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Farmers' decision making strategies on selecting rootcrop varieties in the Visayas Region, Philippines

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フィリピン・ビサヤ州の農民のイモ類品種選択に影響を与える要因

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Summary

In the Philippines, rootcrops play a significant role in providing livelihood and food security among the resource poor people living in fragile upland environment, which comprise about 65% of the total agricultural land in the country. This paper will present the factors which play into farmers' decision-making strategies for varietal adoption, particularly of sweetpotato and cassava in Visayas Region, Philippines. Relative importance of factors as they are considered in the farmers' decision-making process vary according to user-orientation (i.e. subsistent, semi-commercial and commercial) because such would have varietal trait specifications, scale of operations, and consequently, resource needs. In largely market or industry-oriented systems, the economic factor is observed to be more important. The market requirement of varieties is enough motivation to grow a variety subject to resource constraints. Further, the degree of intensity of factor or constraint could be location specific due to natural endowments (e.g. land quality), farming systems, and social relations. But in the absence of markets or profitable use, adoption of a new variety is a difficult choice. Overall, given the complexity of circumstances that are factored in the farmers' decision-making strategies to sustainably adopt varieties from the farmers' own sphere to that of the institutions (i.e. Research and Development policies), any research and development activity that hopes to eventually make the farmers' lives better through the adoption of technologies should be designed with a greater partnership between the natural-technical and social scientists, the local partners and communities.

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摘要

フィリピンで栽培されるイモ類は，自給用および換金作物として重要な役割を担っているが，その多くは全国の農地の約65%を占める生産環境に恵まれていない高地で生産されている。本論文では，ビサヤ州で栽培されるイモ類，とくにサツマイモとキャッサバをとりあげ，農民がどのように品種を選択するのか彼らの意思決定に影響を与える要因について述べる。要因の相対的な重要性は，栽培目的(例：自給自足型，半営利型，営利型)に大きく影響されるが，これは品種の特徴，生産規模，その結果としての投入資源に違いがあるからである。大規模な企業経営では経済的要因が他の要因よりずっと重要であることはよく知られているが，市場で売れる品種の導入が資金の乏しい自給自足型農民のやる気をおこさせる大切な要因ともなる。さらに，これらの要因や問題の程度は地域特有であり，その場所の自然条件(例：土地の質)，ファーミングシステム，地域の社会構造やその人間関係により異なることが観察された。とはいっても，栽培したイモ類を売る市場や利益がまったくない場合には，新品種の導入はほとんど不可能である。このように，農民の意思決定にはさまざまな要因が複雑に絡み合っているので，貧困緩和など住民の生活向上のための品種改良に取り組む場合には，まず関係者間(作物学者，社会学者，個々の農民と彼らが暮らすコミュニティー)で十分なパートナーシップを形成し，農民の意志決定過程を十分理解したうえでの新品種導入が重要である。

キーワード：イモ類作物，参加型アプローチ，農民の判断基準，品種導入，フィリピン・ビサヤ州

1. Introduction

Rootcrop is a group of crops, also known as root and tuber crops, which produce underground tubers or corms. Among these are major rootcrops such as cassava (*Manihot esculenta*), sweetpotato (*Ipomoea batatas*), potato (*Solanum tuberusum*), and yams (*Dioscorea esculenta*). Others classified as minor rootcrops include the edible aroids (*taro, Colocasia esculenta; yautia, Xanthosoma sagittifolium; giant taro, Alocasia macrorrhiza; swamp taro, Cyrtosperma chamissonis; elephant foot yam, Amophophallus campanulatus*) and the lesser yams (*Dioscorea alata, D. bulbifera, D. hispida*).

In the Philippines, rootcrops play a significant role in providing livelihood and food security among the resource poor people living in fragile upland environment, which comprise about 65% of the total agricultural land in the country. They are grown usually in patches in a wide range of agro-ecological environment since they can grow in adverse conditions and amenable to low input-farming. Most grow them in degraded uplands using traditional varieties and without the benefit of technical interventions. Rootcrops are associated with poverty as they are grown largely by poor upland farmers. These economically vulnerable subsistent farmers grow rootcrops mainly for food as well as income supplement (Pardales *et al*. 2001; Pardales and Roa, 2002).

