Package of practices (PoP's)of groundnut for different states

Andhra Pradesh

Sowing time

15th June to 31st July for Kharif season.
November to December for Rabi season.

Varieties

Spanish: Kadiri-6,Narayani, ICGV-91114,Kadiri-9,Harithandhra, Anantha, Dharani, TAG-24, Greeshma, Tirupati-4, Kadiri Amaravathi and Kadiri Chitrvathi.
Virginia: Kadiri 7 bold

Seed rate

Kharif: 125-150 kg kernel/ha depending on kernel size.
Rabi: 150-180 kg kernel/ha depending on kernel size.

Spacing

Spanish bunch, Kharif: 30 x 10cm., **Rabi:** 22.5 x 10cm
Virginia bunch, Kharif : 30 x 15cm., Rabi: 22.5 x 15cm

Seed treatment

Trichoderma harzianum or *T. viride* @ 10 g/kg or tebuconazole 2 DS @ 1.5 g/kg or carbendazim @ 2 g/kg seeds or mancozeb 75WP @ 3 g/kg.
Imidacloprid 17.8 SL @ 2 ml/kg seed or Imidacloprid 600 FS @ 1 ml/kg seed or chlorpyriphos 20EC @ 12.5 ml/kg.
culture @ 6 g/kg (Treat the seeds in the order of fungicide, insecticide and rhizobium)

Manure and Fertilizers

Must be use as per soil test based recommendations
RDF: Apply 20 kg N + 40 kg P_2O_5 + 50 kg K_2O/ha as basal for kharif and 20 kg N + 40 kg P_2O_5 + 50 kg K_2O/ha as basal and 10 kg N/ha at flowering for rabicrop.
Phosphorus should be applied through SSP.
Organics: FYM/Compost @ 10 t/ha once in 2 - 3 seasons.
For calcium: Apply gypsum @ 500 kg /ha at flowering stage by placement.
For zinc deficiency: Apply Zinc sulphate @ 50 kg/ha once in 3 seasons.
For iron deficiency: Spray 0.5% $FeSO_4$ with 0.1% citric acid at one week interval.
For bio-fertilizers: Seed treatment @ 5-10g/kg and soil application of @ 600g/ha of *Rhizobium* and PSB each.
For Intercropping: Use 100% N to groundnut and 50% N to any intercropped cereals

Weed management

Crop must be weed free up to 45 days after sowing.
Pre-emergence: Application of Pendimethalin @ 2.5 to 3L/ha or Oxyflourfen @ 1.5 to 2.0L/ha followed by one inter-cultivation and one hand weeding.
Post-emergence: Imazethaphyr @ 750 ml/ha or Quizalofop ethyl @ 1.0 L/ha at 20 DAS.

For Intercropping system: Use Pendimethalin 30 EC@ 1.0 kg a.i./ha or Oxyfluorfen 23.5 EC@ 0.12 kg a.i./ha.as pre-emergence in groundnut + pigeonpea.

Irrigation management

Flowering, peg penetration and pod development are critical stages.
Eight to nine irrigations at 10 day interval with last irrigation at 90-95 DAS are sufficient to supply about 400 to 450 mm water depth. Withheld irrigation for 25 days after crop establishment to boost synchronized flowering.
About 24-30 % irrigation water can be saved due to use of sprinklers.
Soil moisture conservation practices for rain fed crop: Mulching of groundnut shells using 12.5 t/ha at 15-20 DAS to reduce evaporation losses of soil moisture.
Spray CaSO4 solution (50 g/l) to reduce transpiration losses. Spray urea solution (20 g/l) during dry spell period to recover the crop stress.

Intercropping

Groundnut + Redgram at 7:1 or 11:1 row ratio
Groundnut + Castor at 7:1 or 11:1 row ratio
Groundnut + Bajra/Jowar in 6:2 ratio
Groundnut mixed crop with cowpea, field bean, castor and red gram.

Diseases and pests management

Soil borne pathogens and pests

• Incorporate neem, castor or mustard cake @ 500 kg/ha, 15 days before sowing or in seed furrow at the time of sowing
• Incorporate carbofuran 3G @ 33 kg/ha or phorate 10G @ 10kg/ha at the time of land preparation (for nematodes)
• Soil application T. viride or T. harzianum @ 4 kg enriched in 250 kg FYM or 200 kg castor cake

Foliar diseases – leaf spots, rust and viral diseases

• Spray Tebuconazole @500 ml/ha or Hexaconazole @ 1000 ml/ha against foliar diseases
Inter-crop with pearl millet (7:1), pigeon pea (7:1), sorghum/maize (7:1), castor (4:1) and cowpea/soybean (4:1)
• Grow 4 rows of pearl millet or jowar as border crop and castor or soybean as trap crop (250 g seeds/ha)
• Remove *Parthenium hysterophorus* weed before flowering
• Destroy PBND infected plants

