

1. Ang kalikasan ay ang kapital at pinanggagalingan ng lakas at enerhiya.
2. Ang lupa ang pinanggagalingan ng buhay: Pa-kainin ang lupa, hindi ang halaman at hayaang ang lupa ang magpakain sa halaman.
3. Magtanim ng maraming klaseng halaman at mag – alaga ng iba’t ibang klase ng hayop.
4. Personal at pang – pamayanang kasarinlan.
5. Huwag maging materyal.
6. Kalusugan ng tao at hindi pagkita o pagkakakitaan lamang.

Noong kalagitnaan ng dekada 80 na nag-uumpisa nang lumakas ang hanay ng mga nagsusulong ng LKP, marami ang gumagamit ng salitang *organic* dahil ito ang pamilyar na sa mga tao. Noong panahong iyon, ang pagpapareho sa *organic* at *sustainable agriculture* ay talagang di tama dahil ang *organic* ay nakaayon sa mga pamamaraan sa sakahan na kailangang gawin at suriin ng isang inspektor sa mga produkto ay ang mapatunayang (certify) ito ay *organic*. Ito ay ginagawa sa ibang bansa sa Europa at America (at ngayon sa Pilipinas na rin) upang masiguro na ang pamamaraan ng pagsasaka ay sumusunod sa isang pamantayan na wala o napakakaunti lamang ang pestisidyo o lason sa produkto.

Ang pamantayan ay nasasaad na kailangan ang pagpapalit- palit ng halamang itinatanim sa sakahan (crop rotation), natural ang ginagamit para patabain ang lupa at puksain ang mga peste. Ang mga ilalagay sa lupa upang matiyak na hindi ito masisira at manghihina ay dapat na galing sa mga *renewable resources*, dumi ng hayop, nabubulok na basura at halaman o parte ng halaman, at natural na abono galing sa mga legumbre.



PAMAMARAAN NG ORGANIKONG PAGSASAKA

- 1 Pagtanim ng maraming klase ng halaman (multi- cropping) at hindi isa lamang halaman (monocropping).



- 2 Pagpapalit – palit ng halamang itinatanim (crop rotation).



- 3 Salitang taniman (intercropping).



- 4 Halu – halong paggugulayan (home gardens).



5 Pag – aalaga ng iba’t ibang hayop kasama ang halaman (*animal integration*).



6 Pagpapayaman at pagpapaganda ng lupa sa pamamagitan ng pagkikilib (*mulching*), paggamit ng green manure at mga binulok na halaman o parte ng halaman (*compost*), dumi ng hayop, abo at natural na pataba (*guano o mineral rocks*).



7 Pagtatanim at paghahalo ng mga halamang nag-tataboy sa mga pesteng insekto (*insects repellent plants*).



8 Paggamit ng mga tradisyonal na klase ng mga binhi at uri ng mga hayop.



9 Natural na pamamaraan ng pagkontrol at pagpuksa ng mga peste.



10 Paggamit ng mga halamang gamot (*botanical pesticides*) laban sa mga peste. (Ang pangmatalagalang paggamit ng mga halamang gamot ay maaaring magdulot ng mga problema na pareho doon sa paggamit ng mga pestisidyo. Kaya ito ay dapat gamitin lamang sa kagyat na pangangailangan hanggang sa makakita ng mas natural na pamamaraan sa pagkontrol o pagsugpo ng mga peste.)



Alternatibong Pamamahala

PESTE

sa mga

"ALTERNATIVE PEST MANAGEMENT"

1. Herbal Extract (HE)

Ang *Herbal Extract* (HE) ay produkto ng simpleng pagbabad ng mga *spices* (luyang dilaw, luya, bawang, sibuyas, at iba pa) sa lambanog o tuba. Dahil sa katangiang taglay ng *spices* at *alcohol*, maaari itong gamiting pamuksa ng peste at panlaban sa sakit ng halaman.

Paggawa ng Herbal Extract:

- Maghiwalay ng kalahating ($\frac{1}{2}$) kilong luya o luyang dilaw at kalahating ($\frac{1}{2}$) kilong bawang. Pagsamahin ang dalawang napiling sangkap at ibabad sa dalawang (2) litrong lambanog o tuba.
- Makalipas ang tatlong (3) araw, maaari nang gamitin ang solusyon. (Maaari ding gamitin ang barak bilang alternatibo sa luya.)

Paggamit sa Herbal Extract:

- Ihalo ang dalawang (2) kutsarang HE sa isang (1) litrong tubig, at ipambomba sa halaman na may sakit o pesteng umaatake.
- Maari ding gamitin ang HE bilang pangliway (inoculants) sa binhi at punla.

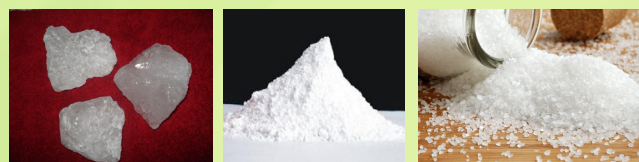
2. Likas na Pestesidyo

- Ang mga pamamaraang nakasaad sa babasahing ito ay hindi solusyon sa problema ng peste at sakit ng sakahan. Ito ay magsisilbing pangunang lunas lamang. Ito rin ay magsisilbing batayang impormasyon para sa maliliit na magsasaka upang itaguyod ang kanyang sariling eksperimento at pananaliksik na nakabatay sa pagmamasid sa kapaligiran at sakahan.
- Para sa Likasaka, ang halaman ay may kakayahang proteksyunan ang sarili sa pinsala na dulot ng peste at sakit. Ang tamang pamamahala ng peste at sakit sa halaman ay nakasalalay sa kalusugan ng halaman.

Ang mga sumusunod ay ang susi sa isang masaganang produksyon:

- Ang pagseguro na buhay ang lupang sakahan (mataas na *organic matter*; balanseng nutrisyon; mataas na populasyon ng IMO);
- Ang pagtanim ng hiyang at angkop na klase/ uri ng tanim ayon sa kalikasan, at kaugalian ng magsasaka; at
- Ang masusing pagmamasid upang maagap na matugunan ang pangangailangan sa buong sakahan.

Tawas, Apog at Asin



Peste na tatamaan:

Slug o snail

Proseso at paggamit:

Ihalo ang 1 parte ng tawas (alum), isang parte ng asin sa 8 parte ng apog;

Isabog ang mixture sa paligid ng sakahan upang matapakan ang slugs/snails.



Gata ng Niyog

(*Cocos nucifera* L.)

Peste na tatamaan:

Aphids, scale insects, pampabaug ng itlog ng insekto at uod

Proseso:

Kayurin ang 2 niyog, lagyan ng 1 litrong tubig at pigain, lagyan ulit ng 1 litrong tubig para sa pangalawang pagpiga. Ihalo ng maigi ang 1 pira-song perla soap sa 2 litrong gata ng niyog hanggang matunaw.

Paggamit:

Ihalo ang 1 parte ng gata na may sabon sa 10 litrong tubig at ipambomba sa hapon ng dalawang beses na may 2 araw na pagitan.

Babala:

Huwag magbomba sa tanghali dahil sa taglay na langis sa gata na maaaring makasunog ng dahon at halaman.

Makabuhay (*Tinospora rumphii*) at Tanglad

Peste na tatamaan:

Uod, atangya, beetles at aphids

Proseso:

Pakuluan ng isang oras ang 1 kilong tinadtad na katawan ng makabuhay, kalahating 1/2 kilo ng salay o



tanglad sa 10 litrong tubig. Palamigin at ilagay sa bote.

Paggamit:

Ihalo ang 4-5 litrong sabaw sa isang sprayer (16 litro) at ipambombasa halaman sa hapon, sa loob ng 2 araw.

Paalaala:

Maari ding haluan ng ibang uri ng pangontra sa peste tulad ng gata ng niyog o tabako.

alternatibong pamamahala sa mga PESTE

Potassium Permanganate

Peste /sakit na tatamaan:

Aphids, mildew, pagdidilaw at pangungulot

Proseso at paggamit:

Ihalo ang 2 kutsara na *crystal* sa isang *sprayer*, ipambomba sa halaman tuwing hapon at sa loob ng 2-3 araw.

Buto ng Mahogany Tree o *Pterocarpus indicus* (Pait at Pakla)

Proseso:

Dikdikin at pakulan ng 1 oras ang 50 pirasong buto ng *mahogany* sa 1 litrong tubig at lagyan ng 2 kutsarang asin. Pwede ring ibabad lamang ito ng 2-5 araw.

Paggamit:

Ihalo ang 1 litrong sabaw sa isang *sprayer* (16 litro). Ipambomba sa halaman sa loob ng 2 beses na may pagitan ng 2 araw.

Paalaala:

Maari ding haluan ng ibang uri ng pangontra sa peste tulad ng gata ng niyog o tabako.



Camphor Balls

Peste na tatamaan:

Adult ng mga borer family, uod at *aphids*

Paggamit:

Dikdikin ang 2 dosena na *camphor balls* sa 16 litrong tubig at haluan ng isang pirasong sabon na *perla* at ipambomba sa halaman sa hapon, 2-3 beses na may 2 araw na pagitan.

Paalaala:

Maari ding haluan ng ibang uri ng pangontra sa peste tulad ng gata ng niyog o tabako.



Chrysanthemum

Peste na tatamaan:

Lahat ng insekto

Proseso:

Iabad ang ½ kilong dahon at katawan ng *Chrysanthemum* sa 10-15 litrong tubig na maligamgam kasama ang 1 pirasong sabon na *perla* sa loob ng 1-2 oras. Palamigin, salain, at ipambomba sa halaman na may peste.

Paalaala:

Maari ding haluan ng ibang uri ng pangontra sa peste tulad ng gata ng niyog o tabako.



Bawang (*Allium Sativum*)

Peste na tatamaan:

Para sa mga *sucking* na insekto

Proseso:

Dikdikin ang ½ kilo ng bawang, lagyan ng 2 kutsarang *edible oil*, 1 litrong tubig at isang pirasong sabon na *perla*.

Paggamit:

Ihalo ang 1 parte ng solusyon sa 50 parteng tubig at ipambomba sa hapon.

Paalaala:

Maari ring haluan ng ibang uri ng pangontra sa peste tulad ng gata ng niyog o tabako.



Sili (*Capsicum Annuum*)

Peste na tatamaan:

Uod, *aphids* at langgam

Proseso at paggamit:

Dikdikin ang 1 lata (sardinas) na sili at ihalo sa 16 litrong tubig na may natunaw na 1 pirasong sabong *perla*. Ipambomba sa halaman sa loob ng 2-3 beses araw-araw tuwing hapon.

Paalaala:

Pwede ring haluan ng ibang uri ng pangontra sa peste tulad ng gata ng niyog o tabako.



Marigold/Amarilyo (*Calendula officinalis*)

Peste/sakit na tatamaan:

Repellent sa mga insekto, pangontra sa mga *nematodes* at ilang peste sa ugat ng halaman.

Proseso sa paggamit:

Bayuhin ang 1 kilong dahon at buong katawan ng *Amarillo*, kasama ang 1 litrong tubig. Ihalo sa 16 litrong tubig, lagyan ng 1 pirasong sabon na *perla*. Iabad ng mula ½ -1 oras, salain at ipambomba sa halaman tuwing hapon sa loob ng 2-3 araw.

Maglagay ng 2 kutsarang tuyo at pulbos na dahon at katawan ng *amarillo* at *neem tree* (50:50) bilang patungtung sa bawat puno ng tanim.