Expectedly, pockets of commercial rootcrop farming are more sophisticated than the subsistent and semi-subsistent ones. These apply technological innovations like the high-yielding varieties, fertilization and cultural management techniques (Scott *et al*. 2000). Commercial growing of sweetpotato in Central Luzon and cassava in Mindanao are grown mainly for the fresh roots market or the starch factories. Commercial growers are profit-oriented and usually have the resources to respond to interventions for increased output (Data *et al*. 1997; Pardales *et al*. 2001).

At the time of the Green Revolution in Asia, rootcrops were taken for granted. When given attention starting in the mid-1970's in order to help the "poorest of the poor", scientists assumed that the small, economically deprived farmers can readily adopt whatever technology introduced to them. Neither were the research efforts sensitive to indigenous knowledge/practices and market preferences in the development of technologies. This high-minded attitude resulted in the development of rootcrop production technologies not suitable to the biophysical environment, the economic condition, and the socio-cultural context of the local people (Pardales and Yamauchi, 1999; Pardales *et al.* 2001). This greatly contributed to the resistance, or at least hesitance of the intended beneficiary farmers to subsequent introduced interventions.

In twenty-five years, the Philippine Rootcrop Research and Training Center has developed a number of high yielding rootcrop varieties, but adoption is sparsely scattered, or only in the relatively small pockets of commercial areas. In addition to the "non-user oriented" basis of technology development, very low adoption was also attributed to limited access to credit and technical support by poor farmers; as well as poor market match. But for long, the constraints to adoption have not been strongly articulated as to help rationalize the rootcrop breeding program. This is mainly because systematic diffusion studies met serious logistics constraints.

This paper will present the factors which play into farmers' decision-making strategies for varietal adoption, particularly of sweetpotato and cassava, the major rootcrops which received the bulk of the breeding budget. In particular, findings support the thrust of the collaborative project between Nagoya University, Japan and the Philippine Rootcrop Research and Training Center (Leyte State University, Philippines) on rootcrop breeding for drought resistance/tolerance. In particular, this paper will seek: 1) to describe how small scale farmers select and maintain a root crop variety; 2) to identify farmer's preferences of root crop varieties and the reasons for such; and 3) to explore the strategic role of the collaborating research institutes with due relevance to improvements in variety improvement and adaptation.

2. Materials and Methods

The research applied a mix of tools (i.e. the informal survey, focused group discussions and the focused formal survey) both qualitative and quantitative, to elicit information.

2-1. Selection of research sites and study design

Three case areas were selected in Leyte island, Eastern Visayas region: Pamahawan, Bontoc (mainly for cassava), Rawis, Dulag (sweetpotato) and Elevado-San Salvador, Matalom (sweetpotato)(Fig.1). In addition, earlier related

Fig.1. A map showing five study sites in Visayas Region, Philippines

Table 1. Research sites, why chosen, land type and use system

Site	*Why chosen/ context/ period HYV introduced*	*Terrain of rootcrop farm*	*Soil type*	*Main crop system*	*Production orientation*
Pamahawan, Bontoc	Pilot feedmill project; hybrid cassava production among cooperative members (1994-1999)	Undulating to sloping	Acidic, clayey	Coconut Corn- cassava	Semi-commercial, industrial (not sustained)
Rawis, Dulag	Hybrid sweetpotato production for starch company (1996-2001)	Flat	Clay to sandy-loam	Sweetpotato-corn- squash-vegetables Coconut	commercial
San Salvador, Matalom	Sweetpotato farm trials in farming systems project (1990's)	Undulating to sloping	Acidic, clayey	Upland rice-sweetpotato- corn Coconut	Subsistence, semi-commercial
Tudela, Camotes	Pilot feedmill project; Hybrid cassava production among coop members (1996-2001)	Undulating to sloping	Acidic, clayey	Coconut Corn-cassava	Semi-commercial, industrial
Central Bohol	Hybrid cassava production for starch (since mid-1980's)	Undulating to sloping	Acidic, clay loam, sandy loam	Corn-cassava-peanuts	Semi-commercial, industrial

