

# Fruits and Vegetables

- 1. Broccoli
- 2. Cabbage
- 3. Cantaloupe
- 4. Carrot
- 5. Cauliflower
- 6. Celery
- 7. Corn
- 8. Cucumber
- 9. Hot Pepper
- 10. Lettuce
- 11. Parsley
- 12. Passion fruit
- 13. Pineapple
- 14. Pumpkin
- 15. Salad Beans
- 16. Sweet Peppers
- 17. Tomato
- 18. Watermelon

## TECHNOLOGY PACKS



## SALAD BEAN



November 2015

# Background

Production decisions concerning how much effort and resources to invest and which farming practices to follow, have consequences and create opportunities for the farm affecting production levels, input costs, time constraints, and the potentially size of the operation. They also may have implications for resource use and environmental quality.

Numerous information exist on the various aspects of production and handling/ marketing of crops and livestock, the majority of which are outdated, not easily understood and lacking the where with all for addressing present day challenges such as good agricultural practices (GAPs) and food safety and climate change that impact on the environment and rural livelihoods. These issues are also closely related to the importance of the role of primary producers in increasing the earnings of all actors along the value chain in supporting the development of a commercially viable and sustainable agricultural industry.

The production of high quality and easily understood information packages is critical as this forms a basis for farmers to obtain financing from lending institutions and to efficiently increase their production through the availability of modern technology. This will also result in a reduction of rural unemployment and will greatly help in alleviating poverty and other associated social ills.

# TECHNOLOGY PACKS

## **SALAD BEAN**



November 2015

Prepared by

Ronald Pilgrim, CARDI (Caribbean Agricultural Research and Development Institute)

Published by

Ministry of Agriculture, St. Lucia

CARDI  
PO. Bag 212, Frederick Hardy Building  
University of the West Indies  
St Augustine Campus,  
St. Augustine Trinidad and Tobago, W.I.

© The Ministry of Agriculture, St Lucia 2015

# Table of Contents

Introduction	4
Botanical Description	5
Ecology and environment	5
Varities/Cultivars	5
Land Preparation	5
Spacing and planting	6
Irrigation	7
Fertilization	7
Weed control	7
Pests and diseases	8
Harvesting/Maturity	11
Field handling	12
Preparation for market	12
Yields	12
Storage	12
Appendix	
Appendix I	15
Appendix II	17
Appendix III	19



# Introduction

This Technological Package (Tech Pack) deals with the production and postharvest aspects of salad bean.

Also included in the Tech Pack are appendices:

- Template for cost of production
- List of recommended pesticides and application rates
- Good Agricultural Practices data record sheet.

Notwithstanding the identification of any specific pesticide for the control of pests and diseases, this decision is for the discretion of the Ministry of Agriculture Area Extension Officer and the farmer.

However, the mention of any pesticides and other products used in the Tech Pack should strictly comply with local regulations and all instructions provided by the manufacturer. Also, the use of trade names in the Tech Pack is for the purpose of citing examples and is not meant to either endorse or discredit any particular product.

# Botanical Description

Salad bean (*Phaseolus vulgaris*.) belongs to the family Fabaceae. The local name in Creole is Pwa Salad.

# Ecology and Environment

Salad bean responds to rich soil and thorough cultivation and will grow in almost any garden soil, from heavy clay to light sandy soils. The soil should not be too acid and should receive a generous amount of rotted manure or compost. Most varieties perform best in the temperature range of 75 - 85°F (24 - 30°C).

# Varieties/Cultivars

Main varieties are Bush Contender, Strike and Contender

# Land Preparation

Plough and rotavate land at least 6 inches (15 cm) deep (Plate 1). On flat land establish drains spaced 30 - 40 feet (9 - 12 m) apart to remove excess water. On sloping land establish drains on the contour 30 - 40 feet (9 - 12 m) apart. Heavy soils that are poorly drained are not suitable for salad bean production because root rot could be a big problem. Salad bean will drop blossoms under wet soil conditions.



Plate 1 Land preparation

## Spacing and Planting

The crop is established by direct seeding, as they do not perform well when transplanted as seedlings. Sow seeds in rows 8 - 16 inches (20 - 30 cm) apart and spaced at 2 - 3 inches (5 - 7 cm) along the rows. Plant seeds 1 - 1.5 inches (2.5 - 4 cm) deep.

For indeterminate (climbing types) varieties, a trellis system for growing beans should be established for the crop to climb (Plate 2).



Plate 2 Trellis system for salad bean



# Irrigation

Irrigation water, especially from streams and ponds, should be sent for analysis to ensure that the water is not polluted or saline. It must be of good quality for irrigation.

