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# Hill Country Vegetables

## Edible Podded Peas and Beans

**K. D. Brandon**

Vegetable Specialist



**The Agro-Enterprise  
Development Project**  
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**AgEnt HILL COUNTRY VEGETABLES.**  
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# **SECTION A**

## **FIELD NOTES**

# HILL COUNTRY VEGETABLES

## Edible Podded Peas and Beans

### FIELD NOTES

#### 1. Introduction

There are four different legume crops under investigation in this trial, two bean and two edible podded pea types, with a total of ten varieties. The objective is to produce high quality products that satisfy the very stringent UK and E.C. specifications. To achieve this, the standards of growing, harvesting and packing have to meet quality standards that are new to Sri Lanka. The only way to succeed is to meet these standards. We have to remember that our Supermarket customers will, from time to time, inspect both the growing and packing operations to ensure minimum quality standards are being achieved. These standards cover cultural/agronomic practices, eg fertilizer use, pesticides, varieties etc., and the way the crop is picked, cooled and packed, and this includes the packhouse itself. If growers fall outside the specifications and standards set by both Governments and individual customer, product will be rejected. It is the responsibility of the grower, in the first place, to ensure that his products meet the required Quality Assurance standards and are safe for the end consumer to eat.

These particular pea and bean crops are being grown in other Far Eastern countries along with some of the central African countries. There is no particular shortages of supplies in Europe, but there is a place for an additional supplier who can guarantee its production and quality standards. Here is an opportunity for Sri Lanka to move into new crops and widen its overall crop profile in the export market place.

The bean varieties are similar to those already being grown in Sri Lanka, but are somewhat smaller in size and are darker green colour, this is a requirement of the markets in Europe. The Fine Bean is very small when picked and great care has to be taken to maintain its quality after harvesting. The Mange Tout and Sugar Snap peas are new, these are eaten whole. The Mange Tout as a flat pod, and the Sugar Snaps as filled pods. Both are sweet and crisp when cooked, and it is essential to harvest all these crops at their correct maturity.

The following guidelines must be adopted if we are to grow the right quality crops. At each stage of the production cycle any international or marketing requirements affecting that particular stage of the production cycle will be highlighted. For example, the regulations covering pesticide applications and the required recording of each application to meet international standards will be set out.

There may be some production problems in the first stage of the development, in particular the influence of the very low pH levels on all the sites. Although I am recommending the use of Hydrated lime to give the quickest response, there may still be short term problems to raise the pH to a satisfactory level. There are two areas that may influence crop growth. Firstly the pH itself, unless this is raised to at least 6.3, growth

will be restricted. Secondly, where heavy applications of lime are applied combined with high organic levels, resulting from growing manna grass, manganese deficiency may occur. This is easily treated by spraying manganese sulphate or a foliar spray containing manganese. It is important that the symptoms are recognized quickly to avoid crop growth problems. For the peas at least one application of  $MnSO_4$  should be applied at the third/fourth leaf stage as a precautionary measure.

NB All growers must keep full records of pesticide applications. A copy of a field record sheet can be found on pages 1-4 in section B of these notes.

## 2. Soil Preparation

Plough or dig into the soil all remaining crop residues on the surface. Where manna grass has been grown, remove the top growth or burn to reduce the amount of crop debris in the soil rooting profile. High levels of organic matter, especially fresh material, will absorb nitrogen from the soil, depleting supplies to the growing crop, and increasing the chance of manganese deficiency. If the soils are prepared well in advance to sowing, up to two months, the Manna Grass can be incorporated into the soil. Keep the soils well watered during this period to increase the breakdown of the grass.

The soil must have a fine structure to a depth of at least 25cm. (10") Avoid any soil compaction within the rooting zone, remembering this can be as deep as one metre.

Work in the Hydrated lime and Limestone into this profile as soon as possible, ensuring a good mix, to raise the pH in the rooting zone. Any delay in adding lime may cause acidity problems to the growing crops. The minimum pH is 6.3-6.5 for all legume crops. The actual application rate will depend on your soil analysis, but a guide is an application of 400g of hydrated lime and 200g of Dolomite per  $m^2$ . (400g = 14oz, 200g = 7oz.) Where soil pH levels are below 5.0, add a further application of Hydrated lime to the surface of the bed and work into the top 10cm. soil before sowing the seeds. 100-150g per  $m^2$ .

Apply the fertilizer after liming and just before seed sowing. All fertilizers must also be incorporated into the soil before sowing, preferably to a depth of 10-12cm. (4"-5") If possible use fertilizers that contain Ammonium Nitrate as the N source, to reduce possible crop damage problems due to the formation of ammonia gas where sulphate of Ammonia and Urea are used.

Where soil magnesium levels are low, which is fairly general on the soils in this area, apply Keiserite at the same time as the other fertilizers at the application rate of 30 grams per  $m^2$ , making sure it is well mixed into the soil profile.

## 2.1. Bed Sizes

Efficient use of land is important, the following bed top widths give a guide to the best use of land where terracing is used.

Two Row beds:	Flat top width -	minimum 90cm. (36")
Three row beds:	" " " -	" 120cm. (48")
Four Row Beds:	" " " -	" 150cm. (60")

## 3. Irrigation

**3.1 Before Sowing.** The soil must be pre-irrigated to raise the soil to field capacity at least two to three days before sowing the seed. This will help the lime to neutralize the acid soil conditions, and ensure the water level in the rooting zone is sufficient for early growth. Do not irrigate just prior to sowing.

**3.2 After Sowing.** Immediately after sowing apply water to stimulate rapid germination, and keep the soil moist throughout the growing period. Do not over irrigate at any time during this stage, as this may encourage too much leaf development.

**3.3 Before Harvesting.** Increase the water level during pod development and throughout harvesting, making sure the pods remain as clean as possible from soil contamination. Always irrigate from late afternoon, to minimize the risk of damage by strong sunlight to the growing plant. Water loss through evaporation will also be reduced at this time giving more time for the water to be absorbed into the soil during the cooler night.

## 4. Sowing

### 4.1 Target Plant Population:

Mange Tout Peas:	80-90/m <sup>2</sup> (67-75 sq.yd.)
Sugar Snap Peas:	80-90/m <sup>2</sup> (67-75 sq.yd.)
Round Beans:	20/m <sup>2</sup> (17 sq.yd.)
Fine Beans:	25/m <sup>2</sup> (21sq.yd.)

Recommended seeding rates should achieve these plant densities, but care must be taken to avoid predator problems after sowing. Areas should be fenced and if rats or mice are noticed, they take the seed from the soil, precautions will have to be taken. There is always a greater risk of damage from these animals on small plot trials. Other animals such as wild boar can cause a lot of damage. All trial areas should be fenced to reduce potential damage.

## 4.2 Spacing:

Mange Tout and Sugar Snap Peas	Rows- 30/50/30/50cm. (12/20")
Mange Tout Peas	In row-3.25cm. (1.3")
Sugar Snap Peas	In Row-3.0cm. (1.2")
Round Beans:	Rows- 45cm. (18")
	In Row-10cm. (4")
Fine Beans:	Rows- 45cm. (18")
	In Row-9cm. (3.5")

The final row arrangement will be determined by the topography of the individual sites and how much terracing has to be done. The above row widths are therefore a guide only. The rows on the peas are so arranged to give two close rows and then a wider row. This arrangement helps to support the pea vines and keeps the pods well above the soil. This usually results in a better standing crop keeping the peas proud of the soil surface. Each trial site will have to have a separate plan based on the topography of the area. Always keep each crop type and variety together, and label with the variety reference number. See page 9 in this section of the guide for the correct plot numbers.

**4.3 Sowing depth:** All crops: 3-5cm.(1.25-2.0")  
For more detailed crop information, see Section E.

## 5. Weed Control

For all trial plots, hand weed. Never allow the plots to become covered in weed growth, this will reduce yield and quality of the product, and will increase the possibility of pest and disease problems.

For commercial production areas in the future, herbicides can be used, provided these are applied evenly over the soil surface and at the correct application rate.

## 6. Product Traceability

All growers will be issued with a code number. This number must be included on each box of product picked in the field. In turn the packhouse will transfer this number to the packed carton of produce. In the event of a problem occurring the grower can easily be identified right up to the point when the product is purchased in the market. This is all part of the growers responsibility, along with the packhouse operation, for "Quality Assurance".

## 7. Pest and Disease Control

Rapid action to control all pest, disease and nutritional problems is essential. Frequent inspection of the crops is vital, this means walking the crops every day. It is important to report any pest, disease or nutritional problem immediately, even if the cause of the problem is not recognized. You will be given a pest/disease/nutritional reporting sheet, this must be filled in and given immediately to the Extension Officer, and faxed to the AgEnt Office for action, as soon as a problem is seen. (See Section D Pages 1-3.)

