Produced by:

High Value Crops Development Program (HVCDP
DA-RFO 02, Nursery Compound, Tuguegarao City, Cagayan. Tel.# (078) 846-3379;

Agricultural Communication (AGCOM) Section
Nursery Compound, San Gabriel, Tuguegarao City, Cagayan. Tel # (078) 304-0562

DA-Cagayan Valley Hilly Land Research Outreach Station (DA-CVHILROS)
Villaros, Tapaya, Bagabag, Cagayan, Nueva Vizcaya;

DA-CVLMROS- Abulug Seed Farm (ASF)

DEPARTMENT OF AGRICULTURE

Regional Field Office No. 02

Tuguegarao City, Cagayan

PUMMELO

PRODUCTION GUIDE

Pummelo

Production Guide

First Edition

For more information, write, visit or call

DEPARTMENT OF AGRICULTURE-REGIONAL FIELD OFFICE NO. 02
Nursery, San Gabriel, Tuguegarao City, Cagayan, 3500
Contact Nos. (078) 844-1324/1312
Fax Nos. (078) 846-9131/844-1031 / Email address: da_rfu2000@yahoo.com

RESEARCH OUTREACH STATIONS

Cagayan Valley Hillyland Research Outreach Station (CVHILROS)
Tapaya, Bagabag, Nueva Vizcaya
Contact No. (078) 648-5939/0916-304-4032

Cagayan Valley Island Agricultural Research Outreach Station (CVIAROS)
Basco, Batanes
Contact No. 0906-581-7466/0926-771-0942

Cagayan Valley Integrated Agricultural Research Center (CVIARC)
San Felipe, Ilagan, Isabela
Contact Nos. (078) 376-0703/622-0961/0962

Cagayan Valley Lowland and Marine Research Outreach Station (CVLMROS)
Agricultural Pilot Center
Minanga Norte, Iguig, Cagayan
Contact Nos. (078) 501-0889

Cagayan Valley Upland Research Outreach Station (CV-UPROS)
Dungo, Aglipay, Quirino
Contact No. 0906-6624-2064/0927-465-6312

SATELLITE STATIONS
Abulug Seed Farm (ASF)
Maquire, Lucban, Abulug, Cagayan
Contact No. 0926-621-0551

Cagayan Breeding Station (CBS)
Maguirig, Solana, Cagayan
Contact No. 0927-676-0219

Isabela Breeding Station (IBS)
Upi, Gamu, Isabela
Contact No. 0905-356-7008

DEPARTMENT OF AGRICULTURE

The DA is the principal agency of the Philippine Government responsible for the promotion of agricultural development growth. In pursuit of this, it provides the policy framework, helps direct public investments; and in partnership with Local government units (LGUs) provides the support services necessary to make agriculture and agri-based enterprises profitable and to help spread the benefits of development to the poor, particularly those in rural areas.

The DA's primary mission is to increase the real incomes of farmers and fisherfolk, thereby contributing to the achievement of the national goals of alleviating poverty, generating productive opportunities, fostering social justice and equity, and promoting sustainable economic growth:

- To help ensure food security and support the national effort toward self-sufficiency in rice and corn;
- To help attain a favorable balance of trade by enhancing the competitiveness of the agricultural and fishery sectors in both domestic and foreign markets;
- To support the development of farmer and fisherfolk organizations; and
- To promote the development of labor-intensive and employment-generating agro-industrial enterprises.

In the pursuit of its mission and objectives, the Department adopts the following principles:

- Private sector enterprise shall be encouraged to promote the efficient allocation and effective utilization of resources, consistent with objectives of equity and social justice.
- The maximum participation of the people in the development process shall be encouraged since development proceeds only through the favorable interaction of all sectors.

FOREWORD

The Cagayan Valley or Region 02 is endowed with rich, fertile soil and favorable climate condition suitable for the production of fruits, vegetables and other high value crops.

Cognizant to this, today's Government goal of self-sufficiency and food security prompts all agencies especially the Department of Agriculture to look for strategies that will pave the way of attaining such. And as food agency, it has the responsibility to produce safe, affordable and accessible food for every Filipino

One good strategy is the growing of pummelo tree. The fruit tree holds a bright economic potential owing to the region's favorable condition which contributed to its year-round cultivation.

Another reason is that the tree is preferred because of numerous advantages such that can be eaten as fresh and in processed form; medicinal benefits that can be used to treat cough, fever and gastric disorders; and due to the limited production areas which makes the crop highly demandable.

Considering all these, the DA-Abulug Seed Farm situated at Maquire, Lucban, Abulug, Cagayan, one of the Satellite Stations of DA-RFO 02, developed a variety called the "Siamese Abulug" with NSIC approved variety registration no. – NSIC 2008 Pm 04. The "Siamese Abulug" fruit has long shelf life and is already available commercially to the public. Said variety is already available to our constituents who wish to plant.

This production guide was conceived so that valuable and cost-efficient pummelo production technology will be imparted to our farmers, students, researchers, agriculture extension workers, and other agriculture stakeholders, which could help them improve their productivity and accelerates the development of high value crops in the Region.