surveys of the collaborative project in Camotes island and central Bohol, Central Visayas region, mainly for cassava, were integrated into the analysis to provide more information and perspective to the problem (Fig. 1). The research sites were selected based on two criteria; 1) introduction of high yielding varieties (i.e. through projects between the research institution and local community) and 2) sufficiency of time elapsed after the introduction; enough time to permit feedback on the constraints/factors on adoption (non-adoption) (Table 1). Sampling was purposive and based on the representativeness of these five village clusters as to rootcrop growing system in Eastern and Central Visayas which are leading rootcrop growing regions in the country.

2-2. Key informant interviews and focused group discussion

After a review of relevant secondary data, project documents and selected papers, key informants (e.g. researchers, local officials and technicians) were interviewed in March 2003 to get insights on the community, households, farming systems, research activities at the sites, varieties introduced and adopted. Linkages established in the villages facilitate the conduct of two focused group discussions (FGD) with a group of 12-18 men/women farmers per site; a total of six FGDs. The FGD was semi-structured where a guide was prepared yet allowed free interaction of relevant points not included in the guide.

2-3. Questionnaire survey

A questionnaire was prepared and tested. This included topics such as the farming household identity and socio-demographics characteristics, farm and farming practices data, support systems, and varietal preferences. Thirty households from each location (n = 90) were randomly selected for interviews. It took a total of three weeks in April and May 2003 to conduct the surveys by two enumerators who were trained the week before fielding. Data cleaning and inputting took a total of eight weeks. These were computer inputted and processed using descriptive type of analyses. Data from two previous surveys in Bohol and Camotes (respondent n = 53) were processed and analysed to increase the number of case areas. Overall total number of respondents which serve as base for the varietal adoption issue was 143.

3. Results and Discussion

3-1. Putting in context: farmer decision-making and varietal preference

It is important to clarify that the question on decision-making strategies by farmers on sustained adoption of a variety is different from the question of preference to grow a certain variety; though the latter could be part of the former. The former involves a multi-faceted process; the latter refers to simple choice. Varietal preference refers to the choice of a certain cultivar or variety, based mainly on preferred traits like skin or flesh color, cooked flesh texture, sweetness, for salad, fit to priming system, etc. which may be hypothetical in an exercise done for the purpose, or active selection by growing. While decision-making strategies involve more than just traits preference; and includes other considerations, such as resources, availability of planting materials, use and market, perceived or actual physical or environmental constraints, etc.. In this context, preferred cultivars may not be grown at any one time, or grown but not sustained, as a result of this mix of factors or constraints.

This difference is crucial in understanding the processes and choices made by farmers and users in order to contextualize the results discussed here. To scientists/ researchers, and breeders particularly, it should make sense to distinguish between varietal traits preference under minimal-constraint or ideal conditions, and the decision processes involved under realistic farming conditions especially among resource-poor small farmers.

3-2. Factors and constraints to farmer decision-making to varietal adoption

In the three Leyte sites, sixty-seven percent (67%) were users of hybrids, mainly cassava in Bontoc and mainly sweetpotato in Dulag and Matalom. About 20% were cooperators in project or varietal trials. In Bohol and Camotes, about 98% of respondents were cassava growers, 75% sweetpotato on the average. Other rootcrops such as ubi, taro, palawan were grown only by 2-5% of respondents.