### 7.1 Product Guidelines For Pest and Disease Control.

The following guide on pages 5 and 6 should be used as the recommended pesticide list for the common pest and disease problems in the development crops. Do not deviate from this list without permission. If the wrong pesticide is used, the crop may be banned from export. Always ensure the correct spray to harvest interval is observed, as this is an E.C. requirement. Pesticide residue analysis is routinely undertaken in the importing countries, any deviation from the approved products list, or a wrong spray to harvest interval, can result in all crops being banned for export. Random pesticide residue analysis will be carried out from time to time on export crops in Sri Lanka.

For the full list of Approved Pesticides, see section C, pages 1-7.

**NB.** For more details and crop information see the Crop Growing Guides in section E, there is a guide for each crop being grown. For information on the current banned pesticide list for E.E.C. Countries see page 3 in the Pesticide Section of this booklet, Section C.

### 7.2 Insect Pests

(Sheet Updated:29/5/94)

Pests	Product	Rate per Hectare	Water Volume - Litres/ha	Harvest Interval Days
Aphids	Dimethoate, Metasystox-R EC25%		250l/ha 250l/ha	7 days 14 days
Bean Fly	Dimethoate		250l/ha	7 days
Pea & bean Weevil	Cyfluthrin		250l/ha	1 day
Thrips	Dimethoate		250l/ha	7 days
Cutworms	Dipterex LC 50% Chlorpyrifos (Lorsban)		250l/ha 250l/ha	2 days 21 days
Caterpillars	Permethrin		250l/ha	1 day
Red Spider	Dimethoate		250l/ha	1 day
White Fly	Permethrin		250l/ha	1 day

### 7.3. Diseases

Disease	Product	Rate per Hectare	Water Volume	Harvest Interval Days
Botrytis	Benomyl		300l/ha	3
Ascochyta	Metalaxyl/Thiabendazol/Thiram.	Seed Treatment.		
Downy Mildew	Metalaxyl/Thiabendazol/Thiram		300l/ha	21 days
Powdery Mildew	Benomyl		300l/ha	12 days
Anthracnose	Carbendazim		300l/ha	7 days
Bean Rust	Baycor EC 300	85ml/ha	170 l/ha	14 days
Bean Rust	Lonacol (Zineb)		300l/ha	7 Days

For calibration of a Knapsack sprayer, test the sprayer using water as follows:

250 litres per hectare = 1 litre per 40m<sup>2</sup> (25gals per acre)

300 litres per hectare = 1 litre per 33m<sup>2</sup> (30gals per acre)

## 8. Fertilizers and Crop Nutrition

Crop nutrition is critical and both under and over dosing with fertilizers reduces yield. The crop data sheets give guidelines on the level of fertilizer normally required when soils have adequate reserves of Phosphate and Potash. These are given as kilograms of plant food per hectare. These levels have to be increased when soil reserves are low and decreased when high reserves are found. This can only be determined through soil analysis and soil samples from each area within the trials programme should be taken. The chart on pages 7 and 8 sets out the actual rates required under different soil fertility regimes. The rates are quoted in both kilograms of plant food and product per hectare, along with their conversion to grams per m<sup>2</sup>.

Applications of nitrogen are more complicated and soil analysis is a poor guide to total nitrogen requirements. The base levels are again given in the **Crop Data Sheets**, top-dressing rates depend on crop growth. On page 8 in this section of the guide notes, is a table of nitrogen rates per hectare along with their conversion to grams per m<sup>2</sup> for both Urea and Sulphate of Ammonia. The preferred nitrogen product will be Calcium Ammonium Nitrate, if this become available in Sri Lanka.

### 8.1 Soil Analysis Results

#### Fertilizer Application - Phosphate and Potash.

Conversion of soil analysis results into kg of plant food per hectare and kg of product per hectare plus grams per m<sup>2</sup> for Mange Tout/Sugar Snap Peas and Round/Fine Beans.

### 8.2. Kg of Plant Food per Hectare

Phosphorus kg/ha			Potassium kg/ha		
Result ppm	Peas	Beans	Result ppm	Peas	Beans
0-9	75	250	0-60	120	275
10-15	50	200	61-120	50	175
16-25	25	150	121-240	25	100
26-45	25	50	241-400	nil	50
46-70	nil	nil	401-600	nil	nil
71-100	nil	nil	601-900	nil	nil
101-140	nil	nil	901-1500	nil	nil

### 8.3. Fertilizer Application Rates, Kg per Hectare of Fertilizer

Phosphorus - Triple Supers			Potash - Muriate of Potash		
Result ppm	Peas	Beans	Result ppm	Peas	Beans
0-9	150kg	530kg	0-60	200kg	458kg
10-15	106kg	425kg	61-120	83kg	292kg
16-25	53kg	319kg	121-240	42kg	167kg
26-45	53kg	106kg	241-400	nil	83kg
46-70	nil	nil	401-600	nil	nil
71-100	nil	nil	601-900	nil	nil
100-140	nil	nil	901-1500	nil	nil

To convert kilograms per hectare of fertilizer to grams per m<sup>2</sup>, divide kg per hectare by 10 to give grams per m<sup>2</sup>.

eg. 425kg per hectare = 42.5 grams per m<sup>2</sup>.

#### 8.4. Magnesium

Where soil analysis show less than 50ppm, apply Keiserite at 300kg per hectare, 30gm<sup>2</sup> during soil preparation. Add a foliar application during growing if deficiency symptoms are seen. Do not confuse low pH symptoms with magnesium deficiency, with low pH the lower leaves have a "crinkled" affect as well as inter-veinal chlorosis.

#### 8.5. Manganese.

This is usually an induced deficiency, high rates of lime plus organic matter when combined together can cause deficiency symptoms. The problem is likely to be greatest on the pea crops, when the problem is often called "Marsh Spot". Spraying a foliar fertilizer containing manganese usually corrects the problem. For the best results spray Manganese Sulphate, if available, at the rate of 5kg per hectare.

#### 8.6. Fertilizer Application - Nitrogen

Fertilizer Nitrogen Rate		Fertilizer Nitrogen Rate	
Kg per Hectare Fertilizer	Grams per m <sub>2</sub> Fertilizer	Kg per Hectare Fertilizer	Grams per m <sup>2</sup> Fertilizer
5	Urea 1.1 Sulphate 2.4	60	Urea 13.0 Sulphate 28.6
10	Urea 2.2 Sulphate 4.8	70	Urea 15.2 Sulphate 33.0
20	Urea 4.3 Sulphate 9.5	80	Urea 17.4 Sulphate 38.1
30	Urea 6.4 Sulphate 14.3	90	Urea 19.6 Sulphate 42.9
40	Urea 8.6 Sulphate 19.0	100	Urea 21.7 Sulphate 47.6
50	Urea 10.9 Sulphate 23.8		

All fertilizer nitrogen rates are grams per m<sup>2</sup> , to convert to kg/ha, multiply by 10.

## 9. Varieties and Plot Numbers

### Mange Tout Peas and Beans

Plot No.	Crop and Variety.
<b>Round Beans</b>	
1	Nerine
2	Narbonne
3	Xera
4	Saranda
5	Masai
<b>Fine Beans</b>	
6	Tavera
7	Niki
<b>Mange Tout</b> (Flat Edible Podded Peas)	
8	Origon Sugar
9	Snowflake
<b>Sugar Snap</b> (Full Podded Edible Peas)	
10	Sugar Gem

Please use the above numbers for all your development plots, as these are the permanent reference numbers for each variety throughout this stage of the development. You should also sow your plots in the same sequence to keep all sites uniform, even though in practice, you may have to sow in different shape blocks depending on the topography of the land.

For plant populations and seed rates etc, see **section A**, pages 3-4, or the Crop Data Sheets in **Section E**.

