CHAYOTE

Divina C. Jose/Rhonda M. Oloan

Chayote (*Sechium edule)* is a perennial monoecious climber belonging to the Cucurbitaceae family. It thrives best in cool areas with elevations ranging from 1000 to 1,500 masl. The fruits come in various shapes from round to long elongated, and some are with ridges and spines. It is locally known as "sayote", commercially grown in the Cordillera in swidden farms, and important in sustainable farming system.

The region has a total production area of 925 hectares with a production volume of 45,564.14 MT (BAS, 2010), and about 2000 chayote farmers. Benguet province has the largest production area of 892 hectares with a total production of 45,122.91 MT and a production yield of 50 tons/ha. Greater harvest is produced during the months of November to June while less produce is expected on July to October where typhoons and heavy rains visit the region. Also, chayote can be found in Nueva Viscaya, Northern Mindanao and Cebu.

The edible parts of the crop have low fiber, protein and vitamin contents than other plants. However, calories and carbohydrate contents are high, chiefly in the young stems, roots and seeds, while the micronutrients and macronutrients supplied by the fruit are adequate (Saade, 2001). Its salient nutritional properties are cited as fllows.

Chemical and Nutrient Contents of Peeled Fruit (BPI, 2011)

Chemical/Nutrient Content	Value	Chemical/Nutrient Content	Value
Total Soluble Solid (TSS)	4.57-5.82 ^{o}Brix	Crude Fat	0.01-0.19 %
Moisture Content	94.26-95.41 %	Carbohydrates (%)	3.76-4.96 %
Ash	0.22-0.28 %	Calcium	Nil-0.12 %
Crude Protein	0.38-0.50 %	Iron	0.23-12.78 %

Chayote is grown mainly for its fruits and shoots. The fruit has a very important role as food supply in the regional and national levels especially during calamities. Likewise, fruits can be processed into wines, pies, kimchi, pickles and candies in the locality but in a backyard scale. The vines can also be manufactured into bags and hats for its flexibility and strength (Bermejo and Leon, 1994) while the infusion of leaves can dissolve kidney stones and assist in the treatment of arteriosclerosis and hypertension (Saade, 2001).

Strains. The different strains of chayote can be determined in fruit shape, presence and density of spines, and texture of the skin. Fruit shapes are globular, globular to flat, elongated and long elongated with small, medium or large sizes. Fruits either have no spines, sparse, medium or dense. Likewise, fruits may have smooth or rough skin, and with or without ridges.

1. BPI Ch1- fruits are big, elongated with intermediate furrows, dense spines at the entire fruit and with rough skin.

2. BPI Ch2- fruits are medium, globular, little bit flat with intermediate furrows and sparse spines at the apex and bottom, and with rough skin.

3. BPI Ch3- fruits are medium, globular, little bit flat with shallow furrows, sparse spines at the apex and bottom with smooth skin.

4. BPI Ch4- big fruits, elongated to long-elongated with shallow furrows, none to sparse spines at the bottom with smooth skin.

5. BPI Ch5- medium fruits, elongated with shallow furrows, sparse spines at the apex and bottom with rough skin.

6. BPI Ch6- medium fruits, globular, little bit flat with shallow furrows but dense spines at the entire fruit and with rough skin.

7. BPI Ch7- fruits are medium, elongated with shallow furrows, no spines with smooth skin.

8. BPI Ch8- medium fruits, globular to elongated with intermediate furrows, sparse spines at the apex and bottom with rough skin.

9. BPI Ch9- small fruits, elongated with intermediate furrows, sparse spines at the entire fruit and with rough skin.

10. BPI Ch10- small fruits, elongated with intermediate furrows, none to sparse spines at the apex and bottom with smooth skin.

11. BPI Ch 11- this strain is the latest introduction from Australia. It has medium fruits, globular with shallow furrows but dense and firm spines at the entire fruit, and with dark green and rough skin.

Climatic and Soil Requirements

1. **Climatic Requirement**. Temperature ranging from10 to 25 ^{o}C enhances foliage and fruit development and longer growing period for 5 to 8 years due to delayed virus disease symptoms. Further, the crop is best grown at elevations of 1,000 masl and above to obtain good quality fruits. Temperatures above 25 ^{o}C promote longer internodes, thus lesser nodes where fruits arise.

2. **Soil Requirement.** The crop requires clay loam, silty clay loam or loam soil with pH ranging from 5.5 to 6.5. Soil should be well drained and supplied with organic fertilizer to have good moisture holding capacity since the crop cannot withstand drought.

CULTURE AND MANAGEMENT

A. **Planting Material.** Select matured fruits from virus-free chayote vines and put under shade and moist environment to enhance sprouting.

