

ZONE SPECIFIC PACKAGE OF PRACTICES

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PACKAGE OF PRACTICES RECOMMENDATIONS
NORTHERN REGION, KERALA

The northern zone is characterised by numerous hills and valleys of the western ghats undulating to the Arabian sea and intersected by nineteen rivers and streams. This region experiences a prolonged dry spell from December to May. Hence the recommendations for agricultural practices for the State as a whole need modifications to suit the peculiar agro-climatic situations of the North Zone. The following specific recommendations are made for the major crops cultivated in the region.

Coconut (Cocos nucifera)

Coconut is grown in different soil types such as laterite, coastal sandy, alluvial and also in reclaimed soils of the marshy lowlands.

West Coast Tall, Laccadive Ordinary, Andaman Ordinary, Philippines, Java, Cochin China and Kappadam are recommended for large scale cultivation. The hybrids released and recommended for large scale cultivation include Lakshaganga (Lakshadweep Ordinary x Gangabondam), Keraganga (West Coast Tall x Gangabondam), Anandaganga (Andaman Ordinary x Gangabondam), Kerasree (West Coast Tall x Malayan Yellow Dwarf), West Coast Tall x Chowghat Dwarf Green, Chowghat Dwarf Orange x West Coast Tall, Chowghat Dwarf Green x West Coast Tall and Lakshadweep Ordinary x Chowghat Dwarf Orange. Of these Anandaganga and Keraganga are recommended for general cultivation under rainfed and irrigated conditions. Other hybrids are recommended for ideal situations and where good management practices are adopted.

The size of pits for planting would depend upon soil type and water table. In loamy soils with low water table a pit size of 1 M x 1 M x 1 M is recommended. In laterite soils with underlying rock, take larger



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pits of size 1.2 M x 1.2 M x 1.2 M. In sandy soils, the size of pits may be 0.75 x 0.75 x 0.75 M. The pits may be filled up with top soil to a height of 60 cm below the ground level. The spacing recommended is 7.5 M between rows and plants. In general, the planting the seedlings during May with the onset of pre-monsoon rains is ideal.

For the first 3 years after planting under rainfed conditions apply fertilizers per plant in two splits at the rates of 1/10, 3/9, 6/9 and 9/9 for the adult palm recommendation in the 1st, 2nd and 3rd year respectively during April-June and September-October. The full dose of fertilizers recommended for adult palm is 1.0:0.50:2.0 kg N, P₂O₅, K₂O per plant per year in 2 or 3 splits for hybrids and high yielding palms under irrigated conditions. For rainfed condition a dose of 0.50:0.32:1.20 kg N, P₂O₅, K₂O per plant is recommended in two splits per year. Under irrigated conditions, apply in 3 or 4 equal split doses in April-May, August-September, December and February-May. Irrigate the palms during the summer months in basins around palms.

The major pests of coconut are Rhinoceros Beetle and Red palm weevil. For control of Rhinoceros beetle hook out the beetles from attached palms by using beetle hook and fill up top most 3 leaf axils around the spindle with a mixture of BHC 5% DP or chlordane 5% DP and soil in equal proportions by volume. Leaf axil filling is to be done thrice in a year in April, September and December as a prophylactic measure. To control Red palm weevil, leaf axis filling as suggested under Rhinoceros beetle is recommended. The two major pathological problems are Bud rot and stem bleeding. Effective control measures are recommended and practised. For the control of Bud rot, in early stages of the disease cut and remove all affected tissues of the crown, apply Bordeaux paste and protect it from rain till normal shoot

emerges and spray 1% Bordeaux mixture on spindle leaves and crown of disease affected as well as neighbouring palms, as a prophylactic measure. To control stem bleeding, root feeding/soil dressing of 25 ml Calixin is recommended. For root feeding, dig out a fresh root and make a slanting cut at the tip and immerse in water. Mix 25 ml calixin and 25 ml water in a polythene bag, dip the root in the solution and tie the distal end to the root. For soil drenching, remove top soil from basin and wet the basin if necessary. Mix 25 ml calixin in 25 L. water and drench the soil. If required, repeat the application every four months.

The following crops are recommended as intercrops.

Cereals: Rice and Maize

Legumes and pulses: Groundnut, horsegram, cowpea

Tubers : Tapioca, Sweet potato, Yams, Colocasia

Spices & condiments: Ginger, Turmeric, Chillies, Pepper, Nutmeg, Cinnamon and cloves.

Fruit plants : Banana, pineapple, papaya

Beverage Crops: Cocoa

Fodder grasses: Hybrid Napier, Guinea grass.

In all cases separate application of adequate fertilizers and manures to the individual crops is essential.

Pepper (Piper nigrum)

Panniyur-I, Panniyur-II, Panniyur-III and Panniyur-IV and Karimunda are the varieties recommended for large scale cultivation. Of these Panniyur-I is to be grown in comparatively open areas.

Planting of standards is to be taken up in April-May with the onset of pre-monsoon showers. For planting pepper, prepare pits on the northern side of standards 15 cm away from it. The pit size should be 50 x 50 x 50 cm. Fill the pits with a mixture of top soil and compost or well rotten cattle manure @ 5 kg per pit. With the onset

of monsoon in June-July 2-3 rooted cuttings in the pits at a distance of 30 cm away from the standards. Press the soil around the cuttings to form a small mound sloping outward and away from the cuttings to prevent water stagnation around the plants.

Recommended nutrient dosage per standard of pepper vines of 3 years growth and above is as follows:-

1. NPK 100:40:140 g/vine/year
2. NPK 50:50:200 g/vine/year
3. NPK 140:55:275 g/vine/year

Apply 1/3 dose for one year old plants and 1/2 dose for two year old plants.

The major disease affecting pepper is quick wilt disease caused by Phytophthora palmivora. Effective control measures has been formulated, recommended and practised. The management of quick wilt of pepper includes

- a) In April-May, clean the garden of all previously affected plants and burn them. Provide regular sanitation.
- b) Improve drainage and aeration in the soil
- c) In May-June take shallow basins around the plants and drench the soil in the basins with 0.1% methoxy ethyl mercuric chloride (3% formulation) or 1% Bordeaux mixture.
- d) Apply 10% Bordeaux paste mixed with rosin soda on the basal exposed stem portion of the vines so that a thin film of the fungicide covers and protect the entire stem in this region.
- e) At the same time, apply 1% Bordeaux mixture mixed with rosin soda as a spray to cover the entire foliage. Repeat the spray, if required.

After regular bearing for about 20 years, the vines of the most varieties start declining in yield. Under-planting should be attempted at about 20 years after

planting or when a regular declining trend in yield appears.

Arecanut (Areca cateches)

The arecanut palm is capable of growing under a variety of climatic and soil conditions. It grows well from almost sea level upto an altitude of 1000 m in areas of abundant and well distributed rainfall or under irrigated conditions. It is grown in a variety of soils such as laterites, red loam and alluvial soils.