## 10. Crop Specifications

## Mange Tout Peas and Beans

Specification	Mange Tout Peas	Sugar Snap Peas	Round Beans	Fine Beans
Variety	Origon Sugar Snowflake	Sugar Gem	Nerine Narbonne Xera Saranda Masai	Taverna Niki
Length	65-110m (2.6-4.4")	60-90mm (2.4-3.6")	110-116mm (4.4-4.6")	75-95mm (3-3.8")
Diameter	NA	NA	6-9mm (0.24-0.36")	5-7mm (0.2-0.28")
Stalk Length	15mm Max (0.6")	15mm max (0.6")	15mm Max (0.6")	15mm Max (0.6")
Calyx	Fresh Green	Fresh Green	NA	NA
Maturity	No Seed Formation. Tender to Eat	85% Seed Closed in Rows. Tender to Eat.	Tender, the Bean must Break Easily, No Stringiness.	Tender, the bean must Break Easily, No Stringiness
Colour	Mid-Dark Green	Mid-Dark Green.	Dark Green.	Dark Green.
Pest & Disease	Nil, Black Spotting Slight.	Nil, Black Spotting Slight.	Nil level	Nil level.
Shape	Flat.	Round.	Round, Straight and Regular.	Round, Straight and Regular.
Pesticides	To EC and UK MRL's. No Surface Residues.	To EC and UK MRL's. No Surface Residues.	To EC and UK MRL's. No Surface Residues	To EC and UK MRL's. No Surface Residues

Source: J. Sainsbury



## Stanhay Drill Settings.

### Robin 820 Single Row Hand Drill

Crop	Belt	Base	Choke	Spacing
1. Nerine Round Bean	Rib 28x28	D	X	10/m @2 mph
2. Narbonne Round Bean	Rib 30x28	D	X	10/m @2 mph
3. Xera Round Bean	Rib 30x28	D	X	10/m @2 mph
4. Saranda Round Bean	Rib 28x28	D	X	10/m @2 mph
5. Masai Round Bean	Rib 30x28	D	X	10/m @2 mph
6. Tavera Fine Bean	Rib 28x30	M	X	11/m @2 mph
7. Niki Fine Bean	Rib 28x30	M	X	11/m @2 mph
8. Origon Sugar Mange Tout Pea	Rib 32x36	Q	P	26/m @2 mph
9. Snowflake Mange Tout Pea	Rib 32x36	Q	P	22/m @2 mph
10. Sugar Gem Sugar Snap Pea	Rib 26x36x2	D Double	G	31/m Double Row @2 mph
1. Valencia Onion	Plain 11.5x96x3	G Triple	T	108/m Triple Row @ 2mph
2. Eclipse Onion	Plain 11.5x96x3	G Triple	T	104/m Triple Row @2 mph

*Information based on seed samples submitted to Stanhay May 1994.*

# **SECTION B**

## **FIELD RECORD SHEET**

# HILL COUNTRY VEGETABLES

## FIELD RECORD SHEET

**NB: Please complete in full for each crop and variety.**

SITE: Company Name:  
Address:

Contact Name:  
Grower ref. No.

Site Reference Number:

Location:

Crop:

Variety:

Date of Sowing:

Date of Crop Emergence:

Trial Area:            m<sup>2</sup>

Number of Days to Emergence:

Number Seeds Sown:            /m<sup>2</sup>

Target Population/m<sup>2</sup>:

Date of First Full True Leaf:

Actual Plant Population:

Date of First Flower:

Date of First Fruit Formation:

Number Days Sowing To First Picking:

Date of First Pick:

Date of End Picking:

Number Days of Picking:

Total Number of Pickings:

### 1. Picking Intervals - Days

Picking No.	1	2	3	4	5	6	7	8
Date of Pick.								
Weight kg.								

**Picking Intervals, Continued.**

Picking No.	9	10	11	12	13	14	15	16
Date of Pick								
Weight kg.								

**2. Soil Analysis Result**

Laboratory Used:

Date:

Sample Taken:  
Results Received:

Nutrient	mg/l	Index
Phosphate ( $P_2O_5$ )		
Potash ( $K_2O$ )		
Magnesium (Mg)		
Soil pH		

**3. Treatments****3.1 Base Fertilizers**

Fertilizer	Date Applied	$g/m^2$	kg/ha
Nitrogen			
Phosphate as $P_2O_5$			
Potash as $K_2O$			
Magnesium as MgO			
Other- specify:			
		Hydrated Lime	Dolomitic
Lime, Limestone etc. Target = pH 6.5		Kg/Ha $g/m^2$	Kg/Ha $g/m^2$

### 3.2 Top Dressing Fertilizers

Fertilizer	Date of Application	g/m <sup>2</sup> N	g/m <sup>2</sup> P <sub>2</sub> O <sub>5</sub>	g/m <sup>2</sup> K <sub>2</sub> O	g/m <sup>2</sup> Mg	g/m <sup>2</sup> Mn	g/m <sup>2</sup> Other
Number 1							
" 2							
" 3							
" 4							
" 5							
" 6							

### 4. Pest and Disease Problems

#### 4.1. Diseases, eg. Mildew, Botrytis, etc.

Date First Noticed	Disease or Symptom	Control Action Date Method	Other Comments

**4.2. Pests, eg. Aphids, Thrips, Cutworms, etc.**

Date First Noticed	Pest or Symptom	Control Action Date      Method	Other Comments

**Other Notes.**

**Signed:**

**Date:**

# **SECTION C**

## **PESTICIDE NOTES**

# HILL COUNTRY VEGETABLES

## PESTICIDE NOTES

### 1. Introduction

Pesticides are dangerous if used incorrectly, both to the spray operator and to the end customer of the product. It is essential that the correct pesticide is chosen for the problem in hand, it has to be applied at the correct dosage rate and in the correct water volume. The sprayer must be clean and free from contamination from previous sprays and have the correct nozzle type. The correct spray to harvest intervals must be observed at all times. If these criteria are taken into account each time spraying takes place, there should be no problems occurring from crop damage due poor pesticide application or choice of chemical. and the end crop will be safe to eat, and will meet current pesticide legislation.

### 2. Choice of Product

On pages 5-7 in this section of the pesticide notes, you will find a list of approved pesticides in Sri Lanka for use on vegetable crops. In addition you will find the preferred pesticide list for the crops currently being grown in Section E, Crop Data Sheets. In the Field Note Section, section , page 5, gives a general list of pests and diseases along with the recommended pesticide for their control. Do not deviate from these lists without checking first product safety, with either the AgEnt Office or through your Extension Officer.

Where ever possible choose products that leave little or no surface residues on the crops, the UK Supermarkets will reject crops where residues are seen, even if the correct harvest intervals are observed.

### 3. Product Concentration

It is always important to apply the correct rate of Active Ingredient over a given area. This is usually quoted in litres or kg etc., of product per hectare. The active ingredient rate has to be applied regardless of the water volume. In the Field Note Section on page 6, you will find the recommended water rates per hectare for insecticides and fungicides. If the water volumes are changed for any reason, the active ingredient rate remains the same over a given land area. The product concentration in the water has to changes to accommodate water volume changes.

eg. 1kg per ha in 300 litres of water = 3.3g per litre of water.  
1kg per ha in 200 litres of water = 5.0g per litre of water.

Both give the same application rate of 0.1 grams of product per m<sup>2</sup>.  
This must be borne in mind when calibrating sprayers, see below.

## 4. Sprayer Calibration

Each sprayer must be accurate in its application and should be calibrated before spraying commences. A simple way to do this with hand held machines is to calculate the area covered by one litre, and spray this with plain water. Repeat as necessary until the correct walking speed in conjunction with sprayer pressure and nozzle size has been established. The Field notes suggest that two main water rates should be used, 250 litres per hectare for insecticides and 300 litres for fungicides. In these cases one litre of water covers 40m<sup>2</sup> and 33m<sup>2</sup> respectively. (Page 6 in Field Notes.) For additional information on spraying and sprayer calibration see pages 8 and 9 in this section of the Field Notes.

## 5. Harvest Intervals

The harvest interval is the time that must elapse from spraying a crop to the first possible harvest date. These must be observed at all times. If no harvest interval is specified we can normally assume that one day must pass between spraying and harvesting after insecticide application, and up to 14 days for fungicides.

Failure to meet these requirements can lead to product rejection, as it is illegal to sell crops in the European market which are harvested before the correct spray to harvest interval has passed.

## 6. Maximum Pesticide Residue Levels

Some of the pesticides we use have legal maximum residue levels in the harvested crop. If these are above the minimum limits, which are determined by residue analysis, we cannot sell the crop. These limits are set by individual countries, the EEC and by Codex. (World Health Organisation.)

A list of pesticides affected by these limits are available, along with crop by crop variations, at the AgEnt Office.

In summary a crop cannot be sold if the **interval** from spraying to harvest is too short and/or the **Maximum Residue Limit** is too high.

**WARNING:** Where overdosing of product occurs, the MRL can be too high even after the correct time interval has elapsed for harvesting, **AND IT IS ILLEGAL TO SELL THE CROP.**

## 7. Field Record Sheets

All spray applications must be recorded, this includes the active ingredient, water volume, weather conditions at time of spraying, method of spraying etc. These must be kept for a period of three years, and the packhouse will also have to maintain copies for inspection by our customers from the importing countries. A copy of a pesticide recording sheet can be found on page 4 in this section of the handout. These records should be kept for a minimum period of three years.

