Scientific Package of Practices (PoPs) for organic production of crops in cropping systems

ICAR-Network Project Organic Farming

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Package of practice for organic production of crops in cropping systems

Chhatisgarh

Prepared by: Dr.M.C. Bhambri, S. K. Agrawal, Anup Singh, Ashok Pal, P.C. Kanwar, P.L. Sahu and S. Navrang, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhatisgarh)

Suggested cropping systems for organic production (based on testing under NPOF)

1. Soybean- Chickpea cropping system
2. Soybean-Onion cropping system
3. Rice-Chickpea cropping system

Details of Cropping Systems

1: Cropping System: Soybean- Chickpea cropping system

Particulars	*Kharif*	*Rabi*
Crop	Soybean	Chickpea
Fortnight of sowing/planting	Second fortnight of June	Second fortnight of October to first fortnight of November
Fortnight of harvesting	Second fortnight of October	Second fortnight of February to first fortnight of March
Varieties suitable for organic farming	JS-335	Vaibhav

Crop *(kharif)* : Soybean

Important features of suitable varieties

Parameters	JS-335
Duration (days)	95-100
Average yield under organic condition (kg/ha)	1500-1800
Source (s) of availability	NSP – IGKV, Raipur
Suitable regions/districts in the state	Kabirdham, Durg, Rajnandgaon, Bemetra,Raipur and parts of Bilaspur districts.
Specific resistance / tolerance to pest	Tolerance to stem fly
Specific resistance / tolerance to disease	Resistance to bacterial pustule and tolerance to bud blight

Field preparation: One deep ploughing followed by two harrowing and planking.

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	70-75		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Rhizobium culture	500 g/ha	Seed treatment

	PSB	500 g/ha	Seed treatment
	Tricoderma viridi culture	500 g/ha	Seed treatment
Spacing (Row X plant) in cm	30 X 10		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	2 t/ha	
	Vermicompost	0.8 t/ha	
	Neemcack	0.2 t/ha	
	Rock phosphate	0.27 t/ha	
Major weeds	Motha (*Cyperus spp*.), Crab grass (*Digitaria sanguinalis*), Jangali kodo – Goose grass *(Eleusine indica)*, Sava – Barnyard grass (*Echinochloa colona*), Badi dudhi – Garden spurge (*Euphorbia hirta*), Dudhi – Milkweed (*Euphorbia geniculata*), Hazardana – Seed-under-leaf (*Phylanthus niruri*)		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-25 DAS	Hand weeding and mechanical weeding by cycle wheel hoe	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Tobacco caterpillar	*Baveriya basiyana* SLNPV 500 L.E.	4 gm/litre of water 2 ml/litre of water

Yield and Economics

Parameters	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Economic yield (kg/ha)	1603	2385	2793	2448	1623	1556	1695	1081	1718
Price* (Rs/kg) (consider 25 % premium on prevailing market price)	Rs 27.50								
Cost of cultivation*(Rs/ha)	Rs. 22585								
Net returns* (Rs/ha)	Rs. 24651								

*based on prices of 2013-14

Crop *(Rabi)*:Chickpea

Important features of suitable varieties

Parameters	Vaibhav
Duration (days)	110-115
Average yield under organic condition (kg/ha)	800-1000
Source (s) of availability	IGKV, Mega seed Project

Suitable regions/districts in the state	Chhattisgarh plains
Specific resistance / tolerance to disease	Wilt resistance

Field preparation: Ploughing through cultivator twice and planking

Cultural practices

Seed rate (kg/ha)	70-80		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Rhizobium PSB	0.5 kg 0.5 kg	Seed treatment Seed treatment
Spacing (Row X plant) in cm	30 X 10		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	1.33 t/ha	
	Vermicompost	0.53 t/ha	
	Neemcack	0.13 t/ha	
	Rock phosphate	0.27 t/ha	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	2	Flowering and pod filling.	2-3
Major weeds	Bathua - Lambsquarters (*Chenopodium album*), Safed senji - White sweet clover (*Melilotus alba*), Krishna neel - Scarlet pipmpernel (*Anagallis arvensis*), Chinouri - Medick (*Medicago denticulate),* Sava - Barnyard grass *(Echinochloa colona),* Motha (*Cyperus spp.*)		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	25-30 DAS	Hand weeding or hand hoe/cycle hoe	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Gram pod borer	HaNPV	250 LE/ha 3 spray at weekly interval.
		Trichogramma spp.	50000 eggs/ha
		Pheromone trap	5-8 nos.

Yield and Economics

Parameters	**2004-05***	**2005-06**	**2006-07**	**2007-08**	**2008-09**
Economic yield (kg/ha)	770	1480	1090	610	957
Price (Rs/kg) (consider 25 % premium on prevailing market price)	25.00				
Cost of cultivation**(Rs/ha)	10091				
Net returns** (Rs/ha)	13828				

*based on prices of 2013-14

Glimpses

		
Neem cake	Vermicopost	F.Y.M.

