains why individuals perceive the same event in different, even conflicting, ways. Fieldworkers who seek to elicit farmers' views realize that there is rarely such a thing as a

user's perspective but instead *multiple perspectives* (Linstone, 1989). Diagnostic methods can be expected to yield as many perspectives of a single situation as there are relevant actors. For example, while the Department of Environment and Natural Resources (DENR) considered the deforestation in Liloan as a critical problem some subsistence upland farmers viewed the situation positively since to them it facilitates land clearing for swidden agriculture. In short, while one actor reviewed deforestation as a problem, the other thought it was a solution.

Creating awareness of this multiplicity of perspectives is not meant to complicate a fieldworker's task. Instead, the multiple descriptions provided by actors as seen from different angles help build a rich picture of the problem situation, as suggested in the preceding section.

While perspectives in themselves are relevant inputs in the R&D process, these become a lot more meaningful and useful when researchers link these to their underlying assumptions. Actors may hold conflicting perspectives simply because these are rooted in conflicting mental frameworks. In other words, much could be gained if diagnostic exercises go beyond examining perspectives, that is by also probing into the underlying mental frameworks. Exploring not only *what* various actors think but also *why* and *how* they think fosters better understanding, and possibly greater collaboration and cooperation, among them.

Box 4. From perspective to multiperspectives: fuelwood gathering.

Key informant interviews in the upland community of Mailhi in Baybay revealed multiple perspectives, and their underlying mental frameworks, on the perceived effects of fuelwood gathering.

Actor	Perspective	Dominant mental framework
ViSCA-GTZ Ecology Program field staff	"Fuelwood gathering contributes to the destruction of the forest ecosystem"	ecological
Husbands	"Fuelwood gathering generates cash income to help support our families"	livelihood
Wives	"Fuelwood gathering answers our household's basic need for cooking fuel"	household needs
Local Firewood Traders	"Fuelwood gathering enables us to sell cheap source of fuel to households"	marketing

The emphasis on multiple perspectives and mental frameworks apply not only to the intervened but to the intervening agents as well. Discussion and debate of different perspectives are a norm where R&D professionals gather.

There is already an overflowing body of literature expounding on the merits of interdisciplinarity in the R&D process. Castillo (1990) systematized the patterns of interdisciplinary work which has helped guide UPWARD's efforts to develop an interdisciplinary approach to research.

Learning the hows of interdisciplinarity needs to be accompanied by a proper understanding of the whys behind it. One fundamental and obvious reason for scientists representing different disciplines to undertake joint research is that the multiple perspectives generated through such an approach is expected to lead to a holistic, and hopefully clearer, understanding of an ill-structured problem situation.

The different perspectives of scientists reflect the body of knowledge available in their respective fields. And just like users, these perspectives are rooted in certain mental frameworks, i.e. dominant scientific paradigms. Genuine interdisciplinarity comes about when scientists, while drawing from the stock of knowledge in their individual fields, become willing to share a common mental framework for viewing the real world. UPWARD's user-oriented diagnostic framework is one such type. It goes without saying that UPWARD researchers can undertake interdisciplinary work more effectively when they willingly adopt and share the user-oriented approach.

Furthermore, interdisciplinary work enhances the conduct of research since scientists make available the different methodologies used in their respective fields. Soft systems, hard systems, applied science and basic science all have their places in the research process although each methodology assumes critical importance at different phases in the inquiry. Interdisciplinary research thus operates by spiraling through several methodologies (Bawden et al, 1984).

FROM *KNOWLEDGE* TO *KNOWLEDGE SYSTEM*

The growing interest in the potentials of indigenous knowledge for development further underscores the need for a user-oriented R&D approach. Perspectives of users emanate in part from the vast reservoir of people's agricultural and natural resource knowledge borne over centuries of experience.

While studies on indigenous knowledge have surged in recent years, most of these deal mainly with the documentation and storage of local knowledge beliefs and practices. These attempts to extract fragments of indigenous knowledge and store them under certain predetermined categories somehow reflect the difficulties of international science to record and analyze indigenous knowledge in its holistic form (Indigenous Knowledge and Development Monitor, 1993).

The findings of such studies are undoubtedly helpful in describing and systematizing aspects of indigenous knowledge. But while its existence, as well as importance, is already well established, indigenous knowledge is still far from attaining full legitimacy in mainstream thinking and from becoming seriously considered as a relevant input in R&D. Research therefore needs to move a step further by outlining approaches and procedures on how indigenous knowledge can be expanded, incorporated into or enhanced by formal science. Otherwise, terminal reports of research projects which list down unique agricultural practices of tribal groups may only find their way into the bookshelves of libraries, ending up as good materials to fascinate, intrigue and entertain readers.

In its pursuit of partnership with local expertise, UPWARD can pave the way for research on indigenous knowledge that goes beyond archival interests. In addition to identifying and classifying knowledge products, research can capture the dynamic character of indigenous knowledge such as by describing not only the indigenous practice per se, but the processes involved as knowledge is generated, transformed, exchanged, adapted or utilized, as well as the actors and the linkages that support these processes (Box 5)

A *holistic* approach to indigenous knowledge research, as contrasted with the typical *extractive* type mentioned earlier, helps avoid the tendency to abstract knowledge from the sociocultural system from which it evolved. The term *local knowledge* is often used to emphasize that it is unique to a given community. Indigenous knowledge, beliefs or practices therefore need to be appropriately viewed and examined in the light of the particular milieu from which these were drawn.

A major constraint in incorporating indigenous knowledge in the R&D process is the wide gap between science-based and indigenous knowledge systems. A big challenge exists for research of how the two systems can be intertwined so that the partnership, "can exploit", as UPWARD puts it, 'the broad principles of global science while being guided by the practical understanding of local agroecological, socioeconomic and cultural conditions and possibilities"

The difficulty seems to be not necessarily because the two knowledge systems maintain two distinct bodies of knowledge but because they stem from different assumptions, values, methods, circumstances and intentions. Upland farmers in Matalom expressed difficulty responding to researcher's queries on farm size and planting distance because the interview questions were structured based on standard measurement systems, i.e. hectares and inches. It was later discovered that this does not indicate a lack of knowledge on the part of farmers; they simply used a more pragmatic measurement system in their farming activities. For example, area is estimated based on the seeding rate of corn while planting distance is approximated using the length of the farmer's stretched palm.

Box 5. From knowledge to knowledge system: *mura* contour hedgerows.

Vetiver (*Vetiveria zizanoides*), a tall, wiry and perennial grass, is indigenous to tropical Asia including the Philippines. The plant's natural habitat are low-lying, swampy areas.

Known locally in Matalom as *Mura* grass, it has long thrived along the dikes of lowland rice fields. Farmers allowed the grass to proliferate since it was observed to help prevent dike damage by holding the soil with its dense curtain of deep roots

In the uplands, farmers have also long been practicing terracing in their farms to control soil erosion. Farmers however noticed that such a structural measure was not able to effectively control erosion especially during heavy rains. Having learned about the use of *mura* in lowland ricefields, farmers thought it might be a good idea to try planting the grass along the contour lines to act as barrier to the downward flow of eroded soil. Farmers soon noticed the visible effects of the vegetative soil control measure, convincing others to try to practice in their farms, too. The practice has now spread in many upland areas of Matalom.

In 1991, ViSCA researchers conducted field trials on *mura* contour hedgerows in Matalom as part of a farming systems project. With the promising results, the project staff decided to promote the practice while teaching farmers a more systematized way of establishing contour lines, which was in turn adapted from the Sloping Agricultural Land Technology (SALT) developed by the Mindanao Baptist Rural Life Center (MBRLC) based in southern Philippines.

Meanwhile, the introduction of contour hedgerows in Pinabacdao by the Integrated Root Crops Program (IRCP) was beset by a shortage of planting materials. Supplies of leguminous hedgerow species were scarce and had to be purchased elsewhere at prohibitive prices.

When the IRCP learned of *mura* contour hedgerows in Matalom, the field staff decided to try them too, hoping the practice might be able to help solve the problem of planting materials. Fortunately, the *mura* grasses which were initially planted in IRCP propagation plots, grew very quickly, indicating the plant's adaptability to Pinabacdao conditions.

The substitution of *mura* for the conventional leguminous species has also contributed to greater acceptance of the contour hedgerow practice. With the addition of *mura* to the menu of hedgerow species which IRCP recommended, farmers have been given more options in selecting and evolving their own combinations of hedgerow species based on their individual preferences. For example, some farmers planted ipil-ipil (*Leucaena leucocephala*) because of its additional use as animal feed; others chose a combination of *mura* and pineapple as double-hedgerows because the former provides effective soil erosion control while the latter serves as cash crop.

Given such disparate mental frameworks, it is not surprising that the two often clash rather than complement. If science-based and indigenous knowledge systems are to be interlocked, scientists and local people need to converge toward a commonly shared mental framework. As to how this can be achieved is not yet clear enough and perhaps this is one area where research on indigenous knowledge can make a major contribution.

