



DEPARTMENT OF AGRICULTURE

Regional Field Office No. 02

Tuguegarao City, Cagayan



UBI

PRODUCTION GUIDE





Ubi

Production Guide

This Publication is a project of the **Department of Agriculture, Regional Field Office No. 02, High Value Crops Development Program**. It contains the most recently available and locally adaptable technical information on **Ubi Production** in Region 02.

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INTRODUCTION

Yam (*Dioscorea alata L.*), locally known as ubi, is one of the most important species under the *Dioscorea* with about 600 species, 150 of which are cultivated for food. Ubi is also called water yam, guyanan arrowroot, greater yam, name-de-agua, ten months yam, white yam, or winged yam. It is 'da shu' or 'shuyu' in China, "gname de chine" in France, "khamatu" in India, "daisho" in Japan, "ube kimali" in Malaysia, "huabon" in Thailand, and "khoaimo" in Vietnam. In the Pacific Island of Ponape, yams are referred to as 2-4 or 6-man yams, depending on how many men it takes to lift the tuber. Some have been accurately recorded up to 250 kilograms (kg) and 2 meters (m) in length.

Ubi may have been cultivated as early as 8,000 B.C. in Asia. It is probably native to China. But it is now known crop throughout the world. The other cultivated species under the genus "tugui" or lesser yam (*Dioscorea esculenta*), potato yam (*D. Cayenensis*), bitter yam (*D. Dumentorum*), Chinese yam (*D. Opposita*), and white yam (*D. Rotundata*).

Ubi is perennial climbing herb with flesh color ranging from white to red deep purple. Tube shape ranges from round to cylindrical and tuber flesh is watery in texture.

In the Philippines, it is usually grown in the country in small patches of land, particularly in Ilocos, Southern Tagalog, Bicol, Central Visayas, and Northern Mindanao.

Ubi is being introduced in Region 02 because of its potential for food and commercial uses.

USES AND NUTRITIONAL VALUE

The tuber is a main ingredient in “halayang ubi” (ubi jam), a favorite dessert during fiestas and holidays. It is also cooked as combination in “sinigang” or “nilaga”. It gives special taste, aroma, and color to “guinataan”, can be processed into powder, chips, and puree. Ubi is used as an ingredient in sweets and confectioneries.

Likewise, ubi powder is a basic ingredient in “puto”, “bibingka”, ice candy, “maruya” tart, jam, macaroons, cake, flan, “bitso”, “suman”, “pastillas”, “polvoron”, ice cream, doughnut, and “empanada”. Other ubi products include chips and fries as potato substitute, dehydrated yam flakes, and instant yam mixtures. Ubi peelings or wastes are fed to poultry and livestock. The peel is a good source of purple dye for food, textile, and cosmetics.

The average crude protein content of ubi tubers is 7.4%. About 75% of the tuber dry matter is starch. Crude protein and starch contents vary significantly among cultivars. It is also a good source of Vitamin C and minerals. Total oxalate levels in yam tuber range from 486 to 781 mg/100 grams (g) dry matter, 50-75% which are in water-soluble form.



Ubi has been used as medicine for thousands of years. Diosgenin is an steroidal saponin, which is extracted from the root of wild yam. Dioscorin is the tuber storage protein of acid ubi. It is commonly used in traditional Chinese medicine to treat kidney and liver problems. Ubi was used commercially to produce hormones for contraceptive pills and steroids.

In addition to their medicinal properties, peels also contain antifungal compounds such as beta-sitosterol which can be used to control ubi diseases.