## 8. Banned Pesticides

There are pesticides that cannot be used under any circumstance, the following list is the current banned E.C. list of chemicals:

### A. Mercury Compounds

1. Mercury Oxide
2. Mercurous Chloride
3. Other Inorganic Mercury Compounds
4. Alhyl Mercury Compounds
5. Alhoxylakyl + Aryl Mercury Compounds

### B. Persistent Organo-Chlorine Compounds

1. Aldrin
2. Chlordane
3. Dieldrin
4. DDT
5. Endrin
6. HCH, containing less than 99% Gamma Isomer
7. Heptachlor
8. Hexachlorbenzene
9. Camphechlor

### C. Other Compounds

1. Ethylene Oxide
2. Nitrofen
3. 1,2, Dibromoethane
4. 1,2, Dichloroethane
5. Dinoseb, its Acetates and Salts
6. Binapacryl
7. Captafol
8. Dicofol
9. Maleic Hydrazide
10. Quintozone
11. Vinclozolin- banned by some customers

## 9. Pesticide Storage

Never allow pesticides to contaminate crops, either growing in the field or after harvesting. If harvested crops are stored in a building awaiting collection, the building must not contain stored pesticides. Pesticides should be kept in a designated pesticide storage building, which should be kept locked. Do not mix pesticides near to harvested crops or where water containing pesticides residues can contaminate produce awaiting collection.

**10. Pesticide Application Record Sheet**

**AgEnt PROJECT  
PESTICIDE APPLICATION RECORD SHEET**

**Farm Name:**

**Ref. Number: FR1**

**Field/Site Name:**

**Crop:**

**Sowing Date:**

**Growth Stage:**

**Spray Operator's Name:**

**Supervisor's Name:**

PRE-PLANTING CHEMICALS					
Date	Product	Active Ingredient	Application Rate	Water Vol.	Temp °C

POST-PLANTING CHEMICALS					
Date	Product	Active Ingredient	Application Rate	Water Vol.	Temp °C

## 11. Pesticide Availability — Sri Lanka

The following chemicals are recommended for use in AgEnt Horticultural Projects, this is not necessarily the full list available, but from this selection most pest and disease problems should be overcome. Specific recommendations are made in the crop Field Notes on page 6 for individual crop under investigation, see also the Field Data sheets in Section E for crop by crop pest and disease control.

### 1. Herbicides

Herbicide	Common Name	Company	Target Weeds	Comments
Gramoxone	Paraquat	Harcros	Non Systemic Total Control	
Gramoxone	Paraquat	Baur	As Above	
Counter	Glyphosate	Harcros	Systemic Total Control	
Glycel	Glyphosate	Baur	As Above	
Baursate 36	Glyphosate 36%	Baur	As Above	
Sencor WP 75%	Metribuzin	Haychem Bayer	Selective Potatoes	
Direx 4L	Diuron Flowable	Anglo Chem	Residual Total Control	
Diuron WP 80%	Diuron	Haychem	As Above	
Diuron WP 80%	Diuron	Haychem	As Above	
Diuron WP 80%	Diuron	Harcros	As Above	
Tri-allate	Avadex		Grass weeds Mange Tout	
Trifluralin	Treflan		Weed Control Beans	

## 2. Insecticides

Insecticide	Common Name	Company	Target Pests	Harvest Intervals
Demro	Dimethoate	Harcros	Aphids	7 Days
Dimitox 40	Dimethoate	Anglo Chem	Aphids	7 Days
Metasystox -R EC25%	Oxydemeton -Methyl	Bayer Hortichem	Aphids	21 days
Basudin 50 EC	Diazinon	Harcros	Soil Pest, Thrips/Aphids	14 days
Harcron	Chlor-pyriphos	Harcros	Soil Pests	21 Days
Lorsban 40 EC.	Chlor-pyriphos	Anglo-Chem	Soil Pests	21 Days
Pyrinex 20 EC.	Chlo-pyriphos	Anglo-Chem	Soil Pests	21 days
Baythroid	Cyfluthrin	Bayer	Caterpillars Pea Month Pea Weevil	1 Day
Ambush EC 25	Permethrin	C.I.C.	Caterpillars Leaf minor etc.	1 Day
Dipterex LC 50%	Trichlor-fon.	Haychem	Caterpillars Cutworms	2 Days
Harfurdan	Carbofuran	Harcros	Soil Pests Nematodes	28 Days

### 3. Fungicides

Fungicide	Common Name	Company	Target Diseases	Comments
Harcozeb	Mancozeb	Harcros	Mildew/Rusts	14 days
Propercol	Mancozeb	Anglo-chem	Mildew/Rusts	14 Days
Vondozeb	Mancozeb	Baur	Mildew/Rusts	14 days
Ridomol MZ WP	Metalaxyl + Mancozeb	Harcros	Downy Mildew	21 Days
Manex 4L	Maneb	Anglo Chem	Rusts	14 Days
Benor	Benomyl	Harcros	Botrytis P. Mildew	12 Days M/T 3 Days Beans
Thiovit	Sulphur 80%	Baur	P. Mildew	2 Days
Sulphur WP 80%	Sulphur	Haychem	P. Mildew	2 Days
Captan WP 50%	Captan	Baur	Scab	7 Days
Plantvax	Oxycarboxin	Anglo Chem	Rusts	21 Days
Blast-all	Carbendazim	Anglo Chem	Anthraco nose Botrytis	7 Days
Baycor EC 300	Triadimefon	Haychem	Rusts	14 days
Lonacol	Zineb	Haychem	Rusts	7 days

## 12. Pesticide Spraying and Calibration

### INSECTICIDE AND HERBICIDE APPLICATION TECHNIQUES

#### SPRAYS & SPRAYING

Some of the principles to be adopted in the control of weeds, insect pests and plant pathogens have been touched upon. In all cases, but primarily in weed control, the use of sprays is one of the major methods. This chapter discusses some of the techniques, equipment and formulations which may be encountered in the course of spraying.

**Spray Equipment.** A wide range of spraying equipment is now available, from the small flit sprayer to large power-operated sprayers with capacities of up to 1800 litres.

The flit sprayer, which holds about a cupful of mixture, is adequate for most small gardens. It should always be thoroughly washed and dried after use, the container and pump shaft being kept apart to minimize corrosion in storage.

The knapsack sprayer, which is one of the most successful all-purpose sprayers, used worldwide, consists of a tank of up to 23 litres capacity and a pump, strapped on the back of the operator. A lever provides compression and in some cases operates a stirrer in the tank. A lance is connected to the spray-tank by a flexible hose. Problems with metal corrosion have now been partly resolved by the use of plastics. These machines are satisfactory in that they are robust, versatile and portable. They are very widely used in all forms of tropical agriculture where labour costs are not prohibitive.

Power-operated sprayers come in a variety of different sizes, from smaller than knapsack size to large tractor-driven machines. Since there are many more parts which can go wrong, portable power-operated sprayers being heavier than manually-operated machines, and the initial costs substantially higher, use of these machines is generally restricted to large-scale operations using tractors with spray booms of 6—9 m or more. Included in this category are fogging machines, which produce a dense fog of fine droplets, in which the pesticide is dissolved. Mist-blowers may be converted to dusting machines to supply powder by using a long vinyl tube with a series of holes in it. Dust is blown through this, and thus distributed.



Aerial spraying is generally used only on large areas where swift application of insecticide is imperative, and the greatly increased additional cost can be afforded.

**Filters & Nozzles.** Since most formulations are mixed in the field, it is particularly important to filter the spray, and ensure that no foreign matter gets as far as the nozzles, which may thus be blocked. The nozzles themselves are of particular importance, since it is they which break

subject to abrasion and wear. As the apertures enlarge, the rate of application increases. In fan nozzles, the aperture is an elongated slit, while cone nozzles have apertures to produce a hollow or a solid cone. The size of the apertures and rates of delivery can be regulated by fitting different nozzles which are available with the better-known sprays.

Fan nozzles are best used to cover the ground at a uniform speed to give an even distribution over the whole width of the swathe. Hollow-cone nozzles give little or no deposit in the centre of the cone, while solid-cone nozzles give the heaviest deposition in the centre of the circle, and are regarded as the best for spot-spraying. Twin nozzles are not recommended on knapsack sprayers, except if blanket spraying is required.

**Volume of Spray Mixture & Droplet Size.** Normal high-volume spraying rates vary from 200 to 450 litres of mixture per hectare, though rates in excess of 2000 litres per hectare are occasionally used. Low-volume rates vary, from up to 75 litres per hectare for aerial application, to up to 200 litres per hectare for land application. Ultra-low volume (u.l.v.) spraying involves the production of very small droplets carried in a light oil and blown by a fan. In general, the smaller the droplet size, the more evenly will the chemical be spread. However, droplets of less than 30 microns are all but airborne, giving rise to drift problems. Since smaller droplets have larger surface areas, and thus evaporate more easily, u.l.v. formulations must not use water, which would evaporate too quickly. A number of suitable solvents have been developed in recent years.