In trying to make full use of this newly rediscovered resource, it must be however kept in mind that not unlike other types of knowledge, indigenous knowledge has both its limitations and potential contributions to development. Thrupp (1989) cautioned against idealist and romanticized visions which suggest that all form of indigenous knowledge are superior. This can be misleading and inappropriate. It should be stressed that the type, extent and distribution of knowledge vary greatly in Third World societies.

In sum, the common research focus on *knowledge* alone seem to paint a static and simplistic picture of indigenous knowledge. In contrast, a *knowledge systems* perspective captures not only the content but also the knowledge processes and actors, as well as their dynamic interactions under a given structure and environment. Most importantly, it alllows for a better view of how indigenous knowledge can become an integral part of R&D.

SUMMARY

UPWARD's transition to a new program phase is characterized by the shifting emphasis from user's perspective to participation. This paper proposed that the change in program focus be complemented by an amplification of the user-oriented diagnostic framework through the integration of knowledge systems thinking.

Specifically, the following points were suggested: 1) expanding the focus to include other actors or key players in a system, besides users, 2) describing fully the problem situation; 3) adopting a soft systems perspective; 4) recognizing multiple perspectives; and 5) viewing indigenous knowledge in its holistic form.

An enhanced diagnostic framework, through the incorporation of the above, would further help UPWARD move *upward* by being able to better respond to newly emerging issues and concerns in agriculture and rural development.

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APPROACHES TO COMMUNITY BASED PGR CONSERVATION

Maricel Piniero and Gordon Prain

Current orthodoxy in plant genetic resources (PGR) collection and conservation ignores or downplays the much older ideas and practices of biodiversity conservation found among rural households and communities. The orthodox history of PGR has been written from above and describes the scientific exploration of supposedly unknown regions and the collection, characterization and preservation in botanical gardens of "unknown" species. More recently, it documents a global rescue mission, involving the systematic removal of plant genetic resources from their natural and cultural habitats for conservation in national or international genebanks and for use in plant breeding, industrial processes and medical science. In agriculture, this history has become the history of the Green Revolution, in which genetic diversity has been exploited to breed high-yielding varieties of many crops, most famously of rice and wheat. A paradox of this recent history is the erosion of genetic diversity in commercial farmlands as many traditional cultivators are replaced by a few of the new, high-yielding varieties, themselves bred from that diversity.

The older, local level history is spoken and performed from below. It is the history of the transformation of foragers into farmers and their development and diversification of agricultural crops over the millennia and into the present. Crop diversification has been driven by the interplay of heterogeneous environments with the efforts of local cultivators to increase the security and adaptability of the household and has involved close observation and evaluation of plant habits and characteristics within environments and subsequent conservation of selected types. The scientifically "unknown" cultivators are infact familiar products of this process.

There is now evidence that these household practices are under serious threat as increased demands for cash income through labouring or migration lead to reduced household labour. UPWARD supports the view that by reinforcing and helping to "scale up" existing household-level skills and conservation practices local communities can take greater control of their own sustainable development. At the same time, community conservation can help overcome some of the problems inherent in global approaches, such as erosion within ex situ collections, anonymity of collections and the absence of an evolutionary dynamic in response to natural and cultural selection pressures.

In conjunction with local communities in Bukidnon, a province of the southern Philippines island of Mindanao, the UPWARD network is exploring ways to support local "curatorship" of rootcrops, which have been important secondary crops in the area, but which are now threatened by intensification of commercial agriculture. What do we mean by the term curatorship? It is meant to convey the investigative as well as the conservationist attitudes

which local people exhibit in relation to the diversity they maintain. Investigation includes evaluation and this contributes to the dynamic aspects of local genetic diversity. A third element of the term concerns the custodial role of households in maintaining diversity which may benefit relatives and neighbors, but most importantly, which is consciously meant to benefit future generations of the family .

One objective of the project in Bukidnon has been to determine the kinds of "community" and community dynamics which are likely to support (or undermine) successful conservation of both germplasm and indigenous knowledge at the local level. A recent compendium of terms and concepts defines community as "a group of individuals sharing the same territory and involved in the different but related aspects of local livelihood" (Borrini 1992). The definition encompasses a wide range of possible groupings among relatively small-scale demographic units in the Philippines such as villages (either local government-defined barangays or tribally defined settlements), quarters or hamlets (*sitio*, *purok*), special-purpose groups such as farmer organizations, cooperative societies, women's groups, etc. In some respects, even an individual household can be considered a community.

Two variables defining types of curator communities were hypothesized to have special importance: gender, because of the frequent association of women with seed and variety management as well as the degree of cohesion and mutual support found in many women's groups; and the degree of informality/formality of the group, because of the novelty of "self-conscious" genebanking which on the one hand might benefit from informal flexibility, but on the other hand needs some degree of local legitimization.

Four different communities have become partners in the project (Table 1 and map): an informal grouping of mainly migrant women in the barangay of Maambong; a tribal family group related by kinship and marriage in Maraging, Cabangalsan; a formal organization of migrant women initiated by the Department of Agriculture in Mauswagon; a tribal village authority in Dalwangan, which in fact became a single tribal family as immediate curator after the intended village-level tribal curatorship broke down. Ethnic origin was also considered an important variable on the hypothesis that different ethnic groups are likely to assign different values to crop diversity general and rootcrops in particular.

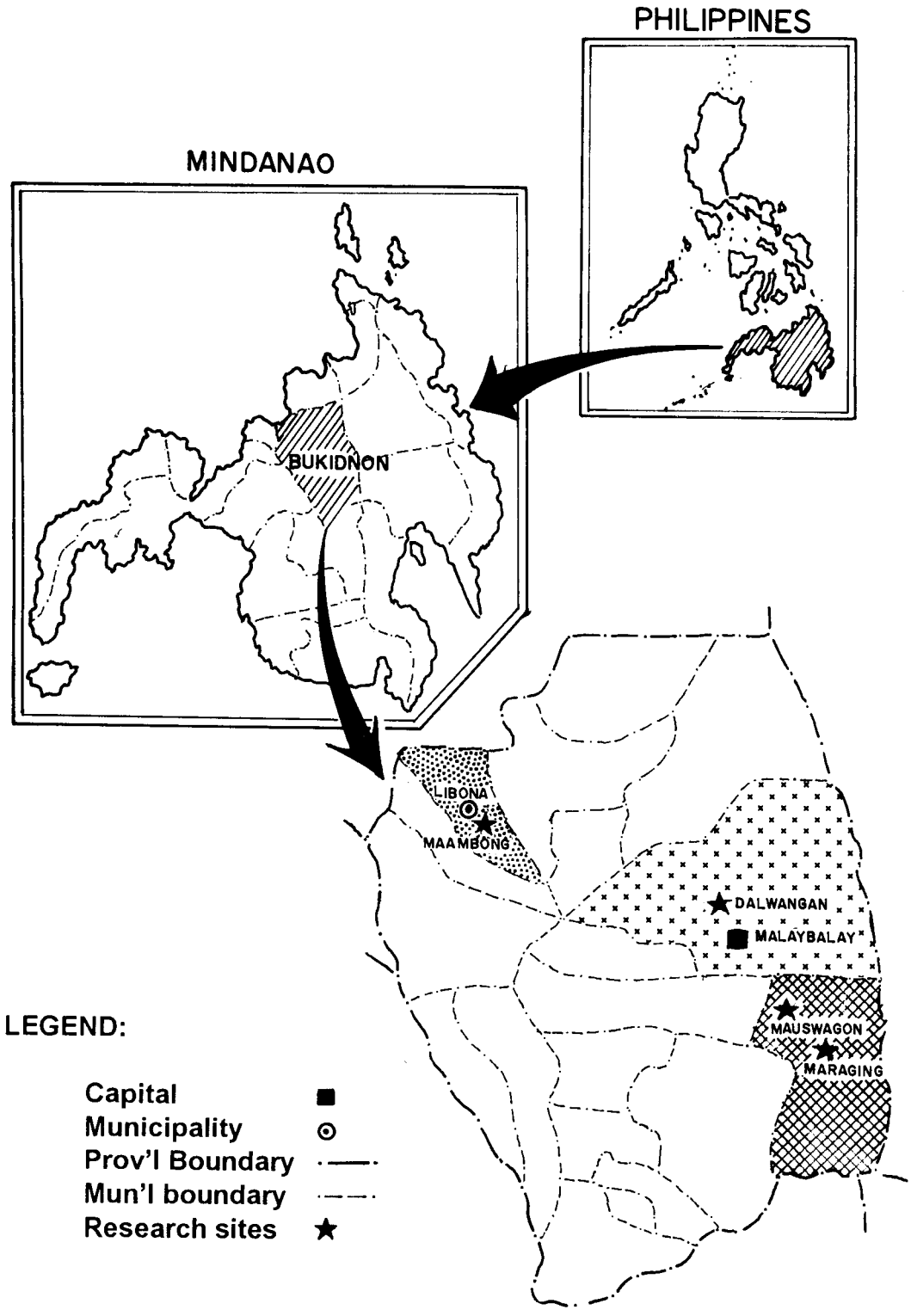
This paper focuses attention on the approaches and strategies and lessons learned (so far) in doing the memory- and gene-banking. Preliminary findings were presented elsewhere (Prain and Piniero 1994) and further substantive results are also now available (Prain and Piniero 1995).