Per 100 grams (g) edible portion, ubi tubers contain the following:

Properties	Amount
Water (g)	74.9
Energy (kcal)	65.0
Protein (g)	1.7
Fat (g)	0.2
Carbohydrates (g)	21.5
Fiber (g)	0.7
Ash (g)	1.0
Calcium (mg)	19.0
Phosphorus (mg)	44.0
Iron (mg)	0.7
Thiamine (mg)	0.09
Riboflavin (mg)	0.02
Niacin (mg)	0.5
Ascorbic Acid (mg)	6.0

Source: *The Philippine Food Composition Tables, 1997. Food and Nutrition Research Institute-Department of Science and Technology (FNRI-DOST).*

PRODUCTION MANAGEMENT

Varieties

Below are some types of ubi:

Name	Description
Original Kinampay	Red-purple flesh
Kabus-ok	White flesh and large tubers
Tamisam	Reddish, white flesh and sweet taste
Binanag	Creamy, white flesh and elongated tubers
Binato	Big, hard tubers and white flesh



Soil and Climatic Requirements

Ubi can be grown in medium and low elevation areas, under open and partially shaded conditions. In high elevation areas, yields can be drastically reduced. Optimum temperatures range from 250°C to 300°C. It requires a well-drained area for planting but grows well in all kinds of soil. However, clay loam soils with high in organic matter are preferred.

Ubi is relatively drought-resistant, but at least 130 cm annual rainfall is needed. It requires ample moisture throughout its growing period, particularly during tuber bulking at 3-5 months after planting. Irrigation can be provided in areas where the dry season is longer than 3 or 4 months and falls within the bulking period of the plants.

Land Preparation

Tillage

- two plowings and two harrowings are usually enough for a field that has been cultivated previously
- plow deep, ubi needs a deep loose soil
- harrow along and across the length of the field to pulverize the soil

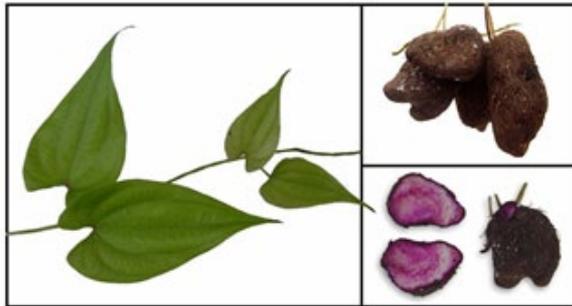
Seedbed

- raise ubi on flat or ridge seedbeds
- if flatbeds are used, plant after the last harrowing
- if ridged beds are desired, construct ridges one meter apart
- on sloping or rolling fields, contour the ridges to minimize soil erosion.

Planting Materials

Ubi is propagated through setts and meristem. Tubers are cut and form setts. It can be propagated directly and indirectly where setts are pre-sprouted.

Meristem culture is used to eliminate diseases. Other tissue culture techniques used include vitro micropropagation using single nodal cuttings and in vitro production of microtubers. However, initial yields from tissue culture plantlets and micro tubers are low.



Preparing the Setts

For a hectare of land, about 20,000 to 27,778 setts are needed. There are four types of sett, the head, middle, tail and whole. The first three are prepared by cutting large tubers into pieces. The fourth type refers to the whole smaller tuber. Setts should be obtained from healthy tubers of healthy plants.

Preparation of Setts

- Slice large tubers into setts weighing from 60 grams to 250 grams. Be sure that each sett has enough skin area.
- Treat cut sides of setts with ash or fungicides.
- Air or sun dry the setts until cuts are dry.
- After drying, setts may be presprouted or planted directly.
- Prior to planting, cut long sprouts before transplanting setts.

Pre-sprouting of setts



Pre-sprout setts to minimize maintenance cost especially in weeding. Setts have a dormancy period of 3-12 weeks depending on the cultivar. In shaded areas, place setts side by side and group according to type. For setts cut from large tubers, the orientation is either skin up or crown sideways. Cover setts with a thin layer of river sand or compost and mulch. Water 2-3 times a week until all setts have produced sprouts. In general, whole setts and head setts sprout ahead of other sett types. Setts are ready for planting when 1 to 2 inches of sprout emerge.

