

Zone-I

HIMACHAL PRADESH

Himachal Pradesh is predominantly a hilly state, where majority area (about 80 %) is rainfed. During Rabi season wheat among cereals, chickpea & lentil among pulses and sarson among vegetables are predominant crops. Among vegetables, cole crops, peas, onion, and garlic are the main crops. Some important advisories to harness optimum returns are advocated for farmers.

Wheat

- ◆ HS 542, HPW 360 cultivars of wheat are recommended for low and mid hill zone of the state under early sown conditions (Up to 20th October) whereas HPW 155, HPW 349, HPW 249, HPW 236, VL 907, HS 507, HPW 368 are recommended for timely sown conditions (15 October- 15 November) in these zones. For late sown conditions (up to December end) VL 892, HPW 373 can be grown in low and mid hill conditions. HPW 155 and HPW 236 are recommended cultivars of wheat for high hill zone and Saptdhara and Him Pratham (DH 114) for high snow-covered areas under timely sown conditions (1-15th October).
- ◆ The sowing should be done in lines with spacing of 22 cm with seed rate of 100 Kg/ha and 150 Kg /ha for timely and late sown conditions respectively. Before sowing treat the seed with Bavistin @ 2.5 g/kg of seed. Apply full quantity of SSP (375Kg), MOP (50 Kg) along with 50 per cent of Urea (130 Kg) along with FYM at the time of sowing while remaining half quantity of Urea should be given at the time of crown root initiation or occurrence of first rain.
- ◆ Since, weed causes heavy economic loss to the wheat crop and to avoid these losses, Vesta @ 400g/ ha or Chlodinafop @ 400g/ha followed by 2, 4- D @ 1.25 kg/ha after 2-3 days of Clodinafop spray are recommended for chemical management of weed problems.

The spray should be done after the appearance of 2-3 leaf stage in weeds.

- ◆ Among diseases yellow rust and Karnal bunt are major problem in wheat crop which can be managed by the spray of Tilt @ 1ml per liter of water at the appearance of the symptoms. Termite is major pest among all pests in this crop and seed treatment with chloropyriphos 20 EC @ 4ml/Kg seed along with soil incorporation of chloropyriphos 20 EC @ 2 L mixing with 25 Kg sand/ha at the time of sowing is recommended for the management of this pest.

Chickpea

- ◆ Himachal chana -1, Himachal chana-2, GPF-2, Palam chana-1, HPG 17 are the recommended cultivars of chickpea. Treat the seeds with fungicide (Bavistin @2.5gm/Kg of seed) and biofertilizers like *Rhizobium* and Phosphorus solubilizing bacteria before sowing. Go for sowing of crop at proper soil moisture. Mid October is the best time for it's sowing, and sowing should be done in lines with 30 cm line spacing for all cultivars except HPG 17 for which line spacing of 50 cm is recommended with optimum depth of 10-12.5 cm. The seed rate for small & medium sized seeded chickpea cultivars like Himachal chana -1, Himachal chana-2, GPF-2, Palam chana-1 is 40-45 Kg/ha however, for bold seeded cultivars like HPG 17, seed rate of 80Kg/ha is recommended. Urea 65 Kg, SSP 375Kg and 50Kg MOP per ha is recommended for the cultivation of chickpea. The full dose of SSP, MOP and half dose of Urea should be applied at the time of sowing while reaming half dose of Urea should be given to crop after 4-5 weeks of sowing.
- ◆ For the management of pod borer in chickpea, spray the crop with Carbaryl 50 WP @1250 gm/ha and apply bavistin @1g / L of water for the management of *Acochyta* blight.

Lentil

- ◆ Vipasha and Markandey are the recommended cultivars of Lentil which can be sown between October end to mid November

with seed rate of 25-30Kg/ha. Urea 22Kg and SSP 250Kg/ha is recommended fertilizers which can be applied at the time of sowing.

Brown sarson and Gobhi Sarson

- ♦ KBS 3, HPBS 1 and HPN 3, ONK 1, GSC 7 are the recommended cultivars of Brown and Gobhi Sarson respectively. First fortnight of October is the best time for the cultivation of these crops.
- ♦ The seed rate of 6Kg/ha is required, and sowing should be done with spacing of 30 cm line to line and 10 cm plant to plant. For brown sarson, apply full does of SSP (250Kg), MOP (65 Kg), Gypsum (140 Kg) along with 50% of Urea (65Kg) at the time of sowing while remaining dose of Urea should be applied before flowering. For Gobhi sarson, apply full does of SSP (375Kg), MOP (65 Kg) and 50% dose of Urea (125Kg) during sowing time and rest of Urea should be applied in two splits after 60 days and 80-90 days after sowing.
- ♦ Two manual weeding are required between 40-70 days of sowing for the management of weeds. Spray of Pendimethalin (Stomp 30 EC) @ 1.5 Kg /ha as a pre-emergence or Isoproturon @ 1Kg/ha in 700-800 l of water as post emergence (30-35 days of sowing) is recommended for the chemical method of weed management.
- ♦ Aphid is the major pest associated with this crop, which can be managed by the spray of methyl Demeton 25 EC or dimethoate 30 EC @ 1ml/L of water.

Winter vegetable

Cole Crops (cauliflower, cabbage, and broccoli)

- ♦ Nursery sowing of cauliflower hybrids (Gibount, Fusiya, Casper RZ, Swati, Shweta, Bio pearl white) in August-September & July -August (Mid group) and (Pahuja-71 & IAHS-9803) in October-November & September (Late group) in low & Mid hills and April-May (Late group) in high hills of HP for healthy seedlings on raised

beds or poly trays or under protected structure.

- ♦ Nursery sowing of Cabbage hybrids (Pusa cabbage hybrid 1, Pusa cabbage hybrid-81, Varun, Pushkar) should be completed in August–September in low and mid hills for healthy seedlings on raised beds or poly trays or under protected structure, while transplanting should be completed from October – January.
- ♦ Nursery sowing of Broccoli varieties/ hybrids (Palam Samridhi, Palam Haritika, Palam Kanchan, Palam Vachitra, KTS-I and Punjab Broccoli-I.) should be completed in September to October in low & Mid hills.
- ♦ Apply FYM@ 200 -250 q per ha at the time of field preparation, NPK @120-180: 75-80: 60-75 kg per ha. Full dose of phosphorus and one-third of N and half of potassium should be applied at the time of transplanting. Remaining part of N should be top dressed at an interval of one month each while half of potassium is to be applied along with N during second top dressing. Borex can be added in the soil for the management of browning in cauliflower
- ♦ First light irrigation should be given immediately after transplanting of the seedlings and regular maintenance of optimum moisture is essential during growth and curd development. The harvesting of curds is to be done as soon as the curds attain prime maturity and compactness
- ♦ Harvesting of broccoli heads at correct time i.e., before the buds open and when the bud clusters are compact
- ♦ Damping off of seedlings is major problem in cole crops and for its control applies Mancozeb 25 g + carbendazim 10 g per 10 litres of water. Seed treatment with hot water (50 °C) and streptocycline (1g/ 10 L water) for 30 minutes each is advised for protection against black rot. In case of attack of aphids and cabbage butterfly, malathion @ 1ml/ L can be applied. Cypermethin @1mLL can be applied for protection against cut worms at early stage.

Garden Pea

- ♦ The sowing of important early pea varieties (Arkel, Palm Triloki, GS-10, AS-10) should be completed in September- October in low and mid hills & March- June in high hills.
- ♦ The sowing of main season pea varieties viz., PB-89, Him Palam Matar-1, AP-3, GS-10 should be completed in late October – November in low and mid hills & October – Mid November in high hills of HP.
- ♦ Application of FYM@ 20 -30 tons, 20-50 kg nitrogen, 30- 60 kg phosphorus and 30-60 kg potassium per ha should be applied at the time of sowing based on fertility status of the soil.
- ♦ First hoeing and earthing up should be completed after 2-3 weeks of sowing and second at flower initiation for higher yield. Pre-emergence application of Alachlor or Pendimethalin @ 3litres /ha is recommended to check the weeds in the initial growth stages
- ♦ Irrigations before flowering, during flowering and at pod formation stages are necessary for quality pods and higher yield.
- ♦ Picking of pods should be done either early in the morning or late in the afternoon. Picking should not be done during mid-day which deteriorates the quality of pea pod due to heat.
- ♦ Powdery mildew is serious problem in peas which can be controlled using karathane 0.5 ml or wettable sulphur 2.0 g or hexaconazole 0.5 ml per L of water. For protection against leaf miner and pod borer lambda cyhalothrin 0.75 ml and malathion 2 ml per L of water can be applied, respectively.

Onion and Garlic

- ♦ Nursery sowing of onion varieties (Palam Lohit, Nasik Red, Agrifound Dark Red) should be completed in mid-October – mid November in low & mid hill and transplanting should be completed in December- January (low & mid hill).
- ♦ The recommended varieties of garlic are GHC-1, Agrifound Parvati, Large Segmented and Solan Selection

- ◆ Apply FYM@ 200-300 q/ha, nitrogen @ 60-150 kg, phosphorus @ 35-150 kg and potassium@ 25-120kg per hectare depending upon the soil test, cultivar and growing season. Apply 50% nitrogen and entire quantity of phosphorus and potash at the time of transplanting or bulb sowing. Remaining half of the nitrogen is top dressed 5-6 weeks after transplanting.
- ◆ Onions are ready for dry bulb harvesting when the tops get dried (or at neck fall stage) and bulbs are mature. Harvesting should be completed in last week of May, which increases storage life of bulbs.

Root & Leafy Vegetables

- ◆ Sowing of root vegetables (Radish, Carrot & Turnip) should be completed in: August-September (Low hill), July – October (Mid hill) and March- August (High hill).
- ◆ The recommended varieties of Radish (Pusa Himani, Japanese white, White Icicle & Early Menu White), Carrot (Nantes, Solan, Rachna) and Turnip (Purple Top White Globe, Golden Ball, Snowball) should be sown
- ◆ Application of FYM @ 100 q/ha, nitrogen @ 50-90 kg, Phosphorus @ 50-80kg & Potash 40-80Kg/ha. Full dose of FYM, P, K and half of N should be applied at the time of sowing and remaining part of N should be top-dressed in two equal instalments at an interval of one month.
- ◆ Sowing of leafy vegetables (Spinach, Beet leaf, fenugreek & coriander) should be completed August-November & February -March in low hill, July- October & February- April (Mid hill) and March- June in high hill
- ◆ The recommended varieties of Spinach are (Pusa Harit, Banerjee Gaint), beat leaf (Virginia Savoy, Long Standing), Fenugreek (IC-74, Palam Soumya, Kasuri Methi, Pusa Kasuri) and Coriander (Mahak and local land races) should be planted.

Fruit crops

Apple

- ◆ Prepare tree basins and apply recommended dose of FYM (100 kg/plant), Nitrogen (1.5 kg Urea per tree basin), Phosphorous (SSP 2 kg per plant) and potash (MOP 1.7 kg per plant) for plants of age more than 10 years. Complete dose of Potash and phosphorous should be given at the Time of basin preparation along with FYM during December- January.
- ◆ Half dose of Nitrogen (750 g per tree) should be given 2-3 weeks before flowering and remaining quantity (750 g per tree) should be applied after one month.
- ◆ The fallen leaves of apple should be collected and decomposed in a compost pit or spray of 5% urea (10 kg in 200lt water) may be done on orchard floor on fallen leaves to ensure fast decomposition of infected leaves.
- ◆ During winters (November- December), expose the root system of infected trees and cut the infected portion and apply Bordeaux paint / chaubatia paste for the control of White root rot.
- ◆ Remove all dead, diseased braches at the time of pruning and apply Bordeaux paint/ chaubatia paste or any other Copper fungicide-based paint.
- ◆ Scarify wounds near collar region and apply Bordeaux paint/ chaubatia paste or any other Copper fungicide-based paint during winter season.
- ◆ For the management of canker, scarify the diseased portion upto healthy region and apply Bordeaux paint/ chaubatia paste or any other Copper fungicide-based paint during winter season.
- ◆ Apply a mixture of lime + copper sulphate + linseed oil (30kg lime+ 500 gm copper sulphate + 500 ml linseed oil in 100 L water) on stems upto a height of 2-3 ft from the ground level during October-November for protection against sun burning.

- ◆ Spray Horticulture Mineral Oil (2%) (20ml/L water) for the control of sanjose scale at green tip stage of apple bud.
- ◆ Spray melathion 50 EC (1ml/L water) or oxy-demeton methyl 25 EC (1ml/L water) just after fruit set to kill crawlers and newly settled stage.
- ◆ Place Phorate Granules (25-30gm Thimet/Phorate 10G) or carbofuran (70-80 gm Furadon 3G) at 5cm depth in rhizosphere in April and October to control woolly apple aphid in non-fruiting trees.
- ◆ Drench with Chlorpyriphos 20 EC (4ml/L water) in collar region during October-November using at least 5 L of pesticide emulsion per tree in collar region for the control of woolly apple aphid. Spray with Chlorpyriphos 20 EC (2ml/L water) or quinalphos 25 EC (2ml/L water) in September- October to check aerial population of woolly apple aphid.
- ◆ For stem borer, clear the hole with flexible wire, insert cotton wick soaked in petrol/ dimethoate 30 EC (1ml/L water) and plug the hole with mud.
- ◆ Drench the tree basin with Chlorpyriphos (5ml/L water) during November- December for the control of root borer.
- ◆ Three to four honeybee hives to be kept per hectare in apple orchards for effective pollination during flowering period. Place the beehives at 5-10 per bloom.
- ◆ To check the deficiency of micronutrients, give a spray of micronutrient mixture (2.5 gm/L).
- ◆ For the management of scab/ powdery mildew give a spray of dodine (1gm/L water) or fluxapyroxad + difenconazole (30ml/100 L water) at green tip stage.

Recommendations against Hail damage:

- ◆ Spray 100 gm Carbendazim or 600 gm Mancozeb in 200 L of water immediately after hail but within 24 hours.

- ◆ Spray 200 gm Boric acid + 500 gm Zinc sulphate + 250 gm Quick lime in 200 L of water within 3-4 days of hailstorm.
- ◆ After 10 to 12 days, a spray of micro-nutrients mixtures like Agromin, Multiplex or Microvit @ 400 to 600 g per 200 L of water should be given.

Stone fruits (Plum, Peach, Apricots, Nectarines)

- ◆ Preparation of tree basins and application of recommended dose of FYM (40kg/plant), Nitrogen (1 kg Urea per tree basin), Phosphorous (SSP 1.5 kg per plant) and potash (MOP 1.2 kg per plant) for plants of age more than 7 years. Complete dose of Potash and phosphorous should be given at the Time of basin preparation along with FYM during December- January.
- ◆ Half dose of Nitrogen (500 gm per tree) should be given 2-3 weeks before flowering and remaining quantity (500 gm per tree) should be applied after one month.
- ◆ For the management of leaf curl due to fungus, give a spray of copper oxychloride (3gm/L) during dormant period (December-January) and spray of carbendazim (1gm/L at pink bud stage.
- ◆ For the management of leaf curl due to aphid, apply methyl-demeton or dimethoate (1ml/L) at pink bud stage.
- ◆ Apply Mashobra paste after scarifying the gum lesion during dormancy.

Mango

- ◆ Apply sticky bands or alkathene sheet around tree trunk (0.5 mt above ground level) to prevent crawling of mealy bug nymphs/ adults. Apply clay paste at the end of alkathene sheet to plug the entry points.
- ◆ Remove diseased braches/ leaves/ inflorescence and spray with potassium metabisulphite (120 gm/200 L water) in the month of October and repeat in January for the control of mango malformation.

- ◆ Give a spray of wettable sulphur (5gm/L)/karathane/carbendazim/hexaconazole (1gm/L) at flowering and after fruit set.

Citrus

- ◆ For control of bacterial canker, remove the dead portions and apply copper oxychloride @ 3g/ L of water.

Animal Husbandry

- ◆ Maintain hygiene in sheds to keep animals free from ectoparasites. Spray insecticides like deltamethrin (@4ml/L of water) in the premises if required. Insecticides like Deltamethrin, Amitraj or Flumethrin can be used to treat the infested animals after consultation with a veterinarian.
- ◆ Vaccinate your animals against Foot and Mouth disease, Hemorrhagic septicemia and black quarter. Vaccination is done free of cost by Department of Animal Health and Breeding at regular intervals.
- ◆ Wash your hands and clean the udder of animal with antiseptic solution before milking to prevent mastitis. Maintain hygiene in animal sheds. Practice full hand milking. Regularly provide Vitamin E and selenium fortified mineral mixture to dairy animals.
- ◆ Feed mineral mixture to dairy animals @ 50g/animal/day to build strong immunity, boost milk production and maintain reproductive health.
- ◆ Plant perennial grasses like Napier bajra hybrid, Setaria and Guinea grass in waste lands or field bunds in the month of July-August or February- March. These grasses provide nutritious green fodder (16-20 quintals per Kanal) in 3-4 cuttings.
- ◆ Silage provides nutritious alternative when there is scarcity of fodder particularly in the months of October-December and April –June and maintains the milk production. Prepare silage in Kharif and Rabi season.

- ♦ Supplement the diet of dairy animals with Urea Molasses Mineral blocks. These blocks are cheap source of energy, protein, and minerals. Keep the block for licking (10-15 minutes) at the time of milking in morning and evening.
- ♦ Grow Azolla round the year as it is a nutritive and cheap organic feed substitute for dairy cattle. It provides high quality protein and micro minerals like selenium and zinc. Cost of feeding can be reduced by including azolla in animal diet thus making dairy farming more profitable.
- ♦ Provide balanced concentrate ration @ 1 kg per 3 L of milk production+ 1 kg for maintenance per day. Prepare balanced concentrate ration by using 40% cereal, 30% oil cake, 27% wheat bran, 2% mineral mixture and 1% salt.

PUNJAB

Wheat

Improved varieties

- ♦ **Timely Sown Irrigated Conditions:** *Unnat* PBW 343, *Unnat* PBW 550, PBW 1 Zn, PBW 725, PBW 677, HD 3086, WH 1105, HD 2967, PBW 621, WHD 943 and PDW 291
- ♦ **Late Sown Irrigated Conditions:** PBW 752 and PBW 658
- ♦ **Time of Sowing:** First fortnight of November is the optimum sowing time of wheat crop. However, sowing of long duration varieties can be commenced from the fourth week of October.
- ♦ **Seed Rate:** 45 kg per acre for *Unnat* PBW 550 and 40 kg for all other varieties.

Seed Treatment

- ♦ **For Termite:** In termite infested soil, treat the seed with 1 g Cruiser 70 WS (thiamethoxam) or 2 ml Neonix 20 FS (imidacloprid+hexaconazole) or 4 ml Dursban/Ruban/Durmet 20 EC (chlorpyrifos) per kg seed and dry it in shade. Seed treated with Neonix also control smuts of wheat.
- ♦ **For Loose Smut:** Treat 40 kg seed with 13 ml Raxil Easy/Orius 6 FS (tebuconazole) by dissolving in 400 ml water or 120 g Vitavax Power 75 WS (carboxin+tetramethyl thiurum disulphide)
- ♦ **Seed Inoculation:** Inoculate recommended quantity of seed for one acre with 500 g consortium or 250 g each of *Azotobacter* and *Streptomyces* (Azo-S) biofertilizer and one litre of water on pucca floor.

Sowing Method and Spacing

- ♦ **Conventional Sowing:** Sow wheat with a seed-cum-fertilizer drill at a depth of 4-6 cm. A spacing of 15-20 cm between the rows gives good yield.

- ♦ **Bi-directional Sowing:** In this method use half the recommended quantities of seed and fertilizer for sowing in one direction and the remaining half in the other direction (across the first direction).
- ♦ **Raised Bed Sowing:** With the help of bed planter, using 30 kg seed per acre, two rows of wheat can be sown 20 cm apart on 37.5 cm wide bed with a 30 cm wide furrow between two beds.
- ♦ **Zero Tillage Sowing:** Wheat can be sown without any preparatory tillage. In weed infested fields, spray 500 ml Gramoxone 24 SL (paraquat) in 200 litres of water per acre before sowing to control weeds.

Fertilizer Application

- ♦ Apply 90 kg urea and 55 kg DAP per acre in medium fertility soils. Apply potassium to deficient soils only.

Weed Control

- ♦ **To control of *Phalaris minor***
 - **Pre-emergence:** Stomp/Dost/Penda/Markpendi/Pendin/Bunker/Zakiyama 30 EC (pendimethalin) @ 1.5 litre as, Platform 385 SE (pendimethalin + metribuzin) @ 1.0 litre per acre
 - **Post-emergence:** Leader/SF-10/Safal/ Marksulfo 75 WG (sulfosulfuron)@ 13 g per acre
 - **Post-emergence:** Isoproturon 75 WP@ 500g per acre
- ♦ **Control of broadleaf weeds only**
 - 2, 4-D sodium salt 80 WP@ 250 g, Algrip/Algrip Royal/ Markgrip/Makoto 20 WP (metsulfuron)@ 10 g per acre.

Irrigation

- ♦ The first irrigation should be relatively light and given after three weeks to October sown crop and after four weeks to the crop sown later.

- ♦ **Army worm** attack usually wheat during March-April, however it is also observed in the month of December in fields having large loads of paddy straw. It damages leaves and ear heads. Spray 400 ml Ekalux (quinalphos) in 80-100 litres of water per acre with hand-operated knapsack sprayer or in 30 litres of water with motorized sprayer. For better effectiveness of the insecticide, spraying should be done in the evening when armyworm larvae are more active. This insecticide will also control aphids.

Wheat sowing with Happy Seeder

- ♦ The last irrigation to paddy crop should be planned in such a way that there is proper moisture in soil at the time of sowing of wheat with Happy Seeder/Super Seeder.
- ♦ Depth of sowing should be between 1.5 to 2.0 inches.
- ♦ Use 5-10 kg more seed per acre of wheat more than recommended in case of sowing with Happy Seeder.
- ♦ Drill 65 kg DAP/acre at sowing. Apply 40 kg urea/acre before first irrigation and broadcast another dose of 40 kg urea/acre before 2nd irrigation. It is cautioned that in heavy textured soils to avoid delay in urea application due to delay in second irrigation, broadcast 33 kg urea/acre before sowing of wheat and the remaining before first irrigation.
- ♦ Care should be taken that there is no clogging of seed and fertilizer tubes of Happy Seeder/Super Seeder. Tap the tubes with a stick to remove clogging, if required.
- ♦ If pink stem borer/rice ear cutting caterpillar damage is observed in previous paddy crop, avoid sowing wheat in the month of October.
- ♦ In case of wheat sown with Happy Seeder, first irrigation should be light and applied at 25-30 days in case of light textured soils and at 30-35 days after sowing in medium to heavy textured soils. In case of wheat sown with Super Seeder, apply irrigation as recommended for wheat cultivated with conventional methods. Apply irrigation after considering rainfall forecast.

- ◆ Prefer to irrigate the fields during daytime to maximize predation of insects by birds.
- ◆ Regularly monitor wheat crop sown in straw managed fields in the month of November- December to identify the problems related to insect pest, disease, or rodent. Use recommended practices for the management of insect pests, diseases, and rodents.
- ◆ Use recommended pre- and post-emergence herbicides for control of weeds in case of crop sown with Super Seeder and only post emergence herbicides for crop sown with Happy Seeder.
- ◆ Incorporation of paddy straw or its retention through Happy Seeder for more than three years helps in increasing the wheat productivity and improves soil health. From fourth year onwards, 20 kg urea can be saved per acre.

Rapeseed and Mustard

- ◆ ***Improved varieties***
 - **Toria:** TL 17 and TL 15
 - **Raya:** RCH 1, PHR 126, Giriraj, RLC 3, PBR 357, PBR 97, PBR 91, RLM 619
 - **Gobhi Sarson:** PGSH 1707, GSC 7, GSC 6, Hyola PAC 401, GSL 2, GSL 1
 - **African sarson:** PC 6 and **Taramira:** TMLC 2
- ◆ **Time of Sowing:** The optimum time of sowing for rapeseed and mustard is given below:

Crop	Sowing time
Toria	Whole September
Intercropping of Toria and Gobhi Sarson	Third week of September
Gobhi Sarson	10-30 October
Raya and African sarson	Mid October to Mid-November
Gobhi Sarson and African Sarson by transplanting	November to Mid-December
Taramira	Whole October

Seed Rate and Method of Sowing

- ◆ When sown as sole crop, 1.5 kg seed per acre is sufficient for rapeseed-mustard. Seed mixed with soil increases the bulk and thus ensures uniform distribution in the field. The depth of sowing should be 4-5 cm. Toria, raya, African sarson and taramira are sown in 30 cm and gobhi sarson in 45 cm apart rows. For sowing of canola gobhi sarson GSC 6 and Hyola PAC 401 during November, reduce row to row spacing to 30 cm.

Transplanting of Gobhi Sarson and African Sarson

- ◆ A successful crop of gobhi sarson or African sarson can be raised by transplanting. For higher yield, transplanting should be done in November.
- ◆ **Nursery Raising:** Sowing of nursery should be undertaken about 60 days for gobhi sarson (GSL 1) and 30 days for canola gobhi sarson and African sarson ahead of the transplanting period. About eight marlas (200 sq. metre) of nursery is sufficient for transplanting one acre. Broadcast uniformly 400 g seed of gobhi sarson or 600 g seed of African sarson.
- ◆ **Method of transplanting:** After applying pre-sowing irrigation, prepare the field well. Draw furrows 45 cm apart for gobhi sarson and 30 cm apart for African sarson. Place one seedling at 10-15 cm distance. Close the furrows and irrigate the field immediately.
- ◆ **Bed planting:** Transplanting of gobhi sarson can also be done on raised beds for higher yield (10-15%) and saving (20-25%) of irrigation water.
- ◆ **Fertilizer Application:** Apply 90 kg urea and 75 kg SSP per acre for Raya, Gobhi sarson and African sarson while 55 kg urea and 50 kg SSP per acre for Toria.
- ◆ **Weed Control:** One hoeing to toria three weeks after sowing and one or two hoeing preferably with improved wheel hand hoe to raya, gobhi sarson, African sarson and taramira are adequate.

- ♦ **Harvesting and Threshing:** Harvest the crop when siliquae turn yellow.

Sugarcane

Improved varieties-

- ♦ **Early Maturing Varieties:** CoPb 92, Co 118, CoJ 85 and CoJ 64
- ♦ **Mid-Late Maturing Varieties:** CoPb 93, CoPb 94, Co 238, CoPb 91 and CoJ 88

Time of Planting

- ♦ Mid-February to the end of March is the optimum time for planting sugarcane in the Punjab. Do not plant early maturing varieties after March. Avoid late planting.

Seed Selection

- ♦ The seed should be free from red-rot, wilt, smut, ratoon-stunting and grassy shoot diseases. Use only the top two-third portion of the selected canes for planting.

Seed Rate

- ♦ Use 20 thousand three-budded setts or 15 thousand four-budded sets or 12 thousand five-budded setts per acre. In other words, 30-35 quintal of seed is required for sowing one acre. Due to thick canes, seed rate of Co 118 and CoJ 85 should be kept about 10% higher (on weight basis).

Seed Treatment

- ♦ To improve germination, soak the setts in ethrel solution overnight by dissolving 25 ml of Ethrel 39 SL in 100 liters of water. Alternatively, soak the setts in water for 24 hours before planting.

Spacing and Planting Techniques

- ♦ **Trench Planting:** Plant crop in rows 75 cm apart and 20-25 cm deep trenches. After placing the setts in trenches, cover the setts

with 5 cm soil.

- ♦ **Paired Row Trench Planting:** Plant two rows of sugarcane 30 cm apart in 20-25 cm deep trenches.
- ♦ **Furrow Irrigated Raised Bed Planting (FIRB):** Sugarcane can also be planted in standing wheat crop sown by furrow irrigated raised bed (FIRB) planter.
- ♦ **Sugarcane Cutter Planter:** Use two-row tractor operated whole cane cutter planter. The complete sugarcane which is fed by the labour sitting on the machine is cut automatically into pieces before dropping into the furrows.
- ♦ **Intercropping:** Intercrop one row of the recommended varieties of summer moong or summer mash in between two rows of sugarcane to get an additional grain yield of 1.5 to 2 q/acre of summer moong/summer mash. Mentha and okra can also be grown as an intercrop.
- ♦ **Fertilizer Application:** Apply 130 kg urea per acre for plant crop and 195 kg urea per acre for Ratoon.
- ♦ **Iron deficiency:** Spray the crop 2 or 3 times with 1% solution of ferrous sulphate (1 kg ferrous sulphate in 100 litres of water) at weekly intervals soon after the symptoms appear.

Chemical Weed Control

- ♦ Pre-emergence application of 800 g per acre Atrataf/Solaro/Masstaf/Markazine 50 WP (atrazine) or Sencor 70 WP (metribuzin) or Karmex/Klass 80 WP (diuron) in 200 litres of water within 2-3 days of planting effectively controls the broadleaf weeds and annual grasses. For control of hardy weed like Bans Patta, use only Sencor 70 WP or Karmex/Klass 80 WP.
- ♦ **Irrigation:** Hot and dry period during April to June is the most critical period for the growth of sugarcane. During this period, irrigate the crop at 7 to 12 days interval.

Berseem

- ♦ **Improved Varieties:** BL 43, BL 42 and BL 10

- ♦ **Time of Sowing:** The last week of September to first week of October is the best time of sowing.
- ♦ **Inoculation:** The inoculation of berseem with specific *Rhizobium* culture will increase the forage yield.
- ♦ **Seed Rate and Method of Sowing:** 8-10 kg seed should be broadcasted in standing water when the weather is calm. For obtaining a high yield of good-quality fodder, mix 750g of mustard seed with the full seed-rate of berseem. Alternatively mix berseem with oats, using 12 kg seed of oats.
- ♦ **Manganese Deficiency:** Spray the crop twice or thrice with 0.5% manganese sulphate solution (1 kg manganese sulphate in 200 litres of water per acre) at weekly intervals on sunny days. Spray the crop after two weeks of cutting.
- ♦ **Weed Control:** Under situations where itsit (*Trianthema portulacastrum*) is a problem, sow berseem mixed with raya which is fast growing crop and exerts tremendous smothering effect on this weed.
- ♦ **Irrigation:** The first irrigation may be given within 3-5 days in light soils and 6-8 days in heavy soils after sowing. Afterwards it may be applied within 8-10 days during summer and 10-15 days during winter.
- ♦ **Harvesting:** First cutting is ready in about 50 days after sowing and subsequent cuttings at 40 days intervals during winter and 30 days intervals in spring, thus giving 4-6 cuttings in all.

Pea

Improved Varieties:

- Early maturing varieties: AP-3, Matar Ageta-7, Matar Ageta-6 and Arkel
- Main season varieties: Punjab-89 and Mithi Phali
- ♦ **Sowing and Seed Rate:** Sowing from mid-October to mid-November give the best crop in the plains and spacing should be

30×7.5 cm for early and 30×10 cm for main season varieties by inoculating with *Rhizobium leguminosarum*. Use seed 45 kg for early maturing and 30 kg for main season variety per acre.

- ♦ **Manures and Fertilizers:** Apply 8 tonnes of farmyard manure, 20 kg of N (45 kg Urea) and 25 kg P₂O₅ (155 kg Superphosphate) per acre before sowing.
- ♦ **Weed Control:** For chemical weed control use Stomp 30 EC (pendimethalin) @1.0 litre per acre within 2 days of sowing.

Potato

Improved Varieties

- Early Varieties: Kufri Surya, Kufri Pukhraj, Kufri Ashoka, Kufri Chandramukhi,
- Mid-Season Varieties: Kufri Pushkar, Kufri Bahar, Kufri Jyoti
- Late Varieties: Kufri Badshah, Kufri Sindhuri
- Processing Varieties: Kufri Frysona, Kufri Chipsona-3, Kufri Chipsona-1
- ♦ **Seed Rate:** For autumn sowing 13-18 q/acre seed tubers of 40-50 g weight should be used for planting. If the seed raised from autumn crop is to be used for spring planting, its dormancy should be broken by dipping cut tubers in a solution of 1% Thiourea and 1 ppm Gibberellic Acid (one ml per 100 litres of water) for an hour followed by air drying the treated tuber pieces for 24 hours in thin layers in shade.
- ♦ **Time of Sowing:** The best time for sowing is last week of September to mid-October for the autumn crop and the second fortnight of January for the spring crop.
- ♦ **Method of Planting:** For mechanized planting, the spacing between the rows and tuber should be kept 65×18.5 cm or 75 cm×15 cm respectively depending upon the available machinery.
- ♦ **Manures and Fertilizers:** Twenty tonnes of farmyard manure or green manuring along with 75 kg of N (165 kg of Urea), 25 kg of

P_2O_5 (155 kg of Single Superphosphate) and 25 kg of K_2O (40 kg of Muriate of Potash) per acre should be used. Drill all P_2O_5 and K_2O and half N at sowing and the remaining N at the time of earthing-up.

- ◆ **Earthing-up:** A double mould board plough or a ridger should be used for earthing up after 25-30 days of sowing.
- ◆ **Weed Control:** Application of paddy straw mulch @24 q/acre immediately after planting. Sencor/Tanoshi 70 WP (metribuzin) @ 200 g as pre-emergence.

Chilli

Improved Hybrids/Varieties

- Hybrids: CH-27, CH-3, CH-1
- Varieties: Punjab Sindhuri, Punjab Tej, Punjab Surkh, Punjab Guchhedar
- ◆ **Sowing Time:** The seed is sown in nursery during end October to mid November. Transplanting is generally done in February-March.
- ◆ **Seed Rate:** Seed rate is 200 g per acre when sown in the nursery. Sow nursery in one marla ($25m^2$) area to transplant one acre.
- ◆ **Nursery:** To ensure successful growing of healthy seedlings from costly hybrid seed of chilli, nursery should be grown under polyhouse (size $24' \times 13' \times 6'$) made of UV stabilized low density polyethylene film of 200 microns (800 guage) thickness.

Time of sowing under polyhouse	Time of transplanting
a) Third week of November	Mid February
b) First week of February	End of April

- ◆ **Spacing:** Thick and stout seedlings perform better than tall seedlings and should be planted on ridges at 75 cm apart with plant to plant spacing of 45 cm.

- ♦ **Manures and Fertilizers:** Apply well-rotten farmyard manure 10-15 tonnes or 6 quintal paddy straw compost per acre for improving the soil health and yield in chilli. The recommended doses of fertilizers are 25 kg of N (55 kg of Urea) and 12 kg of P₂O₅ (75 kg of Single Superphosphate) and 12 kg of K₂O (20 kg of Muriate of Potash) per acre. Whole P₂O₅ and K₂O together with 1/2 N should be drilled at transplanting and the remaining N should be top dressed after first picking. Apply 30 kg N (65 kg urea) per acre to hybrid chilli.
- ♦ **Growth Regulator:** Due to high temperature in May-June dropping of flowers take place. Two foliar sprays of naphthalene acetic acid (NAA) at 10-day interval @4g after 45 and 55 days of transplanting to increases the green and red ripe fruit yield of chilli.

Cauliflower

- ♦ **Improved Varieties;** Late Season: Pusa Snowball-1, Pusa Snowball K-1
- ♦ **Sowing and Seed Rate:** The best transplanting time is June-July for the early varieties, August to mid-September for the main season varieties and October to first week of November for the late season varieties. The seed rate for main and late season varieties is 250 g per acre, whereas, for early season varieties 500 g seed is required.
- ♦ **Spacing:** For the main-season crop is 45×45 cm. and 45×30 cm for early and late-season crops.
- ♦ **Manures and Fertilizers:** 40 tonnes of farmyard manure, with 50 kg of N (110 kg of Urea), 25 kg of P₂O₅ (155 kg of Single Superphosphate) and 25 kg of K₂O (40 kg of Muriate of Potash) per acre is the optimum fertilizer dose for all these varieties. Apply whole of farmyard manure, P₂O₅ and K₂O and half N before transplanting and the remaining half of N as top-dressing four weeks after transplanting.
- ♦ **Irrigation:** First irrigation should be given just after transplanting. Subsequent irrigations can be given at an interval of 7-8 days during

summer and 10-15 days during winter depending upon soil type and weather. The total numbers of irrigations required are 8-12.

Dairy farming

October

- ♦ All categories of animals should be de-wormed at this time.
- ♦ The animal should become pregnant again in 2-3 months after calving. Animals showing post parturient anestrus should be treated. In herds with problem of brucellosis, the 4-8 months old female calves should be vaccinated for brucellosis.

November

- ♦ Reduce the amount of crude protein in concentrate mixture by reducing the quantity of oil seed cakes in it. Prune the trees to allow sunshine inside the shed.

December

- ♦ Tie animals in dry place to protect them from cold. Quickly replace the wet bedding material/straw
- ♦ Give *heeng* occasionally to calves to protect them from cold.
- ♦ Keep animals under the roof at night and in the sun during the day. Apply a solution of glycerin and betadine in case of cracked teats.
- ♦ Mix straw while feeding first cut of berseem. In case of bloat, give the vegetable oil (mustard, sesame, peanut, or sunflower oil) to the animal. Avoid berseem in animals showing prolapse.

January

- ♦ Do not cover the shed on all sides. Keep windows and skylights open for ventilation inside the shed.
- ♦ To protect from cold, the animals may occasionally be given lukewarm water to drink.

- ◆ Keep animals on the *katcha* floor for half the time to prevent lameness.

February

- ◆ In case of infestation, apply the acaricide for control of ectoparasites in cattle.
- ◆ Find out and fulfil the summer fodder availability in this month. Check the working of fans and fountains in the shed.
- ◆ The animal which has been inseminated two to three months ago should be checked for conception.

March

- ◆ Spray 10% Phenyl or 2% copper sulphate (neela thotha) solution to control pests and germs in the shed. Reduce the movement of 7–8-month pregnant animals and feed them concentrate mixture strictly according to the level of milk production. Dried off animals need 1.5-2.5 Kg concentrate mixture daily.

Goat Farming

October

- ◆ Check the animals inseminated in September for signs of oestrous if signs appear inseminate them again. Goats conceived in October will parturate in March.
- ◆ Foot and mouth disease vaccination may be repeated in this month. Animals should be vaccinated for PPR.

November

- ◆ Start feeding legume fodder regularly
- ◆ Start preparing for winter management and fill holes in the floor with soil. Do not allow sewage to accumulate inside the shed.

December

- ◆ Do not close the shed on all sides keep space for ventilation. Start giving paddy straw as bedding material for animals. Kids can be

covered with gunny bag/*jhull* on to protect them from the cold.

- ♦ Give lukewarm water at least twice a day on very cold days. At this time a small amount of sugar / salt may be added to the water.
- ♦ Carefully inspect all goats for signs of pneumonia.

January

- ♦ Maintain proper drainage in goat pens and keep the floor clean and dry. Spread straw/bedding material on the floor.
- ♦ Isolate the goats ready for parturition and give them 250-500g concentrate mixture extra, daily.
- ♦ The diet of pregnant goats should be balanced in each case according to conditions.
- ♦ Place uromin lick/salt in manger for licking.

February

- ♦ This is the best month to start a new goat enterprise.
- ♦ Also buy new goats/kids during this month to increase the herd size.
- ♦ Keep newly purchased goats in a separate place for about a month.
- ♦ Near to parturition trim the hair on both sides of the hind legs of goat.
- ♦ After parturition, dry the kid with a clean cloth and feed them colostrums as soon as possible.
- ♦ Cut lamb umbilicus with clean scissors and disinfect with iodine solution.

March

- ♦ De-worm the herd. At the age of 2 weeks, disbudding should be done in kids.
- ♦ Start feeding kids with fresh fodder like berseem at 3-week age.
- ♦ Keep the kids pen dry, ventilated, and clean to protect them from diarrhoea.

Pig Farming

October

- ◆ Vaccinate two-month-old piglets against swine fever.
- ◆ Check the number of teats of the 8–12-month-old gilt and gilt with higher count should be preferred for breeding. Boar of eight months age can also be used for breeding.

November

- ◆ Spread bedding material for protection from cold.
- ◆ Trim the enlarged hooves and needle teeth of male pigs.
- ◆ Pay special attention to joint swelling.
- ◆ Get tested for brucellosis in case of recurring abortions.

December

- ◆ Use bulbs to keep piglet pens warm.
- ◆ Provide warm drinking water if possible.
- ◆ Prune the trees around the farm to let the sunlight in.

January

- ◆ Mid-January to February is the best time to start a new piggery farm. Get piglets/adult animals from a trusted organization.
- ◆ Take care that only Piglets of more than or exactly two months age (weight 8 kg) should be purchased.
- ◆ Male and female animal should be bought from different places. If this is not possible, at least buy piglets from different sows.
- ◆ Check the teats before purchasing they should be in rows and the number of teats should be more than or equal to six pairs.

February

- ◆ De-worm the passel (group of pigs).
- ◆ Near to calving clean the calving pen and spread straw/bedding material. Bathe the pregnant sow with potassium permanagnate

water and isolate them in the calving pen about 10 days before calving.

- ◆ After calving, wipe clean the piglets with a clean cloth and assist them to suckle the colostrum.
- ◆ Install a light bulb about two feet high to keep children warm.
- ◆ Cut the needle teeth within two days before birth and give iron supplementation on the third and thirteenth day to deal with anaemia. Start giving solid food in the second week.

March

- ◆ Wean the piglets 45-60 days after calving and start giving a solid diet with 20-22% raw protein.
- ◆ Sell male children who are sold by 15 days of age

Poultry farming

October

- ◆ Assess the cleanliness and biosecurity of the entire farm.
- ◆ Restrict workers/ visitors entering the shed unnecessarily.

November

- ◆ Continue the work for the month of October
- ◆ Take measures to maintain the temperature and humidity inside the shed according to the changing weather. Check electrical appliances, light blowers, etc. inside the shed.

December

- ◆ Continue with the chores of the month of October-November.
- ◆ Keep the chicks under the brooder. Use plastic curtains, heaters, or heaters to keep the temperature constant in the shed.
- ◆ Include appropriate medicine/coccidiostats in the diet to prevent coccidiosis/ bloody diarrhea.
- ◆ Add partially dried berseem to the diet of poultry birds.

- ◆ Remove curtains during the day so that adequate sunlight can enter the shed.

January

- ◆ Double the curtains in the shed when it is very cold. The temperature inside the shed should not go below 16 degree C.
- ◆ Increase the amount of energy (grains) in the diet by 15 to 18%.
- ◆ Include appropriate medicine/coccidiostats in the diet to prevent coccidiosis/ bloody diarrhoea.

February

- ◆ Continue with any pending chores from the month of January.
- ◆ Collect all kinds of records in one place to keep track of the year.
- ◆ Keep new workers on the farm after training.

March

- ◆ Get one day old chicks vaccinated against Marek's disease, in the first week against Ranikhet disease, in the second week against Gumboro disease and in the fourth week to prevent Ranikhet disease.
- ◆ Lower the temperature by about 3 to 5 degrees C each week to keep the temperature at 21 degree C for 6 weeks. Provide 24-hour light.

Fish Farming

October

- ◆ Make the following arrangements while continuing the July-August-September work.
- ◆ Start selling fish heavier than 500 grams.
- ◆ Carefully inspect the fish caught for sale to avoid time-consuming disease and parasitic infestation and to get the necessary treatment.
- ◆ Arrange fingerlings equal to the number of fish taken out of the pond after each fish is sold

November

- ◆ Reduce feed supply to fish by 25-75%
- ◆ If moss forms in the pond, stop feeding altogether
- ◆ Continue liming and aeration in the pond
- ◆ Add 400-500 gms per acre of potassium permanganate in the pond for disinfection
- ◆ Arrange fingerlings equal to the number of fish taken out of the pond after each fish is sold

December

- ◆ Stop feeding and fertilizing. Increase water level (depth) to 6 feet. Use lime as needed in the pool.
- ◆ Aerate the pond in the morning. On cloudy days aerate during the day too. Prune trees around the pond.
- ◆ If fish are seen breathing out of the pond, immediately release fresh water or aeration into the pond.

January

- ◆ Continue with the chores of December. Replace 10-20% of pond water with fresh water.
- ◆ Add lime to the pool as needed (if pH is less than 8.5).
- ◆ In case of Argulus lice, apply Botox medicine (10-15 ml / acre) in the pond thrice a week.

February

- ◆ Continue the January work.
- ◆ Start feeding the fish one percent of its weight during the third or fourth week of the month, depending on the temperature.

March

- ◆ Sell all fish weighing more than half a kilo by the third / fourth week of March, continuing the work of February.

- ◆ In preparation for survival in the month of April, make a nylon thread on the pond to protect it from fish-eating birds. Never let food get wet; keep it in a dry place.

JAMMU & KASHMIR

JAMMU REGION

Wheat

Varieties for Sub-Tropical zone

- Timely sown varieties (1st to 25th November): JAUW 584, HD 3226, HD 3086, HD 2967, WH 1105, RSP 561, 303, PBW 621, DPW50, DBW 222, 88, 187 & WB-2.
- Late sown varieties (20th Nov. to 25th December): PBW -752, DBW-173, WH-1124, DBW-90, HD-3059
- Very late sown varieties (26th December to 15 January): PBW-757, WH-1021, Raj 3765, Raj 3077
- Rainfed (PBW660, PBW 664, WH 1080, PBW 175, RSP 81
- Restricted Irrigation: HD 3237, HI1620, WH1142, HD3043

Varieties for Intermediate (800-1350 m)

- Timely sown (2nd to 4th week of November): HS562, VL907, HS507, HPW349
- Rainfed, Timely sown (Last week of October to end of November): VL 832, VL 804
- Late sown rainfed (HS 490, VL 892, HS 420)

Varieties for Temperate & High altitude

- Sown during 2nd to 4th week of November: VL907, HS507, HPW349, VL804, HS 375
- ♦ In case of Zero/ Minimum tillage method of sowing, spray 1-2% glyphosate before sowing after the harvest of previous crop for management of weeds
- ♦ In case of Bed planter method, sowing on raised beds is possible by using bed planter on 37.5cm wide bed and 30cm wide furrow

between two beds. This method gives comparable or 2-3% maximum yield.

- ◆ 40 kg per acre of seed for normal sowing and 50 kg/acre for December sowing should be used. For very late sowing conditions (January), the seed rate should be enhanced to 60kg/acre.
- ◆ Under irrigated normal sown conditions, 40:20:10 NPK & under very late sown conditions 32:16:10 NPK kg/acre should be used. Under un-irrigated conditions, 24:12:8 NPK is required. Once in three years apply 8kg Zinc sulphate per acre.

Rapeseed – Mustard

- ◆ It requires cool climate during early stages (15 to 25°C) of crop growth. For maturity, higher temperature is required.

Varieties

- Sub-tropical (Early sowing- 1st week of September to 30th September): Pusa Bahar, Pusa Basant, Pusa Mustard-25
- Sub-tropical (Timely sowing irrigated- 2nd fortnight of October): Giriraj (DRMRIJ-31), RH-749, RSPR-69, NRCDR-2, RSPR-01, RSPR-03, RL-1359, Kranti, Varuna, Pusa Bold.
- Sub-tropical (Timely sowing rainfed- 2nd fortnight of October): RH-406, RH-30
- Sub-tropical (Late sown- First fortnight of November): NRCHB-101
- Intermediate (up to 3000ft altitude where snowfall is not experienced)- 2nd fortnight of October: Kranti, Varuna, RH-3
- Temperate (Above 3000 ft altitude- From end of September to 15th of October): KOS-1, KS-101 (Gulcheen)
- ◆ 1.75-2.0kg/acre of seed is required for Brassica juncea (Raya) and 2.5 kg/acre for B. campestris (KOS-I & KS-101) to sow 30 cm apart in rows and 10-15cm from plant to plant.

- ♦ For effective control of weeds in mustard apply fluchloralin or trifluralin @ 0.300 kg a.i./acre as pre plant incorporation (PPI) or pre-emergence application of pendimethalin @ 0.3 - 0.4 kg/acre or isoproturon @ 0.400 kg a.i./ acre or oxyfluorfen @ 60 ml/acre must be sprayed after dissolving in 200- 240 litres of water.
- ♦ 24:12:6 NPK along with Sulphur @ 8kg/acre is recommended.
- ♦ In case of prolonged dry spell, the foliar application of 0.05 % thio-urea at 50% flowering stage followed by 50 % siliquae filling stage by mixing 0.5 g thio-urea in one litre of water (7.5 grams in 15 litre pump) with a knapsack sprayer with flat fan T-jet nozzle using a spray volume of 700 litres per hectare must be sprayed between the period of moisture stress which coincides between 50-60 and 90-100 days after sowing.
- ♦ One irrigation at time of thinning and other at siliquae development stage, (If there is no rainfall) has been found to give higher yield of this crop.

Gobhi-Sarson

- ♦ Gobhi-sarson is a high yielding rabi oilseed crop, suitable growing both under irrigated and rainfed conditions.
- ♦ Varieties: GSL-1, GSL-2, DGS-1, GSC-7, RSPN-25
- ♦ 2kg/ acre of seed is required for sowing in lines 40-50 cm apart at a depth of 3 cm during first fortnight of October as a pure crop & by third week of September intercrop with toria. For transplanting, 60 days old seedlings may be used in the last week of November.
- ♦ For irrigated, 24:16:8 NPK & for un-irrigated areas, 20:12:6 NPK along with 8kg/acre of Sulphur is recommended.
- ♦ Rest of the agronomic practices are like mustard

Toria

- ♦ Varieties: RSPT-1, RSPT-2, RSPT-6
- ♦ 2 kg of seed is required to sow one-acre area with 12:7:4 kg/acre of NPK.

- ◆ First week of September is the optimum time of sowing

Chickpea

- ◆ Excess rainfall, heavy soil moisture either at time of sowing or at flowering stage are deleterious to crop growth
- ◆ Varieties: K-468, C-235m, Gaurav, GNG-469, 1581, CSJ-515, DCP 92-3
- ◆ Seed rate: For bold seeded varieties 30-32 kg seed / acre and for small seed varieties 24-26 kg/acre of seed is recommended. Optimum time of sowing is Mid-October in rows 30 cm apart. Before sowing, the seed should be inoculated with 'Rhizobium culture'.
- ◆ 35 kg//acre DAP is sufficient as nutritional requirement for the crop.
- ◆ Pendimethalin 30 EC formulation + Imazethapyr 2 % (ready mix combination) @ 400 g/acre as pre-emergence + one hoeing at 30-35 DAS is recommended for weed control.
- ◆ For management of pod borer, spray the crop with novaluron 10EC @ 1ml/litre or profenofos 50 EC @ 2ml/litre or NSKE (Neem extract) 5% @ 1g/litre water at pod initiation stage. Repeat the spray after 15 days of spraying if need arises.

Lentil

- ◆ It requires cold climate & can tolerate frost and severe.
- ◆ Varieties: L-4147 (PusaVaibhav), PL-406 (Angoori), DPL 15 (Priya), DPL 62 (Sheri)
- ◆ The optimum time of sowing is from last week of October to second week of November.
- ◆ Usually, 16 kg seed is required for sowing in one acre area in lines 20 to 22 cm apart by Kera method.
- ◆ For effective weed control, pendimethalin @ 0.4 kg/acre as pre-emergence integrated with one hand weeding at 60 DAS is recommended.

Berseem

- ♦ It provides nutritious and palatable fodder from repeated cuttings throughout winter and early summer in sub-tropical conditions
- ♦ Berseem thrives best in sub-humid and moderately cool climate
- ♦ Varieties: Mescavi, BL-1, BL-10, Wardan, Pusa Giant
- ♦ Best time of sowing is first fortnight of October with 10-12 kg of seed/acre. Mixing of mustard seed @ 0.4 kg with berseem seed increases the quantity of fodder at first cut.
- ♦ For effective control of Poa annua apply fluchloralin @ 0.4kg/ha in 200 litres of water just before sowing.
- ♦ Apply 20kg of phosphorus and 12 kg of N/ acre at the time of sowing and 12 kg N as top dressing after first cut.
- ♦ On light soil, irrigation may be given within 3-5 days after sowing whereas, on heavy soils it may be delayed for 8-10 days.
- ♦ For management of Stem Rot, spray copper oxychloride @ 0.3%.

Oats

- ♦ Oats makes best growth in cool and moist climate. High temperature at flowering stage increases proportion of empty spikelets and reduces the seed yield.
- ♦ Varieties: Kent, HFO-114, Sabzaar (SKO-7), Palampur-1
- ♦ The most suitable time of sowing is Mid-October to 1st week of November using 40 kg/acre of seed keeping the lines 20-25 cm apart.
- ♦ Apply 16 kg N and 16 kg P₂O₅/acre and 8 kg K₂O at the time of sowing and 16 kg N/ acre after taking the 1st cut of fodder i.e., 60-70 days after sowing.

Cauliflower

- ♦ It thrives best in cool, moist climate. Dry weather and low humidity are not suitable for it. High temperature produces poor quality curds.

- ♦ Early group: PusaKatki, PusaDeepali,
- ♦ Medium Group: Giant Snowball, Pusa Synthetic, Pant Shubra, Pant Gobhi-2, Pant Gobhi-3
- ♦ Late group: Snowball-16, Pusa Snowball-1, Pusa Snowball K-1, Kt-25, Pusa Him Jyoti, Hisar-1. Sowing time for Early Group is May-June, for Medium Group is August & Late Group is September-October.
- ♦ Seed rate is 160-200g/ acre with spacing of 60 cm x 30 cm for Early group & 60 cm x 45 cm for Mid and late group
- ♦ 48:24:24 NPK is recommended; apply 1/2 N along with other fertilizers as basal application and the remaining N should be top dressed 35 days after transplanting.
- ♦ Pre-plant application of fluchoralin@ 0.8-1.0 litre/ acre or pendimelhalin@ 1.32 litre/acre in the finally prepared field followed by one hand weeding after 40-45 days of transplanting is best for intercultural operations.

Cabbage

- ♦ Varieties: Golden Acre, Pride of India, Pusa Drumhead, Pusa Mukta
- ♦ Seed rate for Early and Late varieties is 200 g/ acre and 160 g/ acre.
- ♦ Apply pendimelhalin @ 1.0 litre/acre one day before transplanting in moist soil conditions.

KnolKhol

- ♦ Varieties: G-40, White Vienna, Purple Vienna, King of Market
- ♦ Seed rate for transplanted crop is 0.5-0.6 kg/acre and for direct sown crop is 1.2-1.6 kg/acre
- ♦ 40:20:20 NPK is recommended; apply 1/2 N along with other fertilizers as basal application and the remaining N should be top dressed 35 days after transplanting.

Radish

- ◆ Varieties: Japanese White, Minowase, Pusa Chetki, Pusa Himani, Pusa Reshmi, White Icicle, Pusa Desi, Arka Nishant
- ◆ Seed rate is 4-4.8 kg/acre for Asiatic types, 6-7.2 kg/acre for European types and 1.6-2.0 kg/acre with Dibbling Method.
- ◆ 24:12:20 kg/acre of NPK is recommended dose of fertilizers. Apply 12 t/acre of FYM together with P₂O₅ and K₂O and half of N at the time of field preparation. Remaining half N should be applied at the time of earthing-up.

Carrot

- ◆ The optimum temperature for growth is 16-18°C and colour development in 20-22°C.
- ◆ Varieties: Pusa Kesar, Nantes, Chaman, Pusa Yamdagini
- ◆ Seeds may be soaked in water for 12-24 hours prior to sowing to improve germination
- ◆ 24:12:20 kg/acre of NPK is recommended dose of fertilizers. Apply 12 t/acre of FYM together with P₂O₅ and K₂O and half of N at the time of field preparation. Remaining half N should be applied at the time of earthing up.

Garlic

- ◆ It requires cool and moist period during growth and relatively dry period during maturity
- ◆ Varieties: Agrifound Parvati-2 (G-408), Yamuna Safed (G-1):
- ◆ Planting Time in Sub Tropical areas is September- October; in Intermediate (low) is August -September and Intermediate (High) is March-April.
- ◆ Seed rate is 2.0-2.4 q/acre (Cloves) with Spacing 15 cm x 7.5 cm and 40:20:20 NPK & 8 t/acre of FYM.
- ◆ The weeds in garlic can be initially controlled by the application of pendimethalin @ 0.8-1.0 litres in 250 litres of water or 1.2- 1.6ml/

litre of water for one acre followed by one hand weeding after 45 days of planting.

Peas

- ♦ The optimum temperature for its growth and development is 10°C to 18°C. Hot and dry weather interferes with the filling of pods.
- ♦ Early season varieties: Arkel, Azad P-3, Matar Ageta-7
- ♦ Main season varieties: Arka Karthik, Azad P-1, P-89, Bonneville:
- ♦ Sowing time in subtropical zone for Early crop is Last week of October and for main crop is Mid October to Mid-November. Under Intermediate (Low), Mid-September to October is best time and for Intermediate (High), October to November is the best time.
- ♦ Seed rate for main crop is 24 kg/acre whereas for early crop is 48 kg/acre
- ♦ Apply whole of FYM (8 t/acre) along with 20 N (Half), 24 P₂O₅ and 20 K₂O at the time of field preparation
- ♦ Application of pre-emergence herbicides like linuron @ 0.5 kg/acre @ or pendimethalin @ 1 litre/acre can control the weeds effectively.

French Bean

- ♦ French bean is a cool weather crop. The plants drop their blossoms or pods in very hot weather. The best quality pods are obtained at 15.6°C to 21.1°C.
- ♦ Varieties: Contender, Pusa Parvati, Arka Komal, Arka Anoop, Kashi Param, Kentucky Wonder.
- ♦ In sub-tropical, best sowing time is last week of January to 1st fortnight of February. In Intermediate (Mid) and Temperate (High), the best time is March-April.
- ♦ Seed rate for Bush type varieties is 34 kg/acre & for Pole type: 18.0 kg/acre
- ♦ Apply whole of FYM (8 t/acre) along with 20 N (Half), 24 P₂O₅ and 20 K₂O at the time of field preparation

Spinach

- ◆ It is a cool season crop which can withstand frost better than other vegetables crops.
- ◆ Best sowing time in Sub-Tropical areas is August to December, in Intermediate (Mid) areas is June to September and in Intermediate (High) is March-June.
- ◆ Varieties: Prickly Seeded, Virginia Savoy, Banerjee Giant
- ◆ Seed rate is 14-16 kg/acre Varieties
- ◆ Apply whole of FYM (10 t/acre) along with 32 N (one-fourth), 10 P₂O₅ and 10 K₂O before sowing.

Coriander

- ◆ It is a tropical plant cultivated in rabi season and requires frost free climate at the time of flowering and seed formation.
- ◆ Varieties: Jammu Coriander-07, Pant Haritma, Narnaul Selection, HissarSurbhi
- ◆ Best sowing time is Last week of October with Seed rate of 4-6 kg/acre (irrigated conditions) & 10-12 kg/acre (un- irrigated conditions).
- ◆ Apply whole of FYM (6 t/acre) along with 24 N (one-third), 12 P₂O₅ and 8 K₂O before sowing.

Fruit crops

- ◆ Litchi should better be planted during 1st fortnight of September, because by then, the temperature becomes moderate, and atmosphere has a high humidity.
- ◆ The young plants need stakes to enable them to grow straight in up-right direction. The bamboo sticks are best for this purpose. If the plants show weak growth, they may be given a light dose of urea.
- ◆ Windbreak trees if not planted two years earlier than the planting of the fruit trees around the orchard should be planted, immediately.

- ◆ In younger orchards, the entire available land should be put under rabi crops, preferably Legumes such as Gram and peas. Berseem can only be used as inter crop in guava and pears.
- ◆ Harvesting of mid-season varieties of apple and pear to be continued.
- ◆ Harvesting of walnut should be completed.
- ◆ To check the pre-harvest, drop of fruits in citrus, which is acute problem in some citrus orchard, spray 2,4-D @ 20 ppm.
- ◆ **Management of Citrus canker:** Spray the tree and nursery plants with copper oxychloride (300 g/ 100 L water) + Streptomycin Sulphate (50 g/ 100 L water) or Streptocycline (100 g/ 100 L water) at 15 days interval, give 5-7 sprays.
- ◆ **Management of Anthracnose/Wither tip:** Spray with copperoxychloride (300 g/ 100 L Water) or Carbendazim (100 g/ 100 L water) during september. Repeat sprays at 15 days interval as per disease severity.
- ◆ **Management of shoot borer and mango scale:** Spray new growth with Malathion 50EC (0.05%).
- ◆ **Management of leaf miner /butterfly in citrus:** Spray Dimethoate 30EC 0.03%.
- ◆ **Management of fruitfly in guava:** Harvest the fruits when they are still hard; Collect and destroy fallen fruits; Spray Malathion + Gur bait solution as spot spray
- ◆ Prune affected twigs of peach having leaf curl and plum/apricot/ almonds with stigma blight should be destroyed by burning.
- ◆ For the control of early instars of mealy bug in mango, treat basins with application of 1.5 per cent chlorpyriphos dust @ 250 g/ tree around tree trunk.
- ◆ With onset of winters, acute problem of frost is faced by the evergreens, particularly mango, litchi, guava, papaya etc.
- ◆ Application of manures and fertilizers
- ◆ Application of Farmyard manure or compost to fruit trees,

especially to the young plants during the second half of December

- ♦ Training and pruning in pear, peach and plum should be done in January.

Floriculture (Marigold)

- ♦ Varieties: African marigold (Pusa Narangi Gaiinda, Pusa Basanti Gaiinda); French marigold (Pusa Arpita), Desigutta
- ♦ In plains and low hill regions, rainy season crops are sown in June and transplanted in July; winter season crop is sown in September-October and transplanted in October-November and summer season crop is sown in January under protection and transplanted in February. In intermediate low regions, nursery sowing is done in the month of March-April and transplanting is done after 4-6 weeks.
- ♦ Twenty tonnes of well rotten FYM along with 120 kg N (176 kg Urea), 100 kg P₂O₅ (217 kg DAP) and 100 kg K₂O (166 kg MOP) can be used for open pollinated varieties in one-hectare area. Half nitrogen along with full dose of phosphorus and potash need to be applied as basal dose. Remaining half of N is given in two top dressings, one each after 25 and 50 days of transplanting.
- ♦ Besides hand weeding, weeds can be controlled by various pre-planting herbicides like oxyfluorfen) @ 0.50L a.i./ha or pendamethalin @1.5 L a.i./ha followed by one hand weeding after 45 days of transplanting.

KASHMIR REGION

Wheat

- ◆ Recommended varieties are Shalimar Wheat -1, VL-738 and HS-240.
- ◆ Field should be ploughed at proper moisture condition. After 2-3 ploughings, one planking is desirable.
- ◆ For wheat, urea @ 4 kg/kanal, DAP @ 6.5 kg/kanal, MOP 2.5 kg/kanal and zinc sulphate @ 0.75-1.0 kg/kanal should be applied as basal dose at the time of last ploughing and then level the land by planking before seed sowing.
- ◆ Sowing should be done in rows keeping row to row distance of 23 cm and at a depth of 4-5cm and completed between 10th to 20th October.
- ◆ Seed rate of 100 kg/ha is recommended. However, in case of delayed sowing seed rate may be increased by 20 % i.e 120 kg/ha.
- ◆ Weeds can be controlled by application of post emergence herbicide like sulfosulfuron @ 30 g a.i./ha or Isoproturon 1.5 kg a.i /ha + 2,4-D @ 0.5 kg a.i /ha at 30-35 days after sowing.
- ◆ During Feb-March as soon as the growth starts in the last week of month apply top dose of urea @ 3.25 kg/kanal

Brown Sarson

- ◆ Recommended varieties are Shalimar Brown Sarson-1, Shalimar Brown Sarson-2, Shalimar Brown Sarson-3.
- ◆ Apply well decomposed compost or FYM uniformly @ 10-15 t/ha. Application of vermicompost @ 2.5 t /ha will replace 5 t FYM/ha and 25% NPK from recommended dose of fertilizers.
- ◆ For brown sarson urea @ 2.2 kg/kanal, DAP @ 5.5 kg/kanal, MOP 3.35 kg/kanal, Gypsum @ 6.25-7.5 kg/kanal and Borex @ 0.5 kg/kanal should be applied as basal dose before sowing of seeds.

- ◆ Pre-sowing irrigation for quick germination of crop is desirable where soil moisture is low.
- ◆ Pre-emergence application of pendemethalin @ 1 kg a.i./ha within 2-3 Days After Sowing.
- ◆ Seed can be sown in first fortnight of October with a spacing of 30 cm row to row x 10 cm plant to plant and should be treated with Captan @ 2-3 g per kg for control of seed borne diseases.
- ◆ For line sowing 7.5 kg/ha seed is required, for broadcasting 10-15 kg/ha
- ◆ Partial thinning along with hand weeding should be done at 25-35 days after sowing of brown sarson.
- ◆ During Feb.-March apply top dose of urea @ 2.25 kg/kanal.

Field Pea

- ◆ Recommended varieties are Shalimar Pea-1, Rachna and Prakash, HUDP-15, VL-45, & HFP-715
- ◆ For pea cultivation 2-3 ploughings accompanied by planking will be sufficient to obtain desired seed bed.
- ◆ Apply well decomposed compost or FYM uniformly @ 10-15 t/ha at the time of land preparation. Application of vermicompost @ 2.5 t /ha will replace 5 t FYM/ha and 25% NPK from recommended dose of fertilizers.
- ◆ For pea, urea @ 0.75 kg/kanal, DAP @ 6.5 kg/kanal, and MOP 3.4 kg/kanal should be applied as basal dose at the time of last ploughing and then level the land by planking before seed sowing.
- ◆ Seed can be sown from 15th October to ending November @ 60 to 65 kg /ha. In case of bold seeded varieties, seed rate can be increased up to 100 kg/ha.
- ◆ For seed treatment with Bio-Fertilizers make 10% gur/jagary solution and mix *Rhizobium* spp. @ 5-10 gm /kg seed in the solution.

- ◆ Do not treat seeds with fungicides in case seeds are being inoculated.
- ◆ Line sowing with the help of seed drill or opening the furrows at 30 cm apart. The seed should be placed 5 to 6 cm deep in the soil.
- ◆ Pre-emergence spray of pendimethalin @ 1 kg a.i./ha at 2-3 DAS.

Lentil

- ◆ Sowing should be completed up to first fortnight of November.
- ◆ Recommended varieties are Shalimar Masoor -1, Shalimar Masoor -2
- ◆ For preparation of land, minimum two ploughings are recommended.
- ◆ Apply well decomposed compost or FYM uniformly @ 10-15 t/ha and should be incorporated in the soil at the time of land preparation. Application of vermicompost @ 2.5 t/ha will replace 5 t FYM/ha and 25% NPK from recommended dose of fertilizers.
- ◆ For Lentil, urea @ 0.75 kg/kanal, DAP @ 6.5 kg/kanal, and MOP 2.5 kg/kanal should be applied as basal dose at the time of last ploughing and then level the land by planking before seed sowing.
- ◆ Seed rate of 40 kg/ha is recommended
- ◆ Seed should be treated with *Rhizobium*. Make 10% gur/jagary solution and mix *Rhizobium* species @ 5-10 gm/kg seed in the solution. Seed should be dipped in the solution for 10 minutes followed by drying under the shade. Do not treat seeds with fungicides in case seeds are being inoculated.
- ◆ Seed should be sown in lines at a spacing of 25 cm apart.
- ◆ Pre-emergence spray of pendimethalin @ 0.75 kg a.i./ha within 2-3 DAS to control the weeds effectively.

Oat fodder

- ◆ Recommended varieties are Sabzar, Shalimar Fodder Oats-1
- ◆ Oats requires a well prepared and firm field for good germination of seed. Usually, two ploughings followed by single harrowing

should be given to bring the soil to a fine tilth.

- ♦ Apply well decomposed compost or FYM uniformly @ 10-15 t/ha in the soil at the time of land preparation. Application of vermicompost @ 2.5 t /ha will replace 5 t FYM/ha and 25% NPK from recommended dose of fertilizers.
- ♦ In fodder oats urea @ 5.6 kg/kanal, DAP @ 6.5 kg/kanal and MOP 3.4 kg/kanal should be applied as basal dose at the time of last ploughing and then level the land by planking before seed sowing.
- ♦ Sowing of seed should be done up to 15th October.
- ♦ Oat seed required 100 kg/ha (when sown as sole), Seed should be sown in lines 20 cm apart.
- ♦ During Feb-March as soon as growth starts in the last week of month apply top dose of urea @ 3.25 kg/kanal

Vegetables

Peas

- ♦ Prepare land thoroughly & apply FYM @ 1 ton per kanal along with Urea, DAP and MOP @ 4, 6.5 & 5kg per kanal respectively.
- ♦ Recommended varieties are Bonneville, Shalimar mattar.
- ♦ Seed rate 4-4.5kg/ kanal.
- ♦ For obtaining early crop with higher yield apply 75% of urea DAP, MOP @ 3.75, 5, 4 kg/ kannal and supplying rest 25% through organic fertilizers (Poultry Manure @ 2 q/ha)

Spinach and Methi

- ♦ Sowing of spinach and methi may be continued
- ♦ Soil must be well drained.
- ♦ Seeds should be sown with a spacing of 30x10 cm but not deeper than 3-4 cm
- ♦ Sow 2-3 seeds per hill.
- ♦ Pre sowing irrigation must be done if required.

- ◆ Use treated seeds only.

Garlic and Pran

- ◆ Before planting cloves apply FYM 1 ton, urea 8kg, DAP 6.5kg and MOP 5kg per kanal.
- ◆ Dibble the cloves in lines 5-7cm deep keeping their growing tip upwards.
- ◆ Soil should be well drained and loose for proper development of bulbs.
- ◆ Apply enough well rotten FYM to make soil loose and porous.

Onion

- ◆ Apply fertilizers Urea, DAP, MOP @ 21, 10, and 5 kg/ kanal.
- ◆ Line planting may be adopted with a spacing of 20x15cm.
- ◆ Uproot seedlings when bed is moist.
- ◆ Avoid damage to apical portion of plant.

Fruits

Apple

- ◆ Varieties ready for harvesting include White Dotted Red (maharaji) (204-211 Days After Full Bloom, DAFL), Baldwin (Lal Farashi) (180-187 DAFB), Red Delicious (175-182DAFB), Yellow Newton (184-190DAFB), Kerry Pippin (168-175 DAFB), Lal Ambri (170-176 DAFB), Sunhari (172-177 DAFB), Fuji Zhen Aztec (175 DAFB).
- ◆ Harvest apples and pears at proper maturity for table purpose and storage. Make sure fruits do not get any wound or bruises while harvesting/handling. Store only unblemished fruit to prevent from rotting in storage.
- ◆ Fruits should be harvested only after ensuring that they have attained characteristic skin, flesh, and seed colour.
- ◆ In case of Apple, random samples should be subjected to starch-

iodine test and starch rating should be from 2.00 to 2.5 on 1- 6 rating scale for prolonged storage.

- ◆ In Apples, fruit firmness test should be done with the help of pressure tester and fruit pressure should range between 15 to 17 lbs/ sq inch.
- ◆ Remove twigs infested with WAA and apply Chaubatia paste on cut areas for Woolly apple aphid.

Apple fruit borer:

- ◆ Maintain good sanitation in the infested orchards, all the dropped and infested fruits of apple should be collected and buried deep in the soil.
- ◆ Burlapping practice should be followed, and the overwintering stages should be destroyed along with the burlap.

Apple stem borer:

- ◆ Heavily infested branches, twigs and completely dried trees should be uprooted, removed from the orchard, and destroyed.
- ◆ Insertion of petrol-soaked cotton deep in the holes of apple tree, followed by plastering with mud containing insecticide dust/ WP 10% in 6:1 ratio. OR
- ◆ Pressurized injection of Petrol in the holes, followed by plastering as mentioned above.

San Jose scale & Woolly apple aphid

- ◆ Remove twigs infested with SJS and WAA during pruning and dispose them away from the orchard. Apply Chaubatia paste on cut areas.

European red mite

- ◆ If the population is more than 20 mites per leaf, spray Fenazaquin 10 EC (40ml) per 100 litres of water.

Foliar fungal disease/ fruit rots

- ◆ Collection and destruction of fallen leaves. Bury the diseased mummified fruits in compost pits.

Marssonina sooty blotch, and Flyspeck

- ◆ Dip the harvested fruits in 5% sodium bi-carbonate solution for 10 minutes and wipe with clean coarse cloth.

Root rot

- ◆ Drench tree basin of affected tree with Carbendazim 50 WP @ 0.1% or Carbendazim 12% + Mancozeb 63% 75WP @ 0.5%. Apply fungicide suspension in 15-20 cm deep holes at 30 cm distance throughout the tree basin.

Collar rot

- ◆ Clean the affected collar area and apply Chaubatia or Bordeaux paste.
- ◆ Drench the soil under tree canopy with Metalaxyl MZ 72WP @ 0.5% or Mancozeb 75WP @ 0.6% or Copper oxychloride 50 WP 0.6%.

Pear

- ◆ Late varieties that have not been harvested in the previous month i.e.,
- ◆ Beurre Hardy (Kharpaddur) (139-150 DAFB), Vicar of winkfield (Satarvatikalan) (143- 154 DAFB)

Walnut

- ◆ Harvesting should be done only after ensuring that packing tissue of nuts has turned brown and hull removal is easy.
- ◆ Collect and dispose of fallen fruits to kill immature grubs inside fruit.
- ◆ Properly dry the nuts before storage in ventilated rooms for controlling kernel rot.

Chestnut

- ◆ Nut should be harvested promptly so that they will not be on the ground for more than two days otherwise kernels get spoiled quickly due to high temperatures.

Hazelnuts

- ◆ Nuts should be harvested when the husks begin to yellow, but before they start to drop from the tree.

Sheep and Goat

- ◆ Due to severe winter outside grazing resources are limited or there is non-availability of fodders outside. The animals are mostly stall-fed during this period and are housed in closed shelters. Further, the period coincides with advances stage of gestation and parturition. As such for augmenting the performance of sheep and goat it is advised as under

November and December

- ◆ Allow grazing in the community pastures
- ◆ Due to decrease in grazing resources, gradual shift to intensive feeding should be done.
- ◆ Dry fodder (Sorghum/oats) should be provided @ 0.5 kg/animal and pelleted feed @ 300 gm/adult and 200 gm/weaner from 1st week of Dec.
- ◆ Dry fodder should be gradually increased to 1 to 1.5 kg/animal and concentrate/pelleted feed up to @ 500 gm/adult and 400 gm/young stock by last week.
- ◆ Sanitation and cleanness in and around the livestock sheds should be maintained.
- ◆ Multicomponent Clostridial vaccination (MCC)/ ETV to pregnant ewes before one month of expected date of lambing should be ensured for protection against Lamb dysentery, Struck, Pulpy kidney disease, Black disease, and Braxy.

- ◆ Broad spectrum anthelmintic (**pregnancy safe**) dosing to pregnant ewes should be ensured before 7-15 days of expected date of lambing as advised by veterinarian.

January and February

- ◆ Avoid overcrowding of pregnant stock.
- ◆ Ensure ETV vaccination if not done till date.
- ◆ Provide molasses to pregnant stock @ 30 to 50 gm with concentrate feed
- ◆ Ensure proper nutrition of the stock comprising of 1 to 1.5 kg dry fodder (oats/ MP Chari/Sorghum varieties/ Jungle hay) and 500 gms of concentrate (homemade/ procured from the market) for improving dam lamb performance
- ◆ Take livestock outside for watering; it shall ensure movement and exercise of the pregnant stock to avoid pregnancy toximia
- ◆ If possible, provide turnips 200 to 300 gm per pregnant livestock to avoid pregnancy toximia
- ◆ Provide proper ventilation in the animal houses/sheds to avoid accumulation of obnoxious gases
- ◆ Prepare for lambing / kidding in advance. Keep tincture iodine, feeders and other first aid available in the lambing sheds
- ◆ Prepare a separate pen/ room with heating arrangements for weak, crippled, orphan, and hypothermic lambs. It besides proper management shall ensure routine monitoring of the vulnerable lot.
- ◆ Ensure proper bedding of the lambing pens
- ◆ Ensure cleaning of the dams after parturition.
- ◆ Allow normal lambing to take place. Do not disturb the animal during the lambing process. Provide slight assistance in lambing as and when needed, otherwise refer the case to a veterinarian in case of dystocia/difficult birth.
- ◆ Dip the navel cord of lamb in tincture iodine to avoid joint ill/navel ill etc in lambs

- ♦ Check the milking ability of dams at the time of parturition. Provide bottle feeding/ fostering of lambs born to dams with mastitis or less milking ability.
- ♦ Keep lambs in a draft free warm environment particularly for 1st week after birth
- ♦ Provide creep mixture after ten days of age to lambs for better growth performance
- ♦ Attend hypothermic lambs immediately
- ♦ Colour mark lambs and their dams to avoid mismothering
- ♦ Immediately refer entropion and ectopion conditions in lambs to a veterinarian.
- ♦ Periodic weighing of lambs shall help in detection of problems in advance.
- ♦ Proper sanitation in and around the paddocks/sheds particularly lambing sheds. The lambing area should be kept clean and dry to avoid infections to the newborn lambs/kids.
- ♦ Provide coccidiostats/cidals after two weeks of lamb/kid birth
- ♦ Vaccinate the lambs with ETV after one month
- ♦ Avoid visitors in and around the lambing sheds

Cattle

- ♦ Winters are very severe in Kashmir wherein temperature dips below zero and there is non-availability of green fodders during this period. The cattle are managed intensively within the sheds. As such it is advised as under:
- ♦ Sanitation and cleanness in and around the livestock sheds should be prioritised.
- ♦ Regular monitoring for cold and nutritional stress.
- ♦ Ensure proper ventilation by frequent opening of windows and doors for removal of obnoxious gases accumulated in the closed sheds.

- ♦ Access to adlib clean warm water for drinking and avoid overcrowding in the sheds.
- ♦ Provide proper bedding if temperature dips below zero.
- ♦ Try to improve the micro-environment around the animals for optimum performance by straw bedding, use of curtains and other locally available heating arrangements.
- ♦ Ensure washing of udder of *milch* animals with a mild disinfectant solution (e.g., Potassium permanganate) before and after milking to prevent mastitis and for clean milk production.
- ♦ Separate advanced pregnant animals, manage them in calving pans with adequate bedding and heating arrangement to avoid undue losses due to cold exposure/ hypothermia of newly born calves
- ♦ Get assistance of Veterinarian in case of dystocia/difficult birth.
- ♦ Dip the navel cord of calf in tincture iodine to avoid joint ill/navel ill etc
- ♦ Ensure colostrum feeding to newly born calves. In the event of unavailability of colostrum, fostering should be done.
- ♦ Artificial colostrum may also be an option which can be prepared by mixing an egg, half litre of fresh warm water, half litre of whole milk, one teaspoonful of castor oil and similar amount of cord liver oil.
- ♦ Provide creep ration to calves after 2 weeks of birth
- ♦ Manage calves in clean well bedded draft free sheds with optimum ventilation
- ♦ Follow standard nutritional regimes for different physiological stages and categories of animals on weight basis or following schedule may be adopted for optimum production

Category	Concentrates	Green/Dry fodder
Cow (15litre milk/day)	6.0 Kg	Adlib'./ (8 to 10 kg)
Pregnant cow	6.0 Kg +0.5 kg	-do-

- ◆ Cows should be fed 250 g -500 g of concentrate in addition to normal ration (dry matter @ 3% of body weight + additional concentrate @ 1 kg/3kg of Milk production= 6 kg for 15 litre).
- ◆ Normally 3 kg of concentrates along with 8 to 10 kgs of dry fodder is sufficient to meet the maintenance requirements and 5 kg milk production
- ◆ Silage 15 to 16 kg, turnips 4 to 5 kg along with 4 kg concentrate shall meet the requirements of 10 to 12 kgs of milk production
- ◆ Provide 1 to 1.5 ks of concentrates to calves upto 1 year of age along with 5 to 7 kg silage and 2 to 3 kgs hay
- ◆ Provide turnips and other root crops during the period
- ◆ Dry fodder and silage if available can suffice the requirements of the animals along with recommended quantities of concentrates.
- ◆ UMMB should be provided to animals whose only source of fodder is paddy straw for better performance
- ◆ Follow routine management practices viza viz timely heat detection, timely AI, dosing, and vaccination, etc. Undertake dosing and vaccination in consultation with the local veterinarians.