APPROACHES and STRATEGIES

Responding to local needs is a basic aim of participative approaches to agricultural research and development. Yet the need to conserve a wide range of landraces of secondary crops for hard-to-define future benefits is often not immediately apparent to a community. Even though household familiarity with and management of genetic diversity may be very common, it does not easily translate into an explicit, "public" project.

Table 1. Summary of genebanks - type of groups

Maambong	Dalwangan	Maraging	Mauswagon
"Inahan nga makugihon" Industrious Mothers	"Kauyyagan ho Kallilawon" Livelihood for the people	"Nanay nga makugihon" Industrious Mothers	Rural Improvement Club (RIC)
Curator characteristics			
Initial			
In informal grouping of migrant women	male tribal group headed by the data and other male tribal elders	tribal family group related by kinship and marriage	formal organization initiated by the Department of Agriculture
relatively egalitarian (participants as individual rather than a group)	heirarchical, unitary and closed focused in the authority of the data	participant as individual with equal responsibility	relatively communal although separated by virtue of smaller community (per "*purok*")
de facto			
more complex multiple social network based on kinship links, ritual kinship and special friendship	largely acephalous grouping of linked households especiall women members	very communal focused on the family	not yet visible



Location map of study areas in Bukidnon, Philippines.

Discussing and underlining the short and long term benefits of conservation has been essential and different strategies have been necessary to publicize and legitimize it.

Information drive

Early discussions with the four communities concentrated on the conservation of the different "classes" of local rootcrop cultivars as a contribution to long-term agricultural security and adaptability. Concrete and well known examples of the disappearance of local rice varieties from fields and cooking pots were used to highlight the vulnerability of genetic diversity. To underline the unpredictability of the environment and the consequent need for a range of crop cultivars to respond to these unpredictable changes, we discussed the recent eruption of Mount Pinatubo in northern Philippines, the total change of the surrounding environment and the need for alternative crops and varieties.

In terms of implementation, we emphasized equal partnership between scientists and farmers aimed at the preservation of the diversity of locally valued root crops in a mutually satisfactory way and sustainable in the long run. This aim itself arose out of local concern for the loss of traditional varieties of sweetpotato and other rootcrops illustrating UPWARD's collegial approach to research and development and the need to jointly identify option rather than imposing solutions. In this spirit, questions about incentives, access, monitoring, responsibilities, and rewards were openly explored.

Researcher monitoring

It was important to curators for researchers to be regularly present at the site, especially for major events such as planting and harvesting/replanting but also during the growing period itself. This seems to reflect local people's need for researchers to "validate" their role in the project and perhaps to "legitimate" the project itself. This is supported by the fact that project implementation is greater when a stronger relationship between "insiders" (local people) and "outsiders" (researchers) is built in the early stages. For example, even though the curator group in Maambong was encouraged to harvest and replant when they felt the moment was right, they often delayed these activities -- even on one occasion actually losing some varieties through a delayed harvest -- to wait for the researchers. This shows a degree of dependency that is unsustainable in the long term, but seems an essential element of the early part of the partnership.

Aside from the social and psychological benefits of researcher presence (many visits involve several days' stay in the village), there is also an iterative element which is very important: offering the opportunity for both curators and researchers to reemphasize and discuss the purposes and goals of the genebanking activity. In support of this function, regular informal meetings were held with different curator groups during most visits at which the meaning of conservation was repeatedly debated and any problems associated with the activity discussed.

The use of incentives

Repeated discussion and explanation of the long-term goals of the project were essential for reinforcing commitment and ensuring that no misconceptions creep in about what the "outsiders" may or may not be able to offer. At the same time, we found that various incentives were very important to galvanize interest while the long-term perspective was crystallizing for the group. At the household level the long-term view was clearly present in the management of different kinds of plant and tree species, especially in the homegardens. But at the group level, trust needed building so that the long-term view of diversity could emerge.

A project interested in supra-household cooperation should design or at least encourage incentives that benefit the community. In that way, the project more easily becomes associated with communal action. In Maambong, a simple water tower was constructed for irrigating the genebank, but it also stored rainwater for general use by the community.

Incentives can also focus on households, since they are the basic production and consumption units. In Dalwangan, a small goat-raising enterprise was established to utilize genebank by-products as feed and offer a small income to the one or two households with responsibility for actually looking after the genebank. The tribal authority also saw this as the livelihood component, a potential means for the genebank to be self-sustaining. This is a crucial characteristic to which the tribal authority and the Women's Rural Improvement Club were perhaps more sensitive than the informal women's group or the tribal family group.

An incentive can give purely material benefit to the household or community, or it can have both a material and symbolic component. The power and importance of symbol in rural communities sometimes seems to be little appreciated by "down-to-earth" research and development workers. Certificates of membership distributed to members of both the women's groups in small ceremonies proved to be very potent in building the spirit of these groups. Women who were initially not active in the Rural Improvement Club became active after certificates of membership were distributed to active members. At the suggestion of members of the "Industrious Mothers Group" prizes were also awarded at the first harvest-time to the women with the greatest overall rootcrop diversity and those with greatest sweetpotato diversity. The prestige attached to these awards counted at least as much as the prizes themselves.

Another important element in the choice of incentives is their long-term character. The water tank was constructed close to the genebank in Maambong to offer the possibility of hand irrigation of the genebank during the dry season. But it quickly became a clothes-washing spot and domestic water supply for households nearby. The long-term usefulness of the water tower gave it added force as an incentive over time. The women say that when they see the tank, it "pricks the conscience" (*makonsensiya man kami*) if they have not been maintaining their genebank plot very well.

Periodic improvements to the genebanks

Besides offering small incentives with long term relevance, we also took several measures over time in step with the development of the genebank: construction of a fence to keep out animals; the installation of rat control devices to improve productivity. Another material and symbolic incentive was the establishment of important signboard at each site describing the genebanks. In Maambong, it expressed the sentiments of the group: "*maayong pag abot sa proyekto sa mga inahan nga makaugihon nga nag atiman sa mga lagutmon*" (welcome to the project of industrious mothers who maintain and conserve the different classes/types of rootcrops). The public display of the group name "industrious mothers" also prodded them to be industrious in looking after their plot.

Cross-site visits between community partners

Encouraging local people in their conservation of rootcrop diversity does not need to depend only on what happens "on-site". Exposure to other people's initiatives can lead to experimentation and consolidation in one's own community. Cross-site visits offer not only the opportunity to observe different cultural management practices, to discuss those differences with the hosts, but also to exchange genetic materials (either seeds or other form of planting materials) with one another. This in turn can help ensure the propagation of cultivars not only on the original site but in other sites as well, increasing the likelihood of genetic conservation.

The Rural Improvement Club members in Mauswagon, who are just starting their genebank, were supported by the project to visit the well-established Maambong genebank. To begin with, the outing itself is a unifying experience. It focuses attention on the genebank and membership in the curator grap. By visiting an established site it offers the chance to see their own future. The particular layout is a potential source of innovation and discussions with the Maambong women helped reinforce ideas on conservation. The subsequent improvements in Mauswagon genebank could at least in part be attributed to this cross-visit.

Local institutionalization

To incorporate an on-going project into the existing structure of the community can make the project more sustainable and acceptable in the long run. One member of the "Industrious Mothers' Group" was elected as councilor for the District and was made responsible for activities relating to nutrition and "beautification". She has incorporated into the program the conservation activities of the women's group and part of her mandate is to encourage other districts to start project aimed at conservation. Another kind of institutionalization, achieved through the increased legitimacy of the genebank within the larger community, is the increased participation of male relatives in helping with land preparation for the garden and other tasks.

In one of the other sites, incorporation of the project in the already established rural womens' organization made it easier to mobilize members towards the effort of genebanking Furthermore, other related activities can be easily integrated with conservation which results in reinforcement of these activities. For example, the rural women's organization has linked

conservation to a community-wide homegardening effort. Both activities became the center piece of "Nutrition Month" -- a nationwide effort to focus attention on family nutrition during one month of the year.

Type of genebank and curator group

When considering the different "shapes" or cultures of the different groups we distinguished "expected group structure" at the beginning of the project from the actual shape of the groups managing the genebanks in practice. The anticipated group structures before the first planting are shown in Figure 1. The structure of the Dalwangan group was expected to be hierarchical, unitary, and closed, focused on the authority of the chief (*datu*). The structure of the Maambong group was expected to be relatively egalitarian, with participation as individuals rather than as group members and open to the possibility of new members joining. It was assumed that Mrs. Lydia Vda. de Casseres, the donor of the land where the Maambong site was to be located as well as because of her age, would be "first among equals". The ex officio participation of the barangay captain was expected to facilitate land preparation as well as help to legitimize the activity within the barangay. The structure of the Mauswagon group was expected to be hierarchical, focusing on the authority of officials while members would have equal responsibilities. The Maraging group on the other hand was expected to have equal responsibilities but with close supervision by the hamlet leader.

