



-PN-ABR-811 INS=88799

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AgEnt PROJECT - LEGUME TRIAL

(BIC issue no. 20)

Field Workshop

Thursday 24th March 1994

at

Campion Group - Bogowantalawa

Technical Notes No. 01



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AgEnt PROJECT - LEGUME TRIAL

Edible Podded Peas and Bean Varieties



Mange Tout Peas



Sugar Snap Peas



Round and Fine Beans

AgEnt LEGUME PROJECT.

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AgEnt PROJECT - LEGUME TRIAL.

FIELD NOTES AND SET-UP SHEET.

1. INTRODUCTION.

There are four different vegetable crops under investigation in this trial, two bean and two 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 by 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 standards. Here is the opportunity for Sri Lanka to move into new crops and widen its overall crop profile.

The bean varieties are similar to those already being grown in Sri Lanka, but are somewhat smaller in size, especially the Fine Bean. 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 have any chance of success. At each stage of the development the regulations governing that particular phase of the 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, but the symptoms must be

recognised quickly. 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 1-5 in section B of these notes.

2. SOIL PREPARATION.

2.1 First Trial Sites. (Sowing from end March 1994)

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 occurring.

The soil must have a fine structure to a depth of at least 25cm. (10")

Work in the Hydrated lime and Limestone into this profile ensuring a good mix, to raise the pH in the rooting zone. The minimum pH is 6.3-6.5 for these legume crops. The 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.)

Apply the fertilizer after liming, this must also be incorporated into the soil profile before sowing, to a depth of 10-12cm. (4"-5")

2.2. Second Trial Sites. (Sowing from mid July 1994)

Complete as above as soon as possible, but incorporate at least some of the manna grass, as this should be broken down and releasing nitrogen by the time the sowings take place from July onwards. During dry conditions irrigate these areas to speed up this process. Do not apply any fertilizer until nearer your sowing date. You will be advised on this in due course.

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 ² (67-75 sq.yd.)
Sugar Snap Peas:	80-90/m ² (67-75 sq.yd.)
Round Beans:	20/m ² (17 sq.yd.)
Fine Beans:	25/m ² (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- 45cm. (18") In row-3.0cm.(1.25")
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 guides only. Sometimes the rows on the Peas are so arranged to give two close rows and then a wider space. 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 a reference number.

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, NUTRITIONAL PROBLEMS.

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 Fax'd 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 should be used as the recommended pesticide list for the common pest and disease problems in the trial 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 can result in all crops being banned for export. Random pesticide residue analysis will be carried out from time to time on export crops.

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 the current banned pesticide list for E.E.C.countries see pages 2 and 3 in the Pesticide Section of this booklet, Section C.

7.2 Insect Pests.

Pests	Product	Rate per Hectare	Water Volume - Litres/ha	Harvest Interval Days
Aphids	Dimethoate,		250l/ha	7 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%		250l/ha	2 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

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

250 litres per hectare = 1 litre per 40m² (25gals per acre)

300 litres per hectare = 1 litre per 33m² (30gals per acre)

AgEnt LEGUME PROJECT.**TRIAL DEMONSTRATION AREA.**

Plot No.	Crop and Variety.
Round Beans	
1	Nerine
2	Narbonne
3	Zera
4	Saranda
5	Masai
Fine Beans	
6	Taverna
7	Niki
Mange Tout	
8	Origon Sugar
9	Snowflake
Sugar Snap	
10	Sugar Gem

Please use the above numbers for all your plots, as these are the permanent reference numbers for each variety throughout this stage of the trial 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.

For plant populations and seed rates etc, see section E, Crop Data Sheets.

AgEnt LEGUME TRIAL.**CROP SPECIFICATIONS**

Specification	Mange Tout Peas	Sugar Snap Peas	Round Beans	Fine Beans
Variety;	Origon Sugar Snowflake	Sugar Gem	Nerine Narbonne Zera 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 Resdues

SECTION B

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 = 6.5		Kg/Ha g/m^2	Kg/Ha g/m^2

SECTION C . PESTICIDES

AgEnt FIELD PRODUCTION PROJECTS

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 Chemical.

On pages 5-7 in this section of these notes, is 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 B, 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.

3. Product Concentration.

It is always important to apply the correct rate of Active Ingredient over a given area. This is usually quoted at litres or kg etc., of product per hectare. This activeingredient rate has to be applied regardless of the water volume. The Field Note Sheets, page 5, gives 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 concentration in the water has to changes to accommodate water volume change.

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 cover the same area of 0.03 m².

This must be borne in mind when calibrating sprayers.

4. Calibration.

Each sprayer must be accurate in its application and should be calibrated before spraying commences. A simple way to 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 40m² and 33m² respectively. (Page 5 in 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 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 harvested before the correct time has passed.