Salad bean is shallow rooted with most of the root-absorbing surface in the top 12 inches (30 cm) of the soil, so irrigation is necessary for top quality production. The use of overhead sprinklers or drip irrigation systems is most appropriate for supplying adequate water for salad bean production.

# Fertilization

Specific kinds and rates of fertilizers must be determined from the results of soil and leaf analyses. Composted manure if available should be applied to the soil to help with the uptake of nutrients from inorganic fertilizers; it adds organic matter to the soil, enhances soil structure and growth of micro-organisms. All manure should be well composted to ensure that harmful microorganisms and weed seeds are destroyed.

At planting apply 2,000 lb/acre (2,250kg/ha) of 10:10:10 fertilizer. During crop growth when plants are about 2 - 3 inches (5 - 7 cm) tall apply 1,500 lbs/acre (1,700 kg/ha) of Sulphate of Ammonia.



# Weed Control




Weed control is very important for producing a successful crop. At the early stages of growth it is necessary to weed until the vines are well established. Dacthal W-75 can be applied at the rate of 10 lb/acre (11 kg/ha) before transplanting, however the soil must be moist at the time of application. During the early stages of crop growth young plants should be manually weeded followed by chemical weed control with a contact herbicide; protect against herbicide drift by using a shield. Under "Open Field" and "Protected Agriculture" systems where plastic mulch is used (Plate 9), weeds are suppressed and do not require manual or chemical weed control.




# Pests and Diseases



The major pests and diseases, symptoms and control/management affecting salad bean are indicated in Table 1.

Table 1 Causal agents, symptoms and control of pests and diseases of salad bean

Pest & Diseases	Symptoms	Control/Management
 <p>Plate 3 Leaf Miner</p>	<p>Leaf miners are the larvae of various beetles, flies, moths and sawflies. The adult lays eggs on the leaf and the larvae burrow into the leaf and tunnel through it, feeding and leaving a transparent trail. If you look closely, you can often see a dark dot at the end of one of the lines.</p>	<p>The disease can be controlled with the application of contact or systemic insecticides.</p>
 <p>Plate 4 Aphids</p>	<p>Symptoms are stunting, deformation, gall formation, withering and dying of plants. Leaves may become curled, wrinkled or cup shaped. The symptoms may be due to the feeding or viral diseases spread by the aphids. Honeydew secreted by the aphids encourages the growth of sooty mold (black in colour) on the leaves.</p>	<p>There are a number of organic solutions that can be very effective; this will avoid using chemical controls on an edible crop. However, aphids can also be controlled using contact or systemic insecticides.</p>

Pest & Diseases	Symptoms	Control/ Management
 <p data-bbox="201 583 380 611">Plate 5 Leaf Hoppers</p>	<p data-bbox="613 310 1016 428">Symptoms are stunted growth or leaves that are curled, stippled, or have a burned appearance.</p>	<p data-bbox="1036 310 1412 554">Elimination of weeds that are alternate hosts to leafhoppers. Also leafhoppers can be controlled by application of foliar and soil applied insecticides.</p>
 <p data-bbox="201 957 315 984">Plate 6 Mites</p>	<p data-bbox="613 701 1016 1121">Mites can cause any of the following symptoms: distortion, curling, shedding or discolouration of leaves; russetting or bronzing of leaves and stems; in severe cases the plant becomes stunted, the flowers drop and any fruit already formed fails to develop properly.</p>	<p data-bbox="1036 701 1412 814">Mites can be controlled using contact or systemic insecticides.</p>
 <p data-bbox="201 1461 363 1488">Plate 7 Caterpillar</p>	<p data-bbox="613 1205 1016 1276">Damage by eating the foliage and stems.</p>	<p data-bbox="1036 1205 1412 1276">Apply contact or systemic insecticides.</p>