LADAKH

Vegetable

- ◆ No crop is possible in open field conditions in winters in Ladakh UT. Therefore, crops should be grown under protected structures like 3-side walled greenhouses, trenches, and hi-tech greenhouses.

Vegetable and their varieties to be grown during Rabi season:

- ◆ Chinese cabbage-Springsun-60, Palampur green, Tropic Prince
- ◆ Cabbage- KGMR-1, Mitra
- ◆ Broccoli- Green Magic, Lucky
- ◆ Spinach- Banejee Giant, Silver beat/Beet Leaf, Shalimar green, Virginia Savoy
- ◆ Swiss Chard-CITH-Red, CITH Green
- ◆ Methi- IC-74, Kasuri, Pusa Early Bunching
- ◆ Coriander-Shalimar Dhanai-1, Surabhi
- ◆ Turnip- PTWG
- ◆ Lettuce-Chinese Yellow, Simpson Black seeded, Grishma
- ◆ KnolKhol- White Vienna, early white vienna
- ◆ Celery-Ford Hook Emperor
- ◆ Kale- Khanyari, HaeznHawk
- ◆ Radish-Japanese white
- ◆ Carrot- Early Nantes
- ◆ Nursery of Cole crops, lettuce and Chinese cabbage should be sown in first fortnight of September
- ◆ Vermi compost should be added before sowing/transplanting @5t/ha for leafy vegetable and 7t/ha for cole crops
- ◆ Cabbage andbroccoli should be completed in first fortnight of October at a spacing of 45x30 cm.

- ◆ Spinach and Swiss Chard and other leafy vegetables should be sown at a spacing of 30x30 cm.
- ◆ Radish and carrot should be sown on bunds.
- ◆ Chinese cabbage should be transplanted at a spacing of 30x30 cm.
- ◆ Knol Khol can be transplanted in September- November to get crop throughout the winters.
- ◆ Spinach and Swiss chard should be directly sown before October to get maximum yield throughout the winters.
- ◆ Irrigation is required at an interval of 15-30 days during winter
- ◆ As the irrigation sources are frozen in winter, keep provision of water Tank inside the greenhouse for irrigation purpose
- ◆ Black mulching under the greenhouse/trenches will give excellent yield

Agricultural Engineering

- ◆ Bore well may be employed to cater large area under greenhouses.
- ◆ For maintaining temperature in peak winter, Earth Tube Heat Exchanger facility may be employed in the green houses. Otherwise in area like Changthang, greenhouse polythene may be covered under blankets or can use triple layer polycarbonate as covering material during nighttime to maintain heat loss

Agro-forestry

- ◆ Autumn plantation of willow may be carried out after leaf fall and in the month of November.
- ◆ Cutting height should not be kept 2 m.
- ◆ Irrigate plant immediately after planting and then 15 days after.

Fruit Science

- ◆ Orchard sanitation by cleaning and removing dry leaves, clothes, rotten fruits etc from canal and basin of trees and dispose it with covering $\frac{1}{2}$ mtr soil or by crushing or burying in doubling plastic bag.

- ◆ Management of canopy architecture by pruning trees that are more than four-year-old if not pruned earlier.
- ◆ The plants trees which are 1-3 years should be trained to Modified Central leader system or open centre system.
- ◆ Apply Bordeaux paste/Chaubattia paste/white lead paste/Zinc paint on the cut surface.
- ◆ Digging or preparation of pits for transplanting of new plants
- ◆ Top working of inferior cultivars with highly superior/productive type of cultivar
- ◆ Scrap dead bark & lichen from trees with BARK SCRAPEPS or knife (clean). After each cut sanitize the tools by rubbing alcohol/Ethanol.
- ◆ Apply fertilizer/FYM 3-4 week before expected bloom under the tree canopy away from trunk.
- ◆ FYM should be applied when sufficient moisture is present in soil or before the rainfall is expected
- ◆ Graft wood (Scion) must be collected in March before the bud start to swell.
- ◆ The scion should be one year old, vigorous& healthy diseases free.
- ◆ Should have only vegetative bud not reproductive bud.
- ◆ For healthy storage of graft wood, packed in moist media such as sawdust/newspaper and storage in airtight boxes or polythene bag.

Animal Science

- ◆ During winters, following diseases are prevalent in livestock: -

Goat & Sheep

Disease	Symptoms	Prevention
Bacterial Disease		
Haemorrhagic Septicemia	Fever, dysentery, swelling of lower mandible and death more occurred.	Vaccinate first dose at 3-4 month of age and booster at 3-4 week after first dose. Repeat at every 6/12 months interval in sep/oct.
Brucellosis	Abortion during late pregnancy, infertility, scrotal swelling in male, joint swelling	Disposal of dead foetus and placenta. Use gloves while handling infected items as it affects human beings.
Pneumonia	Fever, respiratory distress, mucous discharge from nostril, reduced feed intake and weight gain, cough	Clean water, well ventilated house.
Enterotoxaemia	Sudden death in young growing kids. Mucous diarrhoea may also seen during death	Vaccinate first dose at 3-4 month of age, booster at 3-4 weeks after first dose. Repeat every 6/12 months interval.
Colibacillium	Diarrhoea, Sudden Death, reduce feed intake, usually occur in young ones	Clean and disinfect the lamb/kid shelter. Provide clean water
Viral Disease		
Peste Des Petits Ruminants (PPR)	Fever, Ocular and nasal mucous discharge, mouth lesion, respiratory distress	First dose at 3 month of age and repeat every 3 years. Separation of infected one from healthy animals.
Foot and Mouth Disease	Fever, wound lesion in foot and mouth, excess salivary secretion, difficult in walking	First vaccination at 3-4 month and Booster 3-4 week after first dose. Repeat every 6/12 months interval in Oct and April
Contagious Ecthyma (Khalay)	Postules, Scab formation, Extension Lesion around Mouth slips. Anorexia and starvation. Kids are more susceptible to the disease	Wash with 1% potassium Permanganate solution. Apply tincture iodine followed by glycerine. Isolate the affected animals from other healthy animals

Disease	Symptoms	Prevention
Endo/Ecto-Parasitic Disease		
Fluke infection	Emaciation, anaemia, edema in lower jaw	Control of snails, avoid grazing in early morning and late evening, deworming of animals periodically.
Tape worm	Reduced growth, fever, kid mortality	Deworming of animals periodically, every six months
Round worm	Fever, anaemia, edema in lower jaw, reduced growth	Deworming of animals periodically, every six months
Coccidiosis	Blood-tinged brownish diarrhoea, anaemia, kid mortality	Clean shed, spray of 10% ammonia solution, administration of anticoccidial drugs.
Pediculosis	Reduced growth, skin allergy and wound, Anaemia and sudden death.	Clean shed, disinfect the shed periodical Pre and post winter dipping. Usually dipping should be done just after shearing and combing

Cattle and Yak

Disease	Time of Vaccination	Dose and Route
Haemorrhagic septicaemia	March-April	5-10 ml S/C
Foot and Mouth Disease	At 4 month of age	3 ml S/C
Brucellosis	December – January	5 ml S/C
Peste Des Petits Ruminants (PPR)	October- November	2ml S/C
Enterotoxemia (Multivalent)	August – September	2ml S/C

Common control measures

- ◆ Proper drainage, sprinkling of copper sulphate near water bodies will help to control fluke infection.
- ◆ Avoid early morning and late evening grazing.
- ◆ Disinfect and keep the animal shed clean and provide clean quality drinking water.
- ◆ Separate infected animal from healthy one.

- ◆ Provide at least 21 days quarantine to the newly purchased animals.
- ◆ Rotational grazing to control infection.
- ◆ Proper nutrition is essential for having healthy kids especially during winter. Simultaneous deficiencies of energy and protein can cause abortion of embryos early in the pregnancy. Deficiencies of some trace minerals such as copper and iodine can be the cause of abortions. Feeding of complete feed block and multi nutrient block may be helpful.
- ◆ In case of outbreak of contagious diseases, immediately segregate the sick animals from healthy one and take necessary disease control measures.
- ◆ Bloat will be formed when animal consume young leaves and grasses, unknown weeds, easily digestible cereals, rotten vegetables, and fruits. Bloat will be followed by diarrhoea; dysentery leads to decumbency and death. Administration of vegetable oil (50-100 ml) orally in a careful manner can help in control of bloat as a first aid and then get veterinary doctor help. Sometime feeding potato, brinjal may also obstruct the food passage and leads to bloat due to obstruction of gas from the rumen.
- ◆ Provide colostrums to the young ones within first few hours of birth.
- ◆ Animal shed should be well ventilated, clean, and free from ammonia smell.
- ◆ Provide good bedding material for pregnant animals and to young ones during winter months.
- ◆ Dipping of all livestock should be done with proper preferred concentration of medicine for effective result. Dipping should be done preferably during summer on a sunny day.
- ◆ All domestic livestock should be dewormed once in 6 months.

UTTARAKHAND

Wheat

- ♦ Under Irrigated conditions of Plain, Bhawar and Trai area the timely sown varieties of wheat are UP 2903, UP 2938 UP 2855, UP 2784, UP2628, UP2554, HD 3086, HD 2967, WH 1105, DPW 621-50, PBW 502, WH542 and BL 953 while late sown variety includes UP2944, UP 2844, UP, 2865, UP 2526, UP 2565, WH 1124, HD 3059, PBW 590, DBW 173, DBW 71, Raj 3765, Raj 3077 and UP 2944.
- ♦ In Rainfed areas of Plain, Bhawar and Trai area timely sowing (Oct. second fortnight) varieties are PBW 396, PBW 644, WH 1080, PBW 299, PBW 175 and V 306.
- ♦ Timely sowing varieties (Nov. first fortnight) like UP 2572, UP 2584, VL 953, VL 907, VL 804, VL 738, HS 507, HS 240 and HPW 349 used under irrigated area of lower hills.
- ♦ Timely sowing varieties (Oct. first fortnight) like UP 2572, VL 953 and VL 829 used under rainfed area of lower hilly area.
- ♦ In Rainfed conditions of hill area timely sowing varieties (Oct. first fortnight) i.e., HPW 42 and HS 365 used.
- ♦ The recommended seed rate is 100 kg/ha.
- ♦ Fertilizer and manure: 150 kg/ha Nitrogen, 60 kg/ha Phosphorus and 40 kg/ha Potash for timely sown wheat and 80 kg/ha Nitrogen, 40 kg/ha Phosphorus and 30 kg/ha Potash for late sown conditions. For higher yield 10 tonnes well decomposed farmyard manure should be applied in one ha area.
- ♦ Seed treatment should be done with 2 gm thiram/kg seed or 5-10 gm biofungicide Trichoderma spp. /kg of seed.
- ♦ 4-6 irrigations are required.
- ♦ In case of the incidence of yellow (stripe) rust, spray of Propeconazole (25 EC) @ 1 ml /litre water should be applied.

Gram

- ♦ Sowing time of gram is November first fortnight optimum time late sowing up to Dec. first fortnight under plain, Bhawar and Trai area while mid Oct. to Nov. first week in lower hilly area.
- ♦ Small grain size varieties of gram are Pant G 114, DCP 92-3, GNG 1581 and RSG 963.
- ♦ Medium size grain varieties of gram are Pant g 186, Pusa 547, Pant G3, Pant G4, Pant G5.
- ♦ Bold Size size variety of gram is Pusa 256.
- ♦ Kabuli channa varieties of gram are Pusa 1003, Pusa 1053, Pant Kabuli Channa 1, Pant Kabuli Channa 2 and JGK 1.
- ♦ 60-80 kg/ha seed required for small size while 80-100 kg/ha seed required for medium size.
- ♦ Fertilizer: 15-20 kg/ha Nitrogen, 40-45 kg/ha Phosphorus and 20-30 kg/ha Potash required.

Barley

- ♦ The recommended varieties of Barley are VL Barley 85 and VL Barley 118
- ♦ For an area of one ha 100 kg seed is sufficient.
- ♦ 10 Tonnes well decomposed farmyard manure should be applied in one ha area.
- ♦ Seed treatment should be done with 2 gm thiram/kg seed or 5-10 gm biofungicide Trichoderma spp/kg of seed.
- ♦ Sowing should be done by last week of October in irrigated condition and first fortnight of October in rainfed conditions.
- ♦ In case of the incidence of yellow (stripe) rust spray of Propeconazole (25EC) @ 1 ml /litre water should be applied.
- ♦ Seed treatment with carboxin fungicide @ 2.5 gm/kg seed for management of loose smut disease.

Lentil

- ◆ Under Plain, Bhawar and Trai areas Nov. first fortnight, late sowing up to second week of December is the best time to sow Pant Lentil 5, Pant Lentil 7, Pant Lentil 8, Pant Lentil 9 varieties.
- ◆ The recommended varieties of Lentil are VL Massor 5, VL Masoor 225, VL Masoor 126, Masoor 507, VL Masoor 103 during Mid Oct to Nov. first week of Nov for Lower hilly area.
- ◆ For an area of one ha 40 kg seed is sufficient.
- ◆ Fertilizer and manure: 40-50 kg/ha Phosphorus and 20-30 kg/ha Potash.
- ◆ Seed treatment should be done with 2 gm thiram/kg seed or 5-10 gm biofungicide Trichoderma spp./kg of seed.
- ◆ Management of wilt disease should be done by selecting resistant or tolerant varieties, seed treatment and following crop rotation with field crops.

Yellow Mustard/Toria

- ◆ The recommended varieties of Toria are VL Toria 3, Pant Hill Toria 1, Uttara, and Pant Pili Sarson 1.
- ◆ Yellow Mustard varieties Pani Swela and Pant Girja are sown during Oct. first Fortnight in Plain, Bhawar and Trai area whereas Pilli sarso 1, Pant Sweta Pant during Oct. second fortnight in lower hilly.
- ◆ Early sowing varieties of Rye are Pusa Mustard 27 and Pant Rye 19 in Plain, Bhawar and Trai area whereas timely sowing last week of Sept. to first fortnight of Oct are Pant Rye 20, Pant Rye 21 and RGN. Late sowing varieties are NRCHB 101, Ashirwad and Vardan.
- ◆ For an area of one ha 5 kg seed is sufficient.
- ◆ Fertilizer and manure: 120 kg/ha Nitrogen, 40 kg/ha Phosphorus and 40 kg/ha Potash for rye and 90 kg/ha Nitrogen, 40 kg/ha Phosphorus and 20 kg/ha Potash and 30 kg/ha sulphur for yellow mustard.

- ♦ Seed treatment should be done with 2 gm thiram/kg seed or 5-10 gm biofungicide *Trichoderma* spp/kg of seed.
- ♦ Acetamiprid (20% SP) @ 0.3 gm/litre should be sprayed for aphid management in the evening when there is no honeybee movement.

Pea

- ♦ Dwarf varieties of pea like KPMR 522, ARPANA, Malviya Matar 15, DDR 23, Pant Matar 13, Pant Matar 25, Pant Matar 74, Pant Matar 155, Pant Matar 250 are sown during mid Oct. to Mid Nov. in Plain, Bhawar and Trai area while regular varieties are Pant Matar 42 and Pant Matyar 243.
- ♦ Varieties: Pant Matar 13, Pant Matar 14, IPFD1-10 are sown during Mid Oct. to first week of Nov. in lower hills while regular varieties are VL Mater 40 and VL Mater 42.
- ♦ For an area of one ha, 80-100 kg seed regular varieties and 125 kg seed for dwarf is sufficient.
- ♦ Fertilizer: 20 kg/ha Nitrogen, 60 kg/ha Phosphorus and 40 kg/ha Potash.
- ♦ Seed treatment should be done with 2 gm thiram/kg seed or 5-10 gm biofungicide *Trichoderma* spp/kg of seed.
- ♦ Sulphex fungicide @ 2gm/litre or Dinocap @ 0.5 ml/litre should be sprayed for management of powdery mildew disease.
- ♦ Incidence of Pod borer insect can be managed by foliar spray of bioinsecticide *Bacillus thurengensis* @1.5 gm/litre or Deltamethrin @1 ml/litre at the time of flowering.

Onion

- ♦ The recommended varieties of Onion are VL Pyaz 3, Agrifound Light Red (ALR), Pusa red, Nasik reed, Pusratnar, Arkaniketan, Arkabindu, Arkapragati, Agri found light red, Agri found rose, Pnjab selection, Pusa white flet.
- ♦ For an area of one ha 8-10 kg seed is sufficient.

- ◆ Fertilizers and manure: 100 kg/ha Nitrogen, 60 kg/ha Phosphorus, 80 kg/ha Potash and 20-30 Tonnes well decomposed farmyard manure should be applied in one ha area.
- ◆ Seed treatment should be done with 2 gm thiram/kg seed or 5-10 gm biofungicide *Trichoderma* spp/kg of seed
- ◆ The right time of nursery sowing is October month and transplanting should be done in the month of December to overcome bolting problem.
- ◆ *Stemphyllum* disease can be managed by spraying of mencozeb @ 2.5 gm/litre after 10 -15 days interval with sticker.
- ◆ Purple disease can be managed by spraying of defeconazole @ 1ml/ litre with sticker after 10-15 days interval after disease incidence.
- ◆ Thrips insect can be managed by spraying Imidacloprid insecticide (17.8 SL) @ 3ml/10 litre.

Potato

- ◆ Hybrid varieties of potato are Kufri Jyoti, Kufri Giriraj, Kufri Jawahar, kufri Bahar, Kufri satraj, Kufri chipsona, Kufri Lalima and Kufri chandan.
- ◆ The recommended time of sowing is October second fortnight for Plain, Bhawar and Trai area while in irrigated valley (up to 3000 ft) Mid Sept. to Mid Oct. Irrigated valley (up to 5000 ft) Jan-Feb.
- ◆ For an area of one ha 25-30 quintal seed is sufficient.
- ◆ Fertilizers and manure: 180 kg/ha Nitrogen, 80 kg/ha Phosphorus, 80 kg/ha Potash and 20-25 Tonnes well decomposed farmyard manure should be applied in one ha area.
- ◆ Green leafy vegetables for Nutrition Garden
- ◆ The recommended varieties of **radish** are Japanese long and Doonagiri gol 8-10 kg/ha seed is sufficient. Sowing time is Sept to Jan for Plain, Bhawar and Trai area, Sept. to Oct. for Lower hilly area while June to July for hill area.

- ♦ The recommended seed rate for **coriander** is 20-25 kg/ha for varieties of Pant haritima and Pant dhaniya 1.
- ♦ The recommended variety of Spinach is All green and seed rate is 25-30 kg/ha.

Apple

- ♦ In lower hilly and hill area the time of sowing is December to first fortnight of February.
- ♦ General varieties for cultivation are Red delicious, Royal delicious, Golden delicious, Rinch-A-Red, Red gold, Early sanwari, Fany, Chuabatia princess, Rimer.
- ♦ Early colouring varieties for cultivation are Wash delicious, Bright, and early, skyline, supreme delicious, top red delicious, hardy man.
- ♦ Spur varieties for cultivation are red spur, silver spur, rd chief, arigansper, hardy man spur, golden spar, super chief, scarlet spur 2.
- ♦ Prepare tree basins and apply recommended dose of FYM (100 kg/plant), Nitrogen (1.5 kg Urea per tree basin), Phosphorous (SSP 2 kg per plant) and potash (MOP 1.7 kg per plant) for plants of age more than 10 years. Complete dose of Potash and phosphorous should be given at the Time of basin preparation along with FYM during December- January.
- ♦ During winters (November- December), expose the root system of infected trees and cut the infected portion and apply Bordeaux paint / chaubatia paste for the control of White root rot.
- ♦ Apply a mixture of lime + copper sulphate + linseed oil (30kg lime+ 500 gm copper sulphate + 500 ml linseed oil in 100 L water) on stems upto a height of 2-3 ft from the ground level during October-November for protection against sun burning.
- ♦ Spray Horticulture Mineral Oil (2%) (20ml/L water) for the control of sanjose scale at green tip stage of apple bud.
- ♦ Drench with Chlorpyriphos 20 EC (4ml/L water) in collar region during October-November using at least 5 L of pesticide emulsion

per tree in collar region for the control of woolly apple aphid. Spray with Chlorpyrifos 20 EC (2ml/L water) or quinalphos 25 EC (2ml/L water) in September- October to check aerial population of woolly apple aphid.

- ◆ For the management of scab/ powdery mildew give a spray of dodine (1gm/L water) or fluxapyroxad + difenconazole (30ml/100 L water) at green tip stage.

Peach

- ◆ Recommended varieties for Plain, Bhawar and Trai area Partap, Early grand, Floridasum, Floridaprince, Floridared, Floridagold, Sarbati, Sarbatisurka, Pant peach 3.
- ◆ Recommended varieties for lower hilly areas are Red june, Paradelux, Totapari, Safeda, early white jaint, Alekzendar, Red gold, Sun heaven, Snow queen.

Plum

- ◆ Varieties for Plain, Bhawar and Trai areas are Satlajpurple, Kalaamratsari, Aloochapurple, Tetro, Kabuli greengang.
- ◆ Recommended varieties for lower hilly areas are Centarosa, Beauty, Redbute, Frontier, Maripoza.
- ◆ Varieties for hill areas are Sweet early, Methle, Celse, Elephantthard, Maripoza.

Apricot

- ◆ Recommended varieties for lower hilly areas are Newkesar, Harkot, Earlysikle, Kesa, Naeeth, Safeda, Charm agi, Sakarpara.
- ◆ Varieties for hill areas are Kesa, Nageeth, Safeda, Charnnagi, Sakarpura.

Almond

- ◆ Recommended varieties for lower hilly areas are Drek, Ne-plus-altra, pearless

- ♦ Varieties for hill areas Marsid, Nanperil, IXL, Ne-plus-altra, Texas

Fish and Pond Maintenance during Winter Season

- ♦ Fish, being a cold-blooded aquatic animal, needs special care during winters. As temperature of the surface water is colder than the bottom layers, the fish prefers to live in the bottom zone. Farmers shall keep the water depth up to 6 feet, so that it gets enough space for hibernating in the warmer bottom zone. In shallow waters, the whole water column becomes cold, which affects the fish and can prove fatal.
- ♦ As day length and light intensity also decreases during winters, oxygen levels decline in ponds due to reduced photosynthetic activity. The situation further aggravates during continuous cloudy days. The farmers are advised to aerate their ponds either by adding fresh water or by using aerators, especially during early hours of the day.
- ♦ Feed intake of fish decreases with decrease in temperature as its digestive system becomes sluggish. Hence, it is essential to reduce the feeding rate by 50-70 % depending on the temperature.
- ♦ In case the temperature falls below 50 degrees, it is advice to stop feeding. Excess feed remains unconsumed and accumulates at the pond bottom, which deteriorates the water quality.
- ♦ Farmers are further advised to use low protein diets. It is also necessary to reduce/stop adding organic manures such as cow dung, poultry droppings, and pig dung in the pond as rate of decomposition of organic manures declines due to poor microbial activity during winters. It is also advised to go for periodic raking of bottom soil (with the help of barbed wire) to prevent any suspected accumulation of toxic gases at the pond bottom.

Animal care during winter season

- ♦ Feed more roughages (like hay, straws. etc.) or forages (berseem) to maintain the milk production and body heat of the dairy animals.

- ◆ Additional quantum of grains like maize, wheat, oats, or readily available whole grains can be given to animals for meeting their energy requirements which generally increases during winters.
- ◆ Use of oil cakes such as mustard oil cake, cotton seed cake etc. can be fed. Seed cakes suffice the protein requirements of the animals and boost production.
- ◆ Calves should be fed with more milk, Increase the feedings per day from two to three times while holding the amount per feeding the same.
- ◆ Hypothermia is a major risk for neonatal calves, and housing, feeding and hydration are key considerations for minimizing hypothermia.
- ◆ During harsh winters, keep animals indoor but take care of ventilation. Keep a vent open for air to pass through the animal house.
- ◆ In case of loose housing system, use curtains around the animal house. The curtains can be made from tarpaulin, bamboo, dry grass, paddy straw, jute bags, guinea bags, jute, etc.
- ◆ Chop the branches of the shady trees which will enhance the infiltration of sunlight in the animals shed.
- ◆ Temperature of drinking water. The water should not be frozen in any case. If the water is too cold, add some hot water to it for balancing the temperature and making it lukewarm.
- ◆ Young stock should be provided with protective clothing to prevent heat loss from the body and providing warmth which can be made from gunny bags, sacks, blankets etc.
- ◆ If the floor of the animal house is concreted, it should be covered with bedding usually comprising of straws which will providing insulating effect and prevent heat loss. Provide a bedding of about 4 to 6 inches to prevent heat loss due to conduction.
- ◆ Keep the floor and bedding of the animal dry using sand, woodchips, saw dust, straws, rice husk etc.

- ♦ For the bed drainage of urine and other excretions, maintain proper alleys and drains. Wet floor may lead to diarrhea, fever, pneumonia, coccidiosis, hypothermia leading to death, etc. Young animals are at higher risk of developing disease due to wet floors.
- ♦ Avoiding overcrowding of the animals in shed as it leads to accumulation of ammonia which may hasten and enhance severity of respiratory problems especially pneumonia. Use recommended floor space for housing animals.
- ♦ For proper elimination of ammonia, livestock waste and other disease-causing pathogens, it is advisable to clean shed twice a day. It will also enhance ventilation in shed.
- ♦ Winters bring chapped and cracked skin to animals as well and udder being the most sensitive part. Care should be taken to dry the udder of dairy animal thoroughly and if the udder becomes chapped or raw, there are many commercial balms and moisturizers that are highly effective in healing and moisturizing udders. Lavender oil, calendula, peppermint oil, etc. can be used for making udder balm at home.
- ♦ Do not clip hair during harsh winter. Clipping of hairs is advisable before and after winters.
- ♦ Deworm the animals at regular intervals. It is advisable to repeat deworming after 21 days of the first dose to prevent worms and their larvae from development.
- ♦ Timely vaccination.
- ♦ Timely sowing of winter fodder crop as Berseem (Vardan, Maskavi, VL 10, VL 42 VL 43) and Oat (UP094, UPO 11, Pant Oat 3) in October to mid-November.

Zone-II**RAJASTHAN****General**

- ♦ **Collection of soil samples just after harvesting of *Kharif* crops for analysis purpose:** After harvesting of *kharif* crops, collect soil samples for different plots from the field for soil analysis purpose. This will help in scientific nutrient management planning for different crops to be sown in forthcoming *Rabi* season, Nutrient Use Efficiency (NUE) could be increased, and this will help in proper soil health. Using recommended dose of fertilizers as per soil testing report in balanced ratio, the production as well as economic profit could be increased.
- ♦ **Soil Moisture Conservation:** Generally, in Rajasthan state monsoon remains active up to the end of September month, rainfall in fallow fields or in *kharif* cropped fields at harvesting time can be conserved through ploughing followed by planking for early sowing purpose of different *Rabi* season crops like Rapeseed-mustard, Taramira, gram. By doing this farmer can save one irrigation water (to be used in pre-sowing irrigation) which could be utilized in these crops on later critical stages.
- ♦ **Application of Gypsum and organic manures:** As per soil testing report application of gypsum in the fields during land preparation to maintain the soil pH at optimum level should be done. This will help to enhance availability of different plant nutrients especially Ca & S, as gypsum is the cheapest source of these two secondary nutrients for plants. This increased availability of all plant nutrients will help in higher production and quality improvement in *Rabi* crops especially in oilseeds & Pulses. To increase organic carbon level in the soil, application of decomposed FYM or any other organic manure in the soil as per availability and mix in the soil during land preparation should be done. This will improve

soil fertility and dependency on inorganic fertilizers could be minimized. This will improve physical, chemical, and biological properties of the soil.

- ♦ **Timely availability of quality Seed:** Seed is the most important critical input in crop production, therefore, availability of quality hybrid/improved variety certified seed at right time at local level and at genuine rate is the prime need of the time. For this, farmers may contact and purchased quality seed from their nearby KVKs, Agricultural Research Stations, SAUs, different ICAR Institutes and cooperative societies. If purchased seed is already treated than ok, otherwise it must be treated as per recommendation of FIR System before sowing.

Rabi crops:

Taramira (*Eruca sativa*)

Rabi oilseed crop which is mostly grown in *barani* or in limited irrigation facility areas, as it is a drought tolerant oilseed crop. It can be grown in low fertile soils with conserved moisture also. Rainfall during late monsoon period could be conserved in soil through ploughing and planking and sowing can be done.

- ♦ *Seed Rate and sowing:* 5-6 Kg/ha, in *barani* areas sowing time depends on available soil moisture and prevailing temperature. As per soil moisture availability sowing can be done in between mid-September to mid-October with 40-45 cm row distance
- ♦ *Improved Varieties:* T-27, RTM-314, RTM-2002

Mustard

Major *Rabi* oilseed crop of the state and Rajasthan ranks first in mustard cultivation in the country, which is cultivated in irrigated areas as well as in *barani* areas through conservation of last monsoon rainfall moisture in the soil. This crop gives higher net return per unit area in comparison to other *Rabi* crops even under low investment and low irrigation facility. Rainfall during late monsoon period could be conserved in soil

through ploughing and planking and sowing can be done in between late September to mid-October. Late sowing results into more incidence of sucking pest and white rust.

- ◆ *Seed Rate:* 4-6 Kg/ha
- ◆ *Manure and Fertilizers:* Apply 8-10 ton well decomposed FYM, if available and mix properly in the soil before sowing. Use chemical fertilizers as per soil testing report recommendations & if report is not available then in irrigated areas apply 80-90 Kg N, 40 Kg P & 40 Kg Sulphur/ha. Use total quantity of N in 2-3 split doses and total quantity of P (prefer SSP instead of DAP) as basal dose.
- ◆ *Improved Varieties:*
 - *For normal situations:* NRCDR-2, DRMRIJ-31, NRCHB-101, RH-30, RGN-73, Bio-902, Aravali, RH-725, PM-32 (Biofortified).
 - *For Barani areas:* RGN-48, RGN-298, RGN-229
 - *For late sowing:* RGN-145, RGN-236



- ♦ To manage termite, use 2-3 ml Imidachloprid 48 FS or 2-3 ml Thiomethaxom 30 FS / kg seed for seed treatment purpose.
- ♦ For weed management purpose apply Pendimethalin 30 EC or Pendimethalin 38.7 CS @ 1 Kg active ingredient as pre-emergence application in 500 litre water just after sowing of mustard.

Chickpea

Gram is a most important *Rabi* pulse crop grown in almost all districts of Rajasthan state under moisture conserved *barani* conditions through conservation of last monsoon rainfall moisture in the soil or under assured irrigated conditions. Suitable time for its sowing is October month.



- ◆ **Improved Varieties:**
 - *Desi:* CSJ-515, IPC 207-28, GNG-1488, GNG-1581, GNG-2144, GNG-2171, GNG-1958, GNG-663, Pratap Chana-1.
 - *Kabuli:* GNG-1969, KAK-2, Shubhra, Ujjaval
- ◆ *Seed Rate:* 60-70 Kg/ha (As per seed size for small and large seeded chickpea, respectively), 100-130 kg/ha for Kabuli chickpea.
- ◆ *Manure and Fertilizers:* Apply 8-10 ton well decomposed FYM, if available and mix properly in the soil before sowing. Use chemical fertilizers as per soil testing report recommendations & if report is not available then apply 20 Kg N, 40 Kg P & 250 Kg gypsum/ha. In zinc deficient areas apply 25 kg Zinc sulphate/ha.
- ◆ For weed management apply Pendimethalin 30 EC or Pendimethalin 38.7 CS @ 1 Kg active ingredient as pre-emergence application in 500 litres water.
- ◆ For Collar rot disease management, treat the seed before sowing by Trichoderma powder or liquid suspension.

For management of pod borer in chickpea spraying of 250 L.E. HaNPV 5% NSKE followed by 1.25 liter Indoxacarb/ ha. Installation of 7-10 /ha pheromone traps for critical monitoring of attack of pod borer. **Barley**

- ◆ A *Rabi* season dual purpose cereal crop cultivated for grain as well as for fodder in almost all districts of semi-arid and arid region of Rajasthan & can be cultivated in all type of soils. It can also be cultivated under certain abnormal situations like late sowing, *barani* situations, less fertile soils as well as in saline and alkali soils. As a result of release of improved varieties, productivity levels increased significantly.
- ◆ *Improved Varieties:* RD-2035, RD-2052, RD-2503, RD-2552, RD-2668 (Malt rich two row barley), RD-2715, RD-2786, RD-2794, RD-2849
- ◆ *Seed Rate:* 80-100 Kg/ha
- ◆ *Sowing Time:* Mid October-Mid November



- ♦ To manage fungal diseases, treat the seed with Vitavax power @ 2 g/kg seed and for termite control with Fipronil 5 SC @ 8 ml/kg seed.
- ♦ *Manure and Fertilizers:* Apply 8-10 ton well decomposed FYM/ha, if available and mix properly in the soil before sowing. Use chemical fertilizers as per soil testing report recommendations & if report is not available than apply 100 Kg N, 40 Kg P & 20 Kg potash/ha. In zinc deficient areas apply 25 kg Zinc Sulphate /ha. Use total quantity of N in 2-3 split doses and total quantity of P & K as basal dose.

Wheat

- ♦ A major *Rabi* cereal cultivated almost in all parts of the state & for higher yield potential it requires sandy loam and loam, fertile and higher WHC soils under irrigated situations. In Rajasthan state it is mainly cultivated under irrigated conditions.
- ♦ *Improved varieties:* Raj-1482, Raj-3765, Raj-3777, Raj-4037, Raj-4120, Raj-4079, Raj-4238, KRL-210, BWD-303, DWD-48 (Bio fortified variety).

- ♦ *Seed Rate*- 100-120 kg/ha.
- ♦ *Sowing Time*: November
- ♦ *Manure and Fertilizers*: Apply 8-10 ton well decomposed FYM/ha, if available and mix properly in the soil before sowing. Use chemical fertilizers as per soil testing report recommendations & if report is not available than apply 120 Kg N, 60 Kg P & 40 Kg potash/ha. In zinc deficient areas apply 25 kg Zinc Sulphate /ha. Use total quantity of N in 2-3 split doses and total quantity of P & K as basal dose.
- ♦ To manage fungal diseases, treat the seed with Vitavax power @ 2 g/kg seed and for termite control with Fipronil 5 SC @ 8 ml/kg seed.

Fenugreek (Methi)

- ♦ A *Rabi* season seed spice crop & cultivated in many districts of the state. Soil & climatic conditions of the state are favourable for its better growth & higher yield. Being a leguminous seed spice crop, it improves soil fertility also.
- ♦ *Improved varieties*: RMt-1, RMt-305, AFg-1, Afg-3
- ♦ *Sowing Time*: 2nd fortnight of October month.
- ♦ *Seed Rate*: 20-25 kg/ha
- ♦ *Manure & fertilizers*: should be applied as per soil testing report & if soil testing report is not available than apply 8-10 ton well decomposed FYM/ha, if available and mix properly in the soil before sowing. Use chemical fertilizers @ 20 Kg N, 40 Kg P & 250 Kg gypsum/ha. In zinc deficient areas apply 25 kg Zinc Sulphate /ha. Use total quantity of N in 2 split doses and total quantity of P & K as basal dose.
- ♦ Treat the seed with Carbendazim 50WP @ 2 g/Kg seed for control of fungal diseases and followed by insecticide & Rhizobium culture.

Other activities to be performed:

- ♦ To achieve higher water use efficiency (WUE) of available irrigation water, especially in canal area, land should be levelled with Laser Land Leveller before sowing of *Rabi* season crops.
- ♦ Collect, Harvest & Conserve maximum rainwater as much as possible in Farm Pond or Plastic based water pond and minimize the losses of conserved rainwater for life saving irrigation on different critical stages during moisture deficit conditions, to achieve higher productivity level.
- ♦ As per availability of resources, prepare proper work plan for sustainable farming/ organic farming/ Paramparagat Krishi in Rabi season and for this nearby KVK may help you in providing proper advisory and guidance.
- ♦ Adopt appropriate IFS Models as per availability of different resources, infrastructure, and facilities on their farm.
- ♦ Eligible farmers register themselves for Pradhanmantri Fasal Bima Yojna (PMFBY) benefits, to minimize the risk from natural calamities.

Horticultural Crops

Fruit crops

Ber

- ♦ *Recommended varieties:* Seb, Gola, Umran, Ilaichi, Kaithali, Mundiya
- ♦ *General Management of orchard:*
 - Orchard should be clean and weed free.
 - To get higher fruit yield it is recommended to place two honeybee colonies or hive/Acre in September month for better pollination because honey bees play important role in pollination. Irrigation should be applied regularly at 10-15 days' interval.

- Plants should be covered with Kheenp (*Leptadenia pyrotechnica*) or Munja grass (*Saccharum munja*) during the December month to protect from frost. Intercultural operations should be done regularly in orchards.
- Foliar spray with Gibberellic acid 80 ppm during October and December month increases fruit size and stop fruit dropping.
- ♦ *Nutrient Management:*
 - Apply pyrite or gypsum @ 6-8 kg/pit according to soil pH.
 - Nitrogenous fertilizer should be applied in two split doses, first dose should be applied during July- August and remaining half dose of Nitrogen fertilizer should be applied during the fruit setting in the month of October-November.
 - Need to apply light irrigation after application of fertilizers.
- ♦ *Post flowering irrigation management:*
 - Need to be apply light irrigations during the September-October month at 10 days' interval (flowering started in September month and fruit setting completed in October month).
 - Irrigation should be stopped before 15 days of fruit ripening or maturity to harvest good quality fruits and helpful in reducing the problems like delayed maturity, fruit cracking, disease problem etc.
 - There is need to regular intercultural operations after every irrigation to maintain soil moisture. Mulching with black polythene or organic mulch with dried plant material like buee or sarkanda or wheat straw to maintain the soil moisture. Foliar spray should be done with Kaolin 7.5% which is helpful in checking of evapotranspiration from plants.
- ♦ *Insect-pest and disease management advisories:*
 - It is advised for soil racking to expose the pupae of fruit fly.
 - There is chance of powdery mildew in October month, apply foliar spray of Kerathan @ 1ml/lit. water or Carbendazim

(Bavstin) @ 0.05% or Sulphur powder @ 0.2% at the time of pea size fruiting and spray should be repeated at 15 days' interval to manage powdery mildew disease.

- Foliar spray with fungicide Hexaconazol 5% SC or propiconazole 5% SC @ 1ml/lit water to manage fruit rotting and black leaf spot of leaves.
- To manage fruit fly install Methyl eugenol trap @ 6 trap/Acre, use fruit fly resistant varieties namely Safeda, Umran, Ilaichi, Sanaur-1 and foliar spray with poison bait (100g Jaggery or molasses+2ml deltamethrin 2.8EC in one-liter water) on tree trunk at weekly interval. Foliar spray with Azadirachtin (0.3%) @ 2.5 ml or Chloropyriphos 20 EC @ 2ml/liter water at the time of pea size fruiting also help in managing fruit fly.
- For termite management avoid application of undecomposed FYM, drench with Chloropyriphos 20 EC @ 1ml/ liter water if termite infestation observed.

Citrus

- ♦ For managing Citrus canker apply Streptocycline @ 250/100 water and NSKE @ 5kg/100 lit. water.
- ♦ For the management of leaf minor spray with Rogor or Metasystox @ 300 ml/100 lit water
- ♦ Fruit dropping is a serious problem before harvesting, hence foliar spray should be done with 10 ppm 2,4-D (1g/100 lit. water)
- ♦ Apply third dose of nitrogenous fertilizer during September month.
- ♦ During October, to fulfill the requirement of micronutrients apply zinc sulphate, magnesium sulphate, boric acid and slacked lime (each @ 1kg/450 lit. water), apply 500 ppm Streptocycline if citrus canker damage is observed during this month.
- ♦ During October at least one intercultural operation should be done in citrus orchards.
- ♦ For the management of Gummosis problem in December month, it

is advised to scrap the gum from bark of the affected parts and apply paste of Bordeaux mixture (1:2:20 ratio), in severe incidence soil drenching with matalaxyl or foliar spray with Fosetyl-Aluminum is recommended.

- ♦ Fruits orchard should be clean and weed free.

Papaya

- ♦ In papaya nursery raising and planting at 2.5 m row and 1.6 m spacing is recommended for higher yields and income.

Aonla

- ♦ In *Aonla regular* orchard cleaning, irrigation and fruit drop can be managed by spray of borax 6g/ liter water.

Guava

- ♦ In *Guava* application of manure and fertilizer and regular cleaning and irrigation in orchard. In this season harvesting the fruit and protect plants from stem and fruit borer pest.

Pomegranate

- ♦ In *Pomegranate* harvest *Mrig Bahar* fruits and protect the plant from fruit rotting, leaf and fruit spot disease.

Lasora

- ♦ In Gunda (*Lasora*) orchard cleaning should be done and defoliate the leaves for early fruiting.

Sapota

- ♦ In Sapota flowering start in September to October, so orchard should be kept clean and after fruit setting *application* of fertilizer and regular irrigation should be initiated.

Seed Spices

Cumin

- ♦ *Recommended varieties:* Cumin- GC-4 and RZ-223
- ♦ *Seed rate and sowing:* 12-15 kg seed/ha, sowing of cumin should be done in the second fortnight of October and up to 05th November in line with Row-to-row distance of 30 cm.
- ♦ *Soil and field preparation:* Sandy and sandy loam soils are suitable for cumin cultivation. Field should be prepared well with help of cultivator and harrow
- ♦ *Nutrient management:* FYM @ 10-15 ton/ha, 20 kg P, 10 kg ZnSO₄ and 15 kg K should be applied before sowing during the field preparation and 30 kg Nitrogen fertilizer should be applied in two split doses; first dose before sowing and remaining second dose 30-35 DAS with the light irrigation. It is also recommended to apply microgranular mixture of Sulphur 67 WG+ 14% Zn @ 10 kg/ha and top dressing with Sulphur 90% WG @ 7.5 kg/ha to get more seed yield.
- ♦ *Soil treatment:* Soil application of Trichoderma viridae @ 2.5 kg / ha mixed with 100 kg FYM or 250 kg castor cake or 250 kg Neem cake before sowing.
- ♦ *Seed treatment:* Seed treatment with Trichoderma viridae @ 10g/kg seed or carbendazim 2g/kg seed for the management of fungal diseases. For management of the sucking insects like aphids, thrips etc. seed treatment with Imidacloprid 70 WP @ 7.5g/kg seed is advised.
- ♦ *Intercropping and interculture:* Due to risky nature of cumin, it is advised to adopt intercropping of cumin and Isabgol in 4:4 ratios. Two interculture (hoeing and weeding) operations required; first at 30-35 DAS and second at 55-60 DAS.
- ♦ *Irrigation management:* Light irrigation should be applied just after sowing and second irrigation apply after 7 days of first, subsequently irrigations should be applied at 15-25 days' interval. During grain

formation stage last irrigation should be given with full amount of water and no need to apply irrigation at maturity stage.

♦ *Insect-pest management:*

- *Aphids:* Installation of yellow sticky traps @ 10-12 trap/ha followed by foliar spray with neem oil 3000 ppm @ 3ml/lit. water or NSKE 5% or Imidacloprid 17.8 SL @ 0.3ml/lit. water
- *Powdery mildew:* dusting with sulphur powder @ 25 kg/ha in morning hours is recommended followed by foliar spray with Kerathan (Dinocap) @ 1ml/lit. water at 10-15 days' interval
- *Blight:* Advised to foliar spray with fungicide propiconazole or hexaconazole 5% SC @ 1ml/lit. water
- *Wilt:* it is a serious disease in cumin, follow seed treatment and soil treatment with Trichoderma and Bavstin before sowing as suggested above
- Moisture level of seeds should be maintained below 8.5-9 per cent for long storage

Coriander

- ♦ *Recommended varieties:* Ajmer coriander-1, 2 & 3, Gujarat Coriander-4, Pusa selection 360, Hisar Sugandh, Hisar Anand, RCr-20, 41 & 436
- ♦ *Soils and field preparation:* In irrigated conditions sandy to sandy loam soils and in rainfed conditions heavy black soils with increased water holding capacity are suitable for coriander cultivation. Field should be deep ploughed once with disc plough, subsequently 2-3 times ploughing with the help of cultivator and harrow
- ♦ *Manure & fertilizers:*
 - FYM @ 10-12 ton/ha,
 - For irrigated conditions: 60 kg N: 30 P: 20 kg K and 10 kg ZnSO₄
 - For Rainfed conditions: 30 kg N; 30 kg P
 - Full dose of phosphorus and potash, one third dose of nitrogen

should be applied before sowing during the field preparation and remaining nitrogenous fertilizer should be applied in two split doses: first dose before sowing and remaining second dose 30-35 DAS with the light irrigation.

- ♦ *Soil treatment:* Soil application of *Trichoderma viridae* @ 2.5 kg / ha mixed with 100 kg FYM or 250 kg castor cake or 250 kg Neem cake before sowing.
- ♦ *Recommended Seed rate and sowing:* 10-12 kg seed/ha for irrigated and 12-15 Kg/ha for rainfed/partially irrigated conditions. Suitable sowing time is ranges from 15th October to 15th November, it should be done on or before 15th November. Row to row distance: 30-45 cm in line sowing
- ♦ *Seed treatment:* Advised to Seed treatment with *Trichoderma viridae* @ 10 g/kg seed or carbendazim 2g/kg seed for the management of fungal diseases, also advised to seed treatment with Imidacloprid 70 WP @ 7.5g/kg seed to manage the sucking insects like aphids, thrips etc.
- ♦ *Irrigation management:* Light irrigation should be applied just after sowing and second irrigation apply after 7-10 days of first, subsequently irrigations should be applied at 15-25 days' interval. 4-6 irrigation in light soils and 3-4 irrigations in heavy soils are sufficient to achieve good production of this crop.
- ♦ *interculture operations:* Two interculture (hoeing and weeding) operations required; first interculture at 30-35 DAS and 60-65 DAS.
- ♦ *Plant protection measures:*
 - Growing castor or marigold as a trap crop for the management of Spodoptera.
 - Plant tall border crops like maize, sorghum for the management of mites, aphid and thrips.
 - Crop rotation of non-host crops like cereal crops for 3 years must be followed.
 - *Aphid and thrips:* Installation of yellow and blue sticky traps

@ 10-12 trap/ha each followed by foliar spray with neem oil 3000 ppm @4ml/lit. water or NSKE 5% or Imidacloprid 17.8 SL @ 0.3ml/lit. or acephate 75 SP @ 1.5 ml/lit. water

- *Seed midge*: foliar spray with neem oil 3000 ppm @4ml/lit. water or NSKE 5% or methyl-O-demeton 25 EC @ 1ml/lit. water
- *Powdery mildew*: Dusting with Sulphur dust @ 20-25 kg/ha in morning hours is recommended followed by foliar spray with Kerathan (Dinocap) @ 1ml/lit. water at 10-15 days' interval, harvesting of the mature crop should not be delayed avoiding powdery mildew attack.
- *Blight*: cloudy weather and high humidity at flowering stage is favourable for this disease, advised to foliar spray with fungicide propiconazole or hexaconazole 5% SC @ 1ml/lit. water at 15 days' interval.
- *Wilt*: Follow seed treatment and soil treatment with Trichoderma or Bavstin before sowing as suggested above
- *Stem gall disease*: Use stem gall resistant variety Ajmer coriander-1 in affected areas, use of healthy seeds for sowing and seed treatment with carbendazim (Bavstin) @ 2g/kg seed and foliar spray with carbendazim @ 1g/lit. or hexaconazole 5 SC @ 1ml/lit. water
- *Frost management*: this crop is very sensitive to frost, during the chances of frosting apply light irrigation and foliar spray with sulfuric acid 0.1% at midnight to escape crop from the frost.
- *Storage*: Moisture level of seeds should be maintained below 8.5-9 per cent for long period storage.

Fennel

- ♦ Cool and dry weather is favourable for this crop and optimum temperature for germination (20-29° Celsius) and for growth (15-20° Celsius) is required.



- ♦ *Recommended varieties:* Ajmer fennel-1, Ajmer fennel-2, Ajmer fennel-3, Gujarat fennel-1, Gujarat fennel-12, Rajasthan Fennel-125, 143 & 157, Hisar Swaroop, G.F.- 11
- ♦ *Soils and field preparation:* sandy loam, loamy and black soils with good drainage containing enough organic carbon are suitable for this crop. Field should be deep ploughed once with disc plough, subsequently 2-3 times ploughing with the help of cultivator and harrow
- ♦ *Manure & fertilizers:* FYM @ 10-15 ton/ha, bio-fertilizers like azotobacter and PSB culture @ 5kg/ha, 250 kg gypsum, 90 kg N: 40 P: 30 kg K and 10 kg ZnSO₄ recommended, full dose of phosphorus and potash, one third dose of nitrogen should be applied before sowing during the field preparation and remaining nitrogenous fertilizer should be applied in two split doses; first dose apply one month later of sowing or transplanting and remaining second dose apply at flowering stage with the light irrigation.

- ♦ *Soil treatment:* Soil application of *Trichoderma viridae* @ 2.5 kg / ha mixed with 100 kg FYM or 250 kg castor cake or 250 kg Neem cake before sowing.
- ♦ *Recommended Seed rate and sowing:* 8-10 kg seed/ha for direct seeding and 1.5-2 kg in nursery for one ha area transplanting is sufficient. In direct seeding First week of October best for sowing of this crop. Row to row distance of 40-45 cm and Plant to plant distance of 15-20 cm should have kept in direct seeding method.
- ♦ *Seed treatment:* Advised to Seed treatment with *Trichoderma* @ 10g/kg seed or carbendazim 2g/kg seed for the management of fungal diseases, also advised to seed treatment with Imidacloprid 70 WP @ 7.5g/kg seed to manage the sucking insects like aphids, thrips etc.
- ♦ *Nursery management:* An area of 100 m² is sufficient for one ha transplanting, beds of 2x3 m prepared and incorporate 15-20 FYM, 2 kg DAP, 500 g urea and 500 g folidol powder per bed, seed should be shown in 20 cm row to row distance during the 15th of July to 15th August; transplanting should be done after 45 to 60 days.
- ♦ *Irrigation:* Light irrigation should be applied just after sowing or transplanting and thereafter 6-8 irrigations should be applied at 15-25 days' interval. At flowering and seed formation stage irrigation must be necessary for getting higher yield.
- ♦ *Interculture operations:* Two interculture (hoeing and weeding) operations required; first interculture at 25-30 DAS and 60 days after sowing or transplanting, thinning should be practiced at the time of first interculture if required.
- ♦ *Plant protection measures:*
 - Growing castor or marigold as a trap crop for the management of Spodoptera.
 - Plant tall border crops like maize, sorghum for the management of mites, aphid, and thrips.

- Follow crop rotation of non-host crops like cereal crops for 3 years.
- *Aphid and thrips*: Installation of yellow and blue sticky traps @ 10-12 trap/ha each followed by foliar spray with neem oil 3000 ppm @4ml/lit. water or NSKE 5% or Imidacloprid 17.8 SL @ 0.3ml/lit. or acephate 75 SP @ 1.5 ml/lit. water
- *Seed midge*: foliar spray with neem oil 3000 ppm @4ml/lit. water or NSKE 5% or methyl-O-demeton 25 EC @ 1ml/lit. water
- *Powdery mildew*: Dusting with Sulphur dust @ 20-25 kg/ha in morning hours is recommended followed by foliar spray with Kerathan (Dinocap) @ 1ml/lit. water at 10-15 days' interval, harvesting of the mature crop should not be delayed avoiding powdery mildew attack.
- *Blight*: cloudy weather and high humidity at flowering stage is favourable for this disease, advised to foliar spray with fungicide propiconazole or hexaconazole 5% SC @ 1ml/lit. water at 15 days' interval.
- *Wilt*: Follow seed treatment and soil treatment with Trichoderma or Bavstin before sowing as suggested above
- *Gummosis disease*: Use healthy seeds for sowing, seeds should be treatment and crop rotation should be followed to minimize this problem
- *Root and stem rot disease*: stem and root rotting is a common symptom of this disease, small and big size sclerotia seen on the roots. Disease can be controlled by seed treatment with carbendazim or bavstin @ 2g or Trichoderma @ 10 g/kg seed and crop rotation of 3 years.
- *Frost management*: this crop is very sensitive to frost, during the chances of frosting apply light irrigation and foliar spray with sulfuric acid 0.1% at midnight to escape crop from the frost.

- *Storage:* Moisture level of seeds should be maintained below 8.5-9 per cent for long storage
- ♦ Vegetable crops cultivation
- ♦ Sowing and cultivation of vegetable Pea/ Beetroot/ Brinjal/ Cabbage/ Cauliflower (Mid and late)/ Carrot/ Potato/ Palak/ Onion/ Radish/ Tomato/ Fenugreek/ Coriender/ Green onion/ Garlic/ Mustard leaves in September-October month.
- ♦ Sowing the seed after seed treatment with improved method for good germination and reduce time and cost of cultivation.
- ♦ Adopt crop rotation, select healthy and resistant varieties, deep ploughing of field can reduce the major leaf curl virus problem in chilli, Brinjal, Tomato and Potato.
- ♦ Manage Termite in soil-by-soil solarisation, summer ploughing and application of chloropyriphos powder @ 25 kg/ha and pest like fruit borer, stem borer, caterpillar, leaf minor, fruit fly etc. can be managed by regular spray of neem oil and other broad-spectrum insecticides.
- ♦ Transplanting of Mid and late cauliflower and cabbage/Tomato/ Chilli/ Brinjal/ Onion vegetables in the month of October-November.
- ♦ *Recommended varieties of various vegetable crops:*
 - *Tomato:* Arka Rakshak, Hisar Lalit, Pusa Ruby, Pusa-120, Best of all, Pusa Gaurav. Farmers are advised to adopt Triple resistant (resistant to leaf curl virus, bacterial blight, and early blight diseases) tomato variety 'Arka Rakshak' developed by IIHR, Bangalore to get more production.
 - *Vegetable Pea:* Bonneville, Azad P-3, Kashi Mattar, Arkel
 - *Carrot:* Pusa Kesar, Pusa Meghali, Pusa Rudhira
 - *Radish:* Pusa Chetki
 - *Onion:* Pusa White Flat, Pusa White Round, Pusa Red, Pusa Ratnar

- *Cabbage*: Golden Acre, Pusa Drumhead
- *Brinjal*: Pusa purple long, Pusa purple Cluster, Pusa Purple Round, Pusa Snowball-1, Pusa Snowball-2
- ♦ *Recommended seed rate and nursery raising*:
 - *Tomato*: 400-500 g (for Hybrid 125-150 g);
 - *Chili*: 500 g (200g for Hybrid);
 - *Brinjal*: 500 g (200g for Hybrid);
 - *Cauliflower & Cabbage*: 400-500 g; seed required for raising of seedlings in nursery for one ha area transplanting.
- ♦ It is advised to adopt line sowing (keep row to row distance 5-10 cm with 0.5-1.0 cm depth) method for nursery raising for vigorous seedling production.
- ♦ Advised to practice seed treatment with bio-pesticides like Trichoderma @ 10g/ kg seed for the management of soil borne fungal diseases, imidacloprid 70 WP @ or Thiamethoxam 30 FS @ 7-8 g/kg seed to manage the sucking insects in nursery as well as field.
- ♦ Farmers are advised to adopt raised bed planting system for vegetables. It provides low risk to water lodging sensitive crops, more saving of water (about 36% water saving compared to flood irrigation), more aeration for plant roots, more stability to plants and low incidence of diseases & weeds.
- ♦ Drip irrigation should be adopted by all vegetable growers to get higher yield with more water saving and low risk of insect-pests and diseases.
- ♦ Mulching: farmers are advised to adopt mulching in raised bed planting system, mulching can be done with black polyethene sheet or rice straw, wheat straw etc. which helps in 30-50% water saving, low incidence of insect-pests and diseases.
- ♦ Advised to adopt balanced fertilization, should be focused on micronutrient mixture like 'Kashi Sukshmshakti' to get higher production due to low risk of physical disorders, diseases etc.

- ♦ Advised to follow **Integrated Pest Management** instead of chemical dependency, the following steps should be undertaken-
 - *Cultural control*: deep summer ploughing, follow 2–3-year crop rotation, timely sowing, or transplanting, use of well decomposed FYM, field should be neat and clean etc.
 - *Mechanical control*: Installation of light traps for collecting phototropic insects, pheromone traps for the purpose of mass collection, mating disruption and monitoring, pheromone lures are available for tomato fruit borer, brinjal shoot & fruit borer, okra shoot and fruit borer, tobacco caterpillar etc., remove disease affected plants and destroy them to check the further spread (this practice most effective in virus affected plants), erection of bird perches @ 50-60/ha to increase predation of insects by birds



- *Biological control:*
 - Focus should be given on conservation of natural enemies and ensure regular releases of egg parasitoid *Trichogramma* sp.
 - Also advised to apply *Trichoderma viridae* @ 5kg/ ha mixed with 100 kg FYM to manage the soil borne diseases.
 - Foliar spray with *Beauveria bassiana* or *verticillium* @ 2-4 kg/ ha with 400-500 lit. water to manage the sucking insect problem in vegetables.
 - Advised to foliar spray of *Bacillus thuringiensis* (Bt.) @ 1 liter per hectare for the management of lepidopteran insect-pests.
 - Also advised to use HaNPV @ 250-500 LE/ ha to manage the tomato fruit borer, *Helocoverpa armigera*.
 - Advised to more focus on non-chemical method of insect-pest management in vegetables to avoid hazardous effects of chemical pesticides, botanicals are also an important component of IPM as suggested below- Foliar spray with NSKE 5% or Neem oil 2% or Azadirachtin 3000ppm @ 3ml/lit. water is effective against different insect-pests.
- *Chemical control:*
 - It is advised to use Ridomil M.Z. @ 2.5/lit. or Copper Oxy chloride @ 3kg/ 1000 lit. water to manage the foliar diseases in different vegetables.
 - To manage the viral diseases like leaf curl virus, yellow vein clearing virus, mosaic virus farmers should ensure the removal of *Datura* and *Makoy* weed plant from the field, adopt virus resistant varieties like 'Arka Rakshak' and practiced foliar spray with systemic insecticide like Malathion 50 EC @ 1ml/lit. water or Imidacloprid 17.8 SL @ 0.3ml/lit. water to manage the vector of such viruses.

- More focus should be given on new molecules like Spinosad 45 SL @ 200-250 ml/ha or Emamectin benzoate 5 SG 500 ml/ha or Indoxacarb 14.5 EC @ 200 ml/ha to manage the shoot and fruit borer and defoliator insects in tomato, brinjal, chili, okra etc.
- Mites also cause significant damage in vegetables, foliar spray with Sulphur 80 WDG @ 2g/lit. and Dicofol @ 2ml or Abametin @ 0.5ml or Spiromesifen @1 ml or Chlorofenpyr @1ml per litre water effective against mites.
- *Nematode management in vegetables:* Nematode is a serious problem in vegetables like tomato, brinjal, okra, chilli, potato etc. Farmers are advised to adopt integrated management as suggested below-
- Crop rotation, deep summer ploughing (May-June) of field followed soil solarization by covering the soil with black polyethene sheet for 4-5 weeks, soil application with *Paecilomyces lilacinus* @ 5kg/ha mixed with 100 kg FYM or 2.5 tone neem or castor cake to before sowing or transplanting. Soil also can be treated with the application of carbofuran 3G @ 25 kg/ha.
- Use of nematode resistant varieties:
 - *Tomato:* Hisar Lalit, Nematex, Pusa-120, Ronita, Kalyanpur-1, 2,3, Slecon-120, Hilani, Arka Vardan, Arka Rakshak
 - *Brinjal:* Black beauty, Vijaya, Banaras, Jaint
 - *Chili:* Pusa Jwala, N.P.-46-A, Mohini, K-2, C.A. 1366, C.A. 2123
 - *Okra:* I.C. 9773, I.C. 18960

Flower cultivation

- ♦ Training and pruning of rose should be done and spray of Diethane M-45@ 2 g/litre of water at cut portion.

- ◆ Sowing of gladiolus bulb after treatment of bulb with 2g per litre Bavistin solution for 10-15 minute.
- ◆ Sowing of winter annuals for decorative and commercial purpose in the month of September -October.

Advisory for Animal Husbandry

October Month

Cattles and Buffalo

- ◆ The month of October witnesses the onset of the winter season and in some areas, there are cold storms accompanied with rain. At such times the cattle and buffalo should be protected against illness caused due to cold weather.
- ◆ Make adequate arrangements to protect the animals from winter.
- ◆ Animal shed should be repaired before starting the winter season to protect from cold.
- ◆ Vaccinate the animals for Foot and Mouth Disease in this month.
- ◆ Start feeding of more roughages (like hay, straws, etc.) or forages to maintain the milk production and body heat of the dairy animals.
- ◆ Provide additional quantity of grains like maize, wheat, oats, or readily available whole grains to animals for meeting their energy requirements which generally increases during winters.
- ◆ For proper elimination of ammonia, livestock waste and other disease-causing pathogens, it is advisable to clean shed twice a day. It will also enhance ventilation in the shed.
- ◆ For better drainage of urine and other excretions, maintain proper alleys and drains. Wet floor may lead to diarrhea, fever, pneumonia, coccidiosis, hypothermia leading to death, etc. Young animals are at higher risk of developing disease due to wet floors.
- ◆ Clean animals with cloth during winters or simply give them grooming once a day to remove dirt and dust.
- ◆ Avoid the usage of water. If there is imminent need of using water

to clean animals, do it in the afternoon or hotter hours of the day. Clean animals immediately with cloth to prevent heat loss.

- ◆ Deworming of animals should be done at regular intervals. It is advisable to repeat deworming after 21 days of the first dose to prevent worms and their larvae from development.
- ◆ Mineral mixture and other supplements must be started to animal in this season.

Sheep and Goat

- ◆ The floor should be non-slippery and be covered with hay, husk, straws, etc. for insulation. Slippery floors lead to fracture of long bones in goats.
- ◆ Provide enough space in shed for all goats to be together safely.
- ◆ Provide a bedding of about 2 to 4 inches to prevent heat loss due to conduction. Haystack beds are admired by goats as they are soft and warm.
- ◆ Lice and mites are increasingly prevalent during the winter months. High infestations can cause anemia, poor coat and skin quality. Use of permethrins and pyrethrins is advisable as de-lousing agents. Ivermectin with recommendation from veterinarian can be used.
- ◆ Sheep and goat farmers should take special care of the body condition score of the meat animals much before the onset of winters. Animals with better body condition score have better insulation and do not readily lose heat.
- ◆ During winters, it is paramount to keep the barn dry and regularly trim the hooves to avoid problems such as foot scald or foot rot.
- ◆ The breeding males should be given an extra allowance of concentrate feed particularly grains during the mating period.
- ◆ Deworm the animals at regular intervals. It is advisable to repeat deworming after every 3-month completion of previous deworming.

Poultry

- ◆ Poultry house should be designed in such a way to provide all the comfort required by birds during winter.
- ◆ An east-west alignment of a rectangular house provides a maximum gain of solar energy in winter.
- ◆ House should be designed in a way that maximum sun light enters the shed during daytime.
- ◆ Birds should be protected from chilled winds, for this gunny bags should be hanged at the places from where the cold air enters. These gunny bags should be hanged down as soon as sunlight goes in the evening till the arrival of sunlight next morning.

November Month

Cattle and Buffalo

- ◆ This month is indication of starting the low environmental temperature compared to normal days.
- ◆ In case of loose housing system, use curtains around the animal house. The curtains can be made from tarpaulin, bamboo, dry grass, paddy straw, jute bags, guinea bags, etc.
- ◆ Reduce humidity to ensure better ventilation, preventing excessive moisture in sheds, roof dripping and ground freezing phenomenon.
- ◆ Hypothermia is a major risk in this season for neonatal calves, and housing, feeding, and hydration are key considerations for minimizing hypothermia.
- ◆ Lukewarm water should be provided for drinking purpose.
- ◆ Calves should be fed with more milk. Increase the feedings per day from two to three times, while holding the amount per feeding the same.
- ◆ Cold weather increases feeding needs of animals.
- ◆ Deworm the calves at regular intervals

- ◆ To prevent mastitis, continue to dip the teat in potassium permanganate after every milking for whole of the season.
- ◆ Maintain heat detection as a priority particularly in buffaloes for natural or artificial insemination.
- ◆ Vaccinate the animals for foot and mouth disease, if not vaccinated previously.

Sheep and Goats

- ◆ In severe cold weather, goats can crowd together for warmth, but this increases the likelihood of injury and respiratory diseases, so prepare a good shed for them before winter season.
- ◆ Sheep and goats should be dewormed multiple times a year to guard against stomach and round worms. Deworming should be done in November or December, and in the cases of high parasite load, deworm again 30 days later to break the lifecycle of the stomach worms and round worms.
- ◆ Sheep and goats tend to gain more weight during winters; therefore, care should be taken to provide them with sufficient ration and pastures for grazing or browsing.
- ◆ Lukewarm water should be provided for drinking purpose, especially to kid/lamb.
- ◆ Animals that have no shelter in winter season provide 30 percent more feed per day than animals that have access to shelter from the wind.

Poultry

- ◆ Around 6 inches of litter is needed in poultry houses during winter. The litter gives warmth to the birds during winter.
- ◆ If litter management is proper, it will be felt quite warm when taken in hand. Litter can be made from straw, sawdust, or wood shavings to the floor. Not only will this provide insulation for the birds' feet, but it will absorb feces better and is easier to clean.

- ♦ Birds release a lot of moisture in their breath and droppings which adversely affects their health, if there is restricted ventilation; it causes ammonia to build up in the air which causes respiratory problems. Ensure the supply of fresh air circulating around the house.
- ♦ Maintain the proper ventilation in poultry house. Keep the curtain open in the daytime.
- ♦ There should also be arrangement of exhaust fans to remove impure air.
- ♦ Deworming of chicks should be carried out with piprazine mixed in drinking water.
- ♦ To protect chickens from winter, Gunny bags/sacks should be planted around the farm.

December Month

Cattle and Buffalo

- ♦ This month have very cold environment, so provide a shelter for cattle and buffalo to get them out of the elements.
- ♦ Providing deep, clean, dry bedding is essential to keep the animals warm.
- ♦ An animal's nutrient requirements also go up as the temperature drops, especially in wet conditions followed by extreme cold. Feed more roughages (like hay, straws, etc.) or forages (Berseem) to maintain the milk production and body heat of the dairy animals. Roughages are generally preferable over concentrates due to their lower cost and greater heat release during digestion.
- ♦ If the grains are costly or not available, then the use of oil cakes such as mustard oil cake, cotton seed cake, etc. can be fed. Seed cakes suffice the protein requirements of the animal and boost production.
- ♦ Cattle and buffalo need more calories to keep themselves warm, especially cattle with less than moderate body condition.

- ◆ Keep a close eye on your herd to watch for additional signs of stress caused by cold weather. Older animal, animal with previous health issues and calves are the groups most susceptible to the cold weather.
- ◆ Provide lukewarm water for drinking purpose.
- ◆ Drop off milk samples for culture if cattle are having mastitis issues.

Sheep and Goat

- ◆ Goats are the hardy animals possessing thick coat of hairs and require least to be look after in winters. However, a night shelter should be provided to house goats to prevent them from chilling winds.
- ◆ Kid/lamb born in winter is more prone to cold stress or hypothermia. Bedding should be provided to protect them from cold floor.
- ◆ Young stock should be provided with protective shedding to prevent heat loss from the body and providing warmth which can be made from gunny bags, sacks, blankets, etc.
- ◆ During harsh winters, adult animals should also be covered for preventing heat loss.
- ◆ Foot health is an extremely important part of sheep and goat care. The animals dwelling in muddy or wet conditions are susceptible to cracked and bruised feet and can suffer from foot rot and warts.
- ◆ It can be more difficult to observe foot ailments during the winter season, thus, checking feet should be a part of winter chore routine. Use of zinc sulphate and copper sulphate for foot dips is advised.
- ◆ Sheep and goats require at least 4 hours of sunlight for keeping their body warm; therefore, exposure to sunlight in sunny days is important.
- ◆ The act of delivering offspring in sheep and goats generally takes place during late night to early morning in winters. Therefore, for newly born kids and lambs, keep soft bedding in the farm at some dry and warm higher place so that immediately after birth, they may be taken care of.

- ◆ Provide lukewarm water for drinking purpose because cold water may lead to digestive troubles.

Poultry

- ◆ Low temperature causes more feed intake and higher oxygen demand. Therefore, when the weather gets colder, it is essential to give the chicken plenty of food as they require extra energy for maintaining body temperature.
- ◆ In winter number of feeders should be increased as compared to summer. Feed should be available to the bird whole of the day.
- ◆ Consider rubbing chickens' wattles and combs with petroleum jelly to provide a barrier against the cold and protect them from frostbite.
- ◆ Provide continuous supply of fresh and clean lukewarm water to birds.
- ◆ Daily monitoring of temperature, humidity and ventilation inside the poultry house as well as outside temperature is recommended.
- ◆ Too high or too low a temperature in brooder house slows down growth and causes mortality.

January Month

Cattle and Buffalo

- ◆ This month also have very cold environment so keep continue with provide a shelter for cattle and buffalo.
- ◆ Animal feeding continue with roughages preferable over concentrates due to their lower cost and greater heat release during digestion.
- ◆ Use of oil cakes in the recommended quantities, such as mustard oil cake, cotton seed cake, etc. can be fed.
- ◆ Continue with your calf deworming programme
- ◆ Keep continue a close eye on herd to watch for signs of stress caused by cold weather.

- ♦ Drinking water should be heated to 10°C to ensure proper water intake.
- ♦ Sheep and Goat
- ♦ All suggestions provided during the last month for protection of the animals against cold and inclement weather may be practiced this month too.
- ♦ Neonant should be provided with protective clothing to prevent heat loss from the body and providing warmth which can be made from gunny bags, sacks, blankets, etc.
- ♦ Sheep require more energy in the winter to maintain body temperature. Utilize average- to good-quality hays during the early gestation period, when ewe nutrient requirements are low compared to late gestation and lactation.
- ♦ Lambs and kids should be vaccinated to prevent Enterotoxaemia.
- ♦ If animals are already consuming their maximum amount of dry matter and are still losing body condition, some roughage will have to be replaced with a more energy-dense feed, such as a grain.
- ♦ Vaccinate the animals for pox disease in this month.

Poultry

- ♦ Many of vaccines/medicine/vitamins are given to poultry through water and as the water consumption of bird is reduced during winter season, therefore, care should be taken that waterers are removed few hours prior to watering and ample amount of medication is added so that each bird gets benefit of medicine/vaccine or other supplements.
- ♦ If still in the month of January the birds huddle together in the farm, this indicates that the ambient temperature of the farm is low and heaters, bulbs and bukharis should be used to increase the temperature.
- ♦ In layer farms, add a supplemental light, if you want to increase egg production throughout the cold weather.

February Month

Cattle and Buffalo

- ♦ The controlled breeding programme for animals should continue in the month of February so that all participating animals become pregnant during this month.
- ♦ All new-born animals should be dewormed.
- ♦ To prevent mastitis in dairy cattle, they should be milked completely.
- ♦ Berseem and Alfalfa should be dried and stored as dry fodder for use during times of low or no green fodder availability.
- ♦ Sheep and Goat
- ♦ All suggestions provided during the last month for protection of the animals against cold and inclement weather may be practiced this month too because cold still present in this month.
- ♦ Lambs/kids should be vaccinated against PPR.
- ♦ Deworming should be done in this month also, in cases of high parasitic load.

Poultry

- ♦ As low temperature causes more feed intake and higher oxygen demand, provide adlib feed to the birds for rapid weight gain and egg production.
- ♦ If water is cold enough, then it should be given to chicken after adding hot water to it, so that the water comes to normal temperature.
- ♦ Store feed in dry place so that it may not get in contact with moisture.
- ♦ If birds fall sick, contact local veterinarian.

HARYANA AND DELHI

Wheat, chickpea, barley, and mustard are main *Rabi* season crops grown by farmers in Haryana and Delhi States. Though, there has been Substantive increase in the productivity of these crops, yet gap persists between the yield realized by the farmers and average yield of the improved varieties of these crops. For instance, productivity of wheat in Haryana and Delhi is, less than average yield of wheat varieties recommended for the states. Similar gaps have been registered for mustard and chickpea crops. Several factors have been identified which are responsible for this gap. Farmer's reluctance in adoption of improved practices of crop production is one of the main factors. The crop advisory prepared for the *Rabi* season crops of Haryana and Delhi States will be helpful for farmers in getting better crop harvest by adoption of improved practices of crop production.

Mustard

October Month:

- ♦ *Time for sowing:* Optimum time for sowing of mustard crop is from 30th September to 20th October.
- ♦ *Improved varieties*
 - *For irrigated conditions:* RH-30, Uravarshi, RH-8812, RH-0749, RH-9304, RB-50, Pusa Mustard-32 (Bio-fortified)
 - *For rainfed conditions:* RH-725, RB-50, RH-406, RH-0119
- ♦ *Seed rate & treatment:* Seed rate of 3.5 kg/ha is required for irrigated crop. Use 4.0 kg/ha seed for rainfed crop depending on availability of moisture in the fields. Treat the seed with carbendazim (2.0 g/kg seed) for management of stem rot disease.
- ♦ *Nutrient management:* Apply 80 kg N, 30 kg P₂O₅, 20 kg K₂O and 25 Kg ZnSO₄ (21%) per hectare in irrigated crop. Half dose of N and full dose of P₂O₅, K₂O and ZnSO₄ should be applied at the time of sowing. Use preferably single super phosphate for meeting

requirement of phosphorus and Sulphur. If Dia-mmonium Phosphate (DAP) is used for meeting phosphorus requirement, use 250 kg of gypsum/ ha at time of last ploughing of sowing. Also inoculate the seed with *Azotobacter* and PSB culture at the time of sowing. Apply 40 kg N and 20 kg P_2O_5 /ha at the time of sowing in rainfed crop.

- ◆ *Plant protection:* Painted bug causes damage to the emerging seedlings at the time of emergence. Spray 500 ml malathion 50 EC / ha in 500-liter water for management of the insect.

November Month

- ◆ Hoeing twice at three and five weeks after sowing of crop is essential for management of weeds. Spray glyphosate 41 % SL @ 62.5 ml/ ha in 375-liter water at 30 DAS for management of orobanche.
- ◆ Irrigate the crop at 35-40 days' stage. Apply remaining half dose of nitrogen at time of first irrigation by broadcasting.

December Month

- ◆ Second spray of glyphosate 41 % SL @ 125 ml/ha in 375-liter water may be done at 55-60 DAS.
- ◆ Foliar application of mancozeb @ 1.5 kg/ ha in 750-liter water is advised for management of white rust disease. The fungicide may be applied at the time of appearance of symptoms of disease and second spray if need may be done at 15 days' interval.
- ◆ Spray carbendazim (0.1%) at 45 and 60 DAS for management of stem rot disease in mustard growing areas where the disease appears regularly.
- ◆ January Month
- ◆ Aphid infestation takes place in end of December and first fortnight of January. Application of 625 ml dimethoate 30EC is advised for management of aphid.
- ◆ Irrigate the crop to mitigate the effect of frost.

Chickpea

October Month

- ♦ *Time of sowing:* Optimum time of sowing for chickpea (desi) is mid-October to end of October. Early sown crop is likely to be infested with wilt disease, therefore, avoid sowing of crop before 15th October. Sowing of Kabuli gram should be done in the last week of October month.
- ♦ *Improved varieties:*
 - *For irrigated conditions:* HC-1, HC- 3, HC- 5, CSJ-515, GNG-2144, GNG-2171
 - *For rainfed conditions:* HC- 1, RSG-501.



- ♦ *Seed rate:* Use seed quantity according to size of seed of the varieties. Use 40 kg seed/ ha of small seed size, 60 kg/ ha of medium seed size and 80 kg/ ha of bold seed size varieties.
- ♦ *Seed treatment:* Seed treatment with chloropyriphos 20 EC (1500 ml/100 kg seed) is advised for management of termite. Prepare 2.0-liter solution of water of above insecticides and treat 1.0 q

seed. Now treat the seed with carbendazim (2.5 g/ kg seed) or *trichoderma viridi* (4g) + vitavax (1g/ kg seed).

- ♦ **Sowing:** Sowing with pora method in rows at 30 cm spacing and at 10 cm depth is advised. Crop sown at shallow depth is likely to be affected by wilt disease. Keep spacing of 45 cm between rows for sowing of the crop under rainfed conditions.
- ♦ **Nutrient management:** Apply 15 kg N (30-35 kg urea) and 40 kg P₂O₅ (250 kg SSP or 80-90 kg DAP)/ha before sowing of the crop and use 25 Kg ZnSO₄ in light textured soils. Inoculate seed with rhizobium and PSB culture before Sowing.
- ♦ **Plant protection:** Wilt, root rot and alternaria blight are main disease of chickpea crop which affect crop yield adversely. It is advised not to do sowing of crop before 10th October for management of wilt disease. Treatment of seed as mentioned earlier should also be done for management of wilt disease. Root rot disease is also managed by the seed treatment practice adopted for management. Cultivation of disease tolerant/ resistant varieties is advised to manage alternaria blight disease

November Month

- ♦ Two hoeing-weeding at 25-30 DAS and 45-50 DAS are required for getting good crop yield.

December Month

- ♦ Apply irrigation before flowering as per crop need.
- ♦ Brown spot on the leaf indicate the deficiency of zinc, therefore, it is advised to apply 25 kg ZnSO₄/ ha before sowing of the next crop.
- ♦ Sometimes pod borer appears in December month and causes damage to leaves and flowers. For management of pod borer, spray 1-liter quinalphos 25 EC or 200 ml fenvalret 20 EC or 125 ml cypermetharin 25 EC or 375 ml novaluron 10 EC in 375-liter water/ ha.

January Month

- ◆ Where irrigation facilities are available, apply irrigation at 45-60 DAS.

February Month

- ◆ Pod borer attack may be possible in some areas for management of pod borer spray 1-liter quinalphos 25 EC or 200 ml fenvalret 20 EC or 125 ml cypermetharin 25 EC or 375 ml novaluron 10 EC in 375-liter water/ ha.
- ◆ Do monitoring of crop for alternaria blight disease especially in moist cold weather, remove the affected plants.