To break dormancy, use the gibberellin inhibitor that produces dwarfing in poinsettias such as chlormequat chloride. Soak tubers for 24 hours to shorten dormancy time from three months to one month.

Planting

Ubi is usually planted from March to May depending on the breaking of dormancy. However, it is best to plant during the start of the rainy season. Plant setts in ridges 1.0 m apart in hills 0.5-0.6 m. Cover with top soil of compost to a depth of 15 cm. Non-sprouted setts can also be planted, but sprouting will be delayed for about 3-12 weeks because of dormancy.

For small areas, it is best to plant the setts in hills to facilitate harvesting.

For pre-sprouted setts, plant during rainy season especially if it is not possible to irrigate or mulch the field. Plant the setts in the seedbed at a depth of 10 cm and at a distance of 1 m x 50 cm or 60 cm. Be sure to orient the sprouts upward in planting.

Replanting



Some amount of sett mortality can be expected, especially when non-sprouted setts are used for planting. Replant about two months after planting.

Check hills with no sprouts for rotten setts which should be removed and replaced with new ones. Unsprouted setts without rot should not be replaced because they can still produce sprouts later.

Mulching

In order to conserve soil moisture and suppress weed growth, it is preferable to mulch ubi with available plant residues such as coconut fronds, corn stalks, rice straw, and grass clippings. See to it that these materials are free from weed seeds. Mulch the field to reduce soil temperature and increase organic matter content of the soil. Mulch the field just after planting. Make the mulch thick if rice straw or any materials is not available.



Weeding

Weeds are controlled to prevent competition for nutrients. While plants are still short and unstaked or if the stake set-up allows, use animal drawn implements to control weeds in unmulched fields. Vines crossing the path of the animal should be lifted and placed along the rows before plowing. Use handtools to remove weeds. Stake set-up does not allow the use of animal drawn implement or if the field is mulched.

With non-sprouted setts and without mulching, pre-emergence herbicides applied within one week after planting, may be used to control weeds. In the case of unmulched ridge seedbeds, rain and weeding operations may cause leveling down of ridges. Hill up the beds at least once, 2-3 months after planting to cover the growing tubers. Animal-drawn implements or grub hoe may be used in hilling up depending on the area.

Weeding can be done at 1-2 months interval. This can be done manually, mechanically (with animal-drawn implements), or with the application of herbicides.

Fertilization

A hectare of ubi with a yield of 35 tons (t) can remove about 128 kg Nitrogen (N), 39 kg Phosphorus Pentoxide (P_2O_5) and 195 kg Potassium Oxide (K_2O) from the soil. This represents more or less its fertilizer requirements. However, fertilization should also be based on soil analysis. Compost or animal manure is mixed with the soil during land preparation or applied as basal fertilizer at the rate of 2-5 t/ha. Sidedress with manure or compost every two months up to the 6th month at the rate of 0.5kg/hill.

Inorganic fertilizers such as 14-14-14 are applied at the rate of 6 bags/ha. The recommended amount is split into two, one-half applied one month after emergence and the other half applied two months after. The fertilizer is applied in bands about 10 cm from the stem and covered lightly with soil.

Trellising

Ubi yield tends to be higher with trellis. Plants are staked before vines elongate. Bamboo poles, wood, cassava stalks, talahib, stalks, or any material that can support the ubi vines for at least seven months can be used to trellis. Set up cassava stalk in an inverted position (top portion buried) to prevent growth. There are various methods of staking, as follows:



Trellis method.

This stake setup is not very stable and requires more materials to support the stakes (posts and tie wire). However, weeding and hilling up operations using animal-drawn implements can be done easily.

Modified trellis method.

With this method, ground spaces under the stake arch need not be weeded as the foliage becomes dense. Also, stakes formed in this manner provide stable support. However, weeding and hilling up operations that utilize animal-drawn implements cannot be done under the arches.

Pyramid method.