Hagonoy (*Chromolaena odorata*)

Peste na tatamaan:

Aphids at uod

Proseso:

Bayuhin ang 2 kilong dahon ng *hagonoy*, iabad sa 16 litrong tubig ng ½ -1 oras, lagyan ng 1 sabon na *perla* hang-

alternatibong pamamahala sa mga PESTE

gang matunaw. Salain at ipambomba sa halaman tuwing hapon sa loob ng 2-3 araw.

Paalaala:

Maari ding haluan ng ibang uri ng pangontra sa peste tulad ng gata ng niyog o tabako.



Wild Sunflower (*Tithonia diversifolia*)

Peste na tatamaan:

Aphids at uod

Proseso:

Bayuhin ang 2 kilong dahon ng wild sunflower, ibabad sa 16 litrong tubig ng mula ½ -1 oras, lagyan ng 1 sabon na perla hanggang sa matunaw. Salain at ipambomba sa halaman tuwing hapon sa loob ng 2-3 araw.

Mataas ang nitrohenyo at posporo nito, kaya makakatu-long din ito sa nutrisyon ng halaman.

Paalaala:

Maari ding haluan ng ibang uri ng pangontra sa peste tulad ng gata ng niyog o tabako.



Tabako (*Nicotiana tabacum* L.)

Peste na tatamaan:

Uod, aphids, tyrips, beetles, leaf miner at hopperb

Proseso:

Pakuluan ng mga kalahating oras ang 250 gramo na dahon ng tabako sa 1 galong tubig, dagdagan ng 2 pirasong sabon na perla (kinayod) hanggang matunaw at isang basong apog. Palamigin, salain at ilagay sa bote at takpan.

Paggamit:

Ihalo ang 2 litrong sabaw ng tabako sa 14 litrong tubig at pambomba sa halaman sa hapon sa loob ng 2-3 beses.

Babala:

Huwag gamitin sa kamatis dahil sa posibleng kontaminasyon sa Mosaic Virus.



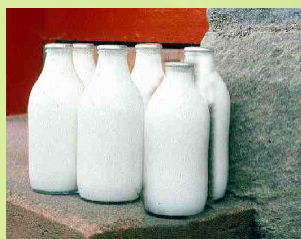
Sariwang Gatas

Peste na tatamaan:

Mildews at Mosaic Virus

Proseso at Paggamit

- Ihalo ang 1 parte ng gatas sa 9 na parte ng tubig at ipambomba sa halaman 2 beses na may 5 araw na pagitan;
- Makatutulong rin ito sa dagdag na calcium at minerales sa lupa.



Tubli (*Melittia piscatoria*)

Peste na tatamaan:

Lahat ng insekto

Proseso:

Magdamag na ibaon ang tubli sa lupa. Ibadat ang 1/2 kilong dahon at katawan ng tubli sa 10-15 litrong maligamgam na tubig kasama ang 1 pirasong sabon na perla sa loob ng 1-2 oras. Palamigin, salain at ipambomba sa halaman na may peste.

Babala:

Gamitin lang kung malala na ang atake ng peste. Nakamatay.



Luya (*Zingiber officinale*)

Peste na tatamaan:

Aphids at repellent ng atang-ya at iba pang insekto.

Proseso:

Pakuluan ang 2 kilong dahon sa 10 litrong tubig. Kasama ang 2 pirasong sabon na perla. Pwede ring bayuhin at ibabad ito ng 8-24 oras.



Salain at gamitin agad.

Paggamit:

Ihalo ang 4 na litrong sabaw sa isang sprayer (16 litrong tubig) at ipambomba tuwing hapon sa loob ng 2-3 araw.

Paalala:

Maaari ding haluan ng ibang uri ng pangontra sa peste tulad ng gata ng niyog o tabako.

Source: ATI-RTC IV-B

PAMAMARAAN NG PAGGAWA NG

5 KLASSE NG CONCOCTION

1. FFJ (Fermented Fruit Juice)

- Gayatin ang 1 kilo ng prutas/gulay (kalabasa, saging, papaya) at isama ang 1 kilo ng molasses/mascuvado/brown sugar. Ilagay sa isang malinis na lalagyan (maaaring timba) at takpan ng walang tintang papel o malinis na puting tela.
- limbak sa loob ng 7 araw; pagkaraan, maaari na itong gamitin bilang sangkap sa inumin o pagkain ng hayop katulad ng baboy.
- Huwag higpitan ang tali upang makalabas ang hangin para makaiwas sa pagsabog.
- Para sa halaman, maglagay ng 2 kutsara sa 1 litrong tubig. Gamitin ng wala pang sikat ng araw at direkta sa dahon ng halaman. Paghaluin kasama ang FPJ at IMO, ipambomba sa dahon at lupa ng mga namumungang puno o halaman na malapit ng mamunga. Nakakatulong para makaiwas sa mga sakit ng halaman at makapagpatamis ng bunga dulot ng potassium.

- Para sa hayop, ihalo ang FPJ sa 1 litrong tubig. Nakakatulong para sa pagtunaw ng mga pagkain na kinain ng mga hayop.

IMO (Indigenous Microorganism)

- Ilagay ang isang kilong kanin sa isang malinis na lalagyan, takpan ng papel, at talian ng goma ang takip.
- Itabi sa loob ng 3-5 araw sa isang maaliwalas na lugar, malayo sa lugar na direktang nasisikatan ng araw.
- Pagkatapos ng 3-5 araw, tanggalin ang puting amag.
- Pagsamahin ang nakuhang puting amag at ang isang kilong molasses. Imbakin sa malinis na lalagyan sa loob ng 7 araw. Ito ay magiging malaputik na sabaw.
- Pagkaraan ng 7 araw, maaari na itong gamitin: 2 kutsara ng IMO sa 1 litro ng tubig at ipambomba sa sahig upang magkaroon ng 60% halumigmig (moisture).
- Nakapagbibigay ng pataba sa lupa, nakapagpaalis ng baho sa mga tae ng mga hayop at nakapagpapabilis makabulok ng mga basura.



- Nakapagbibigay ng maberdeng kulay sa dahon dulot ng nitrohenong nakuha mula sa mga sangkap.
- Nakapagpapabilis ng paglaki ng mga halaman.
- Iapply sa dahon ng halaman kapag hindi pa masyadong sumisikat ang araw o kaya 2 oras bago lumubog ang araw.

OHN (Oriental Herb Nutrient)

- Gayatin ang 5 kilo ng luya o bawang tagalog.
- Ilagay sa lalagyan kasama ng 2 grandeng bote ng beer at imbakin sa loob ng 12 oras.
- Ilagay ang 1 kilo ng molasses at imbakin sa loob ng 7 araw.
- Maaari pang gamitin hanggang 4 beses ang ginamit na sangkap sa paggawa ng OHN. Sa halip na beer, lambanog ang gagamitin na pangbabad, KUNG SA HALAMAN GAGAMITIN.
- Paghaluin ang 2 kutsarang OHN sa 1 litrong tubig at isama sa IMO at FPJ na pinaghalo at ispray sa dahon at lupa ng halaman kada isang lingo.
- Ito ay nakakatulong para makapagpataboy ng mga insekto at pamatay peste sa halaman.
- Nakakatulong para makaiwas sa mga sakit ang halaman.

FPJ (Fermented Plant Juice)

- Gayatin ang 2 kilong gulay/dahon. Pwedeng gumamit ng saha ng saging upang dumami ang sabaw at isama ang 1 kilong molasses/mascuvado/brown sugar sa isang malinis na lalagyan (gaya ng timba) at takpan ng walang tintang papel o puting tela.
- Imbakin sa loob ng 7 araw. Pagkaraan, ito ay maaari ng ilahok sa pakain.

FAA (Fish Amino Acid)

- Gayatin ang 1 kilong isda, o sariwang hasang at bituka o kuhol.
- Ilahok ang 1 kilong molasses sa lalagyan at iburo sa loob ng 20 araw.
- Pagkaraan ng 20 araw, salain at ito ay maaring ihalo sa pagkain ng mga alagang baboy.

Source: ATI-RTC IV-B

VERMICOMPOSTING

VERMICOMPOST PRODUCTION

What is Vermicomposting?

- Vermi - Latin word for worm
- It is simply means production of compost through action of earthworms

BENEFITS FROM VERMICOMPOST

- Vermicast, the end product is full beneficial microbes and nutrients
- It enrich soil with organic matter
- Vermicompost production can be a source of income of our farmers
- Vermimeal as feeds for fish pond

Vermicompost Analysis

BSWM October 2005

Total Nitrogen (N) %	-	1.65
Total Phosphorous (P ₂ O ₅) %	-	0.31
Total Potassium (K ₂ O) %	-	0.10

Total Calcium (CaO) %	-	3.65
Total Magnesium (MgO) %	-	0.76
Sodium (Na) %	-	0.03
Zinc (Zn) ppm	-	375
Copper (Cu) ppm	-	490
Manganese (Mn) ppm	-	1.088
Iron (Fe) ppm	-	19.485
Organic Carbon %	-	13.07

Characteristics of Earthworms

African night-crawler

- Hermaphrodite (male and female reproductive organ are present in each worm)
- Matures in 6 weeks
- Population doubles in about a month
- Temperature requirement 25-29 °C

STEPS IN VERMICOMPOST PRODUCTION

1. Select suitable site

- Shaded (25-29 °C), flood-free
- Accessible to water supply
- Accessible to source of compost materials



2. Gather and prepare compost materials

- Farm residues, garden or kitchen wastes
 - Rice straw, corn stovers
 - Animal manures
 - Vegetable trimmings and fruit peelings



Prepare compost materials

If necessary,

- Pulverize manures
- Shred/cut rice straw and corn stovers
- C/N ratio between 25-35
(Ex: 75% shredded rice straw/ corn stover + 25% fresh kakawate)



3. Prepare vermi-beds

- Enclose vermibeds, 1x1 m or larger with hollow blocks

- Place compost materials in vermibeds
- Water the compost materials about 65 % moisture content
- Mix the materials thoroughly



- Cover with plastic sheets etc. to start “anaerobic process” (1-2 weeks)

4. Stock the Earthworms

- 1 kilo of earthworms (about 1,000 pcs.)
- for every 1 m sq of vermibed that contains
- 100- 200 kilos of materials

5. Care and maintenance of vermi-beds

- At least 60 % moisture level
- Protect the earthworms from its predators



6. Harvest the vermi-compost.

- Harvest within 30-45 days
- Handpick or use screen to separate the earthworms

7. Properly pack and store vermi-compost

- Use bags or sacks
- Store in a cool dry place

Source: ATI-RTC IV-B

ORGANIC VEGETABLE PRODUCTION

Conventional vs. Organic Agriculture

Conventional agriculture:

- Relies much on the use of synthetic chemical inputs
- Concentrates on the heavy saturation of chemical nutrients and pesticides



- In order to promote fast and quick growth of plants, conventional agriculture, puts heavily on saturating plants with nitrogen and other micronutrients like phosphorous and potassium

Organic Agriculture

- It applies nutrients in the soil inorganic form which are broken down through the participation of microorganisms
- These microorganisms convert these organic materials into organic forms for the plants to absorb and use.
- It is feeding the soil not directly to the plants
- Living soil is made where plants are nourished to the maximum without degrading soil quality
- In this process microorganisms play a vital role in ensuring soil fertility that in effect brings in healthy growth of plants
- The living soil has abundance in organic matters and diverse microorganisms that provide continuous supply of nutrients to the plants in a sustainable manner