**Spray Additives.** These are of two kinds. Wetters, or surfactants, are substances added to the spray to reduce the surface tension of the droplets, and thus improve the contact between the spray and the surface. They sometimes also improve the solubility of certain herbicides. Stickers, the second additive, are substances assisting the spray to adhere. Most modern herbicides and insecticides already have stickers added, but an additional sticker may be needed in cases where the leaf surface is particularly waxy. Surfactants, of which there are a number of brands on the market, are generally applied at the rate of 30 ml per 100 litres, while stickers are usually applied at 120 ml per 100 litres.

**Calibration of sprays** is necessary to ensure that the correct dosage rates are applied. The simplest way is probably to spray a typical section of the area for weed control with the standard techniques employed and the usual pump pressure, walking speed and nozzle to be used. Compute the actual area sprayed in square metres, and measure the amount of spray solution used.

E.g. area sprayed 70 m<sup>2</sup>, using 2.6 litres of spray solution (or water, for trial):

Then volume of spray pump output per hectare is

$$\frac{2.6 \times 10,000}{70} = 371.4, \text{ say } 371 \text{ litres per ha.}$$

Assume required dosage is 2.82 litres of chemical per ha.

$$\frac{2.82}{371} = 0.76\% = \text{required concentration of chemical solution.}$$

For an 18 litre spray pump, add 0.76% × 18 litres  
= 137 cc of chemical,

**Safety Precautions.** Many herbicides and pesticides are extremely toxic to animals and humans. Considerable care is therefore necessary in their use. The main points to be remembered are:

- (i) Read the label, particularly the safety precautions, before use.
- (ii) Do not exceed recommended dosages.
- (iii) If a safer formulation is available, use it in preference to a more toxic one.
- (iv) Avoid spraying in windy weather when there is an enhanced danger of drift.
- (v) Avoid all contamination of water sources, and in particular ensure that empty containers are washed out and the washings incorporated in the spray mix. Do not use empty containers for any other purpose, but dispose of these safely.
- (vi) Do not allow any of the spray mixture to come into contact with the body. For this purpose long-sleeved shirts, long trousers, rubber boots, rubber gloves, a respirator and eye protection should be worn by all sprayers.
- (vii) Return all surplus material to a locked store after use.
- (viii) Clean all clothing used with detergents and wash the body with soap on completion of the job.
- (ix) Never use mouth suction to draw liquids into a siphon.
- (x) Have all the necessary containers, siphons and measuring equipment ready before containers are opened.
- (xi) When filling a tank by hose, beware of back siphoning, which occurs when one end of the hose is lower than the liquid level in the tank.
- (xii) Thoroughly clean all apparatus after use. Rinse containers 3 times, draining for 30 seconds after each rinse, and pour water away safely, not into streams.
- (xiii) Do not smoke, eat, drink or handle food, cigarettes, etc., while spraying, but wait until the job is completed and after washing the body.

## **SECTION D**

# **CROP GROWTH REPORTING SHEET**

**HILL COUNTRY VEGETABLES**

Sheet No. FR2

**CROP GROWTH, PEST and DISEASE PROBLEMS  
REPORTING SHEET**

Company:

Date:

Contact Person:

Grower ref No.:

Crop:

Sowing Date:

Variety:

Plot Ref.

Problem:

Describe Symptoms:

Please tick the appropriate box, and add other comments as necessary.

1. Are there unusual colour changes and/or disfigurement to leaves, stems, flowers etc.?

	YES	NO
Affecting leaf margins, centres or veins?		
Affecting stems?		
Affecting stem base and/or root system? (please indicate area)		
Affecting whole plant?		

2. Do think the symptoms have been caused by any of the following?

	YES	NO
Insects, fungi, nutrition or water related		
Soil problems.		
Weather problems		
Chemical treatments		





# HILL COUNTRY VEGETABLES

## FIELD RECOMMENDATION SHEET

Date:

Grower:

Field:

Area:

Crop:

Plot No.

Problem	Recommendation	Application Rate

Other Notes:

Signed: \_\_\_\_\_

# **SECTION E**

## **CROP DATA SHEETS**

## HILL COUNTRY VEGETABLES

### CROP TECHNICAL DATA SHEET

GROWER: AgEnt Project

CROP: Round Beans

#### 1. Varieties

Production Period	Sowing Date	Suitable Varieties
All year under investigation	14-21 day intervals depending on time of year.	Nerine Narbonne Xera Saranda Masai  Please note all seeds are treated with seed dressings, do not eat the seeds and wash hands after handling.

#### 2. Soils

**2.1 Suitable Soil Types:** Free drained light to medium loam soils.

**2.2 Soil Preparation:** Dig the soil to a depth of 25cm, (10") making sure all old crop residues are buried. Make sure there is no compaction below this depth as the roots will penetrate to a depth of at least 1m. Form the planting beds along the land contours making sure the flat tops of the beds are at the correct width for the number of rows planned for each bed. (See page 3 in Section A for details). The soil tilth must be fine to encourage good germination and an even plant stand. During soil preparation incorporate any liming materials to the full depth of 25cm. (10") Where soils have a very low pH, less than 5.0, add more lime just before sowing at the time the fertilizers are applied. When adding fertilizers etc. make sure these are applied evenly over the soil surface before incorporation.

### 3. Crop Nutrition

SUITABLE pH RANGE: 6.5

Nutrient	Base Dressing	Top Dressing	Timing
Nitrogen	50 kg/ha	50+50 kg/ha	At approx. 4 weeks and when first beans are showing.
Phosphate	200kg/ha	Nil	
Potash	175 kg/ha	Nil	
Magnesium	50kg/ha	Only if symptoms are showing.	As soon as symptoms are showing.
Manganese	Nil	Apply as foliar feed as necessary, at the rate of 5kg of Manganese Sulphate per ha.	

To convert kg/ha to grams per m<sup>2</sup> see page 7 and 8 in section A.

For additional notes on crop nutrition refer to Section A Page 5.

#### 4. Crop Establishment Systems

Target Plant Population: 20 plants per m<sup>2</sup>. ( 17 plants per sq. yd.)

Row Spacing: 45 cm.(18")

In Row Plant Spacing: 10cm. (4")

Direct Seeding:      Yes   X      No -

Seeding System: Stanhay single line placement seeder.

Transplanting:      Yes -      No X

Transplanting System: N.A.

Plant Propagation System: N.A.

#### 5. Irrigation Requirements

**Pre-Planting:** Make sure the soil is well watered before sowing, this should be done about 1-2 days prior to seeding. At the time of sowing the soil should be moist, but not too wet. If the beds are made well in advance to sowing, pre-irrigate to encourage weed germination, removing these before sowing. (Spray with Gramoxone)

**Post Planting:** Irrigate immediately after sowing bringing the soil up to field capacity. Keep watering during the germination stage, especially during the evening. Once plants have emerged do not over water, as this can encourage excessive vegetative growth. When pods are set, increase the level of irrigation. Avoid irrigating in strong sunlight.

## 6. Weed Control

Product Name	Timing	Rate per Ha	Application Notes
<p>During the development stage of the project, do not use selective herbicides.</p> <p>Where "stale" seed beds are used, spray the weeds off with Gramoxone.</p>			

## 7. Pest and Disease Control

Pest or Disease Problem	Product	Application Rate	Application Notes
Seed Treatment			Control of soil borne pests and diseases.
<b>Pests:</b>			
Cutworms	Dipterex/Lorsban		As soon as damage is seen.
Bean Fly	Dimethoate		Apply every 7-10 days
Aphids	Metasystox etc.		Apply when first seen.
Caterpillars	Permethrin		Apply after butterfly/moth activity seen.
<b>Diseases</b>			
Botrytis	Benomyl		At first sign of disease.
Downy Mildew	Metalaxyl Plus.		At first sign of disease.
Bean Rust	Baycor/Lonacol		Spray susceptible varieties.
Anthracnose	Carbendazim		Spray at flowering if noticed.

**NB.** Always read the product label before spraying, and comply with all the regulations contained on the label.

## 8. Harvesting

Do EEC Standards Apply? :                      Yes    X        No. -

### 8.1 Recommended Crop Harvesting System:

Hand harvest selected pods that meet the specification, see below and page 10 in Section A for details. Do not leave over mature pods on the plant as these will reduce yield if not picked. Discard these in the field.

Normally pick every day, under fast growing conditions twice per day harvesting may be required. The best time for harvesting is early in the morning when the pods are at their coolest.

