Prakruthi

NATURAL FARMING OF VEGETABLES

(A research programme supported by
Kerala Research programme on local level development)

Vegetable crops that carry a big segment of bio-diversity provide a vast spectra of nutrients for human nutrition. Native flora have been constituting the major part of dietary component of indigenous population in tune with the climate, soil and other geographical features of the area.

Market and Diets:

In the era of commercialisation, transportation and marketing systems developed and the agricultural production became market oriented rather than for the needs of the local population. Simultaneously the markets and what market could supply, started to constitute the dietary component ignoring the more nutritious local items. Population started to feed what market could supply though at higher costs. There were also conscious efforts by market forces to replace locally available items with exotic items with false claims of high nutritive value, taste and like. A typical example is the introduction of cabbage to local village markets of Kerala and false publicity that cabbage is highly nutritious, could totally replace montigna leaves in the diet of local population.

Such market orientation and commercialisation for food production particularly, led to the devastation of local varieties and indigenous cultivation practices of vegetable crops.

This participatory research program with involvement of like minded farmers aims to revive traditional and indigenous cultivation practices, local varieties and other potential varieties responsive to natural farming techniques without chemicals and fertilisers.

Research objectives and stages:

The research program involves the following steps.

1. Survey of the area – the vegetable growing tracts.

2. Identification of potential varieties of selected vegetable crops and also traditional edible plants.

3. Collection of seed samples.

4. Multiplication of identified varieties.

5. Field trial of the selected varieties under natural/organic farming techniques and comparison with intensive cultivation.

6. Identification of the suitable varieties based on the field trial.

7. Multiplication of selected varieties.

8. Distributions of selected varieties to interested farmers and encourage them to undertake natural farming of vegetables for mass production.

9. Promote indigenous and overseas market for naturally grown organic vegetables.

10. Documentation of indigenous cultivation systems and practices.

11. Offer research, extension and advisory support to orgsanic farmers on a continuous basis.

12. Develop linkages with organic farmers in other states and countries for sharing of knowledge and experience.

Present Level of the Programme

a) A primary survey of traditional vegetable tracts of Malappuram District has been conducted and morphological evaluation of 62 crop types done as per the evaluation schedule annexed.

	Crops	No. of types evaluated
1.	Amaranthus	7
2.	Cowpea	6
3.	Bittergourd	5
4.	Cucumber	6
5.	Bhindi	6
6.	Coccinia	5
7.	Pumpkin	7
8.	Ashgourd	5
9.	Brinjal	7
10.	Chilly	8
	Total	62

b) Seed samples numbering 23 have been collected in respect of the ten crops from various house holds / plots evaluated as detailed below:

	Crops/types	No. of seed samples collected
1.	Amaranthus	2
2.	Cowpea	3
3.	Bittergourd	2
4.	Cucumber	2
5.	Bhindi	1
6.	Coccinia	3
7.	Pumpkin	2
8.	Ashgourd	2
9.	Brinjal	2
10.	Chilly	4
	Total	23

c) Preliminary yield trial and seed / stock multiplication has been done in respect of the following crops in Malappuram District.

	Crops	No. of yield trials
1.	Amaranthus	2
2.	Cowpea	1
3.	Bittergourd	2
4.	Cucumber	-
5.	Bhindi	-
6.	Coccinia	2
7.	Pumpkin	1
8.	Ashgourd	1
9.	Brinjal	-
10.	Chilly	2
	Total	11

Based on the experience of extensive surveys of traditional vegetable tracts of Malappuram District, it was felt similar exercise should be done for the whole state or at least a few more districts to cover different zones with diverse climate, soil and culture for the research / results to have wider applicability and stability.

Hence a similar surveys have been initiated in Palakkad, Trichur and Kottayam Districts.

Details of survey in Palakkad District and samples collected.

	Crops	No. of samples collected
1.	Amaranthus	2
2.	Cowpea	3
3.	Bittergourd	1
4.	Cucumber	2
5.	Bhindi	2
6.	Coccinia	2
7.	Pumpkin	1
8.	Ashgourd	1
9.	Brinjal	2
10.	Chilly	3
	Total	19

Details of survey in Trichur District and samples collected.

	Crops	No. of samples collected
1.	Amaranthus	1
2.	Cowpea	2
3.	Bittergourd	1
4.	Cucumber	1
5.	Bhindi	2
6.	Coccinia	1
7.	Pumpkin	2
8.	Ashgourd	1
9.	Brinjal	2
10.	Chilly	2
	Total	15

Details of survey in Kottayam District and samples collected.

	Crops	No. of types evaluated
1.	Amaranthus	1
2.	Cowpea	1
3.	Bittergourd	2
4.	Cucumber	1
5.	Bhindi	1
6.	Coccinia	2
7.	Pumpkin	1
8.	Ashgourd	1
9.	Brinjal	2
10.	Chilly	2
	Total	14

PRIMARY EVALUATION SCHEDULE : CROP : ……

DISTRICT: ……

A) BIO-DATA OF FARMER Sample No.

Name Age : Education :
Address Panchayat : Taluk:

B) FIELD DATA :

Nature of field : Paramba/Paddy field
Soil type : Laterite/loamy/sandy
Management : Irrigated/rainfed/pure/intercropped
Manuring : Chemical/organic/mixed
Plant protection : Chemical/organic/mixed

C) CROP DATA:

Name of Crop :
Variety/local Name :
Plant Growth : Good/Average/Poor
Disease prevalence : High/Moderate/Low
Name of disease
1)
2)

Pest prevalence : High/Moderate/Low
Name of the pest
1)
2)

Fruit size : Big/moderate/small
Number of fruit : Good/average/poor
Yield : High/medium/low

Date : Name/signature of investigator

SEED EVALUATION SCHEDULE : CROP : ……

DISTRICT: ……

Sample No. :

Source :

A) BIO-DATA OF FARMER Details of Agency/Institution

Name Name :
Address Address :
Date of Collection Date of collection :
Date of Planting

Date of germination
First date (10% germination) :

Last date (90% germination completed :

Percentage of germination :
(Sprouting to sowing)

Seed treatment adopted :

Irrigation schedule :

Moisture Percentage maintained : Field capacity/Half of FC/
Dry condition

Pest attack if any :

Disease problem if any :

Growth of seedling : Good/Average/Poor

Date : Name & Signature of Investigator

Annexure **IV**

List of popular varieties recommended by Kerala Agricultural University for intensive cultivation in Kerala and selected for comparative study.