1) Socio-demographic factors

Age and gender: The respondent farmer household heads are all in middle age, a range of 45-50 years. With this demographic structure, most children are either in school, or out seeking off-farm work since the opportunities of farming are very limited. Others start their own families. All this resulted in dearth of family labor, which is the main form of labor in rootcrop growing areas. In the case of high dependency stage, the wife spends most time with taking care of a child and other home chores, leaving only the male to work. Those with married children contribute to dependency as they usually stay with the parents at early stage, and usually already started a family with a baby. The young adults mostly go out to seek other opportunities in non-farm work. Intensification of farming is thus constrained by the dearth of family labor, and the lack of capital to hire labor. This can limit adoption of technology such as the High Yield Variety (HYV), which requires enough labor at appropriate timing of activities (e.g. proper selection of planting materials, fertilization, weeding and cultivation). In subsistent and semi-commercial farming, the labor of both husband and wife are critical since each undertake specific activities: the heavier tasks such as land preparation, and harvesting of cassava done by the men; and women more in weeding and cultivation. Planting, cultivating and harvesting are common activities. They support a household of 5-6 members, which is just about the national average.

Education: Most farmers have completed up to the elementary or some secondary years. But a good percentage of farmers in Bontoc (30%) and Matalom (36.7%) are college graduates. Also, most farmers are members of farmer and other organizations, which indicates a socially conscious behavior. But there are more farmers who are users of hybrids in Dulag, about 97%, than either Bontoc or Matalom, about 83% for both. The implication is that non-adoption of technology could not be due to a difficulty to understand the technology nor a lack of community awareness since the basic orientation is there.

2) Economic factors

Markets and use-orientation: The discussions and surveys showed that the market factor and favorable growing conditions are quite strong incentives for varietal adoption. Dulag farmers are well linked to markets and, thus, grow rootcrops with relatively greater commercial uses. The flat land terrain and soil conditions (i.e. alluvial, clay-loam to sandy) of farms in Dulag contribute to better yields. Thus, the returns to investment of the hybrids and other inputs are likely to be assured. In Camotes and Bohol, the feedmill and starch factory, respectively, provide guaranteed markets and, together with this guaranteed production scheme are enough incentive for farmers to adopt the introduced cassava varieties (Pardales and Yamauchi, 2001). In these commercially growing areas, the matching of varieties to the requirements of the market, whether it is fresh roots or industry, is critical. It will be noted that the semi-commercial and subsistent farms in Matalom, Bontoc and Camotes tended to grow a number of cultivars/varieties at any one time compared to the more market-oriented farmers in Dulag and Bohol. The former were also able to keep, though minimally, the preferred traditional cultivars. The more subsistence the orientation, the wider is the range of cultivars grown. The commercial growers tended to have only one or very much less number of cultivars as they grow only that which the market prefers or has a wider range of use.

Income: Incomes of the farming households include farm, off-farm and non-farm sources. Farm incomes is taken from own production and sale of crops and by-products, while off-farm income includes wage in cash or kind from working in other farms. Non-farm income includes remittances from children working outside of the home community, trading or tending sari-sari store, peddling or handicrafts (e.g. sinamay or twine making in Matalom). On average, about 83% of farming households get 50-80% of incomes from the farm; about 60% get 10-40% from off-farm sources; and 25% get 10-20% from non-farm sources. Bontoc farmers got more from off-farm work while 50% in Dulag did not have off-farm sources. About 75% of farmers in Bontoc and Matalom do not have much non-farm sources, or simply lack such opportunities. Although only about 34% of farmers overall have non-farm incomes such as remittances and handicrafts, they claimed that these sources really helped much. These differences are due to the different farm work alternatives, proximity to urban markets and outside farm opportunities open to them.

Livelihood: In Dulag and Matalom more farmers (27%, 25%) have sweetpotato sharing 60-80% of farm income; and 20% of Dulag farmers have sweetpotato sharing 50-70% of total income. In Bontoc, cassava shares an important part of total income (51% farmers with 50-80% share). 87% and 33% of respondents in Dulag and Matalom did not grow cassava. Overall, both sweetpotato (47%) and cassava (42%, only in Bontoc) share 50-80% of total income. The fact that rootcrops play an important role in the livelihoods of farmers is not a guarantee per se that introduced varieties will be sustainably adopted as the surveys results suggest because of the checkered pattern of adoption. But that is the starting point in most cases.