Varieties: Mangala, Sumangala and Sreemangala are released for cultivation.

Plant tall, quick growing shade trees on the southern and western sides of the seedlings to provide protection from sun scorching.

Plant seedlings in pits at a spacing of 2.7 m x 2.7 m with North-South alignment the row being deflected at an angle of 85° towards west. Dig pits of size 80 x 80 x 80 cm and fill up with rich top soil to a level of 15 cm from the bottom. Plant seedling in the centre of pit, cover with soil upto collar level and press around.

The planting is to be done during May-June in well drained soils and during August-September in clayey soils subject to waterlogging.

Banana may be planted between rows to provide shade to the plants in the initial stages upto 4-5 years.

Manures and fertilizers

Apply green leaf and compost, each at a rate of 12 kg per palm per annum from first year of planting onwards, in September-October.

Apply fertilizer for adult palms except Mangala variety as shown below:

	(g/palm/annum)		
	N	P ₂ O ₅	K ₂ O
Ordinary variety	100	40	140
Mangala variety	150	60	210

Apply 1/3rd dose during first year, 2/3rd dose during second year and full dose from third year onwards. Under irrigated conditions, apply fertilizer in 2 split doses, the first during September-October and the second during February. Under rainfed conditions apply the second dose during March-April after receipt of summer rains. Apply manures and fertilizers during September-October in circular basis of 15-20 cm depth and with a radius of 0.75-1 m from the palm. Apply the second dose of fertilizers around the base of palm after weeding and fork into soil by light forking. In acidic soils, broadcast lime at the rate of 0.5 kg/palm once in two or three years and incorporate into soil by forking during April-May.

Intercropping and mixed cropping

Crops such as elephant foot yam, pineapple, pepper, betelvine, banana, guinea grass, cocoa, ginger and cardamom can be grown in arecanut gardens. While planting cocoa, a spacing of 5.4 x 2.7 m is recommended. In all cases, the intercrops should be manured adequately and separately.

Plant protection

Adopt prophylactic and curative measures against pests and diseases as specified below:-

Mites

1. Spray the undersurfaces of leaves with Chlorbenzilate (0.025%) Dichlorobenzilic acid (0.025%) or Carbophenothion (0.05%) to control the red and white mites. Repeat spraying at intervals of 15-20 days if there is pest recurrence.
2. To control orange coloured mites spray bunches with Dimethoate at 0.05% concentration.

Spindle bug

Spray crowns with BHC 50% WP (250 g in 100 litres of water). The spray should reach the leaf axils. Repeat

spraying after 30-35 days if pest incidence continues.

Inflorescence caterpillar

1. Force open the inflorescence out of the enclosing spathe and spray Malathion 50% EC (250 ml in 100 litres of water).
2. Control slugs: which predispose inflorescence to attack of caterpillar, by using bait of Metaldehyde.

Root grub

1. Loosen soil around the base of palm to a depth of 10-15 cm and drench with chlordane 0.07% suspension twice, once in May just before the onset of SW monsoon and again in September-October ~~in~~ towards the close of the monsoon. Repeat application for 2 or 3 years consecutively to secure a complete eradication of the pest.
2. Rootgrubs can also be controlled by soil application of Aldrin, Chlordane or Heptachlor dust formulations at the rate of 50 kg per hectare or by application of Phorate 10% granules around the palms.

Koleroga (Mehali or fruit rot)

1. Spray Bordeaux mixture 1% on all bunches twice a year, one just before the onset of South-West monsoon and another 40 days later. If monsoon season is prolonged give a third spray. Use rosin-soda adhesive to ensure tenacity of the spray deposit on treated ~~substrates~~ substrates (for details of preparation of the adhesive ~~(See Appendix XVIII)~~).
2. Remove and burn all fallen and infected nuts.

Bud rot

1. Remove and destroy affected spindle and leaves.
2. In early stages of infection, scoop out affected rotten tissues by making longitudinal side splits and apply Bordeaux paste ~~(See Appendix IX)~~ on the exposed healthy tissue or drench crown with 1% Bordeaux mixture.

Foot rot (Ababe)

1. Isolate affected palms by digging trenches 60 cm deep and 30 cm wide around, one metre away from the base and drench with 0.3% Captan.
2. Remove and destroy all severely affected palms and stumps of dead palms.
3. Drench the soil with 0.1% organomercurials containing 3% ai before planting healthy seedlings.
4. Discourage growing of collateral hosts of fungus such as Delonix regia (Gold Mohur) and Pongamia glabra in the vicinity of gardens.

Yellow leaf disease

Maintain garden property to keep affected palms in a healthy condition by adopting recommended manurial, cultural plant protection and other management practices. Improve drainage conditions in the garden.

Band disease

1. Improve soil conditions by loosening hard soil strata if present and by providing good drainage.
2. Adopt adequate control measures against spindle bug, mealy bugs and scales.
3. Where the results of the above treatments are not found satisfactory, apply powdered mixture of copper sulphate and lime in equal quantities at the rate of 225 g per palm twice an year at the base of affected palms.

Sun-scorch

1. Protect palms from South-West sun by wrapping stems with areca sheath or opeque plastic film.
2. Provide reinforcement to palms showing stem fissures.
3. Grow tall, quick growing trees on southern and western sides of garden.

Collar rot of seedlings

1. Improve drainage conditions in nursery beds and gardens.

2. Drench spindle and base of seedlings with 0.1 per cent organomercurials (3% ai) in disease affected nursery or garden.

Die-back of inflorescence

1. Remove affected inflorescence immediately.
2. Spray Zineb (4 g in 1 litre of water) twice, once just after female flowers are set and again 15-28 days later.
3. Aureofungin sol. at 50 ppm concentration is also effective in controlling the disease.

Post-harvest technology

A simple dehusking device has been standardised by the Central Plantation Crops Research Institute, Kasaragod. The out turn with this device is 60 kg of husked nuts in the case of dry nuts and 30 kg in the case of green nuts. The cost of the device is about Rs.250/-.

Rice (Oryza sativa)

Rice can be grown as a transplanted or direct sown crop during three seasons as shown below depending on the availability of water and other local conditions.

Virippu	: First (Autumn) crop April-May to September-October.
Mundakan	: Second (Winter) Crop: September-October to December-January.
Punja	: Third (Summer) Crop December-January to March-April

Varieties

Select varieties most suited to the season and region as shown in Table 1.