	Crops	No. of types
1.	Amaranthus	4
2.	Cowpea	5
3.	Bittergourd	4
4.	Cucumber	3
5.	Bhindi	5
6.	Coccinia	2
7.	Pumpkin	3
8.	Ashgourd	2
9.	Brinjal	4
10.	Chilly	5
	Total	37

Selected parameters for evaluation of crop varieties

	Crops	Traits
1.	Amaranthus	Leaf yield, taste, colour, duration
2.	Cowpea	Grain yield, life duration, resistance to pests
3.	Bittergourd	Fruit yield, life duration, resistance to fruit fly
4.	Cucumber	Fruit yield, keeping quality, colour and attraction, resistance to mosaic virus.
5.	Bhindi	Fruit yield, life duration, resistance to mosaic virus
6.	Coccinia	Fruit yield, taste, life-duration
7.	Pumpkin	Medium fruit size, yield, resistance to virus
8.	Ashgourd	Life – duration, fruit - medium size.
9.	Brinjal	Fruit yield, resistance to virus
10.	Chilly	Medium pungency, yield, life duration, resistance to virus

B. CROP QUALITY ASSESSMENT

Several crops that had been wild plants once were domesticated to and nursed to crop status by men on account of the 'crop qualities' possessed by such plants. The plant breeding and crop breeding works are progressing endlessly by scientists, breeders and farmers worldwide. In the process many plants, crops varieties, cultivars and types are being selected, improved, hybridised and mutated for further refinement while many are discarded, neglected and forgotten despite many positive qualities possessed by them.

Out of 40 varieties/cultivars/types selected during our survey, majority is not popularly accepted commercial varieties due to several factors at production, marketing and consumer levels.

Hence, it was felt appropriate to have a 'Crop Quality Assessment' of these crops/ varieties done by 40 selected experienced farmers around the locations of our field trial. Our master farmers participating in the program gave to the selected farmers the seed samples and required technical and agronomic assistance. These farmers grew the crops/varieties and their assessment of the crop/varieties was made based on the following traits and assessment form.

CROP QUALITY ASSESSMENT FORM

Name	Plant Health/Growth	Yield	Pest Resistance	Disease Resistance	Product quality
	Good Avg/Poor	Good/Avg/Poor	Good/Avg/Poor	Good/Avg/Poor	Good/Avg/Poor
C_1					
V_1					
V_2					
V_3					
V_4					
C_2					
V_1					
V_2					
V_3					
V_4					
C_3					
V_1					
V_2					

V_3					
V_4					
C_4					
V_1					
V_2					
V_3					
V_4					

CROP QUALITY ASSESSMENT FORM (Contd.)

Name	Plant Health/Growth	Yield	Pest Resistance	Disease Resistance	Product quality
	Good/Avg/Poor	Good/Avg/Poor	Good/Avg/Poor	Good/Avg/Poor	Good/Avg/Poor
C_5					
V_1					
V_2					
V_3					
V_4					
C_6					
V_1					
V_2					
V_3					
V_4					
C_7					
V_1					
V_2					
V_3					
V_4					
C_8					
V_1					
V_2					
V_3					
V_4					

C_9					
V_1					
V_2					
V_3					
V_4					
C_{10}					
V_1					
V_2					
V_3					
V_4					

The data collected from 40 farmers as above were tabulated as per the following format.

CROP QUALITY ASSESSMENT
TABULATION OF DATA

Crop /Variety	Data number of farmers who rated the crop/variety under each trait														
	Plant Health/Growth			Yield 3	2	1	Pest Resistance 3	2	1	Disease Resistance 3	2	1	Product quality 3	2	1
Chera	Good	Avg	Poor	Good	Avg.	Poor	Good	Avg	Poor	Good	Avg	Poor	Good	Avg.	Poor
C_1															
V_1	30	8	2	30	5	5	29	6	5	32	6	2	32	6	2
V_2	32	6	2	28	9	3	31	6	3	26	9	5	21	10	9
V_3	21	15	4	22	12	6	19	12	9	21	15	3	19	11	10
V_4	31	8	1	30	8	2	31	6	3	29	6	5	34	4	2
Payar															
C_2															
V_1	28	6	6	24	6	10	32	7	1	33	5	2	33	4	3
V_2	29	10	1	26	6	8	21	7	12	21	8	11	29	9	2
V_3	32	6	2	28	10	2	24	10	6	22	17	7	30	4	6
V_4	33	7	-	32	7	1	29	9	2	26	10	4	33	6	1
Bhindi															

C_3															
V_1	28	10	2	29	6	5	33	7	-	29	7	4	19	20	11
V_2	29	8	3	24	7	9	29	4	7	24	6	10	24	7	9
V_3	30	7	3	28	7	5	25	10	5	28	7	5	27	3	10
V_4	31	6	3	29	7	4	28	7	5	29	6	5	30	7	3
Vazhuthana															
C_4															
V_1	22	10	8	21	10	9	30	7	3	29	9	2	22	5	13
V_2	30	6	4	24	9	7	29	6	5	24	10	6	23	10	7
V_3	35	3	2	36	2	2	32	4	4	29	9	2	38	1	1
V_4	32	6	2	28	8	4	26	10	4	28	7	5	29	9	2
Chilli															
C_5															
V_1	31	6	3	22	6	12	32	5	3	34	4	2	312	6	3
V_2	27	9	4	30	5	5	27	10	3	29	9	2	27	10	3
V_3	36	2	2	37	2	1	28	9	3	28	11	1	35	4	1
V_4	29	10	1	28	7	5	29	7	4	25	10	5	30	6	4
Paval															
C_6															
V_1	28	8	4	29	9	2	24	10	6	29	10	1	15	10	15
V_2	25	14	1	24	10	6	19	14	7	24	12	4	21	10	9
V_3	30	8	2	19	10	11	30	7	3	29	9	2	20	18	2
V_4	27	10	3	29	6	5	28	9	3	26	10	4	33	7	-
Vellari															
C_7															
V_1	20	12	8	27	8	5	26	10	4	25	10	5	35	3	2
V_2	33	6	1	32	7	1	20	8	12	20	10	10	32	7	1
V_3	34	4	2	33	6	1	28	7	5	26	10	4	35	3	2
V_4	30	7	3	36	3	1	29	6	5	28	7	5	37	2	1