Steps in organic vegetable production

Seed selection - OPV, hyv if no opv in the area, seeds - not treated with chemical, pure and with good germination, not GMO

Site selection - area is free from contamination with chemicals

- water is available and safe
- not flooded w/ proper drainage
- available indigenous plants as source of nutrients for compost

Seedbed/seed box/seedling tray preparation

1. Sterilize the soil using sun drying, or treat with boiling water
2. Spray the soil with OHN (@ 2 tbs:1 liter OHN:water ratio)
3. Mix the soil media (1 part garden soil, 1 part carbonized rice hull)

and 1 part compost- either vermi compost, BOF, or other organic compost)

Prepare garden plots

1. Cultivate garden plots with a distance of 1 meter x desired length in an east west direction
2. Mix the plots with compost and carbonized rice hull

3. Sterilize the soil , spray with OHN
4. Practice mulching to avoid too much weeding
5. Dig a hole in 35 cm x 35 cm, put compost
6. Transplant the seedlings
7. Spray with Fermented Plant Juice

Source: ATI-RTC IV-B

Source: PCAARRD Information Bulletin No. 41/2014

ORGANIC

AMPALAYA PRODUCTION

INTRODUCTION

Bitter gourd (*Momordica charantia* L.), locally known as 'ampalaya' or 'amargoso', is also called African cucumber, alligator pear, balsam pear, bitter cucumber, bitter gourd, bitter melon (English), 'foo gwa yip', 'fugua' (Chinese), 'keveli' (Hindi), 'paria' (Indonesian), 'reishi' (Japanese), 'ssunoi' (Korea), 'peria' (Malaysian), 'periakatak', and 'mara' (Thai).

It is one of the most popular vegetables in the Philippines as well as in other Asian countries such as China, Taiwan, Vietnam, Thailand, and India. The plant is grown mainly for the immature fruits although the young leaves and tips are also edible.

USES AND NUTRITIONAL VALUE

The leaves and fruits are used as vegetables and are excellent sources of Vitamin B, iron, calcium, and phosphorus. It has twice the amount of beta-carotene found in broccoli and twice calcium content of spinach.

Slight soaking of the fruits in warm salty water before cooking removes some of the bitterness. The manner of cooking can also reduce bitter taste. Despite its bitter taste, it has become a popular nutritional drink for added vim and vigor.

Ampalaya has long been seen recognized for its potential as an adjunct or supplement to traditional therapeutic regimens in the treatment of diabetes mellitus. Other therapeutic claims include body detoxification (including removal of nicotine), strengthening of the immune system, and fertility regulation. It is also believed to possess astringent, vulnerary, parasiticide, anthelmintic, purgative, emetic, antipyretic, febrifuge, ammenagogue, cooling, and tonic properties.

Per 100 grams edible portion, the fruits contains:

Nutrient	Amount
Water (g)	93.5
Energy (g)	25.0
Protein(Kcal)	0.9
Fat (g)	0.4
Dietary fiber (g)	1.8
Carbohydrates (g)	4.5
Ash (g)	0.7
Calcium (mg)	42.0
Phosphorus (mg)	38.0
Iron (mg)	0.8
Vitamin A (µg)	33.0
Thiamine (mg)	0.05
Riboflavin (mg)	0.04
Niacin (mg)	0.2
Ascorbic acid (mg)	40.0

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

PRODUCTION MANAGEMENT

Ampalaya, in conventional production, is sprayed heavily with pesticides unlike in organic production. The major pest of ampalaya is fruity fly, which can be effectively and safely managed by bagging the fruits at the right stage. Infestation can also be reduced using fruit fly attractants.

Varieties

The common varieties in the Philippines are the Sta. Rita and the 'Native', although the light green and blocky types with broad shoulders which are generally recognized as the Chinese type, are becoming popular. Color varieties from white to dark green and wartiness range from jagged and triangular to smoothly undulating.

Soil and Climate Requirements

Bitter gourd grows best in well-drained sandy to sandy loam soils which are high in organic matter. Alluvial soil along the river beds is also good for production of bitter gourd. A pH range of 6.0-7.0 is considered optimum.

It is a warm-season crop adopted to low- and mid-elevation areas. A temperature range of 24-27 °C is considered optimum for vine growth. The seed germinates faster at temperature higher the 18 °C. High humidity at the time of vegetative growth renders the crop susceptible to various fungal disease.

Land Preparation

Plow and harrow the field crosswise once or twice set furrows at a distance of 1.5-4.0 m depending on the type of trellis that will be used.

Mulching

Plastic mulch can be used to suppress weed growth and conserve soil moisture. Use a 75-cm wide mulch to cover the beds. After making the raised beds and incorporating manure, lay on the plots the plastic mulch with the silver side up. To ensure that the plastic is well stretched, use it only during the warmest part of the day. Secure the ends and the sides with soil. Make holes 0.5-0.75 m apart using heated tin cans with handle. The plastic mulch can be used in three cropping to save on land preparation and weed control. Rice straw and grass clippings can also be used for mulching.

Planting

Seed requirement for one hectare is 2-3 kg. Pre-germinate the seeds by clipping the hard seed coats first to facilitate water absorption, then soak them in the water or roll in a wet rag overnight. Sow 1-2 pre-germinated seeds/hill in beds or furrows at a distance of

0.5-0.75 m. An alternative method is to grow the seedlings in plastic trays for 2 weeks, then transplant one seedling per hill. This saves time in field management and reduces seed requirement. Water the hills before and after sowing or transplanting.

Trellising

Bitter gourd needs strong overhead support for its growth. The plants trailed on trellises continue to give yield for 4-6 months as against 3-4 months when trailed on the ground without support, fruit quality is also better when trellised. In the double row system, plant at a spacing of 2.5 m x 1 m x 0.75 m. Prepare plots/raised beds 1 m between adjacent beds and 2.5 m apart between the twin beds. Provide irrigation canals between the twin beds. Put up bamboo posts along the beds at 3 m apart, 0.5 m deep and 2 m high. Set up braces at the end of the rows to further support the trellis. Tie a network or wires to connect the poles at the top then set up rows of wire or nylon string on the network wires running along the rows to support the vines in the overhead trellis. In the vertical portion of the trellis, layout 2-3 horizontal nylon strings and vertical straws (30 cm apart) to support the climbing vines, the vines take about 1.5-2 months to reach the top of the trellis, thus, at the initial stages of growth, the vines should be trained to crawl on the vertical trellis.

Another trellising method is the continuous overhead trellis with the 2-3 m apart and hills spaces at 0.5-1.0 m. the "A" type of trellis is also used. Grow permanent live trellis around the area such as 'madre cacao' (*Gliricidia sepium*) and 'malungay' (*Moringa oleifera*) as main posts for the trellis. The trimmings from these plants are a good source of nitrogen.

Pruning

Pruning of all branches below the overhead trellis is practiced in some parts of the country. However, it is recommended to prune only the weak and non-productive vines. Leave the vigorous vines for better yield quality.

Fertilization

Organic vegetable farming uses organic fertilizers and plant food supplements prepare from natural sources.

The fertilizer requirements depends on the target yield, variety, soil fertility, climate, and planting season. The general fertilizer recommendation per hectare is 50-100 kg N, 40-60 kg P₂O₅ and 30-60 kg K₂O. Generally, 3 t/ha of well-decomposed animal manure or vermicompost is mixed with the soil during plowing or in the hills basal before planting. Based on soil analysis, the balance can be applied as organic fertilizer splits at 3-4 weeks interval depending on season and growth of the plants. Compost tea, manure tea, and other natural farm inputs such as fermented plant juice (FPJ), fermented fruit juice (FFJ), fish amino acid (FAA), and calcium phosphate from egg shells can be also used.

To prepare manure tea, soak 3/4 sack (30kg) of dried cow or horse manure in a plastic drum with 180 L water. Soak for 5-7 days with frequent stirring.

To prepare FPJ, mix three parts chopped plant shoots or banana trunk with one part raw sugar or molasses. Ferment the mixture for 5-7 days. Dilute the FPJ or manure tea at one part tea to 20-40 parts water. Drench the plots with FPJ or use FPJ as foliar fertilizer. The rate and frequency of fertilization depend on the plants' vigor.

To prepare fermented fruit juice (FFJ), mix overripe fruits and peelings with 1/3 part raw sugar and molasses and ferment for 7 days.

For fish amino acid (FAA), mix fish trashes with equal part molasses. Ferment the mixture to around 2 weeks.

Calcium phosphate is prepared from egg shells, fish bone and animal bones. Char and grind these materials and mix with 10 parts natural vinegar then allow to stand for 2 weeks.

Irrigation

During the rainy season, irrigation is done only when needed. Irrigate one day before planting and at 4-5 days after planting. Subsequent irrigation is done at week intervals. It is necessary to maintain the moisture at the root zone to promote rapid taproot development. Mulching with rice straw, grass trimmings, or plastic can minimize moisture loss.

Weeding

Frequency of weeding is 2-3 times, with the first one done at 30 days after planting. Subsequent weeding is done monthly or as needed. Only light weeding is done if plastic mulch is used. Weeds between rows can just be trimmed to encourage presences of the natural enemies of insect pests.

PEST AND DISEASE MANAGEMENT

The most serious pest of bitter gourd is the fruit fly (*Bactrocera cucurbitae* [Conquillett]). The adult lays eggs on the fruit and the larva tunnels inside, causing deformation and fruit rot. Set up fruit fly traps with methyl eugenol and cue-lure, protein baits or a mixture of vinegar or 'tuba' (coconut wine) and molasses. Bag the female flower after pollination with nylon net for best control of the pest. Collect the affected fruits and bury them to prevent further spread.

Bacterial wilt is a serious soil-borne disease especially in upland areas. Plants wilt and die at the start of fruiting period. To control this disease at the start, graft bitter gourd with sponge gourd (*patola*), bottle gourd or wax gourd. Grafting bitter gourd is a viable option that enables the plant to resist bacterial wilt. Besides, the plant grows more vigorously and its picking period becomes longer.

Grow marigold, cosmos, basil, and amaranth around the area to repel insect pests. Basil is also a good fruity attractant. Place the basil leaves inside improvised plastic container with holes. Basils' strong aroma will attract fruit flies and once inside the container, they are trapped.

Pest and disease management options in ampalaya.

Pests	
Cucurbit beetle (<i>Aul-cophora similis</i>)	Dust seedlings with wood or rice hull. Spray with soap solution (4 tbsp soap/16 L water).
Aphids (<i>Aphis gos-sypii</i>)	Spray hot pepper (100 g macerated hot pepper/16 L water) and soap solution. Spray 'Langkawas' (<i>Alpinia pyramidate</i>) extract.
Fruit fly (<i>Bactrocera cucurbitae</i>)	Collect and bury infested fruits. Use fruit fly attractant such as methyl eugenol with cue-lure or 'tuba' (coconut wine) with molasses (2 parts 'tuba' and 1 part molasses). Wrap fruits with nylon net 1-2 days after the fruits have set.
Disease	
Cutworm (<i>Spodoptera litura</i>)	Spray with commercial preparations of <i>Bacillus thuringiensis</i> and Nuclear Polyhedrosis Virus (NPV). Collect NPV-infected cutworm larvae and store in the freezer for later use. These can be macerated then diluted at 12 infected larvae/16 L water. Langkawas extract can also be sprayed.
Ampalaya mosaic virus	Remove sources of inoculums.