LUCRECIO R. ALVIAR, JR., CESO III

TABLE OF CONTENTS

EDITORIAL STAFF

Subject Matter Specialists: **CELERINA T. MIRANDA**
DA-CV-HILROS Manager , Bagabag, N.V.
BEATRIZ VIERNES
Agriculturist II/CVLMROS-ASF, Abulug, Cagayan
WILLIAM CONTILLO
Engineer-II/DA-CVIARC, Ilagan, Isabela
MA. VISITACION Z. PERDIDO
Agriculturist II-DA-CVIARC-RCPC

Writer/Editor: **CATHERINE S. JIMENEZ**
AGCOM Staff

Production designers: **CATHERINE S. JIMENEZ**
DICKSTEIN U. PASCUAL
AGCOM Staff

Photo credits: **RENATO P. TARUN**
EDUARDO BULAQUI
AGCOM Staff

Circulations: **ANITA L. BULAQUI**
PRISCA B. BAQUIRAN
AGCOM Staff

Technical Editors: **EDITO R. BANARES**
Chief, AgCom Section
HECTOR U. TABBUN
Information Officer - I

Project Coordinator: **ROBERT B. OLINARES**
HVCDP Regional Coordinator

Project Consultants: **LUCRECIO R. ALVIAR, JR., CESO III**
Regional Executive Director
ORLANDO J. LORENZANA

References:

1. Citrus Diseases, California.
2. http://www.fruitsinfo.com/ Pummelo-Exotic-fruits.php)
3. http://www.mixph.com
4. Department of Agriculture-Agricultural Training Institute. 2006. A Guide to Citrus Production, Diliman Quezon City.
5. Department of Agriculture-Cagayan Valley Hillyland Research Outreach Station, Bagabag, Nueva Vizcaya. A guide to Sweet Pummelo Production.
6. Department of Agriculture–Regional Field Unit No. 02. Citrus Production Technology, Maquire, Lucban, Abulug, Cagayan.
7. Department of Agriculture, Ministry of Industry and Primary Resources-Brunei Darussalam, 2006 Citrus IPM Manual 1st Edition, Brunei Darussalam.
8. Technical Working Group on Region 02 Citrus Production Guide. June 2000. Department of Agriculture– Regional Field Office No 02 (DA-RFO 02) Tuguegarao City, Cagayan.
9. www. Google.com

TABLE OF CONTENTS

Planting of citrus fruit trees particularly pummelo, calamansi, oranges and mandarin is very suitable to the Cagayan Valley Region's type of land and climate.

There are numerous advantages of cultivating citrus. They are rich in vitamin C and calcium, and possesses good eating qualities when consumed either as fresh or processed into juices. Citrus is also used in the preparation of candies and marmalades and as food additives for flavoring, coloring and perfume.

Pummelo (citrus maxima), "suha" or "lukban" in local dialect is one of the most popular species of the citrus family. It has a long shelf life that it can be transported to distant markets. Pummelo varieties include Siamese Abulug, Amoy Mantan

Spicy Pummelo Salad - *Directions (continuation)*

In the meantime, cover chicken with the cold water in a 2-quart pan and boil over reasonable heat until it cooked through, 10-15 minutes. Remove chicken, discarding cooking liquid, and, at what time cool enough to handle, shred into 1/2-inch-thick pieces in a large bowl.

Cut skin, including most of the white pith, from pummelo with a sharp knife. Using your hands, split pummelo from center of one end, like an orange. Pull off interior pith and remove the segments one at a time, then remove segment membranes of the fruit and any small seeds, separating jam. Add pummelo pound to chicken.

Grind and dried shrimp into small pieces in chopper, about 20 seconds. Heat a dry 8-inch heavy skillet over moderate heat, then cook dried shrimp, shaking skillet, until pale golden, 1-2 minutes. Transfer to a small bowl.

Beat together lime juice, fish paste, sugar, coconut cream, toasted coconut, chiles, and 1/8 teaspoon salt in a small bowl, then mix into pummelo mixture. Halve extra-large shrimp lengthwise with a sharp large knife, leaving bullets in place. Season with remaining 1/8 teaspoon salt and search in rice flour, shaking off excess.

Serve pummelo salad topped with fried extra-large shrimp and sprinkled with toasted dried shrimp.

Sweet Pummelo Rind Candy

Procedures:

To remove bitter/pungent to taste.

1. Boil in water for 15 minutes, change water three times.

Spicy Pummelo Salad

Ingredients:

- 1/4 cup unsweetened desiccated coconut
- 1 skinless boneless chicken breast (1/2 lb)
- 1 pummelo or 2 grapefruits
- 2 teaspoons dried shrimp
- 1/4 cup fresh lime juice
- 2 tablespoons Asian fish sauce
- 2 tablespoons sugar
- 1 cup canned unsweetened coconut cream or unsweetened coconut milk (not cream of coconut) at room temperature, stirred well
- 2 to 4 fresh red chiles (to taste, each 1 1/2 to 2 inches), minced
- 1/4 teaspoon salt
- 6 jumbo shrimp in shell (10 to 12 per lb)
- 1/4 cup Asian rice flour (not sweet)
- About 4 cups vegetable oil for frying

Directions:

Put the oven frame in middle position and preheat the oven at 350°F. Shake over the coconut in one layer in a shallow baking pan and toast, stirring once or twice, until evenly golden, 8-10

The tree grows from 5-15 meters in height and has low spreading branches with a canopy size ranging from 5-9 meters. Its leaves are ovate to oblong with leaf size ranging from 5cm x 12cm to 8cm x 20cm wide when fully developed.

