GINGER

VR Mamaril

Ginger, *Zingiber officinale* Roscoe is popular tor its distinct sharp and hot flavor due to an oily substance called gingerol. It is known as 'luya' in Tagalog, 'shoga' (Japanese), chiang' (Chinese), 'jingibre' (Spanish), 'gingembre' (French), and 'zanjabil' (Arabic). It has an aerial part of about 0.8 m high, which could grow up to 1.5 m tall (in Costa Rica, Hawaii, and Honduras) and a finger-like perennial underground part or rhizomes called hands.

Ginger can grow in sandy or loose soil, provided it is planted at a depth of about 30 cm, has enough water and which does not hold water when it folds or rains. It can grow in shady places together with tall trees or plants. It is most productive when it is 25% shaded.

The top producing countries are India, China, Indonesia, Nigeria, and Thailand. In 2006, the area planted to ginger in the Philippines was 3,916 hectareswith a total production of 27,261 tons (t). Cagayan Valley was the largest producer (5,566 t), followed by Calabarzon (4,969 t), and Northern Mindanao (4,029 t). Ginger is exported to Japan, Germany, Hong Kong, Britain, and Northern Ireland.

USES AND NUTRITIONAL VALUE

Ginger can be consumed fresh, dehydrated, powdered, or pickled. 'Salabat,' or ginger tea, a popular hot drink, is made from boiled fresh ginger or powdered ginger. Ginger adds flavor to some common Filipino dishes like tinola, goto, arroz caldo, paksiw, batchoy, and pinakbet. It is also used as an ingredient in the manufacture of perfumes and softdrinks and in the preparation of preserves, candies, and pickles. The Chinese consider ginger as the yang of hot/spicy food, which balances cold meals. It is also considered as ying for creating harmony.

Ginger stimulates gastric juice secretion and relieves cough and flu. It is also used to treat migraine, travel sickness, and rheumatoid arthritis. It is known to improve blood circulation and reduce fat deposits in the arteries. In India, ginger is used in the preparation of many ayurvedic formulations, 'ayurveda' being the traditional Indian medical discipline. The curative properties of ginger come from the volatile oil that contains cingibereno, cingiberol, borneol, felandreno, citral, cineol, starch, mucilage, and resin, among other substances.

Per 100 grams (g) edible portion, ginger contains: Energy, Protein, Fiber, Ash, Calcium, Phosphorus, Iron, Thiamine, Riboflavin, Niacin and Ascorbic acid.

CULTURE AND MANAGEMENT

A. **Varieties.** Ginger varieties differ in size and shape of rhizomes, yield, moisture content, quality, and flavor. The following are the more common varieties in the Philippines with their corresponding rhizome characteristics:
    1. Our native ginger
        a. white ginger — small, very fibrous but most pungent of all kinds
        b. yellow ginger — like the white in kind except that it is orange in color, but the part above is dark green
    2. Red Native– Small, red, fibrous, very pungent
    3. Imugan – Medium-sized, slightly fibrous, pungent
    4. Hawaiian – bigger, stouter crops and yellowish brown flesh, sometimes pinkish not so pungent but liked by foreigners. This kind yields about 20-30 tons per hectare. It is good for making into powdered or dried ginger
    5. Jamaica "Oya" – Medium-sized, pale-colored, gives off pleasant, agreeable aroma in dehydrated form
    6. Canton or Chinese Large, yellowish, succulent, less fibrous, less pungent

B. **Soil and Climate Requirements.** Ginger can be grown in flat to slightly rolling areas with well-drained, light to medium textured soil high in organic matter and pH of 6.8-7.0. It can grow in elevations of up to 1,500 meters (m) above sea level with about 200-300 cm annual rainfall evenly distributed throughout the year and a temperature range of 25 -35°C. It grows well even with 25-40% shading.

C. **Planting Materials.**About 800 to 1,500 kg seed-pieces are required per hectare. Store ginger roots under shade and cover with banana or coconut leaves. Select healthy rhizomes with sprouts or eyes just before planting. Cut into pieces with 3-4 sprouts each.

    The seed-pieces may also be pre-germinated for uniform growth. Prepare raised beds of any desired length measuring 1 m wide and 20 cm high. Line sow the seed-pieces 2 cm apart and cover with a mixture of compost and coir dust. Water as needed. Transplant when the sprouts are about 1-2 cm long. New varieties can also be propagated by micropropagation or tissue culture to increase the rate of multiplication.