Bacterial wilt	Rotate planting with non-host crops such as pole sitao. Plant in well-drained soils. Plant ampalaya after rice to reduce the chance of bacterial wilt infection. Graft seedlings with bacterial wilt resistant rootstock tea such as patola or wax gourd.
Downy mildew	Remove infected leaves. Spray with compost tea. Compost tea is prepared by soaking ½ sack (15 kg) of mature compost in ¾ drum (200 L capacity) of water for 5-7 days. Dilute the tea to 20 parts water and spray on the plants.
Little leaf	Remove nearby sources of inoculum such as other cucurbits (squash, patola) with little leaf. Practice crop rotation.
'Namamarako'	Use organic fertilizer. Spray with boron fertilizer following the recommended rates.

HARVESTING

Bitter gourd takes about 55-60 days from sowing to first harvest. Further picking should be done at 3 day intervals as bitter gourd mature very fast. Picking of the fruits at the right edible maturity stage depends on the kinds of varieties. Normally, the picking is done when the fruits are still tender and green so that fruits do not turn yellow or yellowish-orange during transport. Harvest in the morning and store the fruits under shade. With good management, harvesting can last for 4-5 months.

The yield of bitter gourd varies according to the system of cultivation, variety, season, and several other factors. With good management, bitter gourd can yield up to 30 t/ha under organic condition.

POSTHARVEST HANDLING AND STORAGE

Bitter gourd fruits are temporarily stored under shade before packing and transporting. The fruits are graded according to size and color before they are packed in plastic bags or crates. They can be stored at 4°C for 3 weeks. Do not mix organic produce with conventional harvests.

SEED PRODUCTION

Bitter gourd is cross-pollinated. It bears separate male and female flowers. To control pollination, plant in isolation at 500-800 m away from the other varieties of ampalaya. If isolating the crop is difficult, do a controlled pollination. Wrap the unopened petals of the male and female flowers from selected plants the day before the flowers open using a 2 cm x 2 cm piece of foil. The following day, collect the male and flowers and rub the anther to stigma of the female flower. Put back the aluminum foil. Tag the pollinated flower with a piece of string or plastic label.

If the number of seeds of several relatively uniform varieties are to be increased, do sibbing instead of just selfing. Sibbing is pollination among the plants within the same line or variety (genetic make-up). But in selfing, pollination is done within the same plant. Bagged male flowers from all the plants in the same line/variety are bulked and are used to pollinate the bagged female flowers in the same line/variety.

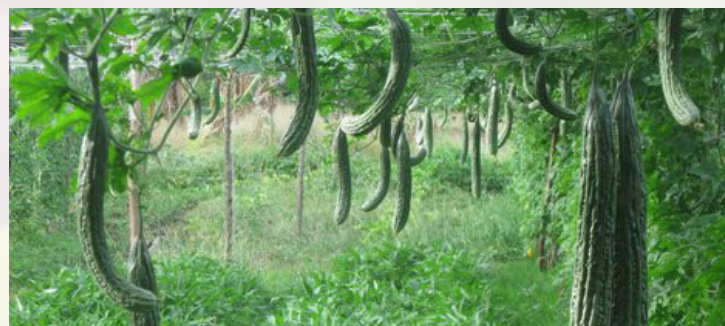
Harvest pollinated fruits at full maturity. Store the fruits until yellow. Scoop out the seeds and place in a plastic container. Let stand overnight to allow fermentation to remove the mucilage on the seeds. Wash seeds the following day. Air-dry the washed seeds, then sun-dry to around 10% moisture content (MC). To determine if the MC is acceptable, put about ½ kg seeds inside a plastic bag and expose to sunlight. If condensation occurs after 30 minutes, continue sun-drying the seeds. Pack the dry seeds in moisture-proof containers, label with the name of the variety and date of extraction

then store in a cool, dry place. If properly stored, seeds can remain viable for up to 2 years. Small quantities of seeds can be stored in the refrigerator.

Cost and return analysis for one season production of organic ampalaya.

Items	Total Amount (P/ha)
A. Labor (P250/MD;P500/MAD)	
Plowing (5 MAD)	2,500
Harrowing (3 MAD)	1,500
Furrowing/Bed Preparation (5 MD)	2,500
Organic fertilization application (10 MD)	2,500
Mulching film application (10 MD)	750
Planting (10 MD)	1,500
Trellising (6 MD)	
Fertilizer: spraying with FPFS and Bio Pesticide (10 MD)	2,500
Irrigation (20 MD)	5,000
Hilling up (4 MD)	1,000
Weeding (10 MD)	2,500
Vine Training (3 MD)	750
Harvesting (10 MD)	7,500
Miscellaneous (20 MD)	5,000
Sub-total	38,000
B. Materials	
Seeds (5 kg/ha)	18,750
Trellising materials	30,000
Organic fertilizer (2 t)	10,000
Mulching film (1.2 m x 400 m)	5,833
FPFS	2,500
Bio-pesticide	500
Net bags, crates, and knives	5,000
Miscellaneous	5,000
Sub-total	77,583
SUB-TOTAL (A+B)	115,583
C. Contingencies (15%)	17,337
Grand Total Cost (A+B+C)	132,920
Gross Income (range)^a	400,000-500,000
Net Income (range)	260,000-360,000
% ROI (range)	200-276%

^a With marketable yield of 20-25 t/ha at farm gate price of P20/kg; Cost are based on 2013 prices; FPFS – ferment plant food supplement; MAD – man-animal days; MD – man-days.



Lettuce PRODUCTION

INTRODUCTION

Lettuce (*Lactuca sativa* L.) is the most popular salad vegetable. Its high fiber content makes it an ideal vegetable for those who are conscious of their diet. Lettuce is easy to grow organically. However, most varieties are suited to cool and high elevation areas. Only few varieties are adaptable to low elevation.

NUTRITIONAL VALUE

Nutritional properties differ among lettuce types. Leafy types contain more micronutrients than heading types. Dark green types have more carotene, iron and Vitamin C. Crisphead or iceberg lettuce has lower nutritional values than butterhead types.

Per 100 grams (g) edible portion, the leaf contains.

Nutrient	Amount
Water (g)	94
Protein (g)	1.2
Fat (g)	0.2
Fiber (g)	0.2
Ash (g)	0.7
Energy value (kJ)	50

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

PRODUCTION MANAGEMENT

Varieties

There are seven varieties of lettuce. Distinguished by their morphologies and end uses. 1) Loose leaf, with a dense rosette of leaves arranged in a loose configuration; 2) Crisphead, with leaves that form in a tight, overlapping fashion; 3) Butterhead, with less compact and smaller leaves than the crisphead varieties; 4) Romaine or Cos, with upright, abalong clusters of coarse, thick leaves with large midribs that overlap into loose head-like structure; 5) Celtuce, stem lettuce or asparagus lettuce, grown for its thick, erect stem which is used as both raw or cooked vegetable; 6) Latin, with elongated leaves, and loose, semi-closed head; and 7) Oilseed lettuce, with seeds that yield up to 35% oil and is among the most popular ancient form of this crop.

The most popular locally is the Crisphead lettuce, which includes green and light green varieties. The loose-leaf type includes red, bronze, dark green, apple green, and chartreuse varieties.

Many leaf type varieties can be grown in low to high elevation sites, although yield and quality are better in cooler areas and season. Among the varieties that perform under organic condition are Estrosa and Lolo Rosanna Romaine. In low elevations, Xanadu is a consistently good performer. Only a few crisphead varieties can form heads under low elevations. Among these are President and Kaiser. Varieties that are not tolerant to high temperature tend to have bitter taste and bolt (flower) early.

Seedling Production

About 150-200 g of seeds are required per hectare. Prepare five seedbeds measuring 1 m x 10 m each. Pulverize the soil, incorporate 1 kg of fully decomposed chicken manure and 300 g carbonized rice hull per

square meter. Wet the seedbeds and make shallow lines 7-10 cm lines 7-10 cm apart. Soak the seeds in warm water for 4 hours, air-dry, and sow thinly. Cover lightly with soil and mulch with rice hull, chopped rice straw or coir fiber. Prick or plant to nursery trays at two-leaf stage. Water regularly. Provide partial shade during the dry season and rain shelter during rainy season. Harden seedlings 1 week before transplanting by decreasing the frequency of watering and by exposing fully to sunlight to minimize transplant shock. Transplant seedlings three weeks after pricking.

Land preparation

Plow and harrow the field twice. Prepare raised bed 0.75 m apart. Beds are 1.0 m wide and any desired length. Incorporate 1 kg of fully decomposed chicken manure and 300-g carbonized rice hull per square meter. Apply rice straw mulch or plastic mulch and make holes 30-40 cm apart in 2 rows/bed for Iceberg and 3 rows/bed for loose leaf. Rows 50 cm apart.

Roll out the plastic mulch with the silver side up. Secure one end by covering it with soil. At about 1 m before the end of the plot, pull the plastic mulch without rolling out to ensure that it is fully stretched. Cover the ends and the sides with soil instead of using bamboo clips. Make holes using heated tin cans 7-10 cm in diameter. The holes may be spaced at 30-40 cm between hills and 50 cm between rows. Allow the weeds to grow along the alleys for pest, soil, and mulch management.

Transplanting and Irrigation

Water the holes thoroughly. Transplant one seedling per hill. During sunny days, transplant in the afternoon to minimize shock. Replant missing hills at once. Lettuce has a shallow root system, thus, water needs to be available near the soil surface. Frequent watering is needed, commonly applied through overhead sprinklers or drip irrigation during the vegetative stages of growth. But even with drip irrigation systems, some growers still rely on overhead irrigation during early stages of growth so that plants develop large and vigorous frames. They then switch to drip system during the later stage of plant growth.

Fertilization

Organic vegetable farming uses organic fertilizers and plant food supplements prepared for natural sources.

Sufficient available phosphorus is important for early plant development. Nitrogen should be adequate to promote overall plant growth but not excessive to avoid weak plants. Lettuce has shallow roots, hence the nutrients should be available in the top 30 cm of soil. Soil pH should be between 6.0 and 6.5 cm to promote calcium availability.

Before transplanting, apply 3-5 t/ha of composed or decomposed animal manure. However, vermincompost is best. Apply manure tea and fermented plant juice (FPJ) once a week to increase plant vigor and resistance to pests and diseases.

To prepare manure tea, soak $\frac{3}{4}$ sack (30kg) of dried cow or horse manure in a plastic drum with 180 L water. Soak for 5-7 days with frequent stirring.

To prepare FPJ, mix three parts chopped plant shoots or banana trunk with one part raw sugar or molasses. Ferment the mixture for 5-7 days. Dilute the FPJ or manure tea at one part tea to 20-40 parts water. Drench the plots with FPJ or use FPJ as foliar fertilizer. The rate

and frequency of fertilization depend on the plants' vigor.

To prepare fermented fruit juice (FFJ), mix overripe fruits and peelings with 1/3 part raw sugar and molasses and ferment for 7 days.

For fish amino acid (FAA), mix fish trashes with equal part molasses. Ferment the mixture to around 2 weeks.

Calcium phosphate is prepared from egg shells, fish bone and animal bones. Char and grind these materials and mix with 10 parts natural vinegar then allow to stand for 2 weeks.

Pests and Disease Management

Semi loopier and aphids are major pests of lettuce. Prepare hot pepper spray solution by mixing 100 g macerated hot pepper in 16 L water. Add 1 tbsp soap and uses botanical spray against these two pests. Bacterial rot can be minimized by mulching and solar sterilization of prepared before transplanting.