Wheat

November Month

- ◆ *Time of sowing:* Sowing of the crop at optimum time is an important factor contributing to crop yield. Optimum time of sowing for irrigated crop is from 25th October to 15th November. Under limited irrigation conditions sowing should be done from last week of October to first week of November. Under late sown conditions, it is advised to complete the sowing by 3rd week of December. Durum wheat varieties should be shown from last week of October to first week of November.
- ◆ *High yielding varieties:*
 - *For irrigated and timely sown conditions:* WH 1105, WH 1184, WH 283, WH 542, HD 2967, HD 3086, DBW 88, DBW 187, DBW 222, PBW 550.
 - *For light textured soils and limited irrigation conditions:* C-306, WH1025, WH 1080.
 - *Durum wheat varieties:* WH 896, WH 912 HD 943.
- ◆ *Seed treatment:* Seed treatment is cost effective technology for management of seed and soil borne diseases. Treatment of seed with vitavax or bavistin 2g or raxil-2 DS (1g/kg seed) is advised

before sowing of the crop. For management of seed borne Karnal bunt disease, seed treatment with thiram (2g) or raxil-2 DS (1g/kg seed) should be done. For management of termite in light textured soils, treatment of seed with chloropyriphos 20 EC (1.5 ml/ kg seed) or ethion 50 EC (5 ml/ kg seed) should be done before treatment with above fungicide.

- ♦ *Seed rate:* Use 100 kg seed per hectare for sowing of the crop timely.
- ♦ *Nutrient management:* It is better to apply fertilizers on soil test basis. In absence of soil testing, it should be applied on basis of general recommendation. Apply 150 kg nitrogen (325 kg urea), 60 kg P_2O_5 (375 Kg SSP or 125 Kg DAP), 30 kg K_2O (50 Kg MOP) and 25 kg $ZnSO_4$ (21%) per hectare in irrigated crop. Apply half dose of N and full dose of P_2O_5 , K_2O and $ZnSO_4$ at the time of sowing. Apply of 30 kg N (50 kg urea), 15 kg P_2O_5 (90 kg SSP for 33 kg DAP), 15kg K_2O (25 kg MOP) and 25kg $ZnSO_4$ (21%) the crop grown under limited irrigation availability. Apply all the fertilizers at the time of sowing.

December Month

- ♦ Late sowing of wheat may be done up to 3rd week of December. Increase seed rate by 25% for late sown crop. Seed rate of 125 Kg/ ha is to be used for varieties having bold seed size. Do seed treatment as above mention method.
- ♦ Varieties recommended for irrigated and late sown condition are: WH 1124, DBW 90, HD 3059, WH 1021, PBW373, RAJ 3765.
- ♦ Apply first irrigation 21-22 DAS after sowing and broadcast remaining half dose (75 kg/ha) of N.
- ♦ *Weed management:* Wheat crop gets infested with both broad and narrow leafed weeds.
 - *Management of broadleaf weeds:* Problem of broad leaf weeds occur in wheat crop where cotton-wheat, pearl millet- wheat, clusterbean- wheat cropping systems are practiced. *Bathua, kharbathua, gajri, jungali palak, piazi, krishan neel, senji,*

hirankhuri, *chatri-matri* etc. are main broad leaf weeds which infest wheat crop. These weeds can be managed by application of following herbicides depending on type of weed flora:

- Apply 2,4-D Na salt (80%) @ 625 g/ha or 2,4-D Ester (34.6 %) @ 750 ml/ha with 625-liter water at 30-35 days after sowing of the crop. Application of 2,4-D Na salt (80%) or 2,4-D Ester (34.6 %) @ 1500 ml/ha is advised for the management of *jungali palak*, *kandai* and *hirankhuri*.
- All types of broad leaf weeds can be managed by application of Metsulfuron @ 20g/ha + surfactant with 500 litres water at 30-35 days after sowing of the crop.
- Management of *malwa*, *jungali palak*, *hirankhuri* and other broad leaf weeds can be done by application of carbentrazone ethyl 40% DF @ 50 g/ha with 500-liter water at 30-35 days after sowing of the crop.
- Management of all type of broadleaf weeds in wheat can be done by application of Metsulfuron methyl + carbentrazonethyl @ 50 g/ha + 0.2 % surfactant with 300 litres water at 30-35 days after sowing of the crop.
- *Management of grassy weeds:* Wild oat (*Avena* sp.) and *kanki* (*Phalaris* sp.) are two grassy weeds which emerge in wheat crop. These weeds can be managed by application of any of the following herbicides-
 - Cladinafop 15 % W.P @ 400 g/ ha at 30-35 DAS.
 - Sulfosulfuron 75 W.P @ 32.5 g/ha + 1250 ml surfactant at 30-35 DAS.
 - Finoxaprop 10% EC @ 1kg/ha + 500 g surfactant at 30-35 DAS.
 - Pinoxaden 50% EC @ 1.0 liter/ha at 30-35 DAS.
- ♦ *Management of mixed weed flora:* There are some situations where both broad leaf and grassy weeds infest the crop. Management of

mixed weed flora can be done by application of any of the following herbicides-

- Apply Total (Sulfosulfuron + Metsulfuron) @ 40 g/ha with 500 liters water at 30-35 DAS. Do not grow sorghum, maize, and moong in fields where Total was applied.
- Apply Atlantis 3.6 WP (Mesosulfuron + idosulfuron) @ 400g/ha + 0.1 % Atlatis activator with 200-liter water at 30-35 DAS. Do not grow sorghum and maize in such fields after wheat crop.
- Vesta 16% WP (Cladinofof propyryzil + metsulfuron methyl) @ 400 g/ha +1250 ml surfactant with 500 liters at 30-35 DAS.
- Accord plus 22 % EC (Fenoxaprop + Metribuzin) @ 1250 ml/ha with 500-liter water at 30-35 DAS. Do not apply the herbicide in wheat varieties: PBW 550, WH 542 WH 283.
- ACM 9 (Cladinofof + Metribuzin) @ 600 g/ha with 500-liter water at 30-35 DAS.
- Shogun (Cladinofof + Metribuzin) @ 500 g/ha with 500-liter water at 30-35 DAS.
- *Management of resistant Phalaris in wheat:* Resistance against herbicides in *Phalaris minor* has been reported in rice-wheat system. Management of resistant biotypes of *Phalaris minor* is comparatively difficult in comparison to management of susceptible biotypes. Apply pendimethalin 30 EC @5.0 liter/ha as pre-emergance with 625-liter water or pyroxasulfon 85% @ 150 g/ha in combination with pendimethalin @5.0 liter/ha and in sequence apply pinoxaden 9% EC @ 1.0 liter/ha or cladinofof 15 % WP@400g/ha or sulfosulfuron 75% W.G. @32.5 g/ha or total @ 40 g/ha or atlantis @ 400g/ha or shagun @500g/ha or ACM 9 @600 g/ha at 30-35 DAS.

January Month

- ♦ If four irrigations are available, apply first irrigation at 22 DAS (CRI state), second irrigation at 45 DAS (tillering stage), third irrigation at 85 DAS (spike formation) and forth irrigation at 105 DAS. It is necessary to apply first irrigation at time. Apply first irrigation at 28-30 DAS in late sown wheat.
- ♦ Zn deficiency symptoms starts appearing at 25-30 DAS. Zinc deficiency in wheat appears as interveinal chlorosis on the most recently developed leaves; plants remain stunted and produce few tillers; if the deficiency is severe the leaves may turn white and dry. For management of Zn deficiency apply 2-3 spray 2.5 kg ZnSO₄ and 12.5 kg urea in 500-liter water at 10-15 days' interval.

February Month

- ♦ For the management of yellow rust disease as soon as symptom appears spray 2 kg zyneb (Dithane or indofil Z-78) or mancozeb (Dithane or indofil M-45) or propiconazol 25% EC 500 ml/ha in 625-liter water and repeat after 10-15 days' interval if required.
- ♦ For management of aphid, spray 1-liter malathion 50 EC in 625-liter water/ ha.

Horticultural Crops

September

- ♦ Apply 1250 ml monocrotophos 36 SL in 1250-liter water /ha for management of insects in citrus plants.
- ♦ If manure and fertilizers are not applied in guava plants, apply according to the age of plants. Apply 15g bavistin per plant for management of wilt disease. Foliar application of 2.5 kg ZnSo₄ + 5 kg urea in 500-liter water is advised.
- ♦ Apply 1.0 L of dichlorwas 76 EC/ha in 1250-liter water for management of hairy caterpillars in grapes.

October:

- ♦ Apply remaining half dose of nitrogen (500-600 g urea) along with irrigation per plant by the end of this month. Foliar application of 1 kg sulfex or 500 ml kerathane /ha in 500-liter water is advised for management of powdery mildew disease. Prepare emulsion of monocrotophos (10 ml) 36 SL or methyl parathion with water and apply on holes of insect for management of bark eating insect.
- ♦ On appearance of nutrient deficiency in citrus plants, spray 5kg ZnSO_4 and 2.5 kg slacked lime in 1000-liter water. Similarly, to recover nitrogen deficiency, spray 1-2 kg urea in 1000 L water.
- ♦ Spray Copper oxychloride (0.3%) in citrus plants for management of citrus canker problem. Do first spray in October, second in December and third in February.
- ♦ Interculture mango orchards so that larvae of mealy bug can be exposed to sunlight.

November:

- ♦ Apply irrigation in ber orchards after setting of fruits by end of the month. Apply remaining half dose of nitrogen (500 g urea) per plant. Irrigate the plants at 15-20 days' interval. Spray of urea (1.5%) and Zinc (0.5%) is recommended to avoid drooping of flowers and fruits. Spray 1.25 liter dimethoate 30 EC or 1.5 oxydemeton methyl 25 EC/ha with 1250-liter water for management of ber fruit fly.
- ♦ Plucking of *maushambi* and *malta* fruit is done carefully to avoid scratching on fruits.
- ♦ Interculture /hoeing is advised in mango orchards to destroy mealy bug eggs/larvae by exposing to sun light. Irrigation the mango plant at 15-20 days' interval.
- ♦ Collect the old, shaded leaves of grape plants and burn them. Remove the old bark from the plants.

December:

- ◆ Spray 1.0 kg sulfex or 500 ml kerathane/ha in 500 liter of water for management of powdery mildew disease in mid and late season varieties of ber. Spray 1.5 liter oxydimeton 25 EC or 1.25 liter dimethoate 30 EC/ha in 1250 L water for management of ber fruit fly.
- ◆ Complete the harvesting of kinnow fruits. Keep the orchard clean by removing weeds and other residues. Apply farmyard manure according to the age of the plants as given in table below and apply irrigation.

Age of the plant	Quantity of FYM
1-3 years	10-40 kg
4-6 years	40-70 kg
7 years and above	100 kg

- ◆ Apply irrigation in orchards at an interval of 20 days. Remove dry twigs and branches in old orchards. Efforts should be made to protect plants from frost. Apply irrigation if possible, to mitigate the effect of frost.
- ◆ Prevent mealy bug from climbing to mango plants. This can be done by fixing alkathene sheets on stem of pants up to a height of 1 meter.
- ◆ Complete harvesting of *aonla* plants by mid of December. Late harvest will lead to infestation of necrosis.
- ◆ Apply irrigation in guava orchards and manage the orchard.

Animal Husbandry:

September month

- ◆ Keep close watch on animals about symptoms of coming in heat and should be mated on right time

- ◆ Do not give too moisture fodder and feed which is prepared more than a week ago
- ◆ Provide adequate care towards the diet and nutrition management of newborn animals and if needed treat them under supervision of veterinary specialist.

October month

- ◆ Get your animals vaccinated against diphtheria to keep them disease free and healthy
- ◆ Daily supervision of animals during change in season for symptoms of any disease or poor health
- ◆ Proper management of health, nutrition, fodder, and feed to minimize cost of rearing your livestock in coming winter period

November month

- ◆ Get your animals vaccinated against foot and mouth disease to keep them disease free and productive.
- ◆ Use dry straw/grass on the animal floor during rainy period and cold waves
- ◆ Small animals and calves are more vulnerable and come in stress due to wet and cold conditions and therefore requires proper care.

December month

- ◆ Adequate management should be made to prevent animals from cold waves.
- ◆ Maintain temperature in shelter homes of animals to avoid harms due to cold weather.
- ◆ Use dry sac or woolen blankets to cover animals during cold waves.
- ◆ Special care of animal born in this month from cold weather.

January month

- ◆ Adequate provision to keep animals safe and healthy from cold waves.

- ◆ Maintain animal shelter clean, dry and hygienic.
- ◆ Animals should be provided fresh and clean drinking water.
- ◆ In case of attack of cold or any infection in animals contact to your veterinary doctor
- ◆ Problem of flatulence in animals is common during this winter period due to over grazing of green fodder berseem.
- ◆ Adequate provision of sunlight in animal shelters to keep animals warm and active.

Zone-III**UTTAR PRADESH****Soil Management**

- ♦ Soil testing for all fields is mandatory and also ensure that every field has its own soil health card.
- ♦ Application of sufficient quantity of inorganic fertilizers based on soil health card is advised to maintain soil health.

Grain Storage

- ♦ Store the grains and pulses in clean and pest free bags at dried and cool places; Treat the bags with 5% neem oil solution. The bags shall be stacked above the ground level. Farmers may put Neem leaves in the bags to prevent the grains from insect attack and moisture.
- ♦ Use of camphor 5-10gms/quintal
- ♦ Use of Parad Tikdi @ 8-10 tablets/quintal

Vegetable Nursery & Production

- ♦ Healthy nursery of Brinjal, Chilli and Tomato should be raised.
- ♦ Low tunnel poly house should be used for nursery raising to avoid white fly infection,
- ♦ Seed treatment practice should be adopted before sowing of vegetable seeds.

Fruit Production

- ♦ In Guava orchards apply 50 g carbofuron + 200 g neem cake with Trichoderma harzianum to control wilt Hands should be properly cleaned with with soap and water before, after and during harvesting operation

Vegetable care

- ◆ Proper washing of vegetables and fruits during pandemic is more important than ever before as it helps to remove various harmful microorganisms.
- ◆ Washing fresh produce is also important as it tends to have more soil attached to it than prepackaged fruits and vegetables.
- ◆ Farm women were also further advised to wash vegetables and fruits in lukewarm water by adding salt/ alum/ vinegar/ baking soda (1teaspoon in a bucket of 10 lt..) whichever is easily available at home and soaking them for at least 1-2 hours to make them free from any contamination.
- ◆ Wash vegetables before peeling and cutting, washing after peeling and cutting may lead nutrients loss.

Fodder & livestock management

- ◆ **Fodder management-** There are two major fodder crops Barseem and Oat.

Berseem

- ◆ Due to higher production potential, succulence, palatability, nutritive value, and continuous supply of fodder over a long period of seven months. It is popularly known as king of fodders. Apart from supplying protein, calcium, phosphorus, and other minerals it enriches the fertility of the soil and improves its productivity. In repeated cuttings from November to May end it yields about 400 quintal highly nutritious and palatable fodder.
- ◆ Mescawi, Wardan, JB-1, BL-10, BL-22, and BL-42 are important varieties. BL- 22 and BL-42 supply green fodder upto Mid-June.
- ◆ It grows well on loam to clay loam soils, rich in lime and having good drainage facilities. For growing of berseem land should be properly levelled and has good drainage. To prepare a good seed bed give three to four ploughings, each followed by planking.

- ♦ October to November is the best time of sowing.
- ♦ Berseem does not grow well on soils where it is sown for the first time, because it requires association with special species of bacteria (*Rhizobium trifoli*) which is essential for its proper growth. Prepare one litre of 10 per cent Gur solution with one packet of berseem culture for 8-10 kg seed treatment. Rub the culture on seed, dry the seed in shade and broadcast in standing water on the same day, preferably in the evening because the direct sunrays kill the bacteria.
- ♦ 20 to 25 kg seed require for one hectare. For getting early first cut and higher yield of good- quality fodder, mix 400 g seed of Chinese cabbage variety of mustard with the full seed rate of berseem. In case of November sowing mix berseem with oats, using half the recommended seed rate of oats.
- ♦ Apply eight tones of farmyard manure alongwith 20 kg phosphorus (125 kg single super phosphate) per acre at the time of sowing. In case absence of farmyard manure, apply 10 kg nitrogen (22 kg urea) and 32 kg phosphorus (200 kg single super phosphate) per acre. The application of phosphorus in the form of single super phosphate supplies Sulphur also. In case of berseem + ryegrass mix apply 10 kg N (22 kg urea) per acre after each cut.
- ♦ *Poa annua* (bueen) is a serious weed of berseem and it effect during the early period of growth. Spraying Basalin (fluchloralin) 45 EC @400 ml in 200 litres of water per acre before the sowing of berseem. Where the infestation of weed (*Trianthema portulacastrum*) is serious, delay the sowing to the second week of October, the incidence of weeds is drastically reduced due to the fall in temperature.
- ♦ The first irrigation is important and should be applied early to get a good crop. It should be given within 3-5 days in light soils and 6-8 days after sowing in heavy soils. Later on, irrigate at 8-10 days interval during summer and 10-15 days during winter depending upon soil type and weather.

- ◆ First cutting is ready after about 45 days of sowing and subsequent cuttings may be taken at 30-35 days intervals during winter and at 25-30 days intervals in spring and summer. It gives 5-6 cutting. Harvesting of berseem should be done with scythe that saves labour by about 50 per cent.

Oats

- ◆ Oats is an important fodder crop next to berseem. It yields about 200-220 quintal fodder per acre.
- ◆ It grows well in cool and moist weather conditions. High temperature at blossoming increases the proportion of empty spikelets and reduces the seed yield.
- ◆ It grows in all types of soils, except the alkaline or waterlogged. It can tolerate slight acidic and saline conditions.
- ◆ Improved varieties are Kent, OL-9, OS-6, OS-8, Haryana Jai, UPO-212, JAO 822.
- ◆ Prepare seed bed by giving three ploughings to make it free from weeds and pulverized.
- ◆ Optimum time of sowing is from second week to last week of October. 30-40 kg seed require according to varieties for acre by the kera method or with pora or drill in rows 25-30 cm. It can be 10-15% higher yield through sowing bi-directional method. Seed treated with @ 01 gm Vitavax per kg of seed to ensure freedom from smut.
- ◆ Apply 10-ton farmyard manure or compost per acre 15 days before the sowing with 25 kg urea at sowing time and 25 kg urea 25-30 days after sowing. In the absence of FYM, it requires 110 kg urea and 8 kg P₂O₅ (50 kg single Superphosphate or 50 kg DAP) per acre.
- ◆ Three to four irrigations including the pre-sowing irrigation are sufficient. First irrigation should be
- ◆ given 25-30 days after sowing and subsequent irrigations at an interval of 30-35 days. In case multicut management irrigation

should be given after each cutting.

- ♦ Control of weed, application of pre-emerg. linuron or post emergence of 0.2 kg 2,4-D per acre.
- ♦ The harvesting of oats from boot to milk stage. First cutting should be done 55-65 days after sowing leaving a suitable height of 3-4 inch and subsequent cuttings at 45-50 days interval.
- ♦ For seed production, crop sown before 15 November and left after first cutting at 55-65 days after sowing. Apply an additional dose of 12 kg N (33 kg urea) per acre after sprouting. This crop gives about 6 quintals of seed besides 100 quintals per acre of green fodder.

Livestock management

- ♦ During rabi season the weather gets cold, so we should make proper arrangements to protect our animals from the cold stress so that they do not suffer from any problem (respiratory problems) and also continue to produce.

Dairy Animals

- ♦ Feed more roughages (like hay, straws, etc.) or forages (berseem) to maintain the milk production and body heat of the dairy animals. 25-30 kg of leguminous fodder like berseem with 10 kg straw need for large animal producing 10 liters of milk.
- ♦ Additional 3 kg concentrates in the form of grains like maize, wheat, oats etc. and oil cakes can meet the requirements of large animal for maintaining body temperature. If the grains are costly or not available, then the use of oil cakes such as mustard oil cake, cotton seed cake, etc. can be feed in recommended dose.
- ♦ Hypothermia is a major risk for neonatal calves, and housing, feeding, and hydration are key considerations for minimizing hypothermia.
- ♦ To avoid Pneumonia and Hypothermia like condition, keep animals indoor but take care of the ventilation. In case of loose house, use curtains (tarpaulin, bamboo, dry grass, paddy straw,

- jute bags, guinea bags, jute, etc.) around the animal house.
- ♦ Sunlight will not only warm the animal house but also disinfect it at the same time.
 - ♦ The water should not be frozen in any case. Too cold or too hot water is detrimental for ruminal microflora. Supplied water should be heated to 10⁰ C to ensure proper water intake.
 - ♦ Adult animals as well as young stock should be provided with protective clothing (gunny bags, sacks, blankets, etc.) to prevent heat loss from the body.
 - ♦ Keep the floor of the animal shed dry using sand, woodchips, saw dust, straws, rice husk, etc.
 - ♦ For better drainage of urine and other excretions. Wet floor may lead to diarrhea, fever, pneumonia, coccidiosis, hypothermia leading to death, etc. Young animals are at higher risk of developing disease due to wet floors.
 - ♦ In Indian conditions, farmers usually lit fire in the animal house for heating the animal house but removal of gases from shed.
 - ♦ Deworm the animals at regular intervals. If the animals have not yet been vaccinated against FMD, PPR, Haemorrhagic Septicaemia, Enterotoxemia, Black Quarter etc, ensure that this is done now.
 - ♦ Most of the animals affected Hypothermia in this season. So proper rubbing and the animal should be warmed by giving energy by external as well as internal. Give the shock therapy such as warm fluids, calcium related fluid, liver tonic as supportive therapy for 3-5 days.

Sheep and Goat

- ♦ Provide at least 1m² floor space for each sheep and goat. The floor should be non-slippery and covered with hay, husk, straws, etc. for insulation.
- ♦ In severe weather, animals can crowd together for warmth, but this increases the likelihood of injury and respiratory diseases.

- ♦ Goats are the hardy animals possessing thick coat of hairs and require least to be look after. The addition of maize or oats in the ration can help increasing the energy content of feed. Generally, provide 200-250 gram of grains to sheep and goats for desired weight gain.
- ♦ Always provide a source of roughage in the form of grass or other types of hay. Berseem is a great source of protein and energy.
- ♦ Care should be taken to over feeding of fodder and straw to avoid fear of urinary calculi formation. Always provide a good salt and mineral source to avoid this condition.
- ♦ The breeding males should be given an extra concentrate feed (grains) during the mating period so that they may perform well.
- ♦ Do not shear wool or hairs during winters. Shearing or clipping of hairs is advisable before and after winters.
- ♦ The animals dwelling in muddy or wet conditions are susceptible to cracked and bruised feet and can suffer from foot rot and warts. Use of zinc sulphate and copper sulphate for foot dips.
- ♦ Sheep and goats should be dewormed multiple times a year to guard against stomach and round worms. Deworming should be done in November or December.
- ♦ Lice and mites are increasingly prevalent during the winter months. High infestations can cause anemia, poor coat and skin quality. Use of permethrins and pyrethrins is advisable as de-lousing agents. Ivermectin with recommendation from veterinarian can be used.
- ♦ New-borns must be dried quickly after birth as hypothermia can set in quickly. Lambs and kids are most susceptible to neonatal pneumonia so, providing dry and warm place.

Poultry

- ♦ In winters when temperature goes down below 15°C, various problems like reduction in weight gain and egg production, water intake, fertility and hatchability, enhanced mortality, etc. occurs.

- ◆ House should be designed in a way that maximum sun light enters the shed during daytime and protected from chilled winds, for this gunny bags should be hanged at cold air entry.
- ◆ Birds release a lot of moisture in their breath and droppings which adversely affects their health, if there is restricted ventilation it causes ammonia build up in the air which causes respiratory problems. So, they need plenty of fresh air circulating around the house.
- ◆ Prior to chick being placed in house, floor should be covered with saw dust, shredded newspapers, grain husk, etc. and install Bukharis or heaters or bulbs for maintaining temperature.
- ◆ Poultry uses food for two main purposes i.e., as an energy source to maintain body temperature and to carry on normal physiological activities and as building material for development of bones, flesh, feather, egg, etc. Therefore, adequate, balanced, and healthy feed should be provided.
- ◆ As low temperature causes more feed intake and higher oxygen demand, provide adlib feed to the birds for rapid weight gain and egg production.
- ◆ If water is cold enough, then it should be given to chicken after adding hot water to it, so that the water comes to normal temperature.
- ◆ Many of vaccines/ medicine/ anti stress vitamins are given to poultry through water. Ensure pest and rodent control in the poultry shed.
- ◆ Store feed in dry place so that it may not get in contact with moisture.

Fish

- ◆ Fish, being a cold-blooded aquatic animal, needs special care during winters.
- ◆ As temperature of the surface water is colder than the bottom layers, the fish prefers to live in the bottom zone. Farmers shall

keep the water depth up to 6 feet, so that it gets enough space for hibernating in the warmer bottom zone.

- ♦ As day length and light intensity also decreases during winters, oxygen levels decline in ponds due to reduced photosynthetic activity especially in cloudy weather. Ponds either by adding fresh water or by using aerators, especially during early hours of the day.
- ♦ Feed intake of fish decreases with decrease in temperature as its digestive system becomes sluggish. Hence, it is essential to reduce the feeding rate by 50-75% as temperature.
- ♦ When water gets colder, the cold-blooded fishes' metabolism will start to slow down.
- ♦ In case the temperature falls, it is advised to stop feeding. Excess feed remains unconsumed and accumulates at the pond bottom, which deteriorates the water quality.
- ♦ It is also advised to go for periodic raking of bottom soil (with the help of barbed wire) to prevent any suspected accumulation of toxic gases at the pond bottom,” said the experts.
- ♦ During winters, various fungal, bacterial, and parasitic diseases like fin rot, gill rot, EUS and argulosis may appear in the pond. Treat the pond with CIFAX @ 400 ml/acre just before the onset of winters. Also treated with potassium permanganate @1-2 kg/acre or limestone @ 50-100 kg/acre. Salt application @ 100 kg/acre also helps in protecting fish against disease in winters.

Rabi Crop production

Wheat

- ♦ Wheat requires well drained and clayey loam soil. However, good crop of wheat can be raised in sandy loam and black soil also. It's sown when the average daily temperature falls to around 22-23 °C, which happen in last October to November.
- ♦ For medium sized grain varieties seed rate of 100 kg/ha, for bold seeded variety 125 kg/ha and for late sown seed rate of 125-150 kg/

ha is recommended.

- ◆ Improved varieties are DBW-187 (Karan Vandana), DBW-222, 252, 47, HS 542 (Pusa Kiran), K 8804, Deva, Indra, Ujiyar, Gomti, Halna, Atal, Gangotri, Prasad, Naina, Unnat Halna, Mandakani, kalayan sona
- ◆ Laser land levelling is a precursor resource conservation technology that is a must for the proper land leveling and implementation which increase productivity and profitability. Zero tillage technology is direct sowing in untilled land which can save time and fuel energy at lower cost.
- ◆ Preparation of soil before sowing, one deep plough followed by 2-3 light ploughing and planking with 10-ton FYM and 120 kg nitrogen, 60 kg phosphorus and 40 kg potash fertilizer sufficient for one ha. Seed sown in 4-5 cm inside the soil and spacing of 22.5 cm is considered optimum for irrigated timely sown wheat, for late sowing spacing is reduced to 15-18 cm.
- ◆ Seed treatment with carboxin (75 WP) @ 2.5 g/kg seed or carbendazim (50 WP) @ 2.5 g/kg seed or tebuconazole (2DS) @ 1.25g/kg seed or a combination of a reduced dosage of carboxin (75 WP) @ 1.25g/kg seed and a bioaet fungus, *Trichoderma viride* @ 4 g/kg seed is recommended.
- ◆ Yellow rust, powdery mildew, brown rust, Karnal bunt and spot blotch may also be controlled with the foliar sprays of propiconazole @ 0.1% and termite prone areas, seed treatment with chlorpyrifos @ 0.9g a.i. /kg seed, be taken up for their management.
- ◆ Aphid control by Imidacloprid 17.8 SL @ 100ml/ha as foliar spray when the population reaches more than 10 aphids per tiller or 5 aphids per ear head.
- ◆ Wheat sown under irrigated conditions requires 4 to 6 irrigations depending on the soil and weather conditions. If water is available for 2 irrigations, it should be applied at crown root initiation stage and boot leaf stage.

- ♦ Control of weed by isoproturon with 2,4-D or metsulfuron, or sulfosulfuron with metsulfuron can be applied at 30-35 DAS at sufficient soil moisture.
- ♦ Under irrigated conditions the yield may vary from 2.5 to 6.5 tonnes /ha.

Barley

- ♦ The crop requires temperature around 12-15°C during growing period and around 30 °C at maturity time. Sandy to moderately heavy loam soils having neutral to saline reaction and medium fertility are the most suitable type for barley cultivation.
- ♦ Two to three ploughing with cultivator followed by planking after every ploughing to save the crop from Termite, Ants and other insect, seed treatment is advisable.
- ♦ 10 tonne FYM with 60 kg nitrogen and 30 kg phosphorus require for on ha. Half nitrogen and full dose of Phosphorous should be applied as basal and remaining half of the Nitrogen should be top dressed after first irrigation, while in case of light soils, one third of nitrogen and full dose of phosphorous as basal, one third of Nitrogen after first irrigation and rest after second irrigation.
- ♦ Optimum seed rate of 50 kg/ha for upland, 25 kg/ha for lowland and hilly region
- ♦ Sowing should be done in rows either by seed drill or behind the plough in furrows. Optimum depth of sowing is 4.0 to 5.0cm.
- ♦ Narendra Barley 1445, DWRB 92, Prakhar (K1055): (resistant to all three rusts, smut, and leaf blight diseases), K1149 (Geetanjali), K551 (Ritambhara) and K125 (Azad) recommended for alkaline/saline soils. Seed treatment with Vitavax or Bavistin @ 2 gm per Kg seed.
- ♦ Generally, Barley crop require 2 to 3 irrigations for better yield. Depending upon the water availability, suitable stages for irrigation should be identified.

- ◆ Among the insect-pests, aphid (*Rhopalosiphum maidis*) can be controlled by spraying Imidacloprid 200 SL, at 100 ml/ha in 200 - 250 litres of water per ha.
- ◆ Barley crop gets ready for harvest by the end of March to first fortnight of April.
- ◆ The average yield of rain fed crop ranges between 2,000 and 2,500 kg/ha, whereas that of irrigated crop is twice as much. Under favorable conditions grain yield of 5 - 6 tonnes/ha.

Maize

- ◆ Maize may be sown any time from April to October, as the climate is warm even in the winter.
- ◆ Maize requires a well-drained sandy loam soil with organic matter. It thrives well in soil pH between 5.5 to 8.0.
- ◆ Buland variety maturity 178 days, tolerant to cold and average yield 31 q/acre, Partap-1 maturity 180 days, tolerant to cold, resistant to diseases and average yield 25 q/acre suitable for baby corn. PMH 9 variety maturity 180 days, cold tolerant, resistant to lodging, common rust and average yield of 32.5 q/ acre
- ◆ Seed is sowed in the middle of October to the middle of November.
- ◆ 4-5 deep ploughing provided an ideal condition for sowing of crop with compost 5 tons / ha and N₂ 100-120 Kg, P₂O₅ 60 Kg and K₂O 30-40 Kg. Urea should be applied in splits, mainly at sowing, knee-high and tasseling stages. Entire dose of P & K 2O with 40 Kg urea and 25 Kg of ZnSO₄ at sowing recommended.
- ◆ Seed treatment with Bavistan@ 3gm/Kg of seeds, depth of sowing 4-6 cm with spacing 70cm x 25cm for row to row and plant to plant. 20-22 kg seed required for one hectare of land.
- ◆ Thinning should be done after 10 days of germination keeping one plant per hill. At knee high stage (about 35 days after germination) the crop plants should be earthed up followed by light hand weeding. The second earthing up should be done at 60 days after germination of crop.

- ◆ First irrigation is to be applied 3-4 weeks after seedling emergence, subsequently at 4- 5 weeks till March and thereafter at 1-2 weeks' interval.
- ◆ Maize stem borer control by application of Endosulfan 35EC @250 ml and Monocrotophos 36 WSC @275 ml/ha in 125 litres of water by starting spray 2-3 weeks after sowing. Application of Neem based pesticides like Margosa @2 ml/ltrs of water are found to be beneficial.
- ◆ Army worm and Silk cutter control by spray Sevin (Carbaryl) 50 WP@ 250g in 125 ltrs of water and control of leaf blight by spraying of Indofil M45 @ 500g in 250 ltr of water/ha. at 10 days interval.
- ◆ Pre-emergence application of Atrazine @ 1 Kg a.i/ha is recommended for weed control.
- ◆ Maize is ready for harvesting even when the stalks and leaves are somewhat green, but the husk cover has dried and turned brown. Shell Maize when the moisture content ranges between 15-20%.
- ◆ Conventional harvester combines can be used for threshing Maize with husk to save labour involved in dehusking. The Maize ears should preferably be dried for 3-4 days after harvesting to improve grain recoveries and reduce breakage losses during shelling.

Bengal Gram (Chickpea)

- ◆ Gram is a winter season crop but severe cold and frost are injurious to it. Temperature, day length and availability of moisture are the three major abiotic factors affecting flowering. Chickpea is sensitive to high (>35°C) as well as low (<15 degree C) temperatures at the reproductive stage. Both extremes of temperatures lead to flower drop and reduced pod set.
- ◆ Chickpeas with colored and thick seed coat are called desi type. The common seed colors include various shades and combinations of brown, yellow, green and black.
- ◆ The kabuli type chickpeas are characterized by white or beige-colored seed with ram's head shape, thin seed coat, smooth seed

surface, white flowers, and lack of anthocyanin pigmentation on the stem.

- ♦ Chickpea grows best on well-drained, light to medium textured soils. Saline, alkaline, or waterlogged soils are not suitable for its cultivation.
- ♦ The sowing is done in the month of October or November. Late sowing (December-January) should be avoided as the late-sown crop may experience moisture stress and high temperatures at the critical stage of pod-filling, leading to reduced yield and seed quality.
- ♦ Chickpea should be sown by the pora method in rows 30 cm. The seed should be placed 10-12.5 cm deep, because the shallow-sown crop is more liable to be damaged by wilt.
- ♦ The optimum seed rate for desi and kabuli gram are 15-18 kg and 37 kg per acre, respectively. It differs from variety to variety, depending on seed size.
- ♦ The seeds should be treated with fungicides (2 g thiram + 1 g carbendazim kg⁻¹ seed) before sowing for reducing seed and soil borne fungal diseases. If chickpea is being grown for the first time, the seeds should be inoculated with Rhizobium culture.
- ♦ The doses of fertilizers should be determined based on the results of soil test. The generally recommended doses for chickpea include 20–30 kg nitrogen (N) and 40–60 kg phosphorus (P) ha⁻¹.
- ♦ If soils are low in potassium (K), an application of 17 to 25 kg K ha⁻¹ is recommended. Foliar spray of 2% urea at flowering has been found beneficial in rainfed crops.
- ♦ Basal application of Zinc Sulfate (ZnSO₄) at 10-25 kg ha⁻¹ is found to give positive response. Foliar application of 0.5% Zinc Sulfate mixed with 0.25% lime also effective in zinc deficiency, 0.5% (w/v) ferrous sulphate in iron deficiency and soil application of 1.0-2.5 kg Borax ha⁻¹ or foliar application of 0.25 kg Borax ha⁻¹ helps in correcting Boron deficiency. Seed treatment with

- ♦ 3.5 g sodium molybdate is found to have beneficial effect in chickpea
- ♦ Chickpea is generally grown as a rainfed crop, but two irrigations, one each at branching and pod filling stages, are recommended for higher yield.
- ♦ Chickpea is a poor competitor with weeds at all stages of growth. Pre-emergence herbicides, such as Fluchloralin @ 1 kg a.i. per ha. effective control. Mechanical and/or manual weeding can be done where wide row spacing is used.
- ♦ Fusarium wilt is a vascular disease that causes browning and blackening of xylem. Its control by use resistant varieties (JG 11, JAKI 9218, JG 130, KAK 2, JGK 1, JGK 2), deep ploughing and seed treatment with *Trichoderma viride* @ 4 g kg⁻¹ seed.
- ♦ Collar rot control by crop rotations with cereals, use resistant varieties (eg, PBG 1, BG 267, GNG 146), seed treatment and 2-3 sprays of mancozeb or chlorothalonil @ 2-3 g L⁻¹ water. Growing high yielding wilt resistant varieties, KWR 108, DCP 92-3, Pusa 256, Vardan.
- ♦ JG 315, Alok, Karnal Chana-1 and Surya under normal condition and Udai, Pusa 372, and Pusa 256 under late sown. Kabuli chickpea variety Pusa 1003 in eastern region and JGK 1 and KAK 2 for Bundelkhand region
- ♦ Application of either NPV @ 250 LE (larval equivalents) per ha when the egg/larval population reaches economic threshold level, or 5% neem fruit powder extract (about 15 kg neem fruit powder per ha.) provide effective control of pod borer. Application of chemical sprays (endosulfan @ 350 g a.i. ml ha⁻¹ indoxacarb @ 70 ml a.i. ha⁻¹ or spinosad @ 45 ml a.i. ha⁻¹) can be applied as and when needed.
- ♦ The crop should be harvested when leaves start to senesce and start shedding, pods turn yellow, plants dry, seed hard and rattles within the pod. After harvest, the plants can be dried in the sun for a few

days. Threshing can be done using commercially available power threshers.

Field Pea

- ◆ Being a winter season crop it requires a cool growing season with moderate temperature throughout the life. High temperature is more injurious to pea crop than frost. High humidity with cloudy weather results into spread of fungal diseases like damping-off and powdery mildew. Optimum monthly temperature suitable for growth is 13-18°C.
- ◆ A well-drained loamy soil free from excessive soluble salts with neutral pH range of 6.5 to 7.5 is suitable for successful cultivation of the crop. Prepare a level field for even distribution of irrigation water, one deep ploughing followed by 2-3 harrowing and planking after each operation. To ensure good drainage and aeration in the field, powdery seedbeds must be avoided.
- ◆ 15th October to 15th November is the best time of sowing. Require 70-80 kg. seed per ha and spacing 30-45 X10 cm for tall variety, similarly, 100 kg. Seed per ha & spacing 22.5X10 cm dwarf varieties with 4-5 cm depth.
- ◆ Improved Varieties: Swati (KFPD-24), Malviya Matar-15 (HUDP-15), Vikas, Sapna (KPMR-1441), IPF 4-9, HUDP 15 IPF 99-25 Malviya P-15 DPL 62 KPMR 522 KPMR 400
- ◆ It can be sown as intercrop with autumn sugarcane as two rows of pea at 30 cm row spacing in the centre of two sugarcane rows at 90 cm apart.
- ◆ Field-pea is mostly grown as rainfed/un-irrigated on residual soil moisture and can sustain drought conditions up to some extent. One or two irrigations at 45 DAS and if needed, at pod filling stage, may be the best recommended irrigation schedule.
- ◆ Apply 20-30kg/ha nitrogen in tall types and 40kg/ha nitrogen in dwarf types as a starter dose of basal dressing. The phosphorus and potassic fertilizer should be apply as basal dose based on soil test

value. 20 kg Sulphur and 15 kg zinc sulphate per hectare should be applied.

- ♦ For control weed spraying Pendimethalin (STOMP) 30 EC @ 0.75-1 kg a.i./ha as pre-emergence and for post emergence apply Metribuzin 70 % WP @ 0.25 kg a.i./ha at 15-20 day after sowing in 400-600 liter of water.
- ♦ Seed Treatment with Thirum (2gm.) +Carbendazim (1gm.) /kg of seed.
- ♦ Powdery Mildew symptoms first appears on the leaves then on other green parts of the plant. Resistant var. like Pant Pea-5, Malviya-15, JP-885, HUP-2 etc. with timely sowing and spraying with Karathane @ 1 ml/litre or wettable sulphur @ 3 gm/litre of water and repeat after 10-15 days, if necessary.
- ♦ Rust is caused by fungus and control by spraying Mancozeb 75 WP @ 2 g / liter of water.
- ♦ Leaf Miner: Larvae of the insect makes tunnel in the leaf causing severe damage in the month of Dec.to March. Spraying Oxydemeton methyl (Metasystox) 25 EC one litre in 1000 liter of water per hectare for its control.
- ♦ Fully ripe and threshed after sufficient drying in the sun. The clean seed may be sun dried for 3-4 days to reduce their moisture content up to 9-10% to be safely stored in appropriate bins.
- ♦ 20-25qtls of grain and straw per ha (irrigated) and 10-15 qtls grains per ha (rain fed) condition.

Lentil (Masoor)

- ♦ Lentil requires cold climate. It is very hardy and can tolerate frost and severe winter to a great extent. It requires cold temperature during its vegetative growth and warm temperature at the time of maturity. The optimum temperature for growth is 18°-30 °C.
- ♦ Well drained, loam soils with neutral reaction are best for lentil cultivation. Acidic soils are not fit for growing lentil. Sowing time for Rainfed lentil sown in second fortnight of October, under

irrigated conditions first fortnight of November and late sowing in first week of December.

- ♦ Important recommended varieties are- PL 639, Malika (K-75), NDL-2, DPL-62, IPL-81, IPL-316, L 4076, HUL-57, DPL-15 etc.
- ♦ For one hectare area require of 40 - 45 kg small seed, 45 - 60 kg bold seed, 50 - 60 kg for late sown and 60 - 80 kg/ha seed for utera cropping with spacing rows 30 cm. apart and it should be sown at a lower depth (3 - 4 cm).
- ♦ Seed treatment with fungicide thirum (2gm) +carbendazim (1gm) or thirum @ 3 gm or carbendazim @2.5 g per Kg. of seed, Insecticide chlorpyrifos 20 E.C. @8 ml./Kg. of seed and culture: Rhizobium + PSB, one packet each for 10 kg seed.
- ♦ First irrigation at 40 - 45 days of planting and second at pod filling stage. Most critical stage for moisture stress is pod formation followed by flower initiation.
- ♦ Nitrogen 20 kg Phosphorus 40 kg and Sulphur 20 kg is recommended per hectare in medium to low fertile soils as basal dressing. Application of 20 kg Zinc Sulphate per ha in zink deficit soil, rainfed and late sown condition. Foliar spray of 2% urea improves yield.
- ♦ Two manual weedings, first at 25-30 days and second 45-50 days after sowing. Weedicide like Pendimethalin 30 EC @ 0.75 - 1 kg a.i. per hectare may be used as a pre-emergence treatment.
- ♦ Yield - A well manged crop yields about 15 - 20 quintals of grain per hectare.

Rapeseed and Mustard

- ♦ Rapeseed and mustard crops are grown on light loam, loam and clay loam soils. Excessive alkaline or acidic soils are not suitable for cultivation of these crops. The land preparation should be done properly with two ploughings followed by planking to get a well pulverized, leveled land with good drainage facility.

- ◆ Varieties: Varuna, Rohini, Vaibhav, Vardan, Basanti, Urvashi, Kanti, Maya and Ashirvad
- ◆ Optimum sowing time for rapeseed and mustard is last week of September to mid of October.
- ◆ Seed rate of 5-6 kg/ha is sown in rows of 30-40 cm and plant to plant distance of 10-15 cm apart.
- ◆ Thinning should be done 25-30 days after sowing to maintain proper plant population.
- ◆ A fertilizer dose of 50:60:30 kg NPK/ha for rainfed crop is optimum. Application of 20kg Sulphur and 1 kg Boron improves the seed quality and oil yield.
- ◆ Two important diseases of rapeseed and mustard are white rust and Alternaria Blight. For controlling these diseases, spray of Blitox-50 (0.3%) or Diethane M 45 @ 2 g/l of water at 10 days interval is found to be effective. Mustard aphid is a key pest of rapeseed and mustard causing 35-40% reduction in yield and 5-6 % reduction in oil content. Spraying of Dimecron 0.25 ml/lit of water 2-3 times. Early sown crop escapes the aphid incidence.
- ◆ Rapeseed and mustards are sown on residual soil moisture hence no irrigation is required in rapeseed and mustard. Irrigation increases the yield of rapeseed and mustard significantly.
- ◆ Mulching with rice straw @ 4 ton/ha results in increase of mustard seed yield significantly.
- ◆ It should be harvested when the pods turn yellowish. The crop is liable to shattering, hence should be harvested just before the pods open to avoid losses.
- ◆ With the use of improved varieties and other agronomic practices a yield of 10-12 q/ha of rapeseed and 15-20 q/ha of mustard can be obtained easily.

Flaxseed (Alsi)

- ♦ Flaxseed is a cold season crop and is grown in both northern and southern regions of India. It can be grown in loamy deep soil, which is fertile, silty, and well drained. Flaxseed can be sown as per utera system of cropping, i.e., sowing flaxseeds before harvesting of standing paddy crop so that it will utilize moisture efficiently under rainfed agro-ecosystem. It requires relative humidity of 50-60% with 7-8 inches of rain.
- ♦ Flax roots go deeper into the soil, so prepare land by proper deep ploughing. 2-3 ploughings can be done. Required 30-40 kg seed/ha. Seeds must be placed 4-5 cm below the soil with spacing between each row can be kept as 20-30 cm and between each crop can be kept as 10cm.
- ♦ Improved Verities are K-2, T-397, No.55, NP (RR) 9, LC 185, S-4, B-67, M-10, Jawahar-17, Jawahar-7 (R-7), Mayurbhanj, Hira, Mukta, Neelum, etc.
- ♦ Use FMY (farmyard manure) at the time of land preparation. If the soil does not have sufficient nutrients, then 30kg of N₂ and 15 kg of P₂O₅ per ha can be given at the time of sowing.
- ♦ Termite, cutworm, wireworm, semilooper, leaf minor, bud fly, pasmo, aster yellows, gram pod borer are some of pests and diseases which can harm flax crop. To protect the crop, avoid continuous cultivation of flaxseed in the same field, use light trap and attractant for bud fly, proper solarisation, neem-based formulation, Seed treated to protect seed-borne diseases and application of pre-emergent and post-emergent herbicide for the protection from weeds.
- ♦ Crop maturing by the end of February which is depends on season and time of sowing. When leaves are dry, and balls turned brownish, flax crop is ready to harvest. The average yield of crop varies from 210-450 kg/ha of seed and irrigated crop yield can range from 1,200-1,500 kg/ha.

Rabi Vegetables

Potato

- ♦ The crop is raised when maximum day temperature is below 30°C, and night temperature is not above 20°C. The highest tuberization is obtained when day and night temperature is 20°C and 14°C, respectively.
- ♦ Potato can be grown on different types of soils with well drained, loose, friable, non-saline and non- alkaline loamy sand to sandy loam soils are suitable for this crop. Soil pH should be in the range of 5.5 - 8.0.
- ♦ Early Varieties are Kufri Surya (Heat tolerant, white tuber, resistance to late blight, good keeping quality, early planting and average yield 100-125 q/acre in 90-100 days), Kufri Pukhraj (Tall plant, vigorous and erect, susceptible to late blight but escapes due to earliness, large uniform tubers, oval, white and yields 130 q/acre in 70-90 days), Kufri Ashoka (Tall plant, erect and medium compact with green foliage, large tubers, smooth, oval long with white skin and yields about 110 q/acre in 75-80 days), Kufri Chandramukhi (white, large, smooth, white skin, uniform and more attractive and yield about 100 q/ acre in 80-90 days) and Kufri Pushkar (White tuber, resistance to late blight, good keeping quality and average yield is 160-170 q/acre in 90-100 days).
- ♦ Late varieties Kufri Chipsona-3 (Medium maturing 90-100 days, resistant to late blight, good keeping quality, oval and white tubers, low reducing content (100 mg per 100 g fresh weight) and high tuber dry matter (21.5%) which is required for producing light coloured chips, suitable for processing into chip and average yield is 165-175 q/acre) and Kufri Frysona (Medium maturing 90-100 days, resistant to late blight, good keeping quality, oval and white tubers, suitable for French fries due to long tubers with high dry matter (22%) and average yield is 160-170 q/acre).

- ◆ Sow 20 kg of Dhaincha for green manuring from end of June to first week of July.
- ◆ The seed requirements for an acre on the basis of seed size are viz, large size- 10-12 q/acre medium size- 7-10 q/acre Small size- 4-6 q/acre. Dipping cut tubers in a solution of 1% Thiourea and 1 ppm Gibberellic Acid (one ml per 100 litres of water) for an hour followed by air drying the treated tuber pieces for 24 hours in thin layers in shade.
- ◆ To control black scurf, treat the tubers with Monceren @ 2.5 ml per litre of water for 10 minutes after taking out of the cold storage. The best time for sowing is last week of September to mid- October for the autumn crop and the second fortnight of January for the spring crop. A ridger should be used for planting the crop manually. Semi-automatic or automatic planters are recommended where tractor power is available. For mechanized planting, the spacing between the rows and tuber should be kept 65x18.5 cm or 75 cm x 15 cm respectively.
- ◆ Twenty tonnes of farmyard manure or green manuring alongwith 75 kg of N (165 kg of Urea), 25 kg of P₂O₅ (155kg of Single Superphosphate) and 25 kg of K₂O (40 kg of Muriate of Potash) per acre should be used.
- ◆ Application of Biozyme 8 Kg granule per acre each at the time of planting and earthing up and spray of Biozyme liquid formulation at tuber initiation stage @200ml/acre increases the yield of potato.
- ◆ A double mould board plough or a ridger should be used for earthing up after 25- 30 days of sowing.
- ◆ Application of paddy straw mulch @ 24 q/acre immediately after planting provides affective control of annual weeds and irrigation saving.
- ◆ Furrow Irrigation: The first irrigation should be given immediately after planting as it ensures better germination. The potato crop responds well to light and repeated irrigations. The total number of irrigations will be 7-8 in light textures soils.

- ♦ Drip irrigation in potato results not only increase in yield but also saves 38% of water over conventional method of irrigation. Under this system, irrigation should be applied at two days' interval. The potato crop should be irrigated with a lateral pipe having dripper discharge of 2.2 litre per hour.
- ♦ Fertigation saves 20% fertilizer. Apply 24.50 kg Urea, 6.6 kg Mono Ammonium Phosphate and kg Muriate of Potash (white) per acre during first month of the growing period of the crop in 7 equal doses with every second irrigation (4 days' interval).
- ♦ The first fertigation should be started after germination of the crop. The remaining amount of fertilizer 97.5 kg Urea, 26.2 kg Mono Ammonium Phosphate and 26.7 kg Muriate of Potash (white) should be applied in equal doses during rest of the crop season (before last irrigation) in 13 equal doses with every second irrigation (4 days interval).
- ♦ Harvesting: Suitable tractor operated digger has been developed and is available in the market. There should be optimum moisture in the soil at the time of harvest. The clods affect the efficient functioning of potato digger.
- ♦ Grading: After harvesting the potato should be graded. Four grades may be made 1-Small size (below 25 g weight) 2-Medium size (25-50 g weight) 3- Large size (50-75 g weight) and 4- Extra-large size (above 75 g weight). Leno bags can be used for potato storage by keeping quality intact.
- ♦ It should be stored in the cold storage where temperature at 2-4 degree C and relative humidity is 75- 80%.

Onion

- ♦ The optimum temperature for vegetative phase and bulb development is 13-24°C and 16-25°C, respectively. It requires about 70% relative humidity for good growth. It can grow well in places where the average annual rainfall is 650-750 mm with good distribution during the monsoon period.

- ♦ The best soil for successful onion cultivation is deep, friable loam and alluvial soils with good drainage, moisture holding capacity and sufficient organic matter. The optimum pH range, regardless of soil type, is 6.0 - 7.5, but onion can also be grown in mild alkaline soils.
- ♦ Varieties of onion are Agrifound dark red, Agrifound white, N-53, Pusa red, Pusa white round, Pusa white flat, Arka kalyan, Arka lalima
- ♦ For raising nursery, apply 5 qt. decomposed farmyard manure at the time of last ploughing in
- ♦ 0.05 ha and mix well with soil. Raised bed should be 10-15 cm height, 1.0-1.2 m width and length as per convenience may be prepared. Application of pre-emergence herbicide pendimethalin @ 0.2% is recommended to control weeds in nursery. About 5-7 kg seeds treated with thiram @ 2 g/kg are required to raise seedlings for one hectare.
- ♦ Application of 20-30 tone FYM/ ha one month before transplanting and mixed in the soil. The recommended dose of nutrients is 100 kg N, 50 kg P and 80 kg K/ ha. The whole quantity of phosphorus, potash and half quantity of nitrogen should be mixed in soil before transplanting. The remaining half nitrogen should be given in top dressing equal quantity in two split doses at 30 days and 45 days after transplanting. Close planting at 15 cm between rows and 7.5 cm between plants is most conducive for high yields.
- ♦ Application of 15 kg sulphur/ha on soils sulphur level above 25 kg/ha while 30 kg sulphur/ha is needed for soils having sulphur level below 25 kg/ha for optimum production of onion.
- ♦ If not controlled thrips properly can cause yield loss up to 50%. If infestation observed in field, spray of Fipronil (Regenta)@30 ml/15lt water or Prophenophos@ 10ml /10 lt. water by 8-10 days interval. Maggots' infestation observed in January-February Month. Its control by spraying Chlorpyriphos @2 lt /acre along with irrigation water or sand.

- ♦ Severe infestation of purple blotch and stemphylium blight may cause yield loss up to 70%. Spray of Propineb 70%WP@350 gm/acre/150 lt of water, twice at 10 days interval is sufficient.
- ♦ The germination of the onion can be checked by storing at 300 C for 9 days after 72-73 harvesting with this technology we can store onion at room temperature for three months.

Tomato

- ♦ Tomato is a warm season crop. The best fruit colour and quality is obtained at a temperature range of 21-24°C. Tomato can be grown on a wide range of soils from sandy to heavy clay. However, well-drained, sandy or red loam soils rich in organic matter with a pH range of 6.0-7.0 are considered as ideal.
- ♦ Azad T-3, Azad T-5, Azad T-6, Kashi Amrit, Kashi Anupam, Kashi Sharad, Kashi Visesh, Pusa Hybrid 8, Pusa Hybrid 4, Pusa Uphar, Pusa Hybrid 2
- ♦ About 100-200g of seeds are sufficient for raising seedlings for one hectare of land. The seedlings with 5-6 true leaves are ready for transplanting within 4 weeks of sowing.
- ♦ For hybrid varieties, recommended dose of fertilizer per hectare is 180 kg N, 100 kg P₂O₅ and 100kg K₂O. Half dose of N, P & K are given at the time of transplanting. Remaining quantities of top dressed 30 days after transplanting. A third dose of 60 kg N is applied 50 days after transplanting.
- ♦ To control spread of whiteflies, uproot, and destroy affected plants. In case of severe infestation, take spray of Triazophos@250ml/200litre or Profenophos@200ml/200litre of water. Repeat the spray after 15 days.
- ♦ Thrips is a very Common pest and mostly seen in dry weather. They suck sap from the foliage and results in curling of leaves for management apply Imidacloprid 17.8SL @60ml or Fipronil@200ml/200Ltr of water.

- ◆ Fruit Rot is major disease of tomato observed due to changing weather. To control spray of Mancozeb@400gm or Copper Oxychloride@300gm. Repeat spray in 15 days interval.
- ◆ Early Blight: Initially small, brown isolated spots are observed on leaf. Later spots are seen on stem and on fruits. If infestation of early blight is observed, spray Mancozeb@400gm or Tabuconazol@200ml/200Ltr. Repeat spray 10-15 days after first spray.

Cauliflower

- ◆ It can grow well in wide range of soil from sandy loam to clay. pH of soil should be 6 to 7. Add lime in case of low pH soil.
- ◆ Early varieties: Early Kunwari, Pant Gobhi, Pusa Deepali
- ◆ Mid Early Varieties: Pusa Hybrid- 2, Pusa Sharad, Pant Gobhi- 4
Mid Late: Pusa Shubhra, Pusa Himjyoti, Punjab Giant 35
- ◆ Late Varieties: Pusa snowball-1, Pusa snowball K-1
- ◆ August to mid-September and October to first week of November is best transplanting time. Use spacing of 45x45 cm and seed rate is 250 gm per acre is required.
- ◆ Apply FYM @250-300q/ha, Nitrogen @100-150kg/ha, Phosphorus @ 60-80kg/ha and Potassium @ 80kg/ha. Half quantity of N and entire quantity of P and K are applied to the soil at the time of field preparation. The remaining half quantity of N is top dressed four weeks after transplanting. Borax @ 15 kg/ha and ammonium molybdate @ 15 kg/ha should also be applied in deficient soil of boron and molybdenum, respectively.
- ◆ Browning (Brown Rot or Red Rot) caused by boron deficiency which is influenced by soil pH. This may be controlled by application of borax or sodium borate @ of 20 kg/ha in soil application.
- ◆ Deficiency of molybdenum causes 'whiptail' syndrome, especially, in highly acidic soils. Application of lime and ammonium molybdate at the rate of 1-2 kg/ha as soil application.

- ◆ Buttoning: Development of small curds with inadequate foliage in cauliflower is known as buttoning. Transplanting of more than 6-week-old seedlings. Planting early varieties in late and vice versa leads buttoning.
- ◆ Diamond back moth is serious pest of cauliflower. They lay eggs under surface of leaves. In case of lack of proper control measures, it causes loss up to 80-90%. In severe infestation spray Spinosad 2.5%SC@80ml/150Ltr of water.
- ◆ Leaf spot and Blight: If infestation of blight is observed to control do spray of Mancozeb or Copper oxychloride @ 300gm/150 Ltr along with 20 ml sticker.

Cabbage

- ◆ A pH range of 6.0-6.5 is considered as optimum for growing cabbage. Plants growing in saline soils are prone to diseases. A temperature range of 15- 21 degree C is considered as optimum for growth and head formation of the crop.
- ◆ Varieties: Golden acre, Pusa Drumhead, Pride of India, Pusa Mukta, Pusa Synthetic, Early Drumhead, Late Large Drum Head, K-1 are some of the varieties.
- ◆ Early cabbage is sown during July-November. About 300-500g of seeds are sufficient for raising nursery to plant one hectare. Prior to sowing seeds are treated with Trichoderma viride (4 g/ kg of seed) or Thiram (3g/ kg of seed).
- ◆ Fertilizer Management: For good yield, 15-20 tonnes of well-decomposed FYM should be incorporated into the soil about 4 weeks before transplanting. Generally, application of 80-120 kg N, 60-100kg P₂O₅ and 60-120 kg K₂O is recommended for optimum yield. Half the dose of N and entire amount of P and K is given at the time of transplanting. The balance N is given six weeks after transplanting or at the time of earthing up.
- ◆ Harvesting and Yield: Cabbage is ready for harvest at 90-120 days after planting. Cabbage should be harvested promptly when the

heads are firm and mature. Average yield obtained from early varieties is 25-30 t/ha and that of late type is 40-60 t/ha.

- ◆ Cutworm: As a preventive measure apply Methyl Parathion or Malathion (5% dust) @10kg/acre in soil before sowing.
- ◆ Leaf Eating Caterpillar, if infestation is observed in field to control of leaf eating caterpillars spray Dichlorvos@200ml/150Ltr water or Flubendiamide 48%S.C@0.5ml/3Ltr of water.
- ◆ Incidence of sucking pest like Aphid and Jassid is observed spray Imidacloprid 17.8SL @ 60ml/acre using 150 Ltr water.
- ◆ Leaf spot or blight control take spray of Metalaxyl 8% + Mancozeb 64%WP@ 250gm/150Ltr of water along with sticker.

Vegetable Pea

- ◆ It gives best results when grown under well drained soil with pH range of 6 to 7.5. Crop cannot withstand in water logging conditions. For acidic soil, do liming.
- ◆ Varieties: Azad P1, Azad P 3, Azad P 4, Azad P 5, Arkel
- ◆ Sowing time between end of October to Middle November and for early on 15 September.
- ◆ Apply 8 tons of farmyard manure, 20 kg of N (45 kg Urea) and 25 kg P₂O₅ (155 kg Superphosphate) per acre before sowing.
- ◆ Pendimethalin@1 lt/acre and Basalin@1 lt/ acre give good results in controlling the weeds.
- ◆ Wilt: The roots turn black and the later rot away. Control by treat seeds with Thiram@3gm/ lt water and avoid early sowing in badly affected areas and crop rotation.
- ◆ Powdery Mildew: Patchy, White powdery growth appears on lower side of leaves, branches, and pods. Three times spray Karathane 40EC@80 ml in 100 water per acre at 10 days interval.

Carrot

- ◆ Loamy or sandy loam soils with enough humus is well suited to the cultivation of carrots. The ideal pH range for obtaining a good yield is 5.5-6.5. The optimum temperature for growth between 16 to 20 °C, while temperatures above 28°C drastically reduce top growth.
- ◆ Seed rate: 5 to 6 kg /ha.
- ◆ Varieties: pusa kesar, Pusa meghali, Pusa vrishti
- ◆ Fertilizer Management: 20-30 tonnes of FYM/ ha should be applied at the time of field preparation. 50 kg N, 50 kg P and 100 kg k/ ha is recommended.
- ◆ Nematodes: To control nematodes, apply neem cake@0.5ton/acre at time of sowing. Growing carrot once in 3 years by following and growing marigold once in 2 years crop rotation
- ◆ Leaf spot: If infestation is observed in field to control spray Mancozeb@2gm/Litre of water.

Brinjal

- ◆ A daily mean temperature of 13-21°C is most favourable for its successful production. The growth of the crop is severely affected when temperature falls below 17°C. It can be grown in plains throughout the year but rabi (October-November) season is the best. Well drained and fertile soil is preferred for the crop. Ideal pH for cultivation of crop is 5.5 - 6.6
- ◆ Varieties: Pusa Shymala, Pusa Purple Long, Pusa Purple Cluster, Pusa Kranti, Pusa Bhairav, Pusa Anmol (H), Pusa Hybrid 5 (long), Pusa Hybrid 6 & 9 (round), Arka Sheel, Arka Shirish, Arka Kusumkar, Arka Navneet (Hybrid), Arka Nidhi, Arka Keshav, Arka Neelkanth.
- ◆ 370-500g seed required for one ha and seed treatment with Trichoderma viridae/T. harzianum @ 2g /100 g of seeds or Carboxyn 37.5% + Thiram 37.5%. Raised beds of size 7.2 x 1.2 m and 10- 15 cm in height are prepared. Thus, 10 beds required for

- one-hectare area. To avoid mortality of seedlings due to damping off, drenching of the beds with Bavistin (15-20 g/10 litres of water).
- ♦ Seeds are sown at a depth of 2- 3 cm and covered with a fine layer of soil followed by light watering by water can. The seedlings are ready for transplanting within 4-6 weeks of planting when they attain a height of 15 cm with 2-3 true leaves.
 - ♦ Long fruited varieties are transplanted at 60 x 45 cm, the round varieties at 75 x 60 cm and high yielding varieties at 90 x 90 cm spacing. 15-20 ton of FYM is incorporated into the soil. Application of 150 kg N, 100 kg P₂O₅ and 50 kg K₂O is recommended for optimum yield.
 - ♦ A light irrigation is given on the first and third day after transplanting. Thereafter irrigation is given at an interval of 8-10 days during winter and 5-6 days during summer.
 - ♦ Pre- emergence application of Fluchloralin (1.5 kg a.i./ha) coupled with one hand weeding 30 days after transplanting is effective for control of weeds.
 - ♦ Delta and yellow sticky traps @ 2-3/ acre should be installed for hoppers, aphids, and white fly etc. Give 2 to 3 sprays of 5 % NSKE against sucking pests. Neem oil (2%) application is also helpful in reducing borer infestation, though marginally, then apply imidacloprid 17.8 SL @ 150 ml/ha. Pheromone traps @ 5/ acre should be installed for monitoring and mass trapping of shoot & fruit borer *Leucinodes orbonalis*. Replace the lures with fresh lures after every 15-20-day interval. Crop rotation with non-solanaceous crops should be followed. Use of green manure, mulching with polythene, soil application with bleaching powder will reduce the infection of bacterial wilt disease.
 - ♦ The fruits become ready for first picking in about 120-130 days of seed sowing. Fruits are harvested at an interval of 8-10 days. Average yield of brinjal varies from 20-30 t/ha.

FRUITS

Aonla

- ♦ India ranks first in the world in area and production. Aonla being a sub-tropical crop prefers dry sub-tropical climate. Heavy frost is not suitable for its cultivation. Slightly acidic to saline/sodic soil having pH between 6.5 to 9.5 is suitable for cultivation.
- ♦ Improved Varieties: Kanchan (NA 4), Krishna (NA 5), NA 6, NA 7 and NA 10.
- ♦ Land is prepared by ploughing, harrowing, levelling, and removing weeds. Aonla propagated by budding or softwood grafting in July-August.
- ♦ Grafted or budded plants are planted 4-5 meter apart under square system of layout during July-August or February.
- ♦ Pits of 1-1.25 m. size are dug two months prior to planting. In each pit 3-4 baskets of FYM and 1 kg. neem cake or 500 g. bonemeal should be mixed with soil and filled in the pits. In sodic soil, 5-8 kg. Gypsum along with 20 kg. sand is filled in the pit irrigation is provided immediately after this.
- ♦ 10 kg. Farmyard manure, 100g. N, 50g. P and 100g. K should be given to one-year-old plants. This dose increased on yearly basis upto ten years.
- ♦ Irrigation is provided at an interval of 15-20 days in dry summer. No irrigation is required rainy and winter season. First irrigation is provided just after manure & fertilizer application (January/February) Irrigation is not provided during the flowering period i.e., mid-March and April.
- ♦ The plants are trained to modified central leader system. Two to four branches with wide crotch angle, appearing in the opposite directions should be encouraged in early years. The unwanted branches are pinched off during March-April. In the subsequent years, 4-6 branches should be allowed to develop.

- ♦ Inter-cropping with vegetables, flowers and a few medicinal/ aromatic plants are well suited for intercropping, cost of inter cropping would be Rs. 10,000/- per acre. Paddy straw, sugarcane trash and farmyard manure can be used for mulching.
- ♦ Necrosis, a physiological disorder has been observed mostly in case of Banarasi and Francis varieties.
- ♦ A budded/grafted tree starts bearing third year onwards after planting, whereas a seeded plant may take 6-8 year. The fruits are harvested manually and sorted according to their size. Fruits can be stored for a period of 6-9 days under ordinary conditions. Aonla tree may bear 1-3 q fruit /tree, giving 15-20 tones yield /ha.

Papaya

- ♦ Papaya being a tropical fruit grows well in the mild sub-tropical regions. Night temperature below 12-14 degree C for several hours during winter season affects its growth and production severely. Well drained sandy loam soil is ideal for cultivation of papaya.
- ♦ Varieties are Honey Dew, Coorg Honey Dew, Washington, Pusa Delicious and Pusa Nanha.
- ♦ Commercially propagated by seed and tissue culture plants. The seed rate is 250-300 g/ha. The seeds after being treated with 0.1% Monosan (phenyl mercuric acetate), cerasan etc.
- ♦ Light irrigation at morning and nursery beds are covered with polythene sheets or dry paddy straw. About 15-20 cm tall seedlings are chosen for planting. Planting during spring (February-March), monsoon (June-July) and autumn (October- November).
- ♦ Spacing of 1.8 x 1.8 m. is normally followed. However higher density cultivation with spacing of 1.5 x 1.5 m. /ha enhances the returns. Pusha Nanha is adopted for high density planting, 6400 plants/ha.
- ♦ Papaya plant needed heavy doses of manures and fertilizers. Apart from the basal dose of manures @10 kg /plant applied in the pits, 200-250g. each of N, P_2O_5 and K_2O getting high yield. $ZnSO_4$ (0.5%)

and H_2BO_3 (0.1%) are sprayed to increase growth and yield.

- ♦ The irrigation schedule is fixed based on soil type and weather conditions of the region and avoid waterlogging.
- ♦ Deep hoeing is recommended during the first year to check weed growth. Application of Fluchloralin or Alachlorin or Butachlorine (2.0 g./ha.) as pre-emergence.
- ♦ Intercropping shallow rooted leguminous crops after non-leguminous is beneficial. About 10% of the male plants are kept in the orchards for good pollination.
- ♦ The insect/pests mostly observed are fruit flies (*Bactrocera cucurbitae*), grasshopper (*Poekilocerus pictus*), aphids (*Aphis gossypii*), red spider mite (*Tetranychus cinnabarinus*), stem borer (*Dasyses rugosellus*) and grey weevil (*Myloccerus viridans*). control by Dimethoate (0.3%) or methyl demeton (0.05%).
- ♦ The main diseases reported are powdery mildew (*Oidium caricae*), anthracnose (*Colletotrichum gloeosporioides*), damping off and stem rot. Application of wettable sulphur (1 g/l.) carbendazim/thiophanate methyl (1 g./l.) and Kavach/ Mancozeb (2 g./l.) are effective control measures
- ♦ Full size fruits are harvested when they turn light green in colour with tinge of yellow at apical end. The economic life of papaya plant is only 3 to 4 years. The average yield of 75-100 tones /ha.
- ♦ Fruits are highly perishable in nature. They can be stored for a period of 1-3 weeks at a temperature of 10- 13°C and 85-90% relative humidity.

Guava

- ♦ Guava is grown in both tropical and sub-tropical regions. Heavy clay to very light sandy soil having pH between 4.5-8.2 and good quality in river basins but sensitive to waterlogging.
- ♦ Varieties: L-49, Allahabad Safeda, Lucknow Safeda, Apple Colour, Chittidar, Red Fleshed, Allahabad Surkha, Sardar, Mirzapuri Seedless, CISH-G-1, CISH-G-2, CISH-G-3.

- ♦ Land is prepared during the summer season by ploughing, harrowing, leveling and removing weeds. Planting is done during the rainy season June-July is the ideal time for planting at 5-8 m distance according to variety, soil fertility and availability of irrigation facilities.
- ♦ Fertilizer 600 g. N, 400 g. K should be applied in the first week of May for rainy season and July for winter season crop. Drip irrigation is very beneficial and 60% of the water saved.
- ♦ Pre-emergence uses of diuron (1.6 kg. /ha), oryzalin (1.67 litres/ha.) or simazine (1.6 kg/ha) are found effective in control of weeds in guava orchards.
- ♦ Dry leaves or straw or black plastic can be used as mulching material its helps conserving moisture and improving the fruits quality. Leguminous crops or vegetable can be grown as intercrops during the first three years.
- ♦ Growth regulators like NAA, NAD and 2,4D have been found effective in thinning of flower.
- ♦ The insect pests mostly observed are fruit fly, stem borer, bark eating caterpillar, thrips, nematodes, mealy bug, and scale insect. Spraying the malathion (2ml.), phosphamidon (0.5ml. per ltr. of water), etc. has been found to be effective in most cases.
- ♦ The main diseases reported are wilt, fruit canker, fruit rot, anthrachose and grey leaf spot. Application of Carbendazim/ Thiophanate methyl (1g/l) or Kavach/Mancozeb (2g/l) depending upon the type of infection for controlling the diseases.
- ♦ Fruit drop is a serious disorder in guava resulting in about 45-65% loss due to different physiological and environmental factors. Spraying of GA for reducing the fruit drop.
- ♦ Foliar application of 0.5% diammonium phosphate and zinc sulphate in combination at weekly intervals for two months reduces the bronzing in guava. Pre-flowering sprays 0.4% boric acid, 0.3%

zinc sulphate and copper sulphate 0.2-0.4% increase the yield and fruit size.

- ◆ Plants start bearing at 2-3 years of age, but they attain full bearing after 10 years with 100 to 150 kg. fruits every year. Harvesting periods is August for rainy season crop and November- December for winter season crop. The shelf life can be extended up to 20 days by keeping them at low temperature of 50 C and 75- 85% relative humidity.

Spices

Garlic

- ◆ It can be cultivated on various soil types. It gives best result when grown in sandy loam and silt loam soils rich in organic matter. Range of soil pH should be 6 to 7.
- ◆ Varieties are- Agrifound white, Yamuna Safed (G-1), Yamuna Safed 2 (G-50), Yamuna Safed 3 (G 282), Yamuna Safed 4 (G 323)
- ◆ 225-250 kg seed require for one acre. Seed treatment with Thiram@2 gm/kg of seed + Benomyl 50WP@1 gm/liter water effectively controls damping off and smut diseases.
- ◆ The manure and fertilizers requirement are 125 kg N, 65 kg P and 100kg K/ha and 40 tonnes FYM. Borax up to 10 kg/ ha increase bulb size and yield.
- ◆ Thrips: If it is not controlled properly, can cause yield loss up to 50%. Mostly observed in dry weather. If infestation observed in field spray Fipronil@30 ml/15 lt water or Profenophos@10 ml or Carbosulfan@10 ml+ Mancozeb@25 gm/10 lt water by 8-10 days interval.
- ◆ Purple blotch: Severe infestation may cause yield loss up to 70%. Deep purple lesions are observed on leaves. Yellow streaks get turn brown and extend along the blade. Spray Propineb70%WP@350 gm/acre/150 lt of water, twice at 10 days interval.

Coriander

- ♦ Coriander is popular for its aromatic seeds, leaves and stems. All parts of the plant are indispensable food adjuncts in Indian cookery.
- ♦ Coriander is a tropical plant and is capable of tolerating heat and drought. Grain yield and quality are at best when moderately cool and dry weather prevails during grain formation stage.
- ♦ It can grow in all types of soil, but well drained loamy soils are suitable for good growth. Coriander is grown throughout the year for leaf purpose but for grain, the crop is sown during October-November. FYM or compost is applied during last ploughing
- ♦ A seed rate of 10- 15 kg/ha is generally adopted for irrigated conditions.
- ♦ Varieties are Pant harithma, V1, V2, GC1, GC2, Sindhu, Swati, CO-2, CO-3., Azad dhaniya-1.
- ♦ FYM 25 tonnes/ ha, 60 kg nitrogen, 40 kg phosphorus and 20 kg potash are recommended.
- ♦ Aphid: If Infestation of Aphid is observed, to control spray of Imidacloprid@6ml/10Ltr water or Thiamethoxam@4gm/10Ltr of water is recommended.
- ♦ Powdery Mildew is Patchy, White powdery growth appears on upper surface of leaves and its control spraying water soluble Sulphur@20gm/10Ltr or Propiconazole10EC (Topas) @200ml/ acre in 200Ltr of water is recommended.

Fenugreek

- ♦ It can be grown in all type of soil rich in organic content but give best result when grown in well drained loamy or sandy loam soils. It can tolerate pH of range 5.3 to 8.2. The crop requires a cool climate and is capable of tolerating frost or freezing weather. Dry weather is essential during crop maturity phase.
- ♦ Last week of October and first week of November is best time for sowing.

- ♦ 18-25 Kg seed/ ha. Seeds are soaked in water for 2 days prior to sowing to enhance germination. Seeds are also treated with Rhizobium culture.
- ♦ Varieties are CO-1Fenugreek, Rajendra Kranti, Pusa early bunching, kasuric selections, Azad methi-1, Hissar Sonali.
- ♦ Farmyard manure or compost at the rate of 15-25 tonnes/ ha is applied. The biomass production is high with higher doses of organic matter. Nitrogen @20 kg/ha, phosphorus 60kg/ha and potash 40 kg/ ha should be applied. To attain fast growth 15-20 days after germination spray Triacntanol hormone@20ml/10 lt of water is recommended.
- ♦ Infestation of Aphid, to control spray Imidacloprid@3ml/10Ltr or Thiamethoxam@4gm/10Ltr of water.
- ♦ To protect crop from root rot, as preventive measure soil application of Neem Cake@60kg/acre. Treat seeds with Trichoderma viride@4gm/kg of seed. If observed in field to control, drenched soil with Carbendazim @5gm/Ltr of water or Copper oxychloride@2gm/litre of water.
- ♦ Powdery Mildew is Patchy, White powdery growth appears on upper surface of leaves and its control spraying water soluble Sulphur@20gm/10Ltr or Propiconazole10EC (Topas) @200ml/acre in 200Ltr of water is recommended.

Fennel

- ♦ Fennel also known as Saunf. Its seeds after drying are used for spice purpose. Fennel is good source of fibre, vitamin C, potassium. It is used for flavouring meat dishes, soups etc. Its leaves are used for garnishing dishes also in salads. Fennel also has medicinal properties. It is used for digestion, also to treat constipation, diarrhea, throat pain, headache etc.
- ♦ All soils rich in organic matter are suitable for cultivation but best result in well drained sandy loam to loamy soils. PH of soil should be in range of 6.5 to 8. Sowing in second fortnight of October. To

- obtain good yield avoid delay in sowing.
- ◆ 4 kg seed require for one-acre land.
- ◆ Varieties are RF-35, RF-101, Gujrat Fennel-1, Azad sounf-1.
- ◆ Apply well decomposed FYM @10-12qtl/acre in soil at time of land preparation. Apply Nitrogen@20kg/acre in form of Urea@45kg/acre in two to three equal splits. First nitrogen application is as basal dose, apply remaining dose of Nitrogen 30 and 60 days after sowing.
- ◆ Aphid: If infestation of Aphid is observed, to controlled spray Dimethoate 30EC@2ml per litre of water or Methyl demeton 25EC@2ml per litre of water.
- ◆ Powdery Mildew: If infestation is observed, spray wettable Sulphur@2gm/ltr of water.

Value addition of vegetables and fruits for nutritional security and income generation

- ◆ Food has been considered as the major factor in maintaining well-being and health of individuals. Active ingredients in food, which are effective in promoting human health, include amino acids, fats dietary fiber, antioxidants, pigments, vitamins, and minerals which are present in different food groups such as pulses, cereals, legumes, oilseeds, fruits, and vegetables. Among all these food groups, fruits and vegetables play a significant role in human nutrition, especially as a source of vitamins, minerals and dietary fiber. The different fruits and vegetables like carrots, tomatoes potatoes, ginger, green leafy vegetables, and the like are important protective foods, because of their nutritional value and antioxidant properties. Value addition of such fruits and vegetables by formulation of different value-added products are an important source of nutritional security.

Tomato

- ♦ Tomatoes are one of the most popular protective foods, because of its lycopene content, outstanding nutritive value, antioxidant properties and a powerhouse of medicinal properties. It is a rich source of minerals like calcium, magnesium, phosphorous, iron, sodium, potassium, and vitamins especially A and C. Tomatoes are consumed mainly as a raw staple food, as an ingredient in different types of food products and in the form of processed products such as powder, tomato juice, paste, puree, sauce, etc.
- ♦ This horticultural crop is an excellent source of health promoting compounds, being a balanced mixture of minerals and antioxidant vitamins including vitamin C and E, as well as rich in lycopene, beta carotene, thiamine, riboflavin, niacin, lutein, and flavonoids such as quercetin. The main antioxidants in the tomatoes are the carotenoids specially lycopene which have the highest lycopene levels among fruits and vegetables, ascorbic acid, and phenolic compounds. Among the different carotenoids, lycopene, is the most abundant in human serum, with important antioxidant activity involved in prevention of several types of cancer and degenerative diseases such as cardiovascular diseases.
- ♦ Due to lack of proper processing, storage and transportation facilities, enormous quantities of tomatoes are lost during, hence proper processing and storage in some preserved form during seasons of glut will ensure its availability and utilization during deficiency period.
- ♦ Hence, processing of tomatoes in different forms as preferred by the consumers, Processing of fresh tomatoes can be done to prepare value added products like tomato pulp, tomato puree, tomato paste, tomato flakes, canned tomatoes, tomato ketchup, tomato soup and sauce, tomato powder and dehydrated tomato.
- ♦ Therefore, replacement of fresh tomatoes for example, with tomato powder can facilitate the processing sector with daily cuisines and

preparation during off season. Tomato powder can be used in processed products, such as soup mixes and confectionary items.