As early as the first planting of the genebank in Dalwangan, the anticipated formal tribal authority structure broke down. Although the tribal elders and youth involved in initial discussions and negotiations were led by the Chief, he was unable to organize adequate preparation for or participation in the planting. Those who attended were mostly his relatives or assistants whom he practically ordered to come on the day of planting. A few non-relatives also attended, either out of "shame" (*hiya*) because they attended the planning session, or because they were friends of the chief's brothers. Most of the original group of elders consulted did not attend. Subsequently the chief played almost no role in managing the genebank. He is a politician active at provincial and regional level, and is involved in many different projects. The lack of an immediate, short-term livelihood dimension also no doubt gave the activity low priority for him.

The genebank was established on land donated by the chief's brother, who was one of the original group of elders. The defacto structure of the curator group in Dalwangan became very rapidly based on this man's household, plus a few close relatives living nearby (Figure 2). The male members' role was restricted to land preparation. Day to day management and even replanting were handled by some of the women in this small kin group.

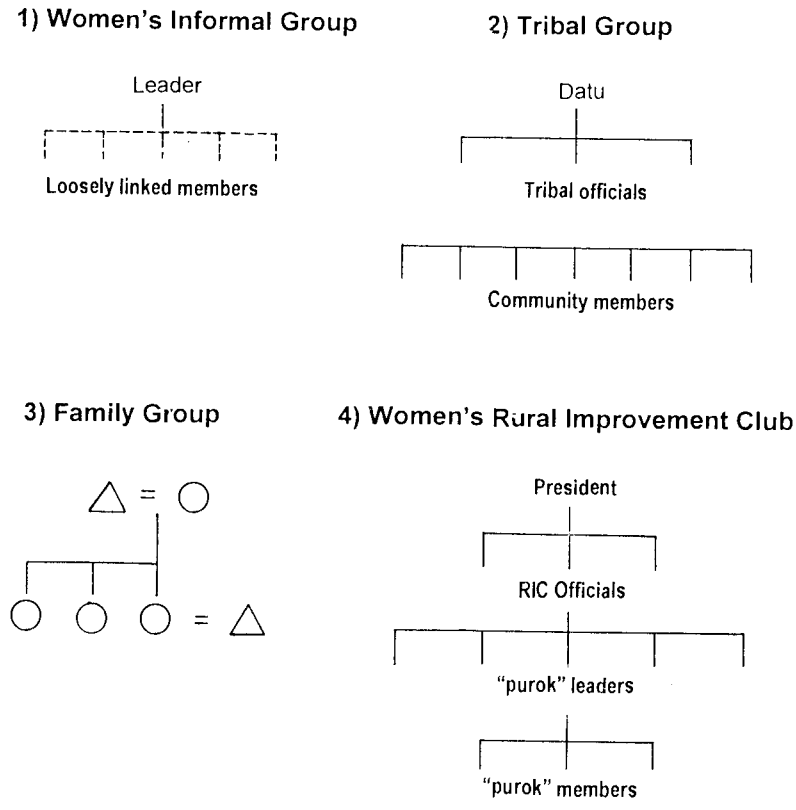


Fig. 1. Anticipated structure of the four curator groups.

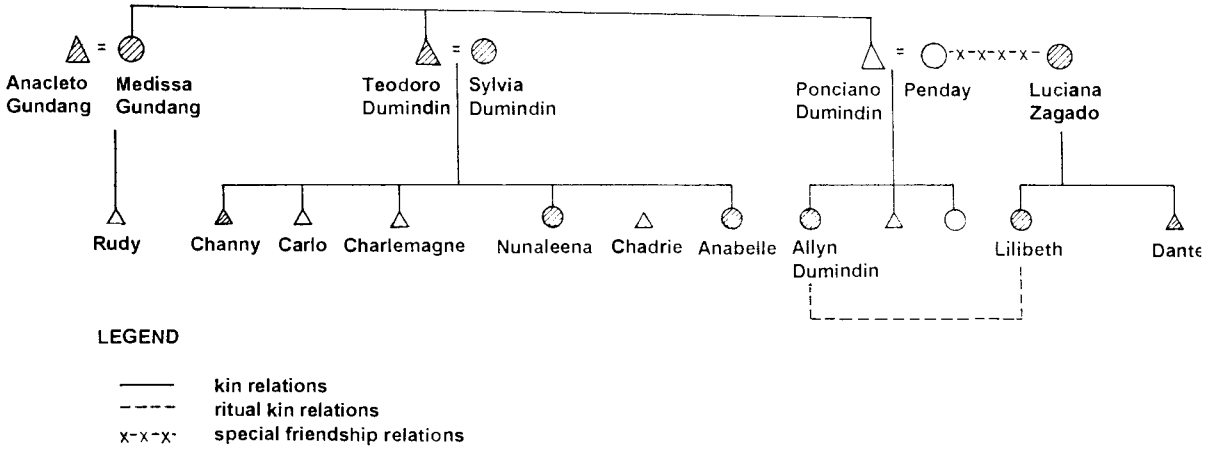


Fig. 2. Relationships in the de facto curator group of Dalwangan genebank.

The expected formal authority structure of leadership was largely transformed into a grouping of linked household but with the chief's brother playing is increasingly "hands-off" role. The failure to replace the expected formal authority with some other type of cohesive force may be one important reason for the eventual abandonment of this genebank. Fortunately one of the women curators was able to save some of the collection in yet a further transformation of the curator structure, this time into a household garden. Although very unexpected it was a welcome confirmation of the resilience and independence of local genebanking, important and emphasized the role of women and homegardens in conservation. These are discussed further below.

In Maambong, the structure also changed in practice, becoming complex. The group became more like a multiple social network based on kinship links, ritual kinship, and special friendship ties (Figure 3). Mrs. Casseres is central to this network. Several men participated in land preparation because of the membership of their wives. Participation by the barangay captain was also partly related to his wife's involvement, although she is a relative "outsider" compared with the other women. His communal interests probably were more important in explaining his involvement. Although he relinquished his official position of barangay captain during the first planting of the genebank, he sought to contribute in various ways to its success.

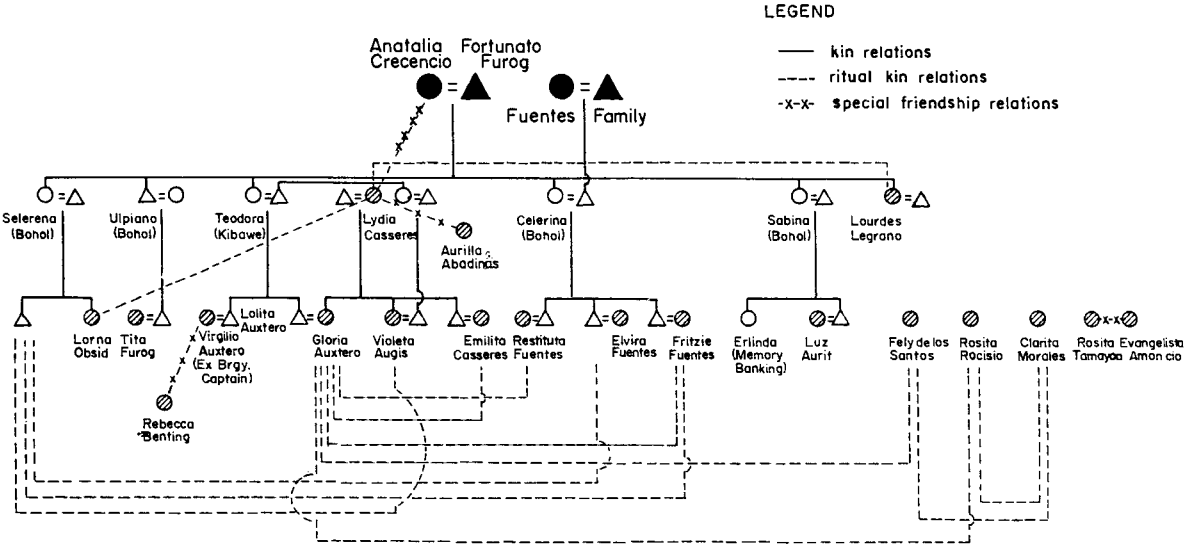


Fig. 3. Relationships in the de facto curator group of Maambong genebank.

The fact that Mrs. Casseres donated the land for this genebank ("so that I can be remembered," she says) seemed to contribute relatively little to her authority. Her leadership depended more on example than on political or economic title. She did not order anyone to do anything, but she herself tried to be the most dedicated curator, hoping either to persuade or failing that, to shame others into emulating her. Even so, she was able to draw on several elements of culturally sanctioned authority, such as her age and kin relations (mother, mother-in-law, aunt, *ninang*, or godmother) and to bring into play reciprocal obligations between friends. In the end, she felt that "policy/regulation" was useless. In the end, she felt that "policy/regulation" was useless. She believed that the genebank would work only if the women incorporated it into their "daily living".