Food source: Using the $1-a-day World Bank food threshold as indicator of poverty, the survey showed that the average food consumption for Bontoc, Dulag and Matalom lie just a little above at $1.57, $1.64 and $1.43 respectively. Food sources, however, come from own production, bought, collected from the wild, or given. Survey showed that 97% of households in Bontoc, 70% in Dulag, and 97% in Matalom get about 30% of food consumed from own production. Most of the rest are bought. At times, about 40% of households collect 5% of the food from the wild, or given.

Energy sources: Rootcrops constitute an important part of own produced food especially among the subsistence and semi-commercial farmers. The native sweetpotato cultivars are preferred to be mealy and not so sweet when used as alternative to rice or corn; while the mealy, yellow fleshed and sweet cultivars are preferred for snacks. The young cassava at 5-7 months of the early maturing hybrids is also preferred for food. So the cassava hybrids get higher percentage adoption or field continuance compared to sweetpotato as it answers both the food and industry preferred traits. Also, hybrids which are similar to the preferred roots used for the home will have a high likelihood of being grown and adopted. In addition, for the purely subsistent farmers the priming nature of harvesting the sweetpotato roots is important criterion. An opportunity for breeders would be to produce varieties that would provide nutrient supplement by enriching rootcrops such as playing around vitamin A and anthocyanin together with the mix of other preferred traits.

Feeds: The cassava-based feed pilot projects in Bontoc and Camotes have shown that cassava could be used in grower pig rations with comparable efficiency to that of the existing commercial feeds. But the sustainability of the cooperative-run enterprises rest on a number of critical factors like the development of markets, business skills and effective links with the farmer suppliers. The latter depended on the price attractiveness of dried cassava chips as raw materials which was not quite successful in these pilot areas. This resulted in very limited success of the business, well below target. Yet still, the cassava hybrids are grown by 83% (Bohol) and 95% (Camotes) of respondents. This sustained adoption of the introduced cassava is due to the fit of its industrial and home use desired traits such as high yielding, early maturity and good eating quality. Sweetpotato vines and "reject" very small roots are also used as supplemental feed for pigs raised in the backyard; a seasonal source though, especially in Dulag and Matalom. In Dulag, a few households raise 2-5 pigs in their backyard which are fattened every 4-5 months and sold live-weight in the market. Sweetpotato vines and roots are reported to be of substantial importance in pig and cattle rations only in the Northern Highlands, Central Luzon and Catanduanes. In Bohol, the introduced hybrids in the mid-1980's

Land: 70%. 76%, 87% of respondents' farms in Bontoc, Dulag and Matalom respectively, are less than 0.5 ha, which consist of 2-3 parcels, rainfed and are not of prime land quality. Same situation is observed in Bohol and Camotes. Poor soil quality coupled with very limited capital as well as user responsibility associated with the tenancy arrangements dampens farmer motivation to really work on improved management of the crop which is really required of the hybrids.

Labor: In the small landholder systems family labor is the most important and commonly available asset. Hired labor is availed of only in the cassava farms which supply the starch factory in Bohol but this is limited and dependent on scarce finance. Dearth of labor is often the case because of ageing farmers, permanent and seasonal migration of the young to work outside the farm, family care demands among women and divided attention given to multi-cropping system. As a result, weeding and cultivation often are not done adequately if at all. This mix defies what often is reported in literature as "surplus rural labor", which is really a myth, as found in the case areas. Labor constraint also negatively impacts on the adoption of varieties.

Capital: 100% percent of the respondents reported that financial capital is one resource they lack or do not have. Many are on the des-saving range and perpetually indebted to landlords, money lenders and/or local stores. They are beyond the question of "access" opportunity since the financial market can be accessed only by the bankable small sector. Capital is needed at least to buy fertilizer and pay some labor in the critical management stages. Since the hybrids require fertilizer and care inputs, the lack or absence of capital is a major constraint to adoption.