CROP QUALITY ASSESSMENT (Contd.)
TABULATION OF DATA

Crop /Variety	Data number of farmers who rated the crop/variety under each trait														
	Plant Health/Growth			Yield			Pest Resistance			Disease Resistance			Product quality		
	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1
Pumpkin	Good	Avg	Poor	Good	Avg.	Poor	Good	Avg	Poor	Good	Avg	Poor	Good	Avg.	Poor
C_8															
V_1	30	7	3	32	6	2	26	10	4	27	7	6	33	4	3
V_2	33	6	1	34	4	2	27	9	4	29	9	2	34	4	2

V_3	29	7	4	30	9	1	29	8	3	30	4	6	30	6	4
V_4	30	5	5	26	10	4	28	7	5	29	7	4	36	2	2
Kumbalam															
C_9															
V_1	32	7	1	15	15	10	30	7	3	29	6	5	35	2	3
V_2	35	3	2	37	2	1	36	4	-	35	2	3	37	2	1
V_3	26	10	4	29	8	3	28	6	6	29	7	4	30	10	-
V_4	29	7	4	28	8	4	26	8	6	27	10	3	30	6	4
Koval															
C_{10}															
V_1	30	8	2	29	7	4	30	8	2	29	6	5	29	10	1
V_2	26	10	4	29	7	4	26	6	8	29	10	1	30	8	2
V_3	34	4	2	33	6	1	32	7	1	30	8	2	39	1	-
V_4	30	7	3	33	6	1	30	10	-	27	13	-	26	14	-

C. FOOD QUALITY ASSESSMENT

The final acceptance and success of any food or vegetable crop/variety depends on how much it is liked by the eaters! Any food or vegetable crop/variety, however, successful as a crop in terms of yield, pest resistance, disease resistance or other morphological or genetical qualities, will be out of farms and houses, if it fails in its food quality tests.

The forty vegetable crop varieties selected were subjected to post harvest processing, keeping, cooking and edibility tests by a selected set of 40 elderly farm women from agriculturists families well experienced in vegetable quality /trial assessments.

The major traits or attributes those contribute to consumer demand and liking of vegetable were identified by a pilot study among twenty urban women who were consumers. The selected traits included keeping quality, cooking quality, nutritive values, general taste as decided edibility by children. All these qualities were assessed by 'as perceived by the interviewee' by rating on a three point continuum as good, average and poor.

FOOD QUALITY ASSESSMENT FORM
TRAITS

Crop/Variety	Keeping Quality			Cooking Quality			Nutritive Value			Taste/Edibility by children		
	Good	Avg	Poor	Good	Avg	Poor	Good	Avg	Poor	Good	Avg	Poor
C_1												
V_1												
V_2												
V_3												
V_4												
C_2												
V_1												
V_2												
V_3												
V_4												

C_3												
V_1												
V_2												
V_3												
V_4												

FOOD QUALITY ASSESSMENT FORM (Contd.)

Crop/Variety	Keeping Quality			Cooking Quality			Nutritive Value			Taste/Edibility by children		
	Good	Avg	Poor	Good	Avg	Poor	Good	Avg	Poor	Good	Avg	Poor
C_4												
V_1												
V_2												
V_3												
V_4												
C_5												
V_1												
V_2												
V_3												
V_4												
C_6												
V_1												
V_2												
V_3												
V_4												
C_7												
V_1												
V_2												
V_3												
V_4												
C_8												
V_1												
V_2												
V_3												
V_4												
C_9												
V_1												
V_2												
V_3												

V_4												
C_{10}												
V_1												
V_2												
V_3												
V_4												

FOOD QUALITY ASSESSMENT
TABULATION OF DATA

Data is given as number of women who rated the crop/variety as Good/Average/Poor.

Crop/Variety 3 2 1	Keeping Quality 3 2 1			Cooking Quality 3 2 1			Nutritive Value 3 2 1			Taste/Edibility by 3 2 children 1		
Cheera	Good	Avg	Poor	Good	Avg	Poor	Good	Avg	Poor	Good	Avg	Poor
C_1												
V_1	35	5	-	20	5	15	24	10	6	20	2	18
V_2	32	7	1	19	6	15	30	19	1	26	7	7
V_3	30	1	9	26	4	10	32	6	2	33	3	4
V_4	29	6	5	35	3	2	34	5	1	35	4	1
Payar												
C_2												
V_1	35	3	2	32	6	2	39	1	-	36	2	2
V_2	29	10	1	30	7	3	26	2	2	29	6	5
V_3	28	6	6	29	8	3	29	6	5	26	7	7
V_4	37	3	-	35	2	3	36	2	2	35	3	2
Venda												
C_3												
V_1	35	3	2	28	10	2	25	10	5	20	5	15
V_2	26	10	4	30	5	5	31	7	2	22	10	8
V_3	27	9	4	29	11	-	33	6	1	30	8	3
V_4	36	2	2	35	2	3	34	5	1	35	5	-
Vazhuthana												
C_4												

V_1	35	5	-	25	15	-	30	2	8	15	20	5
V_2	33	4	3	20	10	10	26	8	6	26	10	4
V_3	35	5	-	35	4	1	32	8	-	35	3	2
V_4	28	8	4	26	6	8	30	6	4	29	9	2
Chilli												
C_5												
V_1	38	2	-	31	6	3	38	2	-	28	8	4
V_2	30	5	5	33	5	2	30	7	3	29	6	5
V_3	25	10	5	34	6	-	29	10	1	35	3	2
V_4	30	10	-	29	8	3	32	3	5	26	10	4
Paval												
C_6												
V_1	38	2	-	30	8	2	35	5	-	20	15	5
V_2	35	5	-	26	10	4	30	6	4	24	10	6
V_3	32	6	2	25	10	5	30	8	2	28	10	2
V_4	30	7	3	35	3	2	33	6	1	35	5	-

FOOD QUALITY ASSESSMENT
TABULATION OF DATA (Contd.)