There are also some interesting lessons from the shifts in structure of the two more recent genebanks in Mauswagon and Maraging. From what appeared as a typically vertical organization with leading officials and a mass of members, the women restructured into a relatively automous secondary level made up of neighbourhoods (*purok*) with their own leaders and members (Figure 4). The other officials of the RIC are also *purok* leaders and hence their location at the same level. Each *purok* manages a strip of land within the genebank (Figure 5)and thus introduces repetition or redundancy into the range of landraces conserved by the different *purok*. Redundancy is also a characteristic of the Maambong genebank, where the individual women plant their own beds with available landraces. It has been the curators themselves who have introduced this design, but it has proved to be a very effective means for reducing the level of erosion and should probably be recommended in all *in situ* conservation work.

Are women more diversity-conscious than men? There are several factors that are significant. Women probably played a key role in plant domestication and agricultural development through the transformation of their food collecting into seed selecting and garden planting activities (Harris 1969); there are strong, present-day links between women, seed management, and indigenous knowledge of landraces (Mula 1992); and between women and genetically diverse homegardens (Midmore et al 1991). Though by no means conclusive these factors do suggest that in many societies, women are at least more diversity-sensitive than men.

Several developments in the genebanking project also highlight the particular affinity between women and conservation. One is the growing enthusiasm demonstrated by the Industrious Mothers group for the curator role and the readiness of many members to associate the activity with the security of their children. Another development has been the way the curatorship of the tribal authority genebanking has gradually by default, passed on to the female family members, female relatives, or female friends and more recently, the way one of these women independently rescued a part of the diversity and began her own genebank. More generally, the closeness and mutual support of the women's group in Maambong continue to inspire the establishment of community genebanks.

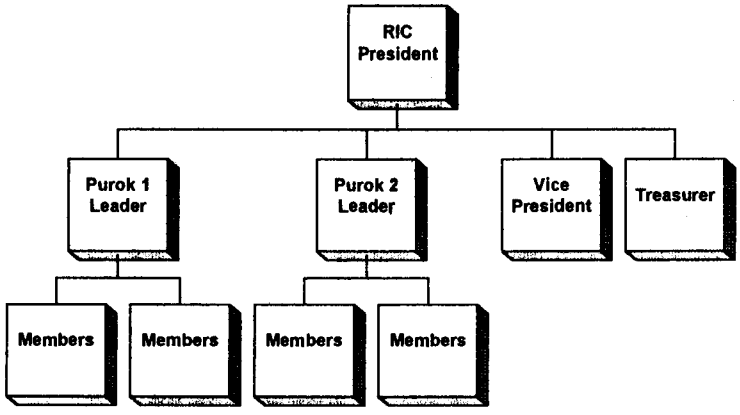
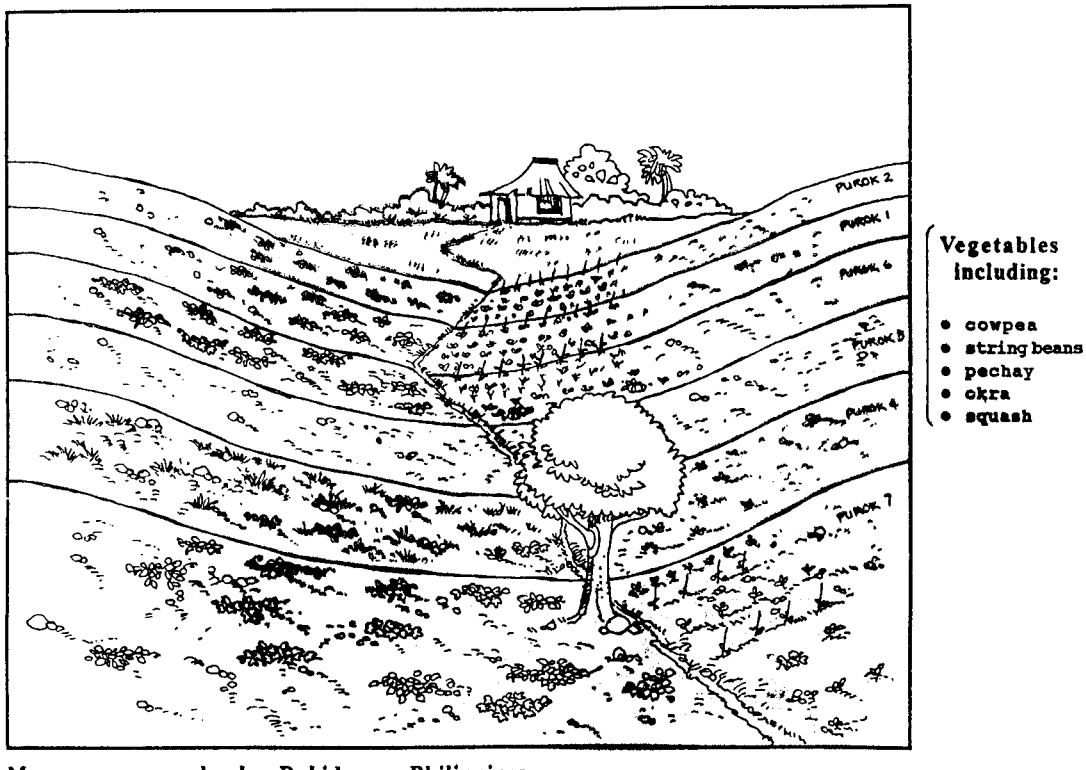


Fig. 4. De Facto organization of Mauswagon genebank.



Mauswagon genebank, Bukidnon, Philippines

Fig. 5. Mauswagon genebank, Bukidnon, Philippines.

The role of homegardening

A reason for women's greater interest and skills in diversity conservation under some circumstances may derive from their frequent close association with homegardening. Often, the purpose of gardens is to maximize the range on inter- and intra-specific diversity, utilizing as many 'tiers" as possible with trees and crops in imitation of the tropical forest (Geertz 1963) and as many landraces as possible to maximize and culinary benefits (Niñez 1985; Mula and Gayao 1991).

One diagnostic element then in determining the feasibility of community genebanking may relate to the kind of management of homegardens or other sites of plant diversity that exist in an area. We should not forget that many socio economic and cultural circumstances can undermine both the capacity for and interest in management of homegardens, a fact that has negative implications for local-level genebanking (Verdonk and Vrieswijk 1992). It may be that a community genebank may function better as a small number of homegardens rather than as large communal plot with all the organizational complexity this entails.

An advantage of the Maambong genebanking model is the way it mimics the familiarity, flexibility and household basis of homegardening while at the same time benefiting from the support and spirit of the group.

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Methods Development: Discussion/Open Forum

1. When, in a particular setting you have different types of 'users' with **conflicting** interests, how do you apply your users perspective?

2. Complementation of hard and soft methodologies should be identified.

3. What role (if any) does community action rather than interaction with the community have in the uplands.

4. Research focus on **opportunities** as well as **problems;** needs different **framework** and **methods.**

5. Should UPWARD's conceptual framework be user-friendly?

6. Methods could also focus more on existing/evolving customary land tenure.

7. Does UPWARD need more than micro-methods? i.e. macro-demand and policy methods

8. Would methods be location-specific?

9. Are UPWARD methods managing to "pass over the pen" or are they still basically data extraction?

10. Methods-driven research is a danger.

11. There is strong need to break free from own discipline and colleagues as source of methods. Look further a field.

12. Need to expose researchers to a wide range of methods.

13. UPWARD should not try to develop methods but to diffuse methods through training.

WORKING GROUP 2

PROJECT MONITORING AND EVALUATION/METHODS

Chairman	Dindo Campilan- Communication Specialist, ViSCA
Rapporteur	Rosana Mula - Rural Sociologist, BSU
Members	Cherry Bagalanon - UPWARD, Los Banos
	Esther Lopez - Director, Crops Research Division, PCARRD
	Prakash Pradhanang- Head, Plant Protection Division, LARC-Nepal
	Lealyn Ramos - Chief Agriculturalist, DA-NOMIARC, Bukidnon
	Peter Schmiediche - Regional Representative, ESEAP, CIP-Bogor
	Esther Velasco - Sociologist, UPLB

MONITORING AND EVALUATION MECHANISMS

1. Creation of the UPWARD Resource and Advisory Committee (URAC)

   a. Functions

   - Sets directions of UPWARD plans and programs;
   - Provide technical assistance;
   - Reviews program reports;
   - Acts as consultative body to the coordinator, individually or as a group;
   - Recommends other individuals to assist in the review process.

   b. Composition

   - URAC is to be composed of senior scientists with broad research experience, proven expertise in their fields, orientation towards interdisciplinarity and representing Asian regions where UPWARD operates

   - Gender balance is considered

   - URAC is to be composed of eight members distributed as follows: one representative each from the Wageningen Support Group, donor agency and CIP; two representatives from South Asia; three representatives from Southeast Asia; and the UPWARD coordinator.