3) Technical and biophysical factors

Farmers include in their decision matrix a number of technical and biophysical factors such as yield, maturity, losses due to drought, pest and diseases, and availability of planting materials. Yield depends on the variety itself and its response and adaptability to the physical environment such as soil quality and moisture, and cultural management. The HYV could not achieve its potential yield without the needed inputs. Since most farmers are resource-poor and could not provide the required inputs and care, it is difficult for them to achieve and appreciate this potential. With this, adoption is not even a point to consider though they may try growing given planting materials. Except Dulag where some fields are alluvial and sandy loam, most soils are nutrient-deficient. Farmers in Bohol, Camotes, Dulag and Bontoc apply fertilizer but often not the recommended amounts due to high fertilizer cost relative to deficient finances. Thus, farmers do not get the expected yield of the hybrids. This and the other cultural management inputs are not enough proof to convince them of the benefits of the HYVs. Sparingly, one or two innovative farmers get the desired output but they are perceived as exceptions with usually some resources and face less constraints; not models the ordinary resource-poor farmer can emulate. In such a constrained land resource, spreading the benefits of the HYV's without the much needed system of support is indeed a big task. This has not been achieved. The poor land quality is a contributory given for the non-adoption of the variety as it sets the first stumbling block.

A range of 45-100% of respondent farmers report drought comes very often with worst cases in Bohol and Bontoc-Matalom sites. This condition is common in rainfed upland areas where most rootcrops are grown. Cassava grown in drought conditions were reported to have stunted growth by 65-95% of farmers; poor yield, 15-73%; yellowing of leaves, 6-65%; defoliation and wilting, 6%; grown crop mortality, 13%. 16% reported to have grown drought tolerant cultivars such as Maruri and Kapulutan. Sweetpotato grown in drought conditions were more seriously affected with high levels of mortality and weevil attack up to 90%. Drought is reported to have wiped out most cultivars and varieties. Considering the normal dry-wet season cycle, farmers time the planting of a crop depending on its respective moisture need like sweetpotato is grown by most towards the end of the wet season when just enough moisture is needed for its establishment; and cassava. But with drought, farmers on the whole do nothing to minimize its effect. Farmers grow cultivars which planting materials are available. 100% get these from local farmers or relatives from other places. On the average, 21% in Leyte and 43-56% in Camotes and Bohol respondents were able to secure hybrids from government projects; As discussed above, planting materials are largely reduced or wiped out due to drought. The local cultivars which still are existing (e.g. Maruri, Kapulutan) are observed to be more tolerant to drought.

3-3. Specific varietal preferences

Reasons for keeping varieties are for food, 92%; for market, 56%; as emergency crop, 37%; as animal feeds, 35%; less input or capital, 18%; recommended by technician, 18%; for barter with other foods, 18%; and supplemental income, 18%. In all sites for market-oriented growing, farmers prefer sweetpotato which are early maturing, high yielding (both main plant and the runner) and has good eating quality (sweet and mealy). But for staple and eaten with fish salad or lechon, the not so sweet mealy ones are preferred; the thick-skinned for pig feeds, using the skin peelings. In addition, Matalom growers also consider tolerance to drought and weevil. Farmers are more sensitive to the root and growing traits of sweetpotato, and the adequacy of demand for cassava. This is because cassava is used more as industrial crop while sweetpotato more as a food crop. In Bohol and Camotes, not surprisingly, the preferred traits for both cassava and sweetpotato is eating quality, 85% and 73%, respectively since its major use is for food. For cassava, especially, drought resistance (60%; 5% for sweetpotato) is an important trait because the growing period for cassava is longer than sweetpotato, then, high yield (cassava, 39% and sweetpotato, 24%). Other minor considerations include early maturing (7.5%), tolerance to weevil (5.7%), pest and diseases (1.8%), multiple use (1.8%), recommended by the technician (1.8%), or fit for food processing (1.1%).