Kharif	***Rabi***
	
Organic Soybean growth stage	Organic Chickpea pod setting stage

Kharif	***Rabi***
	
Organic soybean before harvesting	Organic Chickpea

2. Cropping System: Soybean- Onion cropping system

Particulars	*Kharif*	*Rabi*
Crop	Soybean	Onion
Fortnight of sowing/planting	Second fortnight of June	First fortnight of December
Fortnight of harvesting	Second fortnight of October	First fortnight of April
Varieties suitable for organic farming	JS-335	Nasik red

Crop *(Kharif)*: Soybean

Important features of suitable varieties

Parameters	JS-335
Duration (days)	95-100
Average yield under organic condition (kg/ha)	1500-1800
Source (s) of availability	NSP – IGKV, Raipur
Suitable regions/districts in the state	Kabirdham, Durg, Rajnandgaon, Bemetra,Raipur and parts of Bilaspur districts.
Specific resistance / tolerance to pest	Tolerance to Stem fly
Specific resistance / tolerance to disease	Resistance to bacterial pustule and tolerance to bud blight

Field preparation: One deep ploughings followed by two harrowing and planking.

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	70-75		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Rhizobium culture	500 g/ha	Seed treatment
	PSB	500 g/ha	Seed treatment
	Tricoderma viridi culture	500 g/ha	Seed treatment
Spacing (Row X plant) in cm	30 X 10		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	2 t/ha	
	Vermicompost	0.8 t/ha	
	Neem cake	0.2 t/ha	
	Rock phosphate	0.27 t/ha	
Major weeds	Motha (*Cyperus spp*.), Crab grass (*Digitaria sanguinalis*), Jangali kodo – Goose grass *(Eleusine indica),* Sava – Barnyard grass (*Echinochloa colona*), Badi dudhi – Garden spurge (*Euphorbia hirta*), Dudhi –		

	Milkweed (*Euphorbia geniculata*), Hazardana – Seed-under-leaf (*Phylanthus niruri*)		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-25 DAS	Hand weeding and mechanical weeding by cycle wheel hoe	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Tobacco caterpillar	*Baveriya basiyana* SLNPV 500 L.E.	4 gm/litre of water 2 ml/litre of water

Yield and Economics

Parameters	**2004 ***	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Economic yield (kg/ha)	1603	2385	2793	2448	1623	1556	1695	1081	1718
Price** (Rs/kg) (consider 25 % premium on prevailing market price)	Rs 27.50								
Cost of cultivation*(Rs/ha)	Rs. 22585								
Net returns* (Rs/ha)	Rs. 24651								

*based on prices of 2013-14

Crop *(Rabi)* :Onion

Important features of suitable varieties

Parameters	Nasik Red
Duration (days)	100-110
Average yield under organic condition (kg/ha)	8000-12000
Source (s) of availability	Raipur Local Market
Suitable regions/districts in the state	Chhattisgarh plains

Nursery raising practices (if applicable)

Area of nursery required for 1 ha	500 m^2
Nursery raising method	raised bed method
Bed size (length X breadth in m)	5 X 1

Seed sowing rate/m^2	20 g		
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	Vermicompost	200 g	Soil incorporation
	FYM	500 g	Soil incorporation
Irrigation practices	First come up Irrigation after sowing and next 7-10 days interval		
Weed management	One hand weeding 25-30 days after sowing		
Optimum age of nursery (days)	40-45		

Field preparation: One deep ploughing followed by two harrowing and planking applied for field preparation.

Cultural practices

Spacing (Row X plant) in cm	15 X 10		
Number of seedlings/hill (in nursery crops only)	1		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	5 t/ha	
	Vermicompost	2 t/ha	
	Neem cake	0.5 t/ha	
	Rock phosphate	0.27 t/ha	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	6-8	Formation of bulb	3 - 4
Major weeds	Amarbel – Dodder (*Cuscuta spp),* Bathua - Lambsquarters (*Chenopodium album),* Choulai – Green amarenth (*Amaranthus viridis*), Safed senji – White sweet clover (*Melilotus alba*), Sava – Barnyard grass (*Echinochloa colona*), Motha - (*Cyperus spp*.) and Chanori – Medick (*Medicago denticulate*)		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-25 and 45-50 DAS	Hand weeding and interculture	
Optimum stage of harvesting	100-110 days		

Yield and Economics

Parameters	**2009-10***	**2010-11**	**2011-12**	**2012-13**
Economic yield (kg/ha)	9070	11800	13260	13170
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs. 12.50			

Cost of cultivation*(Rs/ha)	Rs. 37686
Net returns* (Rs/ha)	Rs.126902

*based on prices of 2013-14

Glimpses

		
Neem cake	Vermicompost	F.Y.M.