   - Chairmanship is to be agreed among members

   - Coordinator will act as executive secretary

c. Selection

- Coordinator will select the members of URAC

d. Meeting

- URAC will convene regularly, once a year during the annual UPWARD meeting.

2. Screening and evaluation of research proposals (IFS model)

a. Pre-screening

- Submission of proposal will follow a standard format.

- Coordinator will perform preliminary assessment of research proposals based on current program priorities.

b. Evaluation

- A pool of experts is to be formed from among the Wageningen Support Group, Asian scientists and nutritional research systems.

- Research proposals will be evaluated by selected experts based on a set of standard guidelines.

c. Funding

- It will be decided which among research proposals endorsed by experts will be funded

3. Submission/presentation of annual progress reports by researchers

4. Feedback on progress reports from URAC and fellow researchers

5. On-site visits by coordinator and researchers with related projects

6. Feedback/trip report by visiting coordinator/researchers

DIRECTIONS FOR METHODS DEVELOPMENT

1. Distinguishing methodology from methods development. A methodology is a theory of how research should proceed. Methods development should be guided by the methodology based on the UPWARD Philosophy.

2. Viewing the changing focus from user's perspective to participation not as a total shift but as an evolutionary process. A change in UPWARD methodology requires new research methods.

3. Exploring the extent to which UPWARD research methods can be participatory by focusing on projects that involve users as partners and R&D managers.

4. Identifying social, cultural, economic and other variables that influence user's ability to participate in R&D.

5. Encouraging researchers to try new methods which are consistent with the UPWARD philosophy, especially those of other disciplines and those developed by other organizations/institutions.

6. Ensuring that UPWARD research is firmly grounded on people's realities.

7. Promoting UPWARD methodology and methods by:

   a. integrating them in formal academic programs, and
   b. conducting workshops where biological and social scientists learn to share methods under the UPWARD philosophy.

8. Drawing up indicators for interdisciplinary research.

CAPACITY BUILDING AND INSTITUTIONALIZATION OF THE UPWARD APPROACH: BUILDING THE NETWORK

Gordon Prain

One of UPWARD's three major goals is to stimulate the diffusion of user-focused, food systems-oriented research approaches within agricultural research and development institutions in Asia. To begin this diffusion process, the nascent links developed through the inaugural conference in 1990 were activated through follow-up. Ideally, a development-oriented network is a set of mutually supporting, evenly weighted links between people and institutions with common interests rather than a nucleated entity radiating outwards, but a certain "heaviness" at the centre of the network is inevitable during the process of network formation and activation of links by the coordinating office (See Figure 1).

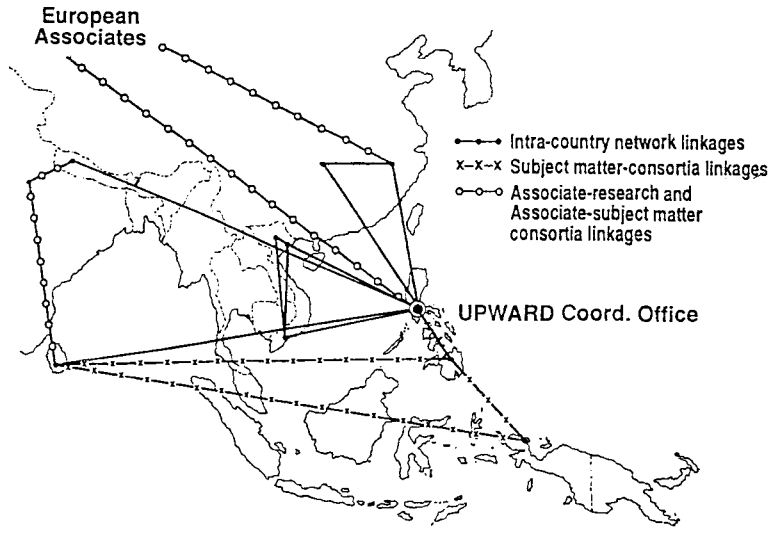

Fig. 1. Example of high density linkages planned for UPWARD's Second Phase.

UPWARD supported the development and spread of user-sensitive methods not only by providing expertise from the coordinating office but also by setting up connections between experienced practitioners in one set of institutions and actual or potential UPWARD researchers with limited experience based in other institutions. The first event sponsored was a Philippine in-country training course for prospective UPWARD project leaders. The

trainers were social scientists from metropolitan and provincial universities and the UPWARD assistant coordinator. The trainees came mostly from government research institutes and technical departments of provincial universities. A second international training course on farm household diagnostic skills was led by the UPWARD coordinator and staff, with support from the local university. These initial courses aimed to 'train trainers'. Several participants subsequently served as trainers in 'echo seminars' which they organized and UPWARD funded in different parts of the Philippines, broadening existing network links and stimulating the formulation of research proposals, as well as bringing new inquiries about joining the network. The modifications which these echo-trainers introduced into the content and format of the training events to suit their problems and needs as well as to reflect the feedback given to coordinating staff have helped to improve subsequent workshops and courses.

Through feedback and direct observations, it is apparent that the echo-seminar idea has tremendous potential for spreading approaches and methods very far and fast. Nevertheless there is a need for ongoing support to 're-echo' the messages among the same participants over time. Courses and seminars create a rather special context, in which common goals, joint activities and the resulting group spirit quickly generate great enthusiasm. Once participants return to their habitual environment, however, more conventional approaches to research - especially when practised by superiors - can easily undermine that enthusiasm. Repeated modest courses and continuing contact are very much needed.

Who are the UPWARD researchers?

Since the aim of the methodology development discussed in the previous section is to help break the mould of conventional research by equipping researchers with greater sensitivity to users, an eclectic strategy was adopted in the identification of researchers and in the evaluation and acceptance of proposals during the early stages of network development.

The researchers are predominantly young, almost half of them women (Table 1). They are based in universities and extension services as well as in national agricultural research institutions. There is a very wide spread of disciplines fairly evenly distributed between the socio-economic and the biophysical sciences (Table 2).

Table 1. Distribution of UPWARD researchers by country (as of December, 1994.)*

Country	Male	Female	Total
China	3	3	6
Indonesia	4	3	7
Nepal	8	1	9
Philippines	18	28	46**
Vietnam	13	4	17
Total	46	39	85

* Includes project leaders and team members.
** Includes UPWARD's Dutch Associate Expert.

Research proposals were solicited through personal contacts and distribution of flyers, which described possible research areas, type of funding and the structure of proposals. As already mentioned, the inaugural conference was the catalyst for the development of a Philippine research cadre and the funding of two multiple activity projects. The methods training events were also fertile grounds for project development. Of the 97 people who attended the early trainings, 56 have implemented UPWARD projects. Proposals have been evaluated by the coordinating office, the senior consultant and the project leader of UPWARD research in the Philippines. Depending on the type of proposal, additional opinions were sought from specialists at the local university, CIP staff, or occasionally, researchers associated with Wageningen Agricultural University, where an informal Dutch support group gives information and other kinds of back-up to UPWARD. For UPWARD's second phase a more systematic form of proposal evaluation is envisaged, comparing different projects using an interdisciplinary team of network members and coordinating office staff. Efforts will be made to gauge the project's potential contribution to the network and to the originating institution. Attempts will be made to improve consultation with the proponents of proposals which show promise.

Table 2. Disciplines involved in UPWARD's research.

Project	"Social science" disciplines	Biological science disciplines
China:	Extension	Systems agronomy Food technology
Indonesia:	Economics Socio-economics	Agronomy Plant breeding, Food processing
Nepal:	Extension Socio-economics Social Anthropology Development Studies	Plant pathology Agronomy Soil science Biochemistry
Philippines:	Family resource management Extension Rural sociology Economics Anthropology Human Ecology Business Management	Environmental sciences Soil science Plant breeding Entomology Agronomy Post-har. physiology Plant protection
Vietnam:	Economics Extension	Food technology Engineering Agronomy Plant breeding

Network researchers and network associates

Like many networks UPWARD quickly built up a hard core of active members close to the hub, mostly consisting of the trainees turned trainers of those receiving support for research projects. This core has been predominantly Filipino but evenly spread across genders and disciplines. NGO participation has so far been mainly indirect, through university faculty.

When networks become closed systems they turn into cliques or in-groups, often distancing themselves from broader national or regional decision-making processes. UPWARD recognized the need for a dual orientation to develop human capacity internally and

influence research directions and public policy externally. Equally important, it saw the need to maintain an open flow between these two orientations. A sub-network was therefore established consisting of a pool of colleagues, sympathizers and opinion and policy-formers, principally in Asia but also in other parts of the world (Table 3). To energize the links with these associates as well as with the network's researchers, information is disseminated in several forms (Table 4). *Notes from the Field*, UPWARD's newsletter, describes network activities and research results and announces plans and library acquisitions. A recently launched working paper series disseminates and seeks comments on reports of selected research activities. A proceedings series publishes the collected papers and discussions from meetings and workshops and Training Documents to circulate methods and approaches in particular research areas.