6. Maximum Pesticide Residue Levels.

Some of the pesticides we use have legal maximum residue levels in the harvested crop. If by residue analysis these are above the minimum limits 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 MRL 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 volumes, 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 the 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 is a list of pesticides that cannot be used under any circumstance. They are as follows:

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 harvest. If harvested crops are placed in a building awaiting collection, the building must not contain stored pesticides. Always keep pesticides under lock and key.

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AgEnt PROJECT

PESTICIDE APPLICATION RECORD SHEET.

Farm Name:

Ref. Number: FRI

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

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PESTICIDE AVAILABILITY - SRI LANKA.**MARCH 1994.**

The following chemicals could have some application in AgEnt Horticultural Projects, this is not necessarily the full list available, but from this selection most pest and disease problems should be overcome. General recommendations are made in the crop Field Notes on page 5., for individual crop underinvestigation, see Field data sheets in Section E.

1. Herbicides.

Herbicide	Common Name	Company	Rates and Dilutions	Comments
Gramoxone	Paraquat	Harcros	To be Confirmed	
Gramoxone	Paraquat	Baur	"	
Counter	Glyphosate	Harcros	"	
Glycel	Glyphosate	Baur	"	
Baursate 36	Glyphosate 36%	Baur	"	
Sencor WP 75%	Metribuzin	Haychem Bayer	"	
Direx 4L	Diuron Flowable	Anglo Chem	"	
Diuron WP 80%	Diuron	Haychem	"	
Diuron WP 80%	Diuron	Haychem	"	
Diuron WP 80%	Diuron	Harcros	"	
			"	

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 h^o 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 m², 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

$$= 137 \text{ cc of chemical,}$$

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., whilst spraying, but wait until the job is completed and after washing the body.

SECTION D.

AgEnt PROJECT - LEGUME TRIAL.Sheet No. FR2.REPORTING SHEET - CROP GROWTH, PEST OR DISEASE PROBLEMS.

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. Colour Changes and/or disfigurement?

	YES	NO
Affecting Leaf Margins, Centres or Veins?		
Affecting Stems?		
Affecting Stem Base?		
Affecting Whole Plant?		

2. Have Symptoms appeared to be caused by:

	YES	NO
Insects, Fungi, Nutrition or Water Related		
Soil Problems.		
Weather Problems		
Chemical Treatments		

3. Vermin and Wild Life:

	YES	NO
Do you think the symptom are Wild Life related?		
Could this be part of the cause?		
Describe the Symptoms:		

4. Have the Symptoms Developed Suddenly?

	YES	NO
On Individual Plants?		
In Specific Areas on the Plant?		
In Individual Areas on the Plot?		

5. Are There Any Suspicious Circumstances?

	YES	NO
Abnormal Weather Patterns: Very Dry		
Very Wet		
Very Windy		
Describe Weather Conditions:		
At what Stage Did They Occur?		

25

6. Spray Application.

	YES	NO
Were There Difficulties in Applying Chemicals?		
Are these: Water Volume Related?		
Chemical Related?		
Temperature Related?		
Sprayer Related?		
Describe Problem:		

7. Similar Problems.

	YES	NO
Are There Similar Problems on Other Crops or Plants in Your Locality?		
Describe Symptoms and Name Crop/s		

8. Any Other Comments Which May Help in the Diagnosis of the Problem.

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ACTION.

1. Fax this copy to the AgEnt Office in Colombo.
2. Give a copy to your Extension Officer.
3. Send a plant sample to the AgEnt Office if possible.

Address: AgEnt Office, 5th. Floor, Deutsche Bank Building,
86, Galle Road, Colombo 3..
F.A.O.: P.Mowbray and G.Kumarage.

SECTION E. CROP DATA SHEETS.

BNC DAVID BRANDONCROP TECHNICAL DATA SHEETGROWER: Agent Project, Sri LankaCROP: Round Beans.1. VARIETIES.

PRODUCTION PERIOD	SOWING DATE	SUITABLE VARIETIES
All Year under investigation.	21 day Intervals Programme Starting from 28th March '94	Nerine Narbonne Zera Saranda Masai NB. All seed is treated with seed dressings, do not eat, wash hands after sowing.

2. SOILS.2.1 SUITABLE SOIL TYPES: Free drained loam soils.

2.2 SOIL PREPARATION: Plough/dig to bury any remaining crop residues. Make sure there is no compaction below the plough depth, if possible raise the soil in the sowing area to a height of 10cm approximately. The soil tilth must be fine to encourage good germination, and to a depth of 25cm.