Table 1. Recommended rice varieties

Kind of land region	Season	Recommended varieties
1. Upland (modan lands) purely rainfed crop	First crop	PTB-28, PTB-30, Suvarnamodan High yielding varieties such as Annapoorna, Triveni Swarnaprapha and Rohini are recommended for areas where rainfall is well distributed.
2. Palliyals (Myals) Single crop terraced uplands	First crop	Medium duration: Aswathy, Jaya, Bharathi, IR-8, Supriya, Mahsuri and Karthika. Short duration: Rohini, Triveni, Annapoorna, Jyothi.
3. Double crop wet lands semi-dry cultivation - dry broadcasting or dibbling	First crop	Medium duration: Aswathy, IR-8, Sabari, Jaya, Bharathi, Supriya, Mahsuri and Karthika. Short duration: Rohini, Triveni, Annapoorna, Jyothi, Swarnaprabha.
	Second crop	Any of the varieties suggested for the first crop season (excepting Rohini) and Rasi as a medium duration variety.
4. Double crop wet land-transplanted crop	First crop	Medium duration: Jaya, IR-8, Sabari, Bharathi, Aswathy, Supriya, Mahsuri, Karthika, Short duration: Annapoorna, Rohini, Triveni, Jyothi, Swarnaprabha.
	Second crop	Medium duration: Jaya, IR-8, Aswathy, Sabari, Bharathi, IR-20, Supriya, Mahsuri, Rasi, Reshmi. Short duration: Annapoorna, Triveni, Jyothi.
	Third crop	Medium duration: Jaya, IR-8, Sabari, Bharathi, IR-20, Supriya. Short duration: Annapoorna, Triveni, Rohini, Jyothi, Swarnaprabha.

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|--------------------------------------|-----------------------------|---|
| 5. Kole area | Sept.Oct. to
Dec.-Jan. | Medium duration: Jaya, IR-8,
Aswathy.
Sabari, Bharathi, Karthika. |
| | Dec.Jan. to
March-April. | Short duration: Annapoorna,
Triveni, Jyothi, Swarnaprabha, |
| 6. Pokkali area | | Vyttila-1. |
| 7. Water logged
and flooded areas | First
crop | Pankaj, Jagannath,
Mahsuri, Neeraja. |
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Seed treatment

Wet treatment

Soak seeds for 30 minutes in solution of 0.1% Methoxy ethyl chloride formulation containing 3% mercury or in a solution of 0.05% with a formulation of 6% mercury. Drain water after 30 minutes and soak for 12 hours in plain water to induce germination.

Dry treatment

Treat seeds with dry formulation of organo-mercury fungicides containing 1% at the rate of 125 g or Captan at 80 g/100 kg of seed.

Caution: The treated seeds should not be exposed to avoid to poultry and pets and these are to be handled with care. Never use Aluminium or zinc containers for seed treatment.

Micronutrient treatment

Soak paddy seeds in CuSO (0.25%) and Zn SO (1%) solution for 24 hours. Drain and keep for sprouting. For soaking 1 kg of seed, 1 litre or micronutrient solution would be needed.

KOOTTUMUNDAKAN

This is a system of rice cultivation in which a mixture of seed of a non-photo sensitive (Virippu) variety and a photosensitive (Mundakan) variety of rice in the proportion 70:30 (w/w) is sown during virippu season. This system is practised in areas where sowing/planting of mundakan crop is not possible due to excess water in field. Hence mixture of two varieties is sown in the first crop season (April-May). The first crop variety will be ready for harvest in August, September and the second crop variety can be harvested in December, January. No cultivation is practised after the harvest of first season variety. But both organic and inorganic manures are applied and incorporated. Though the yield will be less than that of two independent crops this type of rice cultivation alone can be taken up in such areas in view of the special circumstances.

CASHEW (*Anacardium occidentale*)

Cashew is adapted to warm humid tropical conditions. It can be grown in almost all types of soil from sandy to laterite and up to an elevation of 600-700 m including waste lands of low fertility. It grows and yields best in well drained red sandy loams and light coastal sands. Heavy clay soils, poor drainage conditions very low temperature and frost are unsuitable for the crop.

Varieties

The improved types/selections of Cashew recommended are furnished in Table 15. Types K-22-1, NDR-2-1, H-3-7 and BLA-39-4 are recommended for general cultivation.

Table 15 : Improved types/selections of Cashew

Type Nos.	Mean Yield kg/tree/year	Shelling percentage	Other attributes
NLR-2-1	15.6	26	Easily rooted on layering
Anakkayam-1	32.6	28	Early type with short flowering phase.
NDR-2-1	17.1	26	Late type
H-3-19	22.7	26	Regular bearer
H-4-7	15.7	28	"
H-3-17	18.6	NA	"

Planting Material

Plant seedlings, air layers, grafts and budlings.

Selection of mother trees for D Seednuts

Select mother trees in February and collect seednuts in March-April. Select good mature medium sized nuts which sink in water and use these as seeds after drying in sun

for 2-3 days.

Select mother trees having the following characteristics:

1. Good health, vigorous growth and intensive branching habit with panicles having higher percentage of hermaphrodite flowers.
2. 15-25 years age.
3. Bearing nuts of medium size and weight (5-8 g per nut) with an average yield of 15 kg nuts per annum.
4. Bearing 7-8 nuts per panicle.

Raising Seedlings

Raise seedlings in polythene bags during May. Use polythene bags of size 20 x 15 cm and fill the bags with garden soil, leaving a gap of 1-1.5 cm above. Soak seednuts in water for 18-24 hours to hasten germination. Sow the presoaked seednuts in polythene bags filled with garden soil at a depth of 2-3 cm with the stalk end up. Seeds germinate in 7-10 days.

Prepare air layers during February-March so that they will be ready for planting in June-July.

Select pencil-thick terminal shoots 9-12 months old. Remove a strip or ring of bark 0.6-1.2 cm thick by using a sharp knife carefully without injuring the underlying wood. Wind a string around the cut area and cover it with moist moss or wood shavings or sand and saw dust mixture of ordinary potting mixture and wrap around with 150-200 gauge polythene film of size 23 x 15 cm. Secure loose ends of film with jute fibre. When roots begin to emerge from ringed portion in 40-60 days give a 'V' cut at lower end of treated shoot. After about 15 days deepen the cut slightly. Cut and separate rooted shoot about 7 days later. Pot the layers immediately after separation from the tree in containers of size 15 x 15 cm made from coconut husk and keep them in shade. Avoid excessive amount of watering. Plant the layers along with the container in the prepared

pits during the onset of SW monsoon. Mulch the plant base with dry leaves to reduce sun-scorch to tender plants. It is advisable to defoliate the layers two weeks before separation from the mother plant.

Planting and Management

Plant seedlings or air layers in pits of size 50 x 50 x 50 cm during June-July.

Planting may be done at a spacing of 7.5 m for poor and 10 m for rich and deep soils and sandy coastal areas. On very sloppy lands the rows may be spaced 10-15 m apart with a spacing of 6-8 m between trees in a row.

Note: It would be advantageous to raise cashew seedlings initially at a spacing of 4 x 4 m up to a period of six years. Later the extra plants can be thinned out to provide a spacing of 8 x 8 m. The advantage of the system is that firewood can be produced from cashew plantation without adversely affecting the nut production in cashew curing the early stages of growth.