### 8.2 Crop Specifications:

Specification	Supermarkets	Other Markets
Maturity	Not stringy, must break cleanly.	To be confirmed.
Length	110-116mm. (app. 4.5")	
Diameter	6-9mm (app. 0.25-0.36")	
Shape	Straight	
Colour	Dark Green	
Stalk Length	15mm max. (0.6")	
Calyx Colour	N.A.	
Weight	N.A.	
Sugar %	N.A.	
Skin Texture	Smooth	
Internal Colour	Mid/Dark Green	

### 8.3 Grading, Packing and Packaging:

Packaging and Weights	Supermarkets	Other Markets
Individual Weights	N.A.	N.A.
Carton Weights	5kg.	5kg.
Pre-Pack Weights	N.A.	N.A.
Box Dimensions		
Size 1:	To be confirmed.	To be confirmed.
Size 2:		
Size 3:		
Packaging Materials	To be confirmed.	To be confirmed.

## 9. Cooling and Cold Storage

### Recommended Cooling Systems:

Pre-Cooling	Maximum Harvest to Cooling Time: 4 hours		
Target Temperature/ Humidity at Packing	8-10 °C	95 -100 RH%	
Method of Cooling	High humidity cooling preferred, reducing risk of dehydration, at an air temperature no lower than 5-6°C.		

Post Packing	Maximum Storage Period After Packing: 2 Days Maximum		
Target Storage Temperature	6-7 °C	95-100 RH%	
Recommended Cold Storage System	High humidity cold store with positive air circulation. NB: Do not pack beans if they are too wet as product deterioration is likely during transit to the markets.		

Product Transport			
Transport Temperatures	6-7 °C	Maximum Transport Time	2/3 Days
<b>Transport Conditions:</b>			
<p>All beans must be air flown to the markets, preferably with direct flights to reduce stop over problems. Before despatch from the airport, product should be placed into cold store and loaded on to the aircraft as near to take-off as possible.</p> <p>On arrival at the destination, the boxes must be placed directly into cold store, and then moved by cold chain vehicle to the markets.</p>			

## 10. Other Important Factors

All bean crops are highly perishable, and will lose quality rapidly after harvesting if not kept at the right temperature and humidity. During packing great care must be taken to eliminate damage as rough handling reduces shelf life.

The beans should be packed as dry as possible, but not dehydrated, to avoid fungal disease problems during transport. All diseased, broken, over mature and out of specification beans must be removed during packing. Frequent picking ensures that maximum yields of quality beans are harvested, resulting in high packout percentages.

The frequency of picking can only be determined in the field, this is controlled by temperature, nutrition and water levels. Labour should be organised to pick at least once per day, and this should be done as early in the morning as possible. This is when the beans are at their coolest.

Never leave picked beans in direct sunlight after picking. Always place the beans in a shady position which allows good air circulation through the trays. Remember the respiration rates are high in these crops and product heating occurs after picking if air circulation is restricted.

Product must be transported as quickly as possible to the cold store, refrigerated vehicles should be used. If the current days picking is to be packed immediately, cool to 10-12°C before packing, and then reducing the temperature to the correct storage temperature after packing. If there is any delay in packing reduce the temperature to the target storage temperature as quickly as possible.

**NB Soil pH.** Great care must be taken to increase soil pH levels to as near 6.5 as possible before sowing commences. Some growth problems may be experienced if liming occurs very near to sowing, as it takes some months for the lime to increase the soil pH to the required level.

## HILL COUNTRY VEGETABLES

### CROP TECHNICAL DATA SHEET

GROWER: AgEnt Project

CROP: Fine Beans

#### 1. Varieties

Production Period	Sowing Date	Suitable Varieties
All year under investigation	14-21 day intervals depending on time of year.	Tavera Niki  Please note all seeds are treated with seed dressings, do not eat the seeds and wash hands after handling.

#### 2. Soils

**2.1 Suitable Soil Types:** Free drained light to medium loam soils.

**2.2 Soil Preparation:** Dig the soil to a depth of 25cm, (10") making sure all old crop residues are buried. Make sure there is no compaction below this depth as the roots will penetrate to a depth of at least 1m. Form the planting beds along the land contours making sure the flat tops of the beds are at the correct width for the number of rows planned for each bed. ( See page 3 in Section A for details). The soil tilth must be fine to encourage good germination and an even plant stand. During soil preparation incorporate any liming materials to the full depth of 25cm. (10") Where soils have a very low pH, less than 5.0, add more lime just before sowing at the time the fertilizers are applied. When adding fertilizers etc. make sure these are applied evenly over the soil surface before incorporation.

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### 3. Crop Nutrition

SUITABLE pH RANGE: 6.5

Nutrient	Base Dressing	Top Dressing	Timing
Nitrogen	50 kg/ha	50+50 kg/ha	At approx. 4 weeks and when first beans are showing.
Phosphate	200kg/ha	Nil	
Potash	175 kg/ha	Nil	
Magnesium	50kg/ha	Only if symptoms are showing.	When symptoms are seen.
Manganese	Nil	Apply as foliar feed as necessary, at the rate of 5kg of Manganese Sulphate per ha.	

To convert kg/ha to grams per m<sup>2</sup> see page 7 and 8 in section A.

For additional notes on crop nutrition refer to Section A Page 5.

#### 4. Crop Establishment Systems

Target Plant Population: 25 plants per m<sup>2</sup>. ( 21 plants per sq. yd.)

Row Spacing: 45 cm.(18")

In Row Plant Spacing: 10cm. (4")

Direct Seeding:      Yes   X      No -

Seeding System: Stanhay single line placement seeder.

Transplanting:      Yes -      No X

Transplanting System: N.A.

Plant Propagation System: N.A.

#### 5. Irrigation Requirements

**Pre-Planting:** Make sure the soil is well watered before sowing, this should be done about 1-2 days prior to seeding. At the time of sowing the soil should be moist, but not too wet. If the beds are made well in advance to sowing, pre-irrigate to encourage weed germination, removing these before sowing.

**Post Planting:** Irrigate immediately after sowing bringing the soil up to field capacity. Keep watering during the germination stage, especially during the evening. Once plants have emerged do not over water, as this can encourage excessive vegetative growth. When pods are set, increase the level of irrigation. Avoid irrigating in strong sunlight.

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## 6. Weed Control

Product Name	Timing	Rate per Ha	Application Notes
<p>During the development stage of the project, do not use selective herbicides.</p> <p>Where "stale" seed beds are used, spray the weeds off with Gramoxone.</p>			

## 7. Pest and Disease Control

Pest or Disease Problem	Product	Application Rate	Application Notes
Seed Treatment			Control of soil borne pests and diseases.
<b>Pests:</b>			
Cutworms	Dipterex/Lorsban		As soon as damage is seen.
Bean Fly	Dimethoate		Apply every 7-10 days
Aphids	Metasystox etc.		Apply when first seen.
Caterpillars	Permethrin		Apply after butterfly/moth activity seen.
<b>Diseases</b>			
Botrytis	Benomyl		At first sign of disease.
Downy Mildew	Metalaxyl Plus.		At first sign of disease.
Bean Rust	Baycor/Lonacol		Spray susceptible varieties.
Anthracnose	Carbendazim		Spray at flowering if noticed.

**NB.** Always read the product label before spraying, and comply with all the regulations contained on the label.

## 8. Harvesting

Do EEC Standards Apply? :                      Yes   X      No. -

### 8.1 Recommended Crop Harvesting System:

Hand harvest selected pods that meet the specification, see below and page 10 in Section A for details. Do not leave over mature pods on the plant as these will reduce yield if not picked. Discard these in the field.

Normally pick every day, under fast growing conditions twice per day harvesting may be required. The best time for harvesting is early in the morning when the pods are at their coolest.

### 8.2 Crop Specifications:

Specification	Supermarkets	Other Markets
Maturity	Not stringy, must break cleanly.	To be confirmed.
Length	75-95m. (app. 3.0-4.0")	
Diameter	5-7mm (app. 0.2-0.28")	
Shape	Straight	
Colour	Dark Green	
Stalk Length	15mm max. (0.6")	
Calyx Colour	N.A.	
Weight	N.A.	
Sugar %	N.A.	
Skin Texture	Smooth	
Internal Colour	Mid/Dark Green	

### 8.3 Grading, Packing and Packaging:

Packaging and Weights	Supermarkets	Other Markets
Individual Weights	N.A.	N.A.
Carton Weights	5kg.	5kg.
Pre-Pack Weights	N.A.	N.A.
Box Dimensions		
Size 1:	To be confirmed.	To be confirmed.
Size 2:		
Size 3:		
Packaging Materials	To be confirmed.	To be confirmed.

## 9. Cooling and Cold Storage

### Recommended Cooling Systems:

<b>Pre-Cooling</b>	Maximum Harvest to Cooling Time: 4 hours	
Target Temperature/ Humidity at Packing	8-10 °C	95 -100 RH%
<b>Method of Cooling</b>	High humidity cooling preferred, reducing risk of dehydration, at an air temperature no lower than 5-6°C.	

