

**ICAR Network Project on Organic Farming
Dharwad Centre**

Package Developed by

Principal Investigator

Dr. H.B.Babalad

Co- Principal Investigators

Dr. R.K Patil

Dr. K.K.Math

Dr. M.G.Palakashappa

Dr. M.N.Sreenivasa

Dr. D.P.Biradar

Research Associates

Mr. Ananad S. Kamble

Dr. S.N.Bhat

Mr. B.H.Prasannakumar

Mr. R.F.Channagoudar

Ms. G.V.Gangamruta

**Institute of Organic Farming
Directorate of Research
University of Agricultural Sciences
Dharwad-580005, Karnataka**

ORGANIC PRODUCTION TECHNOLOGIES DEVELOPED IN CROPS

GROUNDNUT – ORGANIC PRODUCTION

Groundnut is a one of the important oilseed crops of the country grown over an area of 5.40 million ha and production of 5.43 million tones with a productivity 910 kg/ha. Sustained groundnut production and higher profitability can be managed organically by on-farm management of resource with low external inputs. Based on eight years of experimentation under Network Project on Organic Farming the organic package has been developed.

Details of Varieties

Varieties	Zone/situation	Time of sowing	Duration (days)	Special features
GPBD-4	Zone 8 rainfed	June-July	105-110	Resistant to leaf spot and rust diseases. High yielding and higher oil content
JL 24	All zones	June-July	110-120	Big size pods.
TAG-24, DH-86	All zones	Dec-15 to Jan 15 (Summer)	90-95	Resistant to bud necrosis

Management practices: Inputs required per hectare

a) Seeds : GPBD-4	125.kg
JL 24,TAG-24, DH-86	150 kg
b) Organic manures (equi to RDP)	
Enriched compost	3.00 t
Vermicompost	2.40 t
Green leaf manure	5.00 t
Neem cake	250 kg
Seed treatment with bio-fertilizers and bio-fungicides	
Rhizobium	1000 g
PSB	1000 g
<i>Trichoderma harzianum</i>	750 g

Sowing: Early sowing of *kharif* crops during June I FN. Apply FYM/compost and green leaf manures 10-15 days before sowing and vermicompost at the time of sowing. Treat the seeds with the *Trichoderma* @ 4-5 g/kg seed and biofertilizer. Sow the seeds at a spacing of 30cmx10 cm.

Gypsum application: Apply gypsum @ 500 kg/ha at 35-40 days after sowing, to the plant rows and earthing up will be done.

Weed management: Intercultivation at 25 and 40 DAS and hand weeding at 30 DAS.

Foliar Application: Foliar application of cow urine @ 10 % and Panchagavya spray @ 3% as a source of nutrient and growth promoter at 45 and 60 DAS.

Plant protection measures

- Setaria or bajra as intercrop at 7:1 and castor as trap crop for *S. litura* management.
- Use of pheromone traps @ 5 per hectare for monitoring of *S. litura*.
- Collection of eggmasses of *S. litura* in groundnut as they lay eggs on upper surface of leaves.
- Neem seed kernel extract @ 5% or custard apple leaf extract @ 5% + *Nomuraea rileyi* 10¹¹ conidia/ha @ 1 g/lit as a foliar spray at 45 and 60 DAS against management of defoliators.

Yield: 30-35 q/ha of pod yield and 35-40 q/ha of haulam yield will be obtained.

Note: The package given may be updated with the development of new technologies and location specific information available.

SOYBEAN – ORGANIC PRODUCTION

Soybean is an important oil seed crop of country grown over an area of 9.95 million with a production of 12.57 million tones with productivity of 1264 kg/ha. Based on eight years field experiments carried out at MARS, Dharwad, the package of practices for organic production of soybean has been developed.

Details of Varieties

Varieties	Zone/situation	Time of sowing	Duration (days)	Special features
JS-335	1,2,3 and 8 <i>kharif</i>	May -15 to June end	85-90	Shattering resistant for 8-10 days after maturity resistant to bacterial pustules and leaf spot diseases.
JS 9305	1,2,3 and 8 <i>kharif</i>	May -15 to June end	80-85	Early maturing variety.
DSb 21	1,2,3 and 8 <i>kharif</i>	May -15 to June end	85-90	Resistant to rust disease

Production practices: Inputs required per hectare

a) Seeds	75 kg
b) Organic manures (Equi. RDP)	
Enriched compost	3.33 t
Vermicompost	2.66 t
Green leaf manure	5.33 t
Neem cake	250kg
c) Bio-fertilizers	
Rhizobium	1000 g
PSB	1000 g
<i>Trichoderma harzianum</i>	500 g

