weight loss. Pods should be well formed, straight, bright in color, fresh in appearance, tender but firm, and crisp.

Postharvest Handling

Pods are classified as marketable and non-marketable. Marketable pods are graded/sorted 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.

Packing

Pack pods in bamboo baskets lined with available local materials such as newspapers or banana leaves. Plastic sacks, polyethylene bags, or "bayong" are also suitable for packing pods. Pods can be transported to distant markets with minimal weight loss when packed in thick lined crates.

Snap bean is sold in the local market with Manila as the main outlet. Wholesalers and retailers handle the distribution to smaller outlets in the provinces.

Seed Production

Snap bean is self-pollinated. Select plants that are vigorous and are free of damage from pests and diseases. At 90–100 days from sowing, harvest dry pods and extract seeds. Sun-dry to around 10% moisture content. To determine if the moisture content is acceptable, put some seeds inside a plastic bag and place under the sun. If condensation occurs after 20–30 minutes or more depending on how intense the heat of the sun is, continue sun-drying the seeds. Pack the dry seeds in moisture-proof containers and store in a cool, dry place. If properly stored, seeds can remain viable for about two years.

Cost and Return Analysis per Hectare

Items		Amount (P)
VARIABLE COSTS		
Labor (P220/man-day [MD])		
Clearing (20 MD)		4,400
Bed preparation (20 MD)		4,400
Manure application (15 MD)		3,300
Planting (10 MD)		2,200
Trellising (10 MD)		2,200
Vine training (10 MD)		2,200
Sidedressing/hilling up (10 MD)		2,200
Spraying (8 MD)		1,760
Weeding/hilling up (30 MD)		6,600
Irrigation (10 MD)		2,200
Harvesting (30 MD)		6,600
Miscellaneous (e.g., hauling, repairs, etc.) (10 MD)	2,200	
Subtotal		40,260
Materials		
Seeds (40 kg)		14,600
Manure (60 sacks)		6,000
Fertilizer		
- 14-14-14 (6 bags)		4,938
- 46-0-0 (6 bags)	5,826	
- 0-0-60 (6 bags)	5,118	
Insecticides		4,000
Fungicides		3,950
Fuel and oil		4,000
Trellis materials		12,000
Packaging materials		3,000
Miscellaneous (e.g., pail, gloves, etc.)		2,000
Subtotal		65,432
Interest on Production Loans at 21% p.a.		10,500
Total (Variable Costs)		116,192
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		128,045
Gross Income		
Regular season (at P8/kg with 20 t/ha yield)		160,000
Offseason (at P15/kg with 10 t/ha yield)		150,000
Net Income		
Regular season		31,955
Offseason		21,955

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DEPARTMENT OF SCIENCE AND TECHNOLOGY
Small Enterprise Technology Upgrading Program (SET-UP)

Snap Bean
Production Guide

Introduction

Snap bean (*Phaseolus vulgaris* L.), popularly called "Baguio bean" and "habichuelas", is also known as French bean, green bean, string bean, kidney bean, and haricot bean. It is one of the most widely cultivated vegetable legumes in the Philippines. The term "snap" pertains to the manner by which the young pods are used as vegetables- snapping them to smaller pieces. It also refers to the lower fiber content in snap bean pods compared to dry bean pods, which are tougher and grown only for the dry seeds.

There are two types of snap beans grown in the Cordillera: the pole type, which is more preferred by farmers in Benguet; and the bush type, which is preferred by farmers in Mt. Province and Ifugao. Snap bean is grown in 3,363 hectares (ha) in Benguet Province by 13,374 farmers (Bureau of Agricultural Statistics [BAS], 2006).

Uses and Nutritional Value

The succulent young pods of snap beans can be steamed, sautéed, buttered, or cooked along with other vegetables.

Per 100 grams (g) edible portion, fresh snap bean pods contain:

Properties	Amount
Water (g)	90.5
Energy (kcal)	36.0
Protein (g)	2.0
Fat (g)	0.1
Carbohydrate (g)	6.8
Fiber (g)	1.2
Ash (g)	0.6
Calcium (mg)	77.0
Phosphorus (mg)	38.0
Iron (mg)	1.2
Vitamin A (µg)	60.0
Thiamine (mg)	0.06
Riboflavin (mg)	0.09
Niacin (mg)	0.7
Ascorbic acid (mg)	17.0

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

Production Management

Varieties

Pole Type		Bush Type
Baguio Beans (BSU-1)	Stringless Blue Lake S-7	Bush Blue Lake 274
Alno/Black Valentine	Patig	Labrador
Norman	Kaki/Kanaya	Matador
Redford	B-21	
Burik	Taichung #1	
Gemmy		
Black Kentucky		
Black Gonder		
Kentucky Gonder		
Mayabong		

Soil and Climate Requirements

Snap bean grows best in medium to high elevation areas or temperatures of 18°–29°C. It can also be grown in low elevation areas during the cool, dry months, but the yields tend to be lower; and the pods, more fibrous. Temperatures above 32°C cause blossom drop and deformed pods. Planting is usually done during October and November to achieve higher percentage of pod set.

Snap bean thrives best in well-drained, clay loam soil, rich in organic matter with pH ranging from 5.5 to 7.5.