<b>Post Packing</b>	Maximum Storage Period After Packing: 2 Days Maximum	
Target Storage Temperature	6-7 °C	95-100 RH%
<b>Recommended Cold Storage System</b>	High humidity cold store with positive air circulation. NB: Do not pack beans if they are too wet as product deterioration is likely during transit to the markets.	

Product Transport			
Transport Temperatures	6-7 °C	Maximum Transport Time	2/3 Days
<b>Transport Conditions:</b>			
<p>All beans must be air flown to the markets, preferably with direct flights to reduce stop over problems. Before despatch from the airport, product should be placed into cold store and loaded on to the aircraft as near to take-off as possible.</p> <p>On arrival at the destination, the boxes must be placed directly into cold store, and then moved by cold chain vehicle to the markets.</p>			

## 10. Other Important Factors

All bean crops are highly perishable, and will lose quality rapidly after harvesting if not kept at the right temperature and humidity. During packing great care must be taken to eliminate damage as rough handling reduces shelf life. This is very important for Fine Beans.

The beans should be packed as dry as possible, but not dehydrated, to avoid fungal disease problems during transport. All diseased, broken, over mature and out of specification beans must be removed during packing. Frequent picking ensures that maximum yields of quality beans are harvested, resulting in high packout percentages.

The frequency of picking can only be determined in the field, this is controlled by temperature, nutrition and water levels. Labour should be organised to pick at least once per day, and this should be done as early in the morning as possible. This is when the beans are at their coolest.

Never leave picked beans in direct sunlight after picking. Always place the beans in a shady position which allows good air circulation through the trays. Remember the respiration rates are high in these crops and product heating occurs after picking if air circulation is restricted.

Product must be transported as quickly as possible to the cold store, refrigerated vehicles should be used. If the current days picking is to be packed immediately, cool to 10-12°C before packing, and then reducing the temperature to the correct storage temperature after packing. If there is any delay in packing reduce the temperature to the target storage temperature as quickly as possible.

**NB Soil pH.** Great care must be taken to increase soil pH levels to as near 6.5 as possible before sowing commences. Some growth problems may be experienced if liming occurs very near to sowing, as it takes some months for the lime to increase the soil pH to the required level.

## HILL COUNTRY VEGETABLES

### CROP TECHNICAL DATA SHEET

**GROWER:** AgEnt Project

**CROP:** Mange Tout Peas

#### 1. Varieties

Production Period	Sowing Date	Suitable Varieties
All year under investigation	14-21 day intervals, depending on time of year.	Origon Sugar Snowflake

#### 2. Soils

**2.1 Suitable Soil Types:** Light to Medium Loams

**2.2 Soil Preparation:** Dig the soils to a depth of 25cm (10"), making sure there is no compaction below this depth. Peas are very susceptible to poor water drainage. Bury all old crop residues as soon as possible after the previous crop has been harvested. The soil must have a fine tilth to encourage quick germination of the seed after sowing.

Incorporate the lime during soil preparation, this should be well mixed to a depth of 25cm. Where soils have a pH of less than 5.0, add more lime just before sowing and mix in the top 10cm (4") of soil. (see also page 2 in Section A).

When applying fertilizer, make sure these are applied evenly over the soil surface before incorporating into the top 10cm of the soil profile.

### 3. Crop Nutrition

SUITABLE pH RANGE: 6.5

Nutrient	Base Dressing	Top Dressing	Timing
Nitrogen	30kg/ha	75kg/ha	At first pod formation. Additional N may be required earlier if growth is slow.
Phosphate	50kg/ha	Nil	
Potash	50kg/ha	Nil	
Magnesium	30kg/ha	Nil	
Manganese	Nil	0.5g/m <sup>2</sup> as foliar spray. (MgSO <sub>4</sub> )	As soon as symptoms are seen. If necessary apply Mn as part of trace element spray if MnSO <sub>4</sub> is unavailable.

#### 4. Crop Establishment Systems

Target Plant Population: 80-90 plants per m<sup>2</sup> (67-75 sq. yd.)

Row Spacing: 30-50-30-50cm. (12-20-2-20")

In Row Plant Spacing: 3.25cm.(1.3")

Direct Seeding:      Yes    X      No    -

Seeding System: Direct sowing with Stanhay placement drill

Transplanting:      Yes    -      No    X

Transplanting System: N.A.

Plant Propagation System: N.A.

#### 5. Irrigation Requirements

**Pre-Planting:** Make sure the soil is well watered before sowing, this should be done some 1-2 days before sowing. At the time of sowing the soil should be moist , but not too wet. If the beds are prepared well in advance to sowing, pre-irrigate to encourage weed germination, removing these before sowing.

**Post Planting:** Irrigate immediately after sowing, bringing the soil up to field capacity. Keep well watered during the gemination stage. The best time is to water during the evening. After crop emergence do not over water, this can result in excessive growth, reducing yield. After peas have set increase the water level. Avoid irrigating in strong sunlight.

## 6. Weed Control

Product Name	Timing	Rate per Ha	Application Notes
Do not use herbicides during the development stage of this project.			
Where stale seed beds are used, spray the weed with Gramoxone.			

## 7. Pest and Disease Control

Pest or Disease Problem	Product	Rate per Ha	Application Notes
Seed Treatment (Ascochyta)	Metelaxyl+ Thiabendazole + Thiram.		Control of soil borne pests and diseases.
<b>Pests:</b> Aphids	Metasystox		Spray at first signs of infestation.
Caterpillars	Dimethoate		At first signs of infestation or after butterfly activity.
Cutworms	Permethrin Ambush EC 25 Dipterex LC 50% Lorsban 40 EC		At first signs of problem.
<b>Diseases:</b> Downy Mildew	Metelaxyl + Thiabendazol		At first signs of disease.
Botrytis Cladosporium	Benomyl		At first signs of disease.  Avoid wet areas

**NB.** Always read the product label before spraying, and comply with all the regulations contained on the label.

## 8. Harvesting

Do EEC Standards Apply? :                      Yes   X   No. -

### 8.1 Recommended Crop Harvesting System:

Harvest every day picking all the pods that are at the correct specification. Discard over mature and damaged pods, making sure these are picked to encourage development of young peas. Pick into baskets and transfer into the plastic field crates, taking care not to damage the peas, or allowing them to fall on to the ground.

Keep the harvested crop in the shade before collection and transfer to the cold store. Always allow air to circulate through the plastic crates, to reduce product heating problems.

### 8.2 Crop Specifications:

Specification	Supermarkets	Other Markets
Maturity	There must not be any seed formation in the pods.	To be confirmed.
Length	65-110mm (2.6-4.4")	
Diameter	N.A.	
Shape	Flat and Straight	
Colour	Mid-Dark Green	
Stalk Length	15mm max. (0.6")	
Calyx Colour	Fresh Green.	
Weight	N.A.	
Sugar %	N.A.	
Skin Texture	Smooth	
Internal Colour	Mid-dark Green	

### 8.3 Grading, Packing and Packaging:

Packaging and Weights	Supermarkets	Other Markets
Individual Weights	N.A.	
Carton Weights	2.2kg- 5.0kg	
Pre-Pack Weights	To be confirmed.	
Box Dimensions		
Size 1:	To be confirmed.	
Size 2:		
Size 3:		
Packaging Materials	To be confirmed.	

## 9. Cooling and Cold Storage

### Recommended Cooling Systems:

Pre-Cooling	Maximum Harvest to Cooling Time:	4 Hours
Target Temperature/ Humidity at Packing	8-10 °C	95-100 RH%
Method of Cooling	High humidity forced air is preferred. If packing takes place the day after picking reduce the temperature to 0-1°C as quickly as possible.	

Post Packing	Maximum Storage Period After Packing:	2-3 Days
Target Storage Temperature	0-1 °C	95-100 RH%
Recommended Cold Storage System	Positive air circulation at high humidity will keep the peas in a fresh condition. The humidity is very important to keep the calyx green.	

Product Transport			
Transport Temperatures	1-2 °C	Maximum Transport Time	2-3 Days
<b>Transport Conditions:</b> The peas must be transported to the airport in a refrigerated vehicle, and must not be allowed to stand out in ambient temperatures before loading on to the aircraft.			

## 10. Other Important Factors

The climatic conditions that best suit Mange Tout Peas are to avoid both extremes of temperature and rainfall. The maximum temperature is in the region of 27°C, with a monthly mean of 13-20°C. The high lands in Sri Lanka potentially have a suitable climate from the temperature point of view, but site selection taking into account rainfall patterns is essential. The different monsoon rain areas at different times of the year should make this possible.

Peas are very susceptible to disease build up in the soil, there should be a rotational cropping plan to avoid peas following peas. Ideally there should be at least two years between crops. Round or fine beans can be part of this rotation.