Crop/Variety 3 2 1	Keeping Quality 3 2 1			Cooking Quality 3 2 1			Nutritive Value 3 2 1			Taste/Edibility by 3 2 children 1		
Vellari	Good	Avg	Poor	Good	Avg	Poor	Good	Avg	Poor	Good	Avg	Poor
C_7												
V_1	30	8	2	35	5	-	38	2	-	35	2	3
V_2	35	5	-	20	10	10	15	15	10	7	13	20
V_3	35	5	-	30	10	-	20	12	8	35	5	-
V_4	20	10	10	35	5		30	10	-	30	10	-
Mathan												
C_8												
V_1	35	5	-	25	10	5	35	2	3	29	10	1

V_2	26	10	4	30	5	5	28	10	2	36	2	2
V_3	28	10	2	26	10	4	33	6	1	33	7	-
V_4	30	5	5	28	7	5	35	3	2	35	3	2
Kumbalam												
C_9												
V_1	38	2	-	36	3	1	39	1	-	31	8	1
V_2	25	10	5	36	3	1	30	8	2	30	8	2
V_3	26	8	6	25	10	5	25	10	5	26	10	4
V_4	35	5	-	26	10	4	36	2	2	30	10	-
Koval												
C_{10}												
V_1	33	6	1	26	10	4	28	8	4	30	8	2
V_2	28	10	2	29	6	5	30	5	5	35	5	-
V_3	25	10	5	28	10	2	34	5	1	33	6	1
V_4	35	5	-	20	10	10	38	1	1	20	15	5

D. MARKETING OF ORGANIC PRODUCTS

The demand for naturally grown organic products are on increase throughout the world. The consumers are becoming more and more conscious of the toxic effects of the pesticides and other chemicals in plants as well as, air, water and soil ecosystems.

Though organic foods are very popular in Europe and US but it is yet to pick up in India. In metros like Delhi and Bangalore small specialised stalls are marketing organic food stuffs and are being run profitably with a good number of regular educated elite customers who are not averse to pay a little more for safe and clean food.

However, in Kerala, the concept is still confined to small groups of environmental activists, Gandhians and some ashramas.

The organic growers who produce the vegetables in a natural and organic way with so much strain caution and cost, needs to have an assured market for their products. How would the consumers and vegetable vendors react to organic products? Pilot surveys were conducted among the vegetable vendors and consumers to get their response to sale/purchase and use of organic vegetable products.

The response was measured by using a questionnaire constructed for the purpose and various related criteria were included for rating by 40 consumers and 40 sellers. The criteria were rated based on the response.

The questionnaire used is reproduced in the next page.

QUESTIONNAIRE FOR CONSUMERS

1. Do you think organic vegetables are more pure, hygienic and nutritive? YES/NO

2. Are you willing to pay a higher price for it?
YES/NO

3. Do you feel pesticide residues in vegetables grown by intensive Agriculturists are toxic to human?
YES/NO

4. Do you think enough food and vegetables can be produced by organic/natural way?
YES/NO

5. Will you prefer and selectively buy organic vegetables if the same is made available in your vicinity?
YES/NO

6. Do you feel pesticides should be substituted by alternative methods for vegetable production?
YES/NO

7. Are you aware traditional varieties of vegetables were superior to modern HYV of vegetables in terms of keeping quality, nutritive value and taste? YES/NO

8. Do you think local varieties have higher disease resistance and pest-resistance?

YES/NO

9. Do you feel high level production of vegetables is possible by organic methods?

YES/NO

10. Are you aware of pollution and environmental hazards of pesticide used in agriculture?
YES/NO

QUESTIONNAIRE FOR VEGETABLE VENDORS

1. Do you think organic/naturally grown food/vegetable items have distinct level of qualities?
YES/NO

2. Are they superior to ordinary items?
YES/NO

3. Are the customers willing to give a higher price for such items?
YES/NO

4. Whether shops/outlets can viably exist by handling organic items alone? YES/NO

5. Can you distinguish organic products from conventional items? YES/NO

6. Whether your customers can distinguish organic products from that of ordinary items?
YES/NO

7. Whether the present constraints in marketing of organic products can be overcome?
YES/NO

8. Whether the so-called organic farmers ready to keep their production system truly and fully organic?
YES/NO

9. Whether the olden varieties of vegetables were better than the present high yielding ones with respect to marketable period?
YES/NO

10. Whether existing marketing network will be affected by promotion of localised organic production of vegetables?
YES/NO

E. STUDY OF EXPORT POTENTIAL OF ORGANIC VEGETABLES

Demand for organic grown vegetables has been growing steadily in Europe and US.

However, those countries have very strict codes and procedures for production, processing, packing and transportation as well as marketing of organic products. Certification and labeling are two important stages required to be undergone by organic products before marketed. These countries have their own surplus production of vegetables and fruits. The tropical fruits and vegetables need to find a place in the dietary schedule of the Americans and Europeans and then to compete in costs/price with supply from other third world countries. Again they do not easily take into confidence, the certification and labeling done in other countries. Hence, creation of export potential to such countries will be very slow and it takes much time.

However, the Gulf countries present a promising picture because of so many contrasting reasons. They are in short of production of fruits and vegetables due to soil, geographical and climatic conditions and they are depending on bulk imports from other countries to satisfy their demand. Kerala is already exporting sizeable quantities of fruits and vegetables to Gulf countries and the rich Arab customers have a confidence in producers and traders from Kerala. The Air and Sea distance from Kerala to Gulf is very short and daily direct flight schedules are existing from Kerala to major Gulf countries and a sizeable Keralite population in these countries serves as a buffer market for Keralite items. Arabs used to trade with Keralites since long. However, they are health conscious, strict in pollution and hygiene codes and rules. Hence, markets can be established and exports can be ensured for organically grown fruits and vegetables in Gulf countries.

A survey was conducted in Gulf countries to ascertain and assess the consumer choices, preference and to familiarise various rules and acts prevailing there with regard to food processing, packing, transportation and marketing of fruit and vegetable items in general and organically grown products in particular.The survey was conducted involving influential non-resident Keralaites in Gulf and the respondents consisted of 40 consumers and 40 Super Market owners dealing with fruit and vegetable items. The subject contents for the survey consisted of various issues including consumer awareness, pesticide residues, food-regulations, competition from other countries, choice of items, nutritive requirements etc. Separate questionnaires were used for sellers and consumers.

QUESTIONNAIRE FOR SUPER MARKET OWNERS/SELLERS OF FRUITS AND VEGETABLES IN GULF COUNTRIES.