D. **Clearing.** Clear the area of bushes or stubbles of previous crop to facilitate land preparation. These can be used in compost piles and should not be burned.

E. **Land Preparation.**Plow the field twice then harrow to pulverize the soil. Make furrows 1 m apart. Incorporate fully decomposed chicken manure at 3-5 t/ha.

F. **Planting**. Planting is done at the start of the rainy season, usually April to May. In areas with abundant supply of water throughout the year, planting can be done anytime. Distribute pre-germinated seed pieces in furrows 30 cm apart and cover lightly with soil. In small-scale plantings, mulch with rice straw or coconut leaves. Ginger is usually intercropped with perennial crops such as coconut and coffee. Multiple cropping of ginger (0.3 m x 3 m), papaya (3 m x 3 m), pineapple (0.3 m x 0.75 m), and tomato (1.0 m x 3.0 m) is a common practice in Cavite.

   One week before planting ginger, plow the field and remove all weeds and roots and make sure the place does not hold water when it rains.If planting will be in two rows, the plot must be about 30 cm high and less than two meters wide. The length depends on the farmer.If the soil has disease, sterilize it first by burning plenty of straw, or dried leaves of banana and coconut over it about 3 times.

   Plant only fresh ginger free from disease, about 20 grams in weight, and showing early germination. A hectare of land can accommodate about 800 seedlings.Before planting the ginger, wash them very well first in running water, and to make them free from disease, soak first for 10-15 minutes in chemical:

   1. dissolve 5-6 grams mercuric bichloride in a porcelain cup of hot water
   2. mix this in five (5) gallons of water
   3. add 189 cc strong hydrochloric acid

   Plant the ginger about 5 cm deep in every hill, about 25 cm apart from each other. Arrange the hills in pyramid shape, whether the place has good drainage or not. Plant the ginger sideways or lying down, and cover with about 10 cm thick soil. If the place is under the shade of coconut or other trees with good drainage, plant the ginger about 20-25 cm in a shallow hill, about 45 cm apart from each other.

G. **Fertilization**. Ginger takes up large amounts of nutrients. The general fertilizer requirement is 180 kg/ha N, 180 kg/ha P_20_5, and 255 kg/ha K_2O. The considerably high K requirement makes ginger sensitive to low K supply. A hectare of ginger requires 11.5 bags 14-14-14 and 4 bags 0-0-60 in addition to 5t/ha chicken or animal manure. Incorporate manure during furrow preparation and apply inorganic fertilizers as sidedress at 30 and 60 days after planting.

H. **Irrigation**. Ginger requires light but frequent irrigation during the vegetative stage, if rainfall is not evenly distributed. Depending on soil type and seasonal rainfall, irrigation varies from 4 to 7 days.

I. **Weeding**. Ginger generally requires regular hand weeding during its growth period. Hand weed 1 month after planting. The frequency of subsequent weeding depends on weed density. Mulch with coconut leaves or rice straw to suppress weed growth.

J. **Pest and Disease Management**. Cutworms, scale insects, and aphids are common ginger pests, but they do not cause significant yield losses. Leaf spot, rhizome rot, and bacterial wilt are some of the major diseases. Ginger is tolerant to leafspot. Rhizome rot can be prevented by strict sanitation and use of Trichoderma as part of organic fertilization. During storage, separate healthy rhizomes from shrivelled and discolored ones. Bacterial wilt infection can be avoided by planting in bacterial wilt-free areas. Pull out infected plants and burn.

Pests	Symptoms	Management
1. Bacterial wilt of ginger, *Ralstoniasolanceacearum*	a. "Green wilt" occurs early in the disease cycle and precedes leaf yellowing. Green ginger leaves roll and curl due to the water stress caused by the bacteria that block the vascular systems of the ginger stems. b. Leaves of infected plants turn yellow and then brown. Yellowing should not be confused with another disease of ginger causing similar symptoms, *Fusarium* yellows. Note: Plants infected by the fungus, *Fusarium oxysporum f. sp. zingiberi*, do not wilt rapidly, as in bacterial wilt. Instead, infected ginger plants are stunted and yellowed. The lower leaves dry out over an extended period of time. c. Diseased plants grow poorly and may be stunted and can decline rapidly and die before harvest.	Some of these practices require sufficient planning and may have significant costs in money, supplies, time and labor. ▪ **Site selection.** The site should be well-drained and having no previous history of ginger cultivation. Do not plant downslope from another ginger field, as the runoff rainwater water can carry the pathogen. Select a site with consistent rainfall throughout the growing season, and with a drier period at the end of the growing season (before and during harvest). If a site has excessive rainfall, the waterlogged soil may foster soil-borne diseases such as root rot and bacterial wilt. Choose a site with gently sloping land to improve soil drainage during the rainy months.