Depending upon weed growth, conduct weeding operation during August-September. Mulch the plant base with dry leaves to reduce sun-scorch to tender plants.

Fertilizer Application

The recommended nutrient dosage for full grown cashew tree is as follows:

	N	P ₂ O ₅	K ₂ O
Nutrient dosage (g per tree per annum)	500	125	125

Apply 1/3rd dose during first year, 2/3rd dose during second year and full dose from third year onwards.

Broadcast the fertilisers over the entire tree basin (15 cm deep) within a radial distance of 2 to 3 metres within

the drop line leaving half a metre from the tree trunk and incorporate by light raking.

Intercropping

Pineapple is the most profitable intercrop in cashew plantation in the early growth stages of cashew. Lemongrass and Tapioca can also be raised with less profit.

Plant Protection

For control of the mosquito spray (a) 0.05% Endosulfar (b) 0.10% Carbaryl (c) 0.05% Quinalphos or (d) 0.03% Phosphamidon. The mode of action of b, c and d are basically similar. A rational rotation of insecticides would be desirable to counteract the tendency of pests to develop field resistance. Spraying may be done thrice as follows:

First : Spraying to be given synchronising with the emergence of new vegetative flushes in October-November.

Second: Spraying to be given synchronising with the commencement of panicle emergence in December-January.

Third : Spraying to be given at fruit set initiation/complete flowering in January-February.

Note : 1. For grown up trees, 5 litres of spray fluid would be required at high volume discharge rate and 2½ ltrs. at the low volume discharge rate. For spraying, rocker sprayer with Hi-tree lance is preferable.

2. For low volume application, the concentrations of the insecticides are to be maintained at 0.1% for Endosulfan and Quinalphos and 0.2% for Carbaryl and 0.06% for Phosphamidon. It is difficult to cover the entire canopy with low volume equipment. In such cases the uncovered upper canopy areas may be covered with Rocking sprayer fitted with Hi-tree lance system.

MANURES AND FERTILIZERS:

Fertilizer recommendations for rice are indicated in Table 4.

Apply organic manure in the form of farm yard manure or compost or green leaf at the rate of 5t/ha and incorporate into the soil while ploughing. The entire quantity of phosphatic fertilizers may be applied along with the organic manures.

For 'Modan' cultivation (upland crop) and direct seeded crop in wet lands, apply Nitrogen in three equal split doses, first as basal dressing, second at tillering stage (three weeks after seeding) and the third at panicle initiation stage (about 30 days before flowering). Apply the full dose of P at the time of land preparation as basal dressing. Apply K either in one dose as basal dressing or in two split doses, half as basal and the other half at the panicle initiation stage.

Table 4: Fertilizer recommendation for rice

Kind of land/ region	Variety	N	P ₂ O ₅ (kg/ha)	K ₂ O
Uplands(modan)	PTB-28, 29 and 30	40	20	30
-do-	High yielding short duration varieties	60	30	30
Wet lands (all regions)	High yielding short duration varieties	70	35	35
-do-	High yielding medium duration varieties	90	45	45
-do-	Local varieties	40	20	20
-do-	H4	70	45	45
-do-	Mashuri	50	25	25
Kole lands	* Annapura	90	35	45
	* Medium duration High yielding varieties	110	45	45
Kattukampal and Ponnani Kole lands	Medium duration high yielding varieties	110	45	55

* Location specific recommendations. Strict Surveillance of pests and diseases is a must under such situations.

CUCURBITACEOUS VEGETABLES

Bittergourd, snake gourd, cucumber, pumpkin, ash gourd, bottle gourd, ridge gourd etc. are the common vegetables belong to this group.

Cucurbits can be successfully grown during January-March and September-December. For the rainfed crop, sowing can also be started after the receipt of the first few showers.

	Seed rate (Kg/ha)	Spacing (mxm)	Varieties/Types
Bitter gourd	5-6	2 x 2	Priya, Arka Harit
Snake gourd	3-4	2 x 2
Bottle gourd	3-4	3 x 3	Pusa Summer Prolific Long
Pumpkin	1-1.5	4.5x2	Ambili
Ash gourd	0.75-1	4.5 x2
Cucumber/Melon	0.5-0.75	2x1.5	Mudicode Local
Water Melon	1-1.5	2 x 3	Sugarbaby

SOWING

Pits of 60 cm diameter and 30-45 cm depth are taken at the desired spacing. Well rotten FYM and fertilizer are mixed with top soil in the pit and seeds are sown @ 4-5/pit. Remove unhealthy plants after two weeks and retain 2-3 plants/pit.

MANURES AND FERTILIZERS.

Apply FYM @ 20-25 t/ha as basal dose with half dose of N (35 kg) and full doses of P (25 kg) and K (25kg). The remaining time of vining and at the time of full blooming. For bitter gourd and snake gourd, top dressing may be done in several split doses at fortnightly intervals.

AFTER CULTIVATION

During the initial stages of growth, irrigate at an interval of 3-4 days. Irrigate alternate days, during flowering and fruiting periods.

For trailing cucumber and pumpkin, spread dried twigs on the ground. Bitter gourd, snake gourd and bottle gourd are trailed on pandals. Conduct weeding, and ranking of the soil at the time of fertilizer application. Earthing up may be done during rainy season.

PLANT PROTECTION

Pests:

Fruit flies-apply BHC 10% DP in pits before sowing of seeds to destroy the puparia. In homestead gardens the fruits may be covered with poly, cloth or paper bags to ensure mechanical protection. In large gardens apply Carbaryl 0.2% or Malathion 0.2% suspension containing sugar or jaggery at 10 g per litre at fortnightly intervals after fruit set initiation. Spray and destroy affected and decayed fruits.

Epliachna beetle-Remove and destroy egg masses, grubs and adults occurring on leaves. Spray Carbaryl 0.2%.

Red pumpkin beetles-Adult eats the leaves, makes holes on foliage, and causes damage on roots and fruits. Incorporate BHC 10% DP in pits before sowing the seeds to destroy the grubs and pupae.

Plant lice-Apply 1.5% fish oil soap. First dissolve soap in a little hot water and then make up the volume. Alternatively apply Dimethoate 0.05%, Phosphamidon 0.05% or Monocrotophos 0.05%.

Diseases

Downy Mildew - During rainy season downy mildew may be severe. This can be cheked by spraying Mancozeb 0.2%

Powdery Mildew - Powdery mildew can be controlled by spraying Nitrophenon 0.5%.

Mosaic - During rainy season, mosaic may be severe in Pumpkin. Control vectors by spraying insecticides like Dimethoate 0.05% or Phosphamidon 0.05%. Uprooting and destruction of affected plants and collateral hosts is a must.

Harvesting should be done at least 10 days after insecticide/fungicide application. The fruits should be washed thoroughly in water before cookin.

For short duration varieties of paddy 70 kg N/ha may be applied, 2/3 as basal and 1/3 as top dressing one week before panicle initiation.