Defoliators

• Dig (1 feet) trench around field and dust with carbaryl 50 WP
• Spray of quinalphos 25EC @ 1000 ml/ha or chlorpyriphos 20EC @ 1250 ml/ha or profenofos 50EC @ 500 ml/ha, thiodicarb 75 WP @ 500 g/ha for Spodoptera or novaluron 10EC @ 500 ml/ha at 15 days interval
• Spray NPV-Spodoptera and NPV-Helicoverpa @ 500 LE/ha or Bacillus thuringiensis @ 1 kg/ha or Nomuraea rileyi @ 1 kg/ha or Beauveria bassiana @ 1 kg/ha along with surfactant during evening hours at 60-75 DAS
• Use poison bait (rice bran 12.5 kg + molasses/jaggery 2.5 kg +Chlorpyriphos 25 EC @ 1.25 l) to manage Spodoptera and hairy caterpillars

Sucking pests

• Release Chilomenus exmaculata @ 1250/ha twice against sucking pests
• Spray dimethoate 30 EC @ 1000 ml/ha or imidacloprid 17.8SL @ 150 ml/ha or acetamiprid 20SP @ 300 g/ha or monocrotophos 36 SL @ 800ml/ha at 25-35 days after sowing

Crop duration
100-110 days for kharif and 110-120 days for rabi season groundnut.

Harvesting
Harvesting is done after 80% pods are matured.
Groundnut crop is harvested by digging pods or by pulling the plants from field.
Groundnut crop is harvested when seed moisture content is at 18 to 20 percent.

Note: For improving the yields, moisture conservation practices need to be taken up

Gujarat

Soil
Sandy loam to loamy soils and in medium black soils with good drainage.

Field preparation
Deep ploughing followed by two harrowing to obtain a good tilth in May-June.

Sowing time
Kharif: On onset of monsoon (June)
Summer:15 th January to 15 thFebruary.

Varieties
Spreading type: GJG-HPS-1, GJG 17 and GJG-HPS-2(Kharif)
Semi-spreading: GG 20 and GG 22 (Kharif)
Spanish bunch: GG 5, GG 7, GJG 9 and GJG32 (Kharif); GG 6, TPG 41 and GJG-31 (Summer); GG 2 and TG 37 A (Both seasons)

Seed rate & Spacing

Season	Habitat group	Spacing (cm)	Seed rate (kg/ha)
Kharif	Spreading	75.0	85-100
Kharif	Semi- spreading	60.0	120-125
Kharif	Bunch	45.0	120
Summer	Bunch	22.5-30	125

Seed treatment
Trichoderma harzianum or *T. viride* @ 10g or tebuconazole 2 DS @ 1.5g or carbendazim 50 WP @ 2g or mancozeb 80 WP @ 3-4 g per kg seeds.

Manure and Fertilizers
Must be used as per soil test based recommendations

Season	FYM (t/ha)	N (kg/ha)	P_2O_5 (kg/ha)	K_2O (kg/ha)
Rain fed crop (Kharif)	10 tonnes	12.5	25	50
Irrigated crop(Summer)	12.5 tonnes	25.0	50.0	50

In Viriginlands: Apply *Rhizobium* @ 600g/ha as seed treatment for increased nodulation and nitrogen fixation.
For calcium: Apply gypsum @ 500 kg/ha at the pegging stage will enhance pod formation.
For confectionary groundnut: Apply FYM @ 10 t/ha along with bio-pesticides.
For intercropping: Use 100% N to groundnut and 50% N to any intercropped cereals and 100% RDF to groundnut and 100% RDF to Bt-cotton in groundnut + Bt-cotton (3:1) intercropping system.

Weed management
Crop must be weed free up to 45 days after sowing.
Manual /Inter-cultivation: One hand-weeding at 20 DAS and two hoeing with bullock-drawn implements at 35 DAS and 45 DAS.
Pre-emergence: Pendimethalin @ 1.0 kg a.i./ha (3 litres)
Post emergence: Imazethapyr @ 0.075 kg a.i./ha or quizalofop-ethyl @ 0.050 kg a.i./ha in 500 litres of water at 20 DAS.

Irrigation management
For Kharif crop: Supplemental irrigation at flowering, pegging and pod formation stage in case of no rainfall and water availability.
For summer Crop: Apply 11 irrigations; 1st immediately after sowing germination, 2nd 18-20 DAS, 3rd and 4th at 30 and 40 DAS, 5th to 9th at an internal of 7 to 8 days and the remaining irrigation at an interval of 8 to 9 days depends on soil texture.
For heavy black soil of south Gujarat, seven irrigations are required viz., First irrigation immediately after sowing. Second irrigation after one week and remaining five irrigations at an interval of 13 to 15 days.

Intercropping
Intercrop groundnut with castor (3:1), cotton (1:1 or 3:1) pigeonpea (3:1or 5:1), sesame (1:1 or 3:1), sunflower (1:1 or 3:1) row ratio

Diseases and pests management
Soil borne pathogens and pests
• Rotation of groundnut with cotton, wheat, maize, sorghum, onion and garlic or mixed cropping with moth bean to reduce inoculum of *Sclerotium*
• Soil application *T. viride* or *T. harzianum* @ -2.5 kg enriched in 250 kg FYM or 200 kg castor cake
• Apply neem cake or castor cake or mustard cake @ 500 kg/ha fifteen days before sowing or in seed furrow at sowing
Foliar diseases – leaf spots, rust and viral diseases
• Inter-crop with pearl millet/pigeon pea/sorghum/maize (7:1) or castor/cowpea/soybean (4:1)
• Spray propiconazole 25 EC @ 2000ml or hexaconazole 5 EC @ 500ml or tebuconazole 25.9 EC

@ 500ml for 1ha.