Mange Tout Peas are very young when picked, this increases their respiration rate when compared to more mature crops. This increases the risk of physical damage when picked, additionally high respiration rates mean the picked crops will heat up more quickly and must be cooled quickly. See notes on cooling, page 20 in this section of the field notes.

The pest and disease section highlights some of the potential problems found on Mange Tout peas. Always inspect the growing crops daily for signs of pests and diseases. Take action quickly to control problems before crops become unmarketable. The market requires blemish free pods to meet supermarket specifications. Black spotting can become a problem during wet, humid weather. This is a physiological problem, and cannot be controlled by spraying, although secondary infections can occur.

If the peas are to be packed on the same day as picking, the field heat must be removed before packing. reduce the flesh temperature to 10°C before packing. The remaining temperature can be taken out after packing.

**NB.** Peas area affected by low soil pH, apply the recommended rates of dolomite and hydrated lime as far in advance to planting as possible. In addition apply extra hydrated lime over the top of the beds before sowing, this is particularly important where pH levels are below 5.0.

**HILL COUNTRY VEGETABLES**  
**CROP TECHNICAL DATA SHEET**

GROWER: AgEnt Project

CROP: Sugar Snap Peas

**1. Varieties**

Production Period	Sowing Date	Suitable Varieties
All year under investigation	14-21 day intervals, depending on time of year.	Sugar Gem

**2. Soils**

**2.1 Suitable Soil Types:** Light to Medium Loams

**2.2 Soil Preparation:** Dig the soils to a depth of 25cm (10"), making sure there is no compaction below this depth. Peas are very susceptible to poor water drainage. Bury all old crop residues as soon as possible after the previous crop has been harvested. The soil must have a fine tilth to encourage quick germination of the seed after sowing.

Incorporate the lime during soil preparation, this should be well mixed to a depth of 25cm. Where soils have a pH of less than 5.0, add more lime just before sowing and mix in the top 10cm (4") of soil. (see also page 2 in Section A). When applying fertilizer, make sure these are applied evenly over the soil surface before incorporating into the top 10cm of the soil profile.

### 3. Crop Nutrition

SUITABLE pH RANGE: 6.5

Nutrient	Base Dressing	Top Dressing	Timing
Nitrogen	30kg/ha	75kg/ha	At first pod formation. Additional N may be required earlier if growth is slow.
Phosphate	50kg/ha	Nil	
Potash	50kg/ha	Nil	
Magnesium	30kg/ha	Nil	
Manganese	Nil	0.5g/m <sup>2</sup> as foliar spray. (MgSO <sub>4</sub> )	As soon as symptoms are seen. If necessary apply Mn as part of trace element spray if MnSO <sub>4</sub> is unavailable.

#### 4. Crop Establishment Systems

Target Plant Population: 80-90 plants per m<sup>2</sup> (67-75 sq. yd.)

Row Spacing: 30-50-30-50cm. (12-20-2-20")

In Row Plant Spacing: 3.0cm.(1.2")

Direct Seeding:      Yes    X      No    -

Seeding System: Direct sowing with Stanhay placement drill, using twin hole belt giving two lines of peas, with an average spacing of 3cm.

Transplanting:      Yes    -      No    X

Transplanting System: N.A.

Plant Propagation System: N.A.

#### 5. Irrigation Requirements

**Pre-Planting:** Make sure the soil is well watered before sowing, this should be done some 1-2 days before sowing. At the time of sowing the soil should be moist , but not too wet. If the beds are prepared well in advance to sowing, pre-irrigate to encourage weed germination, removing these before sowing.

**Post Planting:** irrigate immediately after sowing, bringing the soil up to field capacity. keep well watered during the gemination stage. The best time is to water during the evening. After crop emergence do not over water, this can result in excessive growth, reducing yield. After peas have set increase the water level. Avoid irrigating in strong sunlight.

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## 6. Weed Control

Product Name	Timing	Rate per Ha	Application Notes
Do not use herbicides during the development stage of this project.			
Where stale seed beds are used, spray the weed with Gramoxone.			

## 7. Pest and Disease Control

Pest or Disease Problem	Product	Rate per Ha	Application Notes
Seed Treatment (Ascochyta)	Metelaxyl+ Thiabendazole + Thiram.		Control of soil borne pests and diseases.
<b>Pests:</b> Aphids	Metasystox		Spray at first signs of infestation.
Caterpillars	Dimethoate		At first signs of infestation or after butterfly activity.
Cutworms	Permethrin Ambush EC 25 Dipterex LC 50% Lorsban 40 EC		At first signs of problem.
<b>Diseases:</b> Downy Mildew	Metaxyl + Thiabendazol		At first signs of disease.
Botrytis	Benomyl		At first signs of disease.
Cladosporium	-	-	Avoid wet areas

**NB.** Always read the product label before spraying, and comply with all the regulations contained on the label.

## 8. Harvesting

Do EEC Standards Apply? :                      Yes    X        No. -

### 8.1 Recommended Crop Harvesting System:

Harvest every day, picking all the pods that are at the correct specification. Remember Sugar Snap Peas are full podded when harvested. (80% full). Discard over mature and damaged pods, making sure these are picked to encourage development of young peas. Pick into baskets and transfer into the plastic field crates, taking care not to damage the peas, or allowing them to fall on to the ground.

Keep the harvested crop in the shade before collection and transfer to the cold store. Always allow air to circulate through the plastic crates, to reduce product heating problems.

### 8.2 Crop Specifications:

Specification	Supermarkets	Other Markets
Maturity	There must not be any seed formation in the pods.	To be confirmed.
Length	65-110mm (2.6-4.4")	
Diameter	N.A.	
Shape	Full Podded (80%) and Straight	
Colour	Mid-Dark Green	
Stalk Length	15mm max. (0.6")	
Calyx Colour	Fresh Green.	
Weight	N.A.	
Sugar %	N.A., but must have high sugars, sweet to taste.	
Skin Texture	Smooth	
Internal Colour	Mid-dark Green	

**8.3 Grading, Packing and Packaging:**

Packaging and Weights	Supermarkets	Other Markets
Individual Weights	N.A.	
Carton Weights	2.2kg- 5.0kg	
Pre-Pack Weights	To be confirmed.	
Box Dimensions		
Size 1:	To be confirmed.	
Size 2:		
Size 3:		
Packaging Materials	To be confirmed.	

**9. Cooling and Cold Storage****Recommended Cooling Systems:**

Pre-Cooling	Maximum Harvest to Cooling Time:	4 Hours
Target Temperature/ Humidity at Packing	8-10 °C	95-100 RH%
Method of Cooling	High humidity forced air is preferred. If packing takes place the day after picking reduce the temperature to 0-1°C as quickly as possible.	

Post Packing	Maximum Storage Period After Packing:	2-3 Days
Target Storage Temperature	0-1 °C	95-100 RH%
Recommended Cold Storage System	Positive air circulation at high humidity will keep the peas in a fresh condition. The humidity is very important to keep the calyx green.	

Product Transport			
Transport Temperatures	1-2 °C	Maximum Transport Time	2-3 Days
<b>Transport Conditions:</b> The peas must be transported to the airport in a refrigerated vehicle, and must not be allowed to stand out in ambient temperatures before loading on to the aircraft.			

## 10. Other Important Factors

The climatic conditions that best suit Sugar Snap Peas are to avoid both extremes of temperature and rainfall. The maximum temperature is in the region of 27°C, with a monthly mean of 13-20°C. The high lands in Sri Lanka potentially have a suitable climate from the temperature point of view, but site selection taking into account rainfall patterns is essential. The different monsoon rain areas at different times of the year should make this possible.

Peas are very susceptible to disease build up in the soil, there should be a rotational cropping plan to avoid peas following peas. Ideally there should be at least two years between crops. Round or fine beans can be part of this rotation.

Sugar Snap Peas are very young when picked, this increases their respiration rate when compared to more mature crops. This increases the risk of physical damage when picked, additionally high respiration rates mean the picked crops will heat up more quickly and must be cooled quickly. See notes on cooling, page 20 in this section of the field notes.

The pest and disease section highlights some of the potential problems found on Sugar Snap peas. Always inspect the growing crops daily for signs of pests and diseases. Take action quickly to control problems before crops become unmarketable. The market requires blemish free pods to meet supermarket specifications. Black spotting can become a problem during wet, humid weather. This is a physiological problem, and cannot be controlled by spraying, although secondary infections can occur.

If the peas are to be packed on the same day as picking, the field heat must be removed before packing. reduce the flesh temperature to 10°C before packing. The remaining temperature can be taken out after packing.

**NB.** Peas area affected by low soil pH, apply the recommended rates of dolomite and hydrated lime as far in advance to planting as possible. In addition apply extra hydrated lime over the top of the beds before sowing, this is particularly important where pH levels are below 5.0.