1. Are you aware of Organic/Naturally produced fruits/vegetables? YES/NO

2. Are you convinced of its higher quality?
YES/NO

3. Are you willing to arrange a marketing outlet for organically grown vegetables and fruits?
YES/NO

4. Do you anticipate enough demand for organic vegetables?
YES/NO

5. Do you think vegetables grown and imported from Kerala are Superior to those of other areas/countries?
YES/NO

6. Kerala has climatic and geographical potential for production of fruits and vegetables in a natural way. Do you think Kerala products would get good demand and sales in Gulf countries?
YES/NO

7. Whether prices of Kerala items are competitive in comparison to products from other countries?
YES/NO

8. Whether the strict food regulations prevalent in Gulf countries would restrict the business/sales prospects of Kerala vegetable products?
YES/NO

9. Whether natural and original fresh vegetables are preferred to processed/canned products?
YES/NO

10. Whether labeling/certification of products are mandatory for good sales/customer satisfaction?
YES/NO

QUESTIONNAIRE FOR CUSTOMERS IN THEIR RESPONSE TO ORGANIC VEGETABLES.

1. Are you aware of Organic/Naturally grown vegetables? YES/NO

2. Are you getting organic or naturally grown fruits/vegetables in gulf market?
YES/NO

3. Are you convinced of its superior quality?
YES/NO

4. Do you think such items are superior to ordinary products?
YES/NO

5. Are you willing to give a higher price to organic products?
YES/NO

6. Whether Kerala vegetables are superior to products from other countries?
YES/NO

7. Whether prices of Kerala vegetables are competitive in comparison to it from other countries?
YES/NO

8. Do you prefer fresh original organic vegetables to canned/tinned products?
YES/NO

9. Whether labeling/certification of organic vegetables are essential for its better acceptance and good sale
YES/NO

10. Whether prices of vegetables are affordable and reasonable in your opinion, compared to other food products? YES/NO

11. Whether marketing of organic vegetables is feasible within the food-regulatory mechanism prevalent in Gulf Countries?
YES/NO

CROPS AND VARIETIES SELECTED FOR FINAL FIELD TRIAL

CROP		TYPE	VARIETIES
C_1 CHEERA		Leafy Vegetable	V_1 Valli Cheera – Basella rubra V_2 Pachacheera V_3 Chuvanna Cheera – Cheruthu V_4 Chuvanna Cheera – Valuthu
Genus	Species		
Amaranthus			
Family: Amaranthaceae			
C_2 COWPEA Payar		Pulse – Bean	V_1 – Karimani V_2 - Neyyattinkara Local V_3 – Kuruthola payar V_4 – Erupathirandumaniyan
Genus **Vigna**	Species **sinensis**		
Family : Leguminosae			
C_3 BHINDI (Vendai)		Lady's finger – Young fruit	V_1 – Khana cross V_2 - Malappuram local V_3 – Arinja venda V_4 – Nila venda
Botanic Name			
Genus Hibiscus	**Species** esculentus.L.		
Family : Malvaceae			
C_4 BRINJAL (Vazhuthana)		Egg Plant fruit	V_1 – Unda Vazhuthana V_2 - Neenda Vazhuthana V_3 – Kottayam local V_4 – Chundan
Botanic Name			
Genus Solanum	**Species** melongena.		
Family : Solanaceae			
C_5 CHILLI (Mulaku)		Pepper – Spice – Young Fruit	V_1 – Kanthari (C. frutescense) V_2 - Malappuram local V_3 – Palakkad local V_4 – Kottayam local
Botanic Name			
Genus Capsicum	**Species annum L**		
Family : Solanaceae			
C_6 BITTERGOURD (Kaypaka)		Young fruit	V_1 – Munda paval V_2 - Pachapaval V_3 – Kattu paval V_4 – Kaduthuruthy local
Botanic Name			
Genus Momordica	**Species charantia L**		
Family : Cucurbitaceae			

<table>
<tr><td colspan="2">C_7 CUCUMBER
(Vellari)</td><td rowspan="3">Young fruit</td><td rowspan="2">V_1 – Cheru vellary
V_2 - Erode local
V_3 – Trichur local
V_4 – Kanivellari</td></tr>
<tr><td colspan="2">Botanic Name</td></tr>
<tr><td><u>Genus</u>
Cucumis</td><td><u>Species</u>
sativus L</td><td></td></tr>
<tr><td colspan="4">Family : Cucurbitaceae</td></tr>
<tr><td colspan="2">CROP</td><td>TYPE</td><td>VARIETIES</td></tr>
<tr><td colspan="2">C_8 PUMPKIN
(Mathanga)</td><td rowspan="4">fruit</td><td rowspan="3">V_1 – Chenamathan
V_2 - Bharanimathan
V_3 – Malappuram local
V_4 – Trichur local</td></tr>
<tr><td colspan="2">Botanic Name</td></tr>
<tr><td><u>Genus</u>
Cucurbita</td><td><u>Species</u>
moschata</td></tr>
<tr><td colspan="4">Family : Cucurbitaceae</td></tr>
<tr><td colspan="2">C_9 ASHGOURD
(Kumbalam)</td><td rowspan="4">Young fruits</td><td rowspan="3">V_1 – Neykumbalam
V_2 - Trichur local
V_3 – Coimbatore local
V_4 – Marakkumbalam</td></tr>
<tr><td colspan="2">Botanic Name</td></tr>
<tr><td><u>Genus</u>
Benincasa</td><td><u>Species</u>
hispida</td></tr>
<tr><td colspan="4">Family : Cucurbitaceae</td></tr>
<tr><td colspan="2">C_{10} <u>COCCINIA</u>
(Kovakkai)</td><td rowspan="4">Young fruit</td><td rowspan="3">V_1 – Palakkad local
V_2 - Malappuram local
V_3 – Kuruppanthara local
V_4 – Kaduthapacha</td></tr>
<tr><td colspan="2">Botanic Name</td></tr>
<tr><td><u>Genus</u>
Cocciria</td><td><u>Species</u>
indica</td></tr>
<tr><td colspan="4">Family : Cucurbitaceae</td></tr>
</table>

Field trial of these varieties were done based on statistical design and layout with Randomised Block Design. The layout and design were as given in the following tables at four locations L_1 – Chungathara – Pookkottumanna; L_2 – Wandoor, L_3 – Ambalapotti and L_3 – Pandikkad – with four replicantions – R_1, R_2, R_3 and R_4 each for all the four varieties V_1, V_2, V_3 and V_4 for the ten selected crops C_1 to C_{10}.