Rhizoctonia solani is a common, soil borne fungus that often causes bottom rot near maturity when leaves are touching the soil. Rust-colored lesions followed by secondary rots are typical symptoms. Practice good drainage and growing on raised beds to control disease.

Calcium deficiency resulting in leaf tip burn or blackheart symptoms is a problem when the crop is under stress, usually form insufficient of irregular water availability as low soil pH.

Harvesting and Postharvest Handling

Harvest Crisphead lettuce at 45-60 days from transplanting or when heads are relatively firm. Loose leaf lettuce can be harvested as needed but before bolting. Romaine lettuce is harvested based on market requirement. In large scale farms, the lettuce heads are packed immediately in perforated cardboard boxes or plastic crates, bottom side up. If available, vacuum cooling 1°C is best. Transport at 4°C.



Cost and return analysis for one season production of organic lettuce.

Items	Total Amount (P/ha)
A. Labor (P250/MD;P500/MAD)	
Plowing (5 MAD)	2,500
Harrowing (3 MAD)	1,500
Bed Preparation (5 MD)	2,500
Organic fertilization application (10 MD)	2,500
Seedling Production (15 MD)	3,700
Mulching film application (10 MD)	2,500
Transplanting (10 MD)	2,500
Fertilizer: foliar spraying (10 MD)	2,500
Irrigation (20 MD)	5,000
Weeding (10 MD)	2,500
Harvesting (10 MD)	2,500
Miscellaneous (20 MD)	5,000
Sub-total	32,250
B. Materials	
Seeds (200 kg/ha)	13,400
Mulching film (1.2 m x 400 m)	12,500
Organic fertilizer (2 t)	10,000
FPFS	2,500
Bio-pesticide	500
Miscellaneous	10,000
Sub-total	48,900
SUB-TOTAL (A+B)	84,150
C. Contingencies (15%)	12,622
Grand Total Cost (A+B+C)	96,772
Gross Income (range)^a	400,000-480,000
Net Income (range)	223,227-383,227
% ROI (range)	230-296%

^a With marketable yield of 10-12 t/ha at farm gate price of P40/kg; Cost are based on 2013 prices; FPFS – ferment plant food supplement; MAD – man-animal days; MD – man-days.

Source: PCAARRD Information Bulletin No. 42/2014

ORGANIC

Pole Sitao PRODUCTION

INTRODUCTION

Pole Sitao (*Vigna unguiculata* (L.) Walp. cv. Group Sesquipedalis) is also known as asparagus bean, Chinese long bean, garter bean, snake bean, yard long bean (English), 'tao-fak-yao' (Thai), 'kacangpanjang' (Indonesian, Malaysian), 'daudau' (Vietnamese), 'lobia' (Hindi), 'daugok' (Chinese), and 'sasage' (Japanese). Locally, it is known as 'sitao' in Tagalog, 'utong' in Ilocano, 'hantak' in Waray, 'batong' in Cebuano and 'latuy' in Marinduque. It is a climbing herbaceous crop raised primarily for its pods, although shoots and young leaves are also edible. Pods are slender, 30-60 cm long and somewhat inflated with many seeds whose color depends on the variety. It is a subtropical/tropical plant that is widely grown in Southern Asia.

USES AND NUTRITIONAL VALUE

The succulent young pods of pole sitao can be steamed, sautéed, buttered or cooked along with other vegetables. The nutritional value of pole sitao is presented below.

Per 100 grams (g) edible portion, the pods contains:

Properties	Amount
Water (g)	88.9
Energy (kcal)	43.0
Protein(g)	3.1
Fat (g)	0.2
Dietary fiber (g)	2.2
Carbohydrates (g)	7.2
Ash (g)	0.6
Calcium (mg)	61.0
Phosphorus (mg)	47.0
Iron (mg)	0.9
Vitamin A (µg)	42.0
Thiamine (mg)	0.12
Riboflavin (mg)	0.11
Niacin (mg)	1.0
Ascorbic acid (mg)	22.0

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

PRODUCTION MANAGEMENT

Pole sitao is easy to grow organically. However, conventional growers spray a lot of pesticides even at the seeding stage. Such practice sets the stage for more destructive pod borer infestation. To grow pole sitao organically, use varieties suitable for organic conditions, avoid mono-cropping, and grow plants such as cosmos, marigold, lemongrass, ginger, and pigeon pea around the area. These plants can help minimize pest infestation.

Varieties

Among the varieties that can grow well under organic conditions are CSL 19, Sandigan, and Acc 228. Among the new potential varieties selected under the project “Variety Development, On-farm Trials and Seed Production of Organic Vegetables in Southern Luzon” funded by DOST-PCAARRD are 0116-1-1-0-0, 1096-1-1-0-0, 10421-0-0, and 0801-5-1-1-0.

Climate and Soil Requirements

Pole sitao is well adopted to lowland tropics at a temperature range of 20-30 °C. It grows best under full sunlight although it can tolerate partial shading. Adequate water supply and friable, fertile soil promote healthy growth and good quality pods.

Planting is done in October and November to achieve higher percentage of pod set. Although it can be grown throughout the year, some varieties tend to be overly vegetative during wet season.

Land Preparation

Plow and harrow the field twice. For single row planting, make furrows 0.75 m apart and dig shallow holes 30 cm apart along the furrows. For double row planting, prepare raised beds 20 cm and 1-m wide. Dig holes 30 cm between hills and 30 cm between rows. Mix decomposed animal manure well and/or compost during bed preparation.

Plastic mulch may be used to suppress weed growth and conserve soil moisture. After making the raised beds and incorporating manure, roll out the plastic mulch with the silver side up. Secure one end by covering it with soil. At about 1 m before the end of the plot, pull the plastic mulch without rolling out to ensure that it is fully stretched. Cover the ends and the sides with soil instead of using bamboo clips. Make holes using heated tin cans 7-10 cm in diameter. The holes may be spaced at 30-50 cm between hills and 50 cm between rows. The plastic mulch can be used for up to four cropping, which saves on land preparation and weed control activities.

Planting

One hectare of pole sitao requires 10-kg seeds or 10 g/10 m². After basal fertilization with organic fertilizer, directly sow 2-3 seeds/hill, cover lightly with soil, and apply mulch using grass clippings or rice straw. If plastic mulch is to be used, sow 2-3 seeds/hole and cover lightly with soil.

It is best use to pole sitao as rotation crop to the other non-legumes that also require trellis such as cucumber. This way, the trellis can be reused. Intercropping should also be done to prevent build-up of pests. Lemongrass, cosmos, marigold, and other such as plants can be also be planted for the same purpose.

Trellising

Vertical trellis is used for sing row plots. Use bamboo poles 3 m apart along the rows and secure them on top with GI wire. Use nylon string or synthetic straw at two to three lines parallel to the GI wire at the top. Tie straw lines vertically 25 cm apart. For double row plots, use A-type trellis. A network of wires and straws can be also used for the pole sitao vines to cling on.

Use permanent live trellis such as ‘madre cacao’ and

‘malungay’ as main post for the trellis. Trimmings from these plants will serve as source of nitrogen. The trellis can also serve as habitation for the spiders for better pest management.

Fertilization

Organic vegetable farming uses organic fertilizers and plant food supplements prepared from natural sources.

The general fertilizer recommendation for sole sitao is 135 kg/ha N, 135 kg/ha P₂O₅ and 112 kg/ha K₂O. The rate may vary depending on the results of soil analysis. Use well-decomposed animal manure or vermicompost at 3-5 t/ha will contribute an equivalent of 60-100 kg NPK and micronutrients. The balance can be supplied from available nutrients in the soil, N fixation, side dressing with organic fertilizers, drenching with manure tea, and use of natural farm inputs such as fermented plant juice (FPJ). Fermented fruit juice (FFJ), fish amino acid (FAA), and calcium phosphate.

To prepare manure tea, soak 3/4 sack (30kg) of dried cow or horse manure in a plastic drum with 180 L water. Soak for 5-7 days with frequent stirring. To prepare FPJ, mix three parts chopped plant shoots or banana trunk with one part raw sugar or molasses. Ferment the mixture for 5-7 days. Dilute the FPJ or manure tea at one part tea to 20-40 parts water. Drench the plots with the diluted solution or use it as foliar fertilizer. The rate and frequency of fertilization depend on the plants’ vigor.

To prepare FFJ, mix overripe fruits and peelings with 1/3 part raw sugar and molasses and ferment for 7 days. For FAA, mix fish trashes with equal part molasses. Ferment the mixture for around 2 weeks.

Calcium phosphate is prepared from egg shells, fish bones and animal bones. Char and grind these materials and mix with 10 parts natural vinegar then allow to stand for 2 weeks.

Irrigation

Pole sitao requires constant supply of moisture throughout the growing period. Regular watering will increase flowering and pod setting. Avoid too much water that can cause root rot and too water that can result in flower and pod drop.

Weed management

Keep the plants weed-free from planting up to the third week. Hill up after 3 weeks to cover the side-dressed organic fertilizer and suppress weed growth. Regular spot weeding is recommend but a minimum level of weed growth maybe allowed along the alleys to protect the soil. With plastic mulch, hilling up is not necessary.

PEST AND DISEASE MANAGEMENT

Pole sitao is a host to many pests and disease, but this can be controlled using botanical pesticides, bio fungicides, bio pesticides, bio insecticides, and other cultural management schemes.

Pest and disease management options in pole sitao.

Pests	
Beanfly (<i>Ophiomya phaseoli</i>)	Spray with soap solution (4 tbsp soap/16 L water).
Aphids (<i>Aphis craccivora</i>)	Spray with hot pepper extract (100 g macerated hot pepper/16 L water) and soap solution. Use ‘Langkawes’ (<i>Alpinia pyramidata</i>) extract spray.
Leafhopper	Avoid clean culture. Spray with soap solution or Metarrhizium. To prepare Metarrhizium culture, mix sterilized palay and conidial suspension thoroughly. Incubate mixture for 1-2 weeks. Prepare conidial suspension

	for spraying by adding 200 mL of 0.05% soap solution (a mixture of 0.5 g all-purpose detergent and 1 L water) to each bag of palay substrate. Place 1000 L of the conidial suspension in the spray tank and bring the water level to 16 L. Five bags of 200 g palay substrate yield 1 L spore suspension. Spray early in the morning (around 6-8 a.m.) or late in the afternoon (around 4-6 p.m.) to avoid desiccation of the spores.
Pod borer	Grow repellent crops such as basil, onion, and marigold around the planting area. Spray with commercially available <i>Bacillus thuringiensis</i> (Bt) or Nuclear Polyhedrosis Virus (NPV). Collect NPV – infected pod borer larvae and store in the freezer for later use. These can be macerated then diluted at 12 infected larvae/6 L water. Spread
	earwigs to feed on pod borers.
Leaf miner	Conserve natural enemies such as spiders, lacewings, and syrphid flies. Intercrop with okro, eggplant. Tomato or other suitable vegetables. Maintain low weed population along alleys to minimize the pest.
Disease	
Pole sitao mosaic virus	Use resistant or tolerant varieties such as Sandigan and CSL-19.
Cowpea rust	Use resistant varieties such as Sandigan and CSL-19. Prune infected leaves.
Fusarium root rot	Use resistant varieties such as Sandigan. Plant in well-drained soils. Practice crop rotation with other crops except legumes.