Defoliators

• Release adults of *Trichogramma chilonis* @ 50000/ha, two times at 7-10 days interval followed by release of *Braconhebetor* @ 5000/ha two times at 7-10 days.

• Spray NPV-Spodoptera and NPV-*Helicoverpa* @ 250 LE/ha or *Bacillus thuringiensis* @ 1 kg/ha or *Nomuraearileyi* @ 1 kg/ha along with surfactant during evening hrs at 60-75 DAS

• Spray chlorpyriphos 20 EC @ 1250ml or quinalphos 25 EC @ 1000ml for 1 ha

Sucking pests

• Spray *Verticillium lecanii* @ 2.5 kg/ha

• Spray dimethoate 30 EC @ 1000 ml/ha or imidacloprid 17.8 SL @ 150 ml/ha or thiamethoxam 25 WG @ 100 g/ha between 25 and 30 days after sowing

White grub and termites

• Seed treatment with chlorpyriphos 20 EC @ 6.5 ml/kg. In severe case, apply phorate 10G @ 10kg/ha.

• Destroy the termite mound

• Drench soil with chlorpyriphos 20 EC @ 3-4 L/ha before sowing

• Select one host tree from a group trees within the radius of 20m and spray 0.05% monocrotophos during day time and place pheromone (methoxy benzene for *Holotrichiaconsanguinea*) dispensers (2-3/tree) on the host tree in the evening continuously for three evenings after beetle emergence.

• For other species of white grub, host trees are sprayed with insecticide starting from emergence of adult after first monsoon rain and continued for three days.

Crop duration

Bunch type: 105-110 days; Spreading type: 120-130 days

Harvesting

Harvesting is done after 80% pods are matured.
Groundnut crop is harvested by digging pods or by pulling the plants from field.
Groundnut crop is harvested when seed moisture content is at 18 to 20 per cent.

Note: For improving the yields, moisture conservation practices and addition of soil amendments must be donefor tackling drought and micronutrient deficiency.

Karnataka

Climatic situations

Groundnut is cultivated during kharif season under rainfed condition.

Soils

Groundnut is grown in different soil types ranging from medium to deep black cotton soils to red sandy loam soils.

Sowing time

Kharif: June-July
Rabi/Summer: December to January; November for Paddy-Groundnut.

Field preparation
Deep ploughingfollowed by 1-3 harrowing to bring soil to fine tilth.

Varieties
G-2-52,KDG-123, TDG-39 (TGLPS-3),Dh-101, Dh-86, GPBD-5, GPBD-4,Haritandhra, ICGV-91114, ICGS 11

Seed rate
100-150 kg/ha depending upon seed size

Spacing
Bunch type: 30 cm x 10 cm
Spreading type: 45 cm x 10 cm

Seed treatment
Trichoderma harzianum or *T. viride* @ 10g or tebuconazole 2 DS @ 1.5g or carbendazim @ 2g for kg seeds or mancozeb 75WP @ 3g.
Imidacloprid 600 FS @ 1 ml/kg or chlorpyriphos 20EC @ 2.5ml for kg seeds
Bradyrhizobium culture @ 6 g/kg seeds

Manure and Fertilizers
Must be used as per soil test based recommendations
RDF: 18: 46 : 25 kg/ha for rain fed and 18: 71 : 25 kg/ha for irrigated crop as N, P_2O_5 and K_2O.
Organics:FYM or compost 7.5t/ha and vermin-compost @ 1t/ha.
***Rhizobium* and PSB:** @ 600g/ha.
For Calcium: Gypsum @ 500 kg/ha during pegging
Micronutrients: Apply 25 kg/ha ferrous and zinc sulphate sowing in every alternate year.
For inter-crop: Apply 100% RDF to groundnut and 150% RDF to Bt-cotton in groundnut+Bt-cotton (3:1) intercropping system.
Foliar application of 2% urea at 30 and 60 days after sowing.
Weed management Crop must be weed free up to 45 days after sowing.
Manual: Inter-cultivation and hand weeding to be taken up at 15, 30 and 40 DAS to control weeds.
Chemical: Pre emergence application of alachlor 50 EC @ 3 L/ha or pendimethylene 30 EC @ 1 kg/ha. Post emergence application of quizalophop ethyl 5 EC @ 50g/ha.

Irrigation mangement
Withheld irrigation for 21 days after emergence. Irrigate once in 8 days in light soils and once in 10-12 days in medium to heavy soils.
Use of inter-row water harvesting (IRWH) and paired row planting with mulch for water conservation.
Critical stages: Flowering (30-45 DAS); Peg initiation/development (50-60 DAS); Pod formation (70-80 DAS).

Intercropping

Groundnut + Pigeon pea/Pearl millet/Foxtail millet (4:1); Groundnut + 1 row Pigeon pea/Pearl millet/Foxtail millet (11:1); Groundnut + Chilly/Pigeon pea/Cotton/Foxtail millet(4: 2); Groundnut + Hybrid Bt cotton (3:1).