Carrots

- ♦ It is well known for its nutrient contents viz., carotene and carotenoids, besides appreciable amount of vitamins and minerals such as ascorbic acid, tocopherol etc. Among roots and other vegetables, carrot is the best source of carotene, which is a precursor of vitamin A, an essential nutrient for maintaining health. Carrot possesses nutraceutical properties such as anti-mutagenic, chemo preventive, photo protective and immune enhancing aspects. The presence of high concentration of antioxidant carotenoids, especially beta-carotene, may account for the biological and medicinal properties of carrots. Carrot is also rich in fiber content and has been reported to be effective for its multifaceted applications, which have resulted in development of various processing operation for making different products.
- ♦ Carrots have been reported to be effective in the elimination of uric acid. Carrots not only prevent vitamin A deficiency, but also cancer and other diet related human diseases. It has greater cytotoxic effect against cancer cells and reduces the enzymes that promote conversion of pre-carcinogens to carcinogens. It may also enhance the immune system protect against stroke, high blood pressure, osteoporosis, cataract, arthritis, heart disease and urinary tract infections.
- ♦ Processing of carrots would ensure its availability round year and reduction in cost of transportation and storage. During winter season, when carrots are available in plenty, different processed products may be prepared and stored in airtight containers, which may be incorporated in various recipes.
- ♦ Different processed products of carrots are carrot juice, carrot powder, carrot flakes, canned carrot, carrot candy, carrot halwa, carrot grits, carrot soup, carrot Dalia and fabricated baby foods.

- ♦ Carrot powder prepared by dehydrating carrots is often incorporated in traditional food products to enhance the nutritional value, and thereby produce value added products such as paratha, porridge and laddu. These processed carrot products are not only nutritionally adequate, but also qualitatively sound for an extended period.

Ginger

- ♦ Ginger is one of the five most important spices of India, standing next to chilli, garlic, and turmeric. Ginger is an underground stem of the zingiberous herbaceous plant. Ginger rhizomes are available for harvesting every 7-9 months after planting and stages of maturity of the rhizome have a significant influence in its quality and processing.
- ♦ Ginger is commonly used as a food additive, and as spice, it is used in food preparation to impart its characteristic flavour. It has been attributed with antioxidant properties, proteolytic activity, and tenderizing effect. It has been attributed with antioxidant properties which widens its use in preservation of meat and meat products.
- ♦ Ginger has been used to treat numerous types of nausea and vomiting. Ginger's therapeutic properties effectively stimulate circulation of the blood, remove toxins from the body, clean the bowels and kidneys, and nourish skin. Other uses for ginger root include the treatment of asthma, bronchitis, and other respiratory problems. Besides therapeutic properties, ginger has been attributed with antioxidant properties, proteolytic activity, and tenderizing effect. Ginger is used in various food preparations to impart its characteristic flavour and is probably the only spice being used in production of beverages like ginger beer, ginger ale and ginger wine.
- ♦ Although ginger production is very high, but due to lack of proper storage and transportation facilities, about 20 percent of fresh ginger crop gets damaged due to respiration and microbial

spoilage. Hence, it becomes necessary to process the surplus ginger in different preserved forms, which is available throughout the year.

- ♦ The different processed products from ginger include likes Paste, Candy, Preserve, Pickle, Chocolates, Beverages, Powder, Juice, Ice cream, Oleoresin etc.

Fenugreek Leaves

- ♦ Fenugreek is a popular green leafy vegetable available in plenty, at lower cost during winter season. Blanching treatment is used to preserve the colour and nutritional value of GLVs. Fenugreek leaf powder obtained by dehydrating fenugreek leaves has been used to prepare paratha and saag.

Potato

- ♦ Potato is a versatile food, which can be eaten as a staple food, as a complementary vegetable, as a snack item or processed into several forms, and in any of these roles, it enhances the nutritional quality of the diets of people. Potatoes are versatile as they can be consumed in various forms as boiled, fried, baked, roasted, steamed and even in several pressed forms such as French fries, chips, papad, flakes, dice, cubes, granules, flour, canned potatoes etc.
- ♦ Potatoes contribute significantly to the nutritive value of a meal, as it is not only a rich source of energy, but contain good quality edible grade protein, dietary fiber, several minerals and trace elements, essential vitamins and little or negligible fat.
- ♦ It is seasonal and the crop produced has a shorter storage life. Hence, under such circumstances, the post-harvest processing of the bulky, perishable potatoes into dehydrated potato products helps to extend the storage life and a serve to increase the supply in off-seasons in different forms, in a price effective manner.
- ♦ Different processed products of potatoes such as potato flour, potato grits, potato flakes, potato granules and potato cubes.

Sweet Potato

- ♦ Sweet potato, a commonly grown root vegetable of winter season is valued for its high nutritive value, flavours, and digestibility. Sweet potato is widely used in India, for food consumption after boiling, baking, or frying. However, in other countries, flour of the sweet potato is often used in biscuits, cakes, and pudding.
- ♦ The advantage of sweet potato over other vegetables is that it has got the shorter growth period, and adverse weather conditions rarely cause a complete crop loss. Sweet potatoes often referred to as “poor people’s food” or “poor men’s crop” has difficulties in marketing and processing. Processing of sweet potato tuber increases their availability and reduces post-harvest wastage. The processed products of sweet potato are sweet potato flour, sweet potato granules and canned sweet potatoes.
- ♦ Sweet potato flour can be incorporated in wheat flour for bread and biscuit baking, hot cakes, gruel, noodles, candy, puddings, and other preparations. It can be mixed with wheat flour for making chapatti and bread. This flour functions as a stabilizing agent in ice-creams. Sweet potatoes are an important source of dietary protein, substantial quantity of vitamins (Beta carotene, B complex and vitamin C) minerals, trace elements and high energy value.

Zone-IV**BIHAR****Field Crops****Cereals*****Wheat***

- ♦ Timely sowing of wheat crop ensures good crop stand, yield and escape terminal heat stress at the time of maturity. Right time for field preparation and sowing of wheat is 1st week of Nov using zero tillage and late sowing by 20th December. In late sown wheat, increase the seed rate by 10-20%.
- ♦ If sufficient moisture is not available apply light irrigation and complete sowing.
- ♦ Sowing of timely sown wheat varieties DBW 187, HD 2967, K1317, HD 3226, DBW 39, K0307, HD 2824, HD 2402, CBW 38, PBW 343, Sabour Samridhi.
- ♦ Delayed sowing of wheat due to late harvesting paddy, of wheat varieties HD 3118, HD 2985, HI 1563, DBW 107, DBW 14, HD 2643, HP 1633, HD 2307, DBW 173, PBW 752, HUW 234, PBW 373, Sabour Shrestha.
- ♦ Recommended varieties under dry areas are- HD 3171, HD 2888, K 8027, C 306, MACS 6145, Sabour Nirjal, HDR 77, K 9465.
- ♦ Under normal sown crop maintain the row spacing of 20cm and in delayed sown condition 18 cm between two rows.
- ♦ Apply 150-120 kg N, 60 kg P₂O₅ and 40 kg K₂O per hectare for optimum productivity. The N is to be applied in two split doses of 60 kg as basal and the remaining 60-70 kg at first irrigation and full dose phosphorus and potash as basal.

- ♦ Apply Zinc @ 25kg/ha in rice-wheat system to increase the yield.
- ♦ In late sown condition apply 100-120kgN, 40kg P_2O_5 and 20kg K_2O /ha and in rain-fed situation apply 60kgN, 30kg P_2O_5 and 20kg K_2O /ha.
- ♦ Give one irrigation at CRI stage (crown root initiation) stage at 20-25 days after sowing and another irrigation at heading stage are crucial when plant suffers due to moisture stress.
- ♦ Generally, four irrigations are required during critical stages of crop growth in Bihar, 1st at CRI stage (20-25 DAS), 2nd late Jointing stage (40-45 DAS), 3rd at heading stage (65-70 DAS) and 4th at milking stage (90-100 DAS).
- ♦ Wheat field is generally infested both by broad and narrow leaves weeds. For controlling of mixed weed flora narrow and broad leaf weed sulfosulfuron + metsulfuron @40g/ha or clodinafop + metsulfuron 400g/ha mixed with 500L of water applied after 25-30DAS.
- ♦ For control of broad leaf weed apply metsulfuron @10g a.i./ha or 2,4-D Na salt @ 1.0 kg /ha after 30-35DAS.

Maize

- ♦ Complete the sowing of maize from mid-October to mid-November in rows, at a spacing of 60×20 cm using seed drill and maintain optimum depth 5-7 cm.
- ♦ Cultivate improved hybrid variety like Ganga 11, DHM 103, DHM 105, Rajendra hybrid makka-1, ICI 705, Dhawal, Laxmi, Devaki, Saktiman 1, Saktiman 2, Saktiman 3, Saktiman 4.
- ♦ Timely sowing of maize can be sown with zero till drill.
- ♦ Use Gramoxone 24 SL (paraquat) @1.25 L in 500 litres of water per ha before sowing for control of weeds.
- ♦ For higher yield of maize, apply recommended quantity of manures and fertilizers (10 T FYM/ ha, 150-180kg N, 70-80kg P_2O_5 , 70-80kg K_2O and 25kg $ZnSO_4$ per ha. Apply full dose of phosphorous and

potash and 1/3 N at the time of sowing and 1/3 N at the knee-high stage and the remaining 1/3 at the pre-tasselling stage.

- ♦ In zinc deficient areas apply 25 kg of zinc sulphate heptahydrate (21%) or 16.25 zinc sulphate monohydrate (33%) per ha at the time of sowing
- ♦ Seedling, knee height stage, flowering and grain filling are the most critical stage for irrigation in maize and ensure water supply during these stages.
- ♦ For weed management, at least one or two hand weeding required- first 20-25 days after sowing and second on 40-45 days after sowing and do intercultural operation followed by earthing up.
- ♦ If the field is infested with motha, apply 2,4-D amine salt 58 SL@1.0L/ha by dissolving in 375 litres of water at 20-25 days after sowing.
- ♦ Regularly monitor the field to collect and destroy egg masses of fall armyworm from leaves. Egg masses are covered with hairs and are easily visible. Spray the crop with chlorantraniliprole 18.5 SC @ 0.4ml/ litre of water or emamectin benzoate 5SG @0.4 g/litre

Pulses

Gram

- ♦ To obtain higher yield, cultivate improved and disease resistant variety of chickpea. Timely sown varieties: RSG 44, Pusa 329, Pusa 362, DCP-92-3, GCP105, KWR108, BG1003, Vijay, Pragati, Pant gram3, Pant gram 4, HK4, Birsa chana 3, Sadabahar; and Late sown varieties: Pusa 372, KPG 59 (Uday).
- ♦ Apply pre sowing irrigation for good germination and early crop establishment.
- ♦ Complete the sowing between mid-October to mid- November. Seed rate for small seeded is 75-80 kg/ha and for bold seeded 100 kg/ha.

- ♦ Sowing of gram crop at a spacing of 30cmX10cm for small seed and 45cmX10cm for bold seed at depth of 8-10cm because dip sown crop has less incidence of wilt disease.
- ♦ Before sowing seed should be first treated with fungicide carbendazim @ 2g/kg seed then treated with insecticide chlorpyrifos 20EC @ 8ml/kg seed and lastly treated with Rhizobium culture @ 10g/kg seed 2-3 hours before sowing.
- ♦ Apply recommended dose of fertilizer in pulses are 20 kg N (45 kg urea), 40 kg P₂O₅ (250 kg SSP) and 20 kg K (36 kg muriate of potash) at the time of sowing of seed through seed cum fertilizer drill.
- ♦ In absence of winter rainfall, give one irrigation at pod development stage (75 DAS). No irrigation is given at flowering time.

Lentil

- ♦ Best time for sowing of lentil is mid-October to mid-November and it ensures good crop stand and also escapes from the attack of insect pest and diseases. Delayed sown crop is more prone to wilt diseases and too early sowing results in excessive, vegetative growth and poor setting of pods.
- ♦ Cultivate improved varieties like PL 406, PL 639, K 75 (Mallika), HUL 57, NDL 2, WBL 58, WBL 77, PL 777-12 (Arun), IPL 406, Narendra Masoor 1, BR 25, KLS 218 and sowing to be done at 30cmX10 cm spacing at 4-5cm depth.
- ♦ The optimum seed rate required for lentil is 30-35 kg/ha for sole crop and 50-60 kg/ha for paira cropping.
- ♦ Treat the seed 2-3 days before sowing with fungicide carbendazim @ 2g/kg seed then with insecticide chlorpyrifos @ 2ml/kg seed and lastly 2-3 hours before sowing with Rhizobium culture @ 10g/kg.
- ♦ Apply 2-3 MT FYM/ha at the time of final field preparation. Use recommended dose of fertilizer in pulses are 20 kg N (45 kg urea),

40 kg P_2O_5 (250 kg SSP) and 20 kg K (36 kg muriate of potash) at the time of sowing of seed through seed cum fertilizer drill.

- ◆ Two irrigation is required first at pre flowering stage (45 DAS) and second if needed at pod filling stage (75 DAS).
- ◆ Apply 20kg sulphur/ha at the time of sowing resulted more yield

Lathyrus (Khesari)

- ◆ Generally, horse gram is grown as paira cropping or mixed cropping with linseed and sowing start from last week of October to mid of November.
- ◆ Use improved varieties like Bio L212 (Ratan), LS 147-14 (Prateek), B1(Nirmal), Pusa 24, RLS 4595, LSD 3, LSD 6
- ◆ Sow the crop with the spacing of 30X10cm and 40 kg/ha seed rate for dual purpose and for line sowing 25-30kg/ha for grain crop.
- ◆ Use recommended dose of fertilizer in pulses are 20 kg N (45 kg urea), 40 kg P_2O_5 (250 kg SSP) and 20 kg K (36 kg muriate of potash) at the time of sowing of seed through seed cum fertilizer drill.
- ◆ Apply 20kg Sulphur per ha at the time of sowing gives better yield.

Field pea

- ◆ Ideal time for sowing of field pea is mid-October to mid-November and this ensures good crop stand and escapes from the attack of insect pest and diseases. Delayed sown crop is more prone to wilt diseases
- ◆ Use high yielding varieties- Rachna, Aparna, Malviya Matar 15, Pusa Prabhat, VL matar 42, Swarna Tripti.
- ◆ Treat the seed with rhizobium culture @ 10g/ kg seed before sowing.
- ◆ Seed rate 70-80 kg/ha (long duration variety) and 100 kg/ha (short duration variety) and recommended spacing 30cmX10 cm for long duration variety and 22.5cmX10 cm for short duration variety at a depth of 4-5 cm.

- ♦ To obtain better yield apply 20 kg N (45 kg urea), 40 kg P_2O_5 (250 kg SSP) and 20 kg K (36 kg muriate of potash) at the time of sowing of seed through seed cum fertilizer drill.
- ♦ Apply 20kg sulphur/ha at the time of sowing resulted in higher grain yield and better soil health
- ♦ Two irrigation is necessary for Field pea first irrigation at before flowering and second irrigation at pod filling stage.

Oilseeds

Rapeseed/Mustard

- ♦ If sufficient soil is not available give one pre sowing irrigation for better seed germination. Start the sowing of mustard from 1st week October and complete by 2nd week November. Early sown crop has less infestation of aphid and leaf blight.
- ♦ Rapeseed/Mustard to be sown at 30cmX10-15cm spacing and at 4-5cm depth. Before sowing treat the seed with trichoderma@10g/kg of seed.
- ♦ To maintain optimum plant population thinning out operation must be done after three week of sowing and maintain the healthy seedling.
- ♦ Grow improved variety of mustard Timely sown: Sej 2, Pusa Mahak and Pusa Bold; Late sown: Rajendra Rai Pichheti, Rajendra Anukool, Ashirvad; RH0749, T9,44S- 01, RGN 73, NRCHB 101, DRMR 150-35, NRCYS-05-02 Rajendra Suflam Toria: RAUTS 17, Panchali; and Yellow Sarson: Rajendra Sarson 1, Ragini, Benoy according to availability of growing period and purpose.
- ♦ Plough the field and make well pulverized and apply basal dose of fertilizer before final preparation or sowing to be done using seed cum fertilizer drill. Apply 10-12 MT FYM and 60-90 kg N, 60kg P_2O_5 and 40kg K_2O /ha. Apply $\frac{1}{2}$ dose of N and full dose of P and K as basal dose at the time of sowing and remaining half dose of N applied after first irrigation. Since oilseed crop has more

requirement for sulphur hence apply @30kg/ha, so it is advisable to use single super phosphate or bentonite sulphur at the time of sowing.

- ◆ For getting good plant growth, crop required in general about three irrigations apply at interval of three weeks after sowing at 30DAS, before flowering and pod formation stage get more yield

Linseed

- ◆ Sowing of linseed could be started from 1st week of October to 1st week of November. Delayed planting adversely affects the yield. If linseed has been planted in standing paddy crop that is called Utera/Paira cropping
- ◆ Use High yielding varieties like Sabour tisi1, sabour tisi2, Garima, Sweta, Subhra, Gaurav, LCK-8528
- ◆ Linseed is grown as sole crop or mixed cropping with lentil and chickpea. It is also broadcast in standing paddy crop known as *Paira* cropping. It is the popular sowing method in rice fellow area.
- ◆ Sow the crop with the spacing of 30X5cm row to row and plant to plant, and depth should be 4-5cm.
- ◆ Seed rate of 20-30 kg/ha is required for normal sowing and 30-40kg/ha for utera/paira cropping.
- ◆ Application of 8-10 tonnes of FYM/ha applied at the time of field preparation. HYVs are responsive to fertilizer application. Apply 50kg N and 40kg P₂O₅/ha. Under irrigated condition apply 1/2 dose of nitrogen and full dose of phosphorus. Remaining ½ dose of N applied at 1st irrigation. In unirrigated areas apply full dose of nitrogen and phosphorus. Apply 20kg sulphur/ha at the time of sowing resulted more yield.
- ◆ For getting good plant growth, crop required in general about two irrigations apply 1st irrigation at 30DAS and just before flowering is advisable if no winter rain.

Horticultural crops

October

- ◆ Destroy the twigs infested with the shoot gall psylla. Spray insecticides i.e., thiamethoxam 1g/ liter of water + profenophos 2ml/ liter of water + sticker 1/2 ml/ litre of water twice applications of both the insecticides were suggested, first spraying should be done in third week of August and second spraying be done 15 days after first spraying.
- ◆ Planting of papaya in raised bed with application of *Trichoderma* to save plants from foot rot.
- ◆ Land preparation for sowing of potato in field as per the varieties for early crop.
- ◆ Sowing of cauliflower seeds in well prepared nursery and planting of early varieties. Nursery raising for mid-season varieties of cauliflower, cabbage and other cole crops and planting of pointed gourd.
- ◆ Preparation of land and sowing of radish, carrot, coriander, spinach, beetroot, and turnip.
- ◆ Complete the plantation of banana new filed.
- ◆ Complete the work of intercultural operation (tillage and cleaning) in the fruits orchards and apply fungicide (0.2%) for the controlling of fungal diseases.
- ◆ Application of compost 40-50kg per plant on each mango tree. In newly established orchard sowing of pulses/ vegetables. Right time for management of mealy bug by tying polythene banding around the tree trunk and apply grease at the lower end
- ◆ Mulching of fruit tree basin (mango, litchi, etc.) by fallen leaves and dried weeds and grasses/ plant residues for soil moisture conservation.

November

- ♦ Intercultural and earthing-up operation in potato, cole crops and solanaceous vegetables and apply remaining dose of fertilizers.
- ♦ Sowing of vegetables pea var (Bonneville/ Arkel/ Azad matar) and planting of tomato, brinjal and other crops. Before sowing treat the seeds with Rhizobium and apply Trichoderma in the field
- ♦ Protection from frost, make thatch in new gardens with straw, grass etc.
- ♦ Do weeding and cleaning of tree trunks and apply well rotten manure of 40-50 kg per tree dung.
- ♦ To control shoot borer, thrips, hoppers and other lepidopterous pest sprays of Imidacloprid 17.8 SL (by making a solution in 1 ml per liter of water).
- ♦ Right time spraying zinc sulphate for shoot maturation and bearing regulation apply KNO_3 (Potassium nitrate 1%) in litchi and Mango.
- ♦ Dimethoate /Metacystax (0.02 ml) 3 ml on trees. Spray Rogar/ Metasystax / Demacran and 30 gm Dithane M-45 dissolved in 10 litres of water.

December

- ♦ Irrigate the field as per need and spray fungicide if the disease incidence occurs in potato and other vegetable crops. Spray mancozeb at 0.25% followed by cymoxanil + mancozeb or metalaxyl 8 + mancozeb 64%WP (0.25%) at 0.3% at the onset of disease and one more spray of mancozeb at 0.25% seven days after application of systemic fungicides and apply light irrigation in the field.
- ♦ To protect the new orchards from frost, apply light irrigation. Apply the recommended amount of phosphorus and potash to the trees.
- ♦ Right time renovation of old senile mango and guava orchard.
- ♦ For the control of bark-eating insects and stem-boring insects, clean the traps and holes, insert a bit of cotton soaked in Kerosin oil

and plug with mud or dung.

January

- ◆ Right time for preparation of field for summer season vegetables, sowing of seed of vegetables and transplantation of onions.
- ◆ Intercultural operation and irrigation in vegetable peas.
- ◆ Prepare Brinjal, Tomato, Chilli plant for the prevention of fungal disease of peas, spray Karathane 0.1% during morning hours.
- ◆ To protect the mango crop from honeybee and other pests, use the prescribed insecticide.
- ◆ Irrigate the potato after 10 to 15 days as per the need. Spray mancozeb at 0.25%.
- ◆ Use dung manure and phosphorous fertilizers in fruit trees in the first week of January.
- ◆ If there is no rain, apply light irrigation and give half of the recommended amount of nitrogen. Irrigate small plants for protection them from frost.
- ◆ Raising of cucurbitaceous nursery in the poly tunnel for early planting in main field

February

- ◆ Transplanting of cucurbitaceous vegetables plant in the field and planting of brinjal, tomato and chili plants in the field. Use PSB as seedling treatment against bacterial diseases.
- ◆ Stop irrigation 15 days before digging of potato and remove the foliage for seed crop.
- ◆ Dig the sweet potato and plant the spring season taro early.
- ◆ Irrigation, weeding and hoeing should be done according to the time of onion and garlic crop.
- ◆ Sowing of okra and cowpea in the first fortnight of this month.
- ◆ Clean up the gardens. Irrigate small plants to protect them from frost.

- ◆ In new orchards, take care of intercropping crops and sow summer crops like okra and pumpkin.
- ◆ If the effect of midge is visible, then cut and destroy the affected blossom.
- ◆ After the burst of blossom, as soon as the beetle outbreak starts and their number is 5-10 per blossom, then first spray of Imidacloprid (0.005%) should be done.
- ◆ Spraying of soluble sulfur (2g/l) at the time of flowering in mango and litchi
- ◆ For best results, keep a bee box in the Mango and Litchi Orchards while the flowers are in bloom.

March

- ◆ Harvesting, grading and storage of potatoes in cold house.
- ◆ Sow seeds to prepare papaya seedlings.
- ◆ Twigs affected by bunch disease should be cut and removed. For control of scabies, spray Karathane (0.6 %) and.
- ◆ To control fruit drop spraying of NAA 20 ppm by adding 0.5ml/L sticker in the fruits of mango and litchi
- ◆ Foliar spray of 0.1% borax to prevent internal tissue decay and black tip of fruits.
- ◆ Spray NAA 20 ppm solution and Borax (0.1%) solution on small fruits 15 days after fruit set.
- ◆ After completion of fruiting process, give one third dose of nitrogen and potassium and maintain the moisture level by applying irrigation.

April

- ◆ Sowing of Colocassia, Turmeric and Elephant foot yam in sole crop or intercrop in fruit orchards of litchi and mango.
- ◆ Right time layout and digging of pits for new fruit trees orchards establishment

- ♦ Apply irrigation in summer season vegetables and do intercultural operation. With irrigation apply nitrogen fertilizers.
- ♦ Harvesting of vegetable crop as per maturity
- ♦ According to the need of cauliflower, cabbage, weeding and irrigation plant papaya.
- ♦ Spray Imidacloprid 17.8 SL (0.5 ml/L) if there is a high incidence of roasting pest. Spray borax (0.8-1.0 percent) to prevent black tip and internal tissue decay.
- ♦ Irrigate fruit orchards and remaining doses of nitrogenous and potash fertilizers.
- ♦ To know the number of fruit flies and to control it, installing wooden sex scent traps on the trees.
- ♦ Control litchi bug properly.
- ♦ Install the drip or sprinkler irrigation method for water saving.
- ♦ To avoid fruit and seed borer pest infestation, apply Thiacloprid 21.7SC @0.05% about 40-45 days before anticipated harvesting.

Livestock and Poultry

- ♦ The Livestock and Poultry houses should be properly ventilated to avoid various respiratory problem smell of ammonia, which may predispose in animals
- ♦ Livestock should be kept clean, dry, and warm with proper bedding material to avoid contact with cold surface during winter.
- ♦ The animal houses should be protected from smoke from fires which are lit to provide warmth. The smoke and dust increase chance to develop pneumonia.
- ♦ The houses of Livestock and Poultry should be fully opened during daytime for exposure to sunlight of animal shed. Provide them clean and warm water for drinking every part of animal house to sunlight.
- ♦ New-born animals are more prone to cold stress during winter, therefore provide jute coat to them until they start eating concentrate.

- ◆ Poultry shed should be preheated during winter before introducing day old chicks.
- ◆ Adequate arrangement for drainage of water should be made to avoid water logging in and around the house.
- ◆ Spray ecto-parasiticial drugs on animal body surface and in Cattle yard/Pashushala to avoid haemoprotozoal diseases.
- ◆ Different varieties of Berseem (Vardan, Mascavi and BL-42) and Oat (Kent, Oat-9 and JHO- 851) can be cultivated for use as fodder for livestock.
- ◆ The sowing of Fodder (Berseem) should be after seed treatment with rhizobium culture.
- ◆ Sowing of oat to be done in October for obtaining maximum yield.
- ◆ The surplus green fodder can be dried in sunny days for making Hay, which may be used during lean period.
- ◆ The animals should be fed mineral mixture @ 50-60 g/day/cattle or buffalo and balance concentrate mixture @ 1.25-1.5 kg/day/ animal for maintenance purpose.
- ◆ The kids above four months of age should be vaccinated with PPR vaccine.
- ◆ Cattle and buffaloes should be vaccinated for FMD, Haemorrhagic Septicaemia Black Quarter etc. The age of first vaccination should be 4-6 month and it should be repeated every six months for FMD and annually in case of Haemorrhagic Septicaemia and Black Quarter. The female calf should be vaccinated once for brucellosis at the age of 4-8 months with s19 strain vaccine.
- ◆ Vaccinate Poultry bird against different bacterial and viral disease Ranikhet Disease, IBD, Mareks disease, Infectious bronchitis, Fowl pox, Fowl cholera etc.as per vaccination schedule
- ◆ The poultry and calf feed should be added with coccidiostat to avoid problems of coccidiosis.
- ◆ The Mastitis in animals can be prevented with following clean milk production practice.

- ♦ The animals should not be allowed to graze near pond and lakes to protect the animals from internal parasitic infestation.
- ♦ To avoid formation of litter cake, dampness and bad smell in poultry house, daily raking of litter and mixing of lime powder is required.

Fisheries

The advisories categorized below in the context of COVID-19 include scientifically proven best management practices related to fisheries to be followed by the farmers during Rabi season to achieve expected production potential sustainably following maximum profit & nutritional security.

Pre-stocking management

- ♦ Interested farmers can construct new fishponds during this period. Generally, rectangular ponds of clayey loam soil with 1.5-2.5m depth and having a slope ratio of 2:1 is considered ideal.
- ♦ Maintain water depth up-to 6-7 ft (i.e., 2m), to provide space for fishes in warmer bottom layer of pond during winter.
- ♦ Fluctuation in photosynthetic activity during rabi season caused due to decrease in day length and light intensity results in reduced oxygen level. Therefore, to maintain dissolved oxygen level within 6.5-8 mg/l, it is advised to aerate ponds with aerators or by water exchange using submersible pump.
- ♦ Eradicate unwanted weeds and aquatic insects by manual and mechanical method at regular time interval.
- ♦ Organic and inorganic fertilization doses should be provided as per soil and water quality parameters. Avoid fertilization if water turns muddy or dark colored and transparency reduces.

Stocking management

- ♦ Always purchase good quality fish seeds from certified hatchery.
- ♦ Condition the fishes by loosening the mouth of plastic bag and

- gradually dip the bag for free flowing after 15-20 minutes.
- ◆ Avoiding overstocking of fishes. The optimum stocking density varies between 7500-8000 fingerlings per ha.
 - ◆ Encourage composite fish culture of different fish species at recommended stocking rates. Generally, six (6) species carp culture is the most adopted one in Bihar- which includes Catla: Rohu: Mrigal: Silver carp: Common carp: Grass carp at the ratio 1.5:2:1.5:1.5:1.5:2.
 - ◆ Introduce small indigenous fishes like pothia, mola, murrels (murai), etc in fishpond. As, estimated 1 kg of small indigenous fishes contains 1000-fold more of vitamin content with respect to other large-sized culture fishes.
 - ◆ Diversify candidate species for freshwater fish culture- Amur carp, Jayanti Rohu, Pacu, Mono sex Tilapia, Puntius gonionotus, Bighead carp, Magur, Pabda, giant river prawn etc.
 - ◆ Construct polyhouse from low cost and locally available materials to grow adult prawns from post larvae in seasonal ponds. Polyhouse helps to maintain temperature when air temperature drops; hence considered beneficial for high-cost fishes like *Macrobrachium rosenbergii* (Giant river prawn).

Post-stocking management

- ◆ Maintain water pH within 6.5-7.5. If the level lowers apply lime and if it tends to be in a higher end than optimum level apply gypsum.
- ◆ Avoid feeding when temperature drops to 10°C.
- ◆ Generally, fish growth minimizes from mid-November to February due to lower metabolic rate and regains back as the temperature rises.
- ◆ Monitor fishes by netting the pond once within 15 days and provide bath treatment using potassium permanganate solution.
- ◆ Whenever any unusual fish behaviour is noticed, take immediate precaution to overcome those. For example, when fishes start

irregular movement and comes near surface water for gasping, such condition depicts low oxygen concentration in fishpond and immediate aeration is required.

- ♦ Fishes are more prone to common fish diseases of bacterial, fungal, parasitic, and viral such as tail or fin rot, dropsy, gill fluke, EUS and fungal. Therefore, an immediate measure to treat the fishes is required thus it is advised to treat the pond with CIFAX @ 1l/ha just before the onset of winters. Also, apply potassium permanganate @ 3-5 kg/ha or limestone @ 150-200 kg/ha. Salt solution may also be treated in pond @ 250 kg/ha which proves beneficial in protecting fish against disease outbreak during winters.

Fish based Integrated Farming System

- ♦ Horticulture - Duck based fish farming is considered the best model among all available options in Bihar for income generation round the year.
- ♦ Stocking density of ducks- 200-300 per ha, adequate to produce manure and serve as bio-aerator for fishpond.

Biofloc farming

- ♦ Considered as new technology for farmers who does not possess land for pond construction.
- ♦ Minimal or zero water exchange system of fish farming thus utilizing wastewater.
- ♦ Suitable species for this farming system is Pangas, Magur, Kawai, Tilapia and Common carp. To construct biofloc set-up of 7 tanks of 4m dia and 1.5 m height, an amount of Rs. 7-8 lakh is required.
- ♦ Major constraint in this technique is 24X7 electricity connection.
- ♦ Cage culture in large reservoirs
- ♦ An important water resource (chaurs and mauns of Bihar) to tap the fish production potential.
- ♦ Cage culture may be promoted at places having a water depth of 10m round the year with 1000 ha or more water spread area.

Harvesting

- ◆ Crafts used for fish catching must be washed with soap solution followed by 5 min dip treatment with 1% Sodium hypochlorite solution and leave it for drying.
- ◆ Gears involved in fish catching should be treated with disinfectants or with home-made neem solution after every use.
- ◆ During craft operation, a maximum of two persons will be allowed for fishing in freshwater bodies.
- ◆ Indigenous boats operating in each area need to follow the rules of keeping 3m safe distance while fishing.

Marketing and transport guidelines

- ◆ Fish landing centres may be cleaned using bleaching powder (Calcium hypochlorite) or by Sodium hypochlorite.
- ◆ Fish auction points or whole seller market timing may be constricted to avoid unnecessary gatherings.
- ◆ Sanitize insulated/ refrigerated trucks at the entry point for inter-state transits.
- ◆ Wash and sanitize the small- sized transport vehicles on daily basis.
- ◆ Adopt Matsya Bandhu- a solar based mobile refrigerated vehicle designed by Dr. Rajendra Prasad Central Agricultural University, Pusa for fish retailers to avoid distress sale in late hours. The vehicle is eco-friendly and could easily be used to sell fishes in a hygienic way at doorstep.

Along with the above guidelines, the fishermen and all the stakeholders are advised to abide by the general guidelines of personal hygiene- i.e., wearing mask during all the activities, washing hands with soap at regular intervals, keeping safe distance with others and follow 14 days' quarantine, if tested COVID positive or has travelled (migrant workers) from other states.

JHARKHAND

Wheat

- ♦ Improved varieties:
 - *Timely irrigated condition*: HD3249; HD3086; K1006; K0307; Birsa Gehu-3; HD2967; DBW39; HI1612; NW5052; Karan Bandana; (DBW187); Raj 4120; NW5054; K9107; PBW443; HD2733; CBW 38 & HI 1556.
 - *Timely unirrigated condition*: K1317; HD3171; HI1612.
 - *Late irrigated condition*: HI1563; DBW 107; HD3118; HD2985; DBW-14; PBW373; HD 2643; WR544 & RAJ 3765.
 - *Rani-fed Condition*: HI1612; K1317; HD3171 & K8027.
- ♦ **Sowing time**: Wheat is generally sown on timely irrigated condition 1st week of October, timely unirrigated condition 2nd week of November and Late irrigated condition 1st week of December and Rainfed condition last week October to 1st week November.
- ♦ **Requirement of seed**: for timely sowing is 100 kg/ha and for late sowing of wheat 125 kg/ha for getting optimum plant population. Seed treatment should be done with carbendazim @ 2.0g/kg seed. Sowing should be done in lines sowing at a spacing of 20-22 cm x 10 cm.
- ♦ **Application of fertilizer**: In timely irrigated condition 150:60:40 Kg/ha (NPK), in late irrigated condition 90:30:20 Kg/ha (NPK) should be applied. Half of N and entire dose of P & K should be given at the time of sowing and remaining N in two equal doses at 21 DAS and 45 DAS, respectively. About 5 to 10 tonnes of FYM or compost should be applied per hectare at the time of land preparation.
- ♦ **Irrigation**: Proper irrigation is most essential for wheat. Six irrigations at 20-25 DAS (crown root initiation stage), 40-45 DAS (tillering stage), 70-75 DAS (late jointing stage), 90-95 DAS (flowering stage) and 110-105 DAS (milking stage).

- ♦ **Weed Control:** Wheat field should be kept weed free particularly at the early stage of growth apply pendimethalin 30 EC @ 1.5 litre/acre for pre-emergence at under 2 or 3 days sowing of wheat for controlling broad leaved weed, spray 2,4-D @ 0.5 to 1 kg per hectare in about 600 liters of water after 4-5 weeks of sowing for narrow leaf weed- sulphosulfuran 33 ml/ha at 30 to 35 DAS.

Gram

- ♦ **Improved Varieties:** GNG 1958, KGP 59, KWR 108, Pusa 372, Pusa Chana 1021, HK4 (HK 05-169), HK 94-134, KAK-2, Birsa Chana-3, Pusa 256, GCP105, DCP92-3, PG-186 & BG1053.
- ♦ **Seed rate:** About 70 to 85 kg/ha seed is required depending on seed size. The seed should be placed 8-10 cm deep 30X10 cm spacing. Seed treatment with carbendazim 50 WP @ 2 gm/kg seed. Seed inoculation of pulse crops with Rhizobium and PSB bio-fertilizer each @ 20g/kg seed.
- ♦ **Nutrient management:** 25:50:25:20 Kg/ha (NPKS) as basal dose should be given on sowing time. Nipping must be done 35 to 45 days after sowing.
- ♦ **Water Management:** Chickpea is mostly sown as rainfed crop in. However, where irrigation facilities are available, a pre-sowing irrigation should be given. It will ensure proper germination and good crop growth. If winter rains fail, give one irrigation at pre-flowering stage and one at pod development stage. A light irrigation should be given because heavy irrigation is always harmful to chickpea crop.
- ♦ **Weed management:** One hand weeding or inter culture with hand hoe or wheel hoe after 25-30 days and second after 60 days of sowing. fluchloralin 1 Kg per hectare in 800-1000 liters of water as pre-planting spray may be used for affective weed control.
- ♦ **Insect Pests management:** For management of Pod Borer spray spinosad 45 SC @ 0.1 ml/lit or indoxacarb 14.5 SC @ 0.3 ml/Lit or quinolphos @ 1.5 Liter/ha or flubendiamide 48 SC 0.1 ml/lit or Novacuron 10 EC 1 ml/lit of water.

- ♦ **Disease management:** For management of Wilt treat the seed before sowing with Tricodarma 5gm + carboxsin 1 gm/Kg seeds and benlate or mixture of benlate of thiram (1:1) at the rate of 2.5 g per kg Seed. Rouge out the infected plants from the field. Grow resistant cultivars such as Pusa 372, BG1053, HK94-134, DCP92-3 and GCP-105. It generally appears after 3 weeks of sowing. Crop rotation should be maintained for 3 years.

Lentil

- ♦ Lentil is one of the important pulse crops which is grown as rain-fed farming.
- ♦ **Manure and fertilizers:** If available about 25 to 50 q of well decomposed organic manure like FYM or compost should be incorporated in case of very light soils at the time of land preparation. Apply 25:50:25:20 Kg/ha (NPKS) to support optimum growth and yield.
- ♦ **Improved varieties:** HUL 57; WBL77; KLS 218; PL 406; IPL 406; Mallik (K75); Arun (PL77-12); PL639; Narendra Masur-1; Shiwalik (L4076); BR25 and BR26.
- ♦ **Seed rate:** The optimum seed rate for normal crop is 30 kg/ha. Seed rate should be increased to 40 kg/ha in case of late sowing.
- ♦ **Seed treatment:** Treat the seed with carbendazim 50WP @ 2g/kg seed followed by *T. viride* @ 8-10 g/kg to control wilt.
- ♦ **Sowing time and method of sowing:** The crop may be sown between 15 October to 15 November. The crop should be sown in lines at 25 x 8 cm.
- ♦ **Irrigation requirement:** The crop is mostly grown in rainfed areas. It can tolerate drought condition to some extent. It requires 1-2 irrigations depending upon the rains during the growing season. First irrigation should be given 25 to 30 DAS while second should be given 40-45 DAS.
- ♦ **Weed management:** Lentil being slow in growth in early stage, suffers adversely from competition with weeds. The period from

30 to 60 days after sowing is most crucial for competition with weeds. One or two weeding 30 to 60 days after sowing are enough. Weedicide like fluchoralin 45 EC 2 lit/ha or imazethapyr 400-600 ml, in 800-1000 litre of water or alachlor 50 EC @ 2 lit/ha should be sprayed at the time of final planking or 1 or 2 days after sowing.

- ◆ **Plant Protection insect Pest:** Not many insects damage lentil crop. Hairy caterpillar, semi-looper and pod borer do some damage. Hair caterpillar and semi looper can be controlled by spraying dimethoate 30EC @ 2 ml/ litre water, for the control of pod borer, spray spinosad 45 SC 0.5 ml/ litre. To control termite in lentil crop spray chlorpyriphos 20 EC @ 4ml/litre water.

Mustard

- ◆ **Soil:** Light to heavy soil is good for mustard and rapeseed cultivation. Rai can be grown in all type of soil, whereas loam to heavy soil is suitable for toria crop.
- ◆ **Improved varieties:**
 - *Toria:* PT203; Panchali; PB737
 - *Mustard:* Pusa Mustard 25; Pusa Mustard 28; Pusa Mustard 30; NRCHB 101; Siwani T59 (Varuna); Pusa Agrani.
- ◆ **Optimum sowing time:** optimum time for sowing of mustard crop is 15 Oct. to 15 Nov and Toria crop complete sowing time 15 Sept. to 15 Oct. when rapeseed – mustard grown as intercrop, time of sowing a depend upon cultivation of main crop.
- ◆ **Spacing:** for rapeseed mustard keep row to row distance of 30 cm while plant to plant distance of 10-15 cm, seeds are sown at depth of 2 cm.
- ◆ **Seed Requirement:** when rapeseed mustard is grown individually then it requires seed rate of 3.75kg per ha but general recommendation is 5Kg/ha. Do thinning operations three week after sowing and maintain only healthy seeding. To protect seed from seed borne disease before sowing do seed treatment with thiram @ 3g per kg of seeds.

- ♦ **Application of FYM & Fertilizer:** while preparing field, apply 50 to 100q FYM or well decomposed compost in soil. Application of fertilizer for Toria as 50:25:25:20 Kg/ha (NPKs) and for Rapeseed –Mustard as 80:60:40:20 Kg/ha (NPKS) on soil test value basis.
- ♦ **Weed management:** To control weeds take two to three weeding and or 2 hoeing at interval of two weeks when intensity of weed is low. To control weed in Rapeseed & Mustard crop, do pre-plant incorporation of Trifluralin @ 1000 ml/500 liter of water per ha., give pre-emergence spray of isoproturon @ 100g/500 liter within 2 days of sowing.
- ♦ **Irrigation:** Give pre sowing irrigation before sowing of seeds for good growth, crop required in general about three irrigations apply at interval of three weeks after sowing. Apply good quantity of organic manures in soil, it will help to conserved moisture in soil.
- ♦ **Plant Protection:** Aphids suck the sap and plant get weak pale and plant remain stunted and in later stage do not bear pods. To manage, do timely sowing of crop. Avoid excessive use of Nitrogenous fertilizer, when infection is observed in field, take spray of thiamethoxam @ 80 g or imidacloprid 17.8 SL 0.3ml/ litre. White pustules of white rust are observed on leaves, stem and on flowers. Swelling of affected part is observed. To manage this disease spray with Metalaxyl 8% + Mancozeb 64% @ 2 g/lit water or copper oxychloride @ 2.5 g/litre of water should be done twice at the interval of 10-15 days.

Horticultural crops

October

- ♦ Right time for sowing of seed in nursery and preparing their fields, arrangement of seed, fertilizer etc. for timely sowing of winter crops like tomato, brinjal, capsicum, cauliflower, cabbage, broccoli, etc.
- ♦ Field preparation for sowing of vegetable peas (Arkel, Azad matar-1, S-10, etc.) and leafy rapeseed (PT-303, Panchali, Bhawani). Vegetable growers can prepare seedling of tomato, cauliflower,

cabbage for planting. Planting distance for vegetable peas should be 30-35 cm row to row and 10-15 cm plant to plant on raised bed. Seed rate is about 50-60 kg/ ha, fertilizer dose is 40 kg urea, SSP 100 kg, 40 kg MOP per ha and 50-60q FYM/ ha. Apply $\frac{1}{2}$ dose of N at sowing and $\frac{1}{2}$ dose after 35-40 days.

- ◆ Right time for planting of early potato of varieties Kufri Ashoka, Kufri Pukhraj at 50x20cm apart in ridges. Apply 100-120 kg urea, 200-250kg SSP and 200 kg MOP and 10 kg Sulphur for one ha area. Seed treatment with Carbendazim and Mancozeb @ 3g per kg seed for suppression of *Rhizoctonia solani* and *Fusarium spp.*
- ◆ Planting of cabbage, cauliflower, broccoli and solanaceous vegetables-tomato, brinjal, capsicum, chilies by treating seedling with *Trichoderma* solution (5g/L) for 5-6 hrs before planting. Planting at 50 x40cm apart after 4 PM in evening to avoid desiccation of uprooted seedling from sunlight.
- ◆ Apply fertilizer in 2-3 split doses and use enriched FYM or vermi-compost with *Trichoderma* for better plant growth.
- ◆ Plant two rows of marigold/mustard (alternate host) after every 20 rows of cole crops to prevent attack of Spodoptera caterpillar infestation.
- ◆ For cultivation early Onion sow the seed in 2nd fortnight of October of varieties Pusa red, Arka Niketan, Agrifound dark red, Patna white, Bellary red by treating the seed with Thiram @ 3g/ kg seed and place seeds at a depth of 2-3cm and cover them with powdered FYM or vermi-compost and spread a layer of paddy straw and irrigate by sprinkler. For protection against diseases spray Bavistin @ 2 g/L water in 10 days' interval.
- ◆ Plough the orchard and remove weeds from the orchard of mango and litchi and mulch the fruit tree basin with dried weeds, fallen leaves or crop residues.

November

- ♦ High yielding varieties of onion are etc. 40 days old seedlings of Pusa Red, Arka Niketan, Agrifound Dark Red, Patna White, Bellary Red can be planted by maintaining 15 cm distance between rows and 10 cm between plants.
- ♦ Dipping the rooted seedlings of tomato, brinjal, chillies, capsicum, and onion in *Trichoderma* solution (5g/L) for 5-6 hrs before planting. Apply fertilizer @ urea 180 kg, DAP 50 kg and MOP 40 kg/ acre.
- ♦ If wilting of young leaves start followed by complete plant wilt (*Fusarium* spp) is seen, then remove affected plants from field and apply recommended dose of potash fertilizer to get rid of.

December

- ♦ Spray of zinc sulphate @ 2g/litre water in mango and litchi plants for more female flower per panicle.
- ♦ Right time for planting of mid-season var. Kufri Surya, Kufri Pushkar Kufri Kanchan, Kufri Lalima at 50x20 cm apart in ridges. Apply 220-250 kg urea, 450-500 kg SSP and 200 kg MOP and 10 kg Sulphur for one ha area. Seed treatment with Carbendazim and Mancozeb @ 3g per kg seed for suppression of *Rhizoctonia solani* and *Fusarium* spp.
- ♦ This is time incidence of powdery mildew in pea and for protection spray Karathane@1.5ml/L of water or Sulfex @3 g/L of water.
- ♦ In winter when morning temperature drops followed by foggy weather, frost can affect potato. Apply light irrigation and smoke during evening hours; in extreme cases spray Metalaxyl 4.0 % + Mancozeb 64 % W/W @ 2 ml/L of water.
- ♦ Farmers having crops at 25-30 DAS are suggested to earthen up the crops utilizing available soil moisture. Perform first weeding and intercultural operation, irrigate every 10-15 days intervals.

- ◆ Deblossom the early emerged panicles for minimizing the floral mango malformation.
- ◆ For protection of young plants from frost, apply weekly irrigation to new plants and make arrangement for covering the young plants with the help of straw.

January

- ◆ Potato crops at 25-30 DAS farmers are suggested to earthen up the crops utilizing available soil moisture. Irrigate every 10-15 days interval. For control of potato leaf curl mulching with paddy straw could be done. High yielding varieties of potato like Kufri Ashoka, Kufri Pukhraj, Kufri Surya, Kufri Pushkar Kufri Kanchan, Kufri Lalima should be sown at 40-50 cm row to row and 15 cm plant to plant spacing on ridges.
- ◆ Bottle gourd- High yielding varieties are Bottle gourd (Pusa Navin, Arka Bahar, Swarn Sneha); Pumpkin (CO-1, 2, Arka Chandan, Arka Suryamukhi etc.); Bitter gourd (Swarna Yamini, Ranchi Local, Arka Harit, Pusa 2 Mausami) and Cucumber (Balam, Swarna Ageti, Pusa Sanyog, Japani Long Green).
- ◆ Seed rate- 4 to 4.5 kg/ha with spacing of 2-3 metre for Bottle gourd and Pumpkin and 1.25-1.5 metre for Bitter gourd and Cucumber. Irrigation should be given once every week and as per requirement. Farmers interested in summer vegetables should culture the seedlings in poly house or under straw mulching.
- ◆ Perform the halm cutting operation in 15 days prior to digging up, remove top leaves to allow the tubers to harden. Harvesting and curing of potato and grading of potato tubers is an important constraint in marketing process. Grade their potato into four categories <25 g, 25-50 g., 50-75 g, and >75 g.
- ◆ Farmers could transplant seedlings of Chilli (Swarna prafullya), Brinjal (Swarna shyamali, Swarna Pratibha), Tomato (Swarna sampada, Swarna Lalima, Swarna Bhaibhav, Arka Samrat), Onion (Arka niketan), Sponge gourd (Swarna prabha), Ridge gourd

(Swarna manjari, Swarna sawani- Satputia), planting distance should be Chilli and Brinjal- 50X50 cm., Tomato- 60X40cm., Sponge and Ridge gourd 2X0.5 meter and Onion- 10X15 cm. distance. Dip the roots of seedlings in Bavistein solution for half an hour before planting. Prepare seedlings of Capsicum (Swarna atulya) and Cucumber (Swarn sheetal) in poly house.

- ♦ Onion -High yielding varieties of onion are Pusa red, Arka Niketan, Agrifound dark red, Patna white, Bellary red etc. 40 days old seedlings can be sown maintaining 15 cm distance between rows and 10 cm between plants.
- ♦ Dip roots of seedlings in Trichoderma solution (5 gm/L) for 5-6 hrs before planting. If wilting of young leaves (and in roots) followed by whole plant (Fusarium wilt) is seen apply recommended dose of potash fertilizer and remove affected plants.
- ♦ Arrangement of honey-bee boxes for effective pollination in litchi, mango orchards and other vegetable crops.
- ♦ New young plants should be protected from frost. Irrigation to new plants should be assured to minimize the frost damage.

February

- ♦ Potato - In early maturing varieties 15to20 days before digging up, remove top leaves to allow the tubers to harden. For storage of potato storage houses with clay terracotta roofing is best, potato could be stored in earthen flooring of pit dug half footdeep insulated with straw. Grading of potato tubers is an important constraint in marketing process, farmers should grade their potato into four categories <25gm., 25-50 gm., 50-75 gm. And >75 gm.
- ♦ Cabbage and cauliflower- For cabbage and cauliflower sow prepared seedlings in rows 60 cm. apart and 40 cm. distance between plants. Dip roots of seedlings in Trichoderma solution (5 gm/L) for 5-6 hrs before planting.
- ♦ Sow seedlings of Chilli (Swarna prafullya), Brinjal (Swarna shyamali, Swarna Pratibha), Tomato (Swarna Sampada, Swarna

Lalima, Swarna Bhaibhav, Arka Samrat), planting distance should be Chilli and Brinjal-50X50 cm., Tomato- 60X40 cm.

- ♦ Dip the roots of seedlings in Trichoderma or Bavistein solution for half an hour before planting.
- ♦ High yielding varieties of bushy French bean are Pant Anupama, Swarna Priya, Swarna Harita, Arka Komal. Sow seed in rows at 40 cm row to row distance and 10cm plant to plant, seed rate Irrigate the field as per requirement or once every week.
- ♦ High yielding varieties of cowpea are Swarn Mukut, Kashi kanchan, Arka Garima, Pusa Komal etc. Seed to be sown at 30 cm. and 15 cm spacing row to row. plant to plant should be maintained. Seed required for one acre is 15 to 20 Kg. Irrigation should be given as required or once in a week.
- ♦ In present weather conditions farmers could take crops like, French bean, Brinjal, Tomato, Chilli, Pointed gourd, Watermelon, Cucumber, bush Cowpea, Ladies finger etc. High yielding varieties are, for French bean (Swarna Lata, Swarna Priya), Cowpea (Swarn Mukut, Kashi Kanchan), Okra (Pusa Vishal, Samrat).
- ♦ Mango -If mango blooms are in flowering stage avoid using pesticides. Mango flowers infected by Midge insect should be removed by cutting with sharp knife. For promotion of effective pollination arrange honeybee boxes in orchards.

March

- ♦ Turmeric and ginger - For cultivation of turmeric and ginger farmers should prepare land. High yielding varieties are Ginger (Rajendra Sonia) and Turmeric (Vardhaman, Suruchi, Nadia). 20-25q/ha seed is required for sowing at 20x50cm spacing (Turmeric) and 15X50 cm (Ginger) with RDF and FYM good produce and irrigate every 7-10 days.
- ♦ High yielding varieties of okra are Prabhani Kranti, Arka Anamika etc. Prepared seedlings of ladies' finger should be planted at the

distance of 45 cm. row to row and 20 cm. plant to plant. Mix 50Q well decomposed cow dung manure in one acre, and recommended N: P: K fertilizer dose is 40:20:20 kg. for one acre. Irrigate once in a week or as per requirement.

- ◆ Spray of insecticide during flowering of litchi and mango should be avoided because, it will wash away pollen grains as well as kill the pollinating insects.
- ◆ Irrigate the orchards as and when needed and mulch the fruit tree basin with dried grasses and crop residues.

Livestock and Poultry

- ◆ The Livestock and Poultry houses should be properly ventilated to avoid various respiratory problems, smell of ammonia, which may predispose in animals.
- ◆ Livestock should be kept clean, dry and warm with proper bedding material to avoid contact with cold surface during winter.
- ◆ The animal houses should be protected from smoke from fires which are lit to provide warmth. The smoke and dust increase the chance to develop pneumonia.
- ◆ The houses of Livestock and Poultry should be fully opened during daytime for exposure to sunlight of animal shed. Provide them clean and warm water for drinking every part of animal house to sunlight.
- ◆ Newborn animals are more prone to cold stress during winter, therefore provide jute coat to them until they start eating concentrate.
- ◆ Poultry shed should be preheated during winter before introducing day-old chicks.
- ◆ Adequate arrangement for drainage of water should be made to avoid water logging in and around the house.
- ◆ Spray ectoparasiticide drugs on animal body surface and in Cattle yard/Pashu-shala to avoid haemoprotozoal diseases.

- ◆ Different varieties of Berseem (Vardan, Mascavi and BL-42) and Oat (Kent, Oat-9 and JHO- 851) can be cultivated for use as fodder for livestock.
- ◆ The sowing of Fodder (Berseem) should be after seed treatment with rhizobium culture.
- ◆ Sowing of oat to be done in October for obtaining maximum yield.
- ◆ The surplus green fodder can be dried in sunny days for making Hay, which may be used during lean period.
- ◆ The animals should be fed mineral mixture @ 50-60 g/day/cattle or buffalo and balance concentrate mixture @ 1.25-1.5 kg/day/animal for maintenance purpose.
- ◆ The kids above four months of age should be vaccinated with PPR vaccine.
- ◆ Cattle and buffaloes should be vaccinated for FMD, Haemorrhagic Septicaemia Black Quarter etc. The age of first vaccination should be 4-6 month and it should be repeated every six months for FMD and annually in case of Haemorrhagic Septicaemia and Black Quarter. The female calf should be vaccinated once for brucellosis at the age of 4-8 months with s19 strain vaccine.
- ◆ Vaccinate Poultry bird against different bacterial and viral disease Ranikhet Disease, IBD, Mareks disease, Infectious bronchitis, Fowl pox, Fowl cholera etc. as per vaccination schedule
- ◆ The poultry and calf feed should be added with coccidiostat to avoid problems of coccidiosis.
- ◆ The Mastitis in animals can be prevented with following clean milk production practice.
- ◆ The animals should not be allowed to graze near pond and lakes to protect the animals from internal parasitic infestation.
- ◆ To avoid formation of litter cake, dampness and bad smell in poultry house, daily raking of litter and mixing of lime powder is required.

Fisheries

The advisories categorized below in the context of COVID-19 include scientifically proven best management practices related to fisheries to be followed by the farmers during Rabi season to achieve expected production potential sustainably following maximum profit & nutritional security.

Pre-stocking management

- ♦ Interested farmers can construct new fishponds during this period. Generally, rectangular ponds of clayey loam soil with 1.5-2.5m depth and having a slope ratio of 2:1 is considered ideal.
- ♦ Maintain water depth up-to 6-7 ft (i.e., 2m), to provide space for fishes in warmer bottom layer of pond during winter.
- ♦ Fluctuation in photosynthetic activity during rabi season caused due to decrease in day length and light intensity results in reduced oxygen level. Therefore, to maintain dissolved oxygen level within 6.5-8 mg/l, it is advised to aerate ponds with aerators or by water exchange using submersible pump.
- ♦ Eradicate unwanted weeds and aquatic insects by manual and mechanical method at regular time interval.
- ♦ Organic and inorganic fertilization doses should be provided as per soil and water quality parameters. Avoid fertilization if water turns muddy or dark colored and transparency reduces.

Stocking management

- ♦ Always purchase good quality fish seeds from certified hatchery.
- ♦ Condition the fishes by loosening the mouth of plastic bag and gradually dip the bag for free flowing after 15-20 minutes.
- ♦ Avoiding overstocking of fishes. The optimum stocking density varies between 7500-8000 fingerlings per ha.
- ♦ Encourage composite fish culture of different fish species at recommended stocking rates. Generally, six (6) species carp

culture is the most adopted one in Bihar- which includes Catla: Rohu: Mrigal: Silver carp: Common carp: Grass carp at the ratio 1.5:2:1.5:1.5:1.5:2.

- ♦ Introduce small indigenous fishes like pothia, mola, murrels (murai), etc in fishpond. As, estimated 1 kg of small indigenous fishes contains 1000-fold more of vitamin content with respect to other large-sized culture fishes.
- ♦ Diversify candidate species for freshwater fish culture- Amur carp, Jayanti Rohu, Pacu, Mono sex Tilapia, Puntius gonionotus, Bighead carp, Magur, Pabda, giant river prawn etc.
- ♦ Construct polyhouse from low cost and locally available materials to grow adult prawns from post larvae in seasonal ponds. Polyhouse helps to maintain temperature when air temperature drops; hence considered beneficial for high-cost fishes like *Macrobrachium rosenbergii* (Giant river prawn).

Post-stocking management

- ♦ Maintain water pH within 6.5-7.5. If the level lowers apply lime and if it tends to be in a higher end than optimum level apply gypsum.
- ♦ Avoid feeding when temperature drops to 10°C.
- ♦ Generally, fish growth minimizes from mid-November to February due to lower metabolic rate and regains back as the temperature rises.
- ♦ Monitor fishes by netting the pond once within 15 days and provide bath treatment using potassium permanganate solution.
- ♦ Whenever any unusual fish behaviour is noticed, take immediate precaution to overcome those. For example, when fishes start irregular movement and comes near surface water for gasping, such condition depicts low oxygen concentration in fishpond and immediate aeration is required.
- ♦ Fishes are more prone to common fish diseases of bacterial, fungal, parasitic, and viral such as tail or fin rot, dropsy, gill fluke, EUS and fungal. Therefore, an immediate measure to treat the fishes is

required thus it is advised to treat the pond with CIFAX @ 1l/ha just before the onset of winters. Also, apply potassium permanganate @ 3-5 kg/ha or limestone @ 150-200 kg/ha. Salt solution may also be treated in pond @ 250 kg/ha which proves beneficial in protecting fish against disease outbreak during winters.

Fish based Integrated Farming System

- ◆ Horticulture - Duck based fish farming is considered the best model among all available options in Bihar for income generation round the year.
- ◆ Stocking density of ducks- 200-300 per ha, adequate to produce manure and serve as bio-aerator for fishpond.

Biofloc farming

- ◆ Considered as new technology for farmers who does not possess land for pond construction.
- ◆ Minimal or zero water exchange system of fish farming thus utilizing wastewater.
- ◆ Suitable species for this farming system is Pangas, Magur, Kawai, Tilapia and Common carp. To construct biofloc set-up of 7 tanks of 4m dia and 1.5 m height, an amount of Rs. 7-8 lakh is required.
- ◆ Major constraint in this technique is 24X7 electricity connection.

Cage culture in large reservoirs

- ◆ An important water resource (chaurs and mauns of Bihar) to tap the fish production potential.
- ◆ Cage culture may be promoted at places having a water depth of 10m round the year with 1000 ha or more water spread area.

Harvesting

- ◆ Crafts used for fish catching must be washed with soap solution followed by 5 min dip treatment with 1% Sodium hypochlorite solution and leave it for drying.

- ◆ Gears involved in fish catching should be treated with disinfectants or with home-made neem solution after every use.
- ◆ During craft operation, a maximum of two persons will be allowed for fishing in freshwater bodies.
- ◆ Indigenous boats operating in each area need to follow the rules of keeping 3m safe distance while fishing.

Marketing and transport guidelines

- ◆ Fish landing centres may be cleaned using bleaching powder (Calcium hypochlorite) or by Sodium hypochlorite.
- ◆ Fish auction points or whole seller market timing may be constricted to avoid unnecessary gatherings.
- ◆ Sanitize insulated/ refrigerated trucks at the entry point for inter-state transits.
- ◆ Wash and sanitize the small- sized transport vehicles on daily basis.
- ◆ Adopt Matsya Bandhu- a solar based mobile refrigerated vehicle designed by Dr. Rajendra Prasad Central Agricultural University, Pusa for fish retailers to avoid distress sale in late hours. The vehicle is eco-friendly and could easily be used to sell fishes in a hygienic way at doorstep.
- ◆ Along with the above guidelines, the fishermen and all the stakeholders are advised to abide by the general guidelines of personal hygiene- i.e., wearing mask during all the activities, washing hands with soap at regular intervals, keeping safe distance with others and follow 14 days' quarantine, if tested COVID positive or has travelled (migrant workers) from other states.

Zone-V**WEST BENGAL****Boro Paddy:**

- ♦ Rice varieties like IET-4786 (Satabdi), Lalat, WGL-20471 (Lal minikit), IR-36, CR-126-42-1, IET-1444, IET-2233, IET-4094 (Khitish) etc. can be grown successfully during boro season.
- ♦ Rice cultivars like Rajendra Bhagwati, Kanak, Dudheswar etc. can be grown in lowlands with moderate salinity.
- ♦ Timely seed sowing in the nursery (1st to 15th December) and timely transplanting (15th to 30th January) with 40-45 days old seedlings is necessary for better crop growth and yield.
- ♦ Apply 54.25 kg neem coated urea + 312.5 kg SSP + 63 Kg MOP ha⁻¹ as basal. Then add 108.5 kg neem coated urea ha⁻¹ at maximum tillering stage (1st top-dressing) and another 54.25 kg neem coated urea + 20 kg MOP at panicle initiation stage (2nd top-dressing).
- ♦ Before sowing, treat rice seeds with mancozeb + carbendazim 2 g or Trichoderma viridae 10 g by dissolving in 10-12 ml water per kg seed; make paste of fungicide solution and rub on the seed.
- ♦ In irrigated situation high yielding short duration paddy variety like Satabdi, WGL 20471, Rajendra Bhagabati, Shreya etc. can be grown to obtain maximum yield
- ♦ In saline affected soil Mohan (CSR-4), CSR-36, 43 and 46, Gosaba-5 & 6 can be grown to get maximum yield and net return
- ♦ To reduce soil salinity and to improve soil health apply 7-8 t/ha decomposed cowdung/FYM or 1.5-2.0 t/ha vermicompost during land preparation or practice green manuring
- ♦ Transplanting should be done by following skip row method to avoid BPH pest load

- ♦ Apply soil test based balanced fertilizers. For judicious use of nitrogenous fertilizer, follow Leaf Colour Chart (LCC).
- ♦ For better yield, apply 15-20 kg of zinc sulphate monohydrate (33%) per hectare during puddling

Maize (Rabi)

- ♦ Different varieties like, P 3396, Deccan 103, Deccan 105, P 3546, P 3522, Rajkumar, All-Rounder, 900 M Gold. PAC-740 etc. may be used.
- ♦ Optimum plant population (7 plants sq mt-1) should be maintained following planting geometry of 60 cm × 30 cm.
- ♦ Follow ridge and furrow method of sowing as it is better than conventional method (flat sowing), particularly in medium lands with moderate salinity.
- ♦ Apply 5-ton FYM per ha at 10 days prior to sowing. Further, apply 174 kg urea, 375 kg SSP, 120 kg MOP and 25 kg ZnSO₄ (Zinc Sulphate) ha-1 as basal. Top-dressing of urea in two splits viz. 130 kg at knee-high stage and 130 kg at pre-tasselling stage should be done.

Lentil

- ♦ Sowing of lentil should be completed between 1st and 30th November for sole cropping.
- ♦ Lentil can be cultivated as relay crop and seeds are to be broadcasted at least 7-10 days before harvest of kharif paddy. Suitable varieties like WBL-77 (Moitree), L-4717 (Pusa Ageti), KLS-09-3, PL-8, IPL-316 etc. should be sown @ 30 kg seed ha-1
- ♦ For sole cropping, apply only 250 kg of SSP and 35 kg of MOP at the time of final land preparation (basal).
- ♦ If required, a light irrigation can be given during pre-flowering stage.

- ◆ Two foliar sprays of boron @ 0.2% (before and after flowering) can be effective.
- ◆ Sprays either DAP or urea @ 2% during flowering stage is effective in maintaining plant vigour.

Rapeseed-Mustard

- ◆ Sowing of mustard should be completed within 3rd week of October to second week of November.
- ◆ Varieties like Binoy, Varuna, Pusa Bold, Kranti, Bhagirathi, PM-2-3, PM-99-125, PM-5, PM-28, PM-30, YSH-0401, NRCHB-101, TBM-204 etc. are suitable.
- ◆ For utera / paira cropping, seeds of mustard (cv. B-9, TBM 143 etc.) can be sown at least 10-12 days prior to harvesting of preceding kharif paddy.
- ◆ Treat the seeds with Carbendazim (Bavistin) 50 WP (2 g kg⁻¹ seed) at least 4 hours before sowing. Organic seed treatment with *Trichoderma viridae* @ 5 g kg⁻¹ seed can be effective.
- ◆ Crop under line sowing method should be maintained with proper planting geometry (20-25 cm × 10 cm).
- ◆ Apply 3-ton FYM ha⁻¹ at 10 days prior to sowing. Further, apply 43.5 kg urea, 250 kg SSP, 67 Kg MOP ha⁻¹ as basal. Then top-dress urea in two splits viz. 87 kg at branching stage and 43.5 kg at flowering stage.
- ◆ Apply at least two irrigations at branching and flowering stages.
- ◆ In sulphur-deficient soil, apply 45 kg sulphur ha⁻¹.

Summer Greengram:

- ◆ Short duration yellow mosaic virus resistant greengram variety like IPM-02-14 or IPM-205-7 may be grown to obtain maximum yield and return
- ◆ Seed should be inoculated with *Rhizobium*, PSB & KSB @ 1.5 kg /haeache before sowing to get more yield as well reduce the use of chemical fertilizers

- ◆ Two-time spray with micro nutrient (Mo) @ 0.5 g/lit of water during flowering stage at 15 days interval

Sunflower:

- ◆ The variety LFSH-171, KBSH-53 & 78 of sunflower may be grown during rabi-summer season with 3-4 irrigation
- ◆ During field preparation, the organic manure like decomposed cowdung/FYM @ 7-8 t/ha or 2.0 t/ha vermicompost should be used to improve soil health and crop productivity
- ◆ Chemical fertilizers @ 90:90:40 kg NPK/ha is to be used
- ◆ Two-time spray with micro nutrient (B) @ 2 g/lit. of water during square formation and flowering stage should be used for better seed set and maximum yield

Cotton:

- ◆ Hirsutum cotton may be grown during rabi-summer season in non-saline as well as saline soil of Sundarbans in rice- fallow by providing 2-3 irrigations
- ◆ The seed should be treated with fungicide and germinated seeds should be sown directly in a field after land preparation with a spacing of 45cm X 30 cm
- ◆ The sowing of cotton is to be done within 15th of Dec. to 15th of Jan.
- ◆ Chemical fertilizers @ 80:40:30 kg NPK/ha is to be used
- ◆ One-time thinning operation followed by earthing up is to be done within 30-40 DAS
- ◆ Use Indoxacarb 14.5% SC @ 360 ml/ha or Rynaxypyr 18.5 % SC @ 150 ml/ha two times at 15 days interval to control spotted boll worm and Helicoverpa during boll development stage
- ◆ After harvesting the seed cotton, proper sun drying should be done before bagging

Lathyrus:

- ♦ Area under pulse may be increased by growing of lathyrus as paira crop
- ♦ The sowing of lathyrus should be done in the month of Nov. in moist soil when the rice is in flowering stage. 45-50 kg/ha seed is required for sowing.
- ♦ Ratan, B-1, Pusa-24, Prateek, Maha Teora etc. varieties may be grown for better yield
- ♦ Two to three times spray with 2% urea are to be done during growth and flowering stage for better yield
- ♦ Use Indoxacarb 14.5% SC @ 360 ml/ha or Rynaxypyr 18.5 % SC @ 150 ml/ha two times at 15 days interval to control pod borer

Horticultural Crops

Vegetables:

- ♦ For the coming rabi season, the better vegetable crop choice would be tomato, chilli, bitter gourd, French bean and Dolichos bean for the land embankment system. For upland situation, cabbage, cauliflower, knolkhol, brinjal, beet, carrot and radish are suggested.
- ♦ For the YAAS affected saline lands, the salt tolerant crops like bitter gourd, ash gourd, beet, tomato, palak, cabbage, cauliflower, knolkhol and dolichos bean would be best choice.
- ♦ Dolichos bean may be a good choice, as it has long cropping period. The crop must be sown by May-June and it needs harvesting and marketing of produce from October onward upto February-March.
- ♦ In each case seed priming using Chlormequat Chloride (Cycocel) @ 50 ppm for 8 hrs or 1% solution of KNO₃ (prepare a solution of soluble fertilizer 13:0:45 @ 10g/ltr) for 1-2 hour is advised for better germination, seedling vigour and developing crop resistance against biotic and abiotic stresses.
- ♦ To increase net return, input cost must be minimized. Use of homemade manure (organic manure), neem pesticide and bio-

fungicide (Trichoderma) will not only minimize cost of cultivation, but also will help to have better crop stand and better production.

- ♦ To get healthy crop with more self-defense against pests and diseases, use as much organic manure as possible (minimum 1q / cottah). Minimize dependence on inorganic fertilizers.
- ♦ Before land preparation, apply lime @ 2 kg/cottah, which will minimize soil borne disease problem maintain soil pH and enrich soil Ca content.
- ♦ For healthy seedling growth of each vegetable, spray soluble fertilizer 12:61:0 @ 3g/lt upon 12-15 days old seedlings. Repeat after 7 days.
- ♦ Use the same fertilizer solution (12:61:0 @ 3g/lt) at the root zone, immediately after transplanting of seedlings of tomato, chilli, cole vegetables etc. Repeat the same at 2 – 3 days interval.
- ♦ For better nutrient management of vegetable crops, use soluble fertilizers like 19:19:19 or 20:20:20 @ 3 to 5g/lt as much as possible at 7 – 10 days interval.
- ♦ For better growth and yield in vegetable crops, micronutrient plays a vital role. For better micronutrient management, apply Mixed Micronutrient (Grade 5) @ 1.5 to 2 g/lt as spray at 15 to 20 days interval.
- ♦ To increase plant defence against biotic and abiotic stresses, use soluble fertilizer 13:0:45 @ 3 to 5 g/lt starting from flowering to fruiting stage, regularly at 15 to 20 days interval.
- ♦ To increase female flower count as well as yield in cucurbit vegetables (like bitter gourd, cucumber), spray Ethrel (or ethephon 39.5% SL) @ 0.4 ml/lt twice at 2 and 4 true leaf stage.
- ♦ To improve fruit setting and to minimize flower or immature fruit drop in tomato, chilli, brinjal, Dolichos bean, cowpea, cucurbits spray soluble B (Boron 20%) @ 1.5g/lt and NAA 4.5% W/W (Planofix) @ 0.2 ml/lt, alternately at 10-12 days interval.

Mango, Guava & Litchi:

- ◆ Fruit drops in all the three crops can be managed by spray of NAA 4.5% W/W (Planofix) @ 0.3 ml/lit at 10-12 days interval.
- ◆ For better fruit development, spray n-triacontanol (Miraculan) @ 0.5 ml/lit at 15 days interval.
- ◆ Keep sufficient moisture in the orchard basin. Mulching with straw or grass may be practiced for better soil moisture conservation.
- ◆ Apply one third dose of recommended fertilizers and manures beneath the tree canopy area, during October and again in February.
- ◆ In litchi, to prevent fruit cracking, maintain sufficient moisture during hot summer of May. Regular watering is compulsory. Mulching with straw or grass around the tree basin is helpful for better soil moisture conservation. Fresh water spray upon the fruits and leaves during daytime in hot & dry periods may also be helpful.
- ◆ In guava, individual fruit wrapping is a must to avoid fruit fly attack, as well as to get good appearance of the fruits. Wrapping should be done with transparent polythene packets with a paper piece inside it to protect the fruit from direct sunlight.
- ◆ Manures and fertilizers should be applied as per recommendation. For better fruit colour and quality, apply ammonium sulphate instead of urea as nitrogenous fertilizer.
- ◆ For better fruit growth, soluble fertilizers like 19:19:19 or 20:20:20 @ 3 to 5g/lit and any Mixed Micronutrient (Grade 5) @ 1.5 to 2 g/lit may be applied at 10-12 days interval.

Betelvine

- ◆ To protect the plant from cold injury, use plastic sheet protection towards north & west sides of the boroz.
- ◆ Use 75% shade net as roofing. This will protect fog penetration and thereby minimize 'Hemchiti'
- ◆ Avoid applying urea or other nitrogen fertilizer indiscriminately which may make the plant more susceptible to winter injury.

- ◆ Use as much organic manure as possible.
- ◆ Spray 13:0:45 @ 3g/ltr. at 7-10 days interval. This will increase plants own defense against disorders.

Animal Husbandry

- ◆ Animal house under loose housing system needs attention to protect them from cold stress.
- ◆ Supply extra heat for newborn for preventing Pneumonia and Diarrhoea.
- ◆ Maintaining proper cleaning and ventilation under the shade.
- ◆ Dry cleaning should be followed.
- ◆ Arrangement of sufficient sun light during daytime.
- ◆ Provision of bedding and extra heat for preventing cold.
- ◆ Lukewarm and outdoor feeding should be advised.
- ◆ Maintaining body temperature feed like oilcakes and jaggery may be used.
- ◆ Feed more roughage (Hay & Straw).
- ◆ Newborn should be feed with more milk.
- ◆ Drainage system should be clean for preventing food root.
- ◆ Promotion of fodder cultivation (Oats, Berseem, Mustard cabbage).
- ◆ Deworming the animals.
- ◆ Don't shear wools and hairs during Rabi.
- ◆ Additional feed is required for sheep and goat.
- ◆ At least 4 hours' sunlight is required for sheep and goat.
- ◆ Use Cypermethrin for removing ticks and mites inside the shades and use Ivermectin for removing ecto and endo parasitic load.
- ◆ Avoid over feeding.
- ◆ Vaccinate FMD, HS & BQ for cattle, PPR for goat Pox and Ranikhet for poultry, Duck plague for Duck, Swine fever for pigs.

- ◆ For preventing winter stress, gunny bags should be hanged at the places from where cold air entered.
- ◆ Around 6 inches of litter is needed in houses during winter.
- ◆ 24 hours lighting provision inside the poultry shade.
- ◆ Numbers of feeder should be increased.
- ◆ Continuous supply of fresh and clean lukewarm water inside the Poultry shade.
- ◆ Routine inspection of Pipeline.
- ◆ Provision of heater inside the Poultry shade.

Fisheries

- ◆ The feed cost in fish cultivation is about 60-70% of total expenditure. Thus, preparation of feed from low cost easily available local ingredients can reduce the expenditure and increase the profit.
- ◆ During winter, most of the fishes need to sell and dry the pond by removing the water for pond management.
- ◆ The stocking density about to 20% during winter period improves the fish cultivation.
- ◆ In feed mill, ensure that the workers are following industry best practices, along with strict protocols of hygiene and physical sanitation regarding COVID-19.
- ◆ During winters, various fungal, bacterial, and parasitic diseases like fin rot, gill rot, EUS and argulosis may appear in the fish. Treat the pond with CIFAX @ 400 ml/acre just before the onset of winters. Also treat the pond with potassium permanganate @ 1-2 kg/acre or limestone @ 50-100 kg/acre. Salt application @ 100 kg/acre also helps in protecting fish against disease outbreak during winters.

ODISHA

Field Crops

Cereals

Rice (Rabi)

- ♦ The rice varieties like CR dhan 310, Hiranyamayee, improved Lalat, IR-36, Jogesh, Manaswini, MTU-101, MTU-1010, Naveen, Rajlaxmi (Hybrid) and Ajay (Hybrid) are advisable for cultivation to get better yield.
- ♦ Use of Certified seeds and germination test is advisable.
- ♦ Seed rate for rabi rice is 20 kg/acre.
- ♦ Chloropyriphos dust should be applied in the nursery bed to avoid ants and mites.
- ♦ Well decomposed FYM can be applied @ 5 ton/ha.
- ♦ To manage stem borer in paddy, Cartap Hydrochloride 4% G (Caldan 4G/ Nidan) @ 8 kg/acre or Chlorantraniliprole 0.4% GR (Ferterra/ Enfuse) @ 4 kg/acre or Imidacloprid 0.3% GR (Ultimate) @ 6 kg/acre can be applied by mixing it with sand at 1:1 ratio at early crop stage.
- ♦ To control blast disease in paddy, apply Tricyclazole 75% WP @ 120 g/acre.
- ♦ Line transplanting should be followed in the main field.
- ♦ Rice crop should be harvested when the crop looks pale yellow and is at 85% grain maturity.
- ♦ The harvested paddy should be dried in direct sunlight for 2-3 days to get moisture content at 14%.

Maize (Rabi)

- ♦ Seed rate for rabi maize is 6-7 kg/acre.

- ♦ Seed treatment with (Cyantoaniliprone 19.8% + Thiamethoxam 19.8%) @ 4 ml per kg of seeds is recommended to avoid infestation of fall army worm.
- ♦ Atrazine 50% WP @ 800 gm per acre in 200 litres of water is recommended as pre-emergence herbicide within 2-3 DAS.

Pulses

- ♦ Suitable varieties of green gram -IPM 02-14, and black gram- PU-31 are advised for sowing to farmers for higher productivity.
- ♦ Pulse crops like Black gram can be inter-cropped with Maize to suppress weed growth within the rows and retain soil moisture.
- ♦ Seed Treatment with (Carbendazim + Mancozeb) or Vitavax Power (Carboxin 37.5% and Thiram 37.5% DS) @ 2 - 3 gm/ kg of seeds is recommended for better germination and breaking seed dormancy.
- ♦ It is recommended for basal application of Zypmite Plus as soil conditioner & use of Neem Oil and vermicompost under INM.
- ♦ Sowing of black gram and green gram should be completed by using Tractor operated seed cum fertilizer drill after harvesting of rice with available soil moisture to reduce seed rate, labour cost as well as time.
- ♦ Pendimethalin @ 1.5 kg/ha is recommended as pre-emergence herbicide for weed control.
- ♦ Use of Yellow Sticky Trap, Blue Sticky Trap is best under IPM.
- ♦ For control of Leaf eating caterpillar in black gram and green gram, spraying of Emamectin Benzoate 5% SG @ 80 gm or Profenofos 40% EC + Cypermethrin 4% EC @ 400 ml may be recommended in 200 litres of water for spraying 1 acre of land.
- ♦ To control Powdery mildew in green gram, Sulphur 80% WP @ 800 gm per acre is recommended in 200 litres of water.
- ♦ To control Yellow Vein Mosaic disease in green gram, it is recommended to first wipe out all the affected plants in the field

and then spray Thiamethoxam 25% WG @ 66 gm per acre in 200 litres of water to control the transmitting vectors (White fly) of the disease.