The flowers are located either in the axial or terminal point, raceme type of inflorescence, and fruit is yellowish green in color, nearly round to pear-shaped. It matures 5-6 months from flowering. The juice vesicles are either white, light pink or red, depending on the variety. Seeds are few to nil, ridged, deltoid to globous in shape and mono embryonic.

Today, more and more people are engaged in the cultivation of pummelo because of its economic, nutritional, and medicinal benefits.

Fruit of Siamese Abu-

USES

The juicy pulp vesicles are eaten fresh, maybe used as fruit salad mix and sometimes the juice is extracted for beverage.

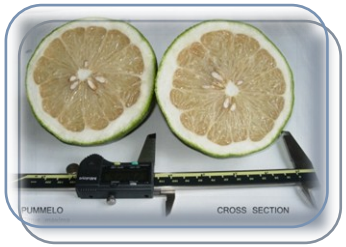
The white inner part of the peel can be processed into candies after the outer peel containing oil glands has been removed.

The aromatic flowers are used in making perfumes.

PROPERTIES

The edible segments form only a small fraction from the thick-skinned fruit. A 100 gram (g) edible portion is composed of the following.

Particulars	Nutritive Value
Water (g)	89.00
Protein (g)	0.50
Fat (g)	0.40
Carbohydrates (g)	9.30
Vitamin A (IU)	49.00
Vitamin B1(ug)	0.07
Vitamin B2(ug)	0.02
Vitamin C (ug)	44.00
Niacin (mg)	0.40



VALUE ADDING

Here are some of the recipes that can be made out of pummelo fruits.

Pummelo and Avocado Salad

Ingredients:

- 1 large (about 10 oz) firm-ripe avocado, peeled, pitted, and cut into lengthwise slices
- 1 small (about 1 1/2 lb) pummelo peeled and segmented
- 1 lime, cut into wedges
- Chili salt

Directions:

On four salad or dinner plates, arrange equal portions of the avocado and pummelo sections. Garnish each serving with lime wedges. To eat, squeeze lime over fruit and sprinkle to taste with chili salt. Make four servings.

Per serving without chili salt: 131 cal; 2g protein; 8.1 g fat; 16

RECIPES

Pummelo

Concentration of minerals found in branches , leaves and fruits of pummelo are as follows:

Elements	Fruits (%)	Leaves (%)	Branches (%)
Nitrogen	2.0	2.6	1.2
Phosphorus	0.2	0.1	0.17
Potassium	2.0	1.00	0.75
Calcium	0.8	4.2	1.8
Magnesium	0.15	0.25	0.28

RECOMMENDED PUMMELO VARIETIES

The provincial asexually propagated recommended varieties can be sourced out from DA-Research Outreach and Satellite Stations or from any accredited nursery operators in your locality.

Magallanes

Origin : Davao City
Yield (No. of fruits per tree) : 227
Weight of fruit (g) : 859.03
Edible Portion (%) : 44.20
Total soluble solids (%) : 9.00
Flesh color : Pink

Amoy Mantan

Origin : Canton China
Yield (No. of fruits per tree) : 203

Siamese Abulug

Plant/Tree Description

Canopy : Spreading with profuse branching

Bearing Habit : Annual

Yield (No. of fruits) : High(300 @ 10 years old)

Fruit Characteristics

Weight Whole Fruit (g) : Medium (600-800)

Skin/Rind Color : Greenish to light yellow and smooth

Pulp/Vesicle

Color : Colorless to creamy white

Texture : Soft

Flavor (% brix) : Sweet (10.5)


Republic of the Philippines
Department of Agriculture
BUREAU OF PLANT INDUSTRY
NATIONAL SEED INDUSTRY COUNCIL

Pursuant to
Republic Act No. 7308
this

CERTIFICATE OF REGISTRATION

is hereby awarded to

Siamese Abulug
(Citrus maxima)

having been approved under

Registry No. NSIC 2008 Pm 04

owned by the Abulug Seed Farm of Maquire, Abulug, Cagayan and evaluated by Celerina T. Miranda and Beatriz B. Viernes of DA-Abulug Seed Farm, Maquire, Abulug, Cagayan

Given this 20th day of November, 2008 at the National Seed Industry Council, Bureau of Plant Industry, National Seed Quality Control Services Bldg., Visayas Avenue, Diliman, Quezon City, Philippines.