3. CROP NUTRITION.SUITABLE pH RANGE: Min.6.5

NUTRIENT	BASE DRESSING Kg/ha Plant Food	TOP DRESSING	
		RATE kg/ha	TIME
Nitrogen	Normal Fertility 50	50+50	At first signs of flower bud. Earlier if growth is slow.
Phosphate	200	Nil	
Potash	175	Nil	
Magnesium	Nil	Nil	
Manganese	Could be a problem apply if symptoms are seen.	0.5g/m ²	

4. CROP ESTABLISHMENT SYSTEMS.Target Plant Population: 20 plants per m²Row Spacing: 45cm.In Row Plant Spacing: 10cm.

Direct Seeding:

Yes	X	No
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Seeding System: Sow using direct seed drill, or sow by hand, ensuring the seed depth is approximately 3/5cm. The ideal germinating temperature is 20-24°C.

Transplanting:

Yes	-	No	X
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Transplanting System: Not applicable.Plant Propagation System: Not applicable5. IRRIGATION REQUIREMENTS.

Pre-Planting: Ensure the soil is moist, but not too wet at time of planting. Overwatering will cause germination and emergence problems, as the soil becomes compacted in the seed area. The irrigation system depends on what is available in the trial area. Low raised beds will assist if furrow irrigation is used.

Post Planting: Always irrigate immediately after sowing, and keep the soil moist throughout the growing period. Water stress will lead to a poor plant development lowering both yield and bean quality. From flowering and first pod development, increase the water levels to encourage rapid pod development. Do not irrigate immediately prior to harvesting, and do not irrigate over the leaf canopy in strong sunlight, if flood irrigation is used the problem of leaf damage is reduced.

6. WEED CONTROL.

PRODUCT NAME	TIMING	RATE PER ha	APPLICATION NOTES
For the trial areas hand weeding is recommended.			

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

7. PEST AND DISEASE CONTROL.

PEST OR DISEASE PROBLEM	PRODUCT	RATE PER ha	APPLICATION NOTES
Seed Treatment	-	-	Soil Borne pests and Diseases
Cutworms	Dipterex		As soon as activity is seen.
Bean Fly	Dimethoate		Apply every 14 days from 2nd. leaf stage.
Aphids	Demeton-S-Methy. etc.		Spray when first seen
Caterpillars	Permethrin etc.		7 days after Butterfly/ Moth activity.
Botrytis	Benomyl		At first signs of disease.
Downy Mildew	Metalaxyl+		At first signs of Disease.
Anthracoise	Seed Treat. Carbendazim		Spray at flowering if problem noticed.

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

8. HARVESTING.

EEC Standards:	Yes	X.	No.
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8.1 Recommended Harvesting System: Hand harvest selecting pods to specification, see page No.7, Section A for full details of J.Sainsbury specification, or below for summary. Harvesting will continue over several weeks, the length of time depends on temperatures and variety. The minimum number of pickings will vary from 4 variety to variety, with picking taking place every 1/2 days. If possible pick in the early mornings when the crop is cool.

8.2 Crop Specifications: See also page 7 in section A.

SPECIFICATION	SUPER MARKETS	WHOLESALE MARKETS
Maturity	Not stringy, must break cleanly	N.A.
.....
Length	110 - 116mm	.....
.....
Diameter	6 - 9mm	.....
.....
Shape	Straight	.....
.....
Colour	Dark Green	.....
.....
Stalk Length	15mm max	.....
.....
Calix	N.A.	.....
.....
Weight	N.A.	.....
.....
Sugar %	N.A.	.....
.....
Skin Texture	Smooth	.....
.....
Flesh Colour	Dark/Mid Green	.....

8.3 Grading, Packing and Packaging:

	SUPER MARKETS	WHOLESALE MARKETS
Individual Weights	To be confirmed	
..... Carton Weights	..... "	..... .....
..... Pre-Pack Weights	..... "	..... .....
..... Box Dimensions	..... "	..... .....
..... Packaging Materials	..... "	..... .....

9. COOLING AND COLD STORAGE.

Recommended Cooling Systems:

PRE-COOLING	Maximum Harvest to Cooling Time: 4 Hours		
Target Temperature Before Packing	10 C	95-100%RH	
<u>Method of Cooling</u>	High humidity cooling preferred to reduce any risk of dehydration. This can be hydro-cooling or high humidity forced air. If hydrocooling is used all excess water must be drained off before packing.		

POST PACKING	Maximum Storage Period: 2 days.		
Target Storage Temperature	6-7° C	95-100%RH	
<u>Recommended Cold Storage System</u>	High humidity cold store, with positive air circulation. NB. Never pack beans if they are wet from hydrocooling, always allow excess water to drain away before packing. All packing/cooling should take place as near to the production as possible.		

TRANSPORT TEMPERATURES	6-7°C	Maximum Time	2/3 Days
<u>Transport Conditions.</u> Beans must be air flown to the market, with direct flights. All product must be taken to the airport in refrigerated lorries, and kept in cold store at the airport before loading.			