B. **Land Preparation and Planting.** Clear the area and prepare very shallow holes about 1square foot wide with a distance of 3 meters between hills and rows. Apply organic fertilizer then mix with the soil. Plant 3 fruit seeds (sprouted or not) per hill leaving 1/3 of the seeds exposed. Planting is usually done towards the rainy season especially when water is a problem to ensure plant growth.

C. **Fertilizer Application and Hilling Up.** Apply organic fertilizer either chicken manure or compost before or at planting time (basal fertilization) and during side dressing every 2 months at the rate of 3 to 5 tons/ha or 300 to 500 grams/hill. Triple 14 or triple 16 at 50 g/hill or 2 sacks/ha can be applied alternately with organic fertilizer as side dress to promote growth and development of the crop. During side dressing, soil is raised to cover and support the base of the plant as well as the applied fertilizer.

D. **Staking/Wiring/Trellising.** Install GI wire using # 14 or 16 horizontally at a height of 6 feet with either wood, bamboo or tree stumps as posts. The GI wire is usually repaired/changed after 5 to 8 years while posts are changed after 3 years depending on the material used.

E. **Irrigation.** Irrigation is carried out either through water hose, sprinklers, watering cans or their combinations, once a week.

F. **Weeding.** Weeds are removed in order not to compete with the absorption of nutrients and sunlight. Likewise, they attract rodents that would damage the crop and serve as alternate hosts of some insect pests and diseases.

G. **Mulching.** Fresh, dried or decomposing weeds are used as mulch to conserve moisture and serve as organic fertilizers when decomposed.

H. **Deleafing.** Remove dried and old leaves every 3 months to give way to young and

active leaves for light reception and food production. Remove plants which are severely infected with virus disease.

I. **Crop Protection.** Spraying of pesticides is not necessary, however, severe pruning leaving 1 foot vine from the base or changing the plants is recommended when there is severe virus disease.

J. **Insect Pests and Diseases and Their Control**

1. **Plant Bug**. Plant bugs puncture and suck the sap of fruit and leaving the fruit oozing with sap, and further leading to the hardening of the fruit which is not fitted for consumption. The insect is usually observed during the months of February to June.

2. **Spider Mites**. Spider mites are tiny insects that are found on the undersides of the leaves and suck the juice of the plants. Infested leaves are discolored and sometimes covered with spider mites webs. Also, infested fruits are malformed as a result of feeding. The insect abound during summer because it is favored by warm weather.

3. **White Flies**. White flies are also suck juice of the plants. It can be seen on the undersides of the leaves, and when leaves wiggle, the insect flies around. Infested leaves are also discolored.

Management of Plant Bug, Spider Mites and White Flies

a. Use sprinkler irrigation to wet the plants
b. Remove fruits that are damaged by plant bugs
c. Cut infested leaves with white flies
d. Sanitation and weeding

4. **Virus disease**. Virus diseases are the most important problem in chayote production. It is caused by squash leaf curl virus (SLCV) and chayote mosaic tymovirus (CMTV). The symptoms are: yellowing of leaves, leaf curling, reduced leaves and malformed fruits.

Management of Virus Disease

a. Use disease free planting materials
b. Grow tolerant strains of chayote
c. Remove infected plants
d. Sanitation and weeding

K. **Harvesting and Packing.** Harvest once a week to obtain the right commercial maturity (soft skin and not fibrous) of the fruit. Sometimes there are fruits which are twins or triplets. Harvested fruits are packed in transparent 25 kg capacity polyethylene plastic for easy hauling from the farm to the service road, and unloading/hauling from the vehicle to the local market stalls.

Cost of Production and Return on Investment

Growing chayote cost about PhP 180,745 for the first year and PhP 134,109 for the second year with return on investments of 49.38 and 101.32 %, respectively. Ten (10) months production was considered for a year since almost no fruits are harvested during the typhoon months of August to September.

Chayote*
(One Hectare)