JOEL S. RUDINAS
Vice-Chairman and Executive Director, NSIC
and Director, Bureau of Plant Industry

TEN YEAR FINANCIAL ANALYSIS OF PUMMELO PRODUCTION IN ONE HECTARE

Age of Tree (Year)	Ave.Prod'n Per Tree (Kg)	Unit Cost Per Kg (P)	Qty. Produced Per Ha (kg)	Total Sale per Year (P)	Cost of Prod' Per Year (P)	Net Income (P)
1					84,210.00	(84,210.00)
2					28,320.00	(28,320.00)
3					32,540.00	(32,540.00)
4	10	25.00	1,560	39,000.00	43,440.00	(4,440.00)
5	50	25.00	7,800	195,000.00	41,690.00	153,310.00
6	100	25.00	15,600	390,000.00	43,668.00	346,336.00
7	150	30.00	23,400	702,000.00	48,056.00	653,944.00
8	200	30.00	31,200	936,000.00	52,861.00	883,139.00
9	280	30.00	43,680	1,310,400.00	58,147.00	1,252,253.00
10	300	30.00	46,800	1,404,000.00	63,961.00	1,340,039.00

Bas
pric
fifth

The
or
ear.

Fifth Year			Amount (P)
A. Inputs			
Chicken dung @ P250.00/bag	40	bags	10,000.00
Urea @ P1,240.00/bag	3	bags	3,720.00
Muriate of Potash @ P1,200.00/bag	4	bags	6,400.00
Fungicides @ 320.00/kg	5	kg	1,600.00
Insecticides @ P850.00/ ltr	5	ltr	4,250.00
Sub-total			25,970.00
B. Labor			
Ringweeding (4x) at 5.00/plant	624	plants	3,120.00
Brushing in between rows of the plant (4x) @P2000.00/ha.	4	ha	8,000.00
Fertilizer application (2x) 4MD at P200.00/day	8	MD	1,600.00
Harvesting and hauling 10MD @ P200.00/day	10	MD	2,000.00
Pruning 5MD @ P200.00/day	5	MD	1,000.00
Sub-total			15,720.00
Total			**41,690.00**

CULTURAL MANAGEMENT

Soil Requirement

Adapted to a wide range of soil types, provided, they are reasonably deep, well-drained and aerated with high moisture retention. Optimum pH ranges from 5.5-6.5. In areas wherein its pH value is below 5 (acidic), it is advisable to increase the value thru liming. Soils that are water logged, sticky, heavy, wet and those underlain with hardpan shall not be used.

Climatic Requirement

The crop grows in lowland tropics in an elevation of up to 400 m above sea level with an optimum temperatures of 23-30 degree centigrade. The plant needs about 1,500-1,800 milli-meters of annual rainfall.

Production of Seedlings for Rootstock

- Select fully developed seeds from mature/ripe fruits of native pummelo or calamandarin.
- Seeds should be selected from fruit trees that are free from abnormalities.
- Seeds from fruits that dropped or fell on the ground should not be used as seedlings for rootstock. Disinfect the seeds when necessary.
- Seedbed nursery should be isolated from existing citrus or-chard to prevent possible contamination through insect vec-tors.

Care of Seedlings for Rootstock

- Water the seedbed to facilitate germination.
- When seeds started to germinate, expose the seedbed to sunlight. Seedlings that grow without shades are hardy and free from dumping-off disease.
- Seedlings do not need too much water. Too much water on poorly drained beds predisposes the seedlings to dumping-off diseases.
- Spray chemicals to protect young seedlings from pests and diseases.
- Recommended minimum dosage should be used to prevent burning.

Potting of Seedlings, Care and Management

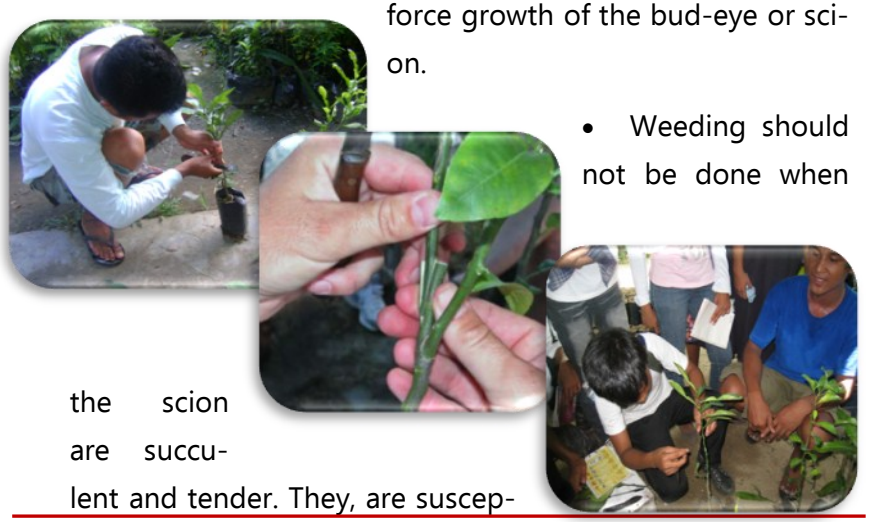
- Seedlings are ready for potting 21-28 days after germination in "7x12"x 0.003 polyethylene plastic bags containing garden soil and place them in the nursery.
- Avoid transplanting seedlings with deformed root system (goose-neck root).
- Water immediately the newly potted plants.
- Eliminate weeding.