10. OTHER IMPORTANT FACTORS.

All bean crops are highly perishable, and will deteriorate rapidly if not kept at the correct temperature or humidity levels. During packing great care must be taken to eliminate damage as this considerably reduces shelf life.

The beans must be packed dry to avoid fungal disease problems in the packs. All diseased, broken, over mature and out of specification beans must be discarded during packing. Frequent picking ensures the beans are in the best possible condition for export.

The frequency of picking can only be determined in the field. In good growing conditions daily harvesting will be required, to maximize yields of Supermarket quality beans.

During picking never leave the picked crop in direct sunlight, always place the beans under some shade, which allows some air movement through the boxes. The picking to cooling time of 4 hours must be considered a maximum time.

If the current days picking is to be packed on the same day, cool the product to 10-12°C before packing. The final cooling can take place after the beans are packed. If the beans are kept for more than 24 hours before packing, reduce the flesh temperature to 7-8°C as quickly as possible after picking.

Never allow the beans to become too cold as damage will occur, this shortens the shelf life and increases the risk of rejection. An absolute minimum temperature would be 6°C.

NB. Soil pH. On many of the soils the pH levels appear to be in the region of 4.5, these are too low for beans. To increase the level to nearer 6.5, apply 400g of Hydrated lime per m² and 200g per m² of Dolomitic Limestone and work into the top 25-30cm of soil, before sowing. There may be short term problems in increasing the pH levels for the first planted trial crops, this may affect yield and quality. Site that are to be planted in the second stage of the development should be treated as soon as possible.

BNC DAVID BRANDONCROP TECHNICAL DATA SHEETGROWER: Agent Project, Sri LankaCROP: Fine Beans.1. VARIETIES.

PRODUCTION PERIOD	SOWING DATE	SUITABLE VARIETIES
All Year under investigation.	14 day Intervals Programme Starting from 28th March.	Taverna Niki NB. All seed is treated with seed dressings, do not eat any seed, always wash hands after sowing.

2. SOILS.2.1 SUITABLE SOIL TYPES: Free drained loam soils.

2.2 SOIL PREPARATION: Plough/dig to bury any remaining crop residues. Make sure there is no compaction below the plough depth, if possible raise the soil in the sowing area to a height of 10cm approximately. The soil tilth must be fine to encourage good germination, and to a depth of 25cm.

3. CROP NUTRITION.SUITABLE pH RANGE: Min.6.5

NUTRIENT	BASE DRESSING kg/ha	TOP DRESSING	
		RATE kg/ha	TIME
Nitrogen	Normal Fertility 50	50+50 ---}	At first signs of flower bud. Earlier if growth is slow.
Phosphate.	200	Nil	
Potash	175	Nil	
Magnesium	Nil	Nil	
Manganese	Could be a problem apply if syptoms are seen.	0.5g/m ²	

4.CROP ESTABLISHMENT SYSTEMS.

Target Plant Population: 25 plants per m²

Row Spacing: 45cm.

In Row Plant Spacing: 9cm.

Direct Seeding:

Yes	X	No
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Seeding System: Sow using direct seed drill, or sow by hand, ensuring the seed depth is approximately 3/5cm. The ideal germinating temperature is 20-24°C.

Transplanting:

Yes	-	No	X
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Transplanting System: Not applicable.

Plant Propagation System: Not applicable

5.IRRIGATION REQUIREMENTS.

Pre-Planting: Ensure the soil is moist, but not too wet at time of planting. Overwatering will cause germination and emergence problems, as the soil becomes compacted in the seed area. The irrigation system depends on what is available in the trial area. Low raised beds will assist if furrow irrigation is used.

Post Planting: Always irrigate immediately after sowing, and keep the soil moist throughout the growing period. Water stress will lead to a poor plant development lowering both yield and bean quality. From flowering and first pod development, increase the water levels to encourage rapid pod development. Do not irrigate immediately prior to harvesting, and do not irrigate over the leaf canopy in strong sunlight, if flood irrigation is used the problem of leaf damage is reduced. If overhead irrigation is used, apply the water in the evenings if at all possible.

6. WEED CONTROL.

PRODUCT NAME	TIMING	RATE PER ha	APPLICATION NOTES
For the trial areas hand weeding is recommended.			

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

7. PEST AND DISEASE CONTROL.

NB. Pesticide range to be confirmed, depending on availability.

PEST OR DISEASE PROBLEM	PRODUCT	RATE PER ha	APPLICATION NOTES
Seed Treatment	-	-	Soil borne pests and diseases
Cutworms	Permethrin		As soon as activity is seen.
Bean Fly	Dimethoate		Apply every 14 days from 2nd. leaf stage.
Aphids	Demeton-S-Methy. etc.		Spray when first seen
Caterpillars	Permethrin etc.		7 days after Butterfly/ Moth activity.
Botrytis	Benomyl		At first signs of disease.
Downy Mildew	Metalaxyl +		At first signs of disease.
Anthraco nose	Seed Treat. Crbendazim.		Spray at flowering if problem noticed.