Diseases and pests management

Soil borne pathogens and pests

• Apply neem, castor or mustard cake @ 500 kg/ha, 15 days before sowing or in seed furrow at the time of sowing

• Apply carbofuran 3G @ 33 kg/ha or phorate 10G @ 10 kg/ha at the time of land preparation (for nematodes)

• Apply *T. viride* or *T. harzianum* @ 4 kg enriched in 250 kg FYM or 200 kg castor cake in soil

Foliar diseases – leaf spots, rust and viral diseases

• Inter-crop with pearl millet/pigeon pea/sorghum/maize (7:1) or castor/cowpea/soybean (4:1)

• Grow 4 rows of bajra/jowar as border crop and castor/soybean as trap crop (250 g seeds/ha)

• Remove *Parthenimhysterophorus* weed and destroy PBND infected groundnut plants

• Increase seed rate 10-15% in PBND prevailing areas

Defoliators

• Dig (1 feet) trench around field and dust with carbaryl 50 WP

• Release *Telenomusremus* adults @ 50000/ha, at 7-10 days interval-4 times against *Spodoptera*

• Spray chlorpyriphos 20 EC @ 1250 ml/ha or quinalphos 25 EC @ 1000 ml/ha or profenofos @ 50 EC @ 1000 ml/ha

• Spray NPV-*Spodoptera* and NPV-*Helicoverpa* @ 250 LE/ha or Bacillus thuringiensis @ 1 kg/ha or *Nomuraearileyi* @ 1 kg/ha along with surfactant during evening hours at 60-75 DAS

• Use poison bait (rice bran 12.5 kg + molasses/jaggery 2.5 kg +Chlorpyriphos 25 EC @ 1.25 l) to manage Spodoptera and hairy caterpillars

Sucking pests

• Release *Chilomenussexmaculata* @ 1250/ha twice against sucking pests

• Spray dimethoate 30 EC @ 1000 ml/ha or imidacloprid 17.8SL @ 150 ml/ha or acetamiprid 20SP @ 1000 g/ha or monocrotophos 36 SL @ 1250 ml/ha at 25-35 days after sowing

Crop duration

100-125 days

Harvesting

Harvesting is done after 80% pods are matured. Groundnut crop is harvested when seed moisture content is at 18 to 20 per cent.

Groundnut crop is harvested by digging pods or by pulling the plants from field depending soil types. The moisture content comes down to 7-8% and should be stored in a polythene lined gunny bag or HDPE or gunny bag with proper care.

Maharashtra

Soil

Well drained light to medium heavy soils with high organic matter content.
Field preparation Deepploughing followed by 2-3 harrowing.

Sowing time
Kharif: June to July
Rabi: November to December
Summer: January to February

Varieties
JL-286 (PhuleUnap), JL-220 (PhuleVyas), JL-501, RHRG-6083 (PhuleUnnati), TAG-24, TPG-41, AK-159, AK-303, LGN-1, KonkanGourav, TrombayKonkanTapora (TKG Bold)

Seed rate
100 -130 kg/ha

Spacing
Bunch type : 30cm x 10cm
Spreading type: 45cm x 10cm

Seed treatment
Trichoderma harzianum or *T. viride* @ 10g or tebuconazole 2 DS @ 1.5g or Thiram + Carbendazim 2:1 or Thiram/Captan 2.5 to 3g for kg seeds

Manure and Fertilizers
Must be used as per soil test based recommendations
RDF: Basal application of 25:50:00:: N, P_2O_5 & K_2O (kg/ha). Additionally 20 kg $ZnSO_4$ per hectare at sowing and 12.5 Kg N + 25 Kg P_2O_5 as top dressing at 30 DAS for higher productivity and profit in lateritic soils of Konkan.
Organics: FYM/ Compost @ 7.5 t/ha before last harrowing.
For Calcium: Gypsum @ 400-500 kg/ha as basal OR @ 50% as basal and 50% at 30-35 DAS.
For Micronutrients: $FeSO_4$ @ 20 kg/ha, $ZnSO_4$@ 20 kg/ha & Boron @ 5 kg/ha.
For confectionary organic groundnut: Use of poultry manure @ 10 t/ha along with bio-fertilizer (Rhizobium + PGPR+PSB) or bio-pesticides (Trichoderma, Neem oil, Neem cake).
For Intercropping: : Use 100% N to groundnut and 50% N to any intercropped cereals.

Weed management
Crop must be weed free up to 45 days after sowing.
Manual Weeding: 1st at 20-25 DAS and 2nd at 30-35 DAS.
Inter-cultivation: Gap filling before 10-12 days after sowing if required. Hoeing at 10-15 DAS and at 35-40 DAS (for earthing up)
Pre-emergence: Pendimethalin 30% EC @ 1.00 kg a.i./ha immediately after sowing at 2 to 3 DAS.
Post emergence: Imazethapyr 10% SL @ 75g a.i./ha OR Quizalofop ethyl @ 50 g/ha at 20-25DAS.
Earthling up & drum rolling: At 45 to 50 DAS (peg formation) for erect types and at 50 to 65

DAS for semi spreading types.

