Final Report

The Dynamics of Seed Supply and Variety Maintenance of Sweetpotato in Bayyo, Mountain Province

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INTRODUCTION

Bayyo traces its beginning to several legends, the most common of which is shared by other communities in Mountain Province. Legend has it that a great flood had covered the earth and the people had drowned except for a brother and a sister who sought shelter in Mt. Kaluaitan (Tales from the Mountain Province).

According to the elders, the brother and sister got married and had five sons. The five sons then spread out to different parts of the earth, each bringing their own crops with them, like rice, sugarcane, beans, taro, and sweetpotato. These five brothers chose to settle in Hapaw, Pingad, Bontoc, Tubeng, and Bayyo. The son who settled in Bayyo had chosen to bring sweetpotato as a crop, thus sweetpotato became the food supply of the Bayyo people.

Other legends speak of the folk hero, Lumauig, who fulfilled his promise to provide food for the people and gave the people of Bayyo sweetpotato.

The name Bayyo means "to pound" in the local dialect and traces the origin of its name to the arrival of an American visitor in the area. The visitor saw a woman pounding rice in a wooden mortar and asked her the name of the place. Unable to understand the language of the man, the woman thought that the visitor was asking her what she was doing and answered him
saying, "agbay-bayyo" or "I am pounding rice." From then on, the place was referred to as Bayyo.

Historical notes of Mountain Province tell of sweetpotato as the staple food during the Spanish and Japanese wars. The accounts say that the survival of the people during the difficult war years is owed to the hardy sweetpotato. In effect, the Bayyo people and other communities of Mountain Province have always depended on the sweetpotato, not only for their subsistence but for their livestock as well. Livestock raising in this area is mainly for ritual purposes as the people believe in offering the butchered animals to deities for healing and bountiful harvests. For others, it also provides cash income.

A remarkable indigenous method practiced even up to the present is the maintenance of their four sweetpotato farming systems where different varieties with distinct characteristics are maintained. Mula et al (1990), in an earlier study, provided a good overview of the distinct production systems: uma (swidden), katualle (permanent swidden), payew (paddy field), dor-an (homegarden), and tuping (stonewall). The study also described the available varieties used in the area and the different uses of sweetpotato in the local farming system.

The study described the dor-an as a household seedbank where the different varieties of sweetpotato are preserved and later availed of during the planting seasons in the swidden.
and paddy fields. This practice of preserving traditional varieties is deemed worth exploring/documenting for its possible contributions to a bigger endeavor towards bio-diversity conservation, hence, this study on the dynamics of seed supply and variety maintenance.

This study focused on the following issues: (1) the different variety mixes used in backyard gardens compared to swiddens or post-rice plots; (2) the different timing of planting and the availability of planting materials in the different production systems of the farms; (3) the problem of ensuring that all varieties are transferred from one season to the next; and (4) the management of quantity of planting material for particular varieties and use of external sources to make up for deficits.
OBJECTIVES

The objectives of this study were the following:

1. To elicit functional relationships between the backyard garden and other production systems of the farm household with regard to seed and varieties;

2. To characterize seed flow linking households and communities; and,

3. To identify specific points and initiate actions for supporting a variety conservation agenda.

RESEARCH METHODS

Locale of the Study

Bayyo is one of the 16 barangays of Bontoc, Mountain Province with a total land area of approximately 5,787 hectares. Perched on the southwestern slope of Mt. Polis, the area has been classified as moderately steep to very steep.

It has four land types: the pine and oak forest located on the topmost portion of the transect, the teeming pinelands, the clustered residential units and the rice fields which are on the same elevation, and the river that supplies the rice fields with irrigation water all year round (HADP RRA Report, 1988).