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

8. HARVESTING.

EEC Standards:	Yes	1.	No.
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8.1 Recommended Harvesting System: Hand harvest selecting pods to specification, see page No.7, Section A, for full details of J.Sainsbury specification, below is a summary. Harvesting will continue over several weeks, the length of time depends on temperatures and variety. The number of pickings will vary rom variety to to variety, with picking every 1/2 days. Always pick in the early mornings if at all possible, when the crop is cool.

8.2 Crop Specifications: (See page 7, Section A, for full details.)

SPECIFICATION	SUPER MARKETS	WHOLESALE MARKETS
Maturity	Not stringy, must break cleanly	N.A.
..... Length	..... 75-95mm	.....
..... Diameter	..... 5 - 7mm	.....
..... Shape	..... Straight	.....
..... Colour	..... Dark Green	.....
..... Stalk Length	..... 15mm max	.....
..... Calix	..... N.A.	.....
..... Weight	..... N.A.	.....
..... Sugar %	..... N.A.	.....
..... Skin Texture	..... Smooth	.....
..... Flesh Colour	..... Dark/Mid Green	.....

8.3 Grading, Packing and Packaging:

	SUPER MARKETS	WHOLESALE MARKETS
Individual Weights	To be confirmed	
..... Carton Weights	..... "	..... .....
..... Pre-Pack Weights	..... "	..... .....
..... Box Dimensions	..... "	..... .....
..... Packaging Materials	..... "	..... .....

9.COOLING AND COLD STORAGE.

Recommended Cooling Systems:

PRE-COOLING	Maximum Harvest to Cooling Time: 4 Hours		
Target temperature Before Packing	10 C	95-100%RH	
<u>Method of Cooling</u>	High humidity cooling preferred to reduce any risk of dehydration. This can be hydro-cooling or high humidity forced air. If hydrocooling is used all excess water must be drained off before packing.		

POST PACKING	Maximum Storage Period: 2 days.		
Target Storage Temperature	6-7° C	95-100%RH	
<u>Recommended Cold Storage System</u>	High humidity cold store, with positive air circulation. NB. Never pack beans if they are wet from hydrocooling, always allow excess water to drain away before packing.		

TRANSPORT TEMPERATURES	6-7°C	Maximum Time	2 Days
<u>Transport Conditions.</u> Beans must be air flown to the market, with direct flights. All product should be taken to the airport in refrigerated lorries, and kept in cold store at the airport before loading.			

10. OTHER IMPORTANT FACTORS.

All bean crops are highly perishable, fine beans are more likely to deteriorate rapidly if not kept at the correct temperature or humidity levels, than round beans. During packing great care must be taken to eliminate damage as this considerably reduces shelf life.

The beans must be packed dry to avoid fungal disease problems in the packs. All diseased, broken, over mature and out of specification beans must be discarded during packing. Frequent picking ensures the beans are in the best possible condition for export.

The frequency of picking can only be determined in the field. In good growing conditions daily harvesting will be required, to maximize yields of Supermarket quality beans.

During picking never leave the picked crop in direct sunlight, always place the beans under some shade, which allows some air movement through the boxes. The picking to cooling time of 3 hours must be considered a maximum time.

If the current days picking is to be packed on the same day, cool the product to 10-12°C before packing. The final cooling can take place after the beans are packed. If the beans are kept for more than 24 hours before packing, reduce the flesh temperature to 7-8°C as quickly as possible after picking.

Never allow the beans to become too cold as damage will occur, this shortens the shelf life and increases the risk of rejection. An absolute minimum temperature would be 6°C.

NB. Soil pH. On many of the soils the pH values are very low, these must be raised to at least 6.3 for beans, with the target minimum value of 6.5. There may well be problems in the short term to raise the value to 6.5 to obtain the best growth patterns for the trials. Where soils are in the region of 4.5 pH, apply 400g of Hydrated Lime per m², plus 200g/m² of Dolomitic Limestone. The limestone should be ground as fine as possible. These dressings must be incorporated into the top 25cm of soil. Sites that are due for planting in the second stage of the development should also be treated as soon as possible.

BNC DAVID BRANDONCROP TECHNICAL DATA SHEETGROWER: AgEnt Project, Sri LankaCROP: Munge Tout Peas.1. VARIETIES.