Irrigation management

Kharif groundnut: Critical stages for protective irrigation are flowering (20-30 DAS), Peg formation (40-45 DAS), Pod development (65-70DAS).

Summer Groundnut: Pre-sowing irrigation followed by irrigations at 15 days internal up to flowering and then at 10 to 12 days interval up to pod development stage. Rest at 7-10 daysinterval depending upon soil type.

Intercropping

Groundnut + Sesame (4:1) at Jalgaon region

Diseases and pests management

Soil borne pathogens and pests

• Apply *T. viride* or *T. harzianum* @ 4 kg enriched in 250 kg FYM or 200 kg castor cake in soil

Foliar diseases – leaf spots, rust and viral diseases

• Inter-crop with pearl millet/pigeon pea/sorghum/maize (7:1) or castor/cowpea/soybean (4:1)

• Spray hexaconazole 5 EC @ 500 ml/ha or tebuconazole 25.9 EC @ 500 ml/ha or plantavax or vitavax 10 g or Mancozeb 25 g per 10 litres of water.

Defoliators

• Release adults of *Trichogrammachilonis* @ 50000/ha, two times at 7-10 days interval followed by release of *Braconhebetor* @ 5000/ha two times at 7-10 days against leaf miner and defoliators.

• Spray NPV-*Spodoptera* and NPV-*Helicoverpa* @ 250 LE/ha or *Bacillus thuringiensis* @ 1 kg/ha or *Nomuraearileyi* @ 1 kg/ha along with surfactant during evening hours at 60-75 DAS

• Spray quinalphos 25EC @ 2000 ml/ha or chlorpyriphos 20EC @ 2500 ml/ha or profenofos 50EC @ 1000 ml/ha, thiodicarb 75 WP @ 500 g/ha for *Spodoptera* or novaluron 10EC @ 1000 ml/ha at 15 days interval

Sucking pests

• Release *Chilomenussexmaculata* @ 1250/ha twice

• Spray entomo-pathogenic fungus *Verticilliumlecanii* @ 2.5 kg/ha

• Spray dimethoate 30EC @ 1000 ml/ha or imidacloprid 17.8 SL @ 150 ml/ha or thiamethoxam 25 WG @ 100 g/ha between 25 and 30 days after sowing

Crop duration

100-110 DAS for kharif and 115-130 DAS for summer depending upon groundnut habitat groups

Harvesting

Harvesting is done after 80% pods are matured. Groundnut crop is harvested by digging pods or by pulling the plants from field. Groundnut crop is harvested when seed moisture content is at 18 to 20 percent.

Odisha

Soils
Well drained light textured sandy loam and loamy soils with pH 6.5-7.0

Sowing time
Kharif: June-july
Rabi: November-December and Summer- second fortnight of January

Varieties
K 6, Smruti, TAG-24, , ICGV 91114(Devi), Dharani (TCGS 1043), K-9, TMV-2,
Seed rate
125 kg kernels per hectare

Spacing
Kharif: 30 cm x 10 cm
Rabi: 25- cm x 10 cm

Seed treatment
For collar rot and Tikka: Bavistin 50WP @ 2g/kg kernel followed by bacteria culture @ 20 g/kg kernel.
For soil pests and foliage feeders: Carbosulphan @20 g/kg of seeds and soil drenching of Chloropyriphos @25 kg/ha before sowing and need based spraying with monocrotophos@ 0.4 kg/ha at 40 and 60 DAS.
Apply 20 g Rhizobium and PSB as seed treatment.

Manure and Fertilizers
Must be used as per soil test based recommendations
RDF:20:40:40 kg N, P_2O_5: K_2O/ha;
For Sulphur:
For Calcium: Apply gypsum @ 250 kg/ha.
Soil Amendments: Ap
Application of 100% PMS @ 0.2 LR significantly increased pod yield of ground nut.
Substitution of PMS by Press mud to an extent of 25% marginally increased pod yield of groundnut.

Weed management
Crop must be weed free up to 45 days after sowing.
Hand weeding twice at 20 & 40 Days after sowing (DAS)
Pre-emergence pendimethalin 0.75 kg/ha or Oxyfluorfen @50 g/ha at 1 DAS pre-emergence + Hand weeding at 20 DAS
Pre-emergence application of pendimethalin @ 0.75 kg a.i./ha fb post-emergence application of Quizalfop-p ethyl

Irrigation management
Irrigated:Apply irrigation at 0.8 IW/CPE at 7-10 days throughout the crop period in sandy loam to sandy clay loam soil. Apply irrigation at 14-16 days during January, 12-14 days during February and 8-10 days interval during March onwards under limited water supply.

Intercropping
Intercropping of groundnut (cv. Smruti) and Arhar (cv. UPAS 120) in ratio of 4:2

Diseases and pests management
Foliar disease-Tebuconazole seed treatment @1.5kg/ha + furrow application of *T. Viride* @ 4 Kg enriched in 50kg FYM/ha followed by broadcasting of *T. Viride* @ 4 Kg enriched in 50kg FYM/ha at 40 DAS as well as 2 sprays of Tebuconazole@1ml/l starting from initiation of foliar diseases and 2nd spray at 15 days interval for reducing the foliar diseases
Soil borne diseases- Deep summer ploughing with MB plough with seed treatment and follow up spray with Tebuconazole

Crop duration
Kharif; 100-110 Days, Rabi; 120-125days

Harvesting
Harvesting is done after 80% pods are matured.
Groundnut crop is harvested by digging pods or by pulling the plants from field.
Groundnut crop is harvested when seed moisture content is at 18 to 20 per cent.