For Mahsuri 50% of N to be applied as basal, 25% at active tillering stage at 40 days after planting and 25% at 60 days after planting i.e., at about one week prior to panicle initiation stage in virippu season.

For medium duration transplanted crop, in general, apply 50% of N and K and full dose of P as basal dressing and the remaining 50% N and K at 5-7 days prior to the panicle initiation stage. In Onattukara region and similar areas having sandy loam soils, apply 50% of N 50% of K and full dose of P as basal dressing; 25% of N at the tillering stage and 25% of N and 50% of K at 5-7 days prior to the panicle initiation stage.

LIMING:

In general, addition of lime is absolutely necessary when the pH is lower than 5.5 and it is advisable when pH varies between 5.5 and 6.5.

For direct seeded crop during first crop season, apply lime about 600 kg/ha in two split doses, the first dose at 350 kg/ha as basal dressing at the time of first ploughing and the second dose 250 kg/ha as top dressing about one month after sowing.

For transplanted crop, apply lime at 600 kg/ha, in two split doses, 350 kg/ha as basal dressing and 250 kg/ha as top dressing as one month after transplanting.

A time-lag of one week should be given between application of lime and fertilizers. For top dressing, lime may be applied one week prior to the application of fertilizers.

WATER MANAGEMENT:

Maintain the water level at about 1.5 cm during transplanting. Thereafter increase at gradually to about 5 cm. until maximum tillering stage. Drain water 13 days before harvest.

Note:- In areas where water for irrigation is assured and where acidity is high, draining and reflooding every 15 days are recommended. In flood-prone areas, aged seedlings of Mahsuri or other varieties recommended for water logged conditions may be planted. The planting may be preponed or postponed to avoid synchronisation of the critical stages of maximum tillering or heading with the usual flood period in the tract.

During the mundakan crop season 5 cm need not be maintained continuously after the cessation of north-east monsoon. 5 cm irrigation once in 6 days will be quite adequate for project areas where water is assured.

For summer rice (in situations where the ground water level is shallow, i.e., within one metre from the surface) 5 cm irrigation two days after disappearance of ponded water is sufficient, instead of 5 cm continuous submergence throughout the crop period.

WEED CONTROL:

Keep the field free of weeds upto 45 days either by hand weeding and interculture or by use of herbicides as follows:-

Benthiocarb (EC) at the rate of 2 kg ai/ha or Pendimethalin (G) at the rate of 1.5 kg ai/ha may be applied on the 6th day after transplanting.

Apply propanil at 1.75 kg ai/ha in 3% solution of fresh urea (500 litres of solution/ha) as spray 12-14 days after transplanting or seeding or Butachlor (G) 1 kg ai/ha 6 days after planting or sowing.

In dry sown crop, pre-emergent spray of Nitrogen at the rate of 1.5 kg ai/ha or Butachlor at 1.25 kg/ha in 300 litres of water on the same day of seeding effectively controls the weeds upto panicle initiation stage.

Wherever broad leaved weeds are predominant, apply Sodium salt of 2, 4-D at 1 kg/ha in 400 litres of water 25 days after transplanting.

Wherever the field is level and water management could be effectively done, 2, 4-D Sodium salt @ 1 kg/ha may be mixed with 10 kg urea/ha and applied on the 20th day after sowing/transplanting. This saves the spraying charges.

Trampling African Payal (Salvinia) in situ in the wet lands at least a week prior to transplantation will control these weeds and add to soil fertility. By following this method, its vegetative regeneration can be prevented. For controlling this weed occurring in channels and other water pockets, Paraquat at 0.76 kg ai/ha in 500 litres of water may be sprayed. Chemical control measures should be applied only in areas where protected drinking water supply is assured.

Weed control in direct sown crop under puddled conditions where sprouted seeds are sown:

Butachlor at 1.25 kg ai/ha or Benthocarb at 1 kg ai/ha is recommended to be applied on 6-9 days after sowing followed by 2, 4-D sodium salt at 0.8 kg ai/ha 20 days after sowing. Use high volume spray (500 L/ha).

Note:- At the time of application there should be only a thin film of water. The field must be well levelled.

Caution

- i) Application of weedicides should be done strictly in accordance with the recommended dosages. There should be underdosing or overdosing.
- ii) Wherever herbicides are applied, this may be followed by hand weeding to destroy the residual populations.
- iii) Dewater the field prior to the application of Propanil base weedicide. Flood the field 48 hours after applying the weedicide and maintain the water level for 3 to 4 successive days to destroy fresh weed sprouts.
- iv) 2, 4-D Sodium salt at the recommended dose can be mixed with any of the following insecticides if a joint application of herbicides and insecticides is warranted. BHC, Carbaryl, Quinalphos, Phosphamidon and Dimethoate. Of these, HCH is the most compatible with 2, 4-D.
- v) Nitrogen should be sprayed uniformly on soil surface. Butachlor and other granules may be broadcasted evenly on soil surface. In both cases, the soil should not be trampled after application.

Cropping pattern:

In sandy loam soils with high percolation rate, best water use efficiency is obtained by following the sequence, rice (short duration)rice (medium duration) - sesamum/daincha.

The following cropping pattern can be adopted on the basis of gross yield per day production, water use efficiency intensity of land utilisation and net income per unit area for the Chalakudy tract.

Maximum food production per unit area:

Kharif	Rabi	Summer
Rice(M)	Rice(SM)	Vegetable(Ashgourd, Watermelon)
Rice(S)	Rice(S)	Tapioca(Short duration H-165)

M - Medium; SM - Semi medium; S-Short duration

Maximum productivity, net income and water use efficiency.

Kharif	Rabi	Summer
Rice (SM)	Rice (M)	Groundnut
Mixed farming with milch animals.		
Kharif	Rabi	Summer
	Rice (M)	Fodder cowpea

In areas where there are no assured water resources for adequate irrigation of Rabi rice adjust the cropping pattern for maximum utilization of rainfall for crop production. Under such situations growing a semi-medium duration rice in Kharif and medium duration rice in Rabi is better to achieve maximum yield, per day production and water use efficiency.

Irrigation schedule for rice under limited water resources

For summer rice, under limited resources of water, phasic stress irrigation can be practised to the advantage of saving substantial quantity of irrigation water without any significant reduction in yield. About 20-30% more area can be irrigated with the same water resources by adopting any of the following phasic stress irrigation schedules.

Schedule	Footing to max.tillering	Max. tillering to bearing	Heading to maturity
5 cm irrigation on attaining*	Continuous submergence	Saturation point*	Saturation point*
-do-	Saturation point	Continuous submergence	Continuous submergence
-do-	Continuous	Continuous submergence	Hair cracking of surface
-do-	Hair cracking of surface	Continuous submergence	Hair cracking of surface

* Irrigation at 5 cm to be given at stages marked

Note: The phasic stresses are given across the table.