PRODUCTION PERIOD	SOWING DATE	SUITABLE VARIETIES
All year production under investigation.	Sow every 21 days Starting from 28th March.	Origon Sugar Snowflake

2. SOILS.

2.1 SUITABLE SOIL TYPES: Free drained loam to light clay soils preferred.

2.2 SOIL PREPARATION: Ensure there is no compaction below the seed, peas are very susceptible to poor drainage. All previous crop residues must be ploughed/dug into the soil before sowing. The soil must be fine to encourage good germination, cultivate to a depth of 25cm. minimum.

3. CROP NUTRITION.SUITABLE pH RANGE: 6.3-6.5

NUTRIENT	BASE DRESSING kg of Plant Food	TOP DRESSING	
		RATE kg/ha	TIME
Nitrogen	30	75	At first pod set.
Phosphate	50	nil	Light soils may need N
Potash	50	nil	during growth at
Magnesium		nil	40kg/ha.
Manganese	Nil	0.5g/m ² Foliar Spray	Apply when symptoms are seen.

4. CROP ESTABLISHMENT SYSTEMS.

Target P Population: 90 m².

Row Spacing: 45cm. Average spacing, it is better to sow two row at 25-30cm, and then leave a wider space of 60cm. This give greater support for the growing peas keeping the pods off the ground

In Row Plant Spacing: 3.0cm.

Direct Seeding:

Yes	X
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No

Seeding System: Direct drill or hand sow, sowing the seed at approximately 2/3 cm. deep.

Transplanting:

Yes

No	X
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Transplanting System: Not applicable.

Plant Propagation System: Not applicable.

5. IRRIGATION REQUIREMENTS.

Pre-Planting: The seed will not germinate in dry soils, the soil should be brought to field capacity prior to sowing, Allow the soil time to dry a little before sowing to reduce the risk of compaction around the seed.

Post Planting:

After germination keep the soil moist but not too wet. The most critical period for irrigation is at flowering and pod development. Over watering during the early stages of growth causes excessive vegetative growth. On the other hand if the soil becomes too dry, early flowering takes place, and there is an increase chance of Powdery Mildew.

6. WEED CONTROL.

PRODUCT NAME	TIMING	RATE PER ha	APPLICATION NOTES
None or use Basagran if available.	Post Emergence	3 litres	1. Sow into a weed free soil. 2. Hand weed and/or cultivate between the rows. 3. Apply Basagran and do not cultivate.

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

7. PEST AND DISEASE CONTROL.

PEST OR DISEASE PROBLEM	PRODUCT	RATE PER ha	APPLICATION NOTES
Ascochyta	Metalaxyl+ Thiabendazole + Thiram.		Seed Dressing
Downy Mildew	as above		Seed Treatment
Botrytis	Benomyl		Spray at first signs of disease.
Cladosporium	-	-	Avoid wet/misty areas Good rotations are important.
Powdery Mildew	Benomyl		At first sign of disease.
Aphids	Metasystox		When Present.
Aphids	Dimethoate		At first signs
Caterpillars	Permethrin		From Flowering.
Cutworms	Dipterex		At first signs of damage.

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

8. HARVESTING.

<u>EEC Standards:</u>	Yes	X	No.
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8.1 Recommended Harvesting System: Harvest every 1/2 days, picking all the pods that are at the correct specification. Discard over mature pods as far as possible at harvest. Harvesting is best carried out early in the morning. Pick into baskets and transfer into plastic field crates. These should be not more than 15cm deep.

Always keep the harvested crop in the shade before despatch to the cold store. Allow air circulation through the boxes to reduce respiration heat build up.

8.2 Crop Specifications:

SPECIFICATION	SUPER MARKETS	WHOLESALE MARKETS
Maturity	There must be no seed formation in pod	N.A.
Length	65-110mm	
Diameter	N.A.	
Shape	Pods Straight/Flat.	
Colour	Mid-Dark Green	
Stalk Length	15mm max.	
Calix	Fresh Green	
Weight	N.A.	
Sugar %	N.A.	
Skin Texture	Smooth	
Flesh Colour	Mid-Dark Green	

8.3 Grading, Packing and Packaging:

	SUPER MARKETS	WHOLESALE MARKETS
Individual Weights	To be advised	
.....
Carton Weights		
.....
Pre-Pack Weights		
.....
Box Dimensions		
.....
Packaging Materials		

9. COOLING AND COLD STORAGE.

Recommended Cooling Systems:

PRE-COOLING	Maximum Harvest to Cooling Time: 4 Hours		
Target temperature Before Packing	6-8°C	95-100%RH	
<u>Method of Cooling</u>	Forced air/high humidity cooling is preferred. Do not use hydrocooling as this may damage the pods and increase fungal breakdown risk. Reduce to 0-1 C if packing takes place the day after picking.		
POST PACKING	Maximum Storage Period: 2/3 days.		
Target Storage Temperature	0-1°C	95-100%RH	
<u>Recommended Cold Storage System</u>	Positive air circulation will keep the peas in a fresh condition. The humidity is important to maintain the condition of the pod, including the calyx, which must remain green.		