PLANTING LAY OUT - CHEEERA C_1 L_1

L_1 (Location-1) C_1 Cheera (Amaranthus Sp. & Basella)

L_1 Chungathara

Varieties--→ (V_1 to V_4) Name----→	V_1 **Vallicheera**	V_2 Pacha cheera	V_3 Chuvanna Cheera	V_4 Chuvanna Cheera Valuthu
Replication (R_1 to R_4)	R_1	R_4	R_3	R_4
	R_2	R_2	R_4	R_1
	R_4	R_1	R_2	R_3
	R_3	R_3	R_1	R_2

No. of Plots 4 replications x 4 varieties = 16

Plot Size (1) = 20 m^2

Plot Area = 20 x 16 = 320 m

PLANTING LAY OUT - CHEEERA C_1 L_2

L_2 – C_1 – Cheera [Amaranthus Sp & Basella Sp.]

L_2 Wandoor

Varieties--→ (V_1 to V_4) Name----→	V_3 **Chuvanna Cheera**	V_1 Vallicheera	V_2 Pacha Cheera	V_4 Chuvanna Cheera Valuthu

	Cheruthu			
Replication (R_1 to R_4)	R_2	R_4	R_2	R_1
	R_3	R_2	R_3	R_4
	R_1	R_3	R_1	R_2
	R_4	R_1	R_4	R_3

No. of Plots 4 replications x 4 varieties = 16

Plot Size - 20 m^2

Plot Area = 20 x 16 = 320 m2

Similar design and layout was done for all other selected varieties / crops at other locations also.

PLANTING LAY OUT - CHEEERA C_1 L_3

C_1 – Cheera [Amaranthus Sp & Basella]

L_3 Ambalapotti

Varieties--→ (V_1 to V_4) Name----→	V_4 **Chuvanna Cheera Valuthu**	V_1 Vallicheera	V_3 Chuvanna Cheera Cheruthu	V_2 Pacha Cheera
Replication (R_1 to R_4)	R_1	R_3	R_4	R_2
	R_3	R_1	R_2	R_4
	R_2	R_4	R_3	R_1
	R_4	R_2	R_1	R_3

No. of Plots 4 replications x 4 varieties = 16

Plot Size - 20 m^2

Plot Area = 20 x 16 = 320 m2

PLANTING LAY OUT - CHEEERA C_1 L_4

C_1 – Cheera [Amaranthus Sp & Basella Sp]

L_4 Perinthalmanna

Varieties--→ (V_1 to V_4) Name----→	V_2 **Pacha Cheera**	V_4 Chuvanna Cheera Valuthu	V_3 Chuvanna Cheera Cheruthu	V_1 Vallicheera
Replication (R_1 to R_4)	R_3	R_2	R_4	R_1
	R_2	R_3	R_1	R_4
	R_1	R_1	R_2	R_3
	R_4	R_4	R_3	R_2

No. of Plots 4 replications x 4 varieties = 16

Plot Size - 20 m^2

Plot Area = 20 x 16 = 320 m2

C_2 L_1

C_2 - COWPEA – PAYAR : PLANTING AND LAYOUT

L_1 Chungathara

Varieties--→ (V_1 to V_4) Name----→	V_1	V_2	V_3	V_4
Replication (R_1 to R_4)	R_1	R_4	R_2	R_3
	R_4	R_3	R_1	R_2
	R_3	R_1	R_3	R_1
	R_2	R_2	R_4	R_4

No. of Plots 4 replications x 4 varieties = 16

Plot Size - 20 m^2 Per Plot
Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

C_2 - L_2

C_2 - COWPEA – PAYAR : PLANTING AND LAYOUT

L_2 Wandoor

Varieties--→ (V_1 to V_4) Name----→	V_3	V_1	V_4	V_2
Replication (R_1 to R_4)	R_2	R_4	R_2	R_1
	R_4	R_2	R_4	R_2
	R_3	R_3	R_1	R_4
	R_1	R_1	R_3	R_3

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot
Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_2 – L_3$

C_2 - COWPEA – PAYAR : PLANTING AND LAYOUT

L_3 Ambalapotti

Varieties--→ (V_1 to V_4) Name----→	V_4	V_2	V_3	V_1
Replication (R_1 to R_4)	R_1	R_4	R_2	R_3
	R_4	R_1	R_3	R_2
	R_3	R_2	R_4	R_1
	R_2	R_3	R_1	R_4

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot
Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_2 – L_4$

C_2 - COWPEA – PAYAR : PLANTING AND LAYOUT

L_4 Perinthalmanna

Varieties--→ (V_1 to V_4) Name----→	V_2	V_4	V_1	V_3
Replication (R_1 to R_4)	R_1	R_2	R_4	R_3
	R_4	R_1	R_2	R_2
	R_3	R_4	R_1	R_4
	R_2	R_3	R_3	R_1

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot
Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_3 – L_1$

Hibiscus esculentas

BHINDI

C_3 - Bhindi: ladys finger : Planting Layout

L_1 - Chungathara

Varieties--→ (V_1 to V_4) Name----→	V_1	V_3	V_2	V_4
Replication (R_1 to R_4)	R_1	R_4	R_2	R_3
	R_4	R_2	R_3	R_1
	R_2	R_3	R_1	R_4
	R_3	R_1	R_4	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_3 – L_2$

Hibiscus esculentas

BHINDI

C_3 - Bhindi: ladys finger : Planting Layout

L_2 - Wandoor

Varieties--→ (V_1 to V_4) Name----→	V_4	V_1	V_2	V_3
Replication (R_1 to R_4)	R_4	R_3	R_2	R_1
	R_2	R_1	R_4	R_3
	R_3	R_4	R_1	R_2
	R_1	R_2	R_3	R_4

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_3 – L_3$

Planting Layout

BHINDI

Hibiscus esculentus

C_3 - Bhindi – Lady's finger

L_3 - Ampalapotti

Varieties--→ (V_1 to V_4) Name----→	V_3	V_1	V_2	V_4
Replication (R_1 to R_4)	R_4	R_3	R_2	R_1
	R_2	R_1	R_4	R_3
	R_3	R_2	R_1	R_4
	R_1	R_4	R_3	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_3 – L_4$