The recommend organic varieties, 0116-1-1-0-0, 1096-1-1-0-0, 10421-0-0 and 0801-5-1-1-0 are resistant tolerant to pests and diseases. Sandigan and CSL-19 are also generally good for organic conditions. Use biological sprays only as a last resort. Other measures include crop rotation, planting of pest repellent crops and attractants of the beneficial insects, pruning of infected plant parts, rouging of severely infected plants, and providing adequate space between plants for good air circulation.

HARVESTING

Pole sitao is harvested 50-60 days from planting, depending on the pod diameter and toughness permitted in the market. It is harvested by hand every 3-4 days for up to 30 times during the growing season. Harvest early in the morning (6-8 a.m.) to avoid weight loss. The harvest should be kept under the shade and handles properly to prevent bruising.

POSTHARVEST HANDLING

Classify pods are marketable and non-marketable. Grade marketable pods according to size and quality. First grade pods are unblemished, tender, straight, long, and at the right maturity. Second grade pods are short, have minimal blemishes and distortion, and slightly over the picking stage. Unselected pods are considered non-marketable but can still be consumed. Optimum storage conditions are 5-7.5 °C and 95-100% relative humidity. Soaking the pods in coconut water can help prolong shelf life.

Packing

Pack harvested pods in thickly-lined bamboo baskets or plastic crates to minimize damage. Wrapping the pod bundles with fresh banana leaves also helps protect the pods and prolong shelf life.

Seed Production

Pole sitao is self-pollinated. Select plants that are vigorous and free of damage from pests and diseases. Allow pods to dry and turn brown before harvesting. Select dry pods from the middle portion and hang pods for further drying. Pods that are harvested 20 days after pollination will give the best quality seeds.

Extract seeds and sun-dry to around 10% moisture content. To determine if the moisture content is acceptable, put ½ kg seeds inside a plastic bag and expose it to sunlight. If condensation occurs after 30 minutes, continue sun drying the seeds. Pack the dry seeds in moisture-proof containers, label with the name of the variety and date then store in a cool, dry place. If properly stored, seeds can remain viable for up to 2 years. Small quantities of seeds can be stored in the refrigerator. Seeds may be treated with dry wood ash or rice hull ash to protect against weevil. Chopped or powdered turmeric may be added. Repeat wood ash treatment for three consecutive weeks if weevil infestation is high.

Cost and return analysis for one season production of organic tomato.

Items	Total Amount (P/ha)
A. Labor (P250/MD;P500/MAD)	
Plowing (5 MAD)	2,500
Harrowing (3 MAD)	1,500
Planting (4 MD)	1,000
Organic fertilization application (10 MD)	2,500
Irrigation (20 MD)	5,000
Hilling up (4 MD)	1,000
Trellising (6 MD)	1,500
Vine training (3 MD)	750
Weeding (10 MD)	2,500
Spraying of FPFS (10 MD)	2,500
Harvesting (10 x 30 MD)	7,500
Miscellaneous (20 MD)	5,000
Sub-total	33,250
B. Materials	
Seeds (15 kg/ha)	9,000
Trellis materials	30,000
Organic fertilizer (2 t)	10,000
FPFS	2,500
Bio-pesticide	500
Net bags, crate, and knives	5,000
Miscellaneous	5,000
Sub-total	62,000
SUB-TOTAL (A+B)	92,250
C. Contingencies (15%)	14,287.50
Grand Total Cost (A+B+C)	109,537
Gross Income (range)^a	250,000-375,000
Net Income (range)	140,462.50-265,462.50
% ROI (range)	128.23-242.35

^a With marketable yield of 10-15 t/ha at farm gate price of P20/kg; Cost are based on 2013 prices; FPFS – ferment plant food supplement; MAD – man-animal days; MD – man-days.

ORGANIC

Tomato PRODUCTION

INTRODUCTION

Tomato or 'kamatis' is the most popular fruit vegetable in the world. It originated from South America then spread around the world after the Spanish colonization. Its many varieties are now widely grown throughout the world, often in greenhouses, in cooler climates. Its belongs to the solanaceous or nightshade family. Its scientific name is *Lycopersicon esculentum*. The Aztecs called the fruit 'xitomatl', meaning plump thing with navel. Other Mesoamericans including the Nahuas, called it *tomalt*, which later became tomato.

USES AND TYPES OF TOMATO

The tomato is consumed in many ways, as raw fruit or as salad, as an ingredient in many dishes, and as drinks. It is also processed into paste for sauces, dried or canned whole. Tomatoes contain the carotene lycopene, one of the most powerful natural antioxidants. Lycopene is known to improve the skin's ability to protect itself against harmful ultraviolet (UV) rays.

The table type tomato variety is used for cooking, preparing salad and processing. An example of this is the cherry tomato. Most of the varieties commercially grown today are hybrids leading to the genetic erosion of the landraces and open-pollinated varieties are still available including the farmer-saved cultivars, Apollo, and Del Monte. Among the varieties developed for organic conditions are 10162 and 10170.

SOIL AND CLIMATE REQUIREMENTS

Tomato can grow well in wide range soil types but sandy loam soil with good drainage is best. A pH from 6 to 6.8 is ideal. Tomato requires cool and dry conditions for better growth. Fruit setting is adversely affected by high temperature. The incidence of foliar diseases is a big problem under wet and humid conditions.

In areas with low elevation, particularly in Luzon, tomato is planted from October to March to take advantage of the dry and cool weather conditions. In areas with medium elevation such as in Laguna, Quezon, and Nueva Viscaya, planting is done from January to February and July. May to September is the planting schedule in Bukidnon. This is to take advantage of the low supply of tomato during the wet season.

PRODUCTION MANAGEMENT

Seedbed Preparation

The nursery should be in an open area and near a sufficient water supply. The soil is preferably loam to assure good drainage. Form raised bed 20-30 cm high and 90 cm wide. The length will vary from one area to another depending on the shape and orientation of the land. For a seeding rate of 400 g/ha, maintain a net area of 260 m² nursery. For small areas, sow seeds in clay pots or seed boxes and prick later to nursery trays or 'lukong' (rolled banana leaves).

A good soil medium for seeding production is mixture of vermicompost/compost, coir dust, and carbonized rice hull or 'kuntan'. To protect the seedlings from heavy rains, place plastic roofing over the seedbeds.

Sowing

Water thoroughly the seedbed before sowing; either with tap water or vermitea. Make small furrows across the bed, 2-4 cm deep, depending on soil type, and 15 cm between furrows. Sow the seeds at a distance of 2.5 cm (1 inch) along the furrows then cover with thin layer of compost. Cover the seedbed with paper, coconut coir or rice straw mulch. If rice straw hull is used, maintain 1.0 cm thickness. For rice straw,

thickness should be just enough to cover the surface to free the emerging seedling and remove after 4-5 days upon emergence. Water the seedbed daily.

Care of Seedlings

Seedling start to emerge 5-6 days after sowing, they fully emerge after 10 days. Practice thinning to have uniform, vigorous seedlings. Start thinning as the first true leaves appear by leaving only one seedling for every 2.5 cm distance. For seed boxes, after germination, prick the seedlings by transferring them into a tray or seed box to allow more space between seedlings and prevent damping-off. In the absence of seedling tray or seed box, used rolled paper pots or rolled banana leaves.

Water the seedlings in the morning or mid-afternoon. Watering late afternoon or evening favors development of damping-off. Harden seedlings by reducing watering and exposure to sunlight one week before transplanting. Spray oriental herbal nutrient (OHM) and vermitea, if necessary.

Land preparation

Plow two to three times with an animal-drawn plow at 20-30 cm deep, then after harrow after each plowing. Make furrows at 0.75-1.0 m apart for determinate and semi-determinate varieties and 1.5 m for indeterminate varieties. Place a handful of vermicompost or compost per hill at transplanting. For home gardens, 0.75 m wide raised beds may be used.

Transplanting

Select healthy seedlings with 3-5 leaves, three to four weeks after seedling emergence. Transplant one to two seedlings per hill spaced 30-40 cm apart. Press the soil gently around the base of the seedlings. Water immediately after transplanting. Tomato can also be planted in plastic bags or clay pots, if the area is limited. Replant missing hills 5-7 days after transplanting. Mulch seedlings with rice straw or use plastic.

Fertilization

Organic vegetable farming uses organic fertilizers and plant food supplements prepared from natural sources.

The total nutrient requirement of tomato per hectare is 100 kg N, 150 kg P₂O₅, and 150 kg K₂O. To meet this requirement, apply vermicompost, compost or well decomposed animal manure at 3-5 t/ha or around a handful per hill. Spray foliar fertilizers such as vermitea, fermented plant juice (FPJ), fermented fruit juice (FFJ), fish amino acid (FAA), and water soluble calcium at 1-2 weeks interval depending on the plant's vigor. Vermicompost maybe side-dressed 1-1 1/2 months after transplanting.

To prepare manure tea, soak 3/4 sack (30 kg) of dried cow or horse manure in a plastic drum with 180 L of water. Soak for 5-7 days with frequent stirring. To prepare FPJ, mix three parts of chopped plant shoots or banana trunk with one part of raw sugar or molasses. Ferment the mixture for 5-7 days. Dilute the FPJ or manure tea at one part tea to 20-40 parts water, then drench the plots or use as foliar fertilizer. The rate and frequency of fertilization depend on the plants' vigor. To prepare FFJ, mix overripe fruits and peelings with 1/3 part raw sugar and molasses and ferment for 7 days. For FAA, mix fish trashes with equal part molasses. Ferment the mixture for around 2 weeks.

Vermitea is prepared by brewing a kilogram of vermicompost

in 30 L water with ½ of sugar for 24 hours. Continuous aeration and agitation is required to maintain aerobic condition and extraction of microorganisms.

Trellising

Trellising is recommend in growing semi-determinate and indeterminate varieties. Use available materials such as bamboo or ipil-pil poles as posts. Tie the branches to the posts and train the vines using plastic straw. An 'A' type trellis is best.

Irrigation

Depending on the weather and soil conditions, water the plants regularly or as needed. Mulching can help conserve soil moisture.

Weeding

Remove the weeds near the base of the plants to minimize competition. Mulching with rice straw can help minimize weeds. For larger areas, use black plastic mulching film. Trim weeds along the rows but do not remove them completely to protect the soil and to encourage natural enemies of tomato pests.

PEST AND DISEASE MANAGEMENT

Practice crop rotation to prevent build-up of pests and disease. Do this by planting non-solanaceous vegetables after the tomato cropping cycle. Grow cosmos, marigold, zinnia, lemongrass, as well as basil around the area to attract natural enemies (e.g., ladybird beetles, lacewings. Syrphids flies, and *Trichogramma* wasps) of crop pests need shelter, pollen, nectar, and food prey to survive.

Pest and disease management options in tomato.