- ◆ For control of aphids and white fly infestation, Thiamethoxam 25% WG @ 66 gm per acre may be recommended in 200 litres of water.
- ◆ Mechanized harvesting and threshing may be followed on custom hiring basis to reduce labour requirement.

Oilseeds

Mustard

- ◆ Suitable mustard variety: Tapeswar is advisable to the farmers for better yield.
- ◆ Seed treatment with Mancozeb @ 3 gram per Kg of seeds is advisable to farmers for better seed germination.
- ◆ In Zn & B deficient soils, ZnSO₄ @ 25 kg/ha and borax @ 10 kg/ha should be applied respectively to increase the seed and oil yield.
- ◆ Irrigation is must at two critical periods of crop, i.e. flowering stage and pod initiation stage.
- ◆ Foliar application of water-soluble fertilizer (NPK 19:19:19) @ 8 gm /litre of water at flowering stage & pod initiation stage is recommended.
- ◆ Diamond back moth may be seen in mustard. Spray Fipronil 5% SC @ 400 ml in 200 litres of water per acre of land.
- ◆ Downy mildew disease in mustard cultivation can be controlled by spraying (Metalaxyl 8% + Mancozeb 64% WP) @ 400 gm per acre in 200 litres of water.

Groundnut

- ◆ Light sandy soil with good drainage facility will be suitable for groundnut cultivation.
- ◆ Procurement of seeds of Variety like Devi, Smruti sowing must be completed by November.

- ♦ Seed treatment with (Carbendazim 0.1% + Thiram 0.15%) or Vitavax power is recommended. Sodium or ammonium molybdate @ 3g/10 kg kernel may be added along with bacterial culture.
- ♦ Advisable to sow the crop with a pre-sowing irrigation, or else apply one post sowing irrigation to facilitate germination.
- ♦ Application of 20 kg N and 40 kg each of P₂O₅ and K₂O/ha in the furrows before sowing and mixed with the soil to avoid direct contact of seeds with fertilizer.
- ♦ To control Leaf miner pest in groundnut, it is recommended to spray Spinosad 45% SC @ 80 ml in 200 litres of water per acre of land.
- ♦ Thrips infestation has also been observed in groundnut. Fipronil 5% SC @ 400 ml may be recommended in 200 litres of water per acre of land.

Horticultural Crops

Onion

- ♦ Onion varieties like Nasik Red, N-53, Arka Kalyan, Arka Niketan, Arka Pragati, Agri Found Light Red, Bhima Red, Bhima Super, Bhima Shakti are suitable for Rabi season.
- ♦ Seed rate is 3-4 kg/ac.
- ♦ 1-1.5 months old onion seedlings should be transplanted in the month of October-November.
- ♦ Treat the seed with Thiram 3g/kg of seed.
- ♦ Fertilizer Dose: 20-25 t/Ha FYM along with NPK 120:60:60kg/ha. Half of Nitrogen Full P₂O₅ and half K₂O at the time of final Land preparation.
- ♦ One fourth of Nitrogen and One fourth K₂O 25-30 DAT
- ♦ Rest One fourth of Nitrogen and One fourth K₂O 45-50 DAT.
- ♦ Herbicide: Oxyfluorfen (23.5% Ec) @80 ml/ Ac within 3DAT or Quizalo-fop-Ethyl 5% Ec @2ml/L at 15-20 DAT.

- ◆ For Thrips apply Imidachloprid @ 0.5ml/ L mixed with a Sticker,
- ◆ For purrplr Blotch apply COC 3gm/L or Mancozeb 3 gm/L.

Mango

- ◆ Irrigation at regular Interval after flower appearance.
- ◆ If Foggy or cloudy weather prevails spray the mango plant with wettable Sulphur 3gm/L .
- ◆ After appearance of flower always spray the crop at afternoon and evening hour as most of the pollinators are active in the mango orchard in the morning hour.
- ◆ Application of Paclobutrazol @ 15 ml (7-15 yrs old plant), 20 ml (16-25 yrs old plant) in 10 litres of water is recommended in a ring that is 5 cm deep and 2-3 ft away from the trunk for regular bearing in Mango during the month of September – October.

Cauliflower

- ◆ *Improved varieties:*
 - *Early (60-70 Day):* Kartika, Early Kanwari, Pusa Deepali, Sweta
 - *Medium (75-90 Day):* Margasira, Pusa Srad, Pusa katki, Aparjita.
 - *Late (More than 90 Days):* Pusa Subhadra, Pusa Snowball-1, Pusa Synthetic
- ◆ Seed: For Early 200-250gm, For Medium and late:150-200gm.
- ◆ Treat the seed with Thiram 3g/kg of seed.
- ◆ Planting: For Early Line to Line 60 cm and Plant to plant 30 cm. For Medium duration crop Line to Line 60 cm and Plant to plant 40-45 cm. For Late duration crop Line to Line 75cm and Plant to plant 45-60 cm.
- ◆ During Final land preparation apply 10 t of well rotten FYM and 10 kg of Borax.

- ♦ Apply NPK @ 60:20:30kg/Ac. Half of Nitrogen Full P₂O₅ and half K₂O at the time of final Land preparation.
- ♦ Soil drenching with Carbendazim @ 1g + Streptocycline @ 0.1g in 1 liter of water to the cole crop nursery bed protect the seedlings from damping off disease.
- ♦ Hoeing and weeding in cabbage is advisable at 21 DAT and then application of urea @ 55 kg per acre is recommended followed by irrigation.
- ♦ To manage Bacterial black rot disease in cauliflower and cabbage, Copper Oxychloride 50% WP @ 600 gm + Plantomycin @ 200 gm may be recommended in 200 liters of water per acre of land.
- ♦ Cucurbits: (Cucumber, Pumpkin, Bitter Gourd, Ridge Gourd, Pointed Gourd)
- ♦ There are chances of infestation of Epilachna beetle in cucurbits. To manage it spraying of Chlorpyrifos 20% EC (Tricel/Premain) @ 2 ml/litre of water or Profenophos 50% EC (Prahara/Profigan) @ 2 ml/litre of water is recommended.
- ♦ Epilachna beetle can also be controlled by spraying of neem-based pesticide (Azadirachtin) 1500 PPM @ 3 ml/litre of water at early stage of infestation.

Potato

- ♦ Varieties: Kufri Ashoka, Kufri Phukhray, Kufri Jyoti, Kufri Lalima, Kufri Chipsona, Kufri Sinduri.
- ♦ Tuber for Planting should be at least 15-20gm at least.
- ♦ Planting of tuber between 1-15 Nov.
- ♦ Planting Distance Row to Row 30 cm and Plant to plant 15 cm.
- ♦ During Final land preparation apply 10 t of well rotten FYM.
- ♦ Apply NPK @ 48:24:48kg/Ac. Half of Nitrogen Full P₂O₅ and half K₂O at the time of final Land preparation.
- ♦ Second hoeing and fertilizer application should be done 3 weeks after first hoeing.

- ◆ There are chances of leaf blight disease incidence in potato crop. Early leaf blight in potato can be managed by spraying Mancozeb 75% WP @ 600 gm/acre or (Carbendazim 12% + Mancozeb 63% W.P) @ 400 gm/acre in 200 litre of water whereas spraying of (Metalaxyl 8% + Mancozeb 64% W.P) @ 400 gm/acre in 200 liters of water is recommended for late blight.

Other Horticultural Crops

- ◆ Hybrid **tomato** variety Arka rakshak can be cultivated round the year. The variety is triple disease resistant (bacterial wilt, early blight, and leaf curl) and can be stored for 15-20 days after harvest in the ambient condition without deterioration.
- ◆ Wilt resistant varieties of **brinjal** like Swarna Shymali, Arka Harsita, Arka Anand Anushree, Kalinga, Bhairabi should be cultivated by farmers for better yield.
- ◆ Seed treatment should be done with Vitavax power @ 2-3 gm/ kg of seeds before sowing. Similarly, seedlings should be treated by preparing a solution of Vitavax power @ 2-3 gm in 1 litre of water & then dipping the roots for at least 30 minutes before transplanting in main field.
- ◆ Mite infestation can be controlled in brinjal by spraying Propargite 57% EC @ 400 ml in 200 litres of water per acre of land.
- ◆ For control of fruit and shoot borer in brinjal, Flubendiamide 480SC @ 80 ml or Spinosad 45% SC @ 80 ml in 200 litres of water may be recommended per acre of land.
- ◆ Fungal wilt in tomato can be controlled by soil drenching and spraying with Thiophanate methyl 70% WP @ 300 gm per acre in 200 liters of water.
- ◆ Sucking pests (White fly, Aphids, Jassids) infect brinjal, chilly, other vegetables, marigold etc. Thiamethoxam 25% WG @ 66 gm in 200 litres of water per acre may be recommended to control white flies.

- ♦ For Broccoli: Palam Samruddhi and Pusa KTS-1 can be taken with a planting distance of 60cm between Row and 45 cm between two plants with a fertilizer dose of 30:40:40 NPK/Ac.
- ♦ Capcium varieties- Arka Gorav, Arka Mohini, Arka Atulya, Yellow Wonder, California Wonder Bharat can be taken with a seed rate of 100gm/ac with a fertilizer dose of 45:30:30 kg of NPK /Ac.
- ♦ French Bean can be taken in winter.
 - Improved varieties for Bush type: Arka Komal, Contender, Pusa Parbati, Pant Anupama. Arka Arjun, Arka Anoop, Arka Suvidha.
 - Improved varieties for Pole type: Kentuky Wonder, Pusa Himlata, Arka Sukomal, Arka Sarath
 - With a fertilizer dose of 8:20:20 NPK and can be planted after September 15.

Fisheries

- ♦ Application of CIFAX @ 1000ml per ha/m water spread area to control Epizootic Ulcerative Syndrome disease in Fish.
- ♦ Application of supplementary feed @ 2% of total fish mass body weight at 2 pm in fish culture pond.
- ♦ Maintaining pond water depth up to 5 feet by adding water from nearby source.
- ♦ False netting in culture pond to access the health and growth of fishes.
- ♦ Aeration of pond water in case of oxygen depletion (Fishes coming to surface at early morning)
- ♦ Use of pre and probiotics for better feed metabolism of fishes.
- ♦ Use of Silver carp advanced fingerling @ 300-400nos per ha/m of water spread area for control of surface algae at culture pond.
- ♦ Lesser use of organic and inorganic fertilizer in fishpond.
- ♦ Use of KMnO₄ @500g per ha/m in culture pond with dissolving

@10g/10lit of pond water and its application in culture pond every 3month as prophylactic measures.

- ◆ Use of water heater in the ornamental fish aquarium/tank.
- ◆ Less feeding to fishes at stunted fingerling production tank.
- ◆ Use of fishpond dyke for seasonal vegetable production.

Poultry

- ◆ Cleaning and spreading of bleaching powder at every alternate day is highly essential for a poultry unit.
- ◆ If any symptom like drowsiness, cough and distorted feet appears in the poultry birds then immediately contact the nearest veterinarian.
- ◆ Clean and fresh water should be provided at least 3 times a day.
- ◆ In case of backyard poultry, birds should be allowed to move in open yard in the daytime.
- ◆ Insulate the poultry house against the cold wind by using gunny bag and at the same time take care of ventilation to avoid ammonia build up.
- ◆ During brooding in winter, brooder temperature should be maintained at 35oC in first week, there after decrease by 3oC of the previous week.
- ◆ Brooding to be done for 4 weeks and heat source provided till environment temperature is equal to brooder house temperature requirement as specified.
- ◆ Feed enough mineral and calcium to laying birds @ 3.25% of feed intake.
- ◆ Water should be given at ambient temperature at 2 times feed intake. Feed to water ratio should be maintained at 1:5 as against 1:2 during winter.
- ◆ Vaccinate birds against RD, Fowl pox and IB to prevent viral diseases.
- ◆ For preventing CRD (Chronic Respiratory Disease) maintain litter

properly, take care of disinfection and avoid ammonia build up in poultry shed.

- ♦ Increase space for each bird by 1.5 times or more or decrease stocking density for each sq. feet.
- ♦ During summer season, avoid feeding at high environment temperature in the mid-day. Birds should be fed in morning and evening time.
- ♦ Transport birds in early morning or late evening to avoid heat stress.

Mushroom

- ♦ In the first week of November, mushroom shed needs to be disinfected for Oyster mushroom cultivation. 200 ml of formalin in 6 litres of water should be sprayed all over the shed and covered with polythene. Then the shed should be closed for two days.
- ♦ For oyster mushroom cultivation paddy straw is cut into 1-2inch size, and then soaked for 10-12 hours in 1% lime water followed by steam sterilization, shade drying up to 65% moisture content. Bed is prepared with boiled wheat as food additive in transparent polythene bags.
- ♦ If flies or its larva are seen in the mushroom bed, spraying of 1-1.5 ml of Dichlorovos or 1.5-2 ml of Malathion per litre of water around the mushroom bed or bag is recommended followed by closing of the mushroom shed for one day.
- ♦ To avoid distress sale of Oyster Mushroom, preparation of value-added products like mushroom powder, pickle, sauce etc. is advised to the growers.

ANDAMAN & NICOBAR ISLANDS

Field crops

Pulses

- ♦ Seed hardening of green gram or black gram seeds for dry land ecosystem with 100 ppm MnSO_4 for 3 h at the ratio of 1:0.3 ratio and dry back to original seed moisture content (8 - 9 %) under shade.
- ♦ Rice fallow pulse as relay cropping broadcast 20 kg of green gram or black gram seeds in the standing crop 5 to 10 days before the harvest of the paddy crop uniformly under optimum soil moisture conditions so that the seeds should get embedded in the waxy mire.
- ♦ Rice fallow crops, foliar spray of DAP 20g/litre or urea 20g/litre or pulse wonder 5 kg/ha once at flowering and second spray 15 days after first spray for enhanced seed set.

Maize

- ♦ Quality maize seeds shall be used the seed rate of 20 kg/ha and sown the seeds with spacing of 60 cm x 25 cm and dibble the seeds at a depth of 4 cm with single seed per hill if the germination is assured otherwise put two seeds per hill.
- ♦ Maize is more sensitive to moisture stress and excessive moisture, so that need based irrigation should be given time and ensure availability of optimum moisture during the critical growth stage of 45 to 65 days after sowing. Because of moisture stress during critical stage will be reduced yield considerably.

Groundnut

- ♦ In Island condition, best season for groundnut sowing is IInd fortnight of December to IInd fortnight of January. Seed rate of 120 kg per ha of kernels for normal kernel size, whereas, in bold seeded variety 175 kg/ha of kernels shall be used.

- ◆ Groundnut seeds treat with 125 ml of Rhizobium and 125 ml of Phosphobacteria per ha and shade dry it for 30 minutes before sowing.
- ◆ Foliar application of combined nutrient solution (DAP 2.5 kg, Ammonium sulphate 1 kg and borax 0.5 kg) spray on 25th and 35th days after sowing. It will be improved the pod fillings in bold seed groundnut.

Livestock

- ◆ Livestock should be properly dewormed after rainy season for internal parasites and dipped for external parasites in consultation with veterinary doctors or state veterinary deptt. or KVKs.
- ◆ Vaccination schedule should be followed for preventing diseases of livestock as per the recommendation of state Veterinary Department e.g., vaccination for swine fever in pigs, vaccination for FMD for livestock etc.
- ◆ For protecting the livestock from extreme stress due to hot and humid condition, proper housing with ventilation should be provided.
- ◆ Strict Bio-security procedures should be followed at livestock farms. Foot bath should be provided at entrance of the farm with phenyl, Dettol, Savlon etc. The
- ◆ The area surrounding the livestock shed should be cleaned and disinfected by spraying Hypochloride solutions, phenol solutions or dusting with lime.
- ◆ Clean palatable water should be provided ad.lib.
- ◆ Balanced feeding of livestock should be practiced. If possible low-cost feed should be formulated from locally available feed ingredients viz. Broken rice, rice bran, coconut cake, Chunni (pulse), Till Cake, Azolla etc.
- ◆ The Livestock feed should be properly stored in a dry and cool place to prevent the dampening and moulding of the feed.

- ◆ Artificial heat should be provided to newborn piglets to avoid early piglet mortality during winter.
- ◆ The farmers should sow fodder seeds or cuttings in their field for ensuring nutritious fodder availability year around viz. Paragrass, Guinea grass, Hybrid napier, Sorghum.
- ◆ The excess fodder should be harvested which may be converted into haylage or silage for future use during dry spell.
- ◆ Supplementation of Mineral mixture (@ 50g cattle, 25g goats and pigs) should be provided for better productivity and reproductive performance in livestock.
- ◆ Avoid herding or farming of different species in the same premises.
- ◆ Clean milk production practice should be followed during milking, storing, transporting and marketing in order to prevent contamination of milk with dust and microbes.
- ◆ Always wear mask, use sanitizer, or wash hands using soaps and maintain social distancing in the farms and marketplaces.

Poultry

- ◆ Poultry should be properly dewormed for internal parasites and dipped / dusted for external parasites in consultation with veterinary doctors or state veterinary deptt. or KVKs.
- ◆ Vaccination schedule should be followed for preventing diseases of poultry as per the recommendation of state Veterinary Department e.g., vaccination for Ranikhet, IBD, Marek's etc. disease for poultry.
- ◆ For protecting the poultry from extreme stress condition, proper housing with ventilation should be provided. Avoid bright bulbs in poultry shed for lighting.
- ◆ The deep litters should be frequently turned and mixed with limes to prevent dampening and cake formation leading fungal growth.
- ◆ Strict Bio-security procedures should be followed at poultry farms. Foot bath should be provided at entrance of the farm with phenyl, Dettol, Savlon etc.

- ♦ The area surrounding the poultry should be cleaned and disinfected by spraying Hypochloride solutions, phenol solutions or dusting with lime.
- ♦ Empty poultry shed should be cleaned and fumigated with formalin and potassium per-magnate or may be sprayed with 10% formalin solution for disinfection.
- ♦ Balanced feeding of poultry should be practiced. If possible low-cost feed should be formulated from locally available feed ingredients viz. Broken rice, rice bran, coconut cake, Chunni (pulse), Till Cake, Fishmeal, Azolla, Shell grits etc.
- ♦ The poultry feed should be properly stored in a dry and cool place to prevent the dampening and moulding of the feed.
- ♦ Artificial brooding should be provided to the chicks upto 4-6 weeks for healthy growth and to reduce mortality.
- ♦ Clean palatable water should be provided ad.lib.
- ♦ Electrolyte should be provided for combating heat-stress.
- ♦ Avoid herding or farming of different species in the same premises.
- ♦ Always wear mask, use sanitizer, or wash hands using soaps and maintain social distancing in the farms and marketplaces.

Fisheries

- ♦ Provide sufficient comfortable zone to fish below the surface layer, which gets heated up beyond optimum temperature range (28-32oC) during summers, by maintaining 5-6 feet water depth.
- ♦ Provision of partial shading of the pond with no- deciduous trees or other means mitigate the impact of high temperature.
- ♦ Oxygen levels may fall to lethal levels, especially during dawn, due to enhanced biological activity in the pond. Hence, aerating the ponds during early hours of the day before sunrise, either by adding fresh water or by aerators.
- ♦ Optimum oxygen level (≥ 5 mg/l or ppm) will keep the fish healthy and increase its food converting efficiency, leading to fast growth

and higher productivity. If the fish come on the surface to gasp atmospheric air, provide aeration, and also suspend manuring and feeding of fish. Partial water exchange improves water quality.

- ◆ The diurnal variation in water pH should be checked, which may fluctuate beyond recommended range of 7.5 to 9 due to excessive growth of algal blooms in the pond.
- ◆ Manuring /fertilization of pond shall be suspended in case water turns dark green, dark brown or greenish brown in color and a green, brown, or sometimes red colored algal mat appears on the water surface.
- ◆ Regular bottom racking with the help of barbed wire is recommended to prevent the accumulation of toxic gases like ammonia and carbon dioxide. Toxicity of ammonia in fishponds increases with increase in temperature and pH, which can be reduced by keeping the ponds well aerated and adding a dose of gypsum/alum as per expert advice.
- ◆ It is also very important to sustain regular plankton (natural fish food) production in the pond and provide a nutritionally balanced supplementary diet. Keep the pond rich in plankton through mixed utilization of organic manures and inorganic fertilizers.
- ◆ Farmers are advised to use fully decomposed organic manures (FYM, biogas slurry, vermicompost or poultry manure) as per recommended rates and feed the fish daily with good quality feed having 25% crude protein @ 1.5-2.0 % of the fish body weight after sunrise (between 9-11 a.m.), preferably by bag feeding.
- ◆ Suspend feeding in case fish come to the surface for gasping atmospheric air or disease is observed in the fish.
- ◆ Increased input in terms of seed, feed and fertilizer should be avoided. It not only enhances input costs, but also deteriorates the water quality elevating the risk of stock loss.
- ◆ Follow recommended prophylactic measures (liming, potassium permanganate application).

- ◆ In case of disease occurrence, consult an expert from KVKs, ICAR-CIARI, Port Blair or Dept, of Fisheries.
- ◆ Always wear mask, use sanitizer or wash hands using soaps and maintain social distancing in the farms and marketplaces.

Horticulture

Brinjal

- ◆ Select the high yield round fruited varieties as per local market demand.
- ◆ Integrated Pest management practices should have followed for control of fruit and shoot borer.
- ◆ Bacterial wilt resistance brinjal like CARI brinjal-1, & 2 and other local private company varieties

Tomato

- ◆ Lime applications @ 100kg/acre before transplanting of seedlings
- ◆ Grow only wilt resistance varieties like Arka Rashak Laxmi, Utkal Raja, Utkal Urbasi etc.
- ◆ Avoid the rainy days for transplanting of seedlings.
- ◆ Select the sandy soils for better crop growth and yield.

Cole crops (Cabbage Cauliflowers)

- ◆ Grow only tropical high temperature tolerant varieties like white marvel, white short etc.
- ◆ Avoid the excess rainy period for transplanting of seedlings.
- ◆ Seedlings should treat with bio fertilizers and bio-inoculants.
- ◆ Soil application of biofertilizers before transplanting
- ◆ Apply micronutrients like boron, zinc, calcium and molybdenum.
- ◆ Don't apply excess chemical fertilizers like DAP and Urea.
- ◆ Drain excess water from field and grown in raised bed during uncertain rain in winter.

French beans

- ◆ Always grow pole types of French beans.
- ◆ Yellow vein mosaic and aphids should control timely to minimize the crop loss.

Root crops (Radish, sweet potato, Carrot)

- ◆ Always choose sandy loam loose soil for root crops
- ◆ Pusachetaki, Japanese long of Radish variety should planned for cultivation.
- ◆ Improved Bio fortified varieties of sweet potato like Bhu-sona and Bhu-sakti and CARI SP-1 and CARI SP-2 should select.
- ◆ The Asiatic variety of carrot like Pusa Rudhira and others should select for cultivation.
- ◆ Soil application of neem manures and trichoderma powder will be beneficial for soil borne disease.

Chilies

- ◆ Grow leaf curling resistance varieties like VNR-Black, bullet mirch, Pusajwala, MDU-1 etc.
- ◆ Control of viral disease minimize the white fly population by spraying of imdachlorophid 1ml/liter water and then spraying of 0.05% of Dimethoate (Rogor), soil application of neem manure or carbofuran @1.5kg/ha is advisable.
- ◆ Spray of NAA at 50 ppm at full bloom stage for control of excess flower drop.
- ◆ Seed treatment with Thiram or Captan @2gm/kg for control Anthracnose in fruit and spray of Benomyle @0.1%

Cucurbit vegetables

- ◆ Cucurbits like pumpkin, ridgeguard, cucumber and bitter gourd are highly sensitive for downy mildew disease due to hot humid condition. Control of this disease by spraying of cupperoxichloride (Blitox) or Mancozeb during early stage of infection.

- ◆ Powdery mildew in several cucurbits' vegetables noticed and it should be managed by spraying of Dinocap (karathane 0.03%) and dusting of sulphur dust.
- ◆ Leaf mosaic viruses in some cucurbits like bitter gourd are frequently notice during Rabi season, control of insect vector.
- ◆ Anthracnose also reported in some fruits of cucurbit vegetables, repeat spraying of mancozeb or Zeneb (Dithane-Z-78)
- ◆ Fruit fly and red pumkin beetle are more serious pest damaged the fruits and leaves of maximum

Watermelon

- ◆ Follow the control measure of fusarium wilt due to uncertain rain in field, remove excess water logging condition.
- ◆ Application of TIBA 25ppm, MH 50ppm +GA 25ppm, boron and calcium @20ppm will be beneficial for more fruiting and fruit cracking.

Okra

- ◆ Grow YMV resistance variety and spray of Dimethoate (Rogor) at interval of 10days
- ◆ Powdery mildew noticed sometimes controlled as per previous crop
- ◆ Spotted bollworm-infected fruit removed and soil application of carbaryl or neem manures.

Coconut

- ◆ Prepare vermicomposting from coconut waste like leaves, flower sheath etc.
- ◆ Fallow clean cultivation in coconut orchard
- ◆ If required watering should be followed by basin making in coconut trees.
- ◆ Mulching practices should follow with coconut leaf, husk or other organic materials.

Arecanut

- ♦ Fallow the clean cultivation and mulching of arecanut orchard should with arecanut residue.
- ♦ Apply neem manure to avoid root diseases

Banana

- ♦ If rhizome weevil notices in planation, arrange proper drainage in field.
- ♦ Remove all affected rhizomes from field and apply chloropyriphos dust.

Mangoes

- ♦ Infection of mango fruit fly noticed in late March-April-May, control these insects with install of sex pheromones. Spray of Dimethoate 0.045% + molasses 0.1%
- ♦ Dip mature unripe fruits dip in sodium chloride solution (5%) in water for one hour.
- ♦ Shooty mold fungus appears in shade area or inner area of middle Andaman, spray of good fungicide two times before maturity.

Guava

- ♦ Install sex pheromone trap for control of fruit fly.
- ♦ Apply trichoderma powder in root zone of guava for control of fusarium wilt.
- ♦ Citrus fruits (Oranges, lime, lemons, Pomaleo)
- ♦ Apply proper nutrition after harvesting and don't leave the fruits for ripening at trees.
- ♦ Regular application of trichoderma powder for control of wilt and dieback in citrus fruits.
- ♦ Marigold
- ♦ Grow round year marigold varieties like Bidhan Marigold-2 and other African marigold flowers for commercial cultivation.

Zone-VI

ASSAM

Field crops

Transplanted early Ahu Rice

- ♦ Field selection: Areas with assured irrigation facilities should be selected. Heavy to medium textured soils are preferred.
- ♦ Nursery management: Seeds are to be put in plain water, stirred well and floated ones are to be discarded. Seeds should be sown in nursery bed during mid-February. Land is to be thoroughly puddled and seed beds of 1.25 m breadth and 10 m length (may be increased or decreased as per the requirement) are prepared with 30 cm gap in between beds. In each seed bed 20-30 kg cow dung or compost, 80 g urea, 80 g SSP and 40 g MOP are to be applied. Well germinated seeds are sown @ 650 to 1000 g per bed. Seed requirement for transplanting one hectare of main field is 40-45 kg. In case of hybrid varieties, seed are to be sown @ 250 -300 g/bed and seed requirement for transplanting 1 ha area is 7.5 kg.
- ♦ Transplanting is to be done by putting 2-3 seedlings per hill at a depth of 4-5 cm in semi dwarf varieties and 1 seedling per hill for hybrid. The spacing is 20 cm x 15 cm. Recommended fertilizer dose is 40 kg N, 20 kg P_2O_5 and 20 kg K_2O per hectare in case of semi dwarf varieties. Only one third of the total urea, full doses of super phosphate and potash are to be applied at the time of final puddling. The 2nd one third and 3rd one third doses of urea are to be applied at tillering and panicle initiation stages respectively. Top dressing of urea should be preceded by weeding. In case of hybrid varieties, recommended fertilizer doses are 100 kg N, 60 kg P_2O_5 and 60 kg K_2O per hectare and urea fertilizer is to be applied in 4 equal splits i.e., at the time of final puddling, at maximum tillering, at panicle initiation and at booting stage.

Wheat

- ◆ Sandy loam to silty loam soils, rich in organic matter are suitable. Clayey soil is not suitable for wheat.
- ◆ Seed priming should be done by soaking the seeds overnight before sowing, for faster emergence and uniform crop establishment.
- ◆ A seed rate of 100-120 kg/ha is adequate. Row to row distance of 20 cm is to be maintained for optimum plant population. Depth of sowing should be 3-5 cm but not deeper than 5 cm.
- ◆ In case of dry topsoil, pre-sowing irrigation is to be applied 3-4 days before sowing for quick and uniform germination of seeds. Two irrigations of 6 cm depth have been recommended for all the agro-climatic zones. The first irrigation must be applied at crown root initiation stage (20-25 days after sowing) of the crop and the second one at heading stage (70-75 days after sowing). Irrigation should be avoided when ground water table remains within 50 cm of the root zone.

Maize

- ◆ In case hybrids maize, it is advised not to keep seeds from previous year's harvest for sowing in the following years. However, seeds from composite varieties can be kept for sowing in the following year, without appreciable decrease in yield.
- ◆ Well drained sandy loam soil is to be selected, Field should be free from water logging.
- ◆ Optimum time of sowing is middle of September to middle of November.
- ◆ Spacing of 60 cm between rows and 20 cm between plants should be maintained.

Buckwheat

- ◆ Optimum time of sowing is September-October for Upper Brahmaputra Valley Zone and October-Mid November for Lower Brahmaputra Valley Zone.

- ♦ Seed rate is 20 kg/ha (2.7 kg/bigha) and spacing is 30 cm between rows is recommended.

Foxtail millet

- ♦ Optimum time of sowing is middle of January to middle of February (the best time is last week of January). Seed rate is 8-10 kg/ha, which may be increased to 15 kg/ha under broadcast sowing. Spacing should be 25 cm between rows.

Lentil

- ♦ Newly recommended varieties are HUL 57 (small seed lentil variety), Axom Masur 1 (SL 2-24) and Axom Masur 2 (SL 2-28).
- ♦ Optimum time of sowing is mid-October to mid-November and recommended seed rate is 30 kg/ha or 4 kg/bigha. The seeds are to be sown in line at a spacing of 25 cm between rows and 5-7 cm from seed to seed.

Rapeseed and Mustard

- ♦ Recommended toria varieties are TS 36, TS 38, and M-27 with 90-95 days duration. Newly recommended varieties suitable for late sowing are Jeuti, TS 46 and TS 67.
- ♦ Some newly recommended Indian Mustard varieties are NRCHB – 101, PM 26 and PM 27 having crop duration of 107 days.
- ♦ Optimum seed rate is 10 kg/ha (1.3 kg/bigha) for toria and seed rate will be 8 kg/ha for mustard.
- ♦ A seed proportion of 75:25 of toria + lentil mixed is recommended for Hills Zone only. As pure crop, a seed rate of 6-8 kg/ha is recommended for Hills Zone.
- ♦ Seed rate of rainfed late sown toria after sali paddy (rice-toria sequence) should be 13 kg/ha, i.e., 33% higher than normal recommended rate of 10 kg/ha.
- ♦ The optimum time of sowing is middle of October to middle of November. Early sowing helps in escaping the attack of aphids.

In Barak Valley Zone, rapeseed and mustard can be sown as late as November 30 in upland condition and up to third week of November in medium upland condition.

- ♦ Irrigation of 6 cm depth of water may be applied either at 50% flowering or at early siliqua formation stage. In case a rainfall of 20-25 mm is received during this period, no post sowing irrigation is essential. Pre-sowing irrigation is normally not required for timely sown crop. However, in dry areas, pre-sowing irrigation may be applied. As moisture conservation tillage practice for rapeseed after *sali* rice, one cross ploughing by power tiller incorporating rice stubbles is recommended.

Linseed

- ♦ Optimum time of sowing is from middle of October to middle of November. In Barak Valley Zone sowing can be done in December after harvest of *sali* paddy. Seed Rate is 15-20 kg/ha. Spacing should be 25 cm between rows and 10 cm between plants.
- ♦ It can also be grown as relay crop with *kharif* rice.

Niger

- ♦ Time of sowing is October (September to middle of October for Lower Brahmaputra Valley Zone).
- ♦ Seed Rate should be 8 kg/ha (1.1 kg/bigha) for line sowing and 12 kg/ha (1.5 kg/bigha) for broadcast crop.
- ♦ Recommended spacing is 25 cm between rows and 5-7 cm between plants

Potato

- ♦ Well drained sandy loam and loam soils, rich in organic matter are suitable. A pulse crop should preferably be included in the rotation to improve the soil condition.
- ♦ Field should be thoroughly ploughed to obtain a good tilth. It should be levelled for uniform distribution of irrigation water or

to maintain soil moisture uniformly under rainfed situation. The furrows should be prepared at 50 cm apart.

- ♦ The optimum time for planting is mid-October to mid-November. In case of Kufri Sindhuri planting may be extended up to middle of December.
- ♦ Virus free, healthy, medium sized sprouted tubers are to be selected for planting. Ideal size is about 2.5 cm in diameter (25-40 g). Bigger sized tubers may be cut into pieces longitudinally with 2-3 eyes in each piece. In case of cut seeds, the pieces are to be dipped in Mancozeb @ 5 g in 1 litre of water for about 10 minutes. After treatment, the seeds are to be spread thinly and dried under shade for 48 hours or should be covered with moist gunny bags for 2-3 days for suberization.
- ♦ The seed requirement is 22.5-25 q/ha when size of the tubers is about 2.5 cm in diameter (about 25 g) and planted with an intra row spacing of 15 cm. Intra row spacing is increased with bigger sized tuber.
- ♦ The sprouted tubers should be planted in furrows with sprouts facing upward. Care should be taken to avoid sprout damage while handling the tubers.
- ♦ The furrow method of irrigation must be adopted. Three irrigations should be applied, first at 25 days (stolon formation stage), second at 60 days (tuber formation stage) and third at 80 days (tuber development stage) after emergence of sprouts. In case of application of mulching materials in furrows, only two irrigations are to be applied at 25 and 60 days after emergence of sprouts. At the time of application of irrigation, care should be taken not to submerge the ridges completely.

Horticultural crops

- ♦ For nursery raising of rabi vegetables, sunny area with well drained friable light soil rich in organic matter should be selected. The nursery bed should be 1 m width and of convenient length. The

bed should be raised to 10-15 cm above the ground level.

- ♦ Important varieties of straw berry are 'Sweet Charlie', 'Festival', 'Chandler' etc. Straw berry is propagated through runner and best time for planting is November.

Livestock

- ♦ The livestock and poultry shed need be repaired before winter, so that they can be protected from inclement weather (cold wind). The sides of the shed may be covered with polythene sheet or gunny cloth to obstruct the flow of wind. Shady trees around the shed should be trimmed.
- ♦ The livestock are needed to be fed silage, hay, edible tree fodders as well as chopped paddy straw (3-5 kg) daily to sustain the milk production during rabi (cold) season.
- ♦ Farmers are suggested to provide artificial heat source to their newborn piglets and poultry chicks during rabi season, if needed.
- ♦ Disease surveillance and monitoring network to be established. List out the endemic diseases of birds (species wise) in the district and store vaccines for those diseases.
- ♦ Timely vaccination against all endemic.
- ♦ Ensure de-worming of livestock (cattle, goat, sheep and pigs) immediately after rainy season.
- ♦ Livestock farmers are suggested for regular supplementation of mineral mixture @ 50-60 g/day/ adult cows and calcium to the lactating cows @ 60-80 ml/day/cow.
- ♦ Suitable bedding (paddy straw, dry grass, wheat bhusa, saw dust, rice husk etc.) to the depth of 4-6 inches in large animals and 2 inches for smaller animals should be provided on puccaa (concrete) floor.
- ♦ Bathing of animals with cold water during winter should be avoided
- ♦ Hairs of animals should not be clipped during winter.

- ♦ All the farmers are requested to contact KVKs at district level for any kind of advisories.

Fish Farming

- ♦ Pond construction, pond preparation and pre stocking management of fish culture needs to be completed by the rabi season. During pond construction one should not dig out a pond in upland. Before construction one may perform soil testing at Krishi Vigyan Kendra. Location with Silt loam soil, less sandy and soil with higher water holding capacity are suitable for pond construction. Ideal soil for pond construction needs to have Nitrogen 30-50 %, Phosphorus 6-16%, Organic Carbon 1-2%, Calcium carbonate 5% and pH 6.5-7.5.
- ♦ In case of old pond, removal of pond muck is most essential as a measure for pre stocking management during this season.
- ♦ De-silting of pond bottom has to be done every 3 years for better release of nutrients for higher fish growth.
- ♦ Liming is done to correct the pond soil pH by applying initial dose/ basal dose as per existing value of soil pH.
- ♦ Monitoring of fish health and behaviour, feeding intensity are to be done on regular basis.
- ♦ The water quality parameter has to be checked regularly as most of the diseases prevail in winter season.
- ♦ Farmers are advised to use low protein diet as the rate of feeding and metabolic activities decreases during winter and advised to reduce adding of organic manure such as cow dung, poultry droppings and pig dung in the pond as the rate of decomposition decreases during winter.

SIKKIM

General Advisory for *Rabi* Season:

- ♦ Sowing should be done within the optimum sowing time of the *rabi* crops.
- ♦ Mulching should be done through locally available biomass to conserve soil moisture for *rabi* crops and suppress the weed growth.
- ♦ Zero till cultivation of vegetable pea/toria/buckwheat can be taken up in rice fallow to utilize the residual soil moisture.
- ♦ Nursery should be raised for cole crops (cabbage, cauliflower, broccoli), onion, rayasaag etc. under protected condition.
- ♦ Nursery bed should be protected from rain (Silpauline: 45GSM) to avoid losses during unexpected rain.
- ♦ COVID protocol and measures to be followed while working in the field.
- ♦ Application of lime @ 1 t/ha 15-20 days before sowing the seed may be done for increasing availability of nutrients to the plants.
- ♦ For plant protection measures, spray neem-based formulation (1500 ppm) @ 0.3% as and when required to all the crops.

Agricultural crops

Rajsmah

- ♦ Sowing of Rajmash seed should be done by last week of August for getting maximum yield. Recommended varieties are – Sikkim Rajma-1, Jwala, Tripura Rajmash Selection 1 etc.
- ♦ Sowing of rajmash should be done on the ridge (ridge-furrow) to avoid seed deterioration due to water logging from continuation rain and proper drainage channel to be made.
- ♦ Apply FYM 5 t/ha + 2.0 t/ha vermicompost + 20 kg/ha biofertilizer.
- ♦ Seed rate of rajmash should be @ 70-80 kg/ha with spacing 30 cm x10 cm.

Rapeseed Mustard

- ◆ Field should be prepared in the month of October-November with 2-3 times ploughing for Rapeseed and Mustard cultivation and apply well decomposed FYM @ 5 t/ha, vermicompost 2 t/ha and 100-120 kg/ha rock phosphate to get optimum yield.
- ◆ Sowing of Rapeseed and Mustard should be done from last week of October to December. Seed rate @ 6-8 kg/ha treated with PSB @20g/kg of seed. Recommended varieties are – Pant Pili Sarson-1, Pant Sweta and existing variety like Uttara and Benoy-9, PM-27, and PM-28 etc and Toria variety TS 36, TS 38

Buckwheat:

- ◆ Sowing should be done from the second fortnight of October to First week of November.
- ◆ Sowing should be done with the seed rate 30-40kg/ha and spacing 30 cm x10 cm
- ◆ Apply FYM @ 5 t/ha and vermicompost @ 1t/ ha.

Horticultural crops

- ◆ At fruiting stage such as orange, kiwifruit utmost precaution should be taken during filed operation to avoid root damage.
- ◆ Ensure proper storage of harvested fruit crop to ensure better price realization like cold storage etc.
- ◆ Precautions to be taken for direct marketing of harvested vegetables and fruits.
- ◆ In orange, FYM @ 20 kg/plant should be applied in the month of April-May every year.

Vegetable pea/Field pea:

- ◆ Zero till cultivation of vegetable/field pea should be practiced.
- ◆ Sowing should be done with spacing of 30-40cm x 10 cm and seed rate @ 60-70 kg/ha

- ◆ Apply lifesaving irrigation for better yield
- ◆ Apply FYM @ 2 t/ha + vermicompost @ 1 t/ ha during the time of sowing.

Cole cops (cabbage, cauliflower, broccoli) and tomato

- ◆ Nursery should be raised in protected condition to avoid untimely rain and low temperature.
- ◆ The nursery site should be dry and free from water stagnation as well as high moisture in the soil.
- ◆ The nursery bed should be prepared by mixing well decomposed FYM or compost @ 4 kg/m².
- ◆ 25-30 days old sapling should be transplanted with spacing of 40-50 cm row to row and plant to plant.
- ◆ Transplant the seedling must be done in the evening and irrigate immediately.
- ◆ Apply FYM @ 7-8 t/ha + vermicompost @ 1-2 t/ ha for getting higher yield.

Root crop (radish, carrot)

- ◆ Soak the seed of carrot overnight in water before sowing for early germination.
- ◆ Seed should be sown on the raised bed of 30-40 cm width.
- ◆ Apply FYM @ 8-10 t/ha + vermicompost @ 1-2 t/ ha for getting higher yield.
- ◆ Spacing for carrot- Row to row: 20-30 cm and plant to plant: 5-10 cm and
- ◆ radish - row to row: 30-40 cm and plant to plant: 5-10 cm should be maintained for good crop yield.
- ◆ To maintain proper spacing thinning should be done after 10-15 DAS

Potato:

- ♦ Potato should be planted in the middle of October – middle of November for higher yield in rice-fallow to utilize the residual soil moisture.
- ♦ Apply well rotten FYM @ 12-15 t/ha along with vermicompost @2-3 t/ha in the line during the time of planting.
- ♦ Tuber size 40-50 g in weight should be planted with row-row spacing of 50-60 cm and plant-plant 20 cm.
- ♦ One irrigation is necessary for getting good yield.
- ♦ Good moisture to be maintained in the field to avoid the red ants' infestation.

Livestock specific advisory

Cattle and Goats

- ♦ Strict hygiene and sanitation need to maintain at the farm premises to prevent the incidence of diseases.
- ♦ Regular supplementation of mineral mixture @50-60g/day to adult cows and calcium to the lactating and pregnant cows @70-80ml/day/cow is very much essential for milking cows for getting optimum production and productivity and avoid disease occurrence.
- ♦ Follow good management practices related to feeding, watering, housing (clean, dry, well ventilated) and general hygiene to keep animals healthy.
- ♦ Calves should be de-wormed as early as 21 days with Piperazine against round worm @110-130mg/kg body weight. Adult cow should be de-wormed preferably with Fenbendazole @7mg/kg body weight.
- ♦ Ensure de-worming of goats with Albendazole @ 7.5mg/kg body weight. In case of pregnant dose, pregnancy safe anthelmintics (Fenbendazole 25mg/kg body weight) should be administered 15 days prior to expected date of kidding.

- ◆ Feed materials should be store in dry place to avoid possible fungal growth (Aflatoxicosis).
- ◆ Foot bath should be made at the entry point of the farm to reduce the contamination.
- ◆ Balance and timely feeding (dry fodder, roughages, concentrate, vitamin, minerals,) should be practice for the optimum production and good health.
- ◆ Avoid slippery floor especially in case of pregnant cattle.
- ◆ Timely vaccination and deworming should be practice.

Poultry Birds

- ◆ Litter materials should be dried and frequently changed in the poultry farm to prevent the incidence of coccidiosis.
- ◆ Proper ventilation and spacing should be followed in poultry farm to prevent the incidence of diseases.
- ◆ Provide artificial heating to poultry birds (day old to 25 days old) through lightning of electric bulb to protect them from low temperature during nighttime.
- ◆ Keep the poultry house well ventilated during daytime.
- ◆ Vaccinate against Ranikhet, IBD, Fowl pox, Marek disease in poultry birds.
- ◆ Poultry birds should be de-wormed with piperazine @32mg/kg in two consecutive feed or water against round worms and Albendazole against other worm @10mg/kg body weight with or without Praziquantel @5 mg/kg body weight and depending upon age of the bird.

Piggery

- ◆ Pigs should be de-wormed with Albendazole @5 mg/kg body weight and Piperazine specifically against round worm @110-200mg/kg body weight.

- ♦ Pig farmers are advised for regular supplementation of mineral mixture @50-60 gm/day for pregnant sow and calcium to the lactating sows @60-80 ml/day/sow.
- ♦ Restrict the movement of visitors into the farms and follow strict bio-security measures. Use of good disinfectant in foot bath.
- ♦ In pigs vaccinate against Swine fever. Vaccination for FMD, BQ and HS for bovines.
- ♦ Creep box with heating source (bulb) should be used in piglets' pens to reduce the mortality due to trampling by the snow and cold shock.

ARUNACHAL PRADESH

Field crops

Rabi Maize

- ♦ Sowing of rabi maize at lower elevated areas should be done in September and completed preferably by mid-October and not delayed further as it may reduce the yield.
- ♦ High yielding hybrids (F1 hybrids) like HQPM-1, C-1415, PAC-705 etc and composite varieties like Vijay, VL Makka-88, etc are recommended for rabi season.
- ♦ Seed treatment with Bavistin + Captan in 1:1 ratio @ 2g/kg seed is recommended at a spacing of 60cm row to row and 20 cm plant to plant.
- ♦ FYM @10 q/ha along with seed treatment with Azotobacter and PSB are also recommended for organic rabi maize.
- ♦ Intercropping of rabi maize with winter vegetables like cole crops, carrot, pea, potato, local beans etc may be practiced for increasing productivity.
- ♦ Two weeding at 30 -60 DAS are recommended to avoid any kind of water and nutrient stress for maize in rabi season.
- ♦ Cobs should be harvested when moisture is not more than 20% in grains. Harvested cobs should be sun dried properly before shelling.
- ♦ For control of the Fall Army worm in rabi maize, Seed treatment with Cyantraniliprole 19.8% + Thiomethoxam 19.8% @ 4 ml kg-1 of seed. At seedling stage spray 5% neem seed kernel extract (NSKE) or Azadirachtin 1500 ppm @ 5 ml l-1 of water to kill eggs and neonate larvae may be applied. In mid-whorl stage, spray Chlorantraniliprole 18.5% SC @ 0.4 ml l-1 or Spinetoram 11.7% SC @ 0.5 ml l-1 of water. In late whorl stage, spray Emamectin benzoate 5% SG @ 0.4 ml l-1 or Thiamethoxam 12.6% + lambda cyhalothrin 9.5% @ 0.25 ml l⁻¹ of water.

Rabi Paddy

- ♦ Complete harvesting of early and medium duration paddy varieties within second fortnight of November when 80% of grains in panicle are mature.
- ♦ Harvesting should be done on bright sunny days and sundry of harvested paddy to bring down moisture level at 12%.
- ♦ If sufficient moisture available in the paddy fields at harvesting time, farmers may go for relay cropping of pea with paddy crop. For this purpose, pea seeds may be sown at the base of the standing hills before 15 days of harvesting.
- ♦ If sufficient residual moisture is available in paddy field, farmers should try to sow rapeseed/mustard or any other pulses by following zero or minimum tillage.

Rapeseed/mustard

- ♦ In India rapeseed and mustard is grown during winter season. The crop needs about 18°C - 25°C temperature. The crop prefers low humidity. There should not be any rainfall especially at the time of flowering. Rainfall, high humidity and cloudy weather are not good for the crop during winter as it invites aphids, and the crop gets spoilt completely. Under Rainfed, conditions as in most areas of Arunachal Pradesh 1 - 2 pre-flowering rains help in boosting the grain yield. Excessive cold and frost are harmful to the crop. Mustard thrives best in medium or heavy loam soils. Heavy soils subjected to water logging should be avoided, as the crop cannot tolerate such conditions. Very light soils usually cause a serious moisture stress. Saline and alkaline soils are often not fit for the crop though it has good tolerance to such conditions.
- ♦ Zero tillage or minimum tillage is recommended for sowing rapeseed/mustard when grown under rainfed condition during rabi season. Practicing zero tillage helps in utilizing the residual moisture in the field after kharif paddy besides allowing to sow the seeds in time it also reduces the cost of cultivation and improves the soil condition by addition of organic matter over time.

- ◆ Ploughing of fields for the Toria/Mustard to be completed by first fortnight of October
- ◆ Sowing of Toria /Mustard seed to be completed by second fortnight of October. Timely sowing ensures the optimum crop growth and less infestation of Mustard aphid.
- ◆ Seed treatment should be done for rapeseed/mustard with *Trichoderma viridae* @ 5g/kg of seed.
- ◆ Suitable variety for Toria is TS-36 & TS-38 recommended for cultivation under Papum Pare district. They are highly adapted under agro-climatic condition of Papum Pare.
- ◆ Sowing of Toria may be extended up to 15th of November in case of available moisture in the soil.
- ◆ Intercultural operation like hand weeding to be carried out at 30, 60 and 90 Days after Sowing.
- ◆ Harvesting of silique to be done at between 120-150 DAS
- ◆ To control mustard aphid spraying of 5% neem seed kernel extract (NSKE) or Azadiractin 1500 ppm @ 5ml/litre of water.

Potato

- ◆ The soil should be friable, porous, and well drained. The optimum pH range is 4.8 to 5.4. It is a cool weather crop. Potato is mostly grown as a rainfed crop. It is cultivated in regions receiving a rainfall of 1200 – 2000 mm per annum.
- ◆ Ploughing of fields for the Potato to be completed by second fortnight of October till 15th of November with ridge and furrow methods of planting.
- ◆ Select the certified and disease-free seed potato tuber for planting.
- ◆ Potato tuber may be treated with *Azotobacter* and *Phosphobacteria* each @ 2gm/kg of tuber before planting. The treated tuber may be shade dry for half an hour and planting to be completed by first fortnight of November. Timely sowing ensures the optimum crop growth.

- ♦ For planting in one ha of area, 22-25 q/ha tubers require with 2-3 eyes and 25-45 gm weight of each tuber by maintaining planting distance of 60 x 20 cm.
- ♦ Suitable variety for Potato is Kufri Pokhraj, Khufri Bahar, Khufri Alankar, K. Jyoti, K. Kanchan (red-skinned) recommended for cultivation in Arunachal Pradesh.
- ♦ First irrigation to be given at 10-12 days or after germination, second at tuberisation at 25 days after planting, 3rd at initiation of tuber at 40 DAP and 4th at development of Tuber at 50-70 DAP.
- ♦ For early blight of potato spraying with mancozeb @ 2.5g/litre of water at 15 days interval for 3 times.
- ♦ Intercultural operation like hand weeding to be carried out at 30, 60 and 90 Days after Sowing.
- ♦ Two earthing up operation may be done at 30-35 DAP and second at 25-30 DAP of first earthing up followed by light irrigation
- ♦ Irrigation should be stopped at least 10 days before haulm cutting and harvesting of Potato to be completed by mid-February on a sunny day to avoid rotting of tubers due to high temperature.
- ♦ Dehaulming (removal of foliage and stem portions) should be done 10-15 days before harvesting which will allow hardening of tuber skin. This practice is highly recommended for production of tubers meant to be kept for seed purpose.
- ♦ Late Blight: For management of dreaded late blight in potato ensure early sowing (Mid October) of the seeds. When crop is full grown keep vigilance for weather condition. If cloudy, foggy, or rainy weather is forecasted then a prophylactic spray Ridomil @ 2.5g/liter of water at 15 days interval for 3 times.

Buckwheat

- ♦ Optimum time of sowing is September-October for high altitude areas of Tawang, West Kameng and Lower Subansiri districts as relay crop after maize and October-Mid November for low altitude areas like Dibang and Lohit valleys.

- ♦ Seed rate is 20 kg/ha and spacing of 30 cm between rows is recommended.

Foxtail millet

- ♦ Optimum time of sowing is middle of January to middle of February (the best time is last week of January). Seed rate is 8-10 kg/ha, which may be increased to 15 kg/ha under broadcast sowing. Spacing should be 25 cm between rows.

Horticultural Crops

Nursery Preparation for winter vegetables

- ♦ Nursery should be prepared for the crops like Brinjal, Chilli, Broccoli, cabbage, cauliflower, knolkhol etc.
- ♦ **Site:** Nursery area should be well fenced to protect it from pet and wild animals. The area should be near the water source. The area should be free from waterlogging. Nursery should be situated near the main field for transplanting. Nursery area should receive sunlight right from south-west aspect is most suitable. Proper drainage must be provided. Raising of seedling require fertile and healthy soil. The soil should be loam to sandy loam. Soil should have good organic matter and aerated. Soil texture should be neither too coarse nor too fine. Soil pH should be of 6 to 7 approx. Soil should normally be rich in all essential nutrient elements.
- ♦ **Soil Preparation:** It needs a deep cultivation of the nursery land either by soil turning plough or by spade and subsequent 2-3 hoeing to get a fine tilth. Mix 2 Kg well rotten and farmyard manure\ compost or leaf compost or 500g vermicompost per square meter and mix in the soil. If the soil is heavy mix 2-3 kg sand per square meter so that the seed emergence may not be hampered.
- ♦ **Soil Treatment:** For raising the healthy seedlings, soil must be treated to make it pathogen and pest free. We can use soil solarization methods or formalin solution. This should be done 10-15 days before seed sowing. Prepare formalin solution (1.5 to 2%)

in one container and drench the soil @ 4-5 litre of water per square meter soil surface to saturate it up to depth of 15-20cm. Cover the drench area with polythene sheet. Hot steam can be used to treat the soil against harmful insect pest. Soil treatment using Captan or Thiram which kill the soil borne pathogens.

- ◆ **Bed preparation:** Beds should be prepared according to the season and the crop. The breadth of the beds should be not more than 1.00 m. The beds should be 15-20 cm raised from the ground surface. The standard size of nursery bed is 3m × 1m ×15 cm. A space between beds should be 30-45 cm. Add 20-25 kg well rotten farmyard manure in each standard size nursery bed. The number of nursery beds depends on the crop, season and growing area for transplanting. The beds should be prepared in the east and west direction and lines/rows for sowing of seeds should be made from north to south direction on the beds.
- ◆ Seed should be treated with *Trichoderma* spp. @2g/100g and apply 10 - 25 g of *Trichoderma* spp. powder per 100 m² of nursery bed or treat with carbendazim 50% WP @ 2g/1kg seed.

Orange

- ◆ Keep the plantation clean and remove unwanted branches continuously.
- ◆ Regular scouting of the field or horticulture crops is recommended for disease and pest management.
- ◆ To control gummosis and collar rot disease of orange apply Bordeaux paste up to 1meter high in post monsoon.
- ◆ Harvesting of oranges may be done in 10-15 days interval. Care should be taken for not damaging the plant or fruits during harvesting.
- ◆ During the month of September second dose of Citrus mixture @ 1kg per plant should be applied for old plants.

Pea:

- ◆ For pea cultivation, temperature range should be between 15 to 30 degrees Celsius. Optimum rainfall range is between 400 to 500 mm. While harvesting, the temperature should range between 15 to 20 degree Celsius and sowing temperature should range between 25 to 30 degrees Celsius.
- ◆ **Soil:** Well drained loamy soil with optimum pH range of 6-7.5 is suitable. Thrives best in cool weather. This crop withstands low temperature at the seedling stage.
- ◆ **Sowing time:** For rabi crop planting is done from October to November.
- ◆ **Seed rate:** 50 to 60 kg of seeds is required for a hectare.
- ◆ **Seed treatment:** Treat the seeds with *Trichoderma* 4 g/kg or Thiram or Captan at 2 g/kg of seed to avoid seed borne diseases. Treat the seeds with *Rhizobium* culture at the rate of 2 kg and apply 2 kg *Phosphobacterium* as soil application just before sowing.
- ◆ **Preparation of field:** The field should be deep ploughed and prepare the land to fine tilth.
- ◆ **Spacing:** Sowing of seeds should be done at 45 x 10 cm in line
- ◆ **Irrigation:** Pea is an Irrigation responsive crop. So, irrigation is done immediately after sowing and another on 3rd day after sowing. Thereafter irrigation is done once in a week if possible. In water scarcity area irrigation should be managed at least at flowering and pod formation stage. During snow fall irrigation is necessarily given to plants.
- ◆ **Manuring:** Apply FYM at 20 t/ha and 60 kg N, 80 kg P and 70 kg K/ha as basal and 60 kg N/ha on 30 days after sowing. While *Rhizobium* inoculated, the N fertilizer may be reduced to 50%
- ◆ Weeding should be done 15 days after sowing. Subsequent weeding should be done as and when necessary. Stake the plants on 30th day of sowing.

- ♦ **Plant protection: Pod borer** can be managed by Spray of Nuvan at 0.5% concentration thrice at fortnightly intervals for **Aphids and leaf miner malathion 50EC may be applied. For management of Powdery mildew**, spray Wettable sulphur 2.5 g/lit in three rounds at 15 days interval.
- ♦ **Harvest:** First picking can be done on 75 days after sowing for most varieties. High temperature during harvest affects the quality of peas.

Plant protection for winter vegetables

- ♦ For lepidopteron defoliator like diamond black moth, cabbage butterfly etc. farmers may use BT products and for the soil borne insects metarhizium products may be used at 7 days intervals for winter vegetables.
- ♦ Nursery bed treated with Trichoderma spp. For control of damping off disease.
- ♦ Use BT for management of caterpillar management at 7 days interval.
- ♦ Use soil solarisation technique for control of soil pest and weed.
- ♦ Spray Copper oxychloride@300gm + streptomycine @6 gm/150 lit of water for management of black rot.
- ♦ To control leaf spot and blight infection spray of Mancozeb @400 gm/ 150 litres of water at 15 days interval
- ♦ To control Broccoli white mold spray Metalaxyl + Mencozeb@2gm / ltr of water @ 10 days interval.
- ♦ For specific pest and disease incidence farmers need to be vigilant frequently and consult with the concerned departments and KVK.

Livestock

Poultry:

- ♦ Provide sufficient bedding materials to keep them warm.
- ♦ Provide adequate clean drinking water +electrolyte

- ◆ Vaccination as per the schedule with proper consultation with vet.
- ◆ Provide anti-coccidial drugs. Make control of coccidiosis in poultry by treated with coccinil plus vet (Amprolium HCL, Ethopabate, sulphat quinoxaline & pyrimethamine promix.,B,P, Vet) the dose rate of 30g dissolved in 50 liters of drinking water for 7 days.
- ◆ Make sure for deworming of poultry chickens with albendazole at the dose rate of 20mg/kg orally. 30-40ml/100 birds in drinking water. Repeat after 21 days.
- ◆ Remove wet litter/provide artificial heating and light

Piggery:

- ◆ Provide proper bedding materials for newly born piglets to protect them from cold
- ◆ Ensure vaccination of pig against swine fever at the age of 3 months old pig and repeat annually
- ◆ Deworm at regular interval.
- ◆ During scarcity of fodder provide hay/silage/feed blocks.

Cattle

- ◆ Protect the newborn from cold.
- ◆ Make sure deworming of calves with albendazole 5mg/kg body weight repeat deworming once in 3-4 months.
- ◆ Store freshly cut paddy straw (To use as feed during lean months).
- ◆ Avoid dampness and keep dry all the cow shed area.
- ◆ Vaccination as per the schedule with proper consultation with vet.

Goats

- ◆ Ensure deworming of goats (Albendazole @ 7.5 mg/kg body weight) especially young kids before the start of rainy season.

Fisheries

- ◆ Don't allow runoff water into the pond, it contains dust, microbes,

sand, derbies, which will pollute the water and cause disease outbreak.

- ◆ Sundry the pond bottom and plough thoroughly, then add limestone powder @ 60 kg/acre to maintain soil PH and release of gases as pre stocking management.
- ◆ In heavy rainy area, go for vegetable cultivation on pond dykes to avoid soil erosion.
- ◆ Fish farmers need to take some special care of their fishponds during rainy season to protect their stock from sudden changes in water quality and prevent physical damages to the pond due to erosion of dikes.
- ◆ In case, during rainy season, cloudy condition persists during the daytime, stop feeding the fish and resume feeding on the next sunny day.
- ◆ If EUS (Epizootic Ulcerative Syndrome) disease outbreaks in monsoon season, then apply CIFAX @ 1 lit. /ha of water body.

Mushroom cultivation

- ◆ Oyster mushroom may be cultivated in almost all the rice growing areas in Arunachal Pradesh. It may be started immediately after harvesting of paddy crop. The required spawns (Mushroom seeds) may be collected from reliable sources. Proper training is essential for cultivation of this crop. Interested farmers are suggested to contact nearest KVK for cultivation of oyster mushroom
- ◆ Mushroom house is fully clean, dark, ventilated and must be dust free.
- ◆ Use fresh paddy straw or paddy husk for mushroom cultivation. Paddy straw are to be chopped into 3-5 cm pieces and soaked in fresh water for 8-16 hours in formalin solution or boil them for at least half an hour. Drain the water completely. It is ready for bagging. 14 x 22-inch PP polybag may be used. 4 to 5 layers of straw may be inserted with some spawn placed on each layer towards the

sides of the bag. Finally, the bag is to be tied tightly and make 30-40 holes with a sterilized knife. Keep the bags in mushroom house hanging one after another. Keep on watering the bags once daily. After 22 days all the bags will turn whitish and in such condition the poly bags need to be removed. Keep on watering twice a day when temperature is above 28°C and when temperature is below 20°C spray water once only. Growing mushrooms will be visible from around 28 – 30 days.

Community Science

Brining of Rabi vegetables from surplus production

- ◆ Boil the brine by adding 1/4 cup of salt in 1 lit of water and then let the brine cool.
- ◆ Wash and prepare the vegetables (cut in same size if necessary).
- ◆ Blanch the vegetable for 2 min.
- ◆ Place them in a jar and cover with brine solution
- ◆ Finish with a capful of refined oil and close the jar.
- ◆ Leafy vegetables are not suitable for brining.

Pickling of Rabi Vegetables

- ◆ Wash and cut the vegetables and steam it.
- ◆ Roast the mustard seed, fenugreek seed, jeera and pound them separately
- ◆ Warm oil in a vessel. Remove half the quantity of oil.
- ◆ Then add vegetables, turmeric powder, slit garlic and all other roasted ingredients.
- ◆ Remove from flame after 1 minute add remaining oil as well as 50 ml of vinegar.
- ◆ Bottle it and serve it after 15-20 days.

Zone-VII

MANIPUR

Agronomy & Horticulture

- ♦ Left over soil moisture after harvesting of kharif paddy should be utilised low water requirement crops such as lentil, latharus, field pea, chickpea, and rape seed mustard etc.
- ♦ Sowing of rabi crops should be started from mid-October to ending November.
- ♦ Field pea varieties, Aman, Prakash, Rachna and Aparna should be sown at a seed rate of 60 to 80kg/ha with a spacing of 30cm x 10cm.
- ♦ Chickpea var. JG-14, JG-16 should be taken up at a seed rate of 60-80kg/ha with spacing 30cm x 10cm.
- ♦ Lentil variety HUL-57 can either be grown in residual moisture (utera cultivation/relay cropping) or with little irrigation after harvest of paddy with a seed rate of 40-50 kg/ha at a spacing of 30cm x 10cm.
- ♦ For acidic soil, liming should be done at sowing time by using Ca CO₃ @ 500 kg/ ha in furrows. Apply NPK@ 20:40:20 kg/ha for rabi pulses.

Rapeseed-mustard

- ♦ As relay crop- If soil moisture is optimum (when step on the soil, footprints are observable but not much impression is made) and supposed to be dried up at the time of harvesting, the seeds should be sown just before 4-7 days of harvesting rice crop so that it can germinate using the conserved moisture.
- ♦ *Sowing seeds and straw mulching:* Seeds should be sown directly into the field and planking follows to fall down the stiff stubbles and then rice straw should be scattered very thinly over the entirely field.



- ♦ *Suitable variety of Manipur- Toria var.:* M-27, TS-36 and TS-38, *Yellow sarson:* Ragini, *Mustard:* NRCHB-101
- ♦ *Seed rate:* 12-14kg/ha. Seeds may be mixed with sand (3to3.5 kg seed+ 2 kg sand for 0.25 ha area) and broadcast.
- ♦ Apply fertilizer dose of 88 kg urea+130 kg SSP+ 33 kg MOP. Total quantity of SSP (130kg) + half of MOP (16kg) should be applied at sowing. First half urea (44kg) should be applied when 1-2 true leaves emerged and the remaining 44 kg with remaining 17 kg MOP should be applied at 25-30 days after first application.
- ♦ Rabi maize should be sown from mid-October to ending November with suitable variety such as HQPM-1, HQPM-5, RCM-76 @ 20 kg/ha with spacing 60 cm×20cm. Apply 10 t/ha FYM or Compost 10-15 days prior to sowing, 150-180 kg N, 70-80 kg P₂O₅, 70-80 kg K₂O and 25 kg ZnSO₄.



- ♦ While carrying out the field activities, safe distance of 3-4 ft should be maintained and engaging more number of people on the same day should be avoided.
- ♦ Preparation of nursery raised beds for sowing of seeds of rabi vegetables (cauliflower, cabbage, broccoli, chilli, tomato, onion, garlic, radish, carrot, beat root etc.) may be done during Sep-Oct and transplanting should be done 30-45 days after sowing depending upon the crops.
- ♦ Recommended and known varieties of Cabbage (Green Hero, Rare Ball), Cauliflower (White Excel, Sweta, Pusa snowball etc.), broccoli (Green magic, Harumi 88, Puspa etc.), tomato (Arka Rakshak, Arka Samrat), Onion (Arka Lalima, Bhima Shakti, Bhima Kiran, Prema) can be used. Seeds should be procured from reliable sources.

- ♦ Farmers are advised to grow the leafy vegetables which have high medicinal values.
- ♦ Farmers are advised to treat vegetable seeds with *Trichoderma viride* or *Pseudomonas fluorescens* @ 5-10 g/ l of water for controlling damping off. Seeds should be soaked for specified period of time and dried into shade properly before sowing. Vegetable nursery should be sown in line to avoid further spread of any diseases on 15-25 cm high raised beds. FYM @ 4 kg/m² should be incorporated in soil during nursery bed preparation. Proper drainage should be provided to avoid water logging and rotting of seedlings. Line spacing of 10-12cm should be marked before sowing of seeds.
- ♦ Ideal time for sowing of King chilli is Dec- Jan. The medium of nursery bed should consist in the same ratio of vermicompost, garden soil and sand (1:1:1 by volume). Sowing should be done on raised nursery beds of 1m width with convenient length or on plastic trays or wooden boxes etc. Transplanting of seedlings should be done 30-45 days after germination in the month of Feb-March for early harvest.
- ♦ Prepare fields for rabi season vegetable crops by mixing 15-20 tonnes/ha of well decomposed Farm Yard Manure. Apply compost/ FYM to soil 3 weeks before sowing or last ploughing to get better results (increased fertility and water holding capacity of soil). Enrich FYM with bio agents like *Trichoderma* and *Pseudomonas* sp.
- ♦ Grow triple disease resistant varieties of Tomato like Arka Rakshak, Arka Samrat for higher yield. Transplanting of seedlings should be done at 60 x 60 cm or 45 x 45 cm. Apply NPK @ 120:80:80 kg/ha, 400g of seeds is sufficient for raising nursery for transplanting 1ha. Ensure staking with bamboo while planting indeterminate varieties of tomato like Arka Rakshak and Arka Samrat on raised bed. Plants should be kept weed free and avoid water stagnation. Biodegradable poly films may be used for mulching to conserve soil moisture and control weed infestation.

- ♦ Proper weed management practices of crops like mulching with locally available materials (rice straw, rice husk etc.) prevent soil erosion and conserve moisture thereby controlling weed growth. Other practices like hoeing, earthing up, irrigation should be followed timely.
- ♦ Need based irrigation and other intercultural operation should be carried out at regular intervals in vegetable crops.
- ♦ Constant monitoring of crops against insect pest attack and roguing of infected plants regularly is advised. In solanaceous crops, constant monitoring of borers by using pheromone traps 10-15/ha is advised.
- ♦ Hand glove and mask should always be worn during the spraying of fungicides and insecticides in the field and equipment should be washed properly before and after use.
- ♦ After harvesting of the vegetable crops (cabbage, cauliflower, broccoli, beans, tomato, potato, and onions), the supply of the harvested produce to market may be done via the agency/sellers/vendors, middlemen identified by the State Government or with the help of FPO and SHGs as per the demands.
- ♦ Safety measures to be followed while harvesting potato, cabbage, vegetable pea, storage, and transport to markets. Adequate personal safety measures to be taken for loading and transporting of farm produce. Precautions to be followed for direct marketing/ supply of vegetables such as tomato, cauliflower, green leafy vegetables, peas, cabbage from farms.
- ♦ Shelf life of harvested tomato, potato and onions can be extended by adopting traditional method (cool ventilated bamboo structure, zero energy cool chamber) in case of delay in marketing. Store potato in cool, well ventilated bamboo structures with no windows on 3 to 4-inch layer of dry sand.
- ♦ After digging the onion, dry it in the shade for 3 days and separate the bulb of the onion by breaking the stalk from 1.5-2 cm, this will increase the storage capacity of onion. Garlic should be harvested

with stalks and leaves.

- ♦ Farmers should preserve required quantity of indigenous quality seeds (king chilli, garden pea, red potato (Aberchaibi), broad bean etc.) for next season.
- ♦ Local indigenous herbs like allium spp, eryngo, houttuyniacordata etc. should be grown.

Fisheries

- ♦ Farmers are advised to maintain the water depth up to six feet as temperature of the surface water is colder than the bottom layers; the fish prefers to live in the bottom zone.
- ♦ The farmers are advised to aerate their ponds either by adding fresh water or by using aerators, especially during early hours of the day as oxygen levels decline in ponds due to reduced photosynthetic activity.
- ♦ It is advisable to provide low protein diets and necessarily reducing the addition of organic manures in the pond. It is also advised to go for periodic raking of bottom soil.
- ♦ Feeding rate should be reduced by 50-75% depending on the temperature.
- ♦ During winters, various diseases (fungal, bacterial, and parasitic) like fin rot, gill rot, EUS and argulosis are commonly encountered. Treating the pond with CIFAX @ 1 litre /ha just before the onset of winters may reduce the disease problems. Treatment of potassium permanganate @ 2.5 -5 kg/ Ha or lime @ 125-300 kg/Ha. Salt application @ 250 kg/Ha also helps in protecting fish against disease outbreak during winters.

Agricultural Engg.

- ♦ Manually harvesting/ picking, accomplish the operation in 4-5feet spaced strips assigning one strip to one person. This will ensure adequate spacing between the engaged labour.



- ◆ All the persons engaged should use masks and ensure hand washing with soap at reasonable intervals.
- ◆ Maintain safe distance of 3-4 feet during rest, taking of meals, transfer of produce at collection point, loading/unloading.
- ◆ Stagger the field operations wherever possible and avoid engaging a greater number of persons on the same day.
- ◆ Engage only the healthy persons to the extent possible and after reasonable enquiry as to avoid the entry of any suspect or likely carrier during field activity.
- ◆ Prefer mechanized operations over the manual ones wherever feasible. Only the essential numbers of persons should be allowed to accompany the machine.
- ◆ Farm machinery should be hired from Custom hiring centre and sanitize every after used.
- ◆ All Farm machines should be sanitized at the entry point and at regular intervals. All transport vehicles, gunny bags or other packaging material should also be sanitized.
- ◆ The collection of the produce may be done in small heaps spaced at 3-4 feet and field level processing should be assigned to 1-2 persons/heap to avoid crowding.

- ♦ Farm level storage like Zero Energy cool chambers should be used for storing of fruits and vegetables to avoid immediate rush to the market.
- ♦ Low cost Pusa Concentric Onion Storage Structure should be used for storing of Onion to control high rotting percentage and fungal infestation of onion under normal condition.

Plant Protection

- ♦ Restrictions due to lock down might limit the availability of plant protection chemicals.
- ♦ Rather than curative measures, preventive measures using various methods with locally available resources will serve as a promising alternative in maintaining the plant health.
- ♦ Cultural, Physical & mechanical methods and use of Indigenous Technology Knowledge (ITK) and also sharing the most effective ITKs amongst farmers provided Social Distancing and maintaining proper hygiene will play a key role in protecting the crop from various Insect pest and diseases during and after the lock down.

Cultural Methods

- ♦ Roguing of disease plants, removal of undesirable plants that might serve as reservoir for insect pest and disease etc helps in reducing pest and diseases incidence.
- ♦ Selection of clean and certified seeds and treating seeds with fungicide or bio-pesticides before sowing for seed borne disease control.
- ♦ Rotation of crops with non-host crops helps in reduction of incidence of soil borne diseases.
- ♦ Planting of mustard as a trap crop in every 15 rows of cabbage can effectively manage diamond back moth.
- ♦ Marigold planting with solanaceae, crucifers, legumes, cucurbits can lower the incidence of nematodes. In tomato marigold or cucumber is commonly used as trap crop for every 15 rows of the

main crop to attract tomato fruit borer.

Mechanical Methods

- ◆ Sun Drying of grains effectively reduce stored grain pests such as rice weevil, pulse beetle etc.
- ◆ Light Trap serve many purpose like monitoring initial infestation, Seasonal incidence, trapping and killing.
- ◆ Hand picking of red hairy caterpillar and destruction of egg masses of *Pieris rapae* (Cabbage white butterfly), *Spodoptera* etc helps in eliminating the insect pest in vegetable crop such as cabbage, cauliflower etc
- ◆ Banding with grease or polythene effectively controls mango mealy bugs.
- ◆ Locally made yellow traps made of locally available material applied with petroleum jelly or castor oil can be used to effectively manage aphids in rapeseed mustard, cucumber, and other vegetables.



- ♦ Traps can be made using ripe mash papaya in a container with a hole to capture both male and female fruit flies for Pumpkin, tomato, mango, watermelon etc.
- ♦ Keeping of bird perches in the field for allowing birds to sit and feed on insects and their eggs, larvae and pupae stages.
- ♦ Specific pheromones, traps can be used to monitor and mass trapping of target pests.
- ♦ Methyl eugenol can be used as fruit fly's traps.
- ♦ Following Indigenous Technical Knowledge (ITKs) may be used for various plant protection measure-

Diseases			
S. No.	Crop	Disease/ Insect pests	ITKs
1	Chilli	Damping off and Die Back	Apply fresh cow dung near the collar region of chilli plant
		Bunchy top	Dusting of ash
2	Rice	Brown spot Disease of rice	2-3 kg of fresh papaya leaves smash and sock in 3-4 litre water overnight. After filtration, the solution is mixed with 50-60 litres of water and 250ml soap solution.
Insect Pests			
1	Onion, Okra, Brinjal and Tomato	Beetles, leaf defoliating insects, leaf miner, thrips and aphids	Sprinkling of ash in and around the vegetable crops
2	Various crops	Soil insect pest	Soil application of Dried seeds and leaves of Neem or <i>Melia azedarach</i> (Local name: Seizarak)
3	Vegetable crops	Aphids and Jassids	Extract of green chilli and garlic as foliar spray
Stored Grain Pests			
1	Rice	Rice weevil, rice moth etc	Grain stored with neem leaves reduced the insect pest damage

2	Green gram and other pulses	Various stored grain insect pests	Treating the seeds thoroughly with mustard oil
3	Green Gram	Various stored grain insect pests	Seeds treated 1% neem leaf powder prior to storage

Community Science

- ◆ Surplus tomato produces to be converted into tomato puree and ketchup.
- ◆ Washing of hand with soap or rub with hand sanitizer before preparation of food and lactating the babies.
- ◆ Supplementing and weaning foods should be prepared with locally available rice, dal, soybean after proper washing, drying and grading.
- ◆ Maximum nutrient loss minimization practices to be followed while preparing food to avoid nutrient loss and wastage.
- ◆ Sun drying (shade) to be encouraged for any surplus leafy vegetables and fruits.
- ◆ Drinking water should be boiled and boiled water be used for rinsing utensils before serving food.

Animal Science

- ◆ Deworm your animals with Albendazole or Fenbendazole @ 10mg/kg body weight.
- ◆ Vaccinate your pigs with swine fever vaccine.
- ◆ Keep your duckling worm specially during winter night.
- ◆ Oath folder seedling should be done during October and November for cattle feed.
- ◆ Protect your birds from coccidiosis by giving cordinal powder/ Furasol powder @ 1g/litre of drinking water.
- ◆ Apply paste of ferrous sulphate with gur at the teats of feeding sow to protect from piglet anaemia.

MEGHALAYA

Boro Paddy

- ♦ Boro paddy variety viz., Navin, Bisnuprasad, Joymati, KRH 2, DRRH 1, Swarna Ganga Red should be selected.
- ♦ Nursery raising should be done in the month of November to December.
- ♦ The field should be ploughed 3 to 4 times followed by laddering. Levelling should be done properly to retain water uniformly in the field.
- ♦ Application of FYM @ 50 quintal/ha and treatment with biofertilizer *Azospirillum* @ 200g/acre seedling.
- ♦ Transplanting @ 2-3 seedlings/hill should be done in the month of December to January.
- ♦ Spacing of 15-25x10-20cm should be maintained.
- ♦ Gap filling of dead hills should be done within 7- 10 days of transplanting.
- ♦ Irrigation water is to be applied to maintain 3-5 cm of standing water in the field after 2-3 days of transplanting upto 10-15 days before harvest.

Maize

- ♦ Plough the field for 2-3 times to obtain fine tilth for better and uniform germination.
- ♦ Maize variety suitable for rabi are Hybrid 4558, Hero 22, DA61, RCM 76, Vivek Hybrid etc.
- ♦ Sowing should be done in the month of last August to mid-September.
- ♦ Application of lime @400-500kg/ha in furrows should be done to achieve higher yield due to acidic nature of soil.

- ♦ Seed rate of 25-30 kg/ha and spacing of 60 cm x 30 cm row to row and plant to plant should be maintained.
- ♦ One hand weeding and earthing up of crop at 40-45 days after sowing found to control the weed and increase crop yield.
- ♦ Mulching with rice straw or weed biomass may control weeds and conserve moisture for higher productivity.
- ♦ Harvesting should be done when the silk attains brown colouration

Rapeseed and Mustard

- ♦ Early sowing (October-November) and harvesting before the onset of frost.
- ♦ Growing of toria varieties such as M-27, TS-36, TS-46 and mustard variety PM 27, PM 28, NRCHB 101.
- ♦ Soil incorporation of Trichoderma @ 2.5 kg/ha pre incubated in 50 kg of well rotten FYM.
- ♦ Seed treatment with freshly prepared aqueous garlic bulb extract 2% or Trichoderma @ 10g/kg seed for the management of seed borne pathogens.
- ♦ Avoid narrow spacing/heavy seed rate.
- ♦ Use yellow sticky traps for mustard aphids.