Fourth Year			
A. Inputs			**Amount (P)**
Decomposed chicken dung @ P150.00/bag	15	bags	2,250.00
Urea @ P1,240.00/bag	4	bags	4,960.00
Complete fertilizer at P1,300.00/bag	7	bags	9,100.00
Insecticides @ P850.00/ltr	5	ltr	4,250.00
Fungicides @ P320.00/kg	5	kg	1,600.00
Foliar fertilizer @ P180.00/pck	2	pck	360.00
Muriate of Potash (0-0-60)	2	bags	3,200.00
Sub-total			22,520.00
B. Labor			
Ringweeding (4x) at P5.00/plant	624	plants	3,120.00
Brushing in between rows of the plant (4x) @P2,000.00/ha	4	ha	8,000.00
Fertilizer application (4x) at 4MD at P200.00/day	16		3,200.00
Spraying, 1 MD at P200.00/day (4x)	4	MD	600.00
Thirty man days required for the following activities: Safeguarding, prunning , harvesting and hauling, sorting and packaging ther activities in the orchard @ P200.00/day	30		6,000.00
Sub-total			20,920.00
Total			**43,440.00**

Third Year			
A. Inputs			**Amount (P)**
Urea @ P1,240.00/bag	2	bags	2,480.00
Complete fertilizer @ P1300.00/bag	4	bags	5,200.00
Insecticides @P850.00/ltr	4	ltr	3,400.00
Fungicides @ P320.00/kg	3	kg	960.00
Foliar fertilizer @ P180.00/pck	1	pck	180.00
Muriate of Potash (0-0-60)	2	bags	5,000.00
Sub-total			12,220.00
B. Labor			
Ringweeding and cultivation (4x) at P5.00/plant	624	plants	3,120.00
Brushing of space in between rows of the plant (4x) @P2,000.00/ha	4	ha	8,000.00
Fertilizer application (4x) at 4MD at P200.00/day	16	MD	3,200.00
Thirty man days required for the following activities:	30	MD	6,000.00
Safeguarding, spraying, prunning and other activities in the orchard @ P200.00/day			
Sub-total			20,320.00
Total			**32,540.00**

Asexual Propagation and Care of Budded Seedlings

- Rootstocks are ready for budding in 6-8 months after potting.
- Apply nitrogenous fertilizer at least five grams per plant monthly.
- Budding should be done at a height of six to eight inches above the ground level.
- Do not fertilize newly budded plants, unless the bud eye have shown signs of growth.
- Remove the wrap of bud, three weeks after budding.
- To hasten growth of bud-eyes, "lopping" or "cripping" the top of the seedlings two to three inches above the bud is recommended.
- When the bud-eyes started to germinate, decapitate the rootstock one to three inches above the bud-eye union to force growth of the bud-eye or scion.



- Weeding should not be done when the scion are succulent and tender. They, are suscep-

ORCHARD ESTABLISHMENT

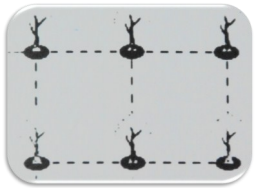
Land Preparation

Thoroughly prepare the land by alternately plowing and harrowing for plain areas. For hilly areas, clear the land and stump ahead before planting especially for bushy or woody orchard. Get soil sample for analysis.

Distance of Planting

The distance of planting varies on the morphological

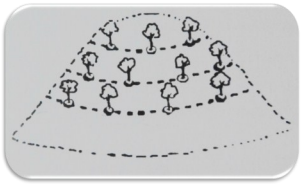
Spacing	Number of Seedlings Per Hectare
8 m x 8 m	156
8 m x 10 m	125
6 m x 8 m	208
10 m x 10 m	100



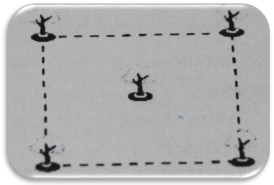
Square system

Field Lay-out

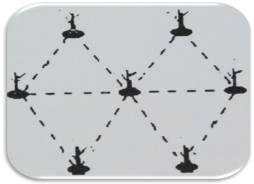
Almost all orchards are planted using the square method. However, rec-



Contour system



Quincunx system



Triangle system

Second Year			
A. Inputs			**Amount (P)**
Urea @ P1,240.00/bag	3	bags	3,720.00
Complete @P1,300.00/bag	2	bags	2,600.00
Insecticide @ P850.00/ltr	1	ltr	850.00
Fungicides @ P650.00/ltr	1	ltr	650.00
Foliar Fertilizer @ P180.00/pack	1	ltr	180.00
Sub-total			8,000.00
			-
B. Labor			
Ringweeding (4x) @ P5.00/plant	624	plants	3,120.00
Brushing of space in between rows of the plant (4x) @P2000.00/ha	4	ha	8,000.00
Fertilizer application (4x) @ 5MD at P200.00/day	16	MD	3,200.00
Thirty man days required for the following activities:			-
Safeguarding, spraying, prunning and other activities in the orchard @ P200.00/day	30	MD	6,000.00
Sub-total			20,320.00
Total			**28,320.00**