Pest & Diseases	Symptoms	Control/ Management
 <p data-bbox="201 604 594 680">Plate 8 Southern Blight caused by the soil-borne fungus <i>Sclerotium rolfsii</i></p>	<p data-bbox="613 306 1016 926">The disease is recognized by wilting and yellowing of leaves and by observing the roots when the plant is pulled up, it will be apparent that the lower stem and upper roots are infected. The stems of erect plants are usually rotted at the soil line. A white, moldy growth is evident on affected stem tissues and adjoining surface soil; later smooth, light tan to dark brown mustard seed-like bodies called sclerotia are evident in the mold.</p>	<p data-bbox="1036 306 1421 464">Chemical control with fungicides. The best method of control is the use of resistant varieties.</p>
 <p data-bbox="201 1283 594 1335">Plate 9 Rhizoctonia Rot caused by the fungus <i>Rhizoctonia solani</i></p>	<p data-bbox="613 984 1016 1268">The symptoms are sunken, reddish-brown lesions found on roots or the hypocotyl and may cause stunting or plant death. When the hypocotyl is girdled on young plants, damping-off may occur.</p>	<p data-bbox="1036 984 1421 1268">The disease can be controlled by seed treatment with fungicide; rotating with non-leguminous crops or deep plough of crop residues. If incidence is high it is advisable to spot treat with fungicide.</p>
 <p data-bbox="201 1669 594 1722">Plate 10 Powdery Mildew caused by the fungus <i>Erysiphe polygoni</i></p>	<p data-bbox="613 1371 1016 1734">Symptoms are white powdery patches appearing on both sides of the leaves. Heavily infected leaves become yellow, then become dry and brown, before dropping off. The pods are covered with white patches that may develop purplish spots and become distorted.</p>	<p data-bbox="1036 1371 1421 1444">The disease can be controlled using appropriate fungicides.</p>

Pest & Diseases	Symptoms	Control/ Management
 <p data-bbox="201 562 594 611">Plate 11 Rust caused by a fungus <i>Uromyces phaseoli</i> var. typical</p>	<p data-bbox="613 310 1018 678">The disease first appears as tiny whitish pustules bumps that form on the underside of bean leaves. Soon, the pustules develop into distinct, round, reddish-brown spots. If not controlled, bean rust will turn bean leaves yellow and the plant will die.</p>	<p data-bbox="1037 310 1414 510">The disease can be controlled by the use of certified seed, crop rotation, deep ploughing, spraying weekly with a copper fungicide.</p>
 <p data-bbox="201 1035 594 1083">Plate 12 Bacterial Blight caused by a bacterium <i>Xanthomonas phaseoli</i></p>	<p data-bbox="613 741 1018 1108">Symptoms are expressed by large dead areas on leaves. Spots begin as small water-soaked or light green areas, which later dry out and turn brown with a narrow yellow halo. Water spots can occur on pods. Under moist conditions a yellow ooze is produced in spots on the pods.</p>	<p data-bbox="1037 741 1414 940">The disease can be controlled by the use of certified seed, crop rotation, deep ploughing, spraying weekly with a copper fungicide.</p>

Good Agricultural Practice (GAP) related to the use of pesticides, requires farmers to maintain up to date records on the application of pesticides to the crop. These records should include trade names, application rates and dates of application. During the harvesting period use pesticides with very a short harvest interval.

## Harvesting/Maturity

The beans should be harvested every week. The stage at which the beans are harvested is critical. If harvested too early, yields will be low and pods will wilt quickly. Beans are mature when they snap cleanly when broken. Beans should be picked before seeds become prominent.

# Field Handling

Once harvested, salad bean should be protected from the sun.

# Preparation for Market

Select beans that well formed and straight, bright in colour with a fresh appearance, and tender but firm. They should snap easily when bent.

# Yields

Yields can vary from 6,000 – 8,000 lb/acre (6,500 – 8,500 kg/ha) depending on variety.

# Storage

Heat increases the rate of respiration of salad bean, which is already relatively high after harvest. Delayed postharvest cooling and exposure to the sun leads to quality deterioration, resulting in shriveling and weight loss. Salad beans should be stored at 40 - 45°F (5 - 7.5°C) with 95 - 100% relative humidity.



# APPENDICES





## APPENDIX I: TEMPLATE FOR COST OF PRODUCTION ANALYSIS: SALAD BEAN

	Input	Quantity	Units	Unit Cost	Total Cost
<b>1.</b>	<b>Land preparation and planting</b>				
	Seeds				
	Trellis materials				
	Other land preparation costs (e.g. equipment rental)				
	<b>Total cost for land preparation and planting</b>				
<b>2.</b>	<b>Crop maintenance</b>				
	Water/irrigation				
	Fertilizer (specify types used)				
	Weed control (specify chemicals etc used)				
	Pest and disease control (specify chemicals etc. used)				
	<b>Total cost for crop maintenance</b>				
<b>3.</b>	<b>Harvest/storage</b>				
	Crates/baskets				
	Estimate any utility costs				
	Transport to market				
	<b>Total cost for harvest/storage</b>				
<b>4.</b>	<b>Labour</b>				
	Land preparation and planting				
	Crop maintenance				
	Harvest/storage				
	<b>Total cost for labour</b>				
<b>5.</b>	<b>Rent/insurance</b>				
<b>6.</b>	<b>Miscellaneous costs</b>				
	<b>Total cost of production</b>				

