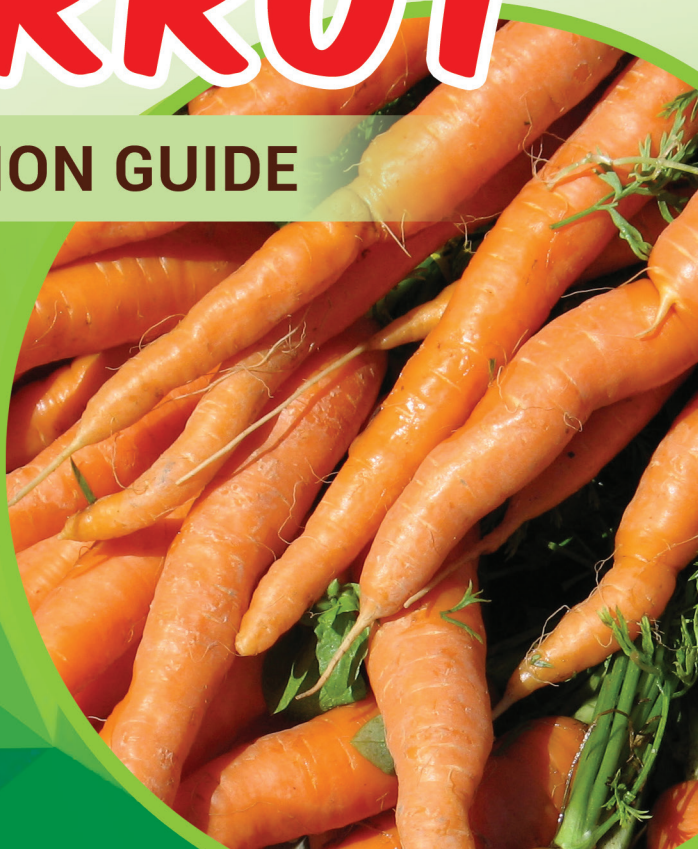
DEPARTMENT OF ARICULTURE
Regional Field Office No. 02
Tuguegarao City, Cagayan

CARROT

PRODUCTION GUIDE



Carrot

Production Guide

This Publication is a project of the **Department of Agriculture, Regional Field Office No. 02, High Value Crops Development Program.** It contains the most recently available and locally adaptable technical information on **Carrot Production** in Region 02.

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Carrot Production Guide

Carrot (*Daucus carota L.*) 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 Agricultucal 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 flavouring. It is also made into juice, cake, jam, wine and dye. It also adds flavor to butter. Carrot is also used as coffee substitute in Germany.

Carrot provides the highest vitamin A content of all vegetables. Bright orange carrots contain two important phytochemicals: cartenoids 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 diuretic and an overall tonic. It is believed to have remineralizing, antidiarrheal, and antianemic 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 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
Dietery fiber (g)	3.4
Ash (g)	0.9
Calcium (g)	69.0
Phosphorus (mg)	38.0
Iron (mg)	2.1
Vitamin A (ug)	1,668.0
Thiamine (g)	0.04
Riboflavin (mg)	0.04
Niacin (mg)	0.8
Ascorbic acid (mg)	8.0

Source: The Philippine Food Composition Table, 1997 FNRI-DOST

Production Management

Varities

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

- **Imperator** – has long roots (23-25 cm), small shoulders and tapered tip;
- **Nantes**- has medium length roots (15 cm), uniform diameter and blunt tip;
- **Danvers** – is large, with medium length roots (18 cm), a processing type used for dicing and slicing; and
- **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:

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

F1 Hybrids- Beniyama, S-505, Hybrid Sigma, Winter, All Season Cross, Rain Winner, Terracota F1. For low elevation areas: Kuroda strain such as EW 35 and Terracota.

Soil and Climate Requirements

Carrots grow well in high elevation areas preferably 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^{o}C, but color deepens rapidly in this temperature range about 3 weeks before harvest. Temperatures below 10^{o}C and above 30^{o}C reduce quality and yields 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.

Carrots 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 or any commercial/organic fertilizer at 3-5t/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 Febuary 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 Nitrogen (N), 71 kg/ha Phosphorus Pentoxide (P_2O_5), and 175 kg/ha Potassium Oxide (K_2O). 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 manure tea, soak ¾ sack of dried cow or horse manure in ¾ plastic drum (200-L capacity) of water. Soak for 5-7 days with frequent stirring. Dilute manure tea 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. Dilure 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.

Pests and Diseas 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 such as:

- **Cutworm –** Spray with biological pesticides such as Bacillus thuringiences (Bt) and Nuclear Polyhedrosis Virus (NPV) following the recommended rates. If needed, spray with insecticides like firpronil, fervarelate, 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.
- **Slugs –** Spread rice hull ash or slug pellets around the plots just to cover the soil.
- **Aphids –** Spray with hot pepper extracts (100g macerated hot pepper/16 L water). If needed, spray carbaryl or malathion following the recommended rates.

Diseases

Recommendations:

- **Powdery mildew –** Spray sulphur-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. 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 90-120 days after emergence depending on the variety and location. Loosen the soil using a spading fork the pull the carrot roots carefully. Haul the roots to the packing house 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 still can 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

Labor P250/man/day (MD)

Items	Amount
Clearing (20 MD)	5,000
Bed preparation (20 MD)	5,000
Manure application (15 MD)	3,750
Planting (25 MD)	6,250
Sidedressing/hilling up (30 MD)	7,500
Spraying (10 MD)	2,500
Weeding/hillingup (30 MD)	7,500
Irrigation (10 MD)	2,500
Harvesting (50 MD)	12,500
Hauling, cleaning, sorting, packing (10 MD)	2,500
Sub-total	**55,000**

Materials

Items	Amount
Seeds (5-10 kg)	10,000
Manure (20 bags 50 kg)	5,000
Fertilizer • 14-14-14 (4 bags) • 46-0-0 (1 bag) • 0-0-60 (2 bags) • Foliar (2 boxes)	 4,000 980 4,000 500
Insecticides	1,700
Fungicides	3,500
Fuel and Oil	2,000
Packaging materials (plastic sacks)	3,500

Miscellaneous (pail,glove,etc.)	1,200
Sub-total	**36,380**

Fixed Costs

Knap sack prayer (1 unit)	2,500
Scythe (5 pcs)	100
Hoe (5 pcs)	500
Shovel (3 pcs)	450
Plastic drum (2 pcs)	1,400
Total (Fixed costs)	
Sub Total	**P 4,950**
Grand Total	**P 96,330**

Gross Income

Regular Season (15 t/ha @ P 10kg)	**P 150, 000**
Offseason (10t/ha @ P 30/kg)	**P 300,000**

Net income

Regular Season – P 150,000 – P 96, 330	**P 53, 670**
Off Season – P 300,000 – P 96, 330-	**P 203, 670**

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