Rajasthan

Soil
Sandy loam to loamy soils with good drainage.

Sowing time
Second fortnight of June for irrigated groundnut belt and with the onset of monsoon in rain fed condition during.

Varieties
Girnar 2, HNG 10, HNG 69, HNG 123, RG 425, RG-578, RG-559-3, RG-510, TG 37 A, PM 1, PM 3

Seed rate
100 kg/ha; 120 kg/ha (for bold seeded) kernels

S**pacing**
30 cm x 10 cm (Bunch type); 40-45 cm x 15 cm (Spreading type)

Seed treatment

Chlorpyriphos 20 EC @ 6.5 ml/ kg seeds.
Trichoderma harzianum or T. viride @ 10g or tebuconazole 2 DS @ 1.5g or vitavax @ 2g or carbendazim 50 WP @ 2g per kg seeds

Manures and Fertilizers

Must be used as per soil test based recommendations
RDF: Apply 15-20 kg N + 60 kg P_2O_5/ha as SSP in *kharif* groundnut. Use FYM/compost @ 10 t/ha at 20 days before sowing once in 2 – 3 seasons.
Use of poultry manure @ 10 t/ha along with bio-fertilizer (Rhizobium + PGPR+PSB) and bio-pesticides (*Trichoderma*, Neem oil, Neem cake) in confectionary groundnut For at par yields to RDF.
For Calcium: Apply 400 kg gypsum/ha once in three years for higher yield of HPS groundnut.
For zinc deficiency: Apply Zinc sulphate @ 30 kg/ha once in 3 seasons.
For Bio-fertilizers: Seed treatment with *Rhizobium* and soil application of PSB @ 600g/ha. each.
Other Agro-chemicals: Foliar spray of 0.1% thio-urea at flowering and Thioglycollic acid (TGA) @ 100ppm at pod development for higher pod yield.
Foliar application of 2% urea at 30 DAS is recommended for higher yield of groundnut.

Weed management

Crop must be weed free up to 45 days after sowing.
Pre-emergence: :Pendimethalin @ 1 kg/ha or Oxyflourfen @ 150 ml//ha followed by one inter-cultivation and one hand weeding.
Post-emergence: If required apply Imazethapyr 10% SL @ 75-100g a.i./ha at 10-12 days after sowing followed by earthing up at one month after sowing or apply Quazafop @ 50-75 g a.i./ha at 15-20 days after sowing followed by earthing up at one month after sowing.

Irrigation management

Apply the irrigation water as and when needed.
Flowering, peg penetration and pod development are the critical stages for water requirement in groundnut cultivation.
Application of organic manure for in-situ moisture conservation.

Intercropping

Groundnut-cluster bean intercropping (3:1). The 75% plant density with 100% RDF in groundnut and 100% plant density with 50% RDF in cluster bean was found most suitable intercropping system

Diseases and pests management

Avoid deep sowing to prevent collar rot disease
• Apply neem cake or castor cake or mustard cake @ 500 kg/ha fifteen days before sowing or in seed furrow at sowing
• Apply Trichoderma sp. @ 4 kg enriched in 250 kg FYM or 200 kg castor cake

Foliar diseases – leaf spots, rust and viral diseases

• Spray propiconazole 25 EC @ 2000ml or hexaconazole 5 EC @ 500ml or tebuconazole 25.9 EC @ 500ml for 1 ha.

White grub and termites

• Seed treatment with Fiprolin 600 FS @ 3 ml/kg

•Seed treatment with chlorpyriphos 20 EC @ 6.5 ml/kg. In severe case, apply phorate 10G @ 10kg/ha.
• Destroy the termite mound
• Drench soil with chlorpyriphos 20 EC @ 30-40 L/ha before sowing
• Select one host tree from a group trees within the radius of 20m and spray 0.05% monocrotophos during day time and place pheromone (methoxy benzene for *Holotrichia consanguinea*) dispensers (2-3/tree) on the host tree in the evening continuously for three evenings after beetle emergence.
• For other species of white grub, host trees are sprayed with insecticide starting from emergence of adult after first monsoon rain and continued for three days.

Crop duration
120-140 days

Harvesting

- Harvesting is done after 80% pods are matured. Groundnut crop is harvested when seed moisture content is at 18 to 20 per cent.
- Groundnut crop is harvested by digging pods or by pulling the plants from field at optimum soil moisture to avoid pod losses.
- Invert them on windrows keeping pods uppermost for about 2-3 days. Pick the pods or thresher and spread out in a thin layer to sun-dry for a further 3-4 days.
- The seeds in well-dried pods should have less than 10% moisture content. Well cleaned, dried, mature pods free from plant debris, soil and other inert materials should be stored in gunny bags in a well- ventilated rodent free room for marketing. The bags should be placed on wooden planks and should not be stacked very high.