- ◆ 2% neem oil or 5% NSKE is found to be effective against mustard aphid and diamond back moth.
- ◆ Practices of zero tillage mustard/pea in rice fallow to enhance the cropping intensity.
- ◆ Zero tillage cultivation of toria after rice and maize is a viable proposition which saves time, energy and reduces cost of cultivation.
- ◆ In Dry upland terraces Maize-mustard, Maize + French bean-mustard, Rice – mustard and Groundnut – mustard can be grown.
- ◆ Marshy/lowland/wetland conditions (raised beds) Maize-mustard, Rice-mustard, Rice-mustard-tomato, Rice-mustard-potato can be grown.
- ◆ Intercropping on raised beds: Cabbage + mustard, Broccoli + mustard, Coriander + mustard.
- ◆ The crop should be harvested as soon as the pods turn yellowish-brown.

Rabi Vegetables

- ◆ Vegetable nursery (cole crops, tomato, brinjal, chilli) should be prepared on raised beds 15 cm high, 1 metre width and length as per convenience with polythene cover on top to prevent damage due to excessive moisture loss.
- ◆ Improved varieties of cabbage (Golden Acre, Pusa Drum Head, Pride of India Rocket, Blue Jays) cauliflower (Pusa Snow Ball, K-1, KSP 1173, Swati), Tomato (Rocky, Pusha Rohini, Nayak, Romeo, Megha 2, Megha 3, Arka Alok, Arka, Rakshak, Arka Abhed) Okra (Arka Niketan), Radish (Arka Nishant), Carrot (KSP 135), Broccoli (KSP 5412, Indame Pirate), knokhol (White Vienna , Purple Vienna, Taj, Green Globe), Frenchbean (Phalguni, Arka Arjun, Naga local), Brinjal (US 28, KSP 1072, Signath, Bholanath)
- ◆ Seed treatment with Trichoderma sp @5gm/kg of seed and Pseudomonas sp @10g/kg of seed to prevent soil borne diseases both in the nursery as well as in the main field.

- ♦ Seedling root dip treatment with *Trichoderma viridae* or *T. harzianum* @ 5g/litre of water gives better protection against root diseases in the main field.
- ♦ Add enriched FYM/Vermicompost with *Trichoderma* and *Pseudomonas* @ 500g/ quintal of organic manure in nursery for healthy vegetable seedlings.
- ♦ After transplanting mulching with locally available resources like paddy straw to prevent moisture loss and suppress weed growth.
- ♦ Spraying with bio insecticides like Neem oil; *Beauveria bassiana*; *Metarhizium anisoplaea*, *Verticillium lecani* should be done on need based basis depending upon the severity of infestation by insects. So also, the same with organic fungicides like blitox-50; bordeaux mixture 1% etc against diseases like leaf blight; leaf spot; downy mildew.
- ♦ Making own biopesticides by using locally available neem leaves, garlic, tobacco etc.
- ♦ Install yellow sticky traps @ 12/acre to monitor cabbage aphids.
- ♦ Install pheromone traps @ 4-5/acre for monitoring Diamond back moth.
- ♦ Mulching with paddy straw or any dry leaves can be done to increase soil temperature, conserve soil moisture especially during the dry periods.
- ♦ For farmers that lacks source of irrigation, they can go for vegetables cultivation in fallow paddy fields with the raised and sunken bed system.
- ♦ Harvested maize stalk should be used for mulching purpose in between the two rows of the french bean.
- ♦ Crop rotation: Paddy-Frenchbean (Lowland), Maize-Frenchbean (Upland), Maize-Carrot-Frenchbean (Upland), Maize-Frenchbean-Tomato (Upland), Maize-Frenchbean-Toria (Upland), Frenchbean-bhindi-blackgram (raised beds) Frenchbean-bhindi-frenchbean (raised beds)

Fruit Crops

- ◆ Khasi mandarin should be prune out for the diseased and dead branches after the harvesting of fruit.
- ◆ Prune 30-40% of shoots during November- December to increase fruiting.
- ◆ Bordeaux paste (1:1:10) should be applied after every pruning operation.

Piggery

- ◆ Use the improved breed of pig viz., Hampshire cross, Ghungroo, Lumsniang, Large black should be reared for higher growth rate and productivity
- ◆ Keep the houses clean, dry and warm.
- ◆ Deep litter pig shed should be constructed to maintain the temperature of the shed in order to avoid winter stress.
- ◆ Silage preparation using sweet potato vines and other green forages should be prepared for feeding of pigs during lean period.
- ◆ Warm bedding materials like paddy straw and jute gunny bags to be kept in conventional pig shed to keep the pigs warm.
- ◆ Supplement mineral mixture @ 50-60g/day/ adult sow and calcium to the lactating and pregnant sows @ 60-80 ml/day/sow to maintain productivity.
- ◆ Protect the piglets from cold and prepare the bedding with dry paddy straw, gunny bags.
- ◆ Deworming should be done with Albendazole/ Febendazole @ 7.5 mg/kg Body wt (at three months' interval).
- ◆ Vaccinate the pigs against Swine Fever.

Prevention and Control of African Swine Fever (ASF) in Pig

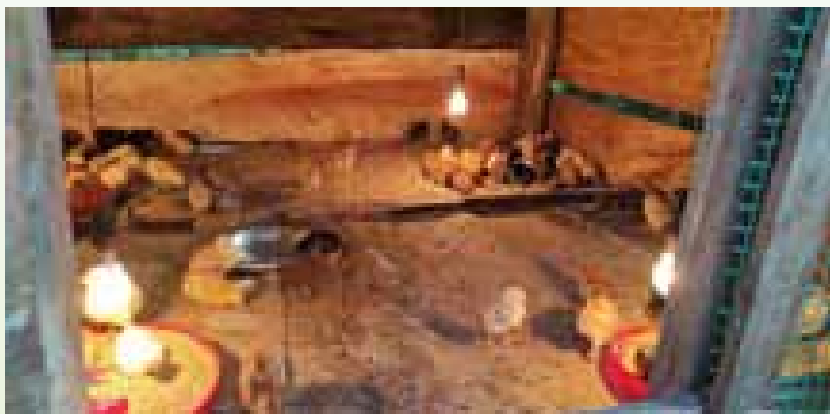
- ◆ Immediate quarantine of infected and suspected farms until diagnosis is confirmed.

- ◆ Establish disinfection points at entrances and exits of the pig farm/pig sty. Foot dip with disinfectant should be made mandatory at the entry point of each pig shed. Pig shed should be disinfected daily with 1% formaldehyde or 2% NaOH or paraphenyl phenolic disinfectants.
- ◆ Personnel and visitors leaving the farm should ensure that shoes, clothing and equipment are disinfected.
- ◆ Pigs should not allow them to comingle with other pigs, wild boar and other animals.
- ◆ No diseased pigs should be sold to traders/ butchers. Stringent environment friendly measures should be adopted for proper disposal of farm waste.
- ◆ Proper disposal of dead carcass with deep burial of 6 feet deep using lime/bleaching powder.
- ◆ Purchase of new pigs from known sources only. Newly purchased pigs/ piglets should be housed separately in quarantine shed for about 4 weeks.
- ◆ Swill feeding should be restricted and if practiced, it should be boiled properly before feeding.
- ◆ Farm utensils used for feeding of diseased pigs should not be used for feeding of healthy pigs.
- ◆ Movement of animals from one household to another/ animal fairs should be strictly prohibited.
- ◆ Movement of personnel (veterinarians and farm workers) from one farm premises to another is prohibited. No visitor should be allowed to go inside the farms.
- ◆ Management of animal health including regular deworming and minerals and vitamins supplements.
- ◆ If any pig suffers from disease, it should immediately be separated from the healthy stock and should be reared in quarantine shed till it is fully recovered.

- ◆ Proper record keeping of animal health and entry and exit of visitors should be maintained.
- ◆ Any suspected cases of ASF should be immediately reported to Veterinary doctors and to the District Veterinary Officer.

Poultry

- ◆ Dual purpose breed of poultry viz., Vanaraja, Kamrupa, Srinidhi, Kuroiler, Rainbow rooster etc should be selected for rearing.
- ◆ Proper housing is required during this period in order to prevent from extreme winter cold.
- ◆ Proper light is required @ 2 watt/bird to keep the birds warm.
- ◆ Birds to be given lukewarm water to prevent any chance of upper respiratory problems.
- ◆ Gunny bags should be hanged in proper direction to avoid entry of cold wind.
- ◆ Poultry shed must be cleaned and ventilated and provide clean drinking water 3-4 times in a day and sometimes add electrolytes to water.
- ◆ Overcrowding should be avoided. Care should be taken to avoid cold stress in birds.



- ♦ The litter materials in poultry shed need to be changed to prevent coccidiosis infestation. If red diarrhoea symptoms are noticed in the birds, immediately administer anticoccidial drugs in the drinking water for 3 -5 days.
- ♦ Farmers are advised to clean the house of poultry birds regularly with phenol@1 ml/ l of water to prevent infection.
- ♦ Birds should be vaccinated against the Ranikhet disease, Gumboro and Fowl pox as per the schedule.
- ♦ Vitamin supplement to be given @ 5ml/100 birds (Chicks), 7ml/100 birds (Growers) and 10 ml/100 birds (Layers).

Cattle/Goat

- ♦ Cattle breed of Jersey Cross can be used.
- ♦ Mineral mixtures to be given @20-25 gram for calves, 50 grams for heifers and 100-200 gram for lactating cows and bulls.
- ♦ Cattle shed should be kept warm and avoid entry of cold wind.
- ♦ Goat breeds like Black Bengal, Assam Hill Goat should be selected.
- ♦ Animal sheds should be cleaned, dry and well ventilated.
- ♦ Deworming and vaccination should be done as per schedule
- ♦ Provide sufficient clean drinking water. Supplement mineral mixture and vitamins daily.
- ♦ Prepare the waste land for growing fodder and plan for winter fodder production like oat and Lucerne.
- ♦ Silage preparation using maize and other green fodders should be prepared for feeding of cattle during scarcity of fodder in winter periods.
- ♦ Oats, being a good rabi fodder should be grown during the month of October-November @ 80-100 kg seeds/hectare.

Fishery

Composite fish culture

- ◆ Supplementary feed which comprises of rice bran and MOC should be given in the ratio of 1:1. Feed may be given at 3-5% of the total weight of the stocked fish.
- ◆ If seed is available partial harvesting can be done in the month of October depending on the growth of the fishes to marketable size.
- ◆ Number of fishes harvested may be replenished by equal number of fingerlings.
- ◆ Final harvesting is done by repeated netting and then by application of MOC @2500kg/ha in case of perennial pond.

Common carp breeding

- ◆ Collection and maintenance of brooders are started in the month of December.
- ◆ Breeding in happa is conducted in the month of February to march
- ◆ Clean the pond embankment and remove all weeds. If algal bloom develops in the pond, feeding and manuring should be temporarily stopped.
- ◆ During cold weather (Severe winter), feeding and manuring in the fishpond should be restricted.
- ◆ Liming @ 65 kg/ha should be given once a month.
- ◆ Partial harvesting about 25 % of the total stock can be done to avoid overcrowded.
- ◆ Three to four months before the breeding season, the common carp brood fish are detached and stocked in segregated ponds (for male and female) to avoid the unwanted spawning.
- ◆ At the end of the season, complete harvesting and marketing of fish can be done.
- ◆ Pond repairing/renovation. Maintain depth of at least 1.5 metre.

- ♦ Harvesting of marketable size fish and restocking with available fish fingerlings can be done.
- ♦ Construction of new pond can be taken up.
- ♦ Water quality should be checked periodically and ensure the water colour of fishpond is always light green.

Oyster Mushroom

- ♦ Growing of different species of Oyster mushroom like *Pleurotus ostreatus*; *P. djamor*; *P. sajorcaju*; *P. flabellatus* etc is advocated from September onwards as the weather condition is highly congenial for mushroom production.
- ♦ Moreover, consumption of mushroom boosts immunity in humans against biotic stress particularly viral infection including Covid 19.
- ♦ It also ensures income, employment, and livelihood security.

Self Help Group (SHG)

- ♦ Women members in SHGs, should establish Nutrition Garden in each household to get fresh vegetables which are rich in vitamins and minerals to enhance immunity to combat COVID19.
- ♦ The vegetables like brinjal, capsicum, chilli, cucurbitaceous vegetable etc can be grown in kitchen garden/Nutrition Garden.
- ♦ The members of SHGs can also make mask, hand gloves, cotton clothes for family members and neighbouring community for safety from COVID19 as well as additional income.

MIZORAM

Maize

- ♦ Land preparation and sowing of maize may be completed from 1st week of October using composite variety or hybrid sweet corn.
- ♦ Spacing for Maize may be maintained at 60x30 cm so that optimum plant population could be maintained.
- ♦ Fertilizer application using FYM and NPK @ 120:60:40 for Hybrids using one third N and full dose of P and K at sowing time and two split doses of N at first earthing up and one month thereafter should be used.
- ♦ For weed control pre-emergence herbicide Atrazine @ 1.5-2 kg a.i / ha for sole crops while Alochlor @ 1.5 kg /ha can be used for mixed cropping systems.
- ♦ In areas where cutworm and White grubs are serious pests, chlorpyrifos @ 2 litre/ha mixed in 60-70 kg sandy soil may be used for soil amendment before sowing or cypermethrin 10EC @ 1 ml /litre may be used for foliar application.

Management of FAW (Fall Army Worm)

- ♦ Hand picking and destruction of egg masses and larvae by crushing or immersing in Kerosene water.
- ♦ Application of dry sand into the whorl of affected maize plants soon after observation of FAW.
- ♦ Mass trapping of male moths using pheromone traps@15/acre.
- ♦ Chemical management: i) To control FAW larvae at 5% damage to reduce hatching ability of freshly laid eggs, spray 5% NSKE nor Azadirachtin 1500 ppm@5ml/litre of water; ii) To manage 2nd and 3rd instars larvae @ 10-20% damage, spray Spinetoram 11.7&SC @0.5ml/litre of water; iii) After emergence of tasselling, hand picking of the larvae is advisable as insecticide management at this stage is not cost effective.

Pulses

- ♦ Cultivation of Rajmash could be started by second fortnight of August and completed in first
- ♦ fortnight of September using improved varieties like ARUN using basal dose of NPK @ 20:40:20 at the time of sowing.
- ♦ Seed bio fortification with Rhizobium and PSB culture should be done before sowing for better plant stand and yield.
- ♦ Apply pre-emergence herbicide Pendimethalin @ 1.5 /ha or Butachlor @ 10ml/litre of water for weed control.



Oilseeds

Soybean

- ♦ Sowing of Soyabean could be completed from 1st week of September using high yielding variety like JS 335, VL 89 and others.
- ♦ Pre emergence weedicide Butachlor may be used to control upland weeds @ of 10 ml/ litre of water.
- ♦ For higher crop production NPK @ of 20:60:40 may be applied for better yield.
- ♦ Seed bio fortification with Rhizobium and PSB culture should be done before sowing for better plant stand and yield.



- ◆ To control Blister beetle that feed on Soyabean flower Dichlorvos @ 2 ml per litre of water may be used.

Toria

- ◆ Cultivation of Toria could be completed from second fortnight of September using high yielding variety like TS 67, TS 36 and Ts 38.
- ◆ Spacing 30 cm row to row and 5 – 10cm plant to plant. Thinning is done 3 weeks after sowing in order to maintain the 5-10 cm plant to plant distance. Seed rate: 5 – 6 kg/ha.
- ◆ Spraying of Isoproturan @ 0.75 kg a.i and Pendimethalin @ 1kg a.i/ ha controlled the rabi weeds effectively and produced higher yield.
- ◆ For higher crop production NPK @ of 50:60:30 may be applied for better yield.
- ◆ Seed should be treated through Thirum/ Captan 2.5 gm/kg seed.
- ◆ Spraying of Blitox -50 or Dithane M 45@ 2g/l of water at 10 days interval found to be effective in controlling Rust and Alternaria blight.

Nursery Management of Winter Vegetable Crops

- ◆ Select a sunny area with well drained friable light soil rich in organic matter.

- ♦ Nursery bed should be prepared by second week of August. Bring the soil into fine tilth and raise the bed to 10-15 cm above ground level. Mix well rotten farmyard manure/ compost or leaf compost in the soil.
- ♦ To make the soil free from soil-borne disease-causing pathogens (Damping-off), drench the bed with 0.1% solution of Captan or Fytolan.
- ♦ Cover immediately with polythene sheet or gunny bag or thick paper for 2 days.
- ♦ Uncover the soil and get it loosened and leave it as such for 3-4 days.
- ♦ Mix Malathion 5% dust thoroughly to protect the seedlings from soil-borne insects.
- ♦ Sowing should be done by last week of August or first/ second week of September. Sow the seeds thinly in U-shaped furrows spaced at 2.5 cm and at a depth of 1-2 cm (4 times the diameter of the seed). Cover the seeds immediately with a thin layer of sand mixed with well dried and sieved farmyard manure.
- ♦ Irrigate the sown beds using water cane fitted with a fine hose.
- ♦ Seedlings are ready for transplanting 21-30 days after sowing.
- ♦ Pit should be prepared and FYM should be applied 15 days ahead of transplanting. Liming should be done earlier to transplanting to raise the soil pH to optimum level. Pit should be treated with insecticide before transplanting of plants. Pit should be prepared at a spacing of 75 x 30 cm (Row to row x Plant to plant).

Rabi vegetable crops (Tomato, Cabbage, Broccoli, Onion)

- ♦ Farmers are advised to prepare Nursery bed for Rabi Crops starting from the month end of August.
- ♦ Land preparation for direct sowing of Rabi crops is to be started by the month of September.

- ◆ Seed treatment of Rabi crops to be done with Carbendazim (0.1%) 2g/kg seed and Trichoderma spp. 4-6g/kg seed.
- ◆ Farmers are advised to adopt sowing of Leguminous crops as intercrop to increase the soil nutrient where the nutrient level of the soil are low.

Management of Aphids in Mustard

- ◆ Set up yellow sticky trap to monitor aphid population.
- ◆ Destroy the affected parts along with aphids.
- ◆ Spray Dimethoate @2.5ml/ litre of water.

Management of insect Pests in Brinjal

- ◆ Collection and destruction of infected leaves along with the insects reduces pest incidence.
- ◆ Spraying the crop with Malathion 2ml/litre of water or Carbaryl (2-4g/litre of water) effectively controls the pest.

Powdery Mildew in vegetables

- ◆ Combine 1 tablespoon, baking soda and one half teaspoon of liquid, non-detergent soap with one gallon of water and spray the mixture literally on the plants. Mouthwash can also be used.

Calendar of Operation for Rejuvenation of Khasi Mandarin

November:

- ◆ Application of Copper Oxylchloride @ 0.2% to manage pre-harvest fruit drop.
- ◆ Harvesting of fruits in right time to avoid fruit fly attack and fruit rot
- ◆ Spraying of Malathion @ 2mL/ litre over fruit to prevent fruit fly egg laying
- ◆ Apply 650g Urea + 1220g SSP + 450g MOP/ tree
- ◆ Clean cultivation
- ◆ Mulching of basin

December-January

- ◆ Basin cleaning and making of half-moon terraces for placement of manure and fertilizers as well as to reduce nutrient loss.
- ◆ Pruning of water sprout, diseases and dead twigs and pasting of cut end with Bordeaux paste
- ◆ Scarification of gum oozing wounds and dressing with 10% Bordeaux paste
- ◆ Cleaning of lichens and mosses
- ◆ Mulching of tree basin

February

- ◆ Application of FYM @ 30 kg/ plant and lime @ 1kg/ plant in the basin
- ◆ To kill the trunk borer grubs, clean the bored holes of the infested trunk with iron wire and insert a cotton swab soaked in petrol/ Dichlorvos or inject 5 mL of Dichlorvos @ 0.2% (2mL/L) and plug with mud.

March-April

- ◆ Application of 30 kg FYM/ tree/ year
- ◆ Application of 650g Urea + 1220g SSP + 450g MOP/ tree
- ◆ Application of Bordeaux paste on tree trunk (upto 60 cm height from ground level)
- ◆ Spraying of Multiplex @ 2.5g/L on new leaves
- ◆ Spraying of Bavistin @ 1g/L + Monocrotophos @ 1mL/L on new flushes
- ◆ Spraying of Zinc Sulphate @ 0.5% + Magnesium Sulphate @ 0.2% + Copper Sulphate @ 0.4% + Manganese Sulphate @ 0.4% on new flushes.
- ◆ To control bark eating caterpillar, inject Dichlorvos @ 0.1% into the tunnel
- ◆ Mulching of basin

Oyster Mushroom Cultivation

- ♦ Cut Straw 3-4 inches and boil it for 20-30 mins. Cool it and squeeze the wet straw to minimize moisture content. Keep it in a polythene, layer by layer. Put the spawn in each layer. Make a hole in the polythene. Incubate it in a dark room for 10-14 days. Take out the polythene and keep it in a rack and water it the next day by sprayer. Mushroom will bloom after 5-6 days and can be harvested.

Piggery

- ♦ Pig farmers are suggested for regular supplementation of mineral mixture @ 20-30 g/head/day for adult Pig and calcium to the lactating and pregnant Sow @ 30-40 ml/head/day to maintain productivity.
- ♦ As Mizoram is currently facing African swine fever epidemic in many districts, the farmers are advised to regularly disinfect the farm premises and Pig sty using disinfectants such as 2% Sodium hydroxide, sodium, or calcium hypochlorite (2-3%) etc. Foot dip should be place at the entrance of the Farm.
- ♦ Pigs brought from other farm or other location should be kept in quarantine for at least 30 days before mixing with another herd. Avoid bringing of Pigs from disease infected area.
- ♦ If there is a suspected case of ASF or sudden death of Pigs in your area, immediately inform the Veterinary officer for further treatment and prevention of the spread of the disease and proper disposal of diseased carcasses.
- ♦ Farmers are suggested to feed their Pigs with locally available non-conventional feed stuffs like kitchen waste, vegetable waste, brewery waste, nutritious plants like wild cassava, Colacasia etc. may be incorporated to some extend to minimize the feed cost as well as to get rid of problem of commercial feed scarcity in Piggery.
- ♦ Ensure vaccination of Piglets against Classical Swine Fever disease initially at the age of 2 months (weaning) and then booster dose at 6 months after first vaccination and thereafter annually.

- ♦ Pigs should be vaccinated against FMD initially at the age of 2 months and then revaccinate annually.
- ♦ Pig should be de-wormed against gastro-intestinal nematode with Albendazole @ 5-10 mg/kg body weight or fenbendazole @ 7.5-10 mg/kg body weight orally.

Preventive Measures for African Swine Fever

- ♦ Importing of pigs, pork or any by-products should be strictly prohibited.
- ♦ Disinfection and Sanitization of Pig and its premises.
- ♦ No visitors should be allowed at the farm.
- ♦ Carcass disposal should preferably be by burial.

Poultry

- ♦ The farmers are suggested to practice backyard Poultry farming and rear dual purpose variety Poultry birds such as Rainbow rooster, Vanaraja, Giriraja etc. so that local demands of eggs and meat can be fulfilled.
- ♦ The maintenance of proper hygienic condition in Poultry house is utmost necessary.
- ♦ The Poultry farmers are advised to regularly disinfect the premises of Poultry houses with 1 % sodium hypochlorite and inhibit the entry of outsiders to the farm premises. Foot dip should be place at the entrance of the Farm.
- ♦ Before introduction of new batches of chicks in the farm, the Poultry houses should be cleaned properly and disinfected with 60-70 g of KMnO₄ mixed with 120-150 ml of formalin solution per 10 cubic feet space. Place the birds in the shed after 24 hrs of fumigation.
- ♦ In case of deep litter system of rearing in Poultry, the litter material should be dried completely before using it as bedding material and the litter material should be turned and raked weekly and

should be replaced with a new litter material before a new batch is introduced.

- ◆ Ensure vaccination of chicks against Ranikhet disease, Marek disease, Fowl pox and Infectious bursal disease.
- ◆ Provide a minimum of 23 hrs light in the brooder continuously and 16 hrs light for adult birds during the laying period.
- ◆ De-beaking should be done as early as 1 day to 6 weeks and should be repeated at 16 weeks of age if necessary.
- ◆ Poultry farmers are suggested for regular supplementation of vitamin and mineral mixture (Grow B-plex/Ambiplex) @ 10-20 ml/100 birds and calcium to the layer during laying period @ 30-40 ml/100 birds to prevent soft shell.
- ◆ Deworming of Poultry birds should be done at the age of 6-8 weeks with Albomar liquid @ 45ml/100 birds in drinking water once in early morning with empty stomach. De-worming can also be done with Piperazine hydrochloride @ 5ml/10 birds.

Dairy Cattle

- ◆ Farmers are suggested to follow routine deworming and vaccination schedule for Dairy Cattle.
- ◆ To maintain productivity and improve immune status of animals, the dairy farmers are suggested for regular supplementation of vitamins and minerals @ 50-100 g/head/day to their livestock.

Goat

- ◆ Ensure deworming of Goat with fenbendazole @ 7.5-10 mg/kg body weight orally especially kids.
- ◆ Goat should be vaccinated against PPR & FMD at the age of 3 months & then re-vaccinate annually.
- ◆ Goat farmers are advised for regular supplementation of mineral mixture @ 10-15 g/head/day for adult and calcium to the lactating and pregnant doe @ 10-15 ml/head/day.

Value Addition

- ◆ *Preparation of tomato powder:* Fully ripe tomatoes were washed well in running tap water. Then it was cut into small pieces and dried in the cabinet drier at 80°C for 10 hours. The dehydrated pieces were then ground into powder in a mixer.

- ◆ *Preparation of tomato soup mix*

Ingredients	Amount
Tomato powder	5 g
Onion powder	0.5g
Corn flour	2.0 g
Cumin powder	0.5 g

Ingredients	Amount
Pepper powder	0.3 g
Salt	1.5 g
Ajinomoto	0.5 g

- *Method:* All the ingredients mixed thoroughly and packed in polyethylene bags.
- ◆ *Preparation of onion powder:* Disease free big onions were selected, and the skin was peeled off. Then it was washed in the running tap water and cut into small pieces. It was dried in the cabinet drier at 60°C for 7 hours. The dehydrated flakes were ground into powder and packed in polyethylene bags. Ten grams of the prepared tomato soup mix was added to 150 ml of boiled water and stirred thoroughly.
- ◆ *Tomato Sauce/ Ketchup preparation method*
 - Washing fully ripe tomatoes
 - Cutting, chopping and blanching
 - Pulping and straining
 - Cooking pulp with sugar
 - Judging end point
 - Addition of vinegar/Acetic acid, salt & preservative
 - Filling hot in bottles

- ◆ Vegetable Soup Mix:
 - *Ingredients:* Onions, carrot, beans, cauliflower, cabbage, tomato, and spinach.
- ◆ *Preparation of vegetable powders:* All the selected vegetables were washed well in running tap water. Then it was cut into small pieces and steam blanched for 3 – 5 minutes except onion and tomatoes. All the vegetables except onion (60°C and 7 hours) were dried in the cabinet drier at 80°C for 10 hours separately. The dehydrated pieces were then ground into powder in a mixer.
- ◆ *Cauliflower Pickle*

Ingredients	Amount
Cauliflower pieces	1 Kg
Salt	150 g
Ginger	25 g
Onion	50 g
Garlic	10 g
Red chilli	15 g
Turmeric	15 g
Cinnamon	15 g
Black pepper	15 g

Ingredients	Amount
Cardamom	15 g
Cumin	15 g
Aniseed	15 g
Clove	6 nos.
Tamarind pulp	50 g
Mustard	50 g
Vinegar	150 ml
Mustard Oil	400 ml

- Method-
 - Washing
 - Cutting into into 2 – 2.5 cm pieces
 - Keeping in sun for 2 hours
 - Frying all spices in a little oil
 - Mixing pieces with fried spices
 - Frying mixture for 5 minutes
 - Cooling
 - Making paste of vinegar and tamarind pulp

- Adding to cauliflower pieces
 - Filling in jar
 - Keeping in sun for a week
 - Addition of oil after heating and cooling it
 - Storage
- ◆ Value Added Product from Cabbage
- *Select mature clean cabbage*
 - *Shred it to 5 mm and mix with 2.5 % salt*
 - *Pack it layer by layer in a container, 2/3 height*
 - *Seal hermetically and allow for natural fermentation at room temperature*
 - *Blanch it at 70°C for 10 minutes, after 28 days*
 - *Store under shade in clean place and use it within four months.*

NAGALAND

Pulse and oilseeds (Field pea, Rapeseed and Linseed)

- ♦ The field should be first deep ploughed, followed by two to three harrowing and planking should be given to prepare a well pulverized seed bed. Field should be well levelled and there should be sufficient moisture at the time of sowing for good germination.
- ♦ Suitable varieties: Field pea - Aman, Prakash and Rachna, Rapeseed - M 27, TS-36, TS 38 and TS-67 for late sown upto first week of December and Linseed - Ruchi, T-397 and Shekhar.
- ♦ In field pea incorporate organic matter @ 200 q ha⁻¹ at the time of land preparation and apply 55 kg of urea, 313 kg of SSP and 42 kg of MOP per ha as basal application at the time of sowing.
- ♦ In rapeseed, incorporate FYM or compost @ 50 q ha⁻¹ at the time of land preparation. Under irrigated condition apply 54 kg of urea, 375 kg of SSP and 50 kg of MOP as basal dose at the time of sowing by placement method and again apply 54 kg urea at the time of first irrigation at three weeks after the sowing. In rainfed condition apply 50 % of the recommended dose fertilizer.
- ♦ In Linseed application of 87 kg of urea, 125 kg of SSP, 17 kg of MOP ha⁻¹ along with FYM@ 20 q ha⁻¹ as basal is recommended under rainfed conditions.
- ♦ Seed sowing should be done during the Second fortnight of October to first fortnight of November however in rapeseed sowing can be delayed upto last week of November.
- ♦ Before sowing pea seeds should be treated with rhizobium culture@ 50 g kg⁻¹ seed, Bavistin @ 2 g kg⁻¹ seed and *Trichoderma viride* @ 4 g kg⁻¹ seed
- ♦ For Rapeseed and Linseed Seed treatment is done with Azotobacter and Phosphotika @ 40 g each/ kg of seed before sowing.
- ♦ At least two weeding should be done at 20 and 40 DAS.

- ◆ For enhancing yield through increased pollination, 5 honeybee colonies ha⁻¹ is recommended to install in rapeseed.

Insect pest management

- ◆ Clip aphids infested shoots or parts in the early stage.
- ◆ Collect and destroy the egg masses, grubs and gregarious early instar larvae in the cropped area.
- ◆ Install yellow and blue sticky trap @ 6 traps/acre at crop canopy level to monitor the sucking pest population
- ◆ Set up light traps @ 1 trap/acre to monitor the emergence of adult moth population.
- ◆ In the early stage of infestation spray the NSKE or Neem oil @ 4%
- ◆ Spray *Trichogramma chilonis* @ 50000/ha or Spinosad @ 0.75ml/L of water in the initial infestation of Lepidopteran pests (caterpillars).
- ◆ If infestation of the leaf feeders/ caterpillars and borers are high spray anyone of the following insecticides, Indoxacarb 14.5 SC @ 0.5 ml/L or Emamectin benzoate 5% SG @ 0.4 g/L of water
- ◆ If the incidence of sucking pests persists (Aphids, Thrips, and bugs) spray anyone of the following insecticides, Imidacloprid 200 SL @ 0.5 ml/L or Thiomethoxam 25 WP @ 0.3 g/L or Spiromesifen 240 SC @ 0.5ml/L of water.

Disease management

- ◆ Use certified seeds of resistant/tolerant variety.
- ◆ Burn infected pea stubble soon after harvest to reduce the disease.
- ◆ Avoid sowing pea in the same infected field.
- ◆ Follow crop rotation with non-leguminous crops and adopt mixed cropping.
- ◆ Spray Benomyl 50% WP @ 80g in 240 litres of water per acre. Second spray after 15 days interval. Or Sulphur 80% WG @ 750g-1kg in 300-400 litres of water per acre followed with second spray after 25 days of interval for Powdery mildew and Pea rust.

- ◆ Spray Blitox @3ml/lit or Dithan M-45 @2g/lit of water at 10 days interval for Sclerotinia stem rot and Alternaria black spot.
- ◆ For white rust, Spray Metalaxyl 8% + Mancozeb 64% WP @1000 g in 400 l of water/acre.

Post-harvest management and storage

- ◆ After sufficient drying in the sun threshed clean seeds should be stored in appropriate bins or gunny bags.
- ◆ For safe storage moisture content should be 9-10 percent in field pea, 8 percent in rapeseed and 8-10 percent in Linseed.

Horticultural Crops

- ◆ Prepare nursery for cole crops (Broccoli, Cabbage, Cauliflower, knoll khol, radish, turnip etc.) and other vegetables like chilli and tomato during the month of August-September. Prepare raised seed bed of about 10-15 cm above the ground on a fine tilth soil with well decomposed FYM with a size of 1m width and of convenient length or raise in pro-tray with coco peat and Vermicompost media in a ratio 1:1.
- ◆ Prepare the field for winter vegetables by ploughing 2-3 times to make friable soil and incorporate 10-15t/ha well decomposed FYM.
- ◆ Transplant 30-40-day old seedlings to the main field or when the seedlings attain 3-4 leaf stage with a spacing of 45x30 cm for early and 60x45 cm for mid and late season crops.
- ◆ Start sowing of winter vegetables like French bean, carrot, pea etc in the month of October and complete the sowing by 15th November.
- ◆ Irrigate the field regularly to avoid moisture stress and get maximum yield.
- ◆ Use paddy straw or dry leaves for mulching to conserve moisture and control weeds.
- ◆ Kiwi can be propagated through hard wood cutting in the month of December – January. One-year-old matured and dormant

shoots of the preceding summer growth having 2 – 3 nodes are selected. The cuttings are planted in moist coarse texture media with 2 nodes below and 1 or 2 nodes above. Care should be taken that male and female plants are identified and planted separately

Insect pest management

- ◆ Clip aphids infested shoots or parts in the early stage.
- ◆ Collect and destroy the egg masses, grubs, and gregarious early instar larvae in the cropped area.
- ◆ Install yellow and blue sticky trap @ 6 traps/acre at crop canopy level to monitor the sucking pest population
- ◆ In the early stage of infestation spray the NSKE or Neem oil @ 4% or Spinosad @ 0.75ml/L of water in the initial infestation.
- ◆ If infestation of the leaf feeders/ caterpillars and borers are high spray anyone of the following insecticides, Emamectin benzoate 5% SG @ 0.4 g/L or Flubendiamide 39.35% SC @ 0.5ml/L of water
- ◆ If the incidence of sucking pests persist (Aphids, Thrips, whiteflies and bugs) spray anyone of the following insecticides, Imidacloprid 200 SL @ 0.5 ml/L or Thiomethoxam 25 WP @ 0.3 g/L or Fipronil 5 SC @1ml/L of water.

Disease management

- ◆ Use resistant or tolerant varieties
- ◆ Follow crop rotation with non-cruciferous crops
- ◆ Treat the seeds with *Trichoderma harzianum* @5g/litre of water for an hour followed by shade dry before sowing reduces soil borne diseases

Suitable Varieties

- ◆ Cabbage: Rareball, *Pusa Ageti*, Pride of India, Green Challenger, Green Express
- ◆ Cauliflower: Hybrid-Madhuri, *Pusa snowball 1*, *Pusa Sharad*, Swati, Himani

- ◆ Broccoli: Green Magic, Green belt, Emerald city
- ◆ Knol Khol: Early white Vienna, King of the market
- ◆ Radish: French breakfast, Sparkles
- ◆ Carrot: Early nantes, N.S 820
- ◆ Pea: Arkel, VL Matar-42, Rachana
- ◆ French bean: Dwarf-Premier, Masterpiece, Green pods

Mushroom

- ◆ Collect good quality paddy straw for oyster mushroom cultivation and store in dry clean place.
- ◆ Always use good quality mushroom spawn.
- ◆ For the management of green mould in mushroom bag use garlic extract. Peel garlic and make a paste of 50g (10 big size cloves) by adding 50ml of water. Squeeze the paste through muslin cloth to get stock solution. Spray garlic extract (stock solution) mixed with 3-5ml/litre of water on the boiled straw. 1 litre of garlic solution is sufficient for 2 kg dry straw (5 kg of boiled straw)
- ◆ Yellow sticky paper can be used for the management of flies in mushroom cropping rooms.

Community Science

- ◆ Farmers can generate income by processing and value addition of surplus horticultural crops by pickling, dehydration etc. and processing into different food products like juices, jam, jellies, candy etc.

Livestock enterprise

- ◆ Due to change in weather from the month of October onwards, arrangements should be made for upcoming winter season. All the animals are to be vaccinated against infectious diseases like Swine Fever in pigs, FMD, HS, and BQ in Cattle, Buffalo, Goat, Mithun etc. and Ranikhet Disease in poultry.

- ♦ In the month of November sudden drop of temperature may affect the animals and poultry birds so the livestock should be placed in covered shed or area during the night with appropriate lightings.
- ♦ Animals affected by Pica (depraved appetite) should be dewormed and adequate amount of mineral mixtures (@2% in the diet) to help cure the disorder.
- ♦ Follow good management practices related to feeding, housing, watering, and general hygiene to keep the animals healthy.
- ♦ Animals during winter require more feed to maintain heat production and body condition. Depending on the age and size and outside temperature and weather conditions, you may need to increase the daily feed allowance by 3 times or more
- ♦ Since shortage of fodders during winter months may occur due care should be taken to store the harvested fodders.
- ♦ Controlled breeding programme should start and continue during the month of February so that all the participating animals should become pregnant at this month.

Mithun

- ♦ Mithun often struggles to get enough water during winter season. Water harvesting structure may be constructed to maintain water uptake and keep them healthy
- ♦ During lean winter there isn't enough green jungle forages. Planting of perennial cold hardy grasses and tree fodders in the range may be done.
- ♦ Winter stress has negative effect on immunity, fertility, and production. Ensure timely deworming, vaccination, and mineral supplementation to keep the Mithun in good health and in optimum production.

TRIPURA

Rabi Rice

- ♦ Transplanting of boro rice should be completed within the month of December to January and preparation of nursery bed should be within 15th Nov-15th Dec. At time of preparation of nursery bed 1kg Urea, 3kg SSP and 800g MOP applied as a basal for one square meter area.
- ♦ Prepare land for transplanting of boro rice by puddling the field twice at 7-10 days' intervals and level for uniform crop stand.
- ♦ Transplanting should be done @ 2-3 seedlings per hill at a spacing of 20 x 15 cm or 20 x 20 cm and a thin layer of water (1-2 cm) should be maintained in the main field up to 10 days after transplanting.
- ♦ MTU 1010, Swarno, Naveen, Tripura Chikon, Gomati, Sahabhagi are the suitable variety for boro season.
- ♦ Boro rice requires 1000 sq. meter nursery area for one-hectare land. Seed treatment with bio control agent like *Pseudomonas fluorescence* (10-15 g per kg of seed), followed by seedling root dip @ 2.5 kg/ha dissolved in 1000 liter of water for 30 minutes or Carbendazim/Tricyclazole @ 2 g/kg of seed or Agrosan/Ceresan 2.5 g/kg of seed may be practiced.
- ♦ For good crop apply FYM @ 5 t/ha and one third of the Nitrogen (43 kg Urea/ha) and full dose of P and K (250 kg SSP and 68 kg MOP/ha) should be applied as basal. While applying the fertiliser, a thin film of water in the field should be maintained. Remaining two doses of nitrogen should be applied at tillering and panicle initiation stage.
- ♦ Water should be maintained up to a depth of 2-5 cms right from one week after transplanting till 2 to 3 weeks before harvest. It should be noted that if irrigation facilities are available, water may be drained out from the field before top dressing of nitrogenous fertilizers.

This is done to avoid undue loss of fertilizer due to runoff. The field may again be irrigated 2 to 3 days after top dressing.

- ♦ Use cono-weeder in boro rice field to control weeds in standing water.
- ♦ Spray Triflumezopyrin 10% SC @ 95g/acre or Pymetrozine 50% WG @ 120g /acre for controlling plant hopper infestation.

Rabi Maize

- ♦ Different varieties like RCM 1-1, RCM 1-2, RCM 1-3, DA 61-A, RCM 75, RCM 76, Vijay Composite, HQPM-1, HQPM-2, VMH-45, Ganga-11, Ganga-2 may be cultivated during rabi season.
- ♦ Ideal time for sowing of Rabi Maize is Mid-November.
- ♦ Treat the seeds before sowing with Trichoderma solution by using 200-250 g for 10-15 minutes.
- ♦ For Maize crop land preparation can be done by giving at least 3 deep ploughing followed by sowing of maize @ 20-22 kg seed/ha and maintain spacing 60 cm x 20 cm @ 3-4 cm deep.
- ♦ Maize is a highly lime responsive crop, so application of lime is recommended by following Proper Soil Testing Procedure.
- ♦ Apply FYM or compost 5 tonne / ha during field preparation and N: P: K @ 120: 60: 40 kg/ha. Entire dose of P & K with 1/3rd of N should be applied at the time of sowing. Application of 25 Kg of ZnSO_4 at sowing is also recommended since maize is susceptible to Zn deficiency. Rest split doses of N should be applied at knee-high and tasselling stages.
- ♦ The most critical stage for irrigation in Rabi Maize is flowering period (15-20 days) including tasselling, silking & pollination. Greatest decrease in grain yield is caused by water deficits during these stages, mainly due to the reduction in grain number of cobs. Ensure proper irrigation during these stages of Rabi Maize.

Mustard & Toria

- ◆ Different varieties like TRC-t-1-1-5-1, TRS -Y-01-5-1-1, TRS -Y-01-2-2-1, SCRT 1-2-1, SCRT 1-2-3, NRCHB-101, TS 67, TS 38 are potential variety for Tripura.
- ◆ A *seed rate* of 700-900 gm/kani is sown in rows of 30-40 cm and plant to plant distance of 10-15 cm apart.
- ◆ NPK fertilizer of 40, 20, 20kg/ha for toria and 90:60:40 for mustard may be applied for better growth and yield.
- ◆ Foliar application of 0.1% boron and 0.5% ZnSO₄ in between flowering to pod formation may increase grain size and oil content.
- ◆ The most serious insect-pest of mustard is aphids. To control aphids organically the spraying of derisom or neem oil @ 2.5 gm or ml/lit of water two to three times are required. Use yellow sticky trap @ 20 to 25 nos/ha.
- ◆ If require, Thiamethoxam 25WG or Clothianidin 50 WDG may also be sprayed to control pest in mustard chemically.

Field Pea

- ◆ Sowing time of pea under Tripura condition is 1st fortnight of November.
- ◆ Seed inoculation with Biofertilizers PSB and Rhizobium @ 40 gm/kg seed mixed in jaggery solution and dried in shade before sowing.
- ◆ Apply Lime @ 200 kg/ha or dolomite 400 kg/ha after clearing the field 15 to 20 days before sowing.
- ◆ NPK fertilizer of 20: 60: 40 kg/kani may be applied for better crop yield.
- ◆ A light irrigation may be provided at flowering initiation stage for better pod formation.
- ◆ Spraying of 0.1% boron in between flowering to pod formation stage is beneficial.

- ◆ Panchagavya/vermiwash may be applied as foliar spray at fortnightly intervals as of growth promoter to enhance marketable yield.

Lentil

- ◆ Sowing of lentil should be completed by 15th November to get good yield.
- ◆ Land is prepared by one ploughing and two harrowing
- ◆ WBL-77, WBL-58, HUL-57 are the suitable varieties of lentil under Tripura condition.
- ◆ Apply 20:40:20 kg NPK /ha and 2-3 MT FYM/ha.
- ◆ Seed should be treated with rhizobium and PSB culture 20 g per kg of seed.
- ◆ Seed rate is 8 to 10 kg/ha and Spacing is 30 x 10 cm
- ◆ One weeding and two hoeing are done for control of weeds
- ◆ Generally, lentil is grown as unirrigated crop in the residual soil moisture but irrigation at pod development stage helps in getting more yield.

Brinjal

- ◆ Treat brinjal seed with biocontrol agent like Trichoderma sp or Pseudomonas fluorescens (10g per kg of seed) or Carbendazim @ 2g/kg of seed or Agrosan/Ceresan @ 2.5g/kg of seed. Application of Trichoderma sp @ 25g per 100 sq. meter nursery area for controlling damping off and fruit rot disease.
- ◆ Follow the crop rotation with non- solanaceous crop or treatment with Streptocycline @ 1g/litres of water for 30 minutes to reduce bacterial wilt.
- ◆ Transplant in furrows incorporated with urea @ 110kg/ha, SSP @ 375kg/ha and MOP @ 96 Kg/ha with a spacing of 75 X 60 cm.
- ◆ Top dress with urea @ 110kg/ha at 30 Days after sowing.

- ◆ Manage brinjal shoot and fruit borer with installing pheromone traps @ 12/ha or release larval parasitoids viz., *Pristomer testaceus*, *Cremastus flavoorbitalis* etc or foliar application of neem oil @ 15L/ha or Emamectin benzoate 5% SG @ 100g/acre or Dimethoate 30% EC @ 660ml/ha.
- ◆ Remove and destroy the brinjal fusarium wilt affected plants, seed treatment with *Trichoderma* sp @ 10-15 g/kg seed or Carbendazim/ Thiram @ 2 g/kg seed.

Chilli

- ◆ Treat chilli seed with biocontrol agent like *Trichoderma* sp or *Pseudomonas fluorescens* (10g per kg of seed) or Carbendazim @ 2g/kg of seed or Agrosan/Ceresan @ 2.5g/kg of seed. Application of *Trichoderma* sp @ 25g per 100 sq. meter nursery area for controlling damping off and fruit rot disease.
- ◆ Apply urea @ 65Kg/ha, SSP @ 250 kg/Ha and MOP @ 40 Kg/ha during ride bed preparation. Top dressing with urea @ 65 kg/kg at 30 DAT.
- ◆ Manage chilli leaf curl disease (whitefly insect) by Dimethoate 30% EC 660 ml/ha or Phosalone @ 625 ml/ha.



- ◆ Manage chilli leaf curl disease (thrips, upward curling of leaf) with installing Blue Stricky trap, 20 to 24 trap/ha or Imidaclopride 17.8% SL 3 ml/10 litre of water or Dimethoate 30% EC 1ml/litre of water or Emamectin benzoate 5% SG 4g/10 litre of water.
- ◆ Follow the crop rotation with non- solanaceous crop or treatment with Streptocycline @ 1g/litres of water for 30 minutes to reduce bacterial wilt.

Tomato

- ◆ Treat tomato seed with biocontrol agent like *Trichoderma* sp or *Pseudomonas fluorescens* (10g per kg of seed) or Carbendazim @ 2g/kg of seed or Agrosan/Ceresan @ 2.5g/kg of seed. Application of *Trichoderma* sp @ 25g per 100 sq. meter nursery area for controlling damping off and fruit rot disease.
- ◆ Apply FYM 10 kg, Neem cake 1 kg, VAM 50 g, Super phosphate 100 g and any systemic or contact insecticide at recommended doses per square metre during the nursery area preparation. Sow the seeds in lines at 10 cm apart in raised seed nursery beds and cover with sand. Irrigation is done using rose can otherwise there is a chance of washing out of seeds and the seedlings are transplanted 25 days after sowing.
- ◆ Manage tomato leaf curl disease (whitefly insect) by Dimethoate 30% EC 660ml/ha or Phosalone @ 625 ml/ha.

Cauliflower

- ◆ Seeds are first sown in seedbeds or seedling trays under shade. Healthy seedlings are later transplanted on raised beds after 30-35 days of sowing.
- ◆ Cauliflower may have the trouble of 'bolting' (Early flowering, no curd), or 'Buttoning' (small non-edible heads) if conditions are unfavorable. Good seed, proper season, the cool, moist atmosphere around the vegetable is a must.

Radish

- ◆ The land should be prepared to fine tilth and levelled.
- ◆ 15 x 10 cm spacing is normally adopted.
- ◆ Weeding and hoeing can be done as and when necessary. At the second weeding, thinning of densely sown plants should be done.
- ◆ Aphids, flea beetles and mustard saw fly can be controlled by spraying Malathion 50 EC 1 ml/lit twice or thrice at 10 days intervals.
- ◆ White rust can be controlled by spraying Mancozeb 2 g/lit or Copper oxychloride 2 g/lit.

Carrot

- ◆ Seeds are sown directly on raised beds or ridged beds.
- ◆ Soil should be loosened about one-and-a-half times the expected length of the carrot. Break the soil fine to avoid any obstruction to root.
- ◆ Edible roots can be harvested in 80-100 days of seed sowing depending on variety.

Banana

- ◆ Clearing and removing of all dried hanging leaves of the pseudo stem should be removed.
- ◆ Utilization of inter space of banana orchard by sowing of legume/ green manure crops (green gram/black gram) is beneficial during the month of August to September.
- ◆ If age of the plant is five months or more then spray IIHR banana special for 5 times from five months onwards at one-month interval.
- ◆ Panchagavya of 3% may be sprayed as foliar spray for three times at 3rd, 6th, and 9th months after planting.
- ◆ Bunch feeding of banana by applying of 500 gm fresh cow dung + 7.5g urea +7.5 g SOP (sulphate of potash) dissolved in 100 ml water allow for 15 days is beneficial for uniform fruit size and quality of banana.



- ♦ Spraying or soil application of Cartap hydrochloride 4G (Boregan SP) is recommended to control major pest of banana.
- ♦ Spraying of Azoxystrobin or Trifloxystrobin is effective against most fungal diseases of banana.

Pineapple

- ♦ September to December months is ideal time for pineapple plantation and Queen' and 'Kew' are the two major cultivars are grown in Tripura.
- ♦ Raised bed of planting of pineapple at spacing of 30 cm X 60 cm X 90 cm (6960 nos./kani) or 40 cm X 60 cm X 90 cm (5200 nos./kani) is ideal for South Tripura condition. For better yield plant to plant spacing should be 30-40 cm, row to row spacing should be 60 cm and 90 cm of bed to bed spacing.

- ◆ For plantation of pineapple, 600 gm sized sucker is ideal in terms of yield and days to flowering.
- ◆ Curing of sucker by keeping suckers under shade for 7 days after spraying of insecticides and fungicides is beneficial.
- ◆ About 300-400 gm organic manure, 18 gm urea, 25 gm SSP and 15 gm MOP per plant/sucker is optimum fertilizer dose for pineapple cultivation.
- ◆ “Weed mat” is a mulching technology is very much effective to management of weed growth and nutrient loss. An amount of Rs. 10,400/- per kani is required as additional cost to adopt the mulching technology.



Zone-VIII**MAHARASHTRA****Advisories Related to Major *Rabi* Crops****Chickpea:**

- ♦ Rainfed chickpea should be sown in first fortnight of October while irrigated chickpea should be sown from last week of October to first week of November. Latest improved desi varieties like Akash, Phule Vikram, Phule Vikrant, JAKI-9218, etc. should be used for high yield. Kabuli varieties like PKV Kabuli-2, Virat, BDNGK-798, etc should be used. Sowing on BBF will be beneficial.
- ♦ For desi varieties, 50-75 kg / ha seed rate should be used based on seed size. In case of Kabuli and bold varieties, a seed rate of 100 kg/ha should be used.
- ♦ The seed should be treated with 4 g Trichoderma or 3 g Carbendazim per kg of seed followed by Rhizobium and PSB biofertilizer inoculation @ 250 g / 10 kg of seed.
- ♦ A recommended fertilizer dose of 25 kg N, 50 kg P and 25 kg K should be applied as a basal dose at the time of sowing. Applying fertilizers based on soil testing is advisable to identify and fulfil the need of secondary and micronutrients.
- ♦ IPM practices should be followed for the control of Helicoverpa by using 5 Pheromone traps per hectare, one spray of 5 % NSKE at flowering stage and ETL based spray of Quinalphos 25 EC 20 ml or Emamectin benzoate 5 SG @ 4 g or Chlorantraniliprole 18.5 SC @ 3 ml per 10 lit of water.
- ♦ Two protective irrigations at flowering and pod filling stage should be given wherever available.

Wheat:

- ♦ The timely sown irrigated wheat should be sown in the first fortnight of November. The late sown wheat may be sown upto 15th December if water is available. The rainfed wheat should be sown during first fortnight of October using residual moisture available in the soil.
- ♦ The improved varieties like Tryambak, Godawari, Tapowan, Parbhani-51, PDKV Washim, PDKV Sardar, AKAW-4647, AKAW-1071 should be used for sowing. Rust tolerant varieties should be preferred.
- ♦ Wheat crop should be irrigated in the critical stages of irrigation i.e., CRI stage (18-20 days), tillering stage (30-35 days), flowering (65-70 days), grain filling stage (80-85 days) and grain maturity stage (95-100 days). If only one irrigation is available, it should be applied at 40-42 DAS, if two irrigations are available, it should be applied at 18-20 and 60-65 DAS and if three irrigations are available, it should be applied at 18-20, 40-42 and 60-65 DAS for better yield.
- ♦ The recommended dose of 100-120 kg N, 50-60 kg P and 50-60 kg K should be applied for timely sown wheat while 80:40:40 kg NPK/ha should be applied for the late sown wheat. Half of the N and full P and K should be applied as a basal dose at the time of sowing while remaining half N should be applied at the time of first irrigation (18-20 DAS). The rainfed wheat can be fertigated with 40 kg N and 20 kg P as a basal dose.
- ♦ The crop should be protected from stem borer by spraying Cypermethrin 10 EC @ 11 ml per 10 lit water if infestation is observed.

Rabi Sorghum:

- ♦ Rabi sorghum crop should be sown on residual moisture after harvest of green gram, black gram, or Soybean. Rainfed Rabi sorghum should be sown during 15th September to 1st October while in the under irrigated situation the crop may be sown up to 31st October.

- ♦ The recommended spacing of 45 cm x 12.5 cm should be followed for higher yield; the seeds should be treated with fungicide and Gaucho insecticide @ 4 g / kg of seed for the control of stem borer.
- ♦ A recommended dose of 80:40:40 kg NPK should be applied to Rabi sorghum of which half N and full P and K should be applied as a basal dose while half of the N should be applied after 30 DAS.
- ♦ Improved varieties like Parbhani Moti, Parbhani Super Moti, Phule Vasudha, Phule Revati, PKV Kranti, etc should be used for higher yield.

Safflower:

- ♦ The rainfed safflower crop should be sown on residual moisture during 1st October to 15th October. Irrigated safflower can be sown up to 15th November.
- ♦ A recommended spacing of 45 x 20 cm should be followed for better yield. The crop stand should be maintained by thinning of crop after two weeks from sowing for maintaining the desired plant population.
- ♦ Improved varieties like PBN-12, PBN-46, PBN-40 (non-spiny), PKV Pink (AKS-311), NARI-6 (non-spiny), NARI NH-1 (non-spiny) should be used.
- ♦ The crop should be protected from the attack of aphids by using 5 % NSKE or Dimethoate 30 EC 10 ml per 10 lit of water.

Linseed:

- ♦ Use improved high yielding and short duration varieties of linseed like Latur-93, NL-97, etc.
- ♦ Use recommended spacing of 30 cm x 15 cm and 10 kg seed/ha. Finish the sowing before 15th October.
- ♦ A recommended dose of fertiliser 50 kg N and 25 kg P should be applied, out of which 50 % N should be applied at the time of sowing and 25 kg after one month of sowing as a top dressing should be applied.

- ♦ Timely plant protection measures should be followed as per recommendations.

Mustard:

- ♦ Mustard can be sown in Maharashtra in the first fortnight of November. Improved varieties like Shatabdi (CAN-9), TPM-1, etc should be used with 5 kg seed rate per hectare. The sowing should be done at 45 cm x 20 cm spacing.
- ♦ The crop should be protected from powdery mildew by spraying of Carbendazim @ 10 g per 10 lit of water or wettable sulphur @ 20 g per 10 lit of water and timely irrigation should be provided.

Sugarcane:

- ♦ Pre-seasonal sugarcane should be planted during 1st October to 15th November while seasonal sugarcane should be planted during 1st January to 15th February. 25 % more yield is realised from pre-seasonal sugarcane.
- ♦ Use improved varieties like MS-10001, VSI-08005, Co-86032, Co-8014 (Mahalaxmi), CoM-0265, etc for higher yield
- ♦ Use 25-30 thousand two budded sets for planting; maintain row to row spacing of 90-100 cm and plant to plant spacing of 22 cm as per recommendations.
- ♦ Sugarcane sets should be treated with recommended pesticides, fungicides and biofertilizers like Acetobacter and PSB before planting and recommended dose of fertilizers 250:115:115 kg NPK / ha for seasonal sugarcane and 300:170:170 kg NPK / ha should be applied. Nitrogen doses should be applied in four equal splits.

Advisories Related to Major Horticulture Crops

Pomegranate:

- ♦ Take pruning for Ambiya Bahar in Pomegranate. Use improved and high yielding varieties like Bhagwa and Super Bhagwa. Give stress of 30 to 60 days according to soil type. Give light irrigation

for flowering. Precaution should be taken so that water stress condition may not occur in pomegranate orchard. Remove suckers shoot in pomegranate orchard. Apply FYM @ 40-50 kg per plant. Apply fertilizer dose of 400:200:200 g / plant after irrigation. Nitrogen should be given in two splits. Take a spray of potassium nitrate @ 15 gm per litre of water.

Citrus (Orange and sweet orange):

- ♦ Ambiya bahar management is the key operation in orange and sweet orange in Rabi season.
- ♦ Stress management should be done in the month of November December as per soil type. 45 to 60 days water stress should be given as per soil type. Light irrigation should be given after completion of stress.
- ♦ Take a spray of potassium nitrate @ 15 gm per litre of water. Application of Bordo-paste should be done on tree trunk in the month of January-February to protect the crop from gummosis and dieback.
- ♦ Apply fertilizer dose of 400:200:200 g / plant after irrigation. Nitrogen should be given in two splits.

Mango:

- ♦ Organic mulching should be done, and the orchard should be irrigated during early in the morning, at evening or during night hours. To protect the mango fruits from the incidence of fruit fly, install "*Rakshak fruit fly trap*" developed by university @ 4 traps per hectare. Fallen fruits should be collected and destroyed to keep orchard clean.

Banana:

- ♦ To protect the crop from the severe cold wave, make a smoke in the orchard to increase the temperature in the evening and apply irrigation at night to raise the temperature. Organic mulching should be done in banana orchard. Irrigate banana orchard during

early in the morning, at evening or during nighttime.

Grapes:

- ♦ Management of October pruning in grape orchard should be done as per availability of water. During rest period, provide only need based irrigation to protect the existing leaves from drying, and contribute towards increasing the reserves of the vines through photosynthetic activity. Care should be taken to reduce/stop the water in case new growth is observed on the shoot. If rainfall exceeds 2.5 mm, no irrigation should be applied especially during rest period.
- ♦ Improved varieties like Thompson seedless, Tas-E-Ganesh, Sonaka, Super Sonaka, Sharad seedless, etc should be used for planting.

Advisories Related to Major Vegetable Crops:

- ♦ **Brinjal:** The crop should be planted in September-October in Rabi season. Improved high yielding varieties like Arka Harshita, Arka Unnati, Arka Shirish, Arka Anand, Arka Shirish, Kalpataru, Krishna, Pragati, Vaishali, Phule Harit, Anuradha, Aruna, etc should be used for planting. Control measures should be taken for brinjal shoot and fruit borer. If observed, collect, and destroy caterpillar or Spray Neemark 4% or Cypermethrin 25% EC 5 ml or Chlorpyrifos 20 EC 20 ml OR Deltamethrin 1 % or Trizophos 20 ml per 10 litres of water.
- ♦ **Tomato:** Triple disease resistant varieties of tomato like Arka Rakshak or Arka Samrat should be used for higher yield. The crop should be planted in the month of August-September for Rabi season.
- ♦ **Onion:** Improved varieties like Baswant-780, N-2-4-1, Agri Found Light Red, Phule Samarth, Bhima Super, Bhima Red, Bhima Shakti, Bhima Shubhra, etc should be used for Rabi cultivation. Transplanting should be done in the month of October-November. Seed can also be done by tractor drawn BBF to save the labour charges and time for seedling preparation and transplanting. Apply

Malic Hydroxide-40 @3000 ppm solution 15 to 20 days prior to harvesting to increase shelf life of onion. Also stop irrigation before three weeks of harvesting.

- ♦ **Okra:** To control powdery mildew in okra, three sprays of 0.03% wettable sulphur should be taken at 10-15 days of interval. Improved varieties like Parbhani Kranti, Arka Anamika, Phule Kirti, Utkarsh, PBNOK-1 should be used for higher yield.

Advisories Related to Major Floriculture Crops:

- ♦ **Gaillardia:** Planting should be done through seeds or seedlings in well-drained soil by using varieties like *Murgudi*, *Fulzari* etc. Apply 50:50:50kg NPK/ha at the time of sowing, remaining 50kg N apply after 30 days after planting.
- ♦ **Marigold:** Marigold should be planted at 60 x 45 cm spacing in well-drained soil. Seedlings should be prepared through seeds of varieties like *Local red*, *Local yellow*, *Bangalore local*, *Orange Crush*, *Pineapple Crush*, *Pusa Basanti Genda* etc., Apply 50:50:50kg NPK/ha at the time of sowing, remaining 50kg N apply after 30 days after planting.
- ♦ **Chrysanthemum:** Chrysanthemum requires well drained soil. Apply 112000 saplings/ha for plantings of variety Sankar-1, Guldasta, Raja, Piwlirevdi, Pandhrirevdi, Zipri, Birbal sahani, etc. Application 75:50:50kg NPK/ha apply at sowing time remaining 75kg N apply after 30 days after planting.
- ♦ **Tuberose:** Tuberose should be planted at 30 x 30 cm spacing in well-drained soil. Application of 50:50:50kg NPK/ha should be done at the time of sowing time. Remaining 50kg N should be applied after 30 days of planting as top dressing. Improved and high yielding varieties like Single, Double, Phule Rajani, Shrungar, Rajat, Kolkata Single, Prajwal, etc should be used.
- ♦ **Gladiolus:** Gladiolus should be planted at 30 x 30 cm spacing in well-drained soil. Application of 50:50:50 kg NPK/ha should be done at the time of sowing time. Remaining 50 kg N should be

applied after 30 days of planting as top dressing. Improved high yielding varieties like Apsara, Meera, Sapna, Punam, Phule Ganesh, Phule Prerana, Phule Tejas, Nilrekha, White Prosperity, etc should be used.

- ♦ **Jasmin:** Planting of jasmine should be done by cutting in well drained black soil; while planting apply 20:20:20 gm NPK/plant, after two months apply 20 gm N/plant. After one year Apply 100:50:50kg NPK/ha at the time of pruning of plants. Improved varieties like Single, Double, Motiya, Madanban, Gundmalai, Bela, Bangalore, etc should be used for higher yield.
- ♦ **Rose:** Plant graft in Light to medium well drained soil at 150 x 150 cm spacing. Apply 20:15:15 gm NPK/plant at the time of pruning. The crop should be protected from diseases like downy mildew and powdery mildew. Spray of copper Oxychloride 75 WP 20 g or Captan 50 % WP 25 g per 10 lit of water if incidence is observed.

Advisories Related to Livestock and Fisheries:

- ♦ **Dairy Cattle:** Vaccination of cattle to protect them from deadly viral foot and mouth disease should be completed in September-October and March-April twice in the year.
- ♦ **Goat:** Vaccination of goats to protect them from deadly viral PPR disease (*Bulkandi*) disease should be completed once in every three years.
- ♦ **Poultry:** Vent pecking is hazardous and economic loss-making bad habits of newly developed poultry breeds like Grampriya, Kaveri, Vanaraja and Giriraja. To avoid this loss, poultry farmers should follow debeaking of birds and sufficient vitamins (A, D, E, K) and minerals (Ca, P, Na) should be given to the birds through feed or water regularly.
- ♦ **Fodder management:** To avoid the annual green fodder scarcity to domestic animals, high yielding Napier fodder varieties like BNH-10, Phule Gunwant and DHN-6 should be cultivated by farmers on 0.04 ha area per animal.

- ♦ **Fisheries:** Farm ponds created under NHM, and state department of agriculture should be utilised for fish farming where water is available throughout the year. Mixed fish breeds like Rohu, Katla, Mrigal and Cyprinus can be grown in fishponds. Biofloc fish farming should be adopted by small and marginal farmers.

Advisories Related to Allied Enterprises:

- ♦ **Sericulture:** Mulberry variety V-1 should be planted for higher leaf yield and quality cocoons. One-acre leaves will be sufficient to rear 200 DFL batch. About 1700 sq. ft. space will be required for 200 DFL. One spray of growth hormone Serimore @ one ampule / 50 DFL should be applied at the time of fifth feeding after forth mode for increasing yield and quality of cocoons. One spray of growth hormone Sampoorna @ one ampule / 50 DFL should be applied at the time of 5-10 % sampling of cocoon formation for uniform growth of silkworms. Cocoons should be harvested after five days of cocoon formation. Cocoon harvester machine should be used for harvesting of cocoons for saving the labour.

Advisories Related to Post Harvest Management and Value Addition:

- ♦ **Sweet Orange:** Sweet orange fruits should be kept in cold storage at -6 °C for 90 days to increase its shelf life. Waxing can also be done.
- ♦ **Grapes:** The fresh fruits should be converted into resins. The fruits can also be kept in cold storage to increase its shelf life.
- ♦ **Aonla:** Aonla fruits should be processed and converted into value added products like Aonla candy, Aonla pulp, Aonla syrup, Aonla powder, Aonla supari, etc.
- ♦ **Pomegranate:** Pomegranates should be used to make value added products like Anardana, Pomegranate juice, etc.
- ♦ **Vegetables:** Tomatoes should be processed to make tomato ketchup, tomato sauce, etc. Green and red chilli should also be processed

to make value added products like chilli sauce, red chilli powder, green chilli paste, etc.

- ◆ **Cereals and pulses:** Sorghum and wheat grains should be stored at below 14 % moisture for long term storage. Improved grain storage bags should be used for storage of wheat, rice, etc. Pulses crops like pigeon pea, chickpea, green gram, black gram should be processed to convert into dal for higher returns. Innovative packaging should be used for fetching more prices in the market.

Advisories Related to Farm Mechanization and Soil Water Conservation:

- ◆ Use minimum tillage operations, avoid ploughing for land preparation to protect land from evaporation losses and to conserve the soil moisture.
- ◆ Use BBF planter for sowing of chickpea for in situ moisture conservation.
- ◆ Chickpea crop should be irrigated through sprinkler irrigation at critical stages like flowering and pod filling for increasing yield wherever irrigation is available.
- ◆ Use of reapers / combine harvesters should be preferred for harvesting of crops like wheat, chickpea, safflower, etc.
- ◆ Rabi onion should be sown with CRIDA Tractor drawn Onion Seed Planter to save labour expenses and to achieve more work efficiency.

Advisories Related to Farm Women:

- ◆ Farm women should use cycle hoe for intercultural operations in field crops to reduce the drudgery.
- ◆ Use serrated sickle for harvesting of Jowar, Bajra and similar crops which reduces the drudgery of farm women.
- ◆ Shed net farmers may use vegetable transplanter to reduce drudgery in transplanting, time, money & labour cost.

- ♦ Each farm woman should develop a model nutritional garden in their farm or home premises to enhance nutritional status and nutrition security of farm family.
- ♦ Nutri-cereals should be added in cropping systems. Nutri-cereals like finger millet, fox tail millet, little millet, etc. can be grown in the Rabi season.
- ♦ Farm women should grow sorghum crop for *hurda* (tender roasted grains) on small area and sale it with attractive packing to earn extra income. Similar practice can be done in case of chickpea.

GUJARAT

Advisories for the crops sown/growing in *kharif* but will continue during *Rabi*:

Paddy:

- ♦ To manage wilt disease in paddy, spray 1 g streptocycline + 10 g copper-based fungicide in 15 lit of water
- ♦ At 50 per cent flowering, spray 25 g mencozeb OR 10 g carbendazim in 10 lit. water to manage false smut disease
- ♦ Use sex pheromone traps @ 40 / ha to check infestation of stem borer

Groundnut:

- ♦ In late sown / late maturing groundnut crop, spray 10 ml hexaconazole / 10 lit water to manage rust disease
- ♦ The crop at maturity showing pale yellow colour of leaves should be checked randomly for pod filling and maturity. If the grains are developing pink colour, harvest the crop by uprooting and keep for sun drying. After sun drying the harvested crop for 4 – 5 days when the moisture level in grains goes below 8 – 7 per cent, carry out threshing and separate the pods from plants
- ♦ Store the pods in clean gunny bags in dry condition.

Castor (Irrigated):

- ♦ On attaining 70 DAS, top dressing with nitrogenous fertilizers should be done based on the region-specific recommendations and soil health card
- ♦ Inter cropping of chickpea can be adopted to increase economic return from unit area

Cotton:

- ♦ After monsoon, crop should be irrigated at regular interval depending upon the soil type, availability of irrigation water and method of irrigation. Drip irrigation is highly recommended to increase economic return and to save irrigation water
- ♦ Cotton plucked / collected in early morning should be sun dried during daytime and can be stored at clean place in dry condition
- ♦ Top dressing of fertilizers and micronutrients should be done at proper stage and as per the recommendations made in soil health card
- ♦ Cutting the terminal tip of plants (de topping) can be adopted between 75 and 100 DAS to check the excessive vegetative growth and to increase boll setting

Pigeon pea:

- ♦ Ensure irrigation at flowering and pod filling stage to avoid yield loss due to moisture stress condition

Pomegranate:

- ♦ To obtain fruits in "*Hast bahar*", stop irrigation after monsoon. Give recommended doses of fertilizers in September – October with two light irrigations

Ber (*Ziziphus* sp.):

- ♦ In irrigated condition, top dressing of recommended fertilizers in September month.
- ♦ Apply 4 – 6 irrigations between October and February.
- ♦ Maintain cleanliness in orchard and destroy the crop residues to remove the primary inoculum of fruit fly. Use methyle eugenol traps for mass trapping of male fruit flies.

Advisories for sowing of *Rabi* crops:

Sugarcane:

- ◆ Varieties GNS 11 (Co N 13072), GNS 10 (Co N 13073), GNS 9 (Co N 9072), GNS 8 (Co N 7072) for south Gujarat region and GS 5 (Co N 05071) for Saurashtra region are recommended
- ◆ Give seed treatment by dipping the sets for 10 minutes in 250 liters water mixed either with 500 g Emisan-6 or 500 ml malathion
- ◆ Inter cropping with chickpea, green gram, onion, garlic can be adopted to increase economic return from unit area

Chickpea:

- ◆ Varieties GJG-3 and GJG-6 are recommended for rainfed cultivation, whereas for irrigated condition GJG -5 can be adopted
- ◆ Give seed treatment with *Rhizobium* and Phosphate Solubilizing Bacterial culture @ 10 ml / kg seed before sowing

Wheat:

- ◆ For timely sowing varieties GW – 366, GW - 496 and GW – 451 and for late sowing GW – 173 and GW – 11 are recommended
- ◆ Looking to the climatic condition, Gujarat state witness short to medium winter duration, hence timely sowing in 2nd and 3rd week of November is preferable to obtain high yield of crop
- ◆ In sandy loam soils, where termite infestation is noticed, seed treatment with either bifenthrin 10 EC @ 200 ml OR fipronil 5 SC @ 600 ml in 5 lit water / 100 kg seed is useful to check the infestation

Onion:

- ◆ For *Rabi* onion, raise nursery in the month of September – October. Avoid damping off disease in seedlings. Drench /spray copper-oxy-chloride @ 40 g / 10 lit, if necessary
- ◆ Varieties for red onion: GJRO -11, Pusa Red, Bhima Shakti
- ◆ Varieties for white onion: GJWO-3, GAWO-2, Bhima Shweta, Bhima Safed, Nasik-53

Maize:

- ♦ Sowing of Rabi maize can be carried out in the 2nd fortnight of October and 1st fortnight of November
- ♦ Varieties: GAYMH – 1 (for north, middle and south Gujarat)
GAYMH – 2 (For middle and South Gujarat)
GAYMH – 3 (For middle Gujarat)
- ♦ In case of infestation of fall armyworm (*Spodoptera frugiperda*), spray *Bacillus thuringiensis*-based formulation OR *Beauveria bassiana* @ 50 g / 10 liters water. In case of heavy infestation, spray emamectin benzoate 5 SG @ 4 g OR chlorantraniliprole 18.5 SC @ 3 ml / 10 lit water covering leaf whorl and whole plant

Mustard:

- ♦ Variety: GDM-4, GDM-6
- ♦ Sowing should be done in the month of October, after the first week. For management of aphid infestation, use NSKE 5 % OR Neem oil-based formulations OR dimethoate 30 EC@10 ml OR thiomethoxam 25 WG @ 4 g / 10 lit of water

Cumin:

- ♦ Sowing of variety GC – 4 and GC – 5 is recommended during 1st fortnight of November
- ♦ Avoid water logging condition. For management of blight, spray crysoximethyle 10 ml OR diafenaconazole 5 ml / 10 lit water

Fennel:

- ♦ Variety: GF -12
- ♦ Sowing should be carried out during the last week of October to first week November. For management of aphid, two sprays of carbosulphan 25 EC @ 20ml / 10 lit water is recommended

Pearl millet:

- ♦ Sowing of semi-*Rabi* pearl millet crop can be done in the first fortnight of October month
- ♦ Variety: GHB – 538, GHB – 744

Ajwain (Carom seeds):

- ♦ Sowing of variety- Guj. Ajwain – 1 is recommended during second fortnight of October

Fodder sorghum:

- ♦ Varieties CSV 21F, Co FS-31, CoFS – 29 are recommended with the seed rate of 10 – 12 kg / ha at the row spacing of 30 cm.

Lucern:

- ♦ Variety: Guj. Anand Lucern – 3, 4

Zone-IX**MADHYA PRADESH****Wheat**

- ◆ Prepare fallow field to conserve the moisture in case of un-irrigated area.
- ◆ Select the variety viz: C-306, JW3020, JW3280, JW3137, HI1531
- ◆ Select the wheat varieties viz. JW3288, JW3020, JW3211, HI1531, HI74672 in case of facility of one or two irrigation
- ◆ For irrigated timely sown condition (15-30 Nov.) use high yielding varieties viz- JW3382, JW3465, JW1201, GW322, GW273, GW366
- ◆ Under irrigated late sowing condition (1-30 Dec.) preference should be to early and terminal react to tolerant variety viz- JW3336, NI1633, HD2864, HD2932 and lok-1.



Seed treatment of wheat by carbendazim Fungicide

- ◆ Seed treatment with fungicide (vitavax or thiram) 2.5 g/k to protect from seed from soil borne pathogens.
- ◆ Seed rate for sowing should be 100 kg/ha in case of 1000 seed weight (38-40 g). Every increase of per from add 2kg seed.
- ◆ Use Recommended dose of fertilizer to harvest potential yield
 - FR – 40:20:10 NPK kg/ha
 - Limited/partial irrigation – 60:40:30 NPK kg/ha
 - Irrigation – 120:60:40 NPK kg/ha
- ◆ Use of micronutrient as per soil test value for harvesting the good yield
 - Zine - 25 kg/ha
 - sulphur - 10 kg/ha
 - Borex - 2 kg/ha
- ◆ Management of irrigation as per availability
 - One irrigation - 35-40 days
 - Two irrigation - 30-35 days
60-65 days
 - Five to six irrigation - 20-25 days
40-50 days
65-70 days
85-90 days
100-105 days
- ◆ Control of weeds should be necessary to use appropriate herbicides
 - Broad leaf - 2-4D @ 0.5 kg a.i./ha
Metsulphuron - 10g/ha
 - Narrow leaf
Sulphosulphuron - 25g ai/ha
Clodinophop - 100 g ai/ha

- ♦ At proper maturity harvest the crop and give the solar treatment before storage it to avoid the losses from insect pests.
- ♦ For improving soil health use of 3 tons FYM
- ♦ Use of PSB and Azotobactor 500g/100kg of seed at the time seed treatment always facilitate the production.

Chickpea

- ♦ Use of high yielding and pest tolerant varieties JG 315, JG 74, JG 322, JG 14, JG 11, JG 130, JG 16, JAKI 92-18, JG 63, JG 412, JG 226, JG 36, PBG 1, BG 267, GNG146, RVG 201, RVG 202.
- ♦ Use high yielding varieties of Kabuli Chickpea JGK 1, JGK 2, JGK 3, KAK 2 and pink chickpea variety JGG 1 for sowing.
- ♦ Sowing must be done in the first fortnight of November by using Ridge and Furrow method or Raised Bed Method for saving of seed and water.
- ♦ Intercropping of chickpea + coriander /mustard in the ratio of 8:2 must be done.
- ♦ For the management of soil borne diseases Trichoderma culture@ 5 kg/hectare mixed with vermicompost must be applied in the soil before sowing.



- ♦ *Seed treatment must be done with Thiophanate-methyl + Pyrethrin 2 ml + 1.0-gram Boron+ 1.0-gram Molybdenum along with 5-gram Rhizobium and 5-gram PSB culture.*
- ♦ Organic seed treatment should be done with 5 gram Trichoderma culture + 5 gram Rhizobium and 5 gram PSB culture.
- ♦ For the management of Pod borers, placing of 50 Bird perchers, 10 Pheromone Traps and 1 Light Trap per hectare.
- ♦ In the initial stage of pest infestation application of 750 ml *Bacillus thuringiensis*, 500 ml NPV, 750 ml *Metarhizium anisopliae* and 1 lit./hectare *Beauveria bassiana* must be done.

Linseed

- ♦ Crop Linseed Use of high yielding multiple resistant varieties viz., JLS 66, JLS 73, JLS 95, RLC 148, RLC 164 under rainfed and JLS 79 RLC 167 under irrigated condition
- ♦ Seed should be treated with suitable fungicides Carbendazim 2g + Mancozeb 1g and Imidacloprid 48 FS @ 1.25 ml/kg seed or by Trichoderma viridae @ 10 g/kg seed followed by PSB and Azotobacter @ 10g /kg seed for better germination and vigour.
- ♦ Seed rate less than 30 kg and 25 kg should be used under rainfed and irrigated condition respectively. Dry sowing followed by irrigated is more effective for better germination and plant stand.
- ♦ Fertilizers should be applied at 80:40:20: 20:5 and 40:20:20: 10:5 N: P: K: S: Zn is recommended under irrigated and rainfed condition respectively.
- ♦ For the management of weed metsulfuron methyl 4g a.i. + clodinafop 60g/1.25 ha land is effective against weed management at 2-3 leaf stage or 18-20 days after sowing. Mechanical weeding dora, kulfa, cycle or hand weeding is also effective for better aeration of the plant and earthing up.
- ♦ Foliar spray of N: P: K: 19:19:19 along with fungicide and insecticide at vegetative stage is effective for better growth of the crop and plant protection. Combine harvester under low RPM and

reaper cum binder may also use for harvesting of the crop in term of minimizing laborers cost.