Land Preparation

Plow and harrow the area 2–3 times. For single row planting, make furrows 0.75–1.0 meter (m) apart. For double-row planting, make 1 m wide and 0.2 m high raised beds. Dig shallow holes 0.3 m between hills. Mix well-decomposed animal manure and/or 14-14-14 fertilizer during bed preparation.

Mulching

Use plastic mulch to suppress weeds and conserve soil moisture. After making the raised beds and incorporating manure, apply plastic mulch with the silver side up. To ensure that the plastic is well stretched, apply during the hotter part of the day. Secure the ends and the sides with soil. Make holes 30—50 cm apart using heated tin cans. The plastic mulch can be used for up to four croppings without being removed from the plot.

Planting

One hectare of snap beans requires 40 kg seeds for the pole type and bush type. After basal fertilization of organic and/or inorganic fertilizers, directly sow 2–3 seeds per hill at a distance of 30 cm x 30 cm between hills, cover lightly with soil, and apply mulch using grass clippings or rice straw. If plastic mulch will be used, directly sow 2–3 seeds per hole and cover lightly with soil.

Trellising

For the pole type snap bean, construct A-type or fence type trellis using bamboo sticks, "rono" or wire # 16, and abaca or plastic twine before vine development.

Fertilization

The general fertilizer recommendation for snap beans is 135 kg/ha N, 135 kg/ha P_2O_5, and 112 kg/ha K_2O. However, proper fertilization should be based on soil analysis.

Apply 2–3 t/ha well-decomposed chicken manure in order to contribute 40–60 kg NPK and micronutrients. Apply 3 bags/ha 14-14-14 as basal fertilizer and another 3 bags as sidedress 30 days after planting. 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 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 7 days. Use 1 tbsp per 4 L of water for drenching on the plots or as foliar fertilizer.

Irrigation

Snap bean requires constant supply of moisture throughout the growing period. Water the plants regularly to enhance flowering and pod setting. Avoid too much water that can cause root rot. On the other hand, too little water can result to flower and pod drop.

Weed Management

Pull out weeds regularly from planting up to the third week. Hill up after 3–4 weeks to cover the sidedressed fertilizer and to suppress weed growth. Regular spot weeding is recommended, but a minimum level of weed growth may be allowed along the alleys to protect the soil. Hilling up is not necessary when plastic mulch is used.

Pest and Disease Management

Snap bean serves as a host to a number of pests and diseases.

Pests	Recommendations
Beanfly	Spray with soap solution (4 tbsp soap/16 L water). If needed, spray with permethrin, cypermethrin, or other appropriate chemicals following the recommended rates.
Aphids	Spray with hot pepper extract (100 g macerated hot pepper/16 L water) and soap solution. If needed, spray with cypermethrin, fenvalerate, deltamethrin, or other appropriate chemicals following the recommended rates.
Leafhopper	Plant sacrificial crops like okra. Spray with soap solution or *Metarhizium*. To prepare *Metarhizium* 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 mL of the conidial suspension in the spray tank and bring the water level to 16 L. Five bags of 200 g palay substrate yields 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 repellant crops such as basil, onion, and marigold. Spray with *Bacillus thuringiensis* (Bt) or Nuclear Polyhedrosis Virus (NPV). If needed, spray with cypermethrin or other appropriate chemicals following the recommended rates.
Leaf Miner	Conserve natural enemies like spiders, lacewings, and syrphid flies. If needed, spray with cyromazine or cartap hydrochloride following the recommended rates. Alternate different products of recommended pesticides to prevent development of pesticide resistance. Intercrop with leeks or lettuce. Maintain low weed population along alleys to minimize the pest.

Diseases	Recommendations
Anthracnose	Use resistant varieties such as B-21. Remove sources of inoculum. Spray with fungicides such as mancozeb, as a last resort, following the recommended rates.
Bacterial blight	Spray with copper-based fungicides following the recommended rates.
Bean rust	Use resistant varieties such as Blue Lake, B-21, and Taichung #1. Remove and burn infected leaves.
Fusarium root rot	Use resistant varieties such as B-21 and Taichung #1. Grow snap bean in a well-drained soil. Practice crop rotation with crops preferred in the market (except legumes).

Most of the recommended varieties are resistant or tolerant to anthracnose, bean rust, and Fusarium root rot especially B-21, Blue Lake, and Taichung #1. Apply chemical sprays only as a last resort. Use preventive measures such as crop rotation and planting of pest-repellant crops and trap crops and attractants of beneficial insects. Follow strictly recommended spacing to allow good air circulation between plants. Remove infected plant parts and rogue severely infected plants. Apply botanical pesticide preparations such as hot pepper spray and soap solution.

Harvesting

Pole snap bean is harvested 60–70 days after planting (DAP), depending on the pod diameter and toughness permitted in the market. Pole snap bean is handpicked every 3–5 days for up to 10 times. Bush snap bean can be harvested as early as 55–60 DAP or at 2 weeks after flower opening at the appropriate pod thickness required by the market. Generally, bush snap bean is stringless, while pole snap bean is more fibrous. Harvest early in the morning (6–8 a.m.) before the heat of the sun gets too intense to avoid