Sowing: Prepare land to a fine tilth by cultivating and harrowing. Optimum time of sowing is during May 15 to June end. Apply organic manures FYM compost and green leaf manures at 10-15 days before sowing. Sow the seeds at 30 cm x 7.5 cm spacing. Treat the seeds with *Trichoderma harzianum* @ 4g /kg seed followed by *Rhizobium* and *Phosphate solubilizing bacteria*. Apply vermicompost at the time of sowing in a row and

sow the treated seeds on the same day. Sow the crop as early as possible from May-15th to June end. Delay in sowing cause reduction in yield due to attack of pest and diseases.

Weed management: Inter cultivation at 20 and 40 days after sowing (DAS) followed by two hand weeding at 25 and 45 DAS will effectively control the weeds.

Foliar Spray: Foliar application of cow urine @ 10 % and panchagavya @ 3% at 30 and 45 days after sowing improve the yield and quality of soybean. It helped to retain more flowers, better pod development and seed filling and induced resistance to diseases.

Plant protection measures

- Collection of eggmasses/early instar larvae from infected plants.
- Pheromone traps@ five / ha for monitoring of *S. litura*.
- Application of neem seed kernel extract @ 5% + *Nomuraea rileyi* 10¹¹ conidia/ha (@ 1 g/l) as at 45 and 55 DAS against management defoliators.
- Botanicals @ 5% spray at 65 DAS as a bio-pesticide for defoliators and pod borer.

Yield: 20-25 q/ha

Note: The package may be updated as and when the location specific research is being carried and new technologies developed.

SORGHUM – ORGANIC PRODUCTION

Sorghum is an important cereal crop of Northern Karnataka. This is grown both during *kharif* and *rabi* seasons where as quality is good from rabi crop. The yield depends upon soil fertility, rainfall varieties, pest and diseases. Based on eight years experimentation under Network Project on Organic Farming the organic package has been developed. The organic practices were followed as per NSOP standards.

Varieties	Zone/situation	Time of sowing	Duration (days)	Special features
M-35-1	1,2,3 and 8 both rainfed and irrigated	September 15 to October 15	120-125	Tolerant to drought and resistant to shoot fly.
DSV-4	1,2,3 and 8 both rainfed and irrigated	September 15 to October 15	115-120	Resistant to charcoal rot disease.

Production practices: Inputs required per hectare

a) Seeds	7.5 kg
b) Organic manures	
Enriched compost	2.00 t
Vermicompost	1.70 t
Green leaf manure	3.30 t
Neem cake	250 kg
c) Bio-fertilizers	
Azospirillum	500 g
PSB	500 g

Sowing: From September second fortnight to October second fortnight is optimum for sowing. Apply organic manures mainly FYM/compost and green leaf manures 15 days before sowing. Before sowing soak the seeds in cow urine @ 25% solution, improves the germination and induce drought hardiness. The soaked seeds are treated with biofertilizers. Sow the seeds in 45 cm row spacing 15 cm apart to a depth of 5-7 cm.

Weed management: Intercultivation at 25, 50 and 60 DAS and hand weeding at 30 DAS to manage the weeds.

Foliar Spray : Foliar spray of cow urine @ 10% and Panchgavya @ 3% spray at 30 and 45 DAS as a source of nutrients and growth promoters improve the yield and help to overcome the nitrogen deficiency.

Plant protection measures

- ❖ Neem seed kernel extract @ 5% spray at 25 DAS help to manage shoot fly and sucking pests.
- ❖ To manage aphids foliar application of *Verticillium lecanii* @ 2 g or Botanical mixture @ 10% spray or NSKE5% as foliar spray.

Yield : 12-15 q/ha grain yield and 4 tonn/ha fodder yield can be obtained.

Note: The package given may be updated with the development of new technologies and location specific information available.

WHEAT RAINFED – ORGANIC PRODUCTION

Wheat is an important crop of Northern Karnataka. Three species viz., *Triticum aestivum*, *Triticum durum* and *Triticum dicoccum* are grown extensively in the state. Based on eight years experimentation under Network Project on Organic Farming the organic package for rainfed durum wheat has been developed.

Details of Varieties

Varieties	Zone/situation	Time of sowing	Duration (days)	Special Features
DWR-2006	1,2,3 and 8 under rainfed	October month	105-110	Resistant to leaf blotch disease.
Bijaga yellow	1,2,3 and 8 under rainfed	October month	105-110	Resistant to leaf blotch disease.