TRANSPORT TEMPERATURES	1-2°C	Maximum Time	2/3 Days
<u>Transport Conditions.</u> The product should be transported to the airport in a cold chain vehicle. The thermostat should be set at 2/3 C. At the airport the consignment must be kept in a cold store before loading the aircraft.			

10. OTHER IMPORTANT FACTORS.

The climatic conditions that best suit Munge Tout peas are to avoid extremes of temperature and rainfall. The highest temperature for quality production is in the region of 27°C, with a monthly mean within the range of 13-20°C. This means production will have to be in the higher areas of Sri Lanka. In the longer term it may be necessary to select different sites for bean and pea production, as beans will tolerate slightly higher temperatures and rainfall.

To avoid any possibility of disease build up, there should be a rotation of three years between pea crops. If sites can be located where both peas and beans can be grown, then a three year rotation with peas, beans and another non pulse crop can be grown.

Always remember that Munge Tout peas are young when picked, this increases their respiration rate when compared to a more mature pea crop. This does two things, firstly the crop will become damaged more easily, as it is more tender, and secondly, there will be a greater risk of heat build up when the crop is picked and placed into boxes. Always ensure there is good air circulation around and through the crop in the boxes after picking. It is also important to cool the crop to its correct temperature as quickly as possible after picking. Never leave the crop in direct sunlight.

The pest and disease section highlights some of the possible problems. Always inspect the growing crop daily for signs of pest and disease attack. It is essential to take remedial action quickly, as the pods must be blemish free to meet the Supermarket specification.

If the peas are to be packed on the same day as picking, it is essential to remove the field heat before packing. Reduce the flesh temperature to at least 10°C before packing. The remaining heat can be removed following packing.

NB. Soil pH. Most soils are very low, apply 400g/m² of Hydrated lime, and 200g/m² of Dolomitic Limestone and work into the top 25cm. of soil. This quantity may cause manganese deficiency in peas, especially where soil organic levels are high. The plants will be stunted and pale green in colour with darker spots on the leaves.

BNC DAVID BRANDONCROP TECHNICAL DATA SHEETGROWER: AqEnt Project, Sri LankaCROP: Sugar Snap Peas.1. VARIETIES.

PRODUCTION PERIOD	SOWING DATE	SUITABLE VARIETIES
All year production under investigation.	Sow every 21 days Starting from 28th March	Sugar Gem. (Sugar Daddy)

2. SOILS.

2.1 SUITABLE SOIL TYPES: Free drained loam to light clay soils preferred.

2.2 SOIL PREPARATION: Ensure there is no compaction below the seed, peas are very susceptible to poor drainage. All previous crop residues must be ploughed/dug into the soil before sowing. The soil must be fine to encourage good germination, to a depth of 25cm.

3. CROP NUTRITION.SUITABLE pH RANGE: 6.3-6.5

NUTRIENT	BASE DRESSING kg of Plant Food	TOP DRESSING	
		RATE kg/ha	TIME
Nitrogen	30	100	At first pod set.
Phosphate	50	nil	Light soils may need N
Potash	50	nil	during growth at
Magnesium	50	nil	40kg/ha.
Manganese	Nil	0.5g/m ²	Apply when symptoms appear.

4. CROP ESTABLISHMENT SYSTEMS.

Target Plant Population: 90 m².

Row Spacing: 45cm. Average spacing, it is better to sow two row at 25-30cm, and then leave a wider space of 60cm. This give greater support for the growing peas keeping the pods off the ground. This is more important for Sgar Snap Peas than Mange Tout.

In Row Plant Spacing: 3.0cm

<u>Direct Seeding:</u>	Yes X	No
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Seeding System: Direct drill or hand sow, sowing the seed at approximately 2/3 cm. deep.

<u>Transplanting:</u>	Yes	No X
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Transplanting System: Not applicable.

Plant Propagation System: Not applicable.

5. IRRIGATION REQUIREMENTS.

Pre-Planting: The seed will not germinate in dry soils, the soil should be brought to field capacity prior to sowing, allowing the soil time dry a little before sowing, to reduce the risk of soil compaction around the seed.

Post Planting:

After germination keep the soil moist but not too wet. The most critical period for irrigation is at flowering and pod development. Over watering during the early stages of growth causes excessive vegetative growth. On the other hand if the soil becomes too dry, early flowering takes place, and there is an increase chance of Powdery Mildew. Keep watering until the pods are nearly ready for harvesting. (Up to 50-60% full)

6. WEED CONTROL.

PRODUCT NAME	TIMING	RATE PER ha	APPLICATION NOTES
None, or use Basagran	Post Emergence	3 litres	1. Sow into a weed free soil. 2. Hand weed and/or cultivate between the rows. 3. Apply Basagran and do not cultivate.