This staking method combines the advantages and disadvantages of the modified trellis method. In addition, it requires fewer, though sturdier materials for stake construction and requires less labor to construct. Ubi grown under this method usually yields lower than those grown under the modified trellis method.

Training the vines

Ubi vines twine to the right, while tugui vines twine to the left. When vines start to elongate, they are trained to climb their respective stakes. They are trained again when long branches start crossing the rows or when weeding and hilling-up operations using animal-drawn implements are about to be done.



Pest management

The most serious disease of ubi is anthracnose (*Colletotrichum gloeosporioides*). Plants can be sprayed with recommended fungicides or with compost tea as a preventive measure. Compost tea is prepared by soaking $\frac{1}{2}$ sack (15 kg) of manure compost in $\frac{3}{4}$ drum (200-L capacity) of water for 5-7 days. Dilute the tea to 20 parts water and spray on the plants.

Ubi beetles can be controlled with hot pepper spray (100 g macerated hot pepper/16 L water) or with carbaryl.

Avoid using tubers infested with nematodes as planting materials. The symptoms of root knot caused by root-knot nematode (*Meloidogyne incognita*) include bumps and excess hairiness that are not typical of the cultivar. Dipping the infested tubers in hot water at 50°C-55°C for 40 minutes can suppress the nematode without adverse effect on the storage life, germination, growth, and yield of the tubers. The use of animal manure can suppress nematode build up thereby resulting in high yield.

Harvesting

Ubi is ready for harvest when the foliage turns yellow and dries up around 10-11 months from planting. Harvesting is usually done from late November to February of the following year. Harvesting can also be done at 6-7 months after planting to take advantage of good market price. Tubers intended for setts can be harvested later.

It is easier to harvest ubi that are planted in mounds. Loosen the soil around the tuber with a bolo, shovel, or spading fork. Lift, clean, and cut the tubers near the base. Injury to the tubers should be avoided to prolong storage life.

Postharvest handling and storage

Sort, clean, and arrange tubers in a single layer with rice straw or banana leaf partition between rows to prevent injury. Cover with appropriate materials such as banana leaves, coconut fronds, or rice straw to minimize weight loss.

Select planting materials for the next planting season. Store tubers in a well-ventilated area and keep dry. Separate blemished or damaged tubers and treat with wood ash to prevent fungal infection.

Ubi can be stored for three months in a raised platform three feet from the ground. Place the tubers in a single layer horizontally on the platform. Another method of storing tubers is to bury them in a ditch covered with soil followed by coconut leaves on top. To prevent rodents and other pests from attacking the stored tubers, securely fence the barns or storage areas or use traps and baits.

Ubi can also be kept in cold storage. Keep them on shelves in rows at 12°C-16°C and 70-80% relative humidity. Tubers can be stored 6-7 months under this condition.

Marketing

Ubi farmers usually sell their produce to retailers, wholesalers, and end-users in the farm, road sides, and public markets. Large-scale farmers enter into contract farming to ensure ready market for their produce.

The Agribusiness and Marketing Assistance Division (AMAD) of the DA-RFO 02 can assist farmers in their market matching activities.

Cost and Return Analysis Per Hectare (Ha.)

A. Labor - P220/man-day (MD)

Items	Quantity	Unit	Unit Cost (P)	Total
Clearing	20	MD	220	4,400
Plowing	2	MAD	2,000	4,000
Harrowing	2	MAD	2,000	4,000
Furrowing	10	MAD	220	2,200
Bed Preparation	10	MD	220	2,200
Manure Application	4	MD	220	880
Planting	20	MD	220	4,400
Trellising	15	MD	220	3,300
Vine Training	4	MD	220	880
Sidedressing	4	MD	220	880
Spraying	4	MD	220	880
Weeding	15	MD	220	3,300
Mulching	6	MD	220	660
Harvesting	20	MD	220	4,400
Cleaning and Sorting	5	MD	220	1,100
Miscellaneous (e.g. hauling, repairs, etc...)				1,000
Sub-total				37,640