Production practices: Inputs required per hectare

a) Seeds	50 kg
b) Organic manures	
Enriched compost	2.00 t
Vermicompost	1.70 t
Green leaf manure	3.30 t
Neem cake	250 kg
c) Bio-fertilizers	
Azospirillum	500 g
PSB	500 g
d) Trichoderma	250 g

Sowing: October is suitable for sowing. Before sowing soak the seeds in water for 2-3 hrs and treat the seeds with Trichoderma @ 4 g/kg seed and Azospirillum and *Pseudomonas fluorescense* biofertilizers. Apply organic manures 15 days before sowing and sow the seeds in 30 cm rows.

Weed management: Intercultivation at 20 and 40 DAS and hand weeding at 30 and 50 DAS will help to manage weeds.

Foliar Spray : Foliar application of Panchgavya @ 3% spray and 10% cow urine at 30 DAS and at boot leaf stage as a source of nutrient and growth promoter enhance yield of wheat.

Plant protection measures

- ✚ Use rust resistant varieties.
- ✚ To manage aphids and sucking pests use NSKE @ 5% or botanical mixture @ 10% spray or *Verticillium lecanii* @ 1g of water as a bio-pesticide.
- ✚ For management termites apply Calatrophis leaves to soil at the time of sowing.

Yield: 12-15 q/ha grain and 28-30 quintals of bhusa (fodder) can be obtained.

Note: The package given may be updated with the development of new technologies and based on location specific information available.

COTTON – ORGANIC PRODUCTION

Cotton is an important commercial crop of Karnataka. Yield is mainly depend upon on duration of crop, rainfall, varieties and pest and disease management. Jayadhar cotton the herbaceum group is extensively grown as a relay intercrop in chilli and as a sole crop under rainfed situations.

Varieties	Zone/situation	Time of sowing	Duration (days)	Special Features
Jayadhar	Zone 3 and 8	July, August sole crop August - September Intercrop	200 days	Suitable for intercropping and for rainfed situations. Drought resistance variety. Resistant to pest and diseases.

Production practices: Inputs required per hectare

a) Seeds	3 kg
b) Organic manures	
Enriched compost	3.30 t
Vermicompost	2.70 t
Green leaf manure	5.30 t
Neem cake	250 kg
c) Bio-fertilizers	
Azospirillum	500 g
PSB	500 g

Sowing: Apply all the organic manures 15 days before sowing. Soak the seeds in 25% cow urine solution and air dried. Before sowing treat the seeds with biofertilizers. Sow the seeds at a spacing of 60cm x 30 cm during July-August as sole crop. Dibble two cotton seeds per hill between two chilli plants in a row in a intercropping system.

Weed management: Intercultivation at 25, 35 and 50 DAS and hand weeding at 30 and 55 DAS.

Foliar spray : Use of Panchgavya @ 3% and cow urine @ 10 % spray at 60 and 75 DAS as a source of nutrient and growth promoter.

Plant protection measures

- Use marigold and bhendi as trap crops for management of bollworm and shoot weevil.
- Maize as border crop
- Use of pheromone traps @ 5 per ha for monitoring of *H.armigera*.
- Yellow sticky trap for management of whiteflies @ 10 /acre.
 - Botanical @ 5% spray at 30 and 60 DAS as a biopesticides for sucking pest management.
 - Release of trichocard @ 1 card/acre at weekly interval 8-10 times after square formation.
 - Neem seed kernel extract @ 5% spray at 90 and 105 DAS as a bio-pesticide for bollworm management.

Yield : As a Sole crop 10-12 q/ha as intercrop 5-6 q/ha.

CHILLI – ORGANIC PRODUCTION

Chilli is an important commercial crop of Northern Karnataka, grown over an area of 2 lakh/ha. The chilli is extensively grown as a sole crop, relay intercrop with cotton, onion, garlic and coriander. The crop is extensively grown in Haveri, Dharwad, Gadag, Belagavi, Bellary, Koppal and Raichur districts of Karnataka. It is mainly grown as dry chilli and has export potential as whole chilli, chilli powder and oleoresin. Based on eight years experimentation under Network Project on Organic Farming the organic package has been developed.

Varieties	Zone/situation	Time of sowing	Duration (days)	Special Features
Byadagi Kaddi Byadagi dabbi Dyvanur	Zone 3 and 8 rainfed	June -July	180-200	Special features suitable for rainfed situations drought to lerant fruit are 12-15 cm in length, less pungent, dark red colour, high in oleo-resin content, wrinkles on the surface and good keeping quality.