Table 3. Distribution of UPWARD network associates (1993)

Region/country	No. of associates	
Asia		141
Bangladesh	5	
Pakistan	3	
Bhutan	2	
Philippines	43	
China	3	
Sri Lanka	11	
India	20	
Taiwan	1	
Indonesia	15	
Thailand	22	
Nepal	10	
Vietnam	6	
Africa	10	
Latin America		10
Europe and North America		56
Total		217

* Network associates are those people and institutions interested in the issues and activities with which UPWARD is concerned, who receive the newsletters and other publications and who supply news and literature from their own programmes.

Table 4. Distribution of UPWARD publications, 1990-1 '95 (May).

Publication	Number of copies	
	Asi ι	Rest of the world
1. Methods Manuals		
a) Asian Training of Trainers on Farm Household Diagnostic Skills	4 ?5	143
b) In-Country Training Workshop for Farm Household Diagnostic Skills	398	129
2. First Annual Proceedings (Proceedings of the Inaugural Planning Workshop in the Users' Perspective with Agricultural Research and Development)	202	98
3. Second Annual Proceedings (Sweetpotato Cultures of Asia and South Pacific)	148	172
4. Best Paper Award	137	68
5. Training Document 1 (Involving Farmers in Crop Variety Evaluation and Selection	89	-
6. Training Document 2 (Involving Farmers in Crop Variety Evaluation and Selection	113	-
7. Local knowledge, Global Science and Plant Genetic Resources: towards a partnership	217	57
8. UPWARD Research 1990-92 Abstracts of Final Report	145	80
9. UPWARD Working Paper No. 1 (Farmer's Indigenous Knowledge of SP Production & Utilization in the Cordillera Region)	260	30
10. UPWARD Working Paper No. 2 (Secondary Crops in Primary Functions: The Search for System, Synergy, and Sustainability)	70	25

In a still broader effort to influence agricultural research and development, UPWARD has helped sponsor international conferences on Asian farming systems and home gardens, and has supported the award of prizes at such conferences for best papers with regard to scholarship and the embodiment of a participative, user-sensitive philosophy.

Achievements and Limitations

In its progress from the seeds of an innovative idea within a forward-thinking agricultural research institution to its emergence in Asia as a fledgling network of researchers dedicated to turning agricultural research upside down, UPWARD has some real achievements to its credit. It has helped to create a continuing dialogue between international and national scientists, between natural and social scientists, and between seasoned and young researchers. Workshops have exposed national technicians, natural scientists, and more quantitatively oriented social scientists to alternative, `softer' approaches to research on agricultural problems. At the same time, social scientists have acquired considerable technical knowledge through the participation of biophysical scientists in workshops and particularly through their increasingly close contact with sophisticated local users of technology. With increasing intensity of these types of exchanges, research becomes more truly interdisciplinary rather than multidisciplinary. An entomologist is currently leading an interdisciplinary team that studies the indigenous classification and management of sweetpotato pests; an agronomist, with support from the Health and Social Welfare Departments of the Philippines, has promoted pot culture of sweetpotato cuttings as a source of green vegetables for urban slum dwellers. An anthropologist, with support from plant breeders, is designing `memory banks' based on farmers' indigenous knowledge of traditional varieties, to complement gene banks.

Thankfully, UPWARD has been allowed considerable latitude in the development of new links, especially in the search for new research areas, and this accounts for the diversity of innovative projects now under way. Within the bounds set by donor and auditor requirements, the organization of the network has remained quite simple, in terms of the requirements placed on project proposals, funding arrangements and the size and functioning of the coordinating office.

However, if the network was characterized in terms of anthropological network theory (Bott, 1971) or along the lines more practically laid out in the excellent paper by Fernando (1989), UPWARD is still a `loose-knit' or `low-density' network. That is to say, most of the active links are with or through the centre, the coordinating office. As mentioned earlier, all networks can expect to have a `heavy' centre to begin with, but understanding the nature of this `heaviness' can help to transform the network into a more participative entity (Figure 1).

At present, there is a relatively low level of communication between network researchers and network associates. Furthermore, communications are still too frequently one-way, from the centre to the researchers. This one-way communication stems from the attempts of the coordinating office to build and consolidate activities of the network. This is compounded by the funding role of UPWARD, which accounts for a very large share of

communication traffic. This brings to mind the image of a centre and its 'satellites', a closed system which, unless transformed, could lead to entropy and marginalization. Networks must be open, and techniques which support such openness need to be identified.

Geographically, the network is heavily weighed towards Filipino researchers and associates, a tendency mainly attributed to the influence of the coordinating office. Though it is entirely reasonable for a newly established network to begin by forging links close to home, there is a clear need to redress the geographical balance in the subsequent phase.

Perhaps a more serious barrier to the long-term institutionalization of the ideas and approach of UPWARD is the fact that most network members are still individuals rather than institutions. Again, the reasons for this are clear. UPWARD's early priority was to identify new blood in the research and extension systems of the region and to break free from the conventional institutional and bureaucratic structures which dominate commodity research. Research support to university teachers and other researchers has often led to *de facto* agreements with their institutions. However, these need to be more formally established to facilitate greater acceptance and diffusion of the approach.

Looking Ahead: Towards a Denser Network

Some of the needs expressed in the preceding section are already being addressed. Many informal contacts with institutions have been firmed up and the institutions rather than the individuals are now the recipients of UPWARD publications. The range of institutions with which UPWARD is linked is also being broadened, with special emphasis on NGOs, both through informal contacts and cooperation and through the funding of NGO projects.

Several initiatives are planned for the second phase to speed up the transformation of UPWARD towards a denser, more tightly knit network (Figure 2). To redress the geographical imbalance, a more equitable distribution of projects is planned with targets for and ceilings on the number of projects per country. At the same time the network will aim to develop autonomous links between researchers in particular localities, regions or countries. This will involve the initial UPWARD network member acting as a kind of 'animator' (Fernando, 1989) in his or her area, especially linking colleagues and senior staff to the rest of the network. The presence of two or more network members in the same region or country is expected to help both the network and the institutionalization of a users' perspective. The selection and support of new research projects will be partly guided by the important criterion of establishing a critical mass of network members with the potential for developing autonomous links.

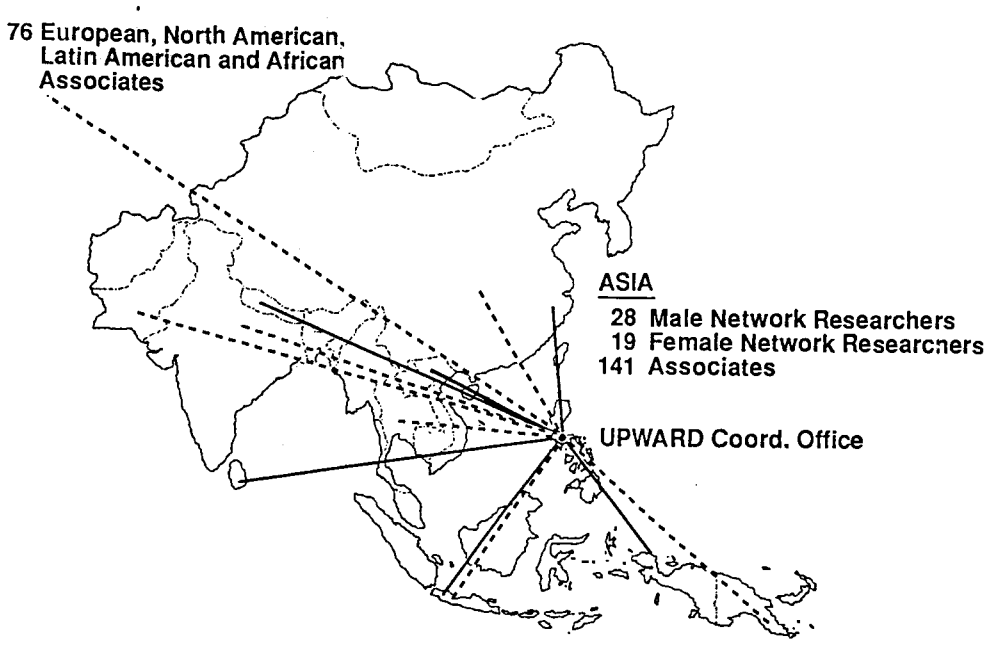

Fig. 2. Current network linkages of UPWARD.

To further stimulate horizontal links across the Asian region, UPWARD will facilitate the establishment and functioning of sub-groups or subject matter consortia on specific topics, such as gender issues or livestock-crop interactions. A consortium on users' perspectives in genetic resources research has already been established through an international workshop. It links Asian researchers with funding and research institutes in the North.

One set of network associates of particular importance is known as "the Dutch Support Group". This is an interdisciplinary group of faculty from Wageningen Agricultural University whose role is to provide inputs on research activities and directions; to offer support in the area of methods; and, in some cases, to participate in training events. Using modest funds now available from the Dutch Government, an important role of this group's members in the future will be to support the subject mater consortia appropriate to their area of specialization.