Continuation at the back

Legend:

MM - Man Machine

MD - Mand Days

MAD - Man Animal Days

B. Materials

Items	Unit Cost	Quantity	Total Cost
Setts	P 20/ kg	2,000 kg	P 40,000
Manure	P 250/ bag	60 bags	P 15,000
Fertilizer (14-14-14)	P 1,300 / bag	6 bags	P 7,800
Fungicides	P 780 / kg	10 kg	P 7,800
Fuel and oil			P 1,000
Trellis materials	P 20/Piece	300	P 6,000
Packaging materials Miscellaneous (e.g., pail, gloves, etc.)			P500
Sub-total			P 78,100.00

C. Fixed Costs

Knap sack sprayer (1unit)	- P 1,500
Scythe (5pcs)	- P 500
Hoe(5pcs)	- P 500
Shovel (3pcs)	- P 450
Plastic Drub (2pcs)	- P 1,000
Total (Fixed Cost)	P 3,950
Grand Total	P 119,690

Gross Income

- Regular Season (at 10/kg with 30t/ha yield) P 300,000.00
- Offseason (at P20/kg with 20t/ha yield) P 400,000.00

Net Income

- Regular Season P 180,310.00
- Offseason P 280,310.00

Pastillas de Ubi

Ingredients

- 4 cups ground boiled ubi
- 3 cups sugar
- 1 big can evaporated milk

Preparation:

- Mix the ingredients together and cook in a copper vat (tacho) over a moderate fire;
- Stir constantly to avoid burning.
- When the ubi thickens and doesn't stick to the vat, remove from the fire and pour on a sugared board.
- Roll the pastillas to one-and-a-half centimeters thick and then cut into desired pieces;
- Arrange the pieces on a cooked sheet and place in the oven at 200oF for 20 minutes.



Puto de Ubi

Ingredients

- 2 cups rice
- 1 ½ cup water
- 1 cup sugar
- ¼ cup mashed ubi
- 4 tbsp baking powder

Preparation:

- Mashed cleaned rice & soak in water overnight
- Grind the rice finely using a native stone grinder
- Boil the ubi in enough water until cooked and soft
- Peel the ubi and mashed finely
- Add sugar and mash the ubi with ground rice, blend well and pass through a strainer to remove lumps.
- Add coconut milk and baking powder. Mix thoroughly.
- Pour the mixture into puto molds or spoon it into individual molds, filling each two-thirds full.
- Set the molds in a steamer over boiling water. Cover the steamer.
- Puto is cooked when a toothpick comes out clean and dry when inserted in the center of the molds.
- Remove from the molds and serve with grated coconut.



Ubi Halaya

Ingredients:

- 2 cups ubi (purple yam)
- 250 grams sugar
- 1 cup sugar
- 1 can condensed milk
- 2 cups coconut milk Butter

Preparation:

- Boil yam until tender and cut into cubes, then grind in a food processor with sugar and coconut milk (if you have powdered variety, mix ingredients).
- Transfer to a sauce pan, add the condensed milk (if starting from fresh) and cook over a slow fire, stirring continuously.
- Continue stirring until the ixture turns into a thick paste and separates from the pan.
- Transfer to a shallow platter or pan and allow to cool. Serve.



Maja de Ubi

Ingredients:

- 1 kilo ubi
- 1 cup rice
- 3 cups cococnut milk
- 2 ½ cups sugar
- A pinch of powdered anise

Preparation:

- Peel the ubi, slice thin, cover with water and boil until very soft.
- Mash well and strain through a coarse strainer.
- Soak and grind the rice with 1 ½ cups water.
- Mix the ground rice, ubi, sugar, coconut milk and anise. Cook over medium heat until thick and smooth.
- Transfer to a greased deep plate and allow to cool.
- Serve in slices with toasted grated coconuts.



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