**Notes**

1. It is recommended that the above data be completed on a per crop basis.
2. The cost of any fixed structures should be considered. For example if a refrigerator is solely used to store salad bean in the year and is expected to last for 10 years, then one tenth of the cost of purchase should be added at item 6. If, however other crops are also stored then these also need to be considered. If salad bean accounts for half the produce stored in a year, then the annual cost calculated as above needs to be divided by 2. Similar considerations should be given to an irrigation system.
3. The revenue obtained from sale of the crop should be compared with the cost of production to determine the profit/loss on the operation.

**APPENDIX II: LIST OF RECOMMENDED PESTICIDES AND APPLICATION RATES**

<b>INSECTICIDES</b>	<b>APPLICATION RATE</b>
Pronto 35 SC	3 - 5 teaspoons/gallon of water
Target	1 - 2 teaspoons/gallon of water
Pirate	½ - 1 teaspoons/gallon of water
Fastac	1 - 2 teaspoons/gallon of water
Caprid	½ - 1 teaspoon/gallon of water
Diazinon (Basudin)	¾ - 1½ pints/acre
Admiral	¼ teaspoon/gallon of water
Dipel	1½ - 2 teaspoons/gallon of water
Aza-direct	1 - 2 teaspoons/gallon of water
Cure	½ - 1 teaspoon/gallon of water
Danitol	1 - 2 teaspoons/gallon of water
Cypro	½ tablespoon/gallon of water
Dimethoate (Perfection, Rogor 40)	1 pint/acre
Phosvel	1¼ - 2 pints/acre
Orthene	3.2 ounces/acre
Permethrin (Ambush)	½ teaspoon/gallon of water
Padan 50 WSP	2 - 3 teaspoons/gallon of water
Lannate	1 teaspoon/gallon of water
Decis	½ teaspoon/gallon of water
Kelthane 42%	1¼ lb/acre
Orthene 75S	1 lb/acre
Malathion	½ - 1 pint/acre
Sevin	1½ lb/acre
BT ( <i>Bacillus thuringiensis</i> )	Label rates
Rotenone	1 - 2 teaspoons/gallon of water
Neem X.	8 - 10 oz/gallon of water
<b>FUNGICIDES</b>	<b>APPLICATION RATE</b>
Bellis	2 teaspoon/gallon of water
Acrobat	2 - 4 teaspoon/gallon of water
Mancozeb (Dithane M45)	1.5 lb/acre
Cabendazim	2 teaspoon/gallon of water
Daconil	1½ - 2 pints/acre
Benomyl (Benlate)	6 oz/acre
Captan	2 - 3 teaspoons/gallon of water
Peltar	3 teaspoons/gallon of water
Manzate DF	2 - 4 teaspoons/gallon of water
Bravo	1½ - 2 pints/acre
Tri-Milttox-Forte	3 teaspoons/gallon of water
Botrillex	5 - 200 lb/acre
Kocide 101	2 - 4 teaspoons/gallon of water
Cupravit	2½ lb/acre

**APPENDIX II: LIST OF RECOMMENDED PESTICIDES AND APPLICATION RATES**

<b>WEEDICIDES</b>	<b>APPLICATION RATE</b>
DCPA (Dacthal W-75)	10 lb/acre
Diphenamide	4 - 10 lb/acre
Paraquat (Gramoxone)	1 - 2 pints/acre
Dymid 80W	5 lb/acre
Atrazine 80 (Gesaprim).	1¼ - 1½ lb/acre
Linuron (Lorox)	1 pint/acre
Prometryn (Caparol)	0.8 - 1.6 lb/acre
Sethoxydim (Poast)	1¼ - 3½ lb/acre
Clethodim (Select)	0.094 - 0.25 lb/acre
Prometryn 50WP (Geagard)	2 - 3 lb/acre
Herbicidal Oil (Stoddard Solvent, Kerosene oil)	40 - 80 gallons/acre

**APPENDIX III: GOOD AGRICULTURAL PRACTICES DATA RECORD SHEET**

<b>Grower name:</b>							
<b>* Name of applicator</b>	<b>Date</b>	<b>Brand and product name</b>	<b>Rate</b>	<b>Size of area/no. of plants treated</b>	<b>Total application (amount of the product used)</b>	<b>Notes/target pest</b>	<b>Start/finish time</b>

\*The applicator should be trained or, if not, supervised by a trained or certified person. Proof of training required.