B. Labor			Amount (P)
Clearing and cutting of trees and weeds in the area(15 MD @ P200.00/day)	15	MD	3,000.00
Staking, 3MD @P200.00/day	3	MD	600.00
Digging of holes @ P10.00/hole	156	holes	1,560.00
Planting of 156 pieces budded pumelo,5 MD @ P200.00/day	5	MD	1,000.00
Replanting 2MD@P200.00/day	2	MD	400.00
Fencing,15 MD @ P200.00/day	15	MD	3,000.00
Sub-total			9,560.00
C. Care and Maintenance			
Brushing of in between rows of the plants(3x), 10 MD @P2,000.00/ha	30	MD	6,000.00
Ringweeding and cultivation (4x) @ P5.00/plant	624		3,120.00
Fertilizer application, organic fertilizer 5MD @ P200.00/day	5	MD	1,000.00
Fertilizer application of urea (4x) at the rate of 50 grams/ Application,4MD @ P200.00/day	16	MD	3,200.00
Thirty Man days required for the following activity: Safeguarding, spraying, pruning of unnecessary sprouts & other activities in the orchard@ P200.00/day	30	MD	6,000.00
Sub-total			19,320.00
Total			**84,210.00**

Preparation of Holes and Planting

- Holes should be wide enough to accommodate the root system of the plant. A desired hole is 40 cubic centimeters.
- The holes should be exposed to rain and sunlight to about 1 -2 weeks. This will allow the accumulation of organic fertilizer and ensure good aeration during the growing period of the plant
- Planting is done at the on-set of the rainy season.
- Cover the hole with soil-manure mixture and press gently
- Press the tree gently in position and be sure that the potted plant should be set at about the same level as it stood in the nursery.
- Re- 

plant im-

mediately the missing hills to complete the hec-

Care of Young Trees

The young tree produces structures for future fruit-bearing. It is necessary therefore to produce as much vegetative growth as possible during the second to fourth year. To achieve this, careful attention to irrigation, fertilization, cultivation and protection against pests and diseases must be done.

Irrigation

- For the first year, water the trees at least once a week during sunny days.

Weed control

- Weeds retard growth and increase labor costs.
- Ring weeding around the base of the plant at least one meter radius is best suited. This is done every three months.
- Always ringweed the base of the plant before application of fertilizer.

Fertilization

The nutrient requirement of the tree is based on the fertilizer requirement. Hence it is recommended that a soil analysis be conducted. Through the assistance of the Department of Ag-

FINANCIAL ANALYSIS OF PUMMELO ORCHARD PRODUCTION PER HECTARE LAND (FIVE YEAR PERIOD)

I. Basis of Estimates

1. A one hectare land fairly level in topography which accommodates about 156 trees at a distance of 8m x 8m.
2. The price of one pummelo budded plant is P100.00/plant.
3. Skilled laborer is hired at P200.00/day.
4. Generally, fruiting starts on the fourth or fifth year after the

II. Estimated Maintenance and Operating Expenses

Items/Description

First Year		
A. Inputs		**Amount (P)**
Concrete posts @ P150.00/piece (pc)	133 pc	19,950.00
Barbed wire @ P1,000.00/roll	12 roll	12,000.00
Tie wire @ P60.00/kilogram (kg)	10 kg	600.00
Pummelo budded @ P100.00/pc	156 pc	15,600.00
Plus ten percent for replanting 15 pieces budded	15 pc	1,500.00
Decomposed chicken manure @ P150.00/bag	6 bags	900.00
Urea @ P1,240.00/bag	2.5 bags	3,100.00
Insecticide @ P850/bag	1 bag	850.00
Fungicide @ P650.00/kg	1 kg	650.00

MARKETING

The selected quality "Siamese Abulug" fruits produced by DA Stations will be promoted thru the DA-Agribusiness Marketing Assistance Section (AMAS)-One-Stop Agribusiness Center (OSAC), as well as other institutional establishment within and outside the region. Prospective buyers and other interested agriculture stake-holders are encouraged to coordinate with DA-AMAS-OSAC office located at Carig, Government Center, Tuguegarao City for market

- Liquid fertilizer can be applied depending on the choice of the farmer.
- Split the amount of fertilizer into two equal applications before and at the offset of the rainy season.

Pruning

- Prune water sprouts emerging below the bud union.
- For the first year, prune young trees to shape the tree to evenly distribute the main scaffold links around the trunk.
- Pruning is done to eradicate diseased twigs, remove dead or poorly placed branches, and long, weak and undesira-ble branches not exposed to sunlight.
- Wounds on the bark and branches should always be painted with water repellant paints.

