

Marigold may also be intercropped along borders and alleys.

Alternaria blight Use resistant or tolerant varieties such as Terracotta and S-505. If infection is severe, spray appropriate fungicides such as mancozeb and chlorothalonil following the recommended rates.

Harvesting

Carrot can be harvested from 90 to 120 days after emergence depending on variety and location. Loosen the soil using a spading fork then pull the carrot roots carefully. Haul the roots to the packinghouse immediately after harvest. Yields are usually 20–30 t/ha under favorable conditions and good management.

Postharvest Handling

Cut the leaves 5–8 cm from the shoulder. Wash the roots and air-dry. Sort and classify according to size and appearance. Roots that are cracked, deformed, and forked are considered non-marketable, but can still be cooked or processed.

Packing

Pack the marketable roots in bamboo baskets, plastic crates, plastic sacks, or polyethylene bags.

Marketing

Carrot is sold either on a wholesale, contract, auction, or consignment basis. In Benguet, carrot is usually sold unsorted and unwashed as ‘buhos’ or ‘palaspas’ by growers.

Cost and Return Analysis Per Hectare	
Items	Amount (P)
VARIABLE COSTS	
Labor (P220/man-day [MD])	
Clearing (20MD)	4,400
Bed preparation (20MD)	4,400
Manure application (15 MD)	3,300
Planting (25 MD)	5,500
Sidedressing/hilling up (30 MD)	6,600
Spraying (10 MD)	2,200
Weeding/hilling up (30 MD)	6,600
Irrigation (10 MD)	2,200
Harvesting (50 MD)	11,000
Miscellaneous (e.g., hauling, repairs, etc.) (10 MD)	2,200
Subtotal	48,400

Materials	
Seeds (5–10 kg)	10,500
Manure (100 sacks)	8,000
Fertilizer	
- 14-14-14 (6 bags)	4,500
- 46-0-0 (2 bags)	1,942
- 0-0-60 (3 bags)	2,559
- Foliar (4 boxes)	480
Insecticides	3,200
Fungicides	6,320
Fuel and oil	4,000
Packaging materials	3,000
Miscellaneous (e.g., pail, gloves, etc.)	1,000
Subtotal	45,501

Interest on Production Loans at 21% p.a.	10,500
Total (Variable Costs)	104,401

FIXED COSTS	
Land rental	10,000
Depreciation	
Knap sack sprayer (1 unit)	500
Scythe (5 pcs)	83
Hoe (5 pcs)	417
Shovel (3 pcs)	320
Plastic drum (2 pcs)	533
Total (Fixed Costs)	11,853

Total Costs	116,254
Gross Income	
Regular season (at P10/kg with 30 t/ha yield)	300,000
Offseason (at P20/kg with 15 t/ha yield)	300,000
Net Income	
Regular season	183,746
Offseason	183,746

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Small Enterprise Technology Upgrading  
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# Carrot Production Guide



**Introduction**

Carrot (*Daucus carota* L.) originated from Central Asia with Afghanistan as the primary center of origin. It is one of the most important vegetables commonly grown in the Philippine highlands. The production areas are in Benguet, Mountain Province, Ifugao, Nueva Vizcaya, Cebu, Davao del Sur, Negros Oriental, and Bukidnon. In 2006, the volume of production was 35,694 tons (t) from a total of 3,486 hectares (ha) nationwide. Benguet was the largest producer followed by Cebu (Bureau of Agricultural Statistics [BAS], 2006).

**Uses and Nutritional Value**

Carrot is usually cooked with other vegetables for “chop suey” and other dishes. It is also eaten raw with lettuce and pepper. Raw carrot sticks and curls are attractive garnishes and appetizers. Carrot tops are high in potassium, but are bitter. A small portion of the tops may be cut finely and mixed with salads, or cooked in broths or soups for flavoring. It is also made into juice, cake, jam, wine, and dye. It also adds flavor to butter. Carrot is also used as a coffee substitute in Germany.