Planting Layout

BHINDI

Hibiscus esculentus

C_3 - Bhindi – Lady's finger

L_4 - Perinthalmanna

Varieties--→ (V_1 to V_4) Name----→	V_2	V_3	V_1	V_4
Replication (R_1 to R_4)	R_4	R_3	R_2	R_1
	R_1	R_2	R_3	R_4
	R_2	R_1	R_4	R_3
	R_3	R_4	R_1	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_4 - L_1$

Planting Layout

C_4 BRINJAL

L_1 - Chungathara

Varieties--→ (V_1 to V_4) Name----→	V_1	V_2	V_3	V_4
Replication (R_1 to R_4)	R_4	R_2	R_1	R_3
	R_2	R_1	R_3	R_4
	R_3	R_4	R_2	R_1
	R_1	R_3	R_4	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_4 - L_2$

Planting Layout

C_4 - BRINJAL

L_2 - Wandoor

Varieties--→ (V_1 to V_4) Name----→	V_3	V_1	V_2	V_4
Replication (R_1 to R_4)	R_3	R_2	R_1	R_4
	R_2	R_3	R_4	R_1
	R_1	R_4	R_3	R_2
	R_4	R_1	R_2	R_3

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_4 - L_3$

Planting Layout

C_4 - BRINJAL

L_3 - Ambalapotti

Varieties--→ (V_1 to V_4) Name----→	V_2	V_3	V_1	V_4
Replication (R_1 to R_4)	R_1	R_2	R_4	R_3
	R_4	R_3	R_2	R_1
	R_2	R_1	R_3	R_4
	R_3	R_4	R_1	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_4 - L_4$

Planting Layout at L_4

C_4 - BRINJAL

L_4 - Perinthalmanna

Varieties--→ (V_1 to V_4) Name----→	V_3	V_4	V_3	V_2
Replication (R_1 to R_4)	R_2	R_3	R_4	R_1
	R_3	R_4	R_1	R_2
	R_4	R_1	R_2	R_3
	R_1	R_2	R_3	R_4

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_5 – L_1$

Planting Layout at L_1

C_5 - Chilli - Mulaku

L_1 - Pookkottumanna

Varieties--→ (V_1 to V_4) Name----→	V_4	V_3	V_2	V_1
Replication (R_1 to R_4)	R_1	R_2	R_4	R_3
	R_4	R_3	R_2	R_1
	R_2	R_4	R_1	R_4
	R_3	R_1	R_3	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_5 –$

L_2

Planting Layout at L_1

C_5 - Chilli - Mulaku

L_2 - Wandoor

Varieties--→ (V_1 to V_4) Name----→	V_4	V_3	V_2	V_1
Replication (R_1 to R_4)	R_1	R_2	R_4	R_3
	R_4	R_3	R_2	R_1
	R_2	R_4	R_1	R_4
	R_3	R_1	R_3	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_5 – L_3$

Planting Layout at L_3

C_5 - Chilli - Mulaku

L_3 - Ambalapotti

Varieties--→ (V_1 to V_4) Name----→	V_2	V_4	V_1	V_2
Replication (R_1 to R_4)	R_2	R_1	R_3	R_4
	R_1	R_2	R_4	R_3
	R_3	R_4	R_2	R_1
	R_4	R_3	R_1	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_5 – L_4$

Planting Layout at L_4

C_5 - Chilli - Mulaku

L_4 - Perinthalmanna

Varieties--→ (V_1 to V_4) Name----→	V_2	V_4	V_1	V_2
Replication (R_1 to R_4)	R_1	R_2	R_3	R_4
	R_4	R_3	R_2	R_1
	R_2	R_1	R_4	R_3
	R_3	R_4	R_1	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_5 - L_2$

Planting Layout at L_2

C_5 - Chilli - Mulaku

L_2 - Wandoor

Varieties--→ (V_1 to V_4) Name----→	V_3	V_2	V_1	V_4
Replications (R_1 to R_4)	R_2	R_1	R_3	R_4
	R_3	R_4	R_1	R_2
	R_1	R_2	R_4	R_3
	R_4	R_3	R_2	R_1

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_6 - L_1$

Planting Layout at L_1

C_6 - Bittergourd - Kaypaka

L_1 - Pookottumanna

Varieties--→ (V_1 to V_4) Name----→	V_4	V_2	V_3	V_1
Replication (R_1 to R_4)	R_2	R_1	R_3	R_4
	R_3	R_2	R_4	R_1
	R_4	R_3	R_1	R_2
	R_1	R_4	R_2	R_3

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_6 - L_2$

Planting Layout at L_2

C_6 - Bittergourd - Kaypaka

Momordica Charantia

L_2- Wandoor

Varieties--→ (V_1 to V_4) Name----→	V_2	V_4	V_3	V_1
Replication (R_1 to R_4)	R_4	R_2	R_3	R_1
	R_1	R_3	R_2	R_4
	R_2	R_1	R_4	R_3
	R_3	R_4	R_1	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_6 - L_3$

Planting Layout at L_3

C_6 - Bittergourd - Kaypaka

L_3- Ambalapotti

Varieties--→ (V_1 to V_4) Name----→	V_1	V_4	V_3	V_2
Replication (R_1 to R_4)	R_2	R_3	R_4	R_1
	R_3	R_1	R_2	R_4
	R_1	R_4	R_3	R_2
	R_4	R_2	R_1	R_3

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_6 - L_4$

Planting Layout at L_4

C_6 - Bittergourd - Kaypaka

L_4- Perinthalmanna

Varieties--→ (V_1 to V_4) Name----→	V_2	V_4	V_3	V_1
Replication (R_1 to R_4)	R_1	R_2	R_3	R_4
	R_4	R_1	R_2	R_3
	R_3	R_4	R_1	R_2
	R_2	R_3	R_4	R_1

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_7 - L_1$

Planting Layout at L_1

C_{7-} Cucumber – Vellari

L_1- Pookkottumanna

Varieties--→ (V_1 to V_4) Name----→	V_3	V_4	V_1	V_2
Replication (R_1 to R_4)	R_1	R_2	R_4	R_3
	R_4	R_3	R_1	R_2
	R_3	R_1	R_2	R_4
	R_2	R_4	R_3	R_1

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_7 - L_2$

Planting Layout at L_2

C_{7-} Cucumber – Vellari

L_2- Wandoor

Varieties--→ (V_1 to V_4) Name----→	V_4	V_1	V_3	V_2
Replication (R_1 to R_4)	R_4	R_3	R_1	R_2
	R_2	R_1	R_3	R_4
	R_1	R_2	R_4	R_3
	R_3	R_4	R_2	R_1