Intercropping

- Intercropping is done to maximize land use.
- For the first year, intercrop the orchard with early matur-ing crops to provide income while the trees are still grow-ing.
- Intercropping should not be planted too close to the tree. It should be one or two meters away from the rows or hills

Mulching

- The profitability of mulching depends on the price of available materials. However, the effects of mulching is evidenced by the growth and yield of fruit trees. Observe necessary precautions for fire hazard and rodents.

Windbreak

- The force of wind often cause the lodge and break of orchard trees hampering its fast growth. Neem tree is the best windbreaker, which also serves as insect repellant.

Care of Bearing Trees

Fertilization

- Fertilization at this stage is done to ensure regular bearing and maintain the normal growth of the trees. The amount of fertilizer needed is based on soil analysis.
- Rate of fertilization varies according to kind, variety, and age of the trees in each stage of growth and fruit devel-

- *Waxing.* Wax the fruits to minimize shriveling and maintain the gloss of the rind for several days.
- *Packaging.* Carefully pack the fruits in *"kaing"* (wooden or karton) and plastic crates lined with newspaper or other suitable materials to prevent abrasions and punctures. Avoid using large and deep containers because it can cause losses owing to compression injury. Size of the containers depend upon the transportation system available. Avoid rough handling particu-

- *Transport* should follow immediately after harvesting and packaging the fruits.

Maturity Indices

For standardization purposes, minimum requirement for pummelo is set, which serve only as a guarantee but not for storage or shelf life, to wit:

- Change in color (green to yellow with 50% color change);
- Juice content of 50% of its weight;
- Soluble solids (sugar) level is 9 percent;
- Tritable acids is 0.6 percent; and Solid to acid ratio is 10:1.

Method and time of picking

- Harvest pummelo fruits either by pulling or clipping from the stem or branches.
- The general rule is twist, jerk, and pull.

The best time to harvest is around 8:00 am to 3:00 pm (with sunlight) to reduce fruit injuries, thus quality of fruit increases.

Packaging and Transport

Bring the fruits for distant transport from the field to a shaded area.

- *Washing.* Thoroughly wash the fruits to remove dirt.
- *Drying.* Dry the fruits with clean cloth. Carefully handle the

- Thorough ring weeding around the base of the plant should be made before any fertilizer application.
- The first application is made at the start of the rainy season to enhance the vigor of the trees before its flowering stage, the second is towards the end of the rainy season.

Irrigation

In areas with distinct dry and wet season, and with long dry spell, irrigation is needed.

- Irrigation is done using either the furrow, hose, sprinkler or drip method, through the use of pumpset or gravity system.
- The critical period when irrigation is needed is during flushes of new growth, fruit setting and rapid increase of fruit size. During flower bud formation, irrigation is needed to prevent flower abortion and at fruitlet development,

To ensure if the soil has enough moisture, get a handful of soil from the field, hold it firmly. If water comes out, then there is too much water in the soil. If the soil is compact and was formed into a ball, the moisture is just enough. However, if the soil crumbles, then it is too dry.

Pruning

- The best time to prune is after the crop is being harvested. Pruning during the bearing stage consist of the removal of diseased and dead twigs, branches and leaves. Branches that are unproductive and less exposed to sunlight are also cut off.

Crop Protection

- Drenching, painting, coating, baiting and trapping are non-spraying methods that can greatly reduce pesticide pollution. Trapping is an old technique ,which uses a little amount of pesticide confined inside a contraption and stays there until its potency is lost. The male insect is lured by an attractant mixed with pesticide which kills it upon contact. The male insects are annihilated thus, no mating occurs resulting to the decrease in insect population and infestation is controlled.

Propping

C. Laboratory Test for Diseases like Citrus Tristeza Virus (CTV)

Collect scion samples and immediately bring them to the laboratory for the Enzyme Linked Immunosorbent Assay (ELISA) Solvent test.

Analysis

- CTV will be detected within 24 hours through ELISA.
- If the ***Candidate*** **Parent Source Tree** shows negative result, the indexed tree will be tagged as ***Certified*** **Parent Source Tree** which means it is virus-free. The tree will be the source of scions for mass propagation.
- If the analysis is positive, discard the tree. Never collect scion

3. Do not select trees which show signs of yellowing or leaf mottling on the foliage and abnormalities in any part of the tree.

4. If a tree has been inspected and found free from any symptoms of any known bud-transmissible virus disease or any abnormalities, tag it as a CPST.