Carrot provides the highest vitamin A content of all vegetables. Bright orange carrots contain two important phytochemicals: carotenoids and flavonoids, which are natural bioactive compounds. These phytochemicals work with nutrients and dietary fiber to protect people against diseases. Beta-carotene, a member of the carotenoids family, protects the body by decreasing the risk of heart disease, stroke, blindness, and certain types of cancers. The deeper the orange color in carrots, the more beta-carotene content. The nutritional value of carrots actually increases with cooking. The tough cellular wall on raw carrots does not break down very easily. Thus, cooking carrots until just tender makes their nutrients, including beta-carotene, more beneficial. Cooking also brings out their natural sweetness.

Carrot is credited with many medicinal properties. It is said to cleanse the intestines. Carrot is also effective as a diuretic and an overall tonic. It is believed to have remineralizing, anti-diarrheal, and anti-anemic properties. Carrot is rich in alkaline elements that purify and revitalize the blood. It nourishes the entire system and helps in the maintenance of acid-alkaline balance in the body. Being a rich source of vitamin A, it has been used extensively in the human diet to improve eyesight. In fact, carrot was used in aerial training schools in World War II to improve the eyesight of students.

Per 100 grams (g) edible portion, carrots contain:

Properties	Amount
Water (g)	86.7
Energy (kcal)	52.0
Protein (g)	1.5

	Fat (g)	0.4
	Carbohydrates (g)	10.5
	Dietary fiber (g)	3.4
	Ash (g)	0.9
	Calcium (mg)	69.0
	Phosphorus (mg)	38.0
	Iron (mg)	2.1
	Vitamin A (µg)	1,668.0
	Thiamine (mg)	0.04
	Riboflavin (mg)	0.04
	Niacin (mg)	0.8
	Ascorbic acid (mg)	8.0

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

**Production Management**

**Varieties**

Carrot comes in different colors—white, yellow, orange, purple, and violet. Several hundred varieties exist, but there are four main types:

- 1. Imperator - has long roots (23–25 cm), small shoulders and tapered tip;
- 1. Nantes - has medium length roots (15 cm), uniform diameter and blunt tip;
- 1. Danvers - is large, with medium length roots (18 cm), a processing type used for dicing and slicing; and
- 1. Chantenay - is short (13 cm) with large shoulders, and usually a large, distinctly colored core.

Practically all varieties in the Philippines are of the Chantenay type. Open pollinated (OP) and hybrid varieties are available commercially.

For mid and high elevation areas:

- 1. ***OP Varieties*** – Kuroda, New Kuroda OP, Nikko Kuroda, KS Kuroda, Super Kuroda, New Kuroda Guson, Kuroda Max, Kuroda Improved, Chunlong, Kuroda Selection, Kuroda Gold, Terracota, Kuroda EW 35, Royal Chantenay
- 1. ***F<sub>1</sub> Hybrids*** – Beniyama, S-505, Hybrid Sigma, Winter, All Season Cross, Rain Winner, Terracotta F<sub>1</sub> For low elevation areas: Kuroda strains such as EW 35 and Terracotta.

**Soil and Climate Requirements**

Carrot grows best in high elevation areas 1,000 m above sea level. Under such conditions, carrots are more succulent and

less fibrous, with smoother texture and deeper color. Roots attain optimal color when air temperature is 15–21°C, but color deepens rapidly in this temperature range about 3 weeks before harvest. Temperatures below 10°C and above 30°C reduce quality and yield of carrots.

Carrot can also be planted in low and mid elevation areas, but only during the coolest months. Otherwise, the roots will be fibrous, lighter in color, and deformed.

Carrot grows best in deep sandy loam soil rich in organic matter with pH ranging from 5.5 to 6.8.