Methods Used

A combination of methods was used in gathering the information needed in the study. Focused group discussions and key informant interviews were carried out during the
initial stage (1993). Sample collection and ocular surveys were done. From the earlier discussions, nine farmers were identified as specific cases which provided the detailed information needed in the study. In 1994, more discussions and key informant interviews were carried out and additional case studies were included. Sample collection and ocular surveys were also repeated.
FINDINGS

Maintenance of Planting Materials

The four well-defined sweetpotato farming systems provide a whole year round supply, although hardly enough, of sweetpotato (roots and vines) not only for human and livestock consumption but for planting materials as well. These are: the swidden (uma) located about one to five kilometers away from the settlement area, the permanent swidden fields (katualle) found within the settlement but at a distance from the homes, stonewalls (tuping) along the footpaths and paddy fields, and the paddy fields (payew) surrounding the settlement area intended primarily for root production in bulk after rice harvest.

Table 1 shows the average area for sweetpotato production in three farming systems in Bayyo. Sixty percent of the 20 respondents planted sweetpotato in the payew with an area ranging from 20 to 200 sq m, averaging 81.16 sq m per farmer. Data on the uma reveal that of the 20 respondents, 10 or one half have uma. The highest area reported is 950 sq m. Only one respondent planted his katualle with sweetpotato at the time of the interview. These findings confirm the observation that many have neglected or even abandoned their uma/katualle.

For the tuping, 55 percent (11) of the respondents planted a length ranging from one to five meters; 25 percent, 6 - 10 m.
TABLE 1. Land area for sweetpotato production in different farming systems (Bayyo, Mountain Province)

<table>
<thead>
<tr>
<th>AREA sq.m.</th>
<th>FARMING SYSTEM</th>
<th>PAYEW</th>
<th>UMA</th>
<th>KATUALLE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>Average area (sq m)</td>
<td>No.</td>
</tr>
<tr>
<td>200 and below</td>
<td>12</td>
<td>60</td>
<td>81.16</td>
<td>4</td>
</tr>
<tr>
<td>201 - 400</td>
<td>3</td>
<td>15</td>
<td>317.33</td>
<td>1</td>
</tr>
<tr>
<td>401 - 600</td>
<td>1</td>
<td>5</td>
<td>485.00</td>
<td>4</td>
</tr>
<tr>
<td>601 - 800</td>
<td>0</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td>801 - 1000</td>
<td>2</td>
<td>10</td>
<td>875.50</td>
<td>1</td>
</tr>
<tr>
<td>above 1000</td>
<td>2</td>
<td>10</td>
<td>1600.50</td>
<td>0</td>
</tr>
<tr>
<td>n/a</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>TOTAL</td>
<td>20</td>
<td>100</td>
<td>20</td>
<td>100</td>
</tr>
</tbody>
</table>

1.0 PAYEW OR PADDY FIELD. Vines grown in the payew come from the uma, katualle, tuping, or dor-an. There are no deliberate patterns of transference of planting materials from the other systems into the payew according to the male farmers in 1994. The payew production serves as the root supply of the farmers for swine and domestic consumption during the rice production season. Among the varieties found in the payew are akkong, tukkong, ingitangit, kalbo-oy, hinaplid, ginumanab, linabaga, bukut, three varieties of violet, and a new lowland variety called linoncia.

Vines of the same varieties are gathered from the uma, dor-an or tuping for planting in the payew after rice harvest in August.
The preferred variety in the payew in 1994 was the akkong because its sweet roots store well and vines provide an abundant supply of stems and leaves to support their swine raising project. Kalbo-oy and ingitangit are secondary choices for their large roots and robust foliage, usually for swine feed. Julie Abkaren said that these varieties do not store well in the pukok or wooden box because of their wet and moist texture.

In the 30 m X 50 m payew of Julie and husband Sancho, akkong composed the bulk or 75 percent of their root harvest of 500 kilos.

The good eating varieties namely violet, tukkong, bukut, and linabaga were planted in small quantities in the payew. Julian Coyyao explained that these varieties have very few and small roots after four months.