Mustard

- ♦ Varieties recommended for MP state are, Pusa Tarak, Pusa Mahak, Pusa Agrani and Pusa Aditya
- ♦ Soil and field preparation: Well drained, light soil, sandy loam, or light loam. Fine firm moist seedbed is required for this pre-sowing irrigation is required.
- ♦ **Sowing time-** Sowing time is most important it should be maintained. The best time is mid-October to mid-November. Delay sowing should be avoided as incidence of Aphid (insect) cause damage to crop.
- ♦ **Seed rate and thinning:** Use 5 kg seed/ha, sow the seed behind the deshi plough in line or with the help of seed drill machine at 30 cm row to row distance. To maintain the plant population in field, plant thinning operation after 15-20 days after sowing is needed.
- ♦ **Pre-sowing stage:** Summer deep ploughing to kill fungal spores and residual population of pests, ensure proper drainage of water, crop rotation and balanced quantity of seed and fertilizers, recommendation of the region, apply 15 kg of Zinc sulphate + sulphur per hectare, removal of pest debris and residue of previous crop to avoid painted bug infestation and disease-causing pathogens.
- ♦ **Sowing Stage:** Sowing at proper time (01-31 October) which escape the incidence of aphids and diseases. Soil incorporation of Trichoderma based product @ 2.5 kg/ha pre-incubated in 50 kg of well rotten farmyard manure for management of soil borne pathogens. Seed treatment with freshly prepared aqueous garlic bulb extract (2% w/v) or Trichoderma based product @ 10 g/kg or metalaxyl-M 31.8% ES @ 6 ml/kg seed for the management of seed-borne pathogens. Avoid narrow spacing/heavy seed rate for the management of Sclerotinia rot.

- ♦ **Seedling and Vegetative stage:** Maintain recommended spacing of plants or optimum plant population by thinning, Irrigation of crop at seeding stage to protect against painted bug.
- ♦ Maintenance of weed free crop by clean cultivation which act as collateral hosts for pathogens regular monitoring of crop and destroying of pest infested/ infected plants, Spray application of micronutrients like boron and zinc are also very useful practice in pest management judicious use of irrigation depending on soil type and rain fall. Irrigation after vegetative state should preferably be avoided to reduce Sclerotinia rot. Hand picking of aphid-infested twigs in the initial attack. Conservation of natural enemies of Aphids namely *Coccinella septempunctata*, *Chrysoperla carnea*, Syrphid fly, etc. Panicle initiation of Orobanche starts early so post-emergence application of glyphosate at 25-50 g/ha at 30 and 50 days after sowing holds some promise with 60- 80% control of broomrape. Release *Chrysoperla* for control of aphid. Roughing/ thinning of crop.
- ♦ Irrigation – 2 to 3 irrigation is required for obtaining better yield potential
- ♦ **Weed control:** Before sowing incorporation of fluchloralin @ 1.0 l/ha. or after sowing pre-emergence application of pendimethalin @ 1 to 1.5 l/ha helps to control most of the weeds in crop or hand weeding at 40-45 days after sowing.

Sugarcane

- ♦ Use of high yielding and high sugar varieties viz. CoJN 86-600, CoJN 86-141, CoJN 9505, COC 671, Co 94008 (Shyama), CoM 88121 (Krishna), Co 86032 (Nayana) is recommended for Madhya Pradesh.
- ♦ **Field preparation:** Initial ploughing with two-disc plough followed by eight-disc plough and using cultivator for deep ploughing followed by one-time operation of rotovator to pulverize the soil to get a fine tilth, free of weeds and stubbles. Level the field for proper

irrigation. Open ridges and furrows at 80 cm apart with the help of victory plough or tractor drawn ridger. The depth of furrow must be 20 cm. Open irrigation channels at 10 m intervals

- ♦ Light soil cover (3-4 cm) over cane setts irrespective of depth of planting. Germination of cane buds is adversely affected if cane setts are covered and put with heavy load of soil particularly in fine textured Clayey soil conditions.
- ♦ There should be sufficient soil moisture (18-20 percent) and good moisture content in cane setts (critical moisture content: 50.3 percent) at the time of planting.
- ♦ Apply FYM at 12.5 t/ha or compost 25 t/ha or filter press mud at 37.5 t/ha before the last ploughing under gardenland conditions. In wetlands this may be applied along the furrows and incorporated well.
- ♦ **Fertilizer:** 300 kg Nitrogen, 85 kg and 60 kg potash is recommended for sugarcane. Phosphorous and potash is applied before planting and nitrogen is applied in four splits.
- ♦ Sett Treatment Select healthy setts for planting. The setts should be soaked in 100 litres of water dissolved with 50g Carbendazim, 200 ml and prophenophos for 15 minutes. Use of moist hot air treated seed be preferred.
- ♦ **Seed Rate:** 1,25000 eue buds/ha or 100 q/ha.
- ♦ Seed cane crop must have been adequately manured and fertilized as per recommendation. It has been reported that phosphorous in the internode contribute to the process of early breaking of bud dormancy.
- ♦ The longer the staling the lower the germination, but the germination of stale cane can also be improved by soaking the setts for three hours in water before planting.
- ♦ Seed cane crop of 8-10 months age should be used for planting.
- ♦ **Propping:** Do double line propping with trash twist at the age of 210 days of the crop.

- ♦ Ratoon Crop management: Remove the trash from the field. Do not burn it. Follow stubble shaving with sharp spades to a depth of 4 - 6 cm along the ridges at proper moisture. Work with cooper plough along with sides of the ridges to break the compaction.
- ♦ Control the weeds followed by last nitrogen application.
- ♦ Tie cane plants together to prevent lodging from wind speed.
- ♦ The gaps areas in the ratoon sugarcane crop should be filled within 30 days of stubble shaving. The sprouted cane stubbles taken from the same field is the best material for full establishment. The next best method is gap filling with seedlings raised in polybags. Apply basal dose of organic manure and super phosphate as recommended for plant crop.

Fruit Crops

- ♦ Plough the orchard and remove weeds from the orchard
- ♦ Soil working to improve aeration and weed control
- ♦ Protect new young plants from frost. Give light irrigation to new plants to minimize the frost damage. Arrangements should also be made to cover the small non-bearing plants with straw
- ♦ Apply Bordeaux Paste on the trunk up to height of 30 to 45 cm. to avoid frequent incidence of termites and any other fungal diseases.
- ♦ In fruit trees if damaged by shoot borers is noticed then prevent them by pulling out the borers from the holes of the damaged shoots and injecting petrol or kerosene into the damaged holes and plugging the holes with mud or clay
- ♦ Apply fertilizer (basal) in fruit crops as per recommendation
- ♦ In mango if die-back symptoms appear then prune the dead woods upto 5-10 cm green portion is advisable and spray copper oxychloride (0.3%) twice at 15 days interval.
- ♦ In mango if symptoms of gummosis are seen, scratch the affected part and clean the surface after that apply Bordeaux paste on affected portion.



- ♦ In mango deblossom the early emerged panicles for minimizing the floral mango malformation
- ♦ Guava: Pruning the lower branches up to a height of 50-75-cms and cut the growing shoot to encourage lateral branches preferably in the east -west direction for better sunlight exposure.
- ♦ Pomegranate: Remove old, disease and pest affected branches, to manage mealy bug as a preventive measure, fastened, 25cm width Polythene (400gauge) strip around tree trunk. Keep orchard clean. If infestation is observed, take spray of Thiamethoxam 25WG@0.25gm/Ltr or Imidacloprid 17 SL@0.35ml/Ltr or Dimethoate 30 EC@2ml/Ltr of water.
- ♦ **Ber:** To control powdery mildew spray 0.25 percent wettable sulphur (250 g in 100 litres of water) or 0.05% Karathane 40EC (50 ml in 100 litres of water)
- ♦ Acid lime: spray comprehensive micronutrient solution to overcome micro nutrient deficiencies
- ♦ Intercropping of vegetables between tree plants.
- ♦ Mango, Pomegranate, Citrus and sapota require to irrigate at 10-12 days. This will improve humidity under their canopy and reduce cracking of fruits.

- ◆ Use of pesticide spray for controlling pests and diseases after consulting scientist of nearest KVK
- ◆ High wind speed may lodge banana stem support the stem to prevent from lodging

General Guidelines for Animal Husbandry

- ◆ In winter/Rabi season, extreme metrological variation leads to drastic drop in temperature during December and January months, during this, it's hard to manage livestock and hence it's really important to take proper care of livestock animals.
- ◆ Provide proper shelter to the animals during winters. Ventilation should be proper no ammonia or nitrogen gas in the shed as it causes pneumonia or other diseases.
- ◆ Floor should be clean, dry and bedding with straws which acts as insulation and prevents heat loss.
- ◆ Curtains should be used in the sheds of loose housing system to obstruct the flow of wind at animal's level. Curtains can be made from tarpuline, bamboo, dry grass, guinea bags, jute etc.
- ◆ Provide proper clean water to the animals, avoid chilled water as it will decrease metabolism of body and will affect the production of animals.
- ◆ Improve body reserves of the animals by providing nutritious and balanced diet during winters. Berseem, most abundantly available green fodder, has high protein percentage and water content, can easily support production level of lactating and growing animals.
- ◆ If there is shortage of green fodder, then 25-30 kg of leguminous fodder can be mixed with 5-10 kg of wheat straw for feeding larger animals. In addition to this 3 kg of concentrate mixture will be sufficient to maintain the body temperature.
- ◆ To avoid incidences of bloat in winter, the leguminous fodders should be mixed with either non legumes or wheat straw.
- ◆ Routing vaccination and deworming should be carried out.

- ◆ Disinfect the farm premises with suitable chemicals such as 1% hypochloride + bleaching powder (7gm in 1 liter of water) or 1% sodium hypochlorite with proper care.

Sheep & Goat

- ◆ Ensure clean, fresh, and lukewarm water in adequate quantities to prevent colic and impaction. Legumes should be mixed with straw to prevent bloat. Make sure that the stored winter feed is mould-free and of good nutritional quality.
- ◆ Strictly avoid early morning grazing on frosty herbs and snow-covered grasses which otherwise cause's huge loss by way of diseases like Braxy/Bradsot.
- ◆ Timely vaccination like Enterotoxaemia Vaccine should be ensured to prevent clostridial diseases. Proper anthelmintic dosing of animals may be done after seeking advice from veterinarian.
- ◆ Do not shear the wool or cut the hairs of the sheep in the winter season.

Poultry

- ◆ During this winter maintain proper shed temperature and make availability of ample lukewarm drinking water to maintain body temperature of birds.
- ◆ It is essential to give the chicken plenty of food as they require extra energy for maintaining body temperature. Use anti-stress vitamins such as vimeral to increase immunity and to reduce climatic stress.
- ◆ Bedding material i.e., litter, around 6-inch depth is needed in houses during winter. Litter insulates the chicks from the cooling effects of the ground and provides protection cushion between bird and floor as it gives warmth to the birds during winter.
- ◆ Ensure vaccination of chicks and birds against Ranikhet and IBD disease if not done earlier. Deworming of the birds should be carried out using proper dewormer after every 3 months' interval.

CHHATTISGARH

Wheat

- ♦ High yielding and improved varieties of wheat suitable for irrigated eco systems are as follows: Ratan, Chhattisgarh Gehun-2, C.G. Gehun-3, Chhattisgarh Amber wheat, Kanishka (C.G.-1029), Chhattisgarh Hansa Gehun, Chhattisgarh Gehun-1023, H.W. 2004, Lok-1, Sujata, H.I.-1500, G.W. 273, D.L. 803-3 (Kanchan), G.W. 322, M.P.-4010, D.L.-788-2 (Vidisha), G.W. 173.
 - *Duram wheat*: H.D.-4672, H.I. 4498, H.I.-8381, H.L.-8627, H.I.-8713, M.P.-1215.
 - *Aestivum wheat*: Ratan, H.I.-1531, G.W.-366, H.I.-1544, M.P.-3336, M.P.-1203, H.D.-2332, H.D.-2864, J.W.-3288.
- ♦ Sowing of wheat should be completed by 25th November for timely sown varieties however, for late sown condition, early maturing varieties be sown between 25th November to 15th December. For timely sown condition, seed rate should be 100-125 kg/ha however for late sown condition, 125-150 kg seed should be sown per hectare.
- ♦ Before sowing, seed should be treated by Carboxin @ 2 g per kg seed. Row to row spacing should be 20 cm. However, 100 to 120 kg Nitrogen, 60 kg Phosphorus and 40 kg Potash should be applied as a blanket application. Actual quantity of nutrients should be based on soil health tests.
- ♦ Irrigation should be applied at critical Root initiation, tillering, jointing, booting, flowering, milk, and dough stages in case of sufficient water availability to fetch maximum yield.
- ♦ For weed management, Metsulfuron methyl 1.6-gram active ingredient per acre @ 25-30 days after sowing should be applied for effective control of broad leaf weeds under optimum moisture condition in the field. Pinoxaden, 16-20-gram active ingredient per acre @ 320-400 gram/m.l. should be applied @ 25-30 days after

sowing for narrow leaf weed control. Pinoxaden + Carfentrazone (20+8 g active ingredient) should be applied @ 25-30 days after sowing for controlling all types of weeds under optimum moisture condition.

Chickpea

- ♦ Chickpea is a major pulse crop of Chhattisgarh plains. Following improved varieties are recommended for cultivation: G.G.-1 (Gujarat Gram-1), JAKI-9218, J.G.-16, Vaibhav, J.G.-130, J.G.G.-1, J.G.-14, Indira Chana-1, J.S.C.-55, J.S.C.-56, B.G.D.-128 (Pusa Shubhra), I.P.C.K.-2002-29, I.P.C.K.-2004-29, I.P.C.-2066-77.
- ♦ According to soil type and availability of irrigation or time of sowing any one of the above varieties can be selected for sowing.
- ♦ Kanhar soils of Chhattisgarh plains are suitable for chickpea cultivation. Sowing should be done between 15th October to 30th November.
- ♦ Seed rate for timely sowing chickpea should be 75-80 kg per hectare however, if sowing is delayed beyond 30th November, then seed rate should be increased by 25 kg/ha. In some parts of Chhattisgarh, utera crop is also taken, in case of utera (Relay), seed rate should be 100 kg/ha.
- ♦ Seed should be treated by Carbendazim @ 2 g per kg seed for protection from soil borne fungal diseases.
- ♦ After treatment with fungicide seed should be treated by Rhizobium and P.S.B. Culture @ 5 g/kg seed followed by Trichoderma @ 5 g/ha seed, treated seed should be shade dried before sowing.
- ♦ Sowing of chickpea should be done with the row spacing of 30 cm. 20 kg Nitrogen, 40 kg Phosphorus, 20 kg Potash and 20 kg Sulphur should be given as basal dose. For good yield light irrigation should be insured at branching and flowering stage.
- ♦ Gram pod borer is the major insect of chickpea. For managing the insect apply Nuclear Polyhydrosis Virus 250 L.E. @ 500 litre water per hectare at morning and evening time. Bird perches should

be fixed in the field after every 5 metres. 5 Pheromone traps per hectare are also effective in monitoring the insect. Pheromone septa should be changed after 15 days.

- ♦ If one caterpillar per square metre is observed, then apply Profenophos + Cypermethrin 44 E.C. or Profenophos 50 E.C. @ 1 litre per hectare.

Lathyrus

- ♦ Lathyrus crop is taken in dorsa and kanhar soils of Chhattisgarh, sole as well as relay crop. Improved varieties of lathyrus are advised as follows- Ratan, Prateek and Maha Tiwda.
- ♦ Sowing of lathyrus should be completed between 15th October to 15th November, seed should be sown @ 40-50 kg/ha. In some parts, lathyrus is taken as relay crop or uter or paira and sown in standing crop of rice, in that case, seed rate should be 75-90 kg/ha.
- ♦ Before sowing, seed should be treated by 3-gram Thirum per kg seed, there after by Rhizobium and P.S.B. Culture @ 5 gram per kg seed, then sowing should be done after shade drying. Row to row spacing for sole crop should be 30 cm.
- ♦ 20 kg Nitrogen, 40 kg Phosphorus, 20 kg Potash and 20 kg Sulphur should be applied in the soil at sowing time.

Field pea

- ♦ Following improved varieties of Field pea are advised for cultivation- Ambika, Adarsh (I.P.F. 99-25), Shubhra, Paras, Vikas, Prakash, I.P.F.D.-10-12, Indira Matar-1, I.P.F.D. 12-2 and Pant P 243. Any one of above varieties as per the availability of seed can be taken.
- ♦ Powdery mildew is the common disease of field pea, in the occurrence of this white powdery spots on upper side of leaves appear. For controlling the disease, timely sowing should be done, balanced fertilizer be applied, and Sulphur dust should be used @ 25-30 kg/ha. For spray soluble Sulphur, @3 g/litre water be sprayed as soon as symptoms appear and be repeated after 15 days.

Linseed

- ♦ Prominent recommended varieties of linseed are as follows- R-552, Kiran, T-397, Padmini, Shekhar, Indira Alsí-32, kartika, Deepika, Indravati Alsí, R.L.C.-133, R.L.C.-143, R.L.C.-148, R.L.C.-153.
- ♦ Linseed is an important oilseed crop of Chhattisgarh suitable for cultivation in dorsa and Kanhar (mid lands) soils of Chhattisgarh. In Chhattisgarh, optimum sowing time of linseed is from October to mid-November. Seed rate should be 30 kg/ha for rainfed and 20-25 kg/ha for irrigated condition.
- ♦ Seed should be treated with Carbendazim @ 2 g/kg seed to protect the crop from seed and soil borne disease. Linseed should be sown in the row to row spacing of 25-30 cm in rainfed condition.
- ♦ 40 kg Nitrogen, 20 kg Phosphorus and 20 kg Potash should be applied as basal in rainfed however, in case of irrigated ecosystems 60 kg, Nitrogen, 30 kg Phosphorus and 30 kg Potash should be applied at the time of sowing.

Mustard

- ♦ Mustard is a potential oilseed crop of Chhattisgarh, following improved varieties are recommended for sowing in the state- Pusa Jai Kisan (B.W.-902), Pusa Bold, Kranti (P.R.-15), Vardan (R.K. 1467), Varuna (T-59), Chhattisgarh Sarson-1, Indira Toria-1.
- ♦ Sowing of mustard should be done between 15th October to 15th November, optimum seed rate is 4-5 kg/ha. Before sowing, seed should be treated with Carbendazim @ 1.5-2 g/kg seed. 100 kg Nitrogen, 80 kg Phosphorus and 40 kg Potash is sufficient for good yield. Irrigation should be ensured at branching, flowering, and siliqua formation. Leaf blight is observed in some parts, for controlling the same, seed should be treated before sowing and apply Propeconazole @ 1 ml per litre of water and repeat the spray after 15 days.

Safflower

- ◆ Following varieties have been found suitable for cultivation in Chhattisgarh- A-1, Naari N.H.-1, Naari H-15, H.U.S.-305, Manjeera, P.B.N.S.-12, Naari-6, P.B.N.S.-40, Parbhani Kusum, Phule Kusum (J.L.S.F.-414), S.S.H.-129, Naari-38, S.S.F.-658.
- ◆ In Chhattisgarh, 15th October to 15th November is the most optimum period for safflower sowing. Seed rate should be 10-15 kg/ha. Spacing between row-to-row sowing should be 45 cm. 90 kg Nitrogen, 40 kg Phosphorus and 30 kg Potash should be applied to fulfil the nutritive requirement of the crop.

Lentil

- ◆ Lentil is also an important pulse crop which is grown in dorsa and kanhar soils. Suitable varieties are as follows- Lens-4076, I.P.L.-81 (Noori), J.L.-3, I.P.L.-316, R.V.L. 11-6, L-4717 (Pusa ageti Masoor), R.K.L.14-20 (Kota Masoor-2), L-4727, Kota Masoor-1 (RKL-607-1), Chhattisgarh Masoor-1.
- ◆ Lentil should be sown between 15th October to 15th November, optimum seed rate is 40-45 kg / ha. Seed should be treated with Rhizobium and Trichoderma culture, P.S.B. @ 5-10 grams per kg seed, then after shade drying, sowing be completed. Optimum row to row spacing is 23-25 c.m.
- ◆ 20 Kg. Nitrogen, 40-50 kg Phosphorus, 20 kg Potash and 20 kg Sulphur should be applied for fulfilling nutritional requirement of the crop for potential yield.

Fodder Crops

Maize:

- ◆ Maize is a good fodder crop for well drained sandy loam soils under irrigated condition. It should be sown by the end of February in summer crop and October- November in rabi season crop. Seed rate should be 50-60 kg / ha with 100 kg Nitrogen, 40 kg Phosphorus and 40 kg Potash fertilizer / ha. Half dose of

Nitrogen should be given at sowing time, while remaining half at knee high stage. Following improved varieties are recommended for cultivation in Chhattisgarh- African Tall, Pratap Makka Chari – 6, Vijay, G.F.- 405, J.- 1006.

- ♦ Fodder maize is sensitive for drought and water logging. During summer, irrigation should be given in 10-12 days interval and in rabi 15-20 days interval.

Hybrid Napier

- ♦ Hybrid Napier is a multi-cut perennial fast growing fodder crop. Although maximum fodder production is harvested during rainy season and summer months. This fodder gives higher production, good quality and digestibility. During winter growth becomes slow. Once planted root slips give fodder for 2-3 years by good management. 8 to 9 % crude protein is found in this fodder. Following varieties are recommended for cultivation- C.O. -3, C.O.-5, R.B.N.-13, Sampooran (DNH-6), IGFRI-7 and 10.
- ♦ Under irrigated condition, it should be planted by root or stem cuttings in February- March. Planting should be done in 60 cm row to row and plant to plant spacing, 30000 to 35000 rooted slips are required for one-hectare area. During last field preparation, 20-25 tonnes well-rotted F.Y.M. be incorporated in the soil and during transplanting 60 kg Nitrogen, 50 kg Phosphorus, and 40 kg Potash per hectare should be given basal and 30 kg Nitrogen be given after each cutting. First cut is obtained after 60-75 days of planting and after each 40-45 days 5 to 6 cuttings can be done.

Berseem

- ♦ Berseem is the most important rabi fodder crop since it gives 4 to 5 cuts from November to March. The fodder is very nutritive and liked by the animals, it fixes atmospheric nitrogen into the soil being leguminous crop. It contains 17 to 21% protein, 12 to 15% dry matter and is very digestive. Following varieties are found good for cultivation in Chhattisgarh- Maskavi, Vardan, Bundel

Berseem-2, Bundel Berseem-3, J.B.-5, Pusa Jiant, U.P.B.-110, JHTB 96-4, B.L.-22.

- ◆ Berseem should be sown from 15 October to 15 November for taking 5-6 cuts. Optimum seed rate is 25-30 kg / ha. 20 kg Nitrogen, 80 kg Phosphorus and 40 kg Potash per hectare be applied for good harvest.
- ◆ For weed control Oxyflorfen 0.1 kg a.i. and Emzethapyre 0.1 kg a.i. per hectare should be applied immediately after first harvest. Irrigation be given after 15-20 days interval and in March-April, at the interval of 10 to 12 days.

Vegetable Crops

Tomato:

- ◆ Tomato is taken almost round the year, the following improved varieties are recommended for cultivation in Chhattisgarh- Pusa early Dwarf, Sweet 72, Pusa Ruby, Pusa Gaurav, Naveen, Mangala, C.O.-1, C.O.-2, PantTamatar-3, DVRT-2, C.o.-3, N.S.-815, avinash-2, Selection-7, Arka Rakshhak.
- ◆ Sowing should be completed in October- November, seed should be done @ 400-500 gram / ha in O.P. varieties and 125-150 gram / ha in case of hybrid varieties. Seed should be treated with Thirum @ 2.5 gram / kg seed. 150 kg Nitrogen, 100 kg phosphorus and 75 kg potash should be applied. For controlling Damping Off soil solarization is the most effective measure. Seed should be treated by Thirum@ 2.5 gram per kg seed or Copper Oxy chloride @ 3 gram per kg seed.
- ◆ Seed should be treated by Trichoderma powder or Trichoderma + Pseudomonas @ 8-10 gram per kg seed.

Cauliflower:

- ◆ Following varieties should be selected for sowing during October-November- Early Kunwari, Pusa Kartik, Pusa Dipali, pusa shubha, Pusa Snowball-2, Pusa sharad.

- ◆ Sowing should be completed in September-October at the rate of 400-500 gram per hectare. 150kg Nitrogen, 80 kg Phosphorus and 75 kg Potash be applied.

Cabbage:

- ◆ Following varieties should be selected for sowing during October-November- Golden Acre, Pusa Synthetic, Harirani, Ganesh Gol, Pusa Drumhead, Late drumhead.
- ◆ Sowing should be completed in September-October at the rate of 400-500 gram per hectare. 150kg Nitrogen, 80 kg Phosphorus and 75 kg Potash be applied.

Onion:

- ◆ Following varieties are recommended for cultivation in rabi season in Chhattisgarh- Agrifound Dark Red, N-53, Bheema Super, Bheema Dark Red, Bheema shakti, Bheema shrubhra, Bheema Shweta.



- ◆ Sowing should be completed by 15th November; seed should be applied at the rate of 8-10 kg / ha.

Vegetable Pea:

- ◆ Suitable varieties for Chhattisagrh- Arkel, Jawahar Matar-1, Jawahar Matar-2, Azad Matar -3, Pant sbji Matar-3.
- ◆ Sowing should be completed in October-November at the rate of 80-100 kg / ha.

Chilli:

- ◆ Following varieties are recommended- Pusa Jwala, Pusa Sadabahar, Indira mirch-1, Jawahar Mirch-218.
- ◆ Sowing should be completed in September-October at the rate of 500 grams / ha for normal and 200 grams /ha for hybrids.

Potato:

- ◆ Following varieties are suitable for cultivation- Kufri Khyati, Kufri Pukhraj, Kufri Surya, Kufri Badsahah, Kufri Leema, Kufri Jawahar, Kufri Arun, Kufri Pushkar, Kufri Chipsona-1, Kufri Chipsona-2, Kufri Chipsona-3, Kufri Fryo and Kufri Frysona.
- ◆ For the control of Early blight, apply Copper Oxychloride or Mancozeb @ 3 gram / lr. of water, spray should be repeated after 10-15 days intervals. For late blight, apply Metlaxyl M.Z. @ 1 gram per litre of water and repeat the same after 10-15 days intervals 3 times.

Livestock and Fisheries:

Animal Husbandry:

- ◆ Animal Vaccinations Pre-Winter needs to be done. Vaccination against Foot and Mouth Disease in Cattle, Buffalo, Sheep, Goat and Pigs is to be repeated since it is given pre-monsoon and prewinter, twice in a year. Sheep and Goats to be vaccinated against Enterotoxaemia, Goat Pox and PPR disease during early months of

Rabi season say Early Sept. to Oct. For poultry, vaccination schedule is to be followed as per age of the birds regardless of season.

- ♦ Artificial Insemination needs to be continued. For this, farmers should check their animals for signs of heat, especially during winter when the symptoms of heat are sometimes obscure. It is always advised to contact veterinary officer or para veterinary worker and get the animal inseminated at home instead of taking them to veterinary hospital, this becomes more relevant due to the current Covid Pandemic situation.
- ♦ To maintain productivity and improve immune status of animals, farmers are suggested for regular supplementation of mineral minute - 60g/ day in adult dairy animals and 20-30g in small ruminants.
- ♦ Try to deworm animals using broad spectrum dewormer as per advice of veterinary doctor & remove ecto-parasites using safe insecticide sprays, one to two weeks prior to vaccination. When applying insecticide spray it is important to dilute them in water as per recommendation of the manufacturer and proper mask needs to be worn by the person using the spray.
- ♦ The frequency of washing and bathing animals should be reduced during peak winter months. Animal housing needs to be strengthened so that cold exposure to animals may be minimized. This is especially important for northern parts of the state.
- ♦ Demand for meat and meat products increases during winter season and farmers need to plan their production cycle so that they can sell their meat animals during this season. Poultry and Goat farmers need to increase the fat and carbohydrate portion of the diet of animals so as to increase their body weight faster and fetch more market price.
- ♦ Farmers should practice physical distancing, regular washing of hands and wearing mask whenever they go to market for sale and purchase of farm produce. Give preference to online marketing

channels and prefer selling direct to customer to fetch more price and this also reduces going to crowded marketplaces.

Fodder Cultivation and Preservation

- ♦ Sowing of Fodder Crops like Maize, Jowar, Oat etc. and Leguminous fodder crops like Barseem, Lucerne and Cowpea etc. should be initiated with the onset of Rabi Season. Procurement of seed, land preparation and inputs required for cultivation of fodder crops should be started as early as possible.
- ♦ During the late part of Rabi season, when harvesting of crops are done, it is highly advised to preserve fodder for summer season when there is imminent scarcity of fodder for livestock. For central and southern parts of Chhattisgarh making 'hay' is advised while in northern cooler parts of the state, making 'silage', along with 'hay' is advised.
- ♦ For making hay crops like oat, napier, lucerne, berseem, peas, cowpea, chick pea, field bean, are suitable and for silage making crops like maize, jowar, para grass and Napier are most suitable for the state.
- ♦ Paddy straw needs to be stored as dry fodder in quantities sufficient to cover entire winter and summer till monsoon. Enrichment of paddy straw by urea treatment should be undertaken. Neem coated urea can also be used for this purpose.
- ♦ Feed requirement for animals and human being is generally more during winter. Increase the animal ration by 5-10% during winter season to maintain production of animals.
- ♦ Take special care so that agricultural pesticides and disinfectants do not get mixed with animal feed and fodder even in little quantities.

Cattle and Buffalo

- ♦ In Chhattisgarh as per the breeding policy Artificial Insemination is preferred in rural areas using Indian Cattle Milch Breeds - Gir, Red Sindhi and Sahiwal and Dual Breed – Tharparker, Ongole,

Kankrej and Harijana while in semiurban area Cross Breeding with half bred Jersey and HF is advised. In urban areas and large dairy farms depending on the rearing condition and market demand AI services is advised.

- ♦ Purchase of animals for dairy farming is advised during early months of Rabi season because of suitability of climate, high availability of green fodder and possibility of getting Kisan Credit Card linked loans from financial institutions is more soon after Kharif season is over, and MSP are released.
- ♦ Animals need protection from cold winds especially during night. Open sheds need to be partially covered using gunny bags and adequate bedding materials. However, proper ventilation is important in cattle shed in winter especially in northern and southern parts of the state which tends to get suffocative.
- ♦ Provide green succulent forage together with leguminous hay or straw to the extent of animal can consume, so that all its maintenance requirements are met with through forage only. Extra concentrate at the rate of 1 kg for every 2 to 2.5 litres of milk should be provided. Salt and mineral supplements should be given to maintain the lactation.
- ♦ High milking breeds require calcium supplementation in order to prevent metabolic diseases like milk fever and ketosis.
- ♦ Water requirement decreases a little during winter. However, in very cold periods warm water must be provided. Watch individual animal for symptoms of mucous secretion from muzzle, sneezing, cough or difficulty in breathing, in the event of which immediate veterinary aid should be sought.
- ♦ Provide at least 60 - 90 days dry period between calving. If the dry period is not sufficient, the milk yield in subsequent lactation will be reduced. Extra concentrate mix of 1.25 to 1.75 kg should be provided for pregnant animal as pregnancy allowance.
- ♦ Wallowing of buffaloes in water is best avoided in winter months.

- ◆ Feed laxative about 3 - 5 days before and after calving (Wheat bran 3 kg + 0.5 gm of Groundnut cake + 100 gm of mineral mixture of salt).
- ◆ Cattle and buffaloes are not seasonal breeders, hence care and management of pregnant animals, during parturition, after parturition and care and handling of newborn calf is as recommended throughout the year. However, since research indicates more incidence of dystokia in winter, farmers are advised to be more vigilant and keep veterinary officer informed beforehand regarding the scheduled date of parturition.

Small Ruminants (Goats)

- ◆ Farmers are advised to start preparing for breeding of sheep and goats in Rabi season by increasing ration for breedable male and female goats and keeping close observation for signs of heat. Being seasonal breeders, they tend to breed from September to November but may continue to February. This is more prominent in northern Chhattisgarh while in rest of the state, being truly tropical they breed throughout the year.
- ◆ Goat farmers of Central and North Chhattisgarh may choose among breeds like Jamunapari, Beetal and Sirohi while Southern regions may prefer Black Bengal instead of Sirohi. Farmers need to upgrade their desi nondescript goat stocks with male of these breeds.
- ◆ The males should be replaced or exchanged once in two years to avoid inbreeding. Hence, all replacements should be done before the onset of Rabi so that the new animal inducted may have sufficient time for acclimatization.
- ◆ In order to synchronize them improved hormonal technology may be used, or buck may be in a partitioned corral of woven-wire net so that the does and the buck may have full view of each other. This may be done a week or two before or during the breeding season.

- ♦ Efforts should always be made to avoid kidding during the peak winter season of January month which can be practically achieved by a planned breeding avoiding summer season within a specified period between 15th May to 15th June. This will save the kids from cold susceptibility and resultant pneumonic death during winter.
- ♦ Goats are particularly sensitive to cold and winter rains triggers many diseases. Farmers of northern regions of the state should provide covered night shelters during peak winter but should not use fireplace or sigri to warm the closed shelter because this may lead to quick accumulation of noxious gasses and can be life threatening.
- ♦ Small and weak animals should be covered with a body cover made from jute gunny bags or cotton cloth. Such animals should be given warm water with added jiggery.
- ♦ The beddings of animals need to be replaced more frequently during Rabi. This will protect them from cold as well as diseases especially parasitic diseases.
- ♦ In this season due to close contact of herding animals like sheep and goats' infectious diseases spreads faster. Farmers need to be vigilant for off-feed animals and symptoms like running nose, sneezing, and coughing.
- ♦ During this season, to escape from severe winter, large flocks of migratory sheep and goats arrive from parts of HP, UP, Gujrat and Rajasthan into the central parts of Chhattisgarh through MP and Maharashtra. All such flocks, if not previously, need to be vaccinated against HS, FMD, PPR and Enterotoxaemia and quarantined for 15 days at border areas. Local sheep and goat farmers should make every attempt not to allow their own flocks to mix with these migratory herds.

Commercial and Backyard Poultry

- ♦ Commercial large poultry farms have little seasonal variation in their rearing practice. However, due to increased market demand

they should plan their production cycle so that their output increases by a significant margin to gain more profits, loess stocking and cater to consumer requirement.

- ♦ Commercial poultry farmers should adhere strictly to their vaccination schedule which is dependent on age of birds rather than seasonality. However, Rural Backyard Poultry Farmers need to vaccinate their birds against Ranikhet Disease and Fowl Pox.
- ♦ Due to proximity of birds in winter communicable disease spreads very fast. Hence strict daily vigil must be done for a sample of birds in large farm or each and individual bird in the flocks reared under backyard condition. If disease symptoms like drooping, ruffled feathers, coryza, discoloration or pock marks erupting in comb and wattles, diarrhea with white or reddish discoloration are observed the birds need to be quarantined immediately for 5-7 days or till full recovery is attained as per advice of registered veterinary practitioner or para-veterinary personnel under supervision.
- ♦ Deworming of backyard poultry with any broad spectrum dewormer is advised before onset of Rabi as per veterinary advice and prevalence of parasitic diseases in the area.
- ♦ Disinfect the premises of poultry houses with 1% sodium hypochlorite and restrict the entry of any outsider to the poultry houses and premises.
- ♦ The moisture and quality of the litter materials in poultry shed need to be maintained to prevent coccidiosis infestation.
- ♦ Migratory Birds arrive in parts of Eastern Central Chhattisgarh from parts of Odisha and Northern Chhattisgarh from parts of North India. Hence, poultry farmers must be vigilant not to allow their poultry in direct or indirect contact with the migratory birds. In case of any unusual death of migratory, poultry or any other birds in the area farmers should immediately inform nearest Veterinary Officer.

Fisheries

- ♦ Farmers are advised to stock larger size advanced fingerlings in the perennial stocking ponds, community ponds and reservoirs.
- ♦ Every month in Rabi fish farmers need to apply lime at the rate of 10 Kg per acre in perennial water bodies.
- ♦ Organic and inorganic fertilizers should be applied for production of natural feeds. Doses should be decided as per organic carbon content in the soil.
- ♦ Fishes should be fed supplementary feed at the rate of 10% body weight along with natural feed.
- ♦ Supplementation of Vitamin and Mineral Mixture at the rate of 1% of feed weight (1 Kg per 100 Kg feed) should be continued.
- ♦ Netting should be done monthly to release the noxious gasses from the pond bottom for observing fishes for disease symptoms and recording growth of fishes for calculating feed required.
- ♦ Since in Rabi rain and other water sources from catchment area generally decreases hence alternative ground water source should be made ready.
- ♦ To have regular annual income fish farmers are advised to adopt Integrated Fish farming model. Under this initiative, due to decreasing water level in water bodies, especially during later part of Rabi, combining fisheries with poultry, duck farming and goatery is advised.
- ♦ During winter months feed requirement for fish decreases, hence farmers are advised to decrease the feeding quantity as winter temperature decreases.
- ♦ During mid Rabi there is increased demand for fish and fish products. Hence, farmers should plan their production cycle so that they harvest maximum during that period to gain more economically.

ANDHRA PRADESH

Rice

- ◆ Varieties recommended during *rabi*

North Coast	Pushkala, Cottondora sannalu, Nellore Mahsuri, Sri Druthi, Tarangini, Chandra, Sujatha, Sasya, Nellore Dhanyarasi
High altitude zone	Cottondora sannalu, Pushkala, Tarangini, Chandra, Nellore Mahsuri, Nellore Sugandha, Swetha, Sri Druthi
Godavari zone	Cottondora sannalu, Prabhat, Nellore Mahsuri, Tarangini, Chandra, Sri druthi, Nellore Mahsuri, Sujatha, Sasya, Nellore Dhanyarasi, Nellore Sugandha, Swetha
Krishna zone	Cottondora sannalu, Vijetha, IR 64, Tarangini, Chandra, Sri Druthi, Nellore Sona, Jagityala Sannalu, Nellore Mahsuri
Southern zone	Nellore Siri, Nellore Sona, Swarnamukhi, Cottondora sannalu, Nellore Mahsuri, Tarangini, Swetha, Nellore Dhanyarasi, Nellore Sugandha
Scarce rainfall zone	Nandyala sannalu, Nandyala Sona, Nellore Mahsuri, Cottondora sannalu, Swetha, Nellore Dhanyarasi, Chandra

- ◆ Sowing can be taken up to 15th December with a seed rate of 20-25 kg in case of transplanted rice.
- ◆ Apply 2 kg Nitrogen (4.4 kg of Urea), 1 kg of P_2O_5 (6.25 kg of SSP) and 1kg of K_2O (1.6 kg of MOP) for a nursery bed of 5 cents (200 m²). Apply total P & K fertilizers and $\frac{1}{2}$ N as basal (before final leveling and thoroughly mixed in the soil). Apply the remaining $\frac{1}{2}$ N at 10-15 days after sowing depending up on seedling growth.

- ◆ Fertilizer application to the main field

Zone	(Kg/acre)		
	N	P	K
North Coastal Zone	48	24	18
High altitude zone	48	24	16
Godavari zone	72	36	24
Krishna Zone	72	36	24
Southern zone	48	24	16
Scarce rainfall zone	96	32	32

- ◆ Apply entire ' P_2O_5 ' & ' K_2O ' as basal while ' N ' in three equal splits (Basal + Active tillering + Panicle initiation stage). In light textured soils apply ' K_2O ' in two splits half at basal and half at panicle initiation along with 2nd top dressing of ' N '.
- ◆ Apply Zinc Sulphate @ 50 Kg / ha to avoid the Zn deficiency. Deficiency in the standing crop can be corrected by spraying zinc sulphate @ 0.2% (2 g / l of water). The spraying should be repeated at 5 days interval depending on the severity of the problem.
- ◆ The crop should be maintained weed free especially till 45 DAT. Hand weeding at 20 and 40 days after transplanting in areas where sufficient manual labour is available.
- ◆ To overcome weed problem, apply any one of the following herbicides while keeping thin film of water. Butachlor @ 1.25 liters / acre (or) Anilophos @ 500 ml/acre (or) Pretilachlor @ 600 ml / acre (or) Oxadiargyl @ 40 grams (mixed with one litre of water) within 3 to 5 days of transplanting or spray Pyrazosulfuran ethyl @ 80-100 g/ acre at 8-12 DAT or Bensulfuron methyl @ 35 g / acre as pre to post emergence or 2,4- D SS @400 g / acre at 20-25 DAT to control broadleaved weeds.
- ◆ For managing BPH Spray acephate @ 1.5 g or monocrotophos @ 2.2 ml or ethofenprox @ 2.0 ml or fenobucarb @ 2.0 ml or imidacloprid @ 0.25 ml or thiamethoxam @ 0.2 g or Buprofuzin 1.6ml or Imidacloprid+ Ethiprol 80WG 0.25g or Pymetrogen 0.6g

per litre of water. Spray fluid (200 litres/acre) should be directed towards the base of the plant.

- ◆ For the control of stem borer Spray Cartap hydrochloride 50 WP 2.0 g or acephate 1.5 g or profenophos 2.0 ml or Chlorantrinirole 0.4 ml/litre of water (or) apply cartaphydrochloride 4G @ 8 kg/acre when the adult moths/egg masses @ one/ sq.m are noticed in the field.
- ◆ For managing gall midge apply phorate 10G @ 12.5 kg/ha or carbofuran 3 G @ 25 kg/ha at 15 DAT in 1– 2 inches of standing water.
- ◆ For managing sheath blight 45 days after transplanting of rice, spray hexaconazole (2 ml) or propiconazole (1ml) per liter of water.
- ◆ For managing leaf blast. after initiation of symptoms under favourable conditions spray Tricyclazole 75 WP (0.6 g /ml) or Isoprothiolane 40 EC (1.5 ml/l). For the control of neck blast after the panicle emergence, the same fungicides may be sprayed once.
- ◆ In areas, where false smut is endemic, spray propiconazole 25 EC 1ml/l or Carbendazim 50 WP 1g/l during evening hours at 50% panicle emergence and flowering stage.

Maize

- ◆ Improved hybrids \ varieties
 - **Hybrids:**
 - **Long duration** (100-120 days) DHM 113, 900 M Gold, 30 B 07, NK-30, Bio 9681, NK 6240, Pro-311, MCH 36, SMH 3904 and JKMH 2492.
 - **Medium duration** (90-100 days) DHM 111, DHM 117, DHM 119, DHM 121, Kohinoor, Prabhal, Bisco 855, JKMH 175, Bio 9637, MCH 2, KH 510, KH 9541, KMH 25K60 and S 6217.
 - **Short duration** (<90 days) DHM 115, Pioneer 3342, KH 5991, DKC 7074 R, JKMH 1701, MMH 133, Bio 605 and Sun Vaman.

- ♦ Specialty corn
 - Hybrids
 - **Sweet corn:** Sugar 75, Bright Gene
 - **Popcorn:** BPCH 6
 - **Baby corn:** HM 4, DHM 115, Prakash, HIM 128, PEH-1 & PEH-2.
- ♦ **Varieties:**
 - **Sweet corn:** Madhuri, Priya, Win Orange, Almora sweet corn.
 - **Popcorn:** Amber popcorn, Pearl popcorn, VL popcorn
 - **Baby corn:** VL 42, Him 123, Him 129, Madhuri, VL78, JH 3459 & VL Baby corn 1
- ♦ Seed treatment is to be done with Captan or Mancozeb @ 3 g/kg of seed with a seed rate of 8kg/acre for normal hybrids and 4 kg/acre for sweet corn. Sowing time for *rabi* is between October 15 and November 15.
- ♦ Basal application of FYM to be given @10 t/acre. Nitrogen may be applied in four splits *viz.*, at sowing, knee high stage (30-35 DAS), at flag leaf emergence (50-55 DAS) and at tasseling-silking stage (60-65 DAS). 20 kg of commercial zinc sulphate per acre may be applied if soils are known to be deficient in available zinc. If deficient symptoms appear later, the crop can be sprayed with 0.2% (2g/l) solution of zinc sulphate.
- ♦ Fertilizer dose

Type	(Kg/acre)		
	N	P	K
Normal hybrids	100	35	35
Sweet corn	80	25	20
Pop corn	40	25	20
Baby corn	75	25	20

- ◆ Pre-emergence spraying with Atrazine 50 W.P. @ 800g - 1.2 kg/acre depending on soil type effectively controls most of the broad-leaved weeds for about 3-4 weeks. As post emergence application at 20-25 days of crop period or 4 leaf stage of weeds, spraying of Atrazine or 2,4-D Sodium salt 80 WP @ 400g or Tembotrione @ 120 ml + Atrazine 400g or Halosulfuron @ 40 g/acre in 200 lit of water will effectively control weeds. After 30-35 days, crop may be inter-cultivated and earthing up is done.
- ◆ For the management of stem borer in endemic areas, prophylactic spraying of Monocrotophos 36 SL @ 1.6 ml/l or Chlorantraniliprole 20 SC @ 0.3 ml/l when the crop is 10-12 days old and application of Carbofuran 3 G in leaf whorls @ 3 kg/acre is recommended when the crop is 25-30 days old.
- ◆ For the management of fall army worm, spraying of 5% (5ml/l) neem oil to control egg masses and first instar larvae or spraying of chlorpyrifos 25 EC 400 ml or Quinolophos 25EC 400ml in 200 litres of water per acre is recommended. The spray should be directed into whorls. When the infestation is heavy, Emamectin benzoate 5SG @80g (0.4g/l) or Spinosad 45SE @60ml (0.3 ml/l) in 200 lit of water should be sprayed per acre. Poison baiting is effective in controlling later instar larvae. 10 kg rice bran + 2kg jaggery in 2 lit of water are mixed and fermented for 24 hrs. Next day 100g Thiodicarb is mixed and dropped in the whorls of the plants.

Pulses

- ◆ Varieties:
 - Green gram (*Vigna radiata*)
 - Rabi-Uplands: LGG 460, LGG 407, TM 96-2, WGG 42, IPM 2-14.
 - Rice fallows: LGG 460, TM 96-2, LGG 410, LGG 407, IPM 2-14.
 - Summer: LGG 460, LGG 407, WGG 42, IPM 2-14.

- Blackgram (*Vigna mungo*)
 - Rabi-Uplands: GBG 1, TBG 104, LBG 787, LBG 752, LBG 685, LBG 645, LBG 709, LBG 20, T9, PU 31.
 - Rice fallows: LBG 648, LBG 645, LBG 685, LBG 709, LBG 752, LBG 787, TBG 104, GBG 1.
 - Summer: GBG 1, TBG 104, LBG 787, LBG 752, PU 31.

♦ **Sowing time:**

Crop	Rabi uplands	Rice fallows	Summer
Greengram/ Blackgram	First fortnight of October	2 nd fortnight of Nov to first fortnight of Dec	Mid-February to mid of March (uplands) March 15 th to March ending. (Rice fallows)

♦ **Seed rate:**

Crop	Rabi uplands	Rice fallows	Summer
Greengram	15-16 kg/ha	30-32 kg/ha	16-18 kg/ha
Blackgram	18 -20 kg/ha	40-45 kg/ha	20 kg/ha

- ♦ **Seed treatment:** Treat the seed with captan/ thiram / mancozeb / carbendazim 2.5 g per kg seed and imidacloprid 600 FS @ 5 ml or thiamethoxam 70 WS @ 5g /kg seed 24-48 hours before sowing to protect the crop from sucking pests and diseases upto 15-20 days after sowing. First treat the seed with fungicide and allow to dry for 30 – 60 min, then treat the seed with insecticide and dry them in shade. Later treat the seed with *rhizobium* 20 g/kg seed before one hour of sowing.
- ♦ **Spacing:** 30 x 10 cm
- ♦ **Manures and fertilizers:** 20 N + 50 P₂O₅ kg/ha as basal dose
- ♦ **Weed Control:** Spray pendimethalin at 2.5 to 3.5 l/ha immediately after sowing or the next day to check the weed growth for the first 20-25 days. Post-emergence application of (if needed) imazethapyr

500 ml/ha at 20-25 days after sowing will control all weed flora. If only grassy weeds are a problem spray quizalofop ethyl 1.0 l/ha.

♦ **Sucking pest management**

- *Thrips*: Spray either monocrotophos 1.6 ml or acephate 1.0 g or fipronil 1.5 ml or dimethoate 2.0 ml or spinosad 0.3 ml or acetamiprid 0.2 g or thiamethoxam 0.2 g per litre.
- *Whitefly*: Foliar application of 5 % NSKE at 20 DAS as prophylactic spray against whitefly that transmits YMV. Spray monocrotophos 1.6 ml or acetamiprid 0.2 g or diafenthiuron 50 WP @ 1.25 g per litre
- *Aphids*: Spray either acephate 1.0 g or monocrotophos 1.6 ml or imidacloprid 0.3 ml or acetamiprid 0.2 g per litre.
- *Maruca management*: Application of 5% NSKE or neem oil @ 5 ml/l should be taken up before flower bud initiation or at 35 DAS to avoid egg laying by Maruca adults. Spray either thiodicarb 75 WP @ 1.0 g/l or profenophos 50 EC @ 2.0 ml/l which has ovicidal action at the time of flower initiation. First spray with ovicides should be given one week before flower initiation as and when the adult population is noticed in the crop. Spray acephate 1.0 g or chloropyriphos 2.5 ml or quinalphos 2.0 ml or thiodicarb 1.0 g per litre at the time of flowering stage. In case of severe incidence spray either novaluron 1.0 ml or spinosad 0.3 ml or emamectin benzoate 0.4 g or chlorantraniliprole 0.3 ml or flubendiamide @ 0.2 ml/l

- ♦ **Anthracnose, Cercospora leaf spot**: Seed treatment with captan/ thiram/mancozeb/ carbendazim 2.5 g per kg seed. Spray carbendazim 0.1% or mancozeb 0.25% or hexaconazole 0.2% by alternating the chemicals twice at 10 days interval.

- ♦ **Powdery mildew**: Spray carbendazim 0.1% or thiophanate methyl 0.1% or hexaconazole 0.2% or propiconazole 0.1% twice at 10 days interval soon after noticing the disease.

Bengal gram

♦ Varieties

- *Desi*: Nandyal Gram 452 (NBeG 452), Nandyal Gram 49 (NBeG 49), Dheera (NBeG 47), Nandyala Sanaga1 (NBeG 3), JG 11 and JAKI 9218.
- *Kabuli*: Nandyala Gram 119 (NBeG 119), KAK 2, Vihar (Phule G 95311) and LBeG 7 (Lam sanaga), Extra-large seeded kabuli: MNK 1

♦ Sowing: October to November

♦ Seed rate: 85-90 kg/ha (desi); 100-110 kg/ha (kabuli); 130-150 kg/ha (Extra-large seed kabuli)

♦ Fertilizers: 20 kg N, 50 kg P₂O₅, 40 kg S/ha as basal dose.

♦ Weed Control: spray pendimethalin at 2.5 to 3.5 l/ha immediately after sowing or the next day to check the weed growth for the first 20-25 days.

♦ Irrigation: Rainfed, but one or two light irrigations at branching and pod formation stage will increase the yields by 15-20%.

♦ Management of fruit borer: Use neem formulations for insect repelling (NSKE 5%) or neem oil 2.5 l/ha soon after the pest occurrence. Use bio-pesticides like Bt 1 kg/ha and NPV 500 LE/ha twice at an interval of 7-10 days in the evening hours. If necessary, spray thiodicarb 1 g or spinosad 0.35 ml or rynaxypyr 0.2 ml or indoxacarb @ 1 ml or flubendiamide 0.25 ml per litre of water.

♦ Management of wilt and dry rot: Seed treatment with *Trichoderma* (8 g/kg) or captan or thiram 2.5 g/kg seed or Carbendazim 3 g/kg or Tebuconazole 1.5 g/kg. Apply developed *Trichoderma viride* (80 kg well decomposed FYM + 20 kg neem cake + 2- 3kg *Trichoderma viride* incubate for 25-30 days in shade) at the time of sowing.

Groundnut

♦ Varieties:

Rabi (Nov- Dec sowings)	Dheeraj, Kadiri 6, Dharani, Narayani, ICGV 91114, Abhaya, Prasuna, Nitya Haritha, Kadiri Amaravathi, Kadiri Harithandra, Bheema, Kadiri7 and Kadiri 8 bold, TAG 24, Greeshma and Rohini
Rabi-rice fallows (Jan sowings)	Kadiri 6, Narayani, Dharani, Dheeraj, TAG 24, Rohini and Greeshma
Coastal sands	Kadiri-6, Greeshma, TAG-24, Narayani, Dharani, Rohini

- ♦ **Seed treatment:** Seed should be treated with Imidacloprid 600 FS @ 2 ml + 4ml of water / kg seed followed by Tebuconazole 2%DS @ 1g or Mancozeb @ 3 g / kg seed. *Trichoderma viride* seed treatment @ 8 g/kg seed is to be given against soil borne diseases.

♦ Sowing time:

Region	Rabi
North coastal Andhra	November to December
Rayalaseema	November to December. Best time- 1 st fortnight of December

- ♦ **Fertilizer recommendations:** Application of 8 N + 16 P₂O₅ + 20 K₂O kg/ac as basal and 4N kg/ac at flowering. Application of Gypsum @ 200 kg /ac at flowering stage by placement. Spraying of multi micronutrient mixture @ 1Kg /ac in 200 litres of water at 30 and 60 DAS to avoid deficiency in the crop.
- ♦ **Weed management:** Crop must be kept weed free up to 45 days after sowing. Hand weeding should be done at 20 and 40 DAS. The crop should not be disturbed by weeding or intercultivation after 45 DAS. Pre-emergence application of Butachlor /Alachlor@ 1 litre or Pendimethalin @ 1.3 – 1.6 litres/ac followed by one intercultivation or one hand weeding at 25 DAS will effectively control the weeds. Wherever pre-emergence herbicides could not be applied, post-emergence application of Imazethaphyr @ 300 ml/

ac controls broad leaved weeds and grasses. For the control of only grassy weeds application of Quizalofop Ethyl @ 400ml /ac at 20 DAS when the weeds are at 2-5 weed leaf stage is recommended.

- ♦ **Leaf miner:** Keeping pheromone traps in the field @ 10 per acre. Spray Quinalphos 25 EC @400 ml or Monocrotophos 36 SL @ 320 ml per ac in 200 litres of water should be followed.
- ♦ **Sucking pests (Jassids, Aphids and Thrips):** Spraying of Monocrotophos 36 SL @ 320 ml or Dimethoate 30 EC@ 400 ml or Imidacloprid 17.8 SL@ 60 ml per ac in 200 litres of water
- ♦ **Tikka leaf spot:** Seed treatment with Tebuconazole 2 % DS @ 1 g or mancozeb @ 3 g/kg of seed. Spraying of Mancozeb 75 WP @ 400 g + Carbendazim 50 WP@ 200 g /ac or Hexaconazole 5 SC @ 400 ml or Chlorothalonil 75 WP @ 400 g or Tebuconazole 25.9 EC @ 200 ml/ac in 200 litres of water at fortnightly intervals from first disease appearance.
- ♦ **Rust:** Seed treatment with Tebuconazole 2 % DS @ 1g or 3 g of Mancozeb/kg of seed. Spraying of Mancozeb @ 400 g or Chlorothalonil @ 400 g or Tridemorph @ 400 g /ac in 200 litres of water at 15 days interval starting from disease appearance.
- ♦ **Peanut bud necrosis disease:** Spraying of monocrotophos @ 320 ml or Dimethoate @ 400 ml or Imidachloprid @ 60 ml/ac in 200 litres of water at 25-30 days after sowing. Maintenance of recommended plant population 44 plants /m² in *Rabi*.

Sugar cane

♦ Varieties:

a. Early maturing	85 A261, 84 A 125, Co 8014, 83 A 30, 87 A 298, 99 V 30, 86 V 96, 91 V 83, 2000 V 59, 2003 V 46, 93 A 145, 97A 85, 2001 A 63, 2003A 255, 2005A 128, 2009V 127 (Ranga) and 2005T 16.
b. Mid-late maturing	Co T 8201, Co A 7602, Co 7805, 83 V 15, 86 A 146, 88 A 162, 2002 V 48, 98 A 163 and 2000 A 225
c. Late maturing	Co 7219, Co 7706 and 87 A 380

- ♦ **Seed rate:** 16,000 three budded setts @ 4 tonnes per acre. Seed from short crop of 6-7 months age ensures good germination and improve cane yield by 2-3 tonnes/acre.
- ♦ **Seed sett treatment:** Dip the setts in carbendazim (0.5 g/l) and chlorpyrifos 20 EC (2 ml/l) or dimethoate (2ml/l) or imidacloprid 48% FS @ 1 ml/l for 15 minutes to eliminate pineapple disease and scale insect.
- ♦ **Spacing:** 80 cm between rows for early varieties and 90 cm for mid-late varieties. Adopt paired row planting (60cm x 120 cm) to promote mechanization and drip irrigation.
- ♦ **Time of planting:**
 - Early varieties: December – January
 - Mid varieties: February
 - Late varieties: March
- ♦ **Fertilizer management:**
 - **Plant crop:** 100 kg P_2O_5 and 120 kg K_2O /ha as basal and 168 kg N/ha in two equal split doses at 45th and 90th day after planting by pocketing.
 - **Ratoon crop:** 100 kg P_2O_5 and 168 kg K_2O and 280 kg N/ha. Entire dose of P_2O_5 and K_2O with 140 kg N at the time of ratooning and the remaining 140 kg N at 45 days after ratooning. Zinc sulphate (2g / l) and ferrous sulphate (10-20 g/l) as foliar spray at 45- 60 days after planting where zinc and iron deficiencies are observed.
- ♦ **Weed management:** Spray Atrazine @ 2 kg/acre or metribuzine @ 600 g/acre in 450 l of water on the third or fourth day after planting, depending on soil moisture. Spray 2,4-D (1.8 kg) + Gramoxone (1.0 l) in 450 l/ac at 20 & 60 DAP between cane rows with hood to protect the crop or spray metribuzine @ 400 g + 2,4-D Sodium salt @ 800 g /acre at 25-30 DAP as blanket application. For the control of creeper weeds spray metsulfuran methyl + chlorimuron ethyl (Almix) @ 8.0 g/acre at 75 days after planting.

- ♦ **Early shoot borer management:** Application of carbofuran 3 G @ 13.0 kg/acre or Fipronil 0.3 G @ 10 kg/acre or chlorantriliprole @ 9kg/acre at the time of planting. Trash mulching @ 1.25 t/acre at 3 days after planting in plant crop and immediately after stubble shaving in ratoon crop. Spray chlorpyrifos (2.5 ml/l) or monocrotophos (1.6 ml/l) or acephate (1g/l) at 4, 6 and 9 weeks after planting with 450, 675 and 900 liters of spray fluid respectively.
- ♦ **Control of scale insect:** Dip the three budded setts in malathion (2 ml/l) or dimethoate (2 ml/l) for 15 minutes before planting. Detrash the cane in the first week of July, August and September months followed by spraying with dimethoate 1.7 ml/l or malathion 3 ml/l.
- ♦ **Smut management:** Avoid second ratoon if incidence is severe. Treat three budded setts in hot water at 52° C for two hours followed by dipping setts in carbendazim. Select seed material from disease free areas atleast 40m away from affected fields. Treat the setts with azoxystrobin + tebuconazole (1ml/l) or propiconazole (1 ml/l) or hexaconazole (2ml/L) for 15 minutes before planting. Spray propiconazole (1.0 ml/L) immediately after ratooning and 30 days after 1st spray in ratoon crop.
- ♦ **Management of red rot:** Select healthy seed material from disease free areas. Avoid ratooning of infected plant crop. Keep the crop erect without lodging by trash twist propping. Soil application of *Trichoderma asperellum* @ 5 kg along with 200 kg FYM to reduce the soil inoculums of red rot as well as soil borne pathogens.

Sesame

- ♦ **Varieties recommended:** Gouri, Madhavi, Varaha, Gowtham and Sarada
- ♦ **Sowing time:** Rabi / Summer: Dec. 15 – January 31
- ♦ **Seed rate:** 2.4 kg / acre
- ♦ **Seed treatment:** Treat the seed with thiram /Captan/mancozeb @ 3 g/ kg seed against soil borne diseases. Against sucking pests, use

Imidachloprid @ 5 ml or thiamethoxam @ 5 g per kg seed.

- ♦ **Sowing:** Line sowing with a spacing of 30 cm between the rows and 15 cm between the plants is preferable.
- ♦ **Manures and Fertilizers:** Farmyard manure 4 t, 16 kg nitrogen, 8 kg phosphorus and 8 kg potash need to be applied per acre. Farmyard manure, entire phosphorus & potash and $\frac{1}{2}$ of the nitrogen need to be applied as basal. The remaining $\frac{1}{2}$ nitrogen is to be applied at flowering stage (30-35 DAS) followed by irrigation as top dressing.
- ♦ **Thinning:** Thinning is to be done 15 days after sowing leaving single plant per hill
- ♦ **Weeding & Inter cultivation:** Pendimethalin @ 4-5 ml/ l is to be applied within 48 hrs after sowing. Intercultivation with gorru is to be practiced at 20-25 DAS.
- ♦ **Management of Leaf webber cum capsule borer:** Spray chlorpyrifos @ 2.5 ml or Monocrotophos @ 1.6 ml per litre of water.
- ♦ **Management of root rot:** Remove the effected plants and destroy. Drench the soil with copper oxychloride @ 3 ml per litre of water at the base of the plants.
- ♦ **Management of Powdery Mildew:** Occurs mostly in *rabi* / summer season. Spray wettable sulphur @ 3g / litre of water.

Horticultural Crops

Mango

- ♦ Application of Paclobutrazol @ 10 g a.i. for non-bearing trees during first fortnight of September will induce flowering and fruit set yield during off years.
- ♦ Spray NAA @ 20 ppm during November December and February for better flowering, fruit setting, fruit retention.
- ♦ During February 0.5% Urea (5 g/l) or 1% Potassium Nitrate (10g/l) may be sprayed to induce flowering if trees do not flower by that time.

- ◆ Spraying of 2% KNO₃ at mustard size of fruit will increase the fruit set and retention of fruits.
- ◆ Spraying two rounds of acephate 75 SP@ 1g/l or phosalone 35 EC @ 1.5 ml/l or carbaryl 50 WP 2 g/l or phosphamidon 40SL 2 ml/l of water will control hopper. First spray at the time of panicle emergence and the second two weeks after first spray.
- ◆ Wettable sulphur @ 2 g/lit may be sprayed after spraying carbaryl to avoid mite resurgence.
- ◆ Install pheromone traps @10/ha for the control of fruit fly.

Banana

- ◆ De suckering and earthing up around the pseudo stem.
- ◆ Application of second and third dose of fertilizers @ 110g Urea and 80g Muriate of potash per plant along with light irrigation.
- ◆ Staking and earthing up for bunch emerging plants.
- ◆ Spraying of KNO₃ or Sulphate of Potash @ 5g/l after 5 and 15 days of bunch emergence.

Cashew

- ◆ Spray Chloripyrifos 2.5 ml/l or Monocrotophos 1.6ml/l during new flush, Spray profenophos 2ml/l or Acephate 1.5g/l + 2g/l Hexaconazole during flowering and spray Lamda Cyhalothrin 2.6ml/l + Hexaconazole 2g/ l during fruit developing stage to control tea mosquito bug.
- ◆ Spray KNO₃@ 5g/l during flowering and fruiting for better fruit set and retention.

Coconut

- ◆ Installation of pheromone traps @ 4/ha for the control of Rhinoceros beetle and red palm weevil.
- ◆ Application of Trichoderma @50g/tree + 5Kg Neem cake/tree for prevention and control of Ganoderma disease.

Advisories in veterinary sector

Cattle and Buffaloes

- ◆ This is breeding season for buffaloes. So, farmers are advised to observe carefully for oestrus symptoms and AI can be done after 12 hours of onset of oestrus.
- ◆ This is also calving season particularly for buffaloes. So, care of the mother at calving and newborn calves must be taken up.
- ◆ The teats of lactating animals are cleaned with lukewarm water daily before and after milking and cleaned with dry towel.
- ◆ All the animals must be vaccinated against Foot and Mouth Disease vaccine during December-January and March-April without fail.
- ◆ Animals must be protected from mosquitoes and other arthropod vectors.
- ◆ Sufficient green fodder in the form of silage can be stored during rainy seasons in rain fed areas.

Sheep & Goat

- ◆ Ewes will be given additional concentrate of 200g/head to improve breeding during this season.
- ◆ Bluetongue virus vaccination is to be given.
- ◆ Fogging with neem leaves around sheep shed / premises may be taken up for controlling arthropod vectors. Animal waste should be disposed far away from the sheds
- ◆ Mosquito nets can be used for protecting sheep from vectors.
- ◆ Proper cleaning of foot / hooves with KMnO₄ lotion and application of boric ointment is advised against foot rot disease.
- ◆ Lambing season continues during this period. Care of newborn lambs, creep feeding, supplementary feeding of lactating ewes, deworming, flushing of breeding ewes for next mating season are to be taken up.

Poultry

- ◆ Proper lighting is to be maintained inside poultry shed especially during night times.
- ◆ Vaccination of flock against new castle disease is advised.
- ◆ Avoid contamination of water

Fisheries

Fish and Shrimp farming farmers

- ◆ Follow strict principles of pond preparation (drying, spraying lime, ploughing, etc.). This will help to kill all the bacterial and viral pathogens from previous culture.
- ◆ Fertilisation is to be carried out in the pond one week prior to stocking. Basal Application of 3t/ha of raw cow dung mixed with SSP @ 10kg/t of cow dung. Application of poultry manure at 1.5 to 2 t/ha also ensures adequate plankton growth.
- ◆ Disease free fish seed should be stocked.
- ◆ Before stocking into grow out ponds, the fish seed should be treated with salt solution, acclimatized, and then released into ponds.
- ◆ During cloudy days or summer, the fishes come up gulping for air due to poor DO in water. During this time, DO enhancers like aeration using aerators or chemicals (calcium peroxide and hydrogen peroxide) are to be used.
- ◆ Use of probiotic bacteria containing Bacillus and Lactobacillus as probiotics source during pond preparation and culture period may be helpful.
- ◆ Cost of feed is the major expenditure in fish and shrimp culture. Provide optimal quantity of feed and avoid excessive feeding.
- ◆ Feed should be stored in cool and dry place. Don't store the feed for long time and check for any mould formation before using it.
- ◆ Fishes and shrimps should be sampled once in every fortnight to check the health condition and growth.

- ◆ For the treatment of fish diseases like myxobolus or tail and fin rot, application of salt @ 40 to 60 kgs is advised per acre for every 15 days or application of 200 grams per acre of potassium permanganate can also be done.
- ◆ Application of probiotics through feed will improve the disease resistance to fish and shrimp.
- ◆ Harvesting equipment needs to be sanitized with 100 ppm chlorinated water or potassium permanganate or Iodine before and after using into the farm.
- ◆ After harvesting the fish and shrimp, they should be iced in the ratio of 1:1 (fish: ice) in insulated boxes.

TELANGANA

Rice

- ♦ Select short duration varieties *i.e.*, Talanaga Sona (RNR 15048), Batukamma (JGL 18047), Kunaram Sannalu (KNM 118), Tellahamsa (RNR 10754), Cottondora Sannalu (MTU 1010) and Nelluri Mashuri (NLR 34449).
- ♦ Treat the seed with Carbendazim @ 3 g. per kg of seed before sowing. For Wet nursery, soak the seeds in Carbendazim solution @ 1 g. per litre of water for 24 hours and sprouted seeds are broadcasted into nursery plot.
- ♦ For *rabi* puddled wet nursery, use sprouted rice seedlings. For 200 m² nursery apply additional 2 quintals of poultry manure or sheep manure or vermicompost as basal along with recommended dose of fertilizers (N and K). Double the dose of Phosphorus during basal application.
- ♦ To protect the nursery from severe cold, cover the nursery during evening hours with polythene sheets or polywoven Urea bag sheets supported by steel rods or bamboo sticks and remove the sheets during morning.
- ♦ To correct zinc deficiency, spray Zinc Sulphate @ 2g per liter of water. Spray a combination of Carbendazim + Mancozeb 2g/ kg of Urea whenever application of Urea is there. Irrigate the field during evening hours and drain the water in the morning.
- ♦ To control Blast in Rabi rice nurseries, spray Tricyclazole @ 0.6 g per liter of water.
- ♦ To control Stem borer, spray Cartap Hydrochloride 50 S.P @ 2 g. or Chlorantriliprole @ 0.3 ml per liter of water.
- ♦ To control Leaf folder, spray Cartap hydrochloride @ 2 g. per litre of water

- ♦ To control Rice whorl maggot, spray Fipronil (5 SC) @ 2.5 ml per liter water or apply Cartap Hydrochloride granules @ 8 kg per acre.
- ♦ If False smut noticed, spray two times, Propiconazole @ 1 ml or Carbendazim 50 WP @ 1 g. or Tebuconazole + Tryfloxystrobin 75 WG @ 0.4 g. per litre of water once at heading stage and again one week after first spray.
- ♦ To control Panicle mite, spray Dicofol @ 5ml + Propiconazole @ 1 ml or Spiromesifen @ 1 ml + Propiconazole @ 1 ml per litre of water.
- ♦ To control Neck blast, spray Tricyclazole @ 0.6 g. or Isoprothiolane @ 1.5 ml or Kasugamycin @ 2.5 ml per litre of water. Spray again with an interval of 10-15 days based on severity of incidence and prevailing environmental conditions.
- ♦ If Sheath blight is noticed, spray Hexaconazole 5 E.C or 5 S.C @ 2ml or Propiconazole @ 1 ml or Tebuconazole @ 1 ml + Tryfloxystrobin 75 WG @ 0.4 g. per litre of water two times at an interval of 15 days.

Maize

- ♦ Recommended time of sowing October to November. In rice fallow maize zero tillage system, up to December.
- ♦ Use Medium duration (DHM 117, DHM 119, DHM 121, Bisco 855, Bio 9637, Karimnagar Makka 1, JKMh 4848, Karimnagar Makka and Short duration hybrids (DHM-115, Pioneer 3342, KH 5991, DKC 7074 for profitable yields.
- ♦ Time of sowing *Yasangi*: October to November. In rice fallow maize zero tillage system, up to December is preferable.
- ♦ Fertilizer requirement: 80-100 kg N, 32 kg P_2O_5 , 32 kg K_2O per acre is recommended. Nitrogen may be applied in four splits *viz.*, at sowing, knee high stage (30-35 DAS), at flag leaf emergence (50-55 DAS) and at tasseling-silking stage (60-65 DAS). Apply 20 kg of Zinc sulphate per acre for every 2-3 seasons. If symptoms appear later, the crop can be sprayed with 2 g/l solution of Zinc sulphate.

- ♦ Four to six irrigations are needed during the Yasangi season. Two irrigations up to flowering at an interval of 20-25 days, one at the time of flowering, two after flowering and one at the early grain filling stage. If five irrigations are given, one irrigation at the vegetative stage may be avoided and if only four irrigations are given, one irrigation after the dough stage may be avoided. The irrigation schedule may however be changed suitably based on the soil conditions.
- ♦ Integrated pest management is the best option for management of FAW viz., summer ploughing, growing single cross hybrids, clean cultivation, intercropping with pulses, balanced application of fertilizers, release of egg parasitoids (*Trichogrammasp*) and as a last resort spray Chlorantraniliprole @ 0.4 ml or Spinetoram @ 0.5 ml or Emamectin benzoate @ 0.4 g/l of water in plant whorls.
- ♦ For Post Flowering Stalk Rots, invariably to go for crop rotation, removing plant debris, summer ploughing, application of balanced K fertilizer, avoiding moisture stress after flowering and growing tolerant hybrids should be followed.
- ♦ For zero tillage maize Dibble the seed after harvesting *Vanakalam* rice at 2-3 cm depth, in optimum moisture, or else, give light irrigation before dibbling depending on the soil type.
- ♦ Spraying of Combination of Gramoxone 1.0 l/ac and Atrazine 1.0 kg/ac can also be used for controlling re-growth of rice stubbles and broad-leaved weeds.

Groundnut

- ♦ **Seed treatment:** Seed treatment with Tebuconazole @ 1g or Mancozeb @ 3g per kg of seed. At places where stem rot is common, treat the seeds with Imidacloprid (600 F.S) @ 1 ml in 7 ml of water per kg of seed before sowing. Wherever severe root grub incidence is common, seed treatment should be done with Chlorpyrifos @ 6.5 ml before sowing. For newly sown Groundnut fields or Groundnut sown under previous paddy fields, treat the seeds with

Rhizobium culture @ 200 g. per kgs of seed for 1 acre. At places where dry root rot and stem rot is common treat the seed with *Trichoderma* @ 10 g. per kg of seed for better control.

- ◆ For efficient weed control, spray pre-emergence herbicides such as Alachlor @ 1litre or Pendimethalin (30% EC) @ 1.30-1.60 litres per 200 liters of water, immediately after sowing or 2-3 days after sowing. Inter cultivation should be done 25-30 days after sowing. Maintain weed free conditions in the field up to 45 days after sowing.
- ◆ To control Spodoptera, install 4-5 Pheromone traps per acre. Spray 5% NSKE solution to control early-stage larvae. To control later stage larvae spray Novaluron @ 200ml or Flubendiamide @ 400 ml per 200 liters of water per acre. Use Poison bait pellets prepared with rice bran 5 kg + Jaggery 0.5 kg + 500 ml Monochrotophos and broadcast them in field at evening hours.
- ◆ To manage Tikka leaf spot, spray Chlorothalonil @ 400 g. or Tebuconazole @ 200 ml per 200 litre per acre.
- ◆ To control leaf folder Spray Chlorpyrifos @ 500 ml or Acephate @ 300 g per 200 liters of water per acre.

Chickpea

- ◆ Sowing should be done in rows with spacing of 30 x 10 cm to maintain optimum plant population of 30-35 plants /sq.mt. to get good yields.
- ◆ Use of Wilt resistant varieties suitable for mechanical harvesting JG-11, JAKI- 9218, NBeG-3, NBeg-47.
- ◆ Under late sowing situations, higher plant densities are recommended upto 44 plants /m² through increased seed rate and zig zag sowings
- ◆ Optimum time of sowing is October –November.
- ◆ For the prevention of soil and seed borne diseases-damping off, seed rot, wilt, dry root rot and better yield seed should be treated

with fungicides and antifungal bio agents. Captan or Thiram @ 3 g or Mancozeb or Carbendazim @ 2.5 g per kg seed.

- ♦ Pre emergence Spray of Pendimethalin @ 2.5 to 3.5 l/ha immediately after sowing or within 24 hrs of sowing will be effective in controlling the seasonal weeds.
- ♦ Apply 20 kg N, 50 Kg P₂O₅, 40 kg S/ha as basal dose at the time of last ploughing. Phosphate should be given in form of Super phosphate.
- ♦ One or two light irrigations at pre flowering at 30-35 days and seed formation at 55-65 days will increase yields. Avoid water logging at any cost as chickpea is very sensitive to poor soil aeration.
- ♦ Foliar sprays of 2 % DAP or Urea at pre flowering stage will enhance yields.
- ♦ Spray Chloropyrifos @ 2.5 ml or Quinolphos @ 2.0ml/l for control of leaf eating caterpillar.

Sesame

- ♦ Sesame can be grown on a wide range of soils but well drained light to medium textured soils is preferred.
- ♦ Keep the field weed free and perfectly levelled to avoid water logging to which sesame is highly sensitive.
- ♦ For the prevention of seed borne diseases, use treated seed with Carbendazim @ 3 g/kg of seed
- ♦ Time of sowing for summer crop is January Second Fortnight to February first fortnight.
- ♦ The crop is very sensitive to weed competition during the first 20-25 days. Two weedings, one after 15-20 days of sowing and other at 30-35 days after sowing are required to keep the field weed free and to make moisture and nutrients available to the crop.
- ♦ For Summer crop give the irrigation, immediately after sowing to improve germination and plant establishment. The subsequent irrigations may be given at an interval of 12-15 days depending on

the soil type, weather conditions and season. For good seed filling and yield, irrigations at flower initiation and capsule formation are essentially required.

Sunflower

- ◆ Sunflower performs well on a wide range of soils such as sandy loams, black soils and alluvials. It prefers mostly fertile, well-drained neutral soils. It can tolerate slight alkaline conditions but not acidity. Water logging areas should be avoided for its cultivation.
- ◆ Light period of 8-10 hrs during flowering and seed filling stage improves yield and oil content.
- ◆ During Yasangi season and under Zero tillage conditions, optimum sowing time is November- December. For Summer season 2nd fortnight of January to 1st fortnight of February is optimum time.
- ◆ Seed treatment with Thiomethaxom @ 3 gm / kg seed or Imidacloprid @ 5 ml /kg seed can protect the crop against necrosis. For the control of Alternaria leaf spot, seed treatment with Iprodione 25% + Carbendazim 25 % @ 2 g per kg seed is to be done.
- ◆ For Weed control used pre-emergence application of Oxadiargil @ 150g per acre within 24-48 hrs after sowing on wet soil.
- ◆ Apply 5-7.5 tonnes of FYM/compost/ha 2-3 weeks prior to sowing. It is desirable to apply fertilizers based on soil test values. Apply 50% N and 100% P & K as basal and remaining N as in two doses.
- ◆ Apply Gypsum @ 55 kg/acre in sulphur deficit soils which improves the oil content. Boron is an essential micronutrient for sunflower, which increases seed filling and yield. Apply Borax @ 2g/l as directed spray to capitulum at star bud stage. First dissolve borax in hot water and make up to the required volume.
- ◆ Bud initiation stage (35-40 DAS), flower opening stage (55-65 DAS) and seed filling stage (65-80 DAS) are the most critical stages in sunflower. Moisture stress at these stages causes significant yield reduction. During Yasangi season by adopting drip irrigation

method which can be scheduled for every 2-3 days can save 20-25 % of irrigation water.

- ◆ When sunflower is raised in isolated areas, birds particularly parrots pose serious problem. It is desirable to take up sunflower cultivation in large continuous blocks of 20-25 acres. Crop should be protected from seed filling to harvest through effective bird scaring particularly in the morning and evening hours. Tying of reflective ribbons above the crop will supplement the bird scaring.

Safflower

- ◆ Safflower requires cool and dry climate during its entire growing season. High temperatures at the time of flowering are harmful to the crop. At all the stages of growth, excessive rainfall or humidity increases the infestation of fungal diseases.
- ◆ Some of the important diseases of safflower like Fusarium wilt can be transmitted through seeds. Therefore, it is always advisable to treat the seeds with appropriate fungicide like Thiram, Captan @ 3 g/kg seed or with Carbendizim @ 1g/kg seed.
- ◆ Planting time for safflower September 2nd fortnight to October 1st fortnight. Under extended rainfall situations, the crop can be sown till end of October to first week of November.
- ◆ Well drained deep black soils are most suitable. The crop can come up well even in light textured soils provided irrigation facility is available. Alkaline reaction favors wilt disease.
- ◆ Cultivation of cotton after safflower or vice-versa should be avoided as it results in poor yields and inefficient exploitation of nutrients because of their identical rooting habits.
- ◆ Under Rainfed conditions, the entire recommended fertilizers are to be applied as basal. In the traditional single cropped yasangi tracts of the state, application of recommended fertilizers 2-3 weeks prior to optimum planting time is recommended for maximum efficiency under receding soil moisture.