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_7 - L_3$

Planting Layout at L_3

C_7 - Cucumber – Vellari

L_3 - Ambalampotti

Varieties--→ (V_1 to V_4) Name----→	V_2	V_3	V_1	V_4
Replication (R_1 to R_4)	R_1	R_4	R_2	R_3
	R_4	R_3	R_1	R_2
	R_2	R_1	R_3	R_4
	R_3	R_2	R_4	R_1

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_7 - L_4$

Planting Layout at L_4

C_7 - Cucumber – Vellari

L_4 - Perinthalmanna

Varieties--→ (V_1 to V_4) Name----→	V_1	V_2	V_4	V_3
Replication (R_1 to R_4)	R_1	R_4	R_2	R_3
	R_4	R_2	R_3	R_1
	R_3	R_1	R_4	R_2
	R_2	R_3	R_1	R_4

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_8 - L_1$

Planting Layout at L_1

C_8 - PUMPKIN - MATHANGA

L_1 - Pookottumpadam

Varieties--→ (V_1 to V_4) Name----→	V_2	V_3	V_4	V_1
Replication (R_1 to R_4)	R_4	R_2	R_3	R_1
	R_2	R_3	R_4	R_3
	R_3	R_1	R_2	R_2
	R_1	R_4	R_1	R_4

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_8 - L_2$

Planting Layout at L_2

C_8 - PUMPKIN - MATHANGA

L_2 - Wandoor

Varieties--→ (V_1 to V_4) Name----→	V_1	V_3	V_2	V_4
Replication (R_1 to R_4)	R_1	R_3	R_4	R_2
	R_2	R_4	R_3	R_1
	R_4	R_2	R_1	R_3
	R_3	R_1	R_2	R_4

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_8 - L_3$

Planting Layout at L_3

C_8 - Pumpkin - Mathanga

L_3 - Ambalapotti

Varieties--→ (V_1 to V_4) Name----→	V_2	V_4	V_2	V_1
Replication (R_1 to R_4)	R_1	R_4	R_3	R_2
	R_2	R_3	R_2	R_1
	R_3	R_2	R_1	R_4
	R_4	R_1	R_4	R_3

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_8 - L_4$

Planting Layout at L_4

C_8 - Pumpkin - Mathanga

L_4 - Perinthalmanna

Varieties--→ (V_1 to V_4) Name----→	V_1	V_3	V_2	V_4
Replication (R_1 to R_4)	R_4	R_2	R_1	R_3
	R_2	R_3	R_4	R_1
	R_3	R_1	R_2	R_4
	R_1	R_4	R_3	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_9 - L_1$

Planting Layout at L_1

C_9 - Ashgourd – Kumbalam

L_1 - Pookottumpadam

Varieties--→ (V_1 to V_4) Name----→	V_1	V_4	V_2	V_3
Replication (R_1 to R_4)	R_2	R_3	R_4	R_2
	R_3	R_1	R_2	R_3
	R_4	R_2	R_3	R_4
	R_1	R_4	R_1	R_1

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_9 - L_2$

Planting Layout at L_2

C_9 - Ashgourd – Kumbalam

L_1 - Pookottumpadam

Varieties--→ (V_1 to V_4) Name----→	V_4	V_2	V_3	V_1
Replication (R_1 to R_4)	R_2	R_3	R_4	R_1
	R_3	R_4	R_2	R_3
	R_4	R_1	R_3	R_2
	R_1	R_2	R_1	R_4

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_9 - L_3$

Planting Layout at L_3

C_9 - Ashgourd – Kumbalam

L_3 - Ambalapotti

Varieties--→ (V_1 to V_4) Name----→	V_4	V_3	V_1	V_2
Replication (R_1 to R_4)	R_1	R_4	R_2	R_4
	R_4	R_2	R_3	R_3
	R_2	R_3	R_4	R_1
	R_3	R_1	R_1	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

$C_9 - L_4$

Planting Layout at L_4

C_9 - Ashgourd – Kumbalam

L_4 - Perinthalmann

Varieties--→ (V_1 to V_4) Name----→	V_1	V_4	V_3	V_2
Replication (R_1 to R_4)	R_4	R_2	R_3	R_4
	R_2	R_3	R_4	R_3
	R_3	R_4	R_1	R_2
	R_1	R_1	R_2	R_1

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

C_{10} L_1

Planting Layout at L_1

C_{10} – Coccinia – Kovakka

L_1 - Pookottumanna

Varieties--→ (V_1 to V_4) Name----→	V_2	V_3	V_1	V_4
Replication (R_1 to R_4)	R_4	R_3	R_2	R_1
	R_2	R_1	R_3	R_4
	R_3	R_2	R_4	R_3
	R_1	R_4	R_1	R_2

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

C_{10}

L_2

Planting Layout at L_2

C_{10} – Coccinia – Kovakka

L_2 - Wandoor

Varieties--→ (V_1 to V_4) Name----→	V_1	V_4	V_3	V_2
Replication (R_1 to R_4)	R_4	R_1	R_2	R_4
	R_2	R_4	R_3	R_2
	R_3	R_2	R_4	R_3
	R_1	R_3	R_1	R_1

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot
Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

C_{10}

L_3

Planting Layout at L_3

C_{10} – Coccinia – Kovakka

L_3 - Ampalapatti

Varieties--→ (V_1 to V_4) Name----→	V_2	V_3	V_1	V_4
Replication (R_1 to R_4)	R_1	R_4	R_2	R_1
	R_4	R_1	R_3	R_4
	R_3	R_3	R_1	R_2
	R_2	R_2	R_2	R_3

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot
Cropped Area = 20 x 16 = 320 m2 ~ 8 cents

C_{10}

L_4

Planting Layout at L_4

C_{10} – Coccinia – Kovakka

L_4 - Perinthalmanna

Varieties--→ (V_1 to V_4)	V_2	V_4	V_2	V_1

Name----→				
Replication (R_1 to R_4)	R_1	R_2	R_4	R_3
	R_4	R_4	R_1	R_2
	R_3	R_3	R_2	R_4
	R_2	R_1	R_3	R_1

No. of Plots 4 varieties x 4 Replications = 16

Plot Size - 20 m^2 Per Plot

Cropped Area = 20 x 16 = 320 m2 ~ 8 cents