Land preparation in the payew or faliling is merely an expression of art, said most farmers. The spiral lines, letters and other artistic forms have no direct bearing on production efficiency. Robin Lengwa in 1994 said that he spelled "AGID" in his payew in memory of his grandfather named Agid. Another farmer constructed the letters "PISAY" on his field because he was amused with the stout and round physique of Pisay, his younger brother. The rows of plain linear sweetpotato beds show the lack of artistic juices according to Julie. It takes time to think about the designs for execution.
2.0 **UMA/KATUALLE OR SWIDDEN FIELDS.** Generally, farmers of Bayyo have more than one *uma*. One *uma* is usually found one kilometer away from the settlement area and another a few kilometers away. The *katualle* is a permanent *uma* within the settlement area but only a few farmers own a *katualle*.

The *uma* near the settlement are tiny patches of land more or less 70 square meters wide area and planted to different crops. The *uma* located three or four kilometers from the settlement serves as the seedbank and planting area for varieties observed as slow maturing, such as *minarcid*, *banaue*, *panayan*, *ampanga*, and other varieties found to yield small but tasty roots according to Julie Abkaren. The old varieties no longer found in the *payew* are found in the distant *uma*, Julie said. These distant swiddens are usually tended once a week, according to Natalia Bomar-o.

There are varieties that are suited only in a particular area. The variety locally called *akkong* is very productive in the *payew* but not in the *uma*. On the other hand, the variety locally called *minarcid* is planted in the *uma/katualle* but not in the *payew* because it is slow maturing.

For varieties that are grown equally well in the *payew* and the *uma*, the maintenance of planting materials is already done with the transfer of planting materials from one system to the other, i.e. from the *payew* to *uma* or vice versa. It has been observed that the best planting materials from the *payew* are gathered along the waterway as the plants in this
area have lesser and smaller roots but with robust foliage. Planting materials gathered from the uma are also considered very good as they are sturdy and therefore not easily broken.

As observed, every farmer in the area tends at least two uma, the other usually three kilometers from the settlement, as in the case of Natalia Bomar-o. These are grown with sweetpotato alternated with crops like peanuts and legumes at different periods because of the fallow system. Because of the nature of the rootcrop, its productivity lasting for two to three years, the security of farmers in terms of food and planting materials should never be at stake.

Threats to loss in varieties at the distant uma would be the ka-ag or wild monkey that usually uproots and disturbs growing plants, some farmers claim. During the 1993 studies, disruption of the peace and order situation in the locality posed as an impending threat to the dwindling area devoted to sweetpotato production. The height of insurgency and military operations within the territorial boundaries of Bayyo discouraged people from tending to their uma located three to five kilometers away from the settlement.

The continuing decrease in the uma area, is also a result of more people migrating to other places for cash income. It was noted then that many had not planted sweetpotato in their payew because of the inadequacy of planting materials, which in turn was due to the decrease in uma hectarage.
Table 2 presents the case of Bernadette, a ricefield tenant. She shares the rice harvest with the landowner but gets to keep all her sweetpotato harvest from the payew. She has five uma apart from her ricefield. She practices crop rotation in order to maintain soil fertility. The fallow period of the three uma is between two to four years. In 1993, her payew is planted with sweetpotato in the later part of June and harvested in January. Planting materials came from the dor-an but since these were not enough, she obtained some cuttings from her first uma which was planted in January. Planting materials were gathered from the payew during harvest in January the time Bernadette was first interviewed and these were intended for uma #2.
Table 2. Planting operations and source of planting materials (Bernadette Hu-ag, 1993-1994)