- ♦ The flowering and grain filling stages are more sensitive to water stress conditions. One irrigation 30 days after planting helps in better growth of the crop. In soils that crack, apply irrigation well before cracks develop for better control of water.
- ♦ First 20 to 35 days are critical for crop –weed competition. Alachlor 50% or Pedimethalin 30% 2.5 l /ha.as Pre-Emergence is recommended. Harrowing at 25 DAS and 45 to 50 DAS not only controls weeds, but also conserves the soil moisture.
- ♦ Spray of Dimethoate @ 2ml or Monocrotophos @1.6ml or Chlorpyrifos @ 2.5 ml at 40 and 60 DAS is recommended to control aphids.

Horticultural Crops

Sweet orange

- ♦ Incidence of Dry root rot is noticed in sweet orange. If noticed initially, irrigate the field and next day drench the soil near tree base with Carbendazim @ 2 g. or Mancozeb @ 3 g. per litre of water or 1% Bordeaux Mixture. Use more of Organic fertilizers such as green manures and apply the mixture of 1 Kg of *Trichoderma* culture with 90 kg farmyard manure and 10 kg Neem powder incubated for 15 days near tree base @ 10 kg mixture per plant. Spray Urea @ 1 kg per 100 litres of water.
- ♦ Micronutrient deficiency was observed at some places. To correct it spray Formula-4 @ 5 g per litre of water on young flush and fruit at peas size stage.
- ♦ To manage mangu mite, spray water soluble Sulphur @ 3 g or Propargite @ 1 ml per litre of water, two times with an interval of 15 days.
- ♦ To control Leaf Folder in Sweet Orange, Spray Neem oil @ 5 ml (1000 ppm) per litre of water and if incidence becomes severe spray Profenophos 50 E.C @ 2 ml or Imidacloprid 17.8 S. L @ 0.5 ml or Novluron 10 E.C @ 0.7 ml or Thiomethaxom 25 W.G @ 0.3 g. + Dichlorvos 76 E.C @ 0.5 ml per litre of water. Spray chemical

pesticides 14 days after Neem Oil Spray for efficient control of insect.

- ◆ Intercultivation should not be done when the tree is in Flowering and Fruiting stage.
- ◆ Irrigation should be done regularly as the Temperatures rises.
- ◆ 2,4-D @ 15 ppm. (1 g per 100 liters) should be sprayed at the time of Flowering, one month after Fruiting and one month before harvesting the fruits.
- ◆ To control Stem end rot in Sweet Orange, Spray Carbendazim @ 1 g. per litre of Water.
- ◆ Apply Bordeaux paste on broken branches and stems of sweet orange and Acid lime after hail storms to avoid Fungal infections.

Acid lime

- ◆ If dry root rot is noticed initially, irrigate the field and next day drench the soil near tree base with Carbendazim @ 2 g. or Mancozeb @ 3 g. per litre of water or 1% Bordeaux Mixture. Use more of Organic fertilizers such as green manures and apply the mixture of 1 Kg of Trichoderma culture with 90 kg farmyard manure and 10 kg Neem powder incubated for 15 days near tree base @ 10 kg mixture per plant. Spray Urea @ 1 kg per 100 litres of water.
- ◆ To control Canker disease use Balaji, resistant variety. Cut the infected branches, Spray 2 to 3 times streptocyclin @ 1 g and Copper oxy chloride @ 30 g per 10 liter of water with an interval of 20 days. Apply Bordeaux mixture on infected stem base and branches after scraping of infected bark.
- ◆ Apply Bordeaux paste on broken branches and stems after hailstorms to avoid Fungal infections.

Mango

- ◆ Spray KNO₃ @ 10 g per litre of water and Boron @ 1.25 g per litre of water separately for uniform flowering and fruiting.
- ◆ To manage sucking pests in mango, first burn the dropped fruits

and spray 2 times Chlorpyrifos @ 2ml or Dichlorvos @ 1.5 ml or Carbaryl @ 3 g + Neem oil (1500 ppm) @ 2.5ml per liter of water with an interval of 15 days.

- ◆ Low temperatures, cloudy weather and higher atmospheric humidity favours the incidence of mango hoppers. To control them spray Dimethoate @ 2 ml or Chlorpyrifos @ 2.5 ml per litre of water at flower initiation and fruit formation stages.
- ◆ Low night temperatures and hot day temperatures favours the incidence of Powdery mildew in mango. To control, spray water soluble Sulphur @ 3 g or Kerathane @ 1 ml or Myclobutanil @ 1 g or Hexaconazole @ 2 ml per litre of water.
- ◆ Spray Naphthalene Acetic Acid @ 20 ppm twice during January to February to reduce flower drop.
- ◆ Spray KNO₃ (13-0-45) @ 10 g per liter of water to retain marble sized fruits.
- ◆ To control flower and fruit drop due to prevailing weather conditions spray 2 times 1 % Urea (10g/liter), once at marble size fruits and another at 20 days after first spray or spray 1 % KNO₃ (10g/liter).
- ◆ To increase the fruit size in Mango Spray 10 g. 13-0-45 + 1.25 g. Boron per Litre of water.
- ◆ To control Mango fruit fly, apply Parathion around the tree basin @ 50-100 g. per tree to control pupae in the soil. To attract adult flies, arrange white or Yellow Methyl eugenol traps @ 4 per acre. Application of Poison bait that is mixture of 50 ml Malathion and 200 g. Molasses or Jaggery in 2 litres of water across the field to attract the adult fruit flies.

Livestock and dairy

- ◆ Deworming of all the adult stock with broad spectrum antihelmintic, Albendazole (Dose: 10 mg/ kg Body weight) during Last week of September.

- ◆ FMD vaccine during month of September.
- ◆ Segregation of animals viz., animals in milk production, Dry, pregnant, non- pregnant and heifers.
- ◆ Feeding regimen is followed as per the production and body weight of the animals.
- ◆ Dry fodder: 7 Kg, Green fodder: 10 -15 kg, concentrate mixture: 2Kg, Mineral mixture: 100 gm (can meet the requirements of an animal producing 5 litres of milk) is the ration to be given.
- ◆ For every additional 2.5 kg milk production for cows provide 1 kg concentrate mixture and buffaloes give 1 kg for every 2 kg milk production.
- ◆ Special care should be taken in case of pregnant and animals in advanced pregnancy and early lactating animals.
- ◆ Breeding animals should be observed morning and evening for heat symptoms.
- ◆ Teaser bull can be employed in the herd for detecting the animals in heat.
- ◆ Feeding of colostrum to the newborn within twelve hours of calving (1/10th of body weight).
- ◆ Provide tender leafy fodder to the calves for early development of Rumen.
- ◆ Calf starter may be given from 3rd day onwards to 2-3 weeks before weaning.
- ◆ Deworming on 14th day, 35th day 56th day and monthly repeated up to six months of age. Later, deworming should be done every six months' interval (Piperzine adipate: 10mg/kg body weight, Albendazole: 7.5 to 10 mg/kg body weight).
- ◆ After attaining the age of six months, FMD vaccine is to be given during September.

Sheep and Goat

- ◆ Rotational deworming at quarterly interval is advised.
- ◆ PPR vaccine during the month of September yearly once both in sheep and goats.
- ◆ Extensive and semi-intensive system of rearing is practiced in Telangana state.
- ◆ Green fodder may be given as per the availability.
- ◆ Flushing must be followed to improve lambing rate in the flock (Flushing is feeding 150 to 200 gm of concentrate mixture to breedable population two weeks before breeding season).
- ◆ For every 20 breedable ewes on breeding Ram should be provided in the flock.
- ◆ Naval dressing with povidine/ Betadine immediately after birth.
- ◆ Lambs must be accessible to the mother for feeding colostrum within twelve hours of lambing.
- ◆ Antibiotic treatment during change of weather.

Poultry

- ◆ In commercial poultry farms, farmers should follow the breed specific regimens advised by the breeder from time to time for both broilers and layers.
- ◆ For backyard poultry Varieties like Rajasree, Vanaraja, Giriraja Gramapriya, Sreenidhi etc. are available in Telangana.
- ◆ Those opting for one day old chicks should have facility for rearing ie., poultry shed, waterers, feeders, and well-balanced ration for better growth.
- ◆ Standard vaccination schedule as advised by the agency may be followed.

Fisheries

- ◆ Provide optimal quantity of feed based on biomass calculation to avoid excessive feeding, since cost of feed is the major expenditure in fish culture.
- ◆ Feed should be stored in cool and dry places. Don't store the feed for long time and also check for any mould formation before using it.
- ◆ Fish feeding rate in water bodies should be at 2-3 % of body weight. Use of aerators or pumping water from bottom to top using motor pumps or disturbing the pond water through boat motor is essential.
- ◆ Application of Hydrogen peroxide at 600 grams per acre to improve DO level
- ◆ Apply Zeolite at 50 kg/ha to prevent the occurrences of Toxic gases (Ammonia and Carbon monoxide) mixed with 20 to 25 Kg sand and broadcast uniformly throughout the pond.
- ◆ Application of water sanitizers [potassium permanganate (400 grams/acre), salt (30 to 60 kg per acre), benzalkonium chloride (1 liter per acre)].
- ◆ Reduce high stocking density
 - ◆ Spray Iodine solution (10%) at 1 litre/acre/4 feet depth or Formalin (32%) at 1 litre per acre
- ◆ Use of disinfected and sundried feeding bags.
- ◆ Cleaning of pond dykes from grass
- ◆ Application of Trichlorofon (0.25-0.5 ppm) at 150 ml per acre once a week for 4 weeks through water.
- ◆ Mixing of Ivermectine at 10 grams per ton of fish biomass for 7 days through feed.

TAMIL NADU AND PUDUCHERRY

Rice

- ♦ Varieties recommended for *Rabi* season

Season and month	Varieties
Late Samba, Thaladi, Pishanam, Late Pishanam	VGD 1, TKM 13, CO 52, CO (R) 50, ADT 39, ADT 38, ADT 49, CO 43, CO 43 sub.1, Improved White Ponni, ADT (R) 46, TRY 3, CO(RH) 4, TPS 3, CR1009
Navarai	ADT 53, CO 51, ADT (R) 45, TPS 5, MDU 6, ADT 36, ADT 37, CORH 3, ASD 16, TKM 9

- ♦ *Nursery management*

- Recommended nursery area: 20 cents /ha, seed rate: 30 kg for long, 40 kg for medium and 60 kg for short duration varieties, 20 kg for hybrids, 5-7 kg for single seedling and 12 -15 kg for two seedlings planting under SRI, 75 kg for dry seeded rice.
- Seed treatment: Soak the seeds in Carbendazim or Pyroquilon or Tricyclozole solution @ 2 g/kg seeds/l water for 10 hours and drain excess water.
- Treat seeds with talc-based *Bacillus subtilis* @10g/kg of seed and soak in 1 litre of water overnight.
- Bio-fertilizers: Soak the seeds in a solution containing 1 kg each of *Azospirillum* and *Phosphobacteria* or 1kg of *Azophos bioinoculants* overnight.
- Weed management in nursery: Apply Pyrazosulfuron ethyl @ 20 g/ha on 3rd-4th DAS (OR) apply pre-emergence herbicide Butachlor 1.0 l/ha (or) Pendimethalin 1.0 l/ha on 8 DAS
- Fertilizers: Apply 40 kg DAP as basal or after 10 DAS; 4 kg of gypsum/cent for clayey soils; 100 g ZnSO₄/cent.
- For dry nursery raised seedlings, dip in 2% ZnSO₄ or ZnO for 30 min before transplanting.

- Direct seeding: Use TNAU rice cum green manure seeder for wet seeded puddled lowland rice cultivation. Sow pre-germinated paddy and Dhaincha in alternate rows in puddled soil and incorporate Dhaincha after one month.

♦ *Main field*

- Dip the seedling roots in a slurry containing 1 kg each of Azospirillum and Phosphobacteria or 1 kg Azophos inoculant in 40 litres of water for 15-30 minutes and transplant.
- Apply 2 kg each of Azospirillum and Phosphobacteria (or) Azophos, Silicate solubilizing bacteria / Potash bacteria with 25 kg of FYM /ha. Apply Bacillus subtilis at 2.5 kg/ha mixed with 50 kg FYM.
- Apply soil test based fertilizers or blanket application of 150:50:50 kg N:P₂O₅:K₂O/ha for short duration; 120:40:40 kg/ha for medium duration varieties; 175:60:60 kg/ha for hybrid rice; 50:25:25 kg/ha for dry seeded rice; 75:25:37.5 kg/ha for dry seeded rice with supplemental irrigation and 75:50:37.5 kg/ha for dry seeded irrigated rice. Full P to be applied as basal and incorporated; N and K to be applied in four equal splits viz., basal, tillering, panicle initiation and heading stages.
- Apply 25 kg/ha ZnSO₄ as basal before transplanting. For Cauvery delta zone, apply 5 kg/ha CuSO₄.
- Foliar spray 1% urea + 2% MAP + 1% KCl at panicle initiation and 10 days after first spray to improve grain filling rate and yield in all varieties.
- Weed management: Butachlor 1.25 kg/ha or Anilophos 0.4 kg/ha as pre-emergence application (OR) Butachlor 0.6 kg + 2,4 DEE 0.75 kg/ha (OR) Anilophos + 2, 4 DEE 'ready-mix' at 0.4 kg/ha (OR) pretilachlor at 1.0 kg/ha (OR) Pyrazosulfuron ethyl @ 20 g/ha on 3 DAT (OR) butachlor 0.75 kg/ha + bensulfuron methyl 50 g/ha on 3 DAT (OR) Oxadiazon 87.5 g/ha followed by Post emergence 2,4-D 1 kg/ha. Post emergence herbicide 2,4-D sodium salt 1.25 kg/ha in 625 litres, three

weeks after transplanting or when the weeds are in 3 - 4 leaf stage. Early post emergence application of Bispyribac sodium 40 g/ha at 2-3 leaf stage of weeds.

- Gall midge management: Distribute *Platygaster oryzae* parasitised galls at 1 per 10 m² on 10 days after transplanting, when natural parasitisation is noticed in abundance. Spray Carbosulfan 25% EC 800-1000 ml (OR) Chlorpyrifos 20% EC 1250 ml (OR) Fipronil 5% SC 1000-1500 g (OR) Fipronil 0.3% G 16.67 - 25 kg (OR) Quinalphos 5% G 5 kg (OR) Thiamethoxam 25% WG 100 g/ha
- False smut management: Two sprays with propiconazole 25 EC @ 500 ml/ha or copper hydroxide 77 WP @ 1.25 kg/ha at boot leaf and 50% flowering stages (OR) Two sprays with copper hydroxide 77 WP @ 2.0 kg/ha at boot leaf and 50% flowering stages

Sorghum

- ♦ Varieties: CO 30, CO 32 and K 12

Pearl millet

- ♦ Varieties: CO 10 and Hybrid CO 9; Remove ergot affected seeds by soaking in 10 % salt solution and removing the floating seeds.

Finger millet

- ♦ Varieties: CO (Ra) 14, CO 15, ML 365, Paiyur 2 and ATL 1

Maize

- ♦ Hybrid CO 6, COH(M) 8 and COH(M) 9; Apply 135:62.5:50 kg/ha N:P₂O₅:K₂O for varieties and 250:75:75 kg/ha for hybrids. Apply TNAU MN mixture @ 30 kg/ha as enriched FYM (Prepare enriched FYM at 1:10 ratio MN mixture and FYM; mix at friable moisture and incubate for one month in shade (OR) 12.5 kg of micronutrient mixture of Department of Agriculture. Apply Atrazine @ 0.50 kg/ha as pre-emergence herbicide on 3-5 DAS followed by 2,4-D @

1 kg/ha on 20-25 DAS; Follow the IPM for FAW management. Raise green manure intercrops & incorporate. Foliar application of TNAU maize maxim @ 7.5 kg/ha during tassel initiation and @ 7.5 kg/ha during grain filling stages to enhance seed filling.

Redgram

- ♦ Varieties: Co (Rg) 7, CO 8 and VBN(Rg) 3; Treat the seeds with Carbendazim or Thiram @ 2 g/kg of seed 24 hours before sowing (or) with talc formulation of *Trichoderma viride* @ 4g/kg of seed (or) *Bacillus subtilis* @ 10 g/kg seed; Pre emergence application of Pendimethalin 0.75 kg/ha (2.5 litres/ha) on 3 DAS

Blackgram and greengram

- ♦ Blackgram varieties: VBN 6, MDU 1, CO 6, VBN 8, VBN 10; Co 7 rice fallow: ADT 3, ADT 6, KKM 1, VBN 6, VBN 9.
- ♦ Greengram varieties: Co (Gg) 7, VBN(Gg) 2, VBN(Gg) 3, CO 8, VBN 4; Rice fallow: ADT 3
- ♦ Treat the seeds with Carbendazim or Thiram @ 2 g/kg of seed 24 hours before sowing (OR) with talc formulation of *Trichoderma viride* @ 4g/kg of seed (OR) *Bacillus subtilis* @ 10g/kg seed. Treat the seeds with 200 g each of Rhizobial culture COG 15, Phosphobacteria and PGPR (*Bacillus subtilis* sp.) using rice gruel, shade dry it before sowing. (or) 25 g each of each of powder formulation of Rhizobium and AM fungi using binder (polymer), shade dry before sowing.
- ♦ Sowing with seed drill maintains optimum plant population; Installation of micro sprinklers, application of pre-emergence herbicides or early hand weeding before 15-20 DAS; Installation of traps; Foliar spray of TNAU Pulses Wonder @ 5 kg/ha during peak flowering stage; mechanical harvest.

Horse gram

- ♦ Variety: Paiyur 2, CRIDA 18R and CRIDA 19 R

Groundnut

- ♦ Varieties: TMVGn 13, VRI(Gn) 6, VRI 8, CO 7, TMV 14, Dharani, BSR 2
- ♦ Apply TNAU MN mixture @ 7.5 kg /ha as Enriched FYM (Prepare enriched FYM at 1:10 ratio of MN mixture & FYM; mix at friable moisture & incubate for one month in shade). Broadcast evenly on the soil surface immediately after sowing. Do not incorporate micronutrient mixture into the soil.
- ♦ Pre-emergence application of Pendimethalin @ 1.0 l/ha
- ♦ Apply gypsum @ 400 kg/ha on 40 to 70 DAS depending upon duration of the variety and soil moisture.
- ♦ Raise one row of cowpea for every five rows of groundnut wherever the red hairy caterpillar is endemic. To manage root rot, treat the seeds with carbendazim @ 2 g/kg or Trichoderma asperellum @ 4 g/kg or Bacillus subtilis @ 10 g/kg of seeds.
- ♦ Soil application of Bacillus subtilis @ 2.5 kg/ha with 50 kg of well decomposed FYM / sand at 30 DAS.
- ♦ Foliar spray of TNAU Groundnut Rich @ 5 kg/ ha during flowering and pod formation stage.

Sesame

- ♦ Varieties: VRI(Sv) 2, TMV 7, VRI 3; Seed treatment with Trichoderma @4g/kg of seed, Bacillus subtilis @ 2 g/kg seed or NSKE 4%. Intercropping of Sesamum + Redgram (6:1) for additional net returns.
- ♦ Apply 35:23:23 kg N:P₂O₅:K₂O /ha and TNAU micronutrient mixture @ 12.5 kg/ha as enriched FYM. Thinning of excess seedlings to be done to induce basal branching.

Sugarcane

- ♦ Intercrop with Dhaincha / Sunnhemp in wider rows and incorporate. Use power weeder with rotavator for weeding and earthing up with ridger to save the cost of cultivation. Trash

mulching to avoid incidence of early shoot borer. Foliar spray of Sugarcane booster

Banana

- ♦ Treat the suckers for 5 minutes in carbendazim 0.1%. Sow sunnhemp/ Marigold on the 45th day; incorporate after a month. At the time of planting tissue cultured banana, apply 25 g *Bacillus subtilis* / plant. Apply 25 kg ZnSO₄ basally.
- ♦ From 4/5th month of planting foliar spray 75 g of banana special in 15 litres of water (about 12 kg/ac) at monthly intervals on the whole plant till the bunch formation and there after two sprays on the bunches
- ♦ Apply press mud @ 15 t/ha (5 kg/pit) or neem cake @ 1.5 t/ha (500 g/pit) during planting to reduce nematode build up.

Guava

- ♦ Nematode management: Use air layers and sterilized soil media. Adopt soil less media (vermiculite and coir pith) in nursery. Intercrop with marigold around the basin of the tree. Apply *Purpureocillium lilacinum* @ 60 g mixed with FYM 5 kg and neem cake @ 250 g per tree once in three months.
- ♦ Spray *Beauveria bassiana* @ 5g/lit during flowering stage to control tea mosquito bug.

Papaya

- ♦ Raise papaya seedlings in insect proof net house and spray with a systemic insecticide 3 days before transplanting to manage papaya ringspot virus
- ♦ Drench the soil with 1% Bordeaux mixture or metalaxyl @ 0.2% at fortnightly intervals 2 to 4 times to manage root rot/wilt.
- ♦ For papaya ringspot disease vector management, spray dimethoate @1.5 ml / l at monthly intervals up to 5 months after planting followed by 0.5% ZnSO₄ + 0.1% boron at 4th and 7th month after planting.

Mango

- ◆ Remove overlapping, intercrossing, diseased, dried, and weak branches in old trees to get good sunlight and aeration. Carry out judicious pruning of the internal branches during August – September, once in three years
- ◆ Management of gummosis in mango: Remove infected twigs, branches, and spray tebuconazole @ 0.1% at 15 days interval.
- ◆ Foliar spray IIHR mango special (2 pre-flowering and 2 post flowering sprays @ 0.5%)
- ◆ Fruit fly Management: Fruit fly management using Methyl eugenol traps @ 25/ha
- ◆ Mango special and Methyl eugenol traps are available with KVK, Krishnagiri
- ◆ To induce off-season flowering, heading back of 10 cm terminal growth after the emergence of new growth (vegetative and floral growth) during December - January along with soil application of Paclobutrazol @ 0.75g a.i. per tree during March - April is recommended for mango variety Neelum. Keeping good soil moisture conditions and nutrient health status of the plant are very important when Pacloburazol application is resorted.

Tomato

- ◆ Varieties: PKM 1, CO 3 (Marutham) and Paiyur 1; Hybrids: TNAU Tomato Hybrid CO 3, TNAU Tomato Hybrid CO4, Arka Rakshak, Arka Samrat.
- ◆ Treat the seeds with *Trichoderma viride* 4 g or *Bacillus subtilis* 10 g or Carbendazim 2 g/kg of seeds 24 hours before sowing. Just before sowing, treat the seeds with *Azospirillum* @ 40 g/400 g seeds. Raise the seeds in pro-trays and transplant in the main field.
- ◆ Weed management: Apply Pendimethalin 1.0 kg a.i./ha or Fluchloralin 1.0 kg a.i. / ha as pre-emergence herbicide, followed by hand weeding once at 30 days after planting.

- ♦ Foliar application of Vegetable special @ 5gm/lit thrice with any wetting agent at 10 days interval from 40 days after planting will boost the quality and yield of fruits
- ♦ Spray ZnSO_4 @ 0.5% thrice at 10 days interval from 40 DAP. Spray 19:19:19 + Mn @ 1 % at 60 DAP, 0.3% Boric acid at flowering and 10 days later
- ♦ Nematode management: Grow marigold as intercrop at 8:1 ratio. Use bio-inoculants, *Trichoderma viride* and *Purpureocillium lilacinum* @ 5 kg/ha + neem cake or FYM at the time of planting or 15-30 DAP.
- ♦ Pin-bollworm management: Place pheromone traps @ 40/ha, border crop with pulses to encourage natural enemies, release *Trichogramma pretiosum* @ 40,000/acre at weekly intervals. Spray Azadirachtin 1.0% EC @ 2.0 ml/l or Indoxacarb 14.5 SC @ 8 ml/10 litres or Chlorantraniliprole 18.5 SC @ 3.0 ml/10 litres or Emamectin benzoate 5 SG @ 4 g/10 litres or Spinetoram 11.7 SC @ 1.0 ml/l or Spinosad 45 SC @ 3.2 ml/10 litres.
- ♦ Leaf curl and tomato spotted wilt virus management: Spray thiamethoxam 25 WG @ 0.4 ml/l or cyantraniliprole 10.26 OD @ 1.8 ml/l or Imidacloprid 17.8 SL @ 0.3 ml/l to manage the vector.
- ♦ Leaf curl: Install yellow sticky traps @ 12 /ha to attract the adults. Remove alternate weed host *Abutilon indicum*. Apply or spray carbofuran 3 CG @ 40 kg/ha or dimethoate 30 EC @ 1 ml/l or malathion 50 EC @ 1.5 ml/l or methyl demeton 25 EC @ 1.0 ml/l. Grow Leaf curl and spotted wilt resistant varieties like Arka rakshak and Arka Samrat

Brinjal

- ♦ Varieties: CO 2, MDU 1, PKM 1, PLR 1, PLR (B) 2, KKM 1, PPI 1, Annamalai and TNAU Brinjal VRM 1, VRM 2. Hybrids: COBH 1, COBH 2, Arka Anand, Arka Asheel
- ♦ Plant grafted brinjal: Thirty days old brinjal seedlings of desirable variety/hybrid are used as scion and grafted on fifty-five to sixty

days old *Solanum torvum* seedlings by cleft grafting. Place the grafted seedlings in mist chamber for 15 days and in shade net for 15 days for hardening.

- ◆ Treat the seeds with *Trichoderma viride* @ 4 g / kg or *Bacillus subtilis* @ 10 g/kg of seed and with *Azospirillum* @ 40 g / 400 g of seeds using rice gruel as adhesive.
- ◆ Apply *Bacillus subtilis* to soil @ 2.5 kg/ha with 50 kg of FYM to reduce the disease incidence.
- ◆ Apply 8-10% neem oil mixed neem cake @ 250 kg/ha at the last ploughing to reduce the fruit and shoot borer incidence.
- ◆ Installation of pheromone trap for fruit and shoot borer and yellow sticky trap for white fly @ each 12 nos./ha at 20 - 25 DAT.

Bhendi

- ◆ Varieties: Arka Anamika, Arka Abhay, Parbhani Kranti, Varsha Uphar and Arka Nikita. Hybrids: CO(BhH) 1, CO (BhH) 3 and Bhendi Hybrid CO 4
- ◆ Seed treatment with *Trichoderma viride* @ 4 g/kg or *Bacillus subtilis* @ 10 g/kg of seeds and again with 400 g of *Azospirillum* using starch as adhesive and dried in shade for 20 minutes.
- ◆ Foliar nutrition: 1% urea + 1%MOP on 30th and 45th DAP. For hybrids, foliar application of 19:19:19 three times @ 0.5% at 10 days interval from 30th DAP
- ◆ Spray Oxyflourfen at 0.15 kg ai/ha or Fluchloralin @ 1.0 kg ai/ha or Metolachlor @ 0.75 kg a.i/ha as pre-emergence application on the third day of sowing.
- ◆ Yellow vein mosaic: Spray azadirachtin 0.03 WSP @ 5 g/10 litres or methyl demeton 25 EC @ 1.6 ml/l or thiamethoxam 25 WG @ 2 g/l to manage the insect vector, whitefly.

Gourds

- ◆ Pumpkin: CO 1, CO 2, Arka Suryamukhi and Arka Chandan

- ◆ Snake gourd: CO1, CO 2, PKM 1, PLR 1 and PLR 2 & Hybrid: Snake gourd COH1
- ◆ Ridge gourd: CO 1, CO 2 and PKM 1 & Hybrid: Ridge gourd COH1
- ◆ Bottle gourd: Pusa Summer Prolific Long, Pusa Summer Prolific Round, Pusa Manjari, Pusa Megdoot and Arka Bahar, PLR 1, PLR 2 & Hybrid: TNAU Bottle Gourd Hybrid CO1
- ◆ Bitter gourd: CO 1, MDU 1, Arka Harit, VK1, Priya and Preethi & Hybrid: COBgoH1
- ◆ Seed treatment with *Trichoderma viride* @ 4 g or *Bacillus subtilis* @ 10g/kg of seeds
- ◆ Apply *Azospirillum* and *Phosphobacteria* @ 2 kg/ha and *Bacillus subtilis* 2.5 kg/ha along with FYM 50 kg/ha and neem cake @ 100 kg/ha.
- ◆ Spray Ethrel 100 ppm (1 ml in 10 lit of water) four times starting from 10 to 15 days after sowing at weekly intervals.
- ◆ Spray PPFM @ 1% at critical stage of crop growth and subsequent spray at 30 days interval
- ◆ Foliar spray of Arka IIHR Vegetable special @ 0.1% at 30, 45 and 70 days after sowing to maximize the yield.
- ◆ Apply neem cake @ 30 g/plant as spot treatment 10 days prior to sowing and Soil application of *Bacillus subtilis* @ 2.5kg/ha should be done to reduce the nematode incidence.
- ◆ Install cucurbit fruit fly trap @ 12 Nos/ha to mass trap fruit fly adults. Place yellow sticky traps @ 12/ha to attract the sucking pests such as aphids, leaf hoppers and whiteflies.

Chilli

- ◆ Varieties K 1, K 2, CO 1, CO 2, CO 3, CO 4, PKM 1 (for semi-dry conditions in Southern Districts), PLR1 (for coastal regions of North - East Tamil Nadu) and KKM (Ch) 1. Hybrids: TNAU Chilli Hybrid CO 1, Arka Meghna and KBCH 4

- ◆ Treat the seeds with *Trichoderma viride* @ 4 g/kg or *Bacillus subtilis* @ 10 g/kg.
- ◆ Drench the nursery with copper oxychloride @ 2.5 g/l of water at 15 days interval. Apply Carbofuran 3 G at 10 g/m² at the time of sowing.
- ◆ Apply Pendimethalin 1.0 kg a.i./ ha or Fluchloralin 1.0 kg a.i. /ha as pre-emergence herbicide followed by hand weeding once 30 days after planting.
- ◆ Thrips: Grow Agathi as intercrop. Treat seeds with imidacloprid 70 WS @ 12g /kg of seed or Thiamethaxm 30FS

Annual Moringa

- ◆ Varieties: PKM 1, PKM 2, KDM 1 (Bhagya)
- ◆ High density planting at 1.5 X 1.0 m spacing with two plants/hill.
- ◆ Apply 135:23:45 g of N:P₂O₅:K₂O/pit.
- ◆ For PKM-2, plant at 1.2 x 1.2 m. Pinch the main shoots on 80th DAS

Tapioca

- ◆ Varieties: CO 2, CO 3, CO (Tp) 4, CO (Tp) 5, MVD 1, H 165, H 226, Sree Visakham (H.1687), Sree Sahya (H.2304), Sree Prakash (S. 856), Sree Vijaya, Sree Jaya, Sree Rekha, Sree Prabha, Sree Athulya, Sree Raksha (CMD resistant), Yethapur 1 (YTP 1) and YTP 2

Small onion (Aggregatum)

- ◆ Varieties: CO 1, CO 2, CO 3, CO 4 and MDU 1, CO (On) 5 and CO6 (free flowering and seed setting type).
- ◆ Bulb treatment *Trichoderma asperellum* @ 5 g/kg.
- ◆ Basal application of *T. asperellum* @ 2.5 kg/ha along with VAM @ 12.5 kg/ha to reduce basal rot incidence.
- ◆ Foliar spray 0.5% ZnSO₄ 1% MnSO₄ thrice on 30, 40 & 50 DAS. Five days after sowing of bulbs, sow maize as barrier crop in 2 rows around the field and ridges at a spacing of 1 ft, to prevent the entry of Thrips.

Coconut

- ◆ Coconut Rugose Spiraling Whitefly: Release *Encarsia guadeloupe* @100 parasitoids /ac, yellow sticky trap 5ft x 15ft smeared with Castor oil @5 Nos./ac, Forced water sprays and release of predator *Chrysoperla zastrowi sillemi* eggs @500 Nos/ac wherever feasible. Pesticide holiday to be declared for the conservation of natural enemies.

Livestock

- ◆ Follow proper quarantine measures while purchasing new animals and desi birds
- ◆ Vaccinate the newly purchased adult poultry with RDVK vaccine (Subcutaneous route).
- ◆ Contact KVKs for mineral mixtures, mineral blocks, Ranikhet vaccines, fodder seeds and other advice.

Cattle and buffalo

- ◆ The dry fodder like paddy straw and sorghum stover may be enriched with urea or molasses and salt to enhance the digestibility in large ruminants.
- ◆ Hydroponics fodder may be utilized wherever available.
- ◆ During the onset of rainfall worm infestation may be more. Hence proper deworming must be done at regular intervals by assessing the worm load in dung at any clinical laboratories or outreach centers of the University.
- ◆ Management of ectoparasites may be taken up by use of medicinal dip or topical applications or by injections.
- ◆ For calves up to 3-6 months of age, mineralized salt blocks may be hanging in the sheds to prevent mineral deficiency.
- ◆ Supplementation of TANUVAS mineral mixture along with concentrate feed @ 30- 50 gm/animal /day for milch animals
- ◆ Supplementation of TANUVAS mineral mixture along with concentrate feed @ 15 gm/animal /day for dry animals

- ◆ Supplementation of Salt (NaCl) @ 30-50 g/day/animal for better milk yield
- ◆ Supplementation of Sodium Bicarbonate (Baking soda) @ 30-50 g/day/animal for better milk fat yield and to avoid SARA.
- ◆ Azolla supplementation may be taken-up @1-2 kg/dairy cattle/day.
- ◆ If brewer's yeast or any other unconventional feed is added in the ration, farmers are advised to feed not more than 10% in the ration.
- ◆ TANUVAS Masti-guard may be used to prevent Mastitis and for clean milk production.
- ◆ Farmers to utilize the validated EVM (Ethno Veterinary Medicine) practices.
- ◆ Avoid feeding fungus and mold affected paddy straw to the cattle.
- ◆ Use potassium permanganate in water for washing the udder before and after milking.
- ◆ Keep the cow in standing position for 1 hour immediately after milking for proper closing of teat orifice to prevent entry of microbes from the dusty and mud floor.
- ◆ Keep the animals inside the shelter during raining and night hours.

Goat and Sheep

- ◆ Locally available feed materials may be effectively used for feeding and the same popularized.
- ◆ Hydroponics fodder may be utilized wherever available.
- ◆ Before the onset of monsoon, based on worm load by dung examination, deworming to be done with appropriate deworming medicine.
- ◆ New animals added to the herd should be quarantined for 25 days to assess incidence of PPR or any other infection.
- ◆ 250-300 g of concentrate feed should be given to the pregnant ewes to avoid stillbirth or weak kids.

- ◆ Fodder tree seedlings should be cultivated by using the rainfall and green fodder leaves may be fed to the animals.
- ◆ Crop residues, unconventional feeds such as tapioca leaves, onion crop residues, banana leaves and stems etc., may be fed to the animals in case of scarcity of pasture.
- ◆ Azolla supplementation may be taken-up @ 250-500 g/sheep/goat/day.
- ◆ Dipping with acaricides should be carried out to get rid of ectoparasites (ticks/fleas) in small ruminants.
- ◆ Farmers to utilize the validated EVM practices.
- ◆ Vaccinate the sheep and goat with PPR / anthrax in consultation with local veterinarians.

Poultry

- ◆ Chicks may be purchased from authorized hatcheries of Veterinary University or private hatcheries with proper precautionary measures.
- ◆ Desi birds should be vaccinated against Ranikhet Disease (7th day F1 strain (Eye drop), 14th day with IBD vaccine (Eye drops), 28th day Lasota (Eye drop), 56th day RDVK vaccine).
- ◆ Amla/butter milk or lemon juice may be added in good quality drinking water to alleviate stress in birds.
- ◆ To improve the growth rate 1 per cent protein level (soya bean meal) may be added in the feed.
- ◆ Suitable coccidiostat should be added in the feed continuously by consulting the local veterinarian to prevent coccidiosis.
- ◆ 3-5 g of oyster shell/limestone/grit per day/bird shall be given to laying hens to avoid leathery eggs.
- ◆ Shifting, transportation, debeaking and vaccination of birds should be done during night or cool hours of the day.
- ◆ Azolla supplementation may be taken-up @ 50 g/bird/day.

- ♦ Farmers to utilize the validated EVM practices.
- ♦ Racking/mixing of bedding materials: add groundnut husk to the bedding materials and mix it. Avoid moisturizing the bedding materials. If more moisture is present, add lime powder and mix the bedding materials. Observe biscuit or red colour of dropping to identify coccidiosis disease in poultry. If any death, conduct a post-mortem examination and give medicines accordingly with help of veterinarians.

Fisheries

Carp culture

- ♦ Replace 10 to 20 % of water with borewell/creak water in freshwater carp culture.
- ♦ Parasite free seed selection.
- ♦ Analysis of water quality parameters at least monthly once.
- ♦ The lime (Calcium carbonate) may be applied at the rate of 150 to 200 kg/ha to increase the pH of pond water.
- ♦ Avoid over feeding.
- ♦ Provide feed based on the biomass.
- ♦ Application of OTC 100 mg /kg of pellet feed for 5 days

Shrimp Culture

- ♦ PCR test is compulsory before releasing the shrimp PL into the pond.
- ♦ Culture water should be treated before releasing the seed.

GIFT Tilapia culture

- ♦ Exchange water and replace with borewell water to avoid DO problems.
- ♦ Reduce the biomass by partial harvest, reduce the application of fertilizers to prevent the deterioration of water. Analysis of water quality parameters at least monthly once.

- ♦ Feeding tray (check tray) should be properly monitored to avoid over feeding.

Ornamental fish culture

- ♦ Application of Oxytetracycline at the rate of 50 mg/kg of feed for one-week period to control bacterial diseases.
- ♦ Dip treatment with 0.5 ppm KMNO_4 and 3% salt solution to control bacterial diseases.

Seabass Culture

- ♦ Size segregation must be done in the initial stage. Avoid shortage of feeding.

Zone-XI**KARNATAKA****Generic Advisory:**

- ♦ Deep plough of land after receipt of sufficient rains helps in retention of rainwater and better percolation in the fields.
- ♦ Compartment bunding may be practiced for better soil and water conservation during NE monsoon.
- ♦ Land levelling can be taken for improved efficiency of water and other resources utilization besides uniform distribution of water in the root zone.
- ♦ Fertilizers are to be applied based on soil test results. For reclamation of problematic soils like saline, soil apply Gypsum (3-7 t/ha) and acid soil (lime 2.5-5 t/ha) can be used (otherwise decided based on soil test report)
- ♦ Immediately after the harvest of Kharif crops, incorporate crop residues into the soil. Composting of agricultural residues using suitable waste decomposer gives nutrient rich good quality compost.
- ♦ In deep black soils, farmers are advised to grow either sole crops of Rabi Sorghum, Safflower and Chickpea or intercrops of Rabi Sorghum + Chickpea / Chickpea + Safflower (4:2).
- ♦ Farmers must adhere COVID guidelines while doing agricultural operations. Use of mask and sanitizer during all operations is essential.
- ♦ Daily intake of fresh vegetables, leafy vegetables, egg, milk and milk products, Vitamin C rich foods like amla, orange, lemon guava, sprouted pulses and fermented foods with emphasis on homemade foods will boost immunity among children to protect from Covid 3rd wave.

- ♦ In the backyard of house, farmers can grow the winter vegetables viz., cabbage, cauliflower, carrot, beetroot, peas, sweet potato, pumpkin and fruits like muskmelon and watermelon. Daily consumption of fruits and vegetables provide nutrition security to the families.

Paddy:

- ♦ After harvesting of kharif paddy crop, keep it for 2-3 days in open field for sun drying.
- ♦ Maintain grain moisture content of 12-14% for storage purpose.
- ♦ Rabi paddy nursery can be initiated using recommended varieties of paddy for each agro climatic zone in the state.
- ♦ Paddy Neck Blast Disease: Lesions on the neck are greyish brown and cause girdling, making the neck and panicle fall. Spray Tebuconazole 50% and Trifloxystrobin 25% (Nativo 75 WP) @ 4 g/ 10 litres of water.





- ◆ Leaf roller in Paddy: On the damaged leaves observe for transparent and longitudinal white streaks and tubular folded leaves. Spray Flubendiamide 20 % WG@ 20 g / 100 Litre of water or Flubendiamide 48 SC @ 8g/ 100 litre of water (While spraying water should drain off from the field).

Ragi:

- ◆ Suitable varieties for rabi season are Indaf-7 & 9, KMR-301 and GPU-48. Use of Indaf-9 or KMR-301 variety for irrigated condition.
- ◆ Seed treatment with Azospirillum @ 150 g.
- ◆ Application of 3-4t of FYM, 20kg of nitrogen, 10kg of phosphorous and 10kg potash per acre will increase yield in finger millet. Split application of nitrogen, that is half of the dose during sowing and another half of the quantity 6-7 weeks after sowing is recommended.

Maize:

- ◆ Grow improved hybrid maize varieties viz., MAH-14-5, Hema and Nithyashree
- ◆ Spacing for maize may be maintained at 60 x 30 cm so that optimum plant population can be maintained

- ◆ Fertilizer application, NPK 60:30:15 kg/acre (Full dose P & K and 20 kg of N and 4 kg of ZnSo₄ apply to the soil before sowing and remaining 20 kg N at 3-4 weeks after sowing.
- ◆ For weed control in maize, spray pre-emergent herbicide Atrazine @ 1 kg ai/ac for sole crop 3 days after sowing.
- ◆ For the management of fall army worm in maize, spray 0.4g Emamectin benzoate 5 SG per liter of water should be done.

Red gram:

- ◆ Spray Pulse magic (10 gm/lit) at fifty per cent flowering stage of the crop and second spray after fifteen days of the first spray.
- ◆ Leaf spot and flower dropping may be managed by spraying carbendazim 1 gram + Pulse magic 10 gram per one litre water
- ◆ Follow IPM practices to manage the pests.



Black gram /Green gram

- ◆ After harvest of paddy, based on availability of residual soil moisture content go for sowing of black gram.
- ◆ Black gram varieties: T-9, Rashmi, or any local varieties @ 8-10 kg per acre. Green gram varieties: KKM-3 or any local varieties @ 6-8 kg per acre may be sown.
- ◆ Sprinkler irrigation may be given as protective irrigation wherever irrigation water facility is available.
- ◆ Spray Pulse magic or pulse special (10 gm/lit) at fifty per cent flowering stage of the crop and second spray at after fifteen days of the first spray.

Chickpea:

- ◆ Early sowing and seed priming with CaCl_2 (2%) to be practiced for inducing drought tolerance. Use of wilt resistant variety Jaki-9218 (25 kg / acre) in wilt endemic areas.



- ♦ To avoid dry root rot and wilt disease treat the seeds with Trichoderma 8 gram per kg seeds. Use of bio-fertilizers (Rhizobium seed treatment and PSB 500 g / ha).
- ♦ Pre-emergence herbicide application of Pendimethalin 30 EC (3.25 lit/ha).
- ♦ Grow sunflower seeds as live bird perches
- ♦ Spray 2% urea during initial stage of flowering. After the crop attains 35 to 40 days, nipping practice is recommended to increase the yield.
- ♦ Spraying of pulse magic (5gm/L of water) for more pods and pod weight at flowering stage.
- ♦ Use of traps & lures (10 Nos./acre) for the management of pod borer menace. Growing of coriander (6:1) as trap crop for the management of pod borer is recommended. Use chemical spinosad 0.25 ml/L of water for control pod borer.

Sorghum:

- ♦ Seeds to be treated with Calcium Chloride to get uniform emergence of seedlings and to induce drought tolerance.
- ♦ Soil application of Trichoderma enriched FYM @ 1kg/ 100 kg FYM before sowing
- ♦ Spray Potassium Nitrate (KNO₃) at 5 gm per lit of water after 30 and 60 days after sowing for increase the drought resistant for higher yield.

Wheat:

- ♦ Pre-emergence herbicide application of Pendimethalin 30 EC (3.25 lit/ha). After 30 days after sowing post emergence application of 20 gm Metsulfuron methyl 20 WDG.
- ♦ At the time of sowing, soil application of Zinc Sulphate and Ferrous Sulphate (8 kg/ac) mixed with 16 kg vermicompost after 10 days shade dry and spray Zinc Sulphate @ 5 gm/lit at tasseling stage of the crops.

Sunflower:

- ♦ Sowing of border crop with jowar/bajra (5-7 rows), use of new hybrids RSFH -1887, KBSH-42, KBSH-44 seeds @ 5 kg / ha, Seed priming with CaCl_2 (2%) for 6 hours.
- ♦ Apply 36:36:25 kg NPK/ac @ ZnSO_4 4 kg, Borax 6 kg + FYM 3 tonnes/ac.
- ♦ Spray of Boron @ 0.5% at the time of flowering and follow hand pollination, honeybee keeping and sprinkling of sesamum seeds for better seed set.
- ♦ Powdery disease can be controlled by spraying myclobutanil 0.5 gram or difenconazole 1 ml or hexaconazole 1 ml per one litre water spray.

Ground nut:

- ♦ Seed treatment with bio-fertilizers (Rhizobium and PSB 500 g / ha).
- ♦ Application of Gypsum (200 kg/ac) at the time of sowing and seed is treated with SAAF at 2 gm/kg of the seed to prevent any infestation from soil borne diseases. Chlorpyrifos is used @ 10 ml/kg of seed to prevent the seed damage from soil insects at initial stages.
- ♦ Pre-emergence herbicide application of Pendimethalin 30 EC (3.25 lit/ha) for initial weed management.

Cotton:

- ♦ Bt. Cotton seeds@450gms per acre, seed treatment with Zinc Sulphate, Ferrous Sulphate, Magnesium sulphate and Manganese sulphate (4 gm/kg of seed) may be followed.
- ♦ Yellow sticky traps @10 per acre, Spray of systemic insecticides (need based)
- ♦ For management of leaf reddening, spray Magnesium sulphate (1%) with 1 per cent 19:19:19 (water soluble) fertilizer at 100-110 days after sowing.

- ♦ Alternative furrow irrigation in drought condition may be adopted.
- ♦ For cotton alternaria leaf spot and leaf blight spray Mancozeb 2 g/lit.

Sugarcane:

- ♦ Use variety CO-86032 & intercrop with onion.
- ♦ Soil application of Azospirillum @ 10 kg / ha, PSB @ 10 kg /ha, Sett treatment (Carbendazim @ 100gm + Chloropyriphos @ 100ml + Urea @ 100 gm/100 liter).
- ♦ Use of pre-emergent weedicide Atrazine @ 1.6 kg/ha and post-emergent weedicide 2-4-D @ 2.5 kg/ha for weed management.
- ♦ Incorporation of straw.
- ♦ Tying & staking.

Mulberry:

- ♦ White powdery patches appear on the lower surface of the leaves. The corresponding portions on the upper surface develop Chlorotic lesions, the leaves become yellow, coarse and loss their nutritive value. Spray wettable sulphur 50WP 2g/liter of water or Carbendazim @ 2g/liter of water. Safety period is 15 days.
- ♦ To manage Leaf Roller in mulberry, release Trichoderma chilonis egg parasitoids from 5th day after chemical spray @ 5 Trichocard per acre.
- ♦ Foliar spray of a multi mineral mixture Seriboost @ 2.5ml/liter of water.
- ♦ Dusting of lime every alternative day on silkworm @ 5g/square feet to manage Muscardine disease in silkworm.
- ♦ Tying of yellow sticky trap along with pheromone lure on every window inside and outside the rearing house to mitigate the Uzi fly infestation in Silkworm rearing.

Onion:

- ◆ Bhima Dark Red, Bhima Shakti, Bhima Kiran, Bhima Light Red, Arka Nikitha, Arka Pragati, Arka Kirthiman, Arka Lalima and Arka Bheem are the red onions and Bhima Shubra, Bhima Shweta and Bhima Safed are the white onions varieties recommended for cultivation in rabi season.
- ◆ About 5-7 kg seeds are required to raise seedlings for one hectare. Application of pre-emergence herbicide pendimethalin @ 0.2% is recommended to control weeds in nursery.
- ◆ Seed treatment with thiram @ 2 g/kg of seed to avoid damage from damping off disease. Foliar spray of benomyl @ 0.2% is recommended to control soil borne diseases in the nursery. When the severity of thrips infestation is high, foliar application of Fipronil, or profenopos @ 0.1% is recommended. Seedlings are available for transplanting in 40-45 days after sowing (DAS) for Rabi season.
- ◆ For drip irrigation, the distance between two inbuilt emitters should be around 30-50 cm and the discharge flow rate should be 4 l/hr. For sprinkler, the distance between two laterals (20 mm) of micro sprinkler should be 6 m and with a discharge rate of 135 l/hr.
- ◆ Application of fertilizers @ NPK 40:40:60 kg /ha as basal and the remaining 70 kg N in seven splits through drip irrigation is recommended for achieving higher marketable bulb yield. Split doses should be applied at weekly interval from transplanting to 60 DAT
- ◆ Application of 0.2% Oxyfluorfen 23.5 % EC before planting + one hand weeding at 40-60 days after transplanting is recommended for marketable bulb yield and weed control efficiency (65-80%).
- ◆ Combined application of 110:40:60:20 kg NPKS along with organic manures equivalent to 15 t FYM and Azospirillum and Phosphorus solubilizing bacteria @ 5 kg each/ha.



- ◆ Spray fungicides and pesticide in combination for effective management of thrips and purple blotch incidence. Spray Schedule includes Mancozeb @ 0.25% with Methomyl @ 0.8 g/l at 30 days after transplanting, Tricyclazole @ 0.1% with Carbosulphan @ 2 ml/l at 45 days after transplanting, Hexaconazole @ 0.1% with profenofos @ 1 ml/l at 60 days after transplanting.
- ◆ While taking onion seed production, farmers are advised to follow isolation distance of 500 to 1000 meters from different onion varietal plots to maintain seed purity. Bulbs should be treated with Carbendazim 50 WP @ 1gm./lit before planting. It is recommended to install 2 honeybee colonies for higher seed yield

Chilli:

- ◆ After the harvest of red chilli, dry the harvested produce on concrete platforms or tarpaulin or polythene sheets for 8 to 10 days to avoid aflotaxin and get dirt free good quality produce.

- ♦ Seedling root dipping in *Trichoderma harzianum* (1kg in 7 litre water) and drenching of carbendazim 2g/lit is recommended.
- ♦ Application of FYM enriched with *Trichoderma* or Arka Microbial Consortium, Seed treatment with seedpro @ 4g/kg and raising of seedlings under 40 mesh nylon net cover.
- ♦ Application of RDF: Rainfed NPK 100-50-50 Kg/ha and Irrigated NPK 150-75-75 kg/ha.
- ♦ For both irrigated and rainfed, spray vegetable special (5g/lit) at 30, 60 and 90 DAP
- ♦ Spray 1gm/lit carbendazim or 3g/lit wettable sulphur at 2 sprays @ 15 days interval
- ♦ Growing 1 row of marigold for every 8 rows of chilli as trap crop.
- ♦ Growing of 2 rows of maize as border crop, use aluminium surfaced reflective agri-mulch for repelling insect vectors and erect yellow sticky traps for pest management.
- ♦ Spray insecticide in rotation of Acephate 75WP @ 1.5g/lit, Fipronil 5% SC @ 1ml/lit, Imidachloprid 70 WG @ 2g/15lit in combination with neem oil 2ml/lit & sagarika 2.5 ml/lit at 7 to 10 days interval until flowering and fruit formation

Watermelon

- ♦ Following modern methods of cultivation like use of seedlings against direct sowing, mulching, drip, and fertigation and use of vegetable special (1g/lit) during fruit development stage
- ♦ Vector control by planting maize/sorghum as barrier crop. Spray acephate 1g/lit or imidachloprid 17.8 SL @ 0.25ml/lit
- ♦ Retention of only 2 shoots per vine and retention of 2 fruits per vine only after 11th node
- ♦ Use yellow sticky traps (25 traps/ ha), spray neem oil 4ml/litre and imidachloprid 17.8 SL @ 0.25ml/lit as per the need.

Vegetable crops:

- ◆ Go for sowing of Cruciferae Family vegetables like Cauliflower, Cabbage, Knol-Khol, etc. and vegetable crops like Bhendi, Brinjal, Ridgeguard, Leafy vegetables, Guards, and other vegetables suitable for Rabi season.
- ◆ Spray Ginger Rich for ginger crop 5g/lit of water @ 45 days interval, starting from 5th month to 8th month old crop.

Brinjal:

- ◆ Seedling root dip in Azospirillum and PSB solution (1kg in 7 litr water) and Applications of VAM to nursery seedlings.
- ◆ Application of 25 t/ha FYM and RDF, NPK 125-100-50 kg/ha, Spray Vegetable special (5g/lit) at 30, 60 and 90 DAP.
- ◆ Crop rotation with non solanaceous crops like Maize and Jowar and Drench Bleaching powder 15kg/ha before transplanting.
- ◆ Spray NAA (Planofix) 50 ppm
- ◆ Use of yellow & blue sticky traps @ 25-30/ha, Spray of Imidachloprid 0.5 ml/litr or Fipronil 1ml/litr at 6, 9 and 11 weeks after sowing.
- ◆ Before fruiting take up 2-3 spray of Melathion 50 EC @ 2 ml/lit.,

Tomato:

- ◆ Use disease resistant hybrid Arka Rakshak & Arka Samrat, Crop rotation with non solanaceous crops, Drench the plants with streptocyclin (1g) +COC (3g) per lit.
- ◆ Grow marigold as a trap crop for nematode, Apply neem cake during planting in the main field.
- ◆ Seedling root dip in Rhizobium and PSB solution (1kg in 7 litr water) and Applications of VAM to nursery seedlings.
- ◆ Application of RDF NPK 250-250-250 Kg/ha for hybrids and 115-100-60 Kg/ha for others.

- ♦ Foliar application of Arka Vegetable special (@ 5 gm / litre) (1st-25 to 30 DAT, subsequent sprays interval of 20-25 days after 1st spray) is directly contributing in yield increase by 20-30 %.
- ♦ Control sucking pest by use of yellow sticky traps @ 25-30/ha, Spray of Neem oil 4ml/lit or Imidachloprid 0.5 ml/litr or Fipronil 1ml/litr at 6,9 and 11 weeks after sowing
- ♦ Spray 1gm/lit carbendazim or 3g/lit wettable sulphur at 2 sprays @ 15 days interval.
- ♦ Marigold or cucumber is commonly used as trap crop for every 15 rows of the main crop to attract tomato fruit borer.
- ♦ To control fruit borer, and leaf miner are major pest observed in the tomato crop. To control these pests, spray HaNPV 100 LE/acre and Neem insecticide 3-5 ml/ltr. of water respectively.
- ♦ Wilting, to control drench with copper oxychloride @ 3 g + Streptocyclin @ 0.5 g/litre of water.

Marigold:

- ♦ Introduction of compact flower hybrids Arka Bangara and Arka Agni
- ♦ Use cuttings for planting
- ♦ Application RDF 125-60-60 KG/ha and during pinching apply 100 kg/ha nitrogen
- ♦ Spray Hexaconazole @ 1 ml/lit or Mancozeb @ 2g/lit

Tuberose:

- ♦ Introduction of single floret flower hybrids Sringar and Prajwal
- ♦ Application RDF 100-50-50 KG/ha
- ♦ Spray Thiurea @ 1000 ppm
- ♦ Spray Hexaconazole @ 1 ml/lit or Mancozeb @ 2g/lit

Mango:

- ♦ In the month of October and November during pre-flowering stage of Mango, the growers are advised to take 2 sprays of Mango Special @ 5 gm/lit along with adjuvants and lime juice to get quality fruits in terms of fruit appearance, keeping quality and taste.
- ♦ Pruning of densely grown and disease infected branches along with 1 or 2 branches at the top of canopy in the month of July-August will increase penetration of light in turn yield in mango.
- ♦ For regulating flowering in mango trees apply paclobutrazol (4-5 ml/tree) in trenches.
- ♦ To manage die back disease, prune the dead woods and spray CoC at 3 g/l twice at 15 days interval.

Cashew:

- ♦ During new flush emergence in Cashew crop, farmers are advised to take up prophylactic spray of Lambda Cyhalothrin 2.5 EC @ 0.5 ml/lit for management of T-Mosquito bug.
- ♦ For more than 5 years Cashew plantation, make small trenches 4 feet away from the trunk of Cashew plant & apply 1kg Urea, 600-gram Rock Phosphate, 200 gram of Muriate of Potash per tree. 20kg of FYM should be given along with inorganic fertilizer.
- ♦ Coconut and Arecanut plantations:
- ♦ Based on age of crop and soil type, provide 15-20 liter of water per plant through drip irrigation.
- ♦ Practice mulching of farm wastes to retain soil moisture content, to avoid evaporation loss and also to control weed growth.
- ♦ Drill a small hole where redpalm weevil is observed and apply Chloropyrifos @ 2ml/litre of water and close the hole with clay soil.
- ♦ For control of inflorescence die back spray with Mancozeb @ 3gram / litre of water and Chloropyrifos @ 2ml per litre of water.

Black pepper:

- ◆ Spraying of KNO_3 to maintain quality of pepper berries. Protective irrigation may be given during moisture stress, mulch with crop residues to maintain moisture.
- ◆ Drench Arka Microbial Consortium (AMC) (drench 3-5 litre/vine) after mixing 4kg AMC with 1kg of Jaggery in 200 litres of water for healthy crop.
- ◆ Remove and destroy disease infected vines to stop further spread of the disease.
- ◆ Spray and drench Potassium Phosphonate 3ml/litre against quick wilt disease during rain break.
- ◆ Spray Black Pepper special (micronutrient mixture) @ 5 gm per lit during September - October month to increase the yield.
- ◆ Spray Potassium Nitrate 5.0 gm in one lit of water to increase the berry size during Sept-Oct month.
- ◆ Provide adequate shade and mulch to the vines in the post monsoon season.
- ◆ Spray lime or kaolin @ 2 kg and 1 kg in 100 litres of water, respectively to avoid direct sunlight and moisture stress (in the month of February)

Coffee:

- ◆ Mulch with crop residues to conserve moisture & give protective irrigation during moisture stress.
- ◆ Cleaning/weeding can be carried out in the coffee plantation before harvesting.
- ◆ For management of stem borer and berry borer infestation, spot spray with Chlorpyrifos @ 2ml/liter and erect Broca traps 25 no. per acre and yellow sticky traps
- ◆ For management of root rot disease, remove infected plants and drench surrounding plants with Propiconazole 2.0 ml per lit.

Ginger:

- ◆ Remove rhizome rot infected plants and apply lime and bleaching powder
- ◆ Spray and drench rhizome rot infected bed with Metalaxyl + Mancozeb @ 2gm/litre
- ◆ Drench Copper Oxychloride (COC) 3gm/litre for healthy bed to avoid spread of the disease
- ◆ Spray Ginger special 5 gm per lit during September-October to get better and quality

Banana:

- ◆ For natural (chemical free) ripening in banana adopt the technology developed by IIHR-Bangaluru.
- ◆ For banana plants planted in November and December 2021, start spraying of IIHR Banana Special @ 5 g/lt. with 1 shampoo sachet at monthly interval upto September 2021.



- ◆ Remove unwanted suckers from the rhizome to maintain normal bunch weight and quality.
- ◆ For management of sigatoka leaf spot spray Propiconazole 1 ml/L

Livestock Advisories during Rabi season:

- ◆ Maximum cattle and buffaloes show oestrus symptoms in winter season. Farmers should identify oestrus signs viz., bellowing, mounting on other animals, cervical discharge, anorexia, reduction in milk yield and do Artificial insemination / Natural mounting accordingly.
- ◆ Too cold climate causes pneumonia to all livestock especially young ones. So, provide proper ventilation, more floor space/animal and avoid overcrowding in dairy/sheep/goat/poultry sheds.
- ◆ To prevent the outbreak of Lumpy Skin Viral Disease (LSD) in cattle (Oct-Nov month), mass vaccination with Goat Pox vaccine against LSD in endemic areas should be carried out.
- ◆ Lumpy Skin Disease (LSD) is a vector borne disease. So, all farmers should protect their livestock against vectors viz., mosquito, house fly and ticks by using mosquito nets, mosquito fly repellents and washing of animals with ectoparasitocidal drugs. Also, famers should practice burning of dry neem leaves especially in morning and evening hours to reduce mosquito bite to livestock.
- ◆ All cattle & buffaloes should be vaccinated against Foot & Mouth Viral disease (FMD) in all villages. Vaccination should be 100% to eradicate FMD viral disease from our country.
- ◆ Livestock farmers should take up cultivation of improved varieties of lucerne and fodder oats during the month of October and November
- ◆ All sheep and goats especially young ones from 3 months to 1 year of age should be vaccinated against PPR viral disease.
- ◆ Sanitize the cattle shed with sodium hypochlorite solution before milking.

- ♦ Wash the milch animals' udder and teats with potassium permanganate solution before milking.
- ♦ All livestock should be treated with appropriate deworming medicines by consulting KVK animal scientist /local veterinary doctor.
- ♦ Poultry birds should be given clean and cold water for drinking throughout the day.
- ♦ All back yard poultry birds compulsorily should be vaccinated against Ranikhet Disease.



KERALA

Rice

- ♦ In wet direct seeded paddy fields, land preparation may be done immediately after the harvest of the first crop. Addition of soil ameliorants, preferably lime or dolomite @ 2 kg/ cent as initial split should be made mandatory along with first ploughing.
- ♦ During the next ploughing, after two weeks, add FYM @ 2 t/acre which will restore the productivity of rice-based cropping system. In Rice- Rice- pulse systems, incorporate crop residues into the soil during first ploughing so that FYM can be reduced to 50 % of the above dosage.
- ♦ Farmers should ensure selection of good quality seeds by soaking in salt solution for 10 minutes. The ones that float must be discarded. Seeds should be immediately washed after removing from solution and then used for sowing.
- ♦ Plough the field thoroughly and ensure proper levelling as this is critical for effective water and weed management.
- ♦ Wherever the land preparation has been done for second crop of paddy (*mundakan*), transplanting can be done. As a prophylactic measure, the seeds may be soaked in a solution of *Pseudomonas* culture (10 grams for 1 kg seeds) to control sheath blight, sheath rot, leaf spot disease etc. The seedlings can be soaked for 30 minutes in *pseudomonas* solution (20-gram *Pseudomonas* in one litre of water). The micronutrient deficiency of paddy can be managed by spraying 5 gram of paddy sampoorana in one litre of water.
- ♦ Apply full doze of P, half the dose of N and half dose of Potash *i.e.*, 90 kg Factomphos and 14.4 kg Potash/ acre as a basal dose.
- ♦ If there is toxicity of iron in the rice field, apply 150 kg lime per acre.
- ♦ In Kuttanad and Onattukara regions, soil testing must be adopted for site specific nutrient management (application of fertilizers

and quality dolomite as liming material) to improve nutrient use efficiency.

Pest and Disease management

- ♦ Tricho cards for managing rice stem borer and leaf folder can be used @ 2cc card per acre at 15,30,45 and 60 days after sowing.
- ♦ Rice case worm: To control this 25 kg sawdust or rice husk ash mixed with one litre kerosene (for 1 acre) can be spread after draining the field.
- ♦ Leaf folder: It can be controlled by using Trichogramma cards (2CC per one acre). Cut the cards in to small pieces and fix in different regions of the field. If the attack is severe, spray quinalphos @ 2ml per one liter of water.
- ♦ Army worm: To control, complete flooding of field for 24 hours, wherever possible. Spraying of chlorantraniliprole @ 3 ml per ten



litre of water in the field, bunds, and weeds. Where transplanting is not yet undertaken, apply chlorantraniliprole granules @ 4 kg per one acre along with basal dose of fertilizers. Keep the field bunds and surroundings weed free.

- ◆ Brown Plant Hopper (BPH): Spray 2 g Thiamethoxam per ten litres of water.
- ◆ Bacterial Leaf blight- To control the spread of Bacterial Leaf blight in paddy, spray 6 g of Streptocycline in 30 litres of water.
- ◆ Sheath Blight- To control sheath blight disease in rice, spray 4-gram Trifloxystrobin + Tebuconazole in 10 litre of water.

Coconut

- ◆ The green manure crops should be ploughed in and incorporated into the soil during August-September. This will increase the water holding capacity of soil.
- ◆ For laterite, sandy and red sandy loam soils, give two ploughings or diggings in September-October and one raking in January. In areas where surface run off is more, form mounds in September-October and level them in November-December.
- ◆ Mulching is an effective method of conserving soil moisture. Mulch the coconut basins with green / dry leaves at the close of northeast monsoon (October-November).
- ◆ While applying second dose of fertilizers to coconut palms, apply 550-gram urea, 700-gram Rajphos and 800-gram potash under irrigated conditions and apply 500-gram urea, 800-gram Rajphos and one kg potash under rainfed conditions. Alternatively, apply 4 kg coconut mixture (10:5:20) per adult palm in a band radius of 5-6 feet from the trunk.
- ◆ Use of borax @100g/palm is advised to reduce button shedding, if noticed.
- ◆ Inter cropping with banana and Colocasia can be done in coconut gardens. This is for ensuring more aeration and retention of moisture.

- ♦ Irrigating coconut palms will prevent stunted growth, drooping of leaves and immature nut fall during long rainless period.
- ♦ Red palm weevil: Coconut log traps with fermenting toddy or pineapple activated with yeast or molasses can be set in coconut gardens to trap the free-floating population of red palm weevil. Use insecticide to each trap to kill the weevil trapped.
- ♦ Rhinoceros beetle: To control attack of Rhinoceros beetle, application of 250 g neem cake or marotti (*Hydnocarpus wightiana*) cake mixed with equal volume of sand in the innermost 2-3 leaf axils. This treatment is to be done twice, i.e., during September-October after the south-west monsoon.
- ♦ Whiteflies: Spray neem oil @5ml per one litre along with soap @ 10gm per one litre on the lower surface of leaves to reduce the incidence of whiteflies in coconut.
- ♦ To manage leaf rot disease, remove the spindle leaf and apply Hexaconazole 5EC (2ml in 300 ml water) and fill the topmost three leaf axils around the spindle with 250gm sand and neem cake mixture.
- ♦ Bud rot: Spray 1 % Bordeaux mixture on spindle leaves and crown of bud rot disease affected palms as well as neighbouring palms, as a prophylactic measure.

Banana

- ♦ For kharif season planted banana, final foliar spray of the multi nutrient mix, banana sampoorana must be carried out after the full emergence of bunch, to avoid nutrient deficiencies.
- ♦ For the rabi season banana, select good quality sword suckers of 2-3 months' age and plant in pits of 50 x50 x 50 cm dimension. Apply 10 kg organic manure and at least 500 g good quality dolomite at the time of planting. For TC banana plantlets, 15 kg organic manure has to be applied.
- ♦ The rhizomes are to be smeared with cow dung solution & ash then they are dried in the sun for about 3 to 4 days before planting.

- ◆ Propping can be followed to reduce the damage due to high wind speed.
- ◆ Apply lime @ 250g/plant to rectify the calcium deficiency in the soil. Boron deficiency is seen during dry weather. Hence, spray 5 grams of sampoorna in one litre of water.
- ◆ Adjust the time of planting to avoid high temperature and drought at the time of emergence of bunches (7-8 months after planting).
- ◆ Ensure good drainage and prevent water logging.
- ◆ Spodoptera-There is a chance of attack of spodoptera in banana. Destroy the affected leaves along with the spodoptera.
- ◆ Rhizome Weevil- There is a chance of Rhizome Weevil attack in banana. As a precaution, apply 250-gram neem cake per pit.
- ◆ Nematode: There is a chance of nematode attack in banana. The symptoms start as black spots on roots and finally result in root decay and falling of plants. To control this, pare the rhizomes and apply neem cake @ 1 kg/plant at the time of planting. For managing nematodes paring+ banana sucker treatment with *Bacillus macerans*/ *Paecilomyces lilacinus* @ 5g/sucker + pit application @10g/pit 45 days after planting can be recommended.
- ◆ Pseudostem weevil: As a prophylactic measure against pseudostem weevil, remove the dry outer sheaths of the pseudostem of all infested and un-infested plants in the endemic areas and spray any of the recommended insecticides. Drenching all the leaf axils, rhizome, and surrounding soil and all-round the entire pseudostem inserting the nozzle through the bore holes made by the larvae, if any and also within the outer sheathes by slightly raising the same at different spots is also effective. Apply quinalphos 0.05 per cent or chlorpyrifos 0.03 per cent. Repeat the treatment after 3 weeks if the infestation persists.
- ◆ Sigatoka disease: To control sigatoka disease in banana, cut and remove the severely affected leaves and spray 1 % Bordeaux mixture with sticker soon after the appearance of the initial symptoms of

the disease.

- ♦ Panama wilt: There is a chance of panama wilt in banana varieties like poovan, kadali etc. Drench the soil with one gram of carbendazim in one litre of water.

Black Pepper

- ♦ Mulching to be done using dried leaves in existing Pepper Garden. Shade to be provided using coconut leaves to pepper vines planted last year. Irrigate vines twice in a week. Spray Pepper Powr Mix @5 g/litre or 19:19:19 @ 5 g per lit in vines bearing pepper and if the spikes bear berries of uneven size foliar application of boron @ 2 g per litre is beneficial.
- ♦ Spraying Bordeaux mixture 1 % and drench copper oxy chloride 4g/litre at monthly intervals prevents phytophthora infections in pepper
- ♦ Flea beetle: Spray any one of the following insecticides namely, dimethoate or quinalphos at 0.05 per cent concentration. The second spraying is to be given at the time of berry formation (September-October) and once again at berry maturing stage, if needed.



Ginger and Turmeric

- ◆ Mulch the crop with glyricidia and earthing up to be done after last application of fertilizer dose in month of October
- ◆ Foliar spray of the multinutrient mix @ 5g/l, is advised to rectify nutrient deficiencies, if noticed for turmeric and ginger.
- ◆ As a prophylactic measure against rhizome rot disease, drenching of either mancozeb 0.3 per cent solution or pseudomonas @20g/l can be done in the field.

Cardamom

- ◆ Forking- It is necessary in hard soils, which is to be carried out in October-November.
- ◆ Harvesting: Peak period of harvest is from August - October.
- ◆ Farmers should be vigilant about Azhukal Disease. Keep the field weed free and rake the inter spaces and irrigation.



- ♦ It is advised to give a heavy irrigation once in a fortnight from February depends on the rainfall. Destroy the katte disease affected plants.

Vegetables

- ♦ All types of vegetables including cool season vegetables (Nov – Feb) can be grown in open conditions as well as in grow bags.
- ♦ For open conditions, apply 3 kg dolomite/cent during land preparation to manage soil acidity. For grow bag vegetable cultivation, while filling the grow bags with 1:1:1 mixture of topsoil, cow dung/compost, and coir pith, apply 50 g of dolomite. Addition of *Pseudomonas* culture to the soil at the time of planting of vegetables will help to reduce incidence of fungal diseases.
- ♦ Foliar spray of the multi-nutrient mix, vegetable sampoorana is advised to rectify nutrient deficiencies, if noticed.



Pest and Diseases management

- ♦ Aphids: There is a chance of aphids in cowpea. Apply 2% neem oil emulsion or apply 20 g *Verticillium lecanii* per one litre of water in 10 days intervals. If aphid attack is severe, apply 3 ml Imidacloprid or 2 g Thiamethoxam per ten litres of water.
- ♦ White fly: Apply 2% neem oil garlic emulsion or spray 20g *Lecanicillium lecanii* per one litre of water in ten days intervals to control the attack of white fly in chilli, brinjal and tomato.
- ♦ Thrips: There is a chance of thrips attack in chilli. Apply 2% neem oil garlic emulsion or spray 2 g Thiamethoxam per ten litres of water.
- ♦ Spodoptera: If the attack is in the initial stage, the affected leaves of cabbage and cauliflower, should be destroyed along with egg, caterpillar, and pupa. Neem Kernel suspension (5 percentage) should be sprayed. If the attack is severe, spray Flubendamide (Tukumi) 2 ml per ten litre of water or Chlorantraniliprole (Coragen) 3 ml per ten litres of water.
- ♦ Fruit borer: To control fruit borer in cowpea, apply 5% Neem Kernel Suspension to control fruit borer in the initial stage. Spray Flubendamide 2 ml per 10 litre of water or Chlorantraniliprole 3 ml per 10 litre if the attack is severe.
- ♦ Green leaf hopper: There is a chance of green leaf hopper attack in bhindi. Spray 2 g thiamethoxam per ten litres of water.
- ♦ Jassid: Due to increase in atmospheric temperature, Jassid attack may be increased. They can be controlled by applying 2% neem oil emulsion once in a week or by spraying *Lecanicillium lecanii* at 20 g per litre of water.
- ♦ Anthracnose disease: During rainy season, there is a chance of Anthracnose disease in Cowpea. As a prophylactic measure, apply 1% Bordeaux mixture or spray copper oxychloride 3 gram per one litre of water.

- ◆ Downy mildew: Due to high relative humidity, there is a chance of downy mildew attack in bitter melon. As a prophylactic measure, spray pseudomonas solution (20 g per one litre) under the leaves.

Rubber

- ◆ Make fire belt around rubber plantation to avoid fire accident.
- ◆ In tapping panels spray Indofil M45 4g/ litre against fungal diseases
- ◆ In rubber protect young leaves of budded seedlings from shedding due to fungal diseases spray a solution of copper oxy chloride 4g in 1 litre of water.

Bee keeping

- ◆ Those who start beekeeping for the first time can procure bee colonies and begin the apiary during October-November
- ◆ Established beekeepers can prepare their colonies for division.
- ◆ Regular inspection of bee colonies is needed to avoid colony absconding and manage pests and diseases.

Biowaste management

- ◆ EM solution or any composting inoculum can be used for composting of farm and home based biowastes in a low cost and effective manner.

Animal Husbandry

- ◆ Ensure the availability of green fodder to the animal daily. Provide mineral and vitamin mixture in prescribed quantity daily.
- ◆ Mix 30g sodium bicarbonate and 1-teaspoon yeast in the feed daily to avoid digestive disorders associated with excessive acidity.
- ◆ Animal should not be allowed to graze in open grazing lands to avoid lightening risk.
- ◆ Vaccinate animals against foot & mouth disease and haemorrhagic septicaemia

- ♦ Take precautions to avoid ecto parasitic infestation. If fever, shivering, brown coloured urine, off feed etc. are noticed, consult veterinary doctor immediately
- ♦ Assure increased ventilation in the shed.
- ♦ Control biting flies in livestock with external application of 'Poovathenna' (Kusum oil) once in three days and prevent the outbreak of vector borne disease, especially Lumpy Skin Disease.



LAKSHADWEEP ISLANDS

Specific Agro Advisories for coming *rabi* season

Generic Advisory:

- ♦ Predominantly the islanders grow vegetables/fruits during this period. The pre-rabi advisory for farmers is to prepare land for vegetables and fruit cultivation. Farmers ready for cultivation of vegetable and fruits have to think about conservation of available water. Conserve water in surface and sub-surface horizons of soil which in turn address drought related issues in coconut and other crops grown in the island. Use natural mulching (locally available farm materials) for conservation of moisture.

Homestead gardens:

- ♦ Drought management in homesteads should be undertaken through husk burial in trenches, mulch with dried coconut leaves, sow cowpea or green manure crops on receipt of NE- monsoon showers in coconut basins.
- ♦ Manage the microclimate with intercrops like tubers, vegetables, perennial vegetables, medicinal plants, spices, and banana to make each homestead as nutritional garden.

Vegetables:

- ♦ Planting material production of vegetables can be initiated. Use grow bag, soil less medium and organic inputs for vegetable cultivation. Use drip or wick irrigation sources for assuring wetness for better growth of plants. Use soil less medium @ 5kg/bag.
- ♦ Farmers interested in vegetable cultivation can start seedling production through nursery method. Farmers should use good quality seeds in warm and protected place by using seedling trays or seed beds with fertile soil enriched with FYM or compost.

- ◆ Seeds should be treated with pseudomonas florescence (10g/Kg).
- ◆ To control Root Knot Nematode, apply Pochonia chlamydosporia 10g/l and apply apply Neemcake 1kg Per Plant. Similarly, to control Powdery mildew, spray Bordeaux mixture 1% in the affected areas. To control fruit rot soil drenching with Tricoderma 10 g/l can be performed.

Coconut:

- ◆ Farmers need to provide staking to young coconut seedlings as protection from heavy winds. The green manure crops should be ploughed in and incorporated into the soil during August-September.
- ◆ To conserve moisture farmers are advised to use natural mulching materials near the coconut basin like green or dry leaves at the close during the onset of northeast monsoon. Farmers are advised to collect all the bio wastes of the farm and compost it for manure.
- ◆ Sanitize the field to control Rhinoceros beetle, Crown cleaning and Fill crown with sand 250g +4 naphthalene ball can be administered and effectively hook out the beetle using beetle hook. For preventing and controlling bud rot sanitize the field clean the Crown cleaning and drench with Bordeaux mixture.

Banana:

- ◆ Take care of newly planted banana with organic manure (10kg/ plant). Irrigate twice a week, provide shade, and mulch using dried leaves.
- ◆ Be vigilant about rhizome weevil. Apply neem-garlic emulsion to control the vectors spreading Bunchy top virus. Spray neem oil and garlic emulsion @6ml/litre on the lower leaf surface to control mites.
- ◆ Provide stake to banana plant or protection from heavy winds. It is advised that farmers have to sanitize the field and perform the weeding periodically. Use the dried banana leaves for Mulching.

- ♦ To prevent Rhizome rot use healthy planting materials, remove the outer layer of rhizome then soak in cow dung slurry and shade dry after the use of this planting material, soil drenching with Bordeaux mixture 1%, field sanitation and avoid water logging.
- ♦ To prevent Rhizome Weevils and Pseudo stem weevil use healthy planting materials. Remove the outer layer of rhizome then soak in cow dung slurry and shade dry after the use of this planting material.

Livestock:

- ♦ Animal growers are advised to avoid water logging near livestock farms including poultry sheds.
- ♦ For livestock keep the hooves away from water to avoid hoof rotting disease.
- ♦ It is advised to take measures to reduce the tick and flies' problem. It is always to be kept in mind that the farm area must be disinfected using disinfectants regularly.
- ♦ All animal growers should make sure that the feed is stored in a dry place.
- ♦ Vaccinate animals against foot & mouth disease and haemorrhagic septicaemia
- ♦ If fever, shivering, brown coloured urine, off feed etc. are noticed, consult veterinary doctor immediately

Fisheries:

- ♦ Fishermen sailing for fishing in boats must adhere COVID guidelines. All fishermen involved in fishing should have been vaccinated.
- ♦ Use of mask and sanitizer during all operations is essential.
- ♦ Fishing time should be based on information provided by the UT administration. Fishermen involved in fishing in groups must undergo COVID test as per the UT administration.

- ♦ Time for marketing should be based on the information provided by UT administration (3-5 pm) if any changes may be adhered. Above all, the fishermen are advised to sell fish at doorsteps.
- ♦ Efficient indigenous fishing techniques have been developed to catch different fishery resources in the lagoon as well as the open ocean waters.
- ♦ Cage fish culture farmers may reduce standing stock by selling harvestable fish directly to consumers by keeping the COVID-19 protocol.
- ♦ Fishermen must adhere to the uniform ban on fishing vessels in Indian Exclusive Economic Zone (EEZ) beyond territorial water in the east and west side as per the period in Lakshadweep from 1st June to 31st July 2021 (61days) for conservation and effective management of fishery resources and for sea safety reasons.