Sweetpotato: A total of 66 sweetpotato cultivars were reportedly grown in a span of fifty years in Leyte sites: Dulag farmers having tried 29 (44%) cultivars/varieties; Bontoc, 19 (29%), and Matalom, 43 (65%). Of these, only 10 (16%) cultivars/varieties are still being grown. These cultivars are shown in Table 2. Of these, the first two are local cultivars followed by hybrids recommended for starch to supply to the factories. Each site has its own preference like Kadavao, Tinugabang and Siete Flores in Bontoc; Kasapad, Minamon and Siete Flores in Dulag; Siete Flores stood out in Matalom. Siete flores is commonly popular among farmers in all sites though not early maturing nor high yielding because of its eating quality (sweet, dark yellow flesh, red skin, mealy) and a sturdy cultivar as it is still grown. It is also harvested by priming and fits the non-intensive system of growers. Any of these not grown, and also with the rest of the 66, were mostly due to being wiped out by intermittent drought months. Farmers have observed that varieties reduce yield after about ten years of growing, so they try new varieties. They look for replacements whatever sells well in the market and use the roots for planting materials. There usually is a dominant variety during each phase. They said that before researchers from ViSCA come to introduce their varieties but over time they come to ask a lot of information from the farmers and engage them in various interactive activities; even invite to act as

Table 2. Percentage of farmers per area growing selected popular cultivars/ varieties

Cultivar	***Type***	***Desired traits***	***Bontoc***	***Dulag***	***Matalom***
Kasapad	native	Eating quality, high yielding, early maturing, high starch	0	100	0
Minamon	native	Eating quality	0	97	0
Kadavao	native	Eating quality (highly preferred), early maturing	93	83	0
VSP 3	hybrid	Eating quality, high yielding, early maturing	0	73	0
Tinugabang	native	Eating quality	70	43	3
VSP 17	hybrid	Industrial use, high yielding	67	40	27
Siete Flores	native	Eating quality	57	87	83
VSP 16	hybrid	High yielding	0	60	0
Kaligaya	native	Eating quality	0	60	0
Katimpa	native	Eating quality, high yield, early maturing	50	0	30

resource persons. They have a system of producing and sustaining planting materials. In fact, they have tried supplying planting materials to other places during the wide propagation of sweetpotato for the starch factory. Farmers exchange varieties among themselves. They use some kind of plot rotation and exchange to sustain their need of planting materials.

Cassava: Farmers reported to have grown eight cultivars/varieties of cassava in Leyte sites, three in Camotes and six in Bohol in about ten years or more. Two are recommended varieties, namely the Golden Yellow and Lakan, used for the starch factory in Bohol, pig feeds in Camotes; and mainly for food in Leyte. The variety requirement of industry motivates the farmer to grow that which is needed, thus the lesser number of varieties grown and the adoption of the recommended high yielding varieties. The fit between use-markets and the desirable traits of HYV's (early maturing, high yielding, good eating quality) both for industry and food motivated growers to adopt them soon after they were introduced. The preferred high HCN content, 12-month maturing varieties in the early 1980's to prevent stealing of cassava grown for starch were later replaced by the 8-10-month maturing HYV's. Still the food oriented semi-commercial and subsistent farmers in Leyte maintain the local cultivars with good eating quality such as the Kapulutan, Maruri and Elorde, especially the first two which were observed to be drought tolerant.

Other rootcrops: These include taro mostly in Dulag where it is a commercial crop; palawan and ubi for food. Eight cultivars of taro were reportedly grown in Dulag with the local Kahilsot as preferred more because of its aroma and sticky-mealy texture; making it traditionally preferred by consumers. Consumers, too, have taro as popular part of their diet: from the petioles and leaves to the rhizome.