<table>
<thead>
<tr>
<th>AREA</th>
<th>1993</th>
<th>YEAR</th>
<th>1994</th>
</tr>
</thead>
<tbody>
<tr>
<td>payew</td>
<td>Planted with sweet-potato in August; planting materials from uma #1 and dor-an</td>
<td>Sweetpotato harvested in January; planting materials gathered from uma #2</td>
<td></td>
</tr>
<tr>
<td>uma #1</td>
<td>Planted with sweet-potato in January; planting materials from payew</td>
<td>Planted with peanuts in May and harvested in September</td>
<td></td>
</tr>
<tr>
<td>uma #2</td>
<td>Planted with peanuts in May and harvested in September from payew</td>
<td>Planted with sweet-potato in January; planting materials</td>
<td></td>
</tr>
<tr>
<td>uma #3</td>
<td>Left to fallow since 1992</td>
<td></td>
<td></td>
</tr>
<tr>
<td>uma #4</td>
<td>- do -</td>
<td></td>
<td></td>
</tr>
<tr>
<td>uma #5</td>
<td>- do -</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Generally speaking, the uma and the payew play symbiotic roles for each other. The uma is the source of sweetpotato planting materials during the land preparation or fallowing in the payew, while the payew supplies the planting materials for the uma in January.

In 1994, Aurora Buasen remarked that her uma located a few kilometers from the residential area has become her seedbank for sweetpotato varieties that take longer time to produce roots, like the minarcid, ampanga, and banaue. She also said, most varieties no longer found in the payew are in the uma. She observed that by sweetpotato harvest time after five months, usually in January, these varieties still have small roots, if not none at all. Yet, the crop has to be
harvested to give way for rice production. While if these are placed in the uma, the roots are given more time to grow.

3.0 **DOR-AN OR HOMEGARDEN.** The dor-an or homegarden serves as the seedbank where different traditional and highly preferred varieties of sweetpotato are grown. The area, therefore, becomes a major source of planting materials. Plants in the dor-an are maintained for two to four years, after which they are replaced with planting materials coming from the three other farm systems. Gathering planting materials from the homegarden is done during the *faliling* season (land preparation in post-rice fields). The most common varieties maintained in the area are *ingitangit*, *akkong*, *kalbo-oy*, and *tukkong* because of their abundant stem and leaf production for swine feed.

The study conducted in the later part of 1993 noted that the planting materials in the dor-an were barely enough, considering its area and the fact that a little of every variety available is planted in it. For Nenita, at a planting distance of 30 centimeters between hills, as many as 160 bundles or approximately 40 kilos (30 stems/bundle) are needed to plant her widest payew. This quantity cannot be gathered from the dor-an alone. Male farmers in 1994 claimed that a dor-an measuring 10 x 12 square meters is the source of planting materials for a payew four times its size.

In 1993, Mercedes, the village's reputed producer of the most and best sweetpotatoes suggested that the *tuping* is a
better seedbank than the dor-an. The tuping of her payew has eight of the twelve varieties she maintains. The rest are found in her dor-an. She experienced losing some varieties in the dor-an during festivities. The yard often served as the cooking area so some plants had to be uprooted. The rest were trampled upon by the people who joined the feast. Amidst the frenzy of the occasion, she never thought of transplanting the uprooted vines. Plants in other homegardens are likely to be subjected to the same fate as the dor-an has a variety of uses other than being a seedbank. Actually, the dor-an is not primarily for gardening purposes. These areas are reserved for residential purposes for the first child who gets married and opts to build his home near his parents' house and also for burial grounds. However, while the need to serve such primary purposes are not yet at hand, the people have put to good use their front/backyard by planting them with sweetpotato and other crops.

4.0 TUPING OR STONEWALL. Considering the area of the settlement, not every household has a dor-an of its own, thus, the tuping provides an alternative for preserving planting materials. The tukkong variety does not thrive well in the homegarden, so it is preserved in the stonewalls. For most, the tuping is mainly the source of swine feed and of petty cash when cuttings are sold in Bontoc Poblacion, or to other residents of the community.
The tuping along the payew are usually prepared and cleaned for planting in January. Some harvested sweetpotato stems from the payew are placed in the gaps between the stones to prevent the growth of weeds during rice production and as swine feed from January until rice harvest.