Networks are open systems and are therefore subject to myriad influences in the way they develop. This is as it should be. UPWARD's aim is to catalyze the expansion of autonomous research and development capacity and activities within the framework of a participative, user-focused philosophy. This is hoped to be achieved by providing modest funding, stimulating the flow of information, supporting workshops on methods and approaches, and finally disseminating the goodwill and the shared belief that, through connecting in these ways we can make a difference.

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Capacity Building and Institutionalization through Network Development

Comments by Glicerio Boy Tan of the Bukidnon based NGO SHAISI

Sweetpotato Won't Grow on Research Papers, Unless.....

- Participatory research must be anchored on the user's mind, heart and hands. Building a network or even institutionalizing UPWARD must consider that without this fundamental step in research the whole super-structure will collapse. Capacity building shall therefore start with the farmer-user. (I have difficulty in this term user because at home there is a billboard sign that says "Help the user, jail the pusher)

- The most effective way of getting the farm family household to participate in the research process is through an organization -- a solidarity group, or in our dialect, the Hugpong. It is the Hugpong where the true self is cultivated and nurtured. The farmer is at his or her best -- confident, trusting and giving, open and sharing his little resources. The Hugpong consist of the primary family and an additional two or more "meaningful" other families but not more than five families to a Hugpong. The Hugpong is the basic unit in any partnership or cooperative endeavor.

- UPWARD research efforts must be anchored on the Hugpong for best results in the field. Without the support of the solidarity group, no sweetpotato can grow on research papers.

Capacity Building on Institutionalization through Network Development

Comments by J. Fellizar, Under Secretary, DOST

PASSION WITHOUT SYSTEM/SYSTEM WITHOUT PASSION

- Network serves a particular/specific purpose

Issues on Network & institutionalization

1. What is the network for? What are the expectations? members in network: Independence; Interdependence

2. Membership in network: (organic/individual) Individual vs. Organization

   - unity of direction: "Framework"; Language

3. Leadership - Coordinative capability/capability building

   - resources
   - authority

4. Accountability & commitment

5. A network apart from existing network or part of the network

6. Network mechanisms - internet

7. A users' perspective for network configuration

   - a network of user's vs. network of researchers

   How much perspectives have been inputted to 2nd phase

8. Density (high vs. low) depends on the nature, magnitude of work, results expected capability level.

Capacity Building and Institutiona ization through Network Development

Comments by A. Niehof, DSG

Notes

3 Points in Dr. Castillo's presentation that I would like to react to:

1. Issue of rurality and rural development;
2. Issue of sustainability;
3. Comparison with family planning (UAP).

Rurality and rural development

What does rural development mean and where does it lead to? Rural people migrate to urban areas because they think they have more or better options there. Sometimes (or often) rural development activities contributed to the image of rural areas as being deprived of such options and opportunities. The days of innocence are over: we now know that rural development does not prevent urbanization, but -- on the contrary -- often stimulates it.

Starting from the assumption that continuing urbanization is undesirable for many reasons, among others, the well being of the migrants themselves, the community of researchers in agriculture and rural development, UPWARD included, have a responsibility. It is to gear rural & agricultural development towards broadening the array of options in rural areas and to contribute to enhancing the quality of life in these areas. That means we are not only talking about agricultural production and biodiversity, but also about employment generation and educational opportunities. Then rural life will acquire a positive quality of its own. In one of the papers it is said: "We cannot afford to keep the farming community traditional and poor. (Belita cs)

Sustainability

"Issues of sustainability and environment have taken over the issue of production", Dr. Castillo said it quite right. The question for us is about the user's perspective on sustainability, particularly long-term environmental sustainability. Do we know enough about farmers' and rural households' perceptions of it. I think it is too romantic to take for granted that small farmers always act in the best interest of the environment. They also are living here and now. We tend to take it for granted that they are wiser and more knowledgeable in this respect than unenlightened urban middle class people. We should explore the dimensions of environmental sustainability in the user's perception. We should give sustainability substance within the UPWARD framework.

Comparison with family planning

Comparison with F.p. is very appealing. However, K(nowledge) - A(ttiude). P(ractice) should not be taken for an iron sequence. F.p. research has shown that people acquire knowledge and change attitudes while practising. So, also in sweetpotato promotion knowledge, attitude and practice are not distinct sequential items, but practice is vital in acquiring knowledge and changing attitude.

Note on time perspective. From the case studies presented, an awareness of seasonality and time-bound regularities (close to the farmer's perspective) emerges. This should not get lost when the case studies are aggregated to a higher level of observation.

Capacity Building and Institutionalization through Network Development: Comments and Discussions

1. Kind/Type of networking

   a. high vs. low density
   b. between researchers
   c. between institutions and/or organizations
   d. between users

2. Networking as key strategy toward achieving goals?

   Points:

   a. Will networking serve the purpose?
      - the need to have a clear framework

   b. difficulty of networking without commonality of language

   c. what mechanism is most efficient

3. There were questions on how networking can contribute towards:

   a. institution building
   b. manpower
   c. leadership and authority

4. How can accountability and commitment of institutions, individuals and/or organizations to the network be strengthened?

5. How much of user's perspectives is going into research, and, consequently networking.

6. There was a question on whether the information coming from the ""users" are real farm issues or problems

7. There was a point raised on some kind of social preparation for the users so that they can feed a clearer view of the problem to the researchers/UPWARD.

WORKING GROUP 3

INSTITUTIONALIZATION AND CAPACITY BUILDING THROUGH NETWORK DEVELOPMENT

Chairman: Julian Gonsalvez - Research Director, International Institute of Rural Reconstruction, IIRR

Members: Betty Gayao - Research Specialist, ViSCA, Baybay, Leyte
Anko Niehof - Head, DSG, Netherlands
Gliceerio Gimenez Boy Tan - President, SHAISI
Zhang Rentian - Zhejiang Academy of Agricultural Sciences, Hangzhou, China
Jurg Schneider - Ethno Botanist, CIP-Bogor, until March 95
Emmanuel Lleva - President, Ifugao State College of Agriculture

Network(ing)

Networking is considered an important means to achieve UPWARD goals. In order to improve upon the networking strategy, the emphasis should be on researcher interaction. The researchers' network has to be strengthened to further the integration of the users perspective in research activities.

The members of the network are Asian researchers, while the associates linked on to are not necessarily Asian. The common denominator of all participants in the network - members and associates - should be the interest in a user-oriented approach in agricultural and ecological research. The roles of associates to the network is: and to promote UPWARD goals; and to provide input to the Network in the form of expertise and experience.

The interdisciplinary character of the network should be maintained, and there should be a balance between representatives of the social sciences and technical sciences.

The intra- and inter-country links in the network need strengthening. Part of the research budgets of researchers could be set aside for intra-country networking, e.g. mutual visits of research locations. In the future, funds should be found for inter-country visit of researchers working in the same field as well.

Newsletters, training activities, and workshops function as vehicles for networking. The newsletter should appear more regularly and should contain more input from the different network members.

Apart from strengthening the researchers' network, the formation of researchers, users links and of users networks should be stimulated as much as possible.

Dutch Support Group (DSG)

The information of researchers about what the DSG has to offer and information at the DSG about ongoing UPWARD research and interests of researchers need to be improved.

The suggestion of mentoring by DSG members of individual researchers is to be positively valued. However, more mutual information (see above) will be necessary. Apart from written information, personal contacts are also thought necessary. When visiting other projects in areas where UPWARD researchers are working, DSG members could possibly stop by to visit them. The DSG members could also participate in workshops and training activities which concern their particular field of interest, and, in this way, personally meet with UPWARD researchers.

The Literature Fund should be made use of. On the basis of identified areas of interest (such as household dynamics, community involvement in soil fertility, farmer-based conservation, etc.) attention can be drawn through the Newsletter to relevant literature available at Wageningen. The UPWARD office/library or individual researchers could react to that and ask for copies. This mechanism should be developed.

It was noted that updated resource material especially in the field of the social sciences for social scientists should be a priority.

Institutionalization in Relation to Development Goals

The following recommendations can be made in this regard:

- Cooperation with development, particularly extension agencies, in order to make them more user-oriented should be intensified.
- Community organization building should be encouraged in the framework of ongoing research projects. Through institutional consultations by UPWARD researchers, local development and government agencies can become more user-oriented.
- It should be possible to train local people and development workers as part of UPWARD research activities at the local level. A budget for that purpose should be found.
- Research reports should reflect development activities undertaken within the framework of the projects, so that people can learn from it.
- As a resource to research, training and development activities, a visual documentation collection should be built up for researchers to use in the field. It is a relatively cheap way (compared to visiting) to exchange information and can be very effective as well.

Capacity Building

Apart from building the research capacity of researchers through training, workshops, courses abroad, etc., capacity building should include strengthening the capacity of researchers to work together with local resource persons. It should build on local knowledge systems and develop local understanding of scientific and technological processes.

In strengthening the research capacity of the researchers, the strengthening of data analysis capacities should receive special attention.