Pests	
Aphids	Spray with hot pepper extract (100 g macerated hot pepper/16 L water) and soap soluble (4 tbsp soap/16 L water). Use commercially available neem soap.
Fruit fly	Use fruit fly attractant such as methyl eugenol, basil or 'tuba' (coconut wine) with molasses (two parts tuba and one part molasses).
Fruit worm (<i>Helicoverpa armigera</i>)	Grow repellant crops such as basil, onion, and marigold. Clip off the affected shoots along with the larva inside. Use pheromone traps to attract males, thereby reducing
Fruit worm (<i>Helicoverpa armigera</i>)	Grow repellant crops such as basil, onion, and marigold. Clip off the affected shoots along with the larva inside. Use pheromone traps to attract males, thereby reducing fertilization and consequently, insect pest population. <i>Trichogramma</i> is also effective in parasitizing the eggs of its host, thereby preventing the growth of the insect pest. Also, spray with commercial preparations of <i>Bacillus thuringiensis</i> (Bt) or Nuclear Polyhedrosis Virus (NPV). Collect NPV-infected larvae and store in the freezer for later use. These can be macerated then diluted at 12 infected larvae/6 L water.
Leaf miner	Conserve natural enemies like spiders, lacewings, and syrphid flies. Intercrop with okra, eggplant, tomato or other suitable vegetables. Maintain low weed population along alleys to minimize pest.
White fly (<i>Bemesia tabaci</i>)	Spray "Perla" soap solution (4 tbsp soap/16 L water or oriental herbal nutrient (OHN)) preparations. OHN is made from plants and herbs such as garlic, ginger, chili (siling labuyo), and neem seeds. For crop production, garlic and ginger have anti-fungal and anti-bacterial properties. Neem controls insects.
Disease	
Bacterial wilt (<i>Ralstonia solanacearum</i>)	Use resistant varieties. Avoid planting after other solanaceous crop such as potato, eggplant, and pepper. Use compost and vermicompost can help minimize the disease.

Blossom-end rot	Avoid fluctuation in soil moisture. Spray water-soluble calcium at flowering stage.
Late blight	This disease is severe in mid and high elevation areas especially during wet season. Vermicompost tea spray and wood vinegar can help minimize the disease if applied early in the season.
Tomato leaf curl virus	Use resistant varieties.

HARVESTING

Tomato is best harvested when red-ripe for best quality. However, for long distance transport, harvest the mature green or pink-blushed fruits early in the morning. Place the harvest in plastic crates or bamboo crates lined with banana leaves or used newspaper to prevent mechanical damage to the fruits. Avoid over or under packing. Removed bruised and damaged fruits. Pack together fruits with similar maturity in one container.

SEED PRODUCTION

Tomato is self-pollinated and is easy to seed-produce. Grow the crop as in fresh tomato production but with stricter measures on the control of seed borne diseases and removal of off-types through rouging.

After rouging at fruiting stage, select the best plants (30-50) as source of stock seeds. Separate the fruits and seeds harvested from these plants for the next cycle of seed and fresh fruit production.

Harvest the fruits when fully mature. Do not include the disease fruits. Allow the fruits to ripen further before seed extraction. For larger seed extraction, place the fruits inside net bag or sacks. Trample on the bag to squeeze off the seeds from the fruits. Place in plastic containers and ferment for 12-48 hours to degrade the gel on the seeds. For smaller volumes, cut the fruits and scoop out the seeds and ferment. Do not add water.

After fermentation, wash the seeds thoroughly in clean water to remove the debris and other clinging matters. Air-dry in a cheese cloth or net bag or spin-dry for several minutes in a spin dryer to hasten air-drying. Sun-dry for several days to about 8-10% moisture. Store in airtight and moisture-proof container. Label properly with variety/cultivar name, date of processing, and lot numbers, if any.

Cost and return analysis for one season production of organic tomato.

Items	Total Amount (P/ha)
A. Labor (P250/MD;P500/MAD)	
Plowing (5 MAD)	2,500
Harrowing (3 MAD)	1,500
Bed preparation (5 MAD)	2,500
Seedling production (15 MD)	3,750
Mulching film application (20 MD)	2,500
Planting (10 MD)	2,500
Organic fertilization application (10 MD)	2,500
Irrigation (20 MD)	5,000
Fertilization: spraying with FPFS and Bio-pesticide (10 MD)	
Weeding (10 MD)	2,500
Vine training (8 MD)	2,500
Harvesting (24 MD)	2,000
Miscellaneous (20 MD)	6,000
	5,000
Sub-total	40,750
B. Materials	
Seeds (200 g/ha)	2,000
Trellis	30,000
Organic fertilizer (3 t)	15,000
FPFS	2,500
Bio-pesticides	500
Mulching film (1.2 x 400 m)	12,500
Net bags, crates, and knives	5,000
miscellaneous	5,000

	Sub-total	72,500
SUB-TOTAL (A+B)		113,250
C. Contingencies (15%)		16,987
Grand Total Cost (A+B+C)		130,237

Gross Income (range) ^a	200,000 – 300,000
Net Income (range)	69,762.50 – 169,672
% ROI (range)	53.57/130.35%

^a With marketable yield of 10-15 t/ha at farm gate price of P20/kg; Cost are based on 2013 prices; FPFS – ferment plant food supplement; MAD – man-animal days; MD – man-days.

Source: UPLB, PCAARRD Information Bulletin No. 285/2012

SEED PRODUCTION OF EGGPLANT

VARIETY DESCRIPTION (fresh)

Mestisa

- potential yield: 30 tons/hectare (t/ha)
- maturity: 55 days after transplanting (DAT)
- fruits: medium long, striped light violet, have 1 week storage life, very good for “Pinakbet”
- resistant to bacterial wilt, and moderately resistant to fruit borer,
- leafhopper, and phomopsis
- ideal for organic production
- IPB-released variety

Mara

- potential yield: 15 t/ha
- maturity: 52 DAT
- fruits: medium purple, shiny, medium long, with good storage life
- resistant to green leafhopper, moderately resistant to bacterial wilt
- NSIC-released variety

ENVIRONMENTAL REQUIREMENTS

- Eggplant (*Solanum melongena* L.) belongs to the family of Solanaceae.
- It can be produced throughout the year, but it is best planted at the tail end of the rainy season. This will coincide with the long dry months of the year, promoting better fruit maturation and harvesting, and avoiding fruit rotting.
- Grows best with temperature range of 22°C-32°C. At extreme temperatures of 15°C and below, and 33°C and above, flower fertilization and yield are significantly reduced.
- Tolerates drought and excessive rainfall better than its relatives, tomato and pepper.

CULTURAL MANAGEMENT

Seedbed Preparation

- Prepare a seedbed, seedbox, or tray.
- Mix 1:1:1 garden soil, compost and sand, or 1:1 garden soil and coir dust.
- Sterilize by heat, or drench the soil
- Mix with fungicide solution.
- Saturate the soil with water.
- Make horizontal rows 5 cm apart.
- Sow the seeds in rows. Cover the seeds with soil, put mulch, and water gently (200–300 g of seeds is needed per hectare).

Pricking

- Prick the seedlings .5 days from seedling emergence, or when the cotyledons have fully opened and true leaves have appeared.
- For pricking in seedbeds, make raised beds 1-m wide.
- Sterilize the soil by drenching with insecticide-fungicide solution to protect the seeds from ants and damping-off.
- Prick the seedlings 5 cm x 5 cm apart.
- Construct polyvinyl plastic or protective structure to protect the seedlings from rain.
- During hot days, provide a shade above the seedbed to protect newly-pricked seedlings, and remove the structure as soon as the seedlings are established to avoid pale and lanky seedlings.
- Pricking could also be done in seedling/plug trays with individual ‘cells’. Prick one seedling per ‘cell’.
- Reduce watering 1 week before transplanting to harden the seedlings

Land Preparation

- Prepare the land thoroughly by mechanical means or with the use of animal-drawn implements.
- Make sure to break big clods of soil.
- Make furrows 75 cm apart.

Transplanting

- Transplant one seedling per hill 3–4 weeks from pricking or 1 week after hardening. Seedlings for transplanting should be 3–4 inches high with 4–6 leaves.
- Transplant seedlings 50–75 cm between hills and 75–100 cm between rows.
- Irrigate the field immediately.
- Transplant during cool or cloudy days, or late in the afternoon to avoid excessive heat during planting.

Irrigation

- Follow furrow irrigation.
- Irrigate every 10 days during dry season and when needed during rainy season.
- If drainage is poor, construct a canal.

Weed Control and Management

- Mulch with rice straw or black plastic sheets to reduce weed population.
- Do not allow the weeds to flower and bear seeds.
- Cut tall weeds if the plants are in the vegetative stage.

Insect Pest Management

- Plant insect repellent plants like Amarillo, ginger, 'kutsai', and other aromatic plants.
- Use organic pesticides like the juice of native hot pepper and soap.
- Control fruit and stem borer by releasing earwigs, known predator of insect pests.
- Spray recommended insecticides only if needed.

Disease Management

- Prevent bacterial wilt by planting after rice or by crop rotation.
- Prevent phomopsis by mulching with rice straw or black plastic sheet which prevents the soil to come in contact with the leaves and fruits.
- Avoid producing the seeds during wet season.

Isolation

- To avoid cross pollination with other eggplant varieties, maintain an isolation distance of at least 200 m.

Roguing

- Remove not true-to-type plants or plants of other eggplant varieties.
- Rogue out plants that are infected with virus and remove fruits infected with phomopsis and anthracnose.

Harvesting

- Harvest when fruits have turned yellow-brown and have lost the pale violet color.

POSTHARVEST HANDLING

Seed Processing

- Soften the fruit by rolling them gently by foot on a flat floor or by beating the fruit gently with wood bat. Apply just enough pressure so as not to crack the fruit.
- Cut a small portion at the fruit peduncle end and open the whole fruit by hand to expose the seeds.
- Submerge the fruits in a pail of water and press out the seeds from the fibrous tissues. Good seeds settle at the bottom while the immature seeds float.
- Discard immature seeds and tissues, and refill the pail with water. Repeat the process until no seeds float.
- Put clean seeds in net bags and air-dry for 2–3 days, then sundry for 4–5 days while turning the seeds from time to time. Increase sun-drying period as the seeds dry.
- For oven-drying, dry seeds initially to no more than 300°C, and increase it to 400°C as the seeds dry.
- For dry-sealed packaging, dry the seeds thoroughly.

Packaging/Storage

- Dry seeds absorb moisture from the air. Use moisture-resistant packaging materials such as thick polyethylene plastic, aluminum-lined packets, tin cans, or glass jars. Seal well.
- Seeds can be packed in paper packets but must be placed in large tin cans or wide-mouth glass jars with desiccants such as charcoal, silica gel, calcium chloride, quick lime, or wood ash at the bottom.
- Cover tightly.
- Keep seeds away from moisture and high temperatures. The cooler and drier the area is, the longer the life of the seeds.

COST AND RETURN ANALYSIS

	MD	Unit Cost ¹	Total Cost
A. Labor Cost			
1. Land preparation (mechanized)			
• Mowing		2,164	2,164
• Disking		1,640	1,640
• Plowing		2,617	2,617
• Harrowing (2x)		1,164	4,328
• Rotavation		3,001	3,001
• Furrowing		1,640	1,640
2. Seedling preparation			
• Sowing	1	210	210
• Land prep/potting	2	210	420
• Pricking	10	210	2,100
• Maintenance	5	210	1,050
3. Transplanting/basal fertilization	20	210	4,200
4. Hilling-up		2,350	2,350
5. Field maintenance			
• Irrigation (Furrow-10x)	20	210	4,200
MD/Irrigation - 2 workers/operation			
• Sidedressing	2	210	420
• Weeding (3x)		3,000	9,000
• Spraying (10x)	18	210	3,780
6. Roguing	2	210	420
7. Harvesting/hauling	80	210	16,800
8. Seed extraction/cleaning/drying	100	210	21,000
9. Seed sorting	10	210	2,100
10. Seed treatment	1	210	210
		Subtotal	83,650
B. Supplies and Materials			
1. Seeds	250 gm	3,750	938
2. Fertilizers			
• Complete	4 bags	1,900	7,600
• Urea	8 bags	1,780	14,240
• Muriate of Potash	3 bags	2,200	6,600
3. Fungicide			1,500
4. Insecticide			5,000
5. Jute sacks	30 pcs	12	360
6. Net bags	30 pcs	10	300
7. Coir dust	1 sack	30/sack	30
8. Garden soil	1 sack	30/sack	30
		Subtotal	36,598
		Grand Total	120,248
III. Seed Store Economics			
1. Cost of production		120,248	
2. Seed yield (kg/ha)	Low 50	Medium 80	High 120
3. Gross income (P3000/kg)	150,000	240,000	360,000
4. Net income	34,469	124,469	244,469
5. ROI (%)	30	108	212

¹Based on prevailing prices of labor and supplies as of July, 2008.