The tuping or stonewalls are planted with sweetpotato varieties with robust vines and leaves for swine feed and domestic consumption. The particular varieties that were observed to grow well in the tuping included getbeng and agubangbang because of the robust leaves. This system is planted with sweetpotato the whole year round providing a ready source of planting materials to supplement whatever is gathered in the uma.

Luz Lippad in 1994 had the agubangbang variety in the tuping along the payew while Aurora Buasen had getbeng because of the robust stems when planted in the stone walls.

Preferences in planting varieties for this system are those observed to produce abundant and robust vines. The tuping is the only farming system for sweetpotato that does not yield roots.

With the introduction of the Land Bank-assisted swine raising project as an additional source of income in October 1993, Bayyo farmers are experiencing a shortage in sweetpotato roots and vines as feed. The new livelihood activity has resulted to the farmers' preferences of akkong and kalbo-oy.
sweetpotato varieties because of the robust stems and leaves for swine feed.

Although not all the households are beneficiaries of the Land Bank project, the Bayyo farmers continue to maintain the different varieties and produce more of the crop to supply others with swine feed. Vines as feed sold at 3.00 (30 stems/bundle) to swine raisers augment the income of the non-participating residents.

**Seed Flow**

Varieties are introduced into the community by villagers who go to other places. Cuttings of varieties are usually shared with other community residents or tried out by the carrier and then shared. Mercedes obtained her *minarcid* cuttings from Talubin, a nearby village, the same place where Cablin obtained the same variety in 1967. Mercedes further mentioned that the variety was brought to Talubin from Alimit, Banaue. Incidentally, Talubin is known in Bontoc as the place which grows the best quality of sweetpotatoes.

In 1994, the preference of varieties for domestic consumption was said to be influenced by the sweet and mealy quality of the cooked root, the size of the root and the abundance of leaf production for swine feed.

The male farmers noted that new varieties observed to possess the qualities required for domestic consumption and swine production are maintained for long periods in the *payaw*, while others are transferred to the *uma* when roots are good,
to the *tuping* when leaves and stems are abundant, or to some *dor-an* (mostly those which are clean and not frequented by animals) for domestic use.

The Abkarens said that there is no hard and fast rule in planting and arranging the different varieties in the *payew*. They observed no direct influence of the arrangement of varieties on the yield.

According to most of the respondents, varieties are identified by the shape of their leaves.

**Maintenance of Varietal Diversity**

During the 1993 field study, more or less 15 varieties have been identified in the locality, each having its own distinct characteristics which influence the preference of farmers. The varieties are named after the person who introduced them in the locality (example: *minarcid* after Mercedes or *linoncia* after Leoncia) or after their place of origin (example: *Ginumanab* from Gumanab, Banaue) or after distinguishing physical characteristics (example: *ingitangit* after the dark color of its stem, *ngitit* being the local term for black).

A farmer plants two or five varieties in the *uma*, *katualle* or *payew*. The reasons for doing so are: (1) the differences in the taste preference among household members; (2) differences in storage period; (3) differences in maturity period; and, (4) the availability of planting materials.
Anita, a woman from a nearby village who married a Bayyo farmer, has to plant three varieties because her children prefer the sweetpotato moist or wet, while her husband prefers it bukkag or dry and mealy. Mary also pointed out that long maturing varieties are favored by pregnant women. By the time the roots are ready for harvesting, they have already delivered their babies, thus, they can go back to the fields to gather the roots.

The aforementioned reasons make it necessary to maintain the different varieties, hence, the women make it a point to preserve the planting materials for each variety in the dor-an, uma or in the tuping. This explains why there are many varieties found in most homegardens and some stonewalls.

With the introduction of the LBP-assisted swine raising project, varietal preferences are now influenced by stem and leaf production. The four farming systems are sources of the swine feed, so the varieties adapted to the different systems that produce robust leaves are preferred.

Although in 1994, Aurora and Bannay Lengwa noted that the uma located further from the community is planted with the preferred domestic varieties like the violet types, minarcid, banaue, bukkut, and linoncia.