Depending upon the schedule, water saving ranges 24-36% of the requirement for 5 cm continuous submergence throughout the crop growth. Grain yield reduction in the above practice is only 0.1 to 1.6%.

PLANT PROTECTION

Control of specific pests and diseases

Pests

Adopt control measures only if the pest population exceeds the economic threshold levels, as detailed below:

Pest	Nursery	Mid-tillering stage	Panicle initiation to booting stage	Flowering and after
Stem borer	5% Dead hearts	5% Dead hearts	Adult month 1/sqm	-
BPH and other hoppers	5-10/hill	5-10/hill	5-10/hill	5-10/hill
Gallfly	1/sqm	5% damaged tiller	-	5 bugs/10 sweeps
Leaf roller	1 damaged leaf/hill	1 damaged leaf/hill	1 damaged leaf/hill	-
Case worm	Presence	Presence	-	-
Rice bug	-	-	-	-
Hispa	1 insect or 1 damaged leaf/hill	-	-	-
Whorl maggot	25% damaged hills	-	-	-
Cut worms	-	-	-	1/hill

Note: In order to determine the need for adopting control measures, inspect the crop frequently and look for the presence of the pest or for external symptoms.

PACKAGE OF PRACTICES RECOMMENDATIONS
FOR THE CENTRAL ZONE

R I C E

A. Crop improvement

Seven rice varieties catering to the specific needs and preferences of the various agroclimatological situations of the zone were released. Five cultures are under advanced stage of release.

Varieties released:

- i) Matta Thriveni : Red kernelled, high yielding (6 t/ha) widely adapted, 100 d.
- ii) Jayathy : Multiple resistant, internationally reputed, 100 d.
- iii) Neeraja : Flood tolerant, 130 d.
- iv) Nila : Red kernelled, high straw yield, rabi specific, 150 d.
- v) Suvarnamodan : Suited to uplands, blast tolerant, 110 d.
- vi) Swarnaprabha : Suited to upland, good straw yield, 100 d.
- vii) Rasmi : Red kernelled, rabi specific, suited to illdrained soils, good straw yield, multiple resistant, 150 d.

Varieties in pipeline

- i) Culture 8754 : Red kernelled, sheath blight tolerant 110 d.
- ii) Culture 8756 : Red kernelled, sheath blight and blast tolerant, 100 d.
- iii) Culture 8770 : Red kernelled, multiple resistant, 105 d.

- iv) Culture 8772 : Red kernelled, multiple tolerant, 120 d.
- v) Culture 24 - 20 : Red kernelled drought tolerant, extra short duration, 70 d.

B. Crop Management

Technologies for efficient nutrient use for specific variety/location of the zone were evolved.

1. Jayathy and Mahsuri require 50 : 25 : 25 kg/ha of NPK.
2. For "Koottumundakan" system, first crop requires 20 : 10 : 10 and second crop 30 : 15 : 15 kg NPK/ha.
3. Urea super granules (USG) and split application can reduce N loss in submerged soils.
4. Placement of USG can be delayed upto 20 DAT.
5. In rice-rice-fallow system, NPK dose in second crop can be reduced to 75%.
6. In rice-rice-green manure system, fertilizer dose in first and second crops can be reduced to 75%.
7. Benthocarb, butachlor, pendimethalin and oxyfluorfen are the effective pre-emergent herbicides in dry sown rice.
8. For second crop, 5 cm irrigation once in 6 days is adequate.
9. For summer rice, 5 cm irrigation 2 days after disappearance of ponded water is sufficient.
10. Rice-rice-bhindi is the most economic cropping system under irrigation constraint, with 1.2 iw/CPE ratio for bhindi.

C. Crop protection

Technologies involving low cost and pollution free approaches and tolerant varieties were formulated.

1. Fresh cowdung extract spray (20 g/l) was effective against bacterial leaf blight.
2. Jayathy, Rasmi, Cul.8770 and Cul.8772 are tolerant to major pest and diseases of the zone.
3. Triazophos @ 0.35 kg a.i./ha was found to be very effective in controlling leaf folder.
4. Dipping roots in chlorpyrifos (0.02%) for 12 hours is effective against gall midge.
5. Validacin 3 L @ 2 ml/l is effective against sheath blight.
6. Seed dressing with Fongorene/Beam/Bavistin followed by foliar application of Bavistin at tillering and panicle initiation stages is the best schedule to effectively control rice blast.

D. Post-harvest technology

1. A paddy winnower-cum-cleaner has been fabricated which has the efficiency of cleaning 1000 kg/hr for grain purpose and 600 kg/hr for seed purpose.
2. Seed viability of medium duration rice can be maintained at 80% if stored in poly bags (700 gauge) for 12 months and short duration variety for 8 months.

VEGETABLES AND PULSES

A. Crop improvement

Recommended varieties : MC-84 (Bitter gourd)
Surya (Brinjal)
Sugarbaby, Arka Jyothi (Water melon)
V-240, V-16, GC 82-7 (Cowpea)

Varieties in the pipeline: Culture 7, 9 (Cowpea)

B. Crop management

1. Irrigating bittergourd at 15 mm CPE is advantageous over farmers' practice.
2. Seed treatment with molybdenum @ 1 g/kg of seed increases the grain yield in pulses.

F R U I T S

A. Crop management

1. One fallow can be retained at any growth stage in Palayankodan variety of banana.
2. Economic yield can be obtained from the first ratoon crop under wider spacing in Nendran.

B. Crop protection

1. Crop cropping with marigold, sunhemp, sesamum, coriander and Acorus calamus in robusta can bring down nematode population.

2. Sucker dipping with neem oil, tobacco decotion and fish oil soap is effective against burrowing nematode in banana.
3. Carbofuran 3 g a.i./plant in best for controlling nematodes in nendran.

C. Post harvest technology

1. Technologies were standardised for preparing dishes like halwa, chips, cutlet, pickles etc. from the unused portions of the fruits of banana, jacks and pineapple.
2. Harvesting pineapple 130 days after flowering is ideal for keeping quality of syrup.

C A S H E W

A. Crop improvement

- i. Varieties released : Madakkathara 1 and 2, Anakkayam-1.
- ii. Varieties recommended : K-22-1, H-3-17, H-1598, H-1608

B. Crop management

Top working is effective to rejuvenate low yielding trees of 20 years or more.

C O C O N U T

Basin irrigation with 500 l of water at 50 mm CPE is the most economic irrigation schedule for coconut.

KERALA AGRICULTURAL UNIVERSITY

SOUTHERN ZONE

Location - Specific Package of Practices Recommendations

Cassava:

- (1) For intercropping under partially shaded conditions of Coconut gardens:

Grow Sreevisakh Spacing: 90x90 cm
(leaving the Coconut basins)

Optimum plant population
8000 plants/ha.

Fertilizer dose:

50:50:100 kg/ha, of N, P₂O₅ & K₂O

- (11) For intercropping among Cassava:

Use bunch varieties of Groundnut
TMV-2, TMV-7, TG-3, TG-14
Spanish Improved.