B. Collection of Budsticks for Indexing

1. Divide the tree into four quadrants.

2. From each quadrant, collect two budsticks from branches selected at random starting from eastern side of the tree and

INSECT PESTS AND DISEASES AND THEIR CONTROL

A. Insect Pests	Damaged	Control Measures
1. Rind Borer (Prays endolemma)  	Newly opened flowers and young fruits . Larvae bore inside the fruit and feed on the rind tissue. Dropping of immature fruits.	Collect and burn or bury infested fruits. Use of attractants (supernet, methyl euganol and sorgen). It is controlled by sanitation and by pre and post–bloom spray with the use of insecticide following the recommended dosage
2. Scale Insects		
a. Snow scale (Pinnaspis sp.)	Leaves turn yellow Dieback occurs and molds are produced.	Prune infested twigs and burn it. Use of clean planting materials. Spraying of nursery and orchard trees with oil-based materials or suitable insecticides at recommended dos-

A. Insect Pests	Damaged	Control Measures
3. White flies (Aleurodicus dispersoes) 	Leaves turn yellow and fall prematurely. Sooty molds are produced.	Spray with suitable insecticides. In small areas, soap and detergent solutions help to provide effective control, together with pruning and mulching, which helps the plants fight moisture loss due to the infestation.
	Leaves and fruits. Red spider (Panonychus citri McGreg) causes tiny scratch like marks on the upper surface of the leaves. Abundant scratch like marks give the leaves at a pale or grayish appearance. The leaves drop leaving the petiole attached to the green	Spray appropriate acarricides or a sulfur-based fungicides at recommended dosage.

INDEXING

It is a procedure that can determine if an infection is latent in a symptomless citrus plant. It is done by inoculating highly susceptible test plants that readily manifest specific symptoms for a disease when infected.

It is important to conduct such practice to determine the different virus or virus-like diseases that may be present in a single candidate mother tree, different varieties or species being used as standard indicator plants. Likewise, to identify the different virus or virus-like pathogens that may be present.

Methods and Indexdate Parent for Selection ing of Candi- Tree

A. Survey tion of Parent (CPST) and Selec- Candidate Source Trees

B. Bacterial and Fungal Disease	Symptoms	Trans - mission	Manage- ment
1.Citrus canker (Xanthomonas citri) 	Lesion on both sides of the leaf and fruit ridges on the fruit.	Contami- nated budwood, man, ani- mals, tools and wind.	Burn severely infected trees or eradica- tion. Timely and regular spray- ing with any copper-based fungicides. Observe field sanitation.
2. Footrot 	Sap oozing from small cracks on the bark; lesions and spread around the trunk. Infected leaves became chlo- rotic, the yellow color appearing first in the midrib and spreading to the lamina. Later, the yellow leaves drop and twigs and even branches die. The leaves of the	Transmit- ted by fungus	Use resistant rootstock; avoid deep planting, wa- ter manage- ment; aera- tion around the crown; surgical treat- ment; treat with copper- based fungi- cide. Practice clean culture

C. Virus and Virus-like Dis- eases	Symptoms/ Causal Organism	Transmis- sion	Management
2. Triztesa (Virus) 	Clearing of veins and stem pitting on sen- sitive pummelo varieties. Most varieties are affected by stem pitting disease which develop large number of pits on trunks and stems. Leaf color changes from normal green to olive green with a characteristics of hardening in the appear- ance of leaves. Root decay which begins at the root tips and progresses back to the large roots. Top of the	It is trans- mitted by Black Citrus Aphid (Taxoptera aurantii) (inset), Brown citrus aphids (Taxoptera citricidus), and Melon aphids (Aphids gossipii). This can al- so be spread through budding and graft- ing.	Use of disease -free budwood and resistant rootstocks. Mother trees where scions are obtained should be pe- riodically ex- amined and indexed. Con- trol insect vec- tor by botani- cal and chemi- cal spraying. Quarantine and eradica- tion for very limited infes- tations. Disin- fect tools used for budding and pruning with formalin solutions.

B. Bacterial and Fungal Disease	Symptoms	Management
3. Pink Disease (Corticum salmonicolor) 	Infection usually starts in sap pockets on the twigs and branches. The appearance of cracks on the bark and the secretion of gum are the first signs of the disease. The infected twigs or branches manifest a sudden yellowing followed by wilting of the leaves. Death of the infected part. At a certain stages of disease development during humid or rainy days, the infected parts are covered with masses of pinkish mycelium that often extend in strands over the bark.	Remove affected barks of trunks and prune diseased parts and burn. Disinfected by spraying copper fungicide or lime sulfur mixture. Field sanitation.
4. Scab (Sphaceloma fawcetti)	Disease starts as small, pale orange, circular spots on young fruits. As disease advances and fruits start to mature, several lesions	Spray copper fungicides at the time when new flushes of growth appear or at time of blooming when two-thirds of petals have fallen. Successive

C. Virus and Virus-like Diseases	Symptoms/ Causal Organism	Transmission	Management
1. Huanglongbing (Yellow Mottling or Greening) Diaphorina citri 	Reduction of leaf size in upright position similar to that caused by zinc and manganese deficiency. Affected trees produce leathery leaves with tendencies to roll, and develop into dull, yellow-green color similar to boron deficiency. Midribs of the older leaves developed during the dry season turn yellow similar to nitrogen deficiency. Leaves showing different types of chlorosis may occur in the branches have dying foliage, resulting on death of tree. Fruits are	Diplodia citri (Jumping plant lice).	Eradicate infected plants. Use of disease free planting materials. Shoot tip grafting. Health indexing and spraying of insecticides on citrus trees at shooting stage. Biological control of psyllid vector (Octoparasites). Rouging of diseases plants.