SEED PRODUCTION of OKRA

VARIETY DESCRIPTION (Fresh)

Smooth Green

- Yield: 21 tons/ha
- Harvest maturity: 45-50 days from planting
- Fruits are smooth, 7-10 cm long, green, and slender
- IPB selection

ENVIRONMENT REQUIREMENTS

- Okra grows best under tropical conditions with temperature range of 20°C – 35°C.
- Tolerant to wide range of soils, but prefers well-drained soils high in organic matter and pH of 6-7.6

CULTURAL MANAGEMENT

Land Preparation

- Prepare land thoroughly by mechanical means or with the use of animal-drawn implements.
- Make sure to break big clods
- Space the furrows 75 cm apart.

Planting

- Okra is direct seeded, requiring 10 kg seed/ha.
- Soak seeds in water overnight before planting for faster and uniform germination. Air dry the seeds before sowing.
- Sow 2-3 seeds/hill along the furrows 30-cm apart.
- Irrigate immediately after planting to ensure uniform seed germination.
- Two weeks after planting, thin out weak and diseased seedlings, maintain one healthy plant per hill.

Fertilization

- Rate of fertilization depends on soil analysis, but in its absence, apply 10 gm or 1 tbsp complete fertilizer (14-14-14). Add about a handful of chicken manure per hill and cover with a thin layer of soil.
- At 30 and 45 days thereafter, side dress 15 g of a mixture of 2 parts Urea (46-0-0) and
- 1 part Muriate of Potash (0-0-60) per hill.

Irrigation

- During dry months, furrow irrigate every 7 days. Irrigate only as needed during the wet season
- Water is critical at planting, after emergence, during the vegetative stage and at flowering and fruit development.

Weeding

- Keep the plants weed-free within the first month. Hand-weed especially around the base of the plants.
- At 30 days after planting, hill up immediately after sidedressing to cover the fertilizer and control weeds.

Insect Pest Management

- The most common pests of okra are cotton stainer and leafhopper. For leafhopper, spray appropriate chemical on the underside of the leaves where the insect settle

Disease Management

- Cercospora leaf mold and powdery mildew are the major diseases of okra. Prune and burn infected leaves to minimize or prevent

their spread. Spray appropriate fungicide.

Pollination/Isolation

- Okra is predominantly self-pollinated crop; 4-45% cross pollination can occur depending on variety.
- Bees and flies pollinated okra.
- Maintain an isolation distance of 200 m for certified seed and 400 m for breeder seed.

Crop Inspection and Roguing

- Inspect the crop three times during the growing period
- For certified seeds, inspect 1) A month after emergence, check for leaf size, shape and color, growing habit and vigor. 2) At flowering and podding stages, check for the shape and color of flowers, fruit size, shape and color and number of ridges in pods. 3) At first maturity, check for fruit size, shape and color, late maturity and unproductive plants.
- To keep the genetic purity of the seed lot, avoid planting different varieties of okra in succession on the same lot. This will avoid volunteer plants from dormant seeds of the previous variety to be mixed with the newly-planted variety.

Harvesting

- Seeds mature about 110-120 days from emergence
- The basal and apical pods do not mature all at the same time so that about 3-4 primings may be needed.
- Pods turn leathery brown in color at seed maturity.

POSTHARVEST HANDLING

Seed Processing

- Put matured pods in canvass matting and sundry for 2-3 days or until pods become brittle.
- Thresh pods to extract the seeds and clean using air-screen cleaner or winnow.
- Get only the healthy seeds and remove seeds that are unfilled.
- Dry clean seeds gradually under the sun for 4-5 days to lower the moisture.

Packaging/Storage

- For home use, pack the seeds in a thick plastic or paper envelopes and place them in large aluminium cans or largemouth jars lined at the bottom with charcoal, lime or silica gel.
- Seal the package well.
- Place the seeds in a cool, dry place.
- For large volume, pack the seeds in thick plastic bags or aluminium-lined packets and seal tightly.
- Keep the seeds in a cool and dry place or storage area. The drier the stored seeds and the cooler the storage area, the longer the life of the seeds.



COST AND RETURN ANALYSIS

	MD	Unit Cost ¹	Total Cost
A. Labor Cost			
1. Land preparation			
• Mowing		2,164	2,164
• Disking		1,640	1,640
• Harrowing (2x)		2,164	4,328
• Rotavation		3,001	3,001
• Furrowing		1,640	1,640
2. Planting/basal fertilization	5	210	1,050
3. Hilling-up		2,350	2,350
4. Field Maintenance			
• Irrigation (Furrow-8x)	16	210	3,360
• 2 MD/Irrigation	2	210	420
• Sidedressing		3,000	9,000
• Weeding (3X)	12	210	2,520
• Spraying (6x)			
5. Roguing	2	210	420
6. Harvesting/hauling	50	210	10,500
7. Seed extraction/cleaning/drying	20	210	4,200
8. Seed Treatment	1	210	210
		Subtotal	46,803

B. Supplies and Materials	Quantity		
1. Seeds	5kg	400/kg	2,000
2. Fertilizers			
• Complete	4 bags	1900/bag	7,600
• Urea	4 bags	1780/bag	7,120
• Muriate of Potash	2 bags	2200/bag	4,400
3. Fungicide			1,000
4. Insecticide			2,000
5. Jute sacks	30 pcs	12	360
6. Net bags	30 pcs	10	300
		Subtotal	24,780
		Grand Total	71,583
III. Seed Store Economics			
1. Cost of production		71,583	
2. Seed yield (kg/ha)	Low 300	Medium 500	High 800
3. Gross income (P3000/kg)	90,000	240,000	240,000
4. Net income	18,417	78,417	168,417
5. ROI (%)	26	110	235
¹ Based on prevailing prices of labor and supplies as of July, 2008.			

VEGETABLE

Planting Calendar

Introduction

One of the critical factors in successful crop production is the time for planting. In the Philippines, four (4) distinct climate types determine the planting season and the kind of vegetable grown on a specific geographic location.

The following publication aims to provide an overview of the planting season of vegetables nationwide, to serve as a guide in determining the vegetables to grow in a particular area and the most appropriate time to plant them.

This planting calendar is designed to complement the information bulletin series, which gives a detail guide in the production and management of a number of locally-grown vegetable.

PLANTING CALENDER FOR TYPE 1 CLIMATE

Two pronounced seasons: dry from November to April; wet during the rest of the year. All the provinces on the western part of the islands of Luzon, Mindoro, Negros and Palawan are covered in Type 1.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bitter gourd												
Bottle gourd												
Cabbage												
Carrot												
Cauliflower												
Celery												
Chayote												
Cowpea												
Cucumber												
Eggplant												
Garden pea												
Garlic												
Hyacinth bean												
Kutsai												
Lettuce												
Lima bean												
Melon												
Musk melon												
Mustard												
Okra												
Onion												
Pechay												
Pigeon pea												
Radish												
Snap bean												
Spinach												
Sponge gourd												
Squash												
Sweet pepper												
Tomato												
Waterleaf												
Watermelon												
Wax gourd												
Winged bean												
Yam bean												
Yardlong bean												

Source: Bureau of Plant Industry, San Andres, Malate Manila

PLANTING CALENDER FOR TYPE 2 CLIMATE

No dry season with a very pronounced maximum rainfall from November to January. The areas covered are Catanduanes, Sorsogon, Eastern Albay, the eastern and northern parts of Camarines Norte and Camarines Sur, a great portion of the eastern part of Quezon, the eastern part of Leyte and a large portion of eastern Mindanao.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bitter gourd												
Bottle gourd												
Cabbage												
Carrot												
Cauliflower												
Celery												
Chayote												
Cowpea												
Cucumber												
Eggplant												
Garden pea												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Garlic												
Hyacinth bean												
Kutsai												
Lettuce												
Lima bean												
Melon												
Musk melon												
Mustard												
Okra												
Onion												
Pechay												
Pigeon pea												
Radish												
Snap bean												
Spinach												
Sponge gourd												
Squash												
Sugar beet												
Sweet pepper												
Tomato												
Waterleaf												
Watermelon												
Wax gourd												
Winged bean												
Yam bean												
Yardlong bean												

PLANTING CALENDER FOR TYPE 3 CLIMATE

Seasons not very pronounced, relatively dry from November to April and wet during the rest of the year. This type of climate covers the western part of Cagayan (Luzon), Isabela, Nueva Viscaya, the eastern portion of the Mountain Province, Southern Quezon, the Bondoc Peninsula, Masbate, Romblon, Northeast Panay, Eastern Negros, Central and Souther Cebu, part of Northern Mindanao and most of Eastern Palawan.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bitter gourd												
Bottle gourd												
Cabbage												
Carrot												
Cauliflower												
Celery												
Chayote												
Cowpea												
Cucumber												
Eggplant												
Garden pea												
Garlic												
Hyacinth bean												
Kutsai												
Lettuce												
Lima bean												
Melon												
Musk melon												
Mustard												
Okra												
Onion (big bulb)												
Onion (small bulb)												
Pechay												
Pigeon pea												

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Radish												
Snap bean												
Spinach												
Sponge gourd												
Squash												
Sugar beet												
Sweet pepper												
Tomato												
Waterleaf												
Watermelon												
Wax gourd												
Winged bean												
Yam bean												
Yardlong bean												

PLANTING CALENDER FOR TYPE 4 CLIMATE

Rainfall more or less evenly distributed throughout the year. The areas covered by Type 4 climate are Batanes province, Northeastern Luzon, Western Camarines Norte and Camarines Sur, Albay, Eastern Mindoro, Marinduque, Western Leyte, Northern Negros and most of Central, Eastern and Southern Mindanao.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bitter gourd												
Bottle gourd												
Cabbage												
Carrot												
Cauliflower												
Celery												
Chayote												
Cowpea												
Cucumber												
Eggplant												
Garden pea												
Garlic												
Hyacinth bean												
Kutsai												
Lettuce												
Lima bean												
Melon												
Musk melon												
Mustard												
Okra												
Onion												
Pechay												
Pigeon pea												
Radish												
Snap bean												
Spinach												
Sponge gourd												
Squash												
Sweet pepper												
Tomato												
Waterleaf												
Watermelon												
Wax gourd												
Winged bean												
Yam bean												
Yardlong bean												

Source: PCAARRD Information Bulletin No. 2000/2000



MAGAZINE ON ORGANIC FARMING/ AGRICULTURE INFORMATION



DEPARTMENT OF AGRICULTURE
REGIONAL FIELD OFFICE IV-MIMAROPA
DILIMAN, QUEZON CITY
2015