Use the non-trailing grain cowpea

Variety : V 26

Rice:

- (1) For Thiruvananthapuram District, grow the following varieties:

Neyyattinkara sub-division:

Short duration : Jyothi, Triveni, Remya
Medium " : Jyothi, Bharathi

Nedumangad Sub-division:

Short duration : Jyothi, Triveni
Medium " : Bharathi

Attingal Sub-division:

Short duration : Jyothi, Triveni
Medium " : Bharathi

- (ii) For delayed sowing and late planting (over-aged seedlings) in Thiruvananthapuram District:

Var. Arathi

- (iii) For Kollam district : Suvarnamodan
(Modan areas)
- (iv) For Pathanamthitta : Onam, Bhagya
District
- (v) Apply 2, 4-D 1.0 kg ai/500 liter.
of water/ha, one month after
sowing to control striga
(in Pathanamthitta District)
- (vi) Apply Carbofuran (at nematodal doses) and higher
potash (50% more than the recommendation) to
minimise the incidence of sheath rot and sheath
blight in endemic areas.

To improve the efficiency further, include the
fungicide vitavax.

Coconut:

- (i) For coconuts in the red loam soils of Southern
Zone, apply:
0.68 kg N, 0.23 kg P₂O₅ and 0.90 kg K₂O per palm
per year.
- (ii) To control infestation by the coreid bug, apply
Carbaryl 0.1% or Endosulfan 0.1% on the newly
opened inflorescence after the receptive phase
of the female flowers and on unopened inflorescences.

Banana: Red Banana

For the variety Red Banana, apply 10 kg compost,
farm yard manure or green leaves as basal, and
the following as indicated.

Top dressing at	4th Month	6th Month	8th Month
Cowdung	10 kg	10 kg	10 kg
Urea	250 gms	250 gms	300 gms
M.O.P	180 g	250 g	200 gms
Super Phosphate	250 gms	--	--
Groundnut Cake	100 gms	100 gms	100 gms

Vegetables:

The following varieties are recommended for the Southern Zone:

Green Chilli:

- Jwalasakhi - As pure crop
- Jwalamukhi - For intercropping in Homesteads

Bhindi: Kiran

Amaranthus : Arun(Red, multi-cut)

Sweet potato: Kanjangad

Fodder Crops:

Quineagrass:

Haritha for the sandy soils under partially shaded conditions.

Mushrooms:

Detailed Package of Practices for rearing "Oyster" mushroom (*Pleurotus sp.*) and paddy straw mushroom (*Volvariella volvacea*) recommended.

Homestead models evolved:

The Scientists of the Special Station at Kottarakkara evolved homestead models for the coastal uplands (rainfed and irrigated situations) and mid lands (irrigated situation) of the Southern Zone.

The models are essentially coconut-based mixed farming systems in which the crop-livestock components interact synergistically to ensure optimum on-farm resource utilization and productivity. The models ensure benefit: cost ratios of Rs.1.64, Rs.1.84 and Rs.1.80 per rupee invested.

Pepper:

For the control of "Pollu" caused by the flea beetle, spray any one of the following insecticides namely, endosulfan, dimethoate, quinalphos, or monocrotophos, all at 0.05% concentration. The sprayings are to be given at the time of spike emergence (June-July), at berry formation (September-October), and once again at berry maturing stage, if needed.

KERALA AGRICULTURAL UNIVERSITY
ZONE SPECIFIC PACKAGE OF PRACTICES

HIGH RANGE ZONE

- Res. Responsibility: 1. Regional Agri Research Station,
Ambalavayal, Wayanadu Dist.
(Lead Station)
2. Cardamom Research Station,
Pampadumpara. (Sub Station)

The High Range Zone comprises of areas situated above 750 M. above MSL and spread over in six districts in the state. It covers 29% of the total geographic area, accommodates 7% of the population and provides 16% of the total cultivated area. It enjoys a sub-tropical climate with well distributed rainfall. The High Range Zone is characterised by the high value nature of crop production and is dominated by perennial crops.

Ten farming situations are identified in the zone. Zone specific Package of Practices for various crops in the farming situations are presented hereunder.

R I C E

Season: Nancha (First Crop): June-July to October-September.
Puncha (Second Crop): December-January to April-May.

Varieties:

A new variety - Edavaka having high grain yield (4900 hg/ha) and straw (5300 kg/ha) was found superior to other varieties. The variety is medium in duration and has red grain. It is suitable for both seasons and is moderately resistant to blast and leaf folder.

WND-1, WND-II, Sabari, Bharathi, Red Thriveni, Jyothi.

Seed rate: 80-90 kg/ha for transplanted crop.

Age of Seedling : 30-35 days.

Manures and Fertilizers: Organic manure at the rate of 5 t/ha. Phosphatic fertilizers also applied along with organic manures.

Fertilizer recommendations.

Land	Variety	N	P ₂ O ₅	K ₂ O
Wet Lands	Medium duration varieties	90	45	45
-do-	Local varieties	40	20	20

Cropping System.

The following cropping patterns can be adopted on the basis of gross yield per day, water use efficiency and intensity of land utilization.

<u>Nancha</u>	<u>Puncha</u>
Rice	Rice
Rice	Ginger
Rice	Yam
Rice	Vegetable

Rice followed by ginger is recommended as the most economical cropping pattern.

PEPPER

Rooted cuttings: The best season for rooting of laterals in black pepper is recommended as the last fortnight of June.

CARDAMOM

Variety: PV-1 variety evolved from Malabar type is recommended for the High Range Zone.

Agrotechnique: Cultivation of cardamom under artificial shade has been found feasible and economical.

Mixed cropping with arecanut and pepper in the garden lands has been widely accepted.

Crop protection: Control measure of 'Azhukal' disease (capsule rot) caused by Phytophthora sp HAVE been workd out and recommended.

The disease affects the leaves, tender shoots, panicles and capsules. The infected capsules become dull greenish brown and decay.

Control:

- i) Trashing and destruction of the infected should be done as phyto-sanitary measure just prior to the ~~on~~ onset of SW monsoon. Remove the trash from the basal region of the plant.
- ii) Spray the shoots with 1% B.M. with adhesive (Rosin-soda) or any other sticker by the commencement of the monsoon and continue the spraying operation two or three times up to November - December according to the intensity of the disease and rainfall.
- iii) Give a drenching spray to the panicle with 1% B.M. at the rate of 3 l. per plant during July-August when the disease intensity is maximum.

G I N G E R

Crop protection:

Bacterial Wilt of Ginger

Control: Drenching and foliar spraying with 1% Bordeaux mixture at monthly intervals, two months after planting.

Rhizome rot:

Control: Seed treatment with Captan 0.2%-effectively control pre-emergence rhizome rot.

T U R M E R I C

Variety: Type PTS-9 was proved to be high yielding under High Range Conditions.