3-4. Decision-making strategies for varietal adoption

Relative importance of factors as they are considered in the farmers' decision-making process vary according to use-orientation (i.e. subsistent, semi-commercial and commercial) because such would have varietal trait specifications, scale of operations, and, consequently, resource needs. In largely market or industry-oriented systems, the economic factor is observed to be more important. The market requirement of varieties is enough motivation to grow a variety subject to resource constraints. Further, the degree of intensity of factor or constraint could be location specific due to natural endowments (e.g. land quality), farming systems, and social relations. But in the absence of markets or profitable use, adoption of a new variety is a difficult choice.

In short, any breeding attempt or efforts at introducing a variety should consider first the use and/or market of such. Then, understanding the realities of farmer physical and socio-economic conditions, a support system for production resource inputs fit for small farmers should be in place. Developing stable markets, creating/providing the needed support environment and the institutional innovation to effect these have had very limited success in the past. The pilot projects (which were vehicles for varietal introduction) were part of the research phase to still fine tune the technologies and develop markets. This is an important point since any loophole or weakness in the process was bound to result in either market failure, or technology gap. Since the usefulness of the recommended variety at the farmer-user level was a derived one, adoption could only result from established use of the variety (assuming fitness to farmer circumstances) and a reasonable support system. That the HYV's have not been sustainably adopted is not surprising. It is just like a "chicken-and-egg" question when dealing with resource-poor farmers caught in a complex web of multi-sided constraints. Such is the dilemma of his quite limited decision options that the farmers often resort to the status quo. To the poor farmer facing a multitude of constraints, it simply takes too much to change.

4. Implication and Conclusions

From the surveys and FGDs, it will be noted that the expressed preferences of farmers on certain varietal traits have not always watered down to sustained adoption. Technical, socio-demographic, economic factors and biophysical conditions are interwoven in the farmers' decision-making sphere. Rootcrop growers were found to be earning just a little above the food threshold. Thus, they are resource-poor; they farm on non-prime quality, fragmented lands; and most only have use rights. Such dearth in resources and fragility of physical givens are disincentives to the adoption of the introduced hybrids despite promising results of farmers' field experimentation. Labor, which is their most abundant resource, is pushed towards non-farm options because the productivity of their farms have dwindled over the years without the benefit of enhancing inputs and the latter due to serious resources constraints.

Results of varietal preference exercise such as that done during the focused group discussions with farmers in the sites, or field days elsewhere, are not guarantee for adoption. It is helpful as informative guide and tool to understand their choices; a really "iffy" situation. Sustained adoption is beyond simple preference, and is discussed here in terms of the interplay of a web of factors and constraints. Understanding these would be a plus to any breeding program. The demand for varieties is a derived demand. Without relevant use and effective markets, there can be no sustained adoption; only try-outs. Under the cases here, only the hybrid cassava varieties (i.e. Golden Yellow, Lakan) were reasonably adopted because of their fit to farmers' preferred traits, uses and markets.

It is clear that because small rootcrop farmers are resource-poor and live in complex, diverse environment, any effort to work with them especially with varietal introduction should be done in an environment with reasonable support system made possible by some institutional innovation. This is a policy concern that research and development institutions should consider. These are policies that deals with demand (e.g. market development, development of related technologies like processing, distribution and promotion strategies), supply (e.g. production inputs like fertilizer and capital as part of support system), and linkage policies (e.g. extension/ training approach, institutional creativity, organization skills).

Where does the question on drought tolerance fit? The bio-physical factor is a first-order condition since the physical environment (e.g. climate, terrain, soil quality) is a given in the short run. Thus, the farmer-decision maker takes this also as given in his own sphere. He only makes with whatever planting material is left after a dry spell. Since, most of rootcrop growing areas face at any one time risks of drought, screening for drought tolerance would indeed be relevant to the farmer's problematic environment and resources. Overall, given the complexity of circumstances that are factored in the farmers' decision-making strategies to sustainably adopt varieties from the farmers' own sphere to that of the institutions (i.e. Research and Development policies), any research and development activity that hopes to eventually make the farmers' lives better through the adoption of technologies should be designed with a greater partnership between the natural-technical and social scientists and the local partners and communities.

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