Note: For improving the yields, moisture conservation practices along with maintenance of plant population and management of collar rot need to be done

TamilNadu

Sowing time
For Irrigated : Chithiraipattam (April-May), Margazhipattam (Dec- Jan), Thaippattam (Jan-Feb);
For Rainfed : Anippattam (June- July), Adippattam (July-Aug), Purattasipattam (Sep- Oct), Ayppasipattam (Oct- Nov), Karthigaipattam (Nov- Dec)

Varieties
Co 6, Co 7 TMV 2, TMV 7 (Old popular variety), TMVGn 13, TMV 14, VRI 2, VRI 6, VRI 7 , VRI 8, ALR 3

Seed rate
125 kg/ha (175 kg/ha of kernels for bold seeded varieties)

Spacing

- 30 x 10 cm

- 15 x 15 cm (Wherever groundnut ring mosaic (bud necrosis) is prevalent)

Seed treatment

- Thiram or Mancozeb @ 4 g/kg of seed or Carboxin or Carbendazim at 2 g/kg of seed.
- *Trichoderma viride* @ 4 g/kg seed or *Pseudomonas fluorescens* @ 10 g/kg seed.
- Treat the seeds with 3 packets (600 g)/ha of Rhizobial culture TNAU14. If the seed treatment is not carried out, apply 10 packets/ha (2000 g) with 25 kg of FYM and 25 kg of soil before sowing.

(***** Treat the seed in order of fungicide, Insecticide and Rhizobium)

Manures and Fertilizers

Must be used as per soil test based recommendations

RDF:

For irrigated : 25 : 50 : 75 kg $N:P_2O_5:K_2O$ /ha

For rainfed : 10 : 10 : 45 kg $N:P_2O_5:K_2O$ /ha

Apply N and K in three splits *viz.*, 50 % N & K as basal + 25 % N and K at 20 DAS + 25 % N and K at 45 DAS is recommended.

Micronutrients : TNAU MN mixture @ 7.5 kg /ha enriched with FYM (1:10).

For zinc deficiency : Apply 25 kg $ZnSO_4$/ha as basal OR foliar spray of 0.5% $ZnSO_4$.

For iron deficiency : Foliar of spray 1% $FeSO_4$ at 30, 40 and 50 DAS.

For boron deficiency : Borax 10 kg + Gypsum as soil application at 45 DAS.

For calcium : Gypsum @ 400 kg/ha (50% basal and 50% at 45 DAS).

For groundnut + pigeon pea intercropping system: Application of 100% RDF in groundnut (100% PD) and 50% RDF in pigeonpea (75% PD).

For drought management:

Foliar spray of 0.5% KCl at flowering and pod development stages. Application of Pusa hydrogel @ 2.5 kg/ha.

Multi-nutrient spray (To be prepared)

Overnight soaking of DAP @2.5 kg + AS @1 kg + borax @ 0.5 kg in 37L water. About 32L of filtrate mixture diluted up to 500L/ha. Add 350 ml. of plano-fix and sprayed on 25^{th} and 35^{th} DAS.

(or)

Groundnut rich spray (Ready mix)

Foliar spray of TNAU Groundnut Rich @ 2 kg/acre in 200L water at peak flowering and at pod development stages.

Weed management

Pre-sowing:

Fluchloralin at 2.0 l/ha soil applied and incorporated followed by light irrigation.

Pre-emergence:

Pendimethalin @ 3.3l/ha applied on third day after sowing.

Post emergence:

Spray Imazethapyr @ 750 ml/ha at 20-30 days after sowing based on weed density as post emergence spray

- If no herbicide is applied two hand hoeing and weeding are given on 20th and 40th day after sowing.

- Apply, PE Oxyfluorfen @ 200 g/ha on 3rd DAS and followed by one hand weeding on 40-45 DAS
- Apply, PE Oxadiazon @ 0.8 kg ha-1 followed by one earthing up using hoes (or) working star type weeder
- Apply, PE Metalachlor @ 1.0 kg ha-1 followed by one hand weeding on 40 DAS.

Earthing Up : Earthing up during second hand weeding / late hand weeding

Irrigation Management

- Schedule the irrigation at 0.40 and 0.60 IW/CPE ratio during vegetative and reproductive phases respectively.
- Apply irrigation as follows
    - Sowing or pre-sowing
    - Life irrigation, 4 - 5 days after sowing if sowing irrigation given to break the surface crust.
    - 20 days after sowing
    - At flowering give two irrigations
    - At pegging stage give one or two irrigation
- Pegging, flowering and pod development phases are critical for irrigation during which period adequate soil moisture is essential.

Intercropping

- Groundnut+Pigeonpea (6:1)
- Groundnut+Sesame (4:1)
- Groundnut+Blackgram (4:1)
- Groundnut+Sunflower (6:2)
- Groundnut+Cowpea (5:1 to 6:1).

Major pest and disease management

Early leaf spot*: Cercospora arachidicola*

- Carbendazim 500 g/ha (or) Mancozeb 1000 g/ha (or) Chlorothalonil 1000 g/ha

Late leaf spot: *Phaeoisariopsis personatum*

- Intercropping pearl millet or sorghum with groundnut (1 : 3) or crop rotation with cereals
- Deep burying of crop residues in the soil and removal of volunteer groundnut plants
- Spray Carbendazim 0.1% or Mancozeb 0.2% or Chlorothalonil 0.2%.