I. Cost of Production

A. Labor Cost		**Year I**	**Year II**
Operation/Activity	**Man Days** PhP250/man day	**Amount (PhP)**	**Amount (PhP)**
1. Land Preparation (clearing, digging planting holes and basal fertilization)	18	4500	---
2. Planting (900 hills)	2	500	---
3. Care and Management (wiring, irrigation, side dressing, weeding, deleafing)	150	37,500	(140 m-day) 35,000
4. Harvesting, packing and hauling	180	45,000	45,000
Sub-Total		**87,500**	**80,000**
B. Cost of Inputs	**Number/Unit Price**		
1. Fruit seeds	2700 @ 2/pc	5,400	---
2. Fertilizers			
Chicken manure	30 @ 180/sack	5,400	5,400
Triple 14	4 @ 1350/sack	5,400	5,400
3. Other Materials			
G I Wire # 16	8 @ 2,500/roll	20,000	---
Post	900 @ 10/pc	9,000	4,500
Garden Hose	5 @ 1700/roll	8,500	---
Rainburst	5 @ 200/pc	1,000	1,000
Plastic bags	6400 @ 400/100	25,600	25,600
4. Tools		Depreciation Cost	Depreciation Cost
Bolo	2 @ 350/pc	525	394
Shovel	2 @ 650/pc	975	731
Grub hoe with handle	2 @ 350/pc	525	394
Scythe	7 @ 175/pc	920	690
Sub-Total		**83,245**	**39,755**
C. Land rent	**1 ha @ 10,000/yr**	**10,000**	**10,000**
Total Cost of Production		**180,745**	**134,109**

* Based from survey and Personal Interview from chayote farmers at the Cordillera Region.
* Cost of labor, supplies and materials are based on 2011 prices.

II. Economic Analysis

A. Total Cost of Production
B. Gross Returns
C. Net Income = Gross Income – Total Cost of Production
D. ROI (%) = $\frac{\text{Gross Income – Total Cost of Production}}{\text{Total Cost of Production}}$ X 100

Cost of Prod'n	**Marketable Yield**	**Ave. Price**	**Gross Return**	**Less 10% spoilage & price fluctuation**	**Net Income**	**ROI (%)**
(Year 1) 180,745	120 tons/ha (3,000 kg/harvest for 10 mos.)	2.50	300,000	30,000	89,255	49.38
(Year 2) 134,109	120 tons/ha	2.50	300,000	30,000	135,891	101.32

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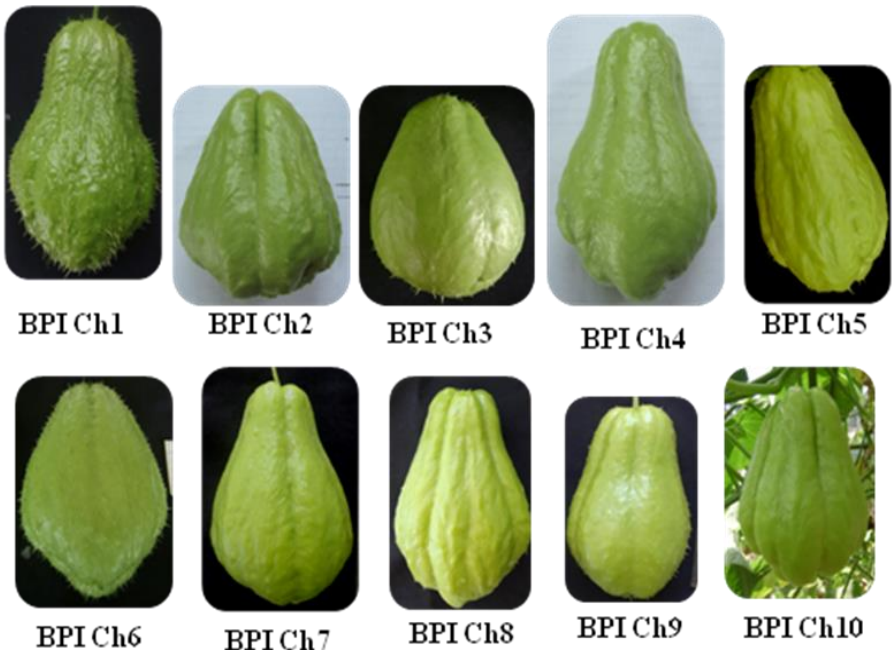
Appendices
PICTORIALS

Different Chayote Accessions/Strains



BPI Ch 11- Australian strain

Production areas of Chayote

Atok, Benguet

Kibungan, Benguet

Kapangan, Benguet


Sto Tomas, Baguio


Irisan, Baguio


Tuba, Benguet

Cultural Management Practices

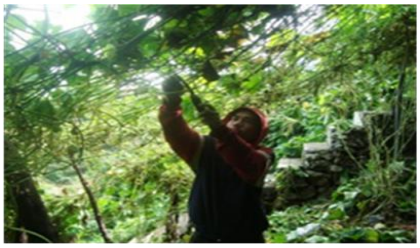

a. Planting/basal organic fertilization


b. Sprinkler irrigation


c. Weeding and hilling up


d. Hilling up


e. Mulching


f. Deleafing


Deleafing


Deleafing

Virus Disease Symptoms

Leaves infected with virus

Fruits infected with virus

Fruits packed in Polyethylene Plastic