Pests	Symptoms	Management
	d. Rotten rhizomes, often discolored. Water-soaked appearance of infected rhizomes and stem vasculature. Discoloration of vascular tissues e. Soft rots, caused by *Erwinia spp*.	▪ **Planting.** Avoid planting during very wet weather, as this promotes dispersal of the pathogen within fields in draining water and on muddy boots and tools ▪ **Site preparation.** Hill the planting rows to promote aeration of roots and adequate soil drainage. Use clean, pathogen-free equipment. Prepare soil plowing and harrowing so that the site and soils drain well after rainfall. ▪ **Plant pathogen-free seed.** Plant disease-free ginger by using pathogen-free seed.
2. Rhizome rots, *Fusarium sp p.* or *Pythium spp.*	a. Stunted plant growth; yellow leaves and stems; brown discoloration of water conducting tissue within stem; root system rotted, mushy and turning black; rotted rhizome gives off a foul odor b. Disease favors warm, moist soils; spread primarily through use of infected seed pieces which may not show any outward signs of disease	Plant ginger in well-draining soils or on hills created by tilling; do not plant any seed pieces which show symptoms of disease; seed pieces can be treated with hot water (50°C/122°F for 10 min) or appropriate fungicides prior to planting; destroy all crop debris after harvest; keep fields weed free; do not grow ginger for more than one year in same area.
3. Bacterial soft rot, *Erwinia spp.*	a. Light yellow lower leaf tips; yellow leaves; drooping, withered leaves b. Favors water logged fields	Treating seed with Bordeaux mixture prior to planting and solarizing the soil can help to reduce the incidence of the disease

Pests	Symptoms	Management
4. Root-knot nematode, *Melo idogyne spp.*	a. Water soaked lesions on roots; Galls on roots which can be up to 3.3 cm (1 in) in diameter but are usually smaller; reduction in plant vigor; yellowing plants which wilt in hot weather b. Galls can appear as quickly as a month prior to planting; nematodes prefer sandy soils and damage in areas of field or garden with this type of soil is most likely	Plant resistant varieties if nematodes are known to be present in the soil ;check roots of plants mid-season or sooner if symptoms indicate nematodes; solarizing soil can reduce nematode populations in the soil and levels of inoculum of many other pathogens

K. **Harvesting**. Harvest ginger when the leaves turn yellow and wither. This is about 8-10 months after planting, depending on the variety used. Harvest ginger only when it is mature enough. In harvesting, dig every hill with the help of a fork, then pull up the plant, shake off the soil, and lay them on the ground. The branches and leaves may be cut off but take care not to hurt the crops. While harvesting, segregate the ginger according to variety and size. Put in containers so as not to hurt them.

To harvest, dig each hill with a spading fork or a hoe, pull the entire plant, shake off the soil, lay on top of the bed, and cut off the stem without breaking the rhizomes. Care should be practiced during harvesting to minimize injury that results to faster weight loss and susceptibility to decay.

Harvest according to the following market requirements: Market/Product Forms = Harvesting Period (months after planting)

a. domestic market = 8-11
b. salted and pickled 5-7 pickled (for export) = 3
c. dehydrated = 6-8
d. fresh ginger (for export) = 7-10

L. Ginger is ready to harvest when the leaves turn yellow and begin to wilt, about 8 months after planting.

POSTHARVEST HANDLING

When the leaves of the ginger plant turn yellow and begin to wilt, it is time to harvest the ginger. In a ginger plantation, three people should do the harvesting: one will dig up the crop with the help of a fork or spade another will pull up the plant, shake off the soil and stack them in rows.

The third will cut the stems and lay them for drying.Care must be taken not to hurt the crops. Gather the harvest three (3) hours after, preferably late in the afternoon. Segregate them according to sizes.