Production practices: Inputs required per hectare

a) Seeds	3 kg
b) Organic manures	
Enriched compost	4.20 t
Vermicompost	3.30 t
Green leaf manure	6.70 t
Neem cake	250 kg
c) Bio-fertilizers	
Azospirillum	250 g
PSB	250 g
Trichoderma	10 g

Seed bed preparation: prepare 15 raised beds of size 7.5 m length x 1.20 m width x 10 cm height. Add 50 kg FYM and 25 kg VC to the beds. Sow the seeds at 8 cm rows and water the beds once in two days and stop watering 2-3 days before planting. Plant the seedlings after one month in well prepared field.

Planning : Apply all the organic manures 15 days before sowing. Seedlings are

planted at row spacing of 60cm x 60cm during June-July.

Weed management: Intercultivation at 30, 45 and 60 DAS and hand weeding at 35 and 50 DAS.

Foliar spray : Spray Panchagavya @ 3% and cow urine @ 10% at 45, 60 and 75 DAS as a source of nutrient and growth promoter helps for flowering and pod development.

Plant protection measures

- ❖ Barrier crop of maize or jowar 4-6 rows all along the border of chilli field to prevent sucking pest like thrips and mites and encourage natural enemies.
- ❖ Plant one row of marigold for every 15 rows of chilli as trap crop for *H.armigera* management.
- ❖ Use Pheromone traps @ 5/ha for monitoring of *H.armigera*.
- ❖ Foliar spray NSKE 5% or *verticillium lecanii* @ 2g/l + cow urine 10% at 30 and 45 days after transplanting (DAT) for management of sucking pests.
- ❖ Use yellow sticky traps @ 10/acre for management of sucking pests.
- ❖ NSKE 5% or botanical @ 5% spray or chilli+garlic extract @ 2% at 60 and 90 DAT as a biopesticide to control fruit borer.
- ❖ For management of anthracnose and fruit rot foliar spray of *Pseudomonas fluorescence* @ 5 g/l of water.

Yield: 7.5-10 q/ha dry chilli yield.

POTATO– ORGANIC PRODUCTION

Potato is a one of the important commercial crops of Karnataka. It is being grown in Northern Karnataka during *Kharif* season and it can also be grown during of *rabi* season if assured irrigation is available. Based on eight years experimentation under Network Project on Organic Farming the organic package has been developed.

Varieties	Zone/situation	Time of sowing	Duration (days)	Special Features
<i>Kufri Jawahar</i>	Zone 8	June month	60-75 days	Medium size round tubers. Resistant to late blight disease.

Production practices: Inputs required per hectare

a) Seeds/tubers	1000 kg
b) Organic manures	
Enriched compost	4.20 t
Vermicompost	3.30 t
Green leaf manure	6.70 t
Neem cake	250 kg
c) Bio-fertilizers	
Azospirillum	1kg
PSB	1kg
Trichoderma	4 kg

Tubers selection : Use disease free certified seeds for planting. Use tubers with viable sprouting buds and big tubers can be cut in to pieces with at least two buds which weighs 35-40 g.

Sowing: Prepare land to fine tilth by deep ploughing and harrowing. Apply all the organic manures 10-15 days before sowing. Apply vermicompost +250 kg neem cake at the time of planting. June is suitable for *kharif* planting. Prepare land into ridges and furrow with 60 cm rows and plant seed tuber at 20 cm apart on the ridge. After 30 days earthing up can be done this increase the number of tubers and protect the tubers from disease.

Weed management: Intercultivation at 20 and 45 days after planting (DAS) and 2 times hand weeding at 25 and 50 DAS.

Foliar spray : Foliar application of cow urine @ 10% panchagavy @3% at 30 and 45 days after planting.

Plant protection measures

- Dip the tubers for 10 minutes in a *Trichoderma* solution prepared in 50 litre of water with 4 kg of *Trichoderma*.
- Release of Trichocard @ 1 card/acre @ weekly interval 3 to 4 times after noticing the shoot borer incidence @ 25/ha for mass trapping set up shoot borer pheromone traps.
- Mechanical removal of infested shoots.
- Use of wettable sulphur @ 3g/lit if mite infestation is noticed.
- NSKE @ 5% spray at 45 DAS as a biopesticide
- Neem seed kernel extract or botanicals @ 5% or *Nomuraea rileyi* @ 1 g /ltr of water for management of *Spodoptera litura*.

Yield: 50 q/ha

CHICKPEA – ORGANIC PRODUCTION

Chickpea is an important pulse crop of Northern Karnataka. The *Desi* type chickpea contribute to around 80% and the *Kabuli* type around 20% of the total production. India is the largest producer of this pulse contributing to around 70% of the world's total production.