Loss of Varietal Diversity

Most of the 1993 respondents claimed that varieties they knew of in their younger days are still found in the locality today. The oldest of them, however, mentioned a variety
called bukkut, which is rarely found. She said it was one of the well-liked varieties when she was still a little girl because it is sweet and its tops are good as a vegetable. The variety has profuse white sap and thrives well in stony and sandy soil. The roots are usually round and small but in loamy areas like the payew and uma, it does not produce good roots.

In the process of collection of samples, Mercedes was able to spot a lone bukkut plant in the dor-an of a relative. While in 1995, the bukkut was found in the perimeters of the payew.

The local system of nomenclature in the study site also contributes to the confusion in the identification of varieties which may lead to the seeming loss of certain varieties.

Based on the collection of samples (roots and cuttings) from nine case respondents in 1993 and five case respondents in 1994, there were varieties exactly the same but with different local names. Such is the case of linoncia and akkong #2. This usually happens when a variety has lost its popularity and gets reintroduced. This would then get a new name, usually after the person who introduced it or based on special characteristics. The minarcid, for instance, was known by another name (kinablin) when it was brought into the village in 1967 by a woman named Kablin. When it was re-introduced, mass produced and distributed to other farmers.
by Mercedes in 1976, its name became minarcid. Still others call it violet after the shades of violet in its stems and leaves when there is also another variety called violet which is different from minarcid.

Three varieties called violet were found in the payew in 1994 among three women, apart from the so-called minarcid. All three varieties had white skinned roots but different leaf types.

The hinaplid and kalbo-oy had white roots but are distinguished through the color of the stem, the hinaplid stem being red and the kalbo-oy green.

There were also other varieties with very minimal variations like the intensity of color, leaf serration and presence of trichomes. For instance, the roots of linoncia and ingitangit are very similar in appearance. It is only when the roots are cooked that one can tell/see the difference. It needs a close scrutiny of the samples to determine differences. According to a plant breeder's opinion, this could either be due to genetic or environmental influence. Slight variations in color, for instance, might be due to the environment particularly exposure of the plant to sunlight. On the other hand, the presence of trichomes or more leaf serrations can be explained genetically.
CONCLUSION

The study has proven that the four farming systems of Bayyo are interrelated and are purposefully planted with particular varieties of sweetpotato. Prior to October 1993, the varieties planted were based on domestic preference of the roots as a staple food. However, by 1994 the preferred varieties were fast maturing and abundant suppliers of leaves and stems for swine feed.

Sharing and experimentation of new varieties are common between and among households. The person who brings the new variety usually shares the cuttings with other households immediately. The acceptance of the variety is dependent on the domestic eating preference and until recently, the productivity of vines and leaves.

Varietal conservation is naturally done by the farmers in their transference of planting materials to the different systems. The loss of varieties can be due to uprooting by man and animals. However, with the presence of varieties in at least two farming systems (tuping and uma), the traditional varieties are still found.

Planting materials for the payew are supplied by the three farming systems guaranteeing no shortage problems. The farmer's preference or need of the variety is shown in the dominance of the variety harvested from the payew.
The cyclical transfer of cuttings from the four systems ensures more or less the conservation of varieties. However, results of the group consultation revealed that the uma and tuping make a better niche for seed and variety maintenance than the dor-an since the latter has multiple functions. The need for a space to build a dwelling unit, or a burial ground, and for a ritual are too important to be ignored. Even if the uma is threatened by the ka-ag and the abandonment of their fields because of insurgency, the damage (being intermittent and temporary) is not as significant as that done in the dor-an.
PHOTO DOCUMENTATION

A

B

Payew
Harvesting
Dor-an

A

B
Varieties

A

akong

B

bikut
C

D
AGUBANGBANG

Ginumanab
en-ngit anggit

tukong
linonia
A woman farmer tending her sweet potato
A case respondent