A. **Cleaning/Washing.** Trim off the shoots and roots and clean the rhizomes immediately after harvest. Wash the rhizomes first to remove soil particles then wash again in water with sodium hypochlorite prepared at 1 drop of 30% sodium hypochlorite per 3.8 L water to disinfect the rhizome and heal the wound faster. Air-dry the rhizomes after washing.

B. **Drying**. Ginger rots easily, but this can last long if dried. The following are recommended:
    1. Soak and wash in water the fresh ginger. Scrape off gently all outer skin so as not to hurt the cells beneath this skin. Most of the cells that contain the oil and fragrance of ginger lie under the skin.
    2. Cut up the ginger about 1/8 inches thin.
    3. Dip in 2% sodium metabisulfite solution (1½ tbsp./1 water) for about 5-10 minutes, drain.
    4. Spread the sliced ginger on a wire tray or nylon. Dry in the sun or in the oven at 65°C until brittle.
    5. Store in containers safe from insects.

C. **Curing.** Cure the rhizomes first under 90% relative humidity and 25°-30°C for 9 days. If available, spray or dip the rhizomes in fruit wax to prevent shrivelling.

D. **Grading.** Classify rhizomes according to size, weight, and appearance. Select healthy rhizomes and discard those that are infected with diseases.
    The size classification for ginger is as follows:
    1. Class I – Large > 3oo g
    2. Class II – Medium 150-300 g
    3. Class III – Small <150 g

E. **Storage after curing**. Store only clean and healthy rhizomes. Keep the 10-month old rhizomes under 7.2°C and the younger rhizomes at 13°C. Maintain relative humidity at 75% to minimize weight loss, sprouting, and rotting.In areas where cold storage is not available, farmers keep their harvest in 2-m deep pits of up to 2 t capacity. These pits, covered with banana or coconut leaves, are located under the shade in backyards. Through this practice, ginger rhizomes can be kept for a year.

F. **Marketing.** Ginger is generally sold in the local market by the "kaing", can, sack, kilo, pile or "tumpok", or by piece. In the export market, ginger is sold in fresh, preserved, or dried forms. Dried – ginger comprises more than 50% of the ginger sold in the foreign market. It is classified as peeled, unpeeled, whole, or split.

COST OF PRODUCTION PER HECTARE

Variable Cost	Man-Animal Day (Php 450)	Hire Tractor (P80/ hour)	Man-day (Php 350)	Total
A. Land Preparation				
Land Clearing			5	1,750
Plowing		4		3,200
Harrowing		2		1,600
Furrowing	1			450
Compost application			5	1,750
Seed preparation			3	1,050
Planting			5	1,750
Side-dressing			4 (2x)	1,400
Weeding			72 (4x)	25,200
Irrigation			10	3,500
Harvesting/Hauling			60	21,000
Cleaning/sorting			60	21,000
Miscellaneous			10	3,500
			Sub-Total	**87,150**
B. Materials	**Quantity**	**Unit Amount (P)**		
Seed Pieces	1,300 Kg	150		195,000.00
Compost	50 bags	450		22,500.00
Fertilizer				
Complete (14-14-14)	12 bags	1,180/bag		14,160
Murate of potash (0 – 0 – 60)	4 bags	2,500		10,000
Fuel and Oil				6,000
Packaging Materials				5,000
Miscellaneous (pails, gloves, etc.)				4,000
			Sub --total	**256,660.00**
Interest on Production Loan at 21% PA				21,000
			Total Variable Costs	**364,810.00**
Fixed Costs				
Land rental				10,000
Depreciation				
Scythe 5 pcs @ Php 50 each				250
Spading Fork 3 pcs @Php 450 each				1,350
Hoe 3 pcs @Php 450 each				1,350
Shovel 3 pcs @ Php 350 each				1,050
Plastic Basin 3 pcs @ Php 300 each				900
			Total Fixed Costs	**14,900**
			Total Production Costs	**379,710.00**
Gross Income				
Regular Season (Php 20.00/kg with 30 tons/ha)				**600,000**
Off Season (Php 40.00/kg with 20 tons/ha)				**800,000**
Net Income				
Regular Season				**220,900.00**
Off Season				**420,290.00**

Source: Ginger Production Guide, Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCAARD) DOST, 2009

References

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