B A N A N A

Variety: 'Bodles altafort' was found to be the best table type variety under the rainfed conditions in the High Range Zone. The variety takes 520 days to mature.

M A N G O

Variety: Pairy, Bennet Alphonso, Prior are suitable for cultivation under Wayanad conditions, for easiness and yield.

Agrotechnique:

Stone grafting was recommended as the best method of vegetative propagation in mango.

V E G E T A B L E S

Variety: Tomato Var.

Pusa early dwarf was found to be superior for yield under High Range conditions.

Cabbage variety 'September' was found superior and was recommended for large scale cultivation.

Cauliflower var.

'Swathy' is recommended for cultivation under hill ranges.

Brinjal variety.

Arka Navaneeth found most promising for commercial cultivation.

KERALA AGRICULTURAL UNIVERSITY
SPECIAL ZONE OF PROBLEM AREAS

Location-specific package of practices recommendations

The Special zone of problem areas comprises mainly of 4 distinct agro-ecological situations viz., Kuttanad, Pokkali, Kole and Onattukara. The sugarcane tract of Central Travancore also is now included in the Zone. Location-specific recommendations generated and popularised for specific farming situations are given below:

KUTTANAD (Kayal, Karappadam, Kari, Orumundakan)

RICE VARIETIES

Kuttanad being an endemic area for BPH and Sheath blight, grow varieties with multiple resistance: Pavizham (115-118 days), Karthika (115-120 days), Aruna (100-110 days), Makom (100-110 days), Remya (115-120 days), Kanakom (120-125 days).

Time of sowing

Sow 'Punja' rice before 30th November. Sow additional crop (Kharif) before 15th June.

Seed treatment

Soak sprouted seeds in 0.2% chlorpyrifos for 3 hours before sowing to prevent incidence of gall midge and thrips at early states.

Liming

Apply lime in 3 splits ie. 350 kg ha^{-1} at the time of first ploughing and 250 kg ha^{-1} as top dressing one month after sowing. Drain water after a week.

Time of application of fertilizers

Apply fertilizers in 2 (early duration varieties) or 3 splits (medium duration). First application of fertilizers should be done 12-15 DAS, immediately after draining water. Let in water 24 hours after application.

Weed Control

Prepare the field as usual and drain to encourage weed germination. Spray paraquat at 0.5 to 0.75 kg^{-1} in 500 lit. water. Re-flood the field 2 days after spraying and retain water (10-15cm) for 7 days. Drain and sow seeds as usual.

Use pre-emergence herbicides, Butachlor ($1.25 \text{ kg a.i. ha}^{-1}$) or benthocarb ($1.25 \text{ kg a.i. ha}^{-1}$) 6-9 DAS in areas where cultural methods have not been adopted.

On standing crop, spray 2,4-D.Na salt at 0.4 kg ha^{-1} at 20 DAS.

To control wild rice (only in fields having wild rice menace), coat rice seeds with calcium peroxide (20% by weight) using PVA solution and dry under shade. Sow seeds in standing water (10-15 cm). Drain the field only 10-12 days after sowing.

Control of Salvinia

Release the bioagent weevil, Cirtobagous Singularis.

Plant protection

Apply pesticides only on need-basis. As far as possible, follow integrated pest management practices involving resistant varieties, optimum seed rate, seed treatment, field sanitation, balanced fertilizer application, use of light traps and use of recommended doses of pesticides when the pest population exceeds the threshold level.

Coconut

Grow a green manure crop like sesbania (alluvial soil) or cowpea (sandy soil) in coconut palm basins and incorporate (in situ) before the plants flower. Adopt all other package of practices recommendations for coconut.

Fertilizer application

Apply NPK at 250:350:900 kg/ha⁻¹ in alluvial soils. In other areas apply NPK at 500:320:120 kg/ha⁻¹.

Plant protection

Use coconut log traps with fermented toddy applied in between to attract red palm weevil which is a very severe pest.

Intercropping in coconut gardens

Intercrops recommended : Banana, Cocoa, Yams,
Cassava, cowpea.

Varieties:	<u>Crop</u>	<u>Variety</u>
	Banana	Palayamthodan, Njalipoovan
	Cocoa	
	Cassava	cv 4/84 (6 months)
	Cowpea	VS 4 (Vegetables) Ptb 1 (Grain)
	Bhindi	Pusa Sawani or local
	Yam	Dek 4/86 (D. <u>Esculanta</u>) Dak 10/86 (D. <u>Alata</u>)

Farming systems

Raise rice during kharif (June-September) and follow it by raising common carps like Catla, Rohu, mrigal, Cyprinus.

Form special water control structures (dykes) while using pesticides. Stock fish fingerlings at 5000 nos ha⁻¹.

In channels surrounding bunds where coconut is grown as a monocrop, grow intercrops like banana and fodder and fish in the channels. Maintain a milch cow for an area of 4000 m^{-2} of farming system.

In ponds, adopt duck-fish system. Raise ducks (400 Nos ha^{-1}) in ponds. Droppings of duck form the feed for fish.

2. POKKALI

Rice

Varieties : Vyt. 2, Vyt. 3

Fertilizer dose

Apply NP fertilizers at $20:40:0 \text{ kg ha}^{-1}$ at the time of spreading seedlings.

Farming system

1. Grow fish along with rice after spreading seedlings in the field. Male tilapia (50g size) is the variety to be chosen. Before releasing tilapia fingerlings (5000 nos ha^{-1}), destroy weed fishes by applying mahua cake at 1500 kg ha^{-1} of standing water.

2. After the harvest of Pokkali rice in October-November, adopt supplementary stocking of prawn (P. indicus) at $5000-10000 \text{ ha}^{-1}$ during December-January.

3. KOLE

Rice:

Varieties.

In areas prone to drought grow, culture 24-20 (80-85 days).

Other areas: Jyothi, Mattathriveni, Thriveni, Karthika.

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Prilveni

(Season bound)

Manuring

Accession No.

Apply cattle manure or compost as basal dose at

5000 kg ha⁻¹. Accept fertilizer usage as per existing

package of practices recommendation.

Time of application of nitrogen for dry sown crop.

Three doses first at sowing (50%), 25-35 DAS (25%) and 50-55 DAS (25%).

Weed control

Spray pre-emergence herbicide butachlor at 1.25 kg a.i. ha⁻¹ in 30 lit. water.

Sesamum

Varieties : Kayamkulam-1, Thilothamma (multipodded), Soma.

Irrigation: Give two irrigations, if water is available. One irrigation at branching and the other at flowering.

Cowpea: Grow cowpea during summer in rice fallows.

Varieties: Grain purpose: C 152, S 488, V-118

Dual purpose : CO 3, CO VU-8456, S 488, Kanakamony.

Blackgram: Variety : CO 139, 307

CO 4, T9.

Cassava:

Variety: Grow Koombuvilla (6 months) in 'Thara' lands (after rice nursery).