Rust: *Puccinia arachidis*

- Mancozeb 1000g /ha (or) Chlorothalonil 1000g /ha (or) Wettable sulphur 2500g /ha (or) Tridemorph 500 ml/ha
- If necessary, repeat the spray 15 days later.

Stem rot: *Sclerotium rolfsii*

- Seed treatment with *Trichoderma viride* @ 4 g/kg seed
- soil application of *Trichoderma viride* @2.5 kg/ha, mixed with 50 kg of organic manures
- Seed treatment with 3 g Thiram + Carbendazim.
- Removal or burial of crop residues

Bud necrosis: Peanut bud necrosis virus (PBNV

- Adopt a close spacing of 15 x 15 cm.
- Remove infected plants up to 6 weeks after sowing

Alternaria leaf disease: *Alternaria arachidis and A. tenuissima*

- Foliar application of Mancozeb (0.3%) or Copper oxychloride (0.3%) or Carbendazim(0.1%)

Red Hairy caterpillars: *Amsacta albistriga, A. moorei*

- Prior to summer rains dig out and destroy the pupae from the field bunds and shady spots
- Set up 3 to 4 light traps /ha
- Collect and destroy egg masses in the cropped area.
- Avoid migration of larvae by digging a trench 30 cm deep and 25 cm wide with perpendicular sides around the infested fields.
- Apply Phosalone 35 EC 750 ml/ha in 375 l of water (or) Dichlorvos 76 EC 627 ml/ha at 25 kg/ha (for young caterpillars)

Groundnut leaf miner: *Aproaerema modicella*

- Set up light traps @12/ha
- Apply Dimethiate 30 EC 660 ml/ha (or) Malathion 50 EC 1.25 l/ha (or) Methyl demeton 25% EC 1000 ml/ha

Pod borer: *Anisolabis stalli*

Apply Malathion 5 D 25 kg/ha (or) Carbofuran 3% CG 50 kg/ha at 40 DAS

Crop duration

100 – 110 days

Harvesting

Harvesting is done after 80% pods are matured.
Groundnut crop is harvested by digging pods or by pulling the plants from field.
Groundnut crop is harvested when seed moisture content is at 18 to 20 per cent.

WestBengal

Sowing time

For kharif: June to July depending on onset of monsoon.
For Rabi: October to November using paired row (20/30 x 20 cm) sowing depends on residual soil moisture and land availability after rice.
For Summer: January to March depends on the temperature and harvesting of potato.

Varieties

Girnar 3, TAG 24, TG 51,TG 37A,

Seed rate

130-150 kg pods /ha for all the seasons depending upon shelling out turn.

Spacing

Kharif: 30 x 10cm.;
Rabi and summer: 25-30 cm x 10 cm

Seed treatment

Imidachloprid@ 2ml/kg seed followed by Tebuconazole 2DS@ 1g or Mancozeb @ 3 g/kg seed.
Soak in 0.05 % Ethrel solution for 12 hours followed by shade drying for seed dormancy.
Trichoderma viride seed treatment @ 4 g/kg seed for rot prone areas.

Rhizobium inoculation (@ 600 g/ha) is necessary for groundnut in non-traditional areas and rice fallows.

Manure and Fertilizers

Must be use as per soil test based recommendations

RDF: Apply 20:60:40 kg/ha as $N:P_2O_5:K_2O$ for all the seasons and 30:60:40 as $N:P_2O_5:K_2O$ for red lateritic soils.

Generally residual fertility of potato is to be used by summer groundnut. (15:30:45)

For confectionary groundnut : Additionally apply FYM @ 5t/ha along with urban-compost @ 5t/ha.

For Intercropping system: Use 100% N to groundnut and 50%N to any intercrop cereals.

Apply 100% RDF in groundnut (100% PD) and 50% RDF in pigeonpea (100% PD).

Weed management Crop must be weed free up to 45 DAS. Herbicide not widely adopted.

Kharif: One to two hands weeding at 10-15 DAS and 25-30 DAS.

Rabi and Summer: One to two hands weeding at 15-20 DAS and 35-40 DAS.

Note: Pendimethalin @ 2.5 to 3L/ha or Oxyflourfen @ 1.5 to 2.0L/ha as pre-emergence and/or Imazethaphyr @ 750 ml/ha or Quizalofop ethyl @ 1.0 L/ha at 20 DAS as post-emergence can be used for weed control in groundnut.

Irrigation management

No irrigation during kharif season. Rabi season groundnut cultivated on residual soil moisture except for delayed sowing which needs 1-2 irrigations. About 4-6 irrigations required for summer groundnut depending upon climate and rainfall.

Diseases and pests management

Cercospora leaf spot, Stem rot, Collar rot etc.

Crop duration

110-120 days for kharif groundnut depending upon variety and rainfall and about 110-115 days for rabi/summer groundnut depending upon variety, sowing time and temperature.

Harvesting

Harvesting is done after 80% pods are matured. Groundnut crop is harvested by digging pods or by pulling the plants from field. Groundnut crop is harvested when seed moisture content is at 18 to 20 percent.