Details of Varieties

Varieties	Zone/situation	Time of sowing	Duration (days)	Special Features
Annigeri-1,	Zone 3 and 8	October-November	90-95	Resistance to drought
JG-11	Zone 3 and 8	October-November	90-100	Bold seeded resistant to wilt and high yielding

Production practices: Inputs required per hectare

a) Seeds	50 kg
b) Organic manures (Equi. RDP)	
Enriched compost	1.00 t
Vermicompost	8.0q
Green leaf manure	1.70 t
Neem cake	250kg
Trichoderma	2.50 g
c) Bio-fertilizers	
Rhizobium	1000 g
PSB	1000 g

Sowing: Prepare land to a fine tilth, apply, FYM /Compost and green manures 15 days before sowing and apply vermicompost at the time of sowing to seed row. Soak the seeds @ 25% cow urine solution for two hours, air dried and treat them with biofertilizers before sowing. Sow the seeds at 30 x 10 cm row the spacing.

Weed management: Intercultivation at 30 and 45 days after sowing (DAS) and hand weeding at 35 DAS will help to manage the weeds efficiently.

Clipping : At 35 – 40 DAS clip the apical vegetative shoot to increase branching.

Foliar spray: Foliar spray of cow urine 10 % and panchagavya @ 3% at 30 and 45 DAS as a source of nutrient and growth promoter.

Plant protection measures

- Intercropping of coriander at 4:1 row ratio help to reduce pod borer.
- Monitoring of *Helicoverpa* by pheromone traps @ 5/ha.
- For attraction of birds, sprinkle puffed rice or cooked rice with turmeric powder in the morning or evening hours.
- Use Ha NPV @ 250 LE/ha +Neem Seed Kernel Extract @5% or chilli + garlic extract @ 2% at 30 and 45 DAS for management of pod borer.
- Barrier crop of sorghum all along the border of chickpea reduce rust incidence.

Yield: 12-15 q/ha

MAIZE – ORGANIC PRODUCTION

Maize is a one of the most important coarse cereal food and fodder crop .In India, maize is grown over an area of 8.33 million ha with an annual production of about 16.68 million tonnes and an average productivity of about 2002 kg ha⁻¹. In Karnataka, maize occupies an area of 1.07 million ha with an annual production of about 3.03 million tonnes and an average productivity of 2833 kg ha⁻¹. In the state it is grown under rainfed as well as irrigated conditions. Based on eight years experimentation under Network Project on Organic Farming the organic package has been developed.

Varietals details :

Varieties/hybrids	Zone/situation	Time of sowing	Duration (days)	Special Features
EH-434042 (Arjun) or other hybrids	3 and 8 rainfed/irrigated	June-July	110-115	High yielding

Production practices: Inputs required per hectare

a) Seeds	15 kg
b) Organic manures	
Enriched compost	4.20 t
Vermicompost	3.30 t
Green leaf manure	6.70 t
Neem cake	2250 kg
c) Bio-fertilizers	
Azospirillum	1000 g
PSB	1000 g

Sowing: Prepare land by ploughing and harrowing to a fine tilth Apply FYM/compost and green leaf manures 15 days before sowing and incorporate into the soil. Apply half of the vermicompost at the time of sowing to seed row. Soak the seeds in water for 8 hrs air dry and treat them with biofertilizers. Sow the seeds by hand dibbling at a spacing of 60 cm x 30 cm during June 1st FN. Apply remaining half dose of the vermicompost at 30 days after sowing (DAS) and ensure sufficient moisture at the time of application.

Weed management: Intercultivation at 20 and 40 DAS

two and hand weeding at 25 and 45 DAS will manage weeds efficiently.

Foliar Spray : Panchagavya @ 3% and cowurine @ 10 % spray at 30 and 45 DAS as a source of nutrient and growth promoter.

Plant protection:

- Plant NB 21 grass on the bunds as a trap crop for management of stem borer of maize.
- Release of *Trichogram* @ 50000/ha (1 card/ha) at weekly interval 3 to 4 times to control stem borer.
- *N. rileyi* @ 1g/l spray or HaNPV 250LE/ha for management of cob borer
- Neem seed kernel extract @ 5% or Botanicals @ 10% spray at 45 and 60 DAS as a bio-pesticide to control aphids and stem borer.
- To control armyworm spray NSKE 5% and *Nomuraea rileyi* @ 1 g /l of water.

Yield : 30 - 35 q/ha grain yield and 5.0 tonne of fodder yield.