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

7. PEST AND DISEASE CONTROL.

PEST OR DISEASE PROBLEM	PRODUCT	RATE PER ha	APPLICATION NOTES
Ascochyta	Metalaxyl+		Seed Dressing
Downy Mildew	Thiabendazole + Thiram. as above		Seed Treatment
Botrytis	Benomyl		Spray at first signs of disease.
Cladosporium	-	-	Avoid wet/misty areas Good rotations are important.
Powdery Mildew	Benomyl		At first sign of disease.
Aphids	Metasystox		When first seen.
Caterpillars	Dimethoate		From Flowering.
Cutworms	Permethrin Dipterex		At first signs of damage. mage seen.

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

8. HARVESTING.

EEC Standards:	Yes X	No.
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8.1 Recommended Harvesting System: Harvest every 1/2 days, picking all the pods that are at the correct specification. Discard over mature pods as far as possible at harvest. Harvesting is best carried out early in the morning. Pick into baskets and transfer into plastic field crates. These should be not more than 15cm deep. Always keep the harvested crop in the shade before despatch to the cold store. Allow air circulation through the boxes to reduce respiration heat build up.

8.2 Crop Specifications:

SPECIFICATION	SUPER MARKETS	WHOLESALE MARKETS
Maturity	The pods must have 85% formed seeds	N.A.
Length	60-90mm	
Diameter	N.A.	
Shape	Round and straight.	
Colour	Mid-Dark Green	
Stalk Length	15mm max.	
Calix	Fresh Green	
Weight	N.A.	
Sugar %	N.A.	
Skin Texture	Smooth	
Flesh Colour	Mid-Dark Green	

No pesticide residues on the pods.

8.3 Grading, Packing and Packaging:

	SUPER MARKETS	WHOLESALE MARKETS
Individual Weights	To be advised	
..... Carton Weights
..... Pre-Pack Weights
..... Box Dimensions
..... Packaging Materials

9. COOLING AND COLD STORAGE.

Recommended Cooling Systems:

PRE-COOLING	Maximum Harvest to Cooling Time: 4 Hours		
Target temperature Before Packing	6-8°C	95-100%RH	
<u>Method of Cooling</u>	Forced air/high humidity cooling is preferred. Do not use hydrocooling as this may damage the pods and increase fungal breakdown risk. reduce to 0-1 C if packing takes place the following day.		

POST PACKING	Maximum Storage Period: 2/3 days.		
Target Storage Temperature	0-1°C	95-100%RH	
<u>Recommended Cold Storage System</u>	Positive air circulation will keep the peas in a fresh condition. The humidity is important to maintain the condition of the pod, including the calyx, which must remain green.		

TRANSPORT TEMPERATURES	1-2°C	Maximum Time	2/3 Days
<u>Transport Conditions.</u> The product should be transported to the airport in a cold chain vehicle. The thermostat should be set at 2/3 C. At the airport the consignment must be kept in a cold store before loading the aircraft.			

10. OTHER IMPORTANT FACTORS.

The climatic conditions that best suit Sugar Snap peas is to avoid extremes of temperature and rainfall. The highest temperature for quality production is in the region of 27°C, with a monthly mean within the range of 13-20°C. This means production will have to in the higher areas of Sri Lanka. In the longer term it may be necessary to select different sites for bean and pea production, as beans will tolerate slightly higher temperatures and rainfall.

To avoid any possibility of disease build up, there should be a rotation of three years between pea crops. If sites can be located where both peas and beans can be grown, then a three year rotation with peas, beans and another non pulse crop can be grown.

Always remember that Sugar Snap peas are relatively young when picked, their respiration rate is high when compared to a mature pea crop. This does two things, firstly the crop will become damaged more easily as it is young and tender, this includes dehydration, and secondly, there will be a tendency for heat to build up when the crop is picked and placed into boxes. Although the risk is less than Mange Tout. Always ensure there is good air circulation around and through the crop in the boxes after picking. It is also important to cool the crop to its correct temperature as quickly as possible after picking. Never leave the crop in direct sunlight.

The pest and disease section highlights some of the possible problems. Always inspect the growing crop daily for signs of pest and disease attack. It is essential to take remedial action quickly as the pods must be blemish free to meet the Supermarket specification. Caterpillar problems can be greater with Sugar Snap peas than Mange Tout, as there is more time for the caterpillar to develop.

If the peas are to be packed on the same day as picking, it is essential to remove the field heat before packing. Reduce the flesh temperature to at least 10°C before packing. The remaining heat, can be removed following packing.

NB Soil pH. Most soils are very acid, apply 400g/m² of Hydrated lime and 200g/m² of Dolimitic Limestone before planting. Work well into the top 25cm. of soil before planting.