**Land Preparation**

Plow and harrow the field 2–3 times. Prepare raised beds 20 cm high, 0.7–0.8 meter (m) wide, and 0.3 m apart. Pulverize the soil and incorporate fully decomposed chicken manure at 3–5 t/ha and complete fertilizer at 3–5 bags/ha one week before planting.

**Planting**

One hectare of carrots requires 5–10 kg seeds. Before planting, make shallow lines across the prepared beds spaced 10 cm apart. Sow the seeds thinly and cover lightly with soil.

In low elevation areas, the best time to plant is from the last week of October up to February or during the coolest part of the year. In the highlands, planting can be done throughout the year.

**Fertilization**

The general fertilizer recommendation is 126 kg/ha N, 71 kg/ha P<sub>2</sub>O<sub>5</sub>, and 175 kg/ha K<sub>2</sub>O. However, fertilization should be based on soil analysis. Apply organic fertilizers such as well-decomposed manure or compost at 3–5 t/ha 1–2 weeks before planting to contribute 60–100 kg NPK and micronutrients. The remaining nutrient requirement can be applied at 30 days from sowing, just after weeding and thinning. Cover the fertilizer with soil during hilling up. Tea manure and fermented plant juice (FPJ) may also be used to improve soil fertility.

To prepare tea manure, soak ¾ sack of dried cow or horse manure in a ¾ plastic drum (200-L capacity) of water. Soak for 5–7 days with frequent stirring. Dilute tea manure in up to 20 parts water and spray on the leaves at 1–2 weeks interval. To prepare FPJ, mix three parts chopped plant shoots or banana trunk with one part raw sugar or molasses. Ferment mixture for 5–7 days. Dilute 1 part FPJ to 20–40 parts water and drench on the plots or use as foliar fertilizer.

**Irrigation**

Carrot needs a lot of moisture during the first 30 days of growth. Irregular watering leads to cracking and forking. Water every 5–7 days or as needed. Mulch with dried grasses or rice straw to minimize weed growth and moisture loss.

**Weeding**

Herbicides such as linuron may be used. Spray just after sowing to control broad-leaf weeds. Subsequent hand weeding is done in time with thinning and hilling up.

**Thinning and Hilling Up**

Thinning is done to provide enough space to the growing roots. Start thinning at 30 days after sowing, at a spacing of 10 cm between plants. Hill up immediately after thinning to cover the growing roots, control weeds, and cover the sidedressed fertilizer. Second weeding and hilling up is done 45 days after the first weeding.

**Pest and Disease Management**

Carrot is generally tolerant to pests and diseases, making it easy to grow organically. However, there are also a number of pest and disease problems:

Pests	Recommendations
Cutworm	Spray with biological pesticides such as <i>Bacillus thuringiensis</i> (Bt) and Nuclear Polyhedrosis Virus (NPV) following the recommended rates. If needed, spray with insecticides like fipronil, fenvalerate, permethrin, or other registered chemicals following the recommended rates.
Armyworm	Spray with Bt following the recommended rates. Maintain populations of ground beetles and tachinid flies. Spread ash baits along the field borders. If needed, spray recommended pesticides such as carbaryl, fenvalerate, or malathion following the recommended rates.
Mole cricket	Use biological sprays such as Bt and NPV. Spray with pesticides such as diazinon following the recommended rates. Use carbofuran following the recommended rates, as a last resort.
Slugs	Spread rice hull ash or slug pellets around the plots just to cover the soil.
Aphids	Spray with hot pepper extract (100 g macerated hot pepper/16 L water). If needed, spray carbaryl or malathion following the recommended rates.

Diseases	Recommendations
Powdery mildew	Spray sulfur-based fungicides or mancozeb following the recommended rates.
Bacterial soft rot	Avoid injury to the roots during harvest and remove infected roots.
Root-knot	Practice crop rotation with non-host crops like corn. Plant marigold by broadcasting the seeds in between seasons. Plow under the marigold plants at land preparation.