Kharif	***Rabi***
	
Organic Soybean growth stage	Organic Onion growth stage
Kharif	***Rabi***
	
Organic soybean before harvesting	Organic Onion produce

3. Cropping System: Rice-Chickpea cropping system

Particulars	*Kharif*	*Rabi*
Crop	Rice	Chickpea
Fortnight of sowing/planting	Second fortnight of June	Second fortnight of November
Fortnight of harvesting	First fortnight of November	First fortnight of March
Varieties suitable for organic farming	Kasturi and Sugundhmati	Vaibhav

Crop *(kharif)*:Rice

Important features of suitable varieties

Parameters	Kasturi	Sugandhmati
Duration (days)	120-130	135-140
Average yield under organic condition (kg/ha)	3500-4000	3500-4000
Source (s) of availability	NSP, IGKV, Raipur	NSP, IGKV, Raipur
Suitable regions/districts in the state	Chhattisgarh Plain zone	Chhattisgarh Plain zone
Specific resistance / tolerance to pest	Stem borer tolerance	
Specific resistance / tolerance to disease	Blast resistance	

Nursery raising practices.

Area of nursery required for 1 ha	1000 m^2		
Nursery raising method	Raised bed method		
Bed size (length X breadth in m)	10 X 1		
Seed sowing rate/m^2	40 g		
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	Enriched compost	100 g	Soil application
	Cow dung manure	500 g	Soil application
	N.E.O.C. – Non edible oil cake	50 g	Soil application
Irrigation practices	First come up irrigation after sowing and next 6-7 days interval		
Optimum age of nursery (days)	21-25 days		

Field preparation: Sowing ofSunhemp should be done during May month for green manuring purpose and incorporated in the field at vegetative stage around 40-45 DAS. For incorporation of the green manure impound the water in the field and after that plough the field twice and use rotavator once for proper incorporation and puddling.

Cultural practices

Spacing (Row X plant) in cm	20 X 10		
Number of seedlings/hill (in nursery crops only)	2-3		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source		Quantity/ha
	Enriched compost		6.6 t
	Cow dung manure		4.4 t
	N.E.O.C. – Non edible oil cake		0.88 t
	Rock phosphate		0.05 t
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Biodynamic preparation	2.5 g/32.5 lit water	P.I. and flowering stage
	Panchagavvya	50 litre	P.I. and flowering stage
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	5-6	Tillerig & grain filling	5-7
Major weeds	Sava – Barnyard grass (*Echinochloa colona, Echinochloa crus-galli*) Motha (*Cyperus spp*.), Kauva keni – Benghal day flower (*Commelina benghalensis*), Resham Kanta – Sessil joyweed (*Alternanthera sessilis*), Kana – Creeping cradle plant (*Cynotis axillaris)* etc.		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20 DAT and 10-15 days interval thereafter.	Ambika Paddy weeder	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	leaf folder	Neem oil	2 litres

Yield and Economics

Parameters	**2009-10***	**2010-11**	**2011-12**	**2012-13**
Economic yield (kg/ha)	3550	4280	4260	4320
Price (Rs/kg) (consider 25 % premium on prevailing market price)	16			
Cost of cultivation*(Rs/ha)	31900			
Net returns*(Rs/ha)	43362			

*based on prices of 2013-14

Crop *(Rabi)* :Chickpea

Important features of suitable varieties

Parameters	Vaibhav
Duration (days)	110-115
Average yield under organic condition (kg/ha)	800-1000
Source (s) of availability	IGKV, Mega seed Project
Suitable regions/districts in the state	Chhattisgarh plains
Specific resistance / tolerance to disease	Wilt resistance

Field preparation: Ploughing through cultivator twice and planking

Cultural practices

Seed rate (kg/ha)	70-80		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Rhizobium PSB	0.5 0.5	Seed treatment Seed treatment
Spacing (Row X plant) in cm	30 X 10		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	Enriched compost	1.66 t	
	Cow dung manure	1.11 t	
	N.E.O.C. – Non edible oil cake	0.22 t	
	Rock phosphate	0.17 t	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Biodynamic preparation	2.5 g/32.5 litre water	2 spray at flowering stage in 15 days interval
	Panchagavvya	50 litre	3 spray at flowering stage in 10 days interval
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	2	flowering	2-3
Major weeds	Bathua - Lambsquarters (*Chenopodium album*), Safed senji -White sweet clover (*Melilotus alba*), Krishna neel - Scarlet pipmpernel (*Anagallis arvensis*), Chinouri - Medick (*Medicago denticulate)*, Sava - Barnyard grass *(Echinochloa colona),* Motha (*Cyperus spp.*)		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	25-30 DAS	Hand weeding or hand hoe/cycle hoe	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)

	Gram pod borer	HaNPV	250 LE/ha 3 spray at weekly interval.
		Trichogramma spp.	50000 eggs/ha
		Pheromone trap	5-8 nos.

Yield and Economics

Parameters	**2009-10***	**2010-11**	**2011-12**	**2012-13**
Economic yield (kg/ha)	1008	1210	1370	1270
Price (Rs/kg) (consider 25 % premium on prevailing market price)	32			
Cost of cultivation*(Rs/ha)	21622			
Net returns* (Rs/ha)	19045			

*based on prices of 2013-14

Glimpses

Cow dung manure

Neem cake

Kharif

Organic rice field of NPOF experiment during 2012-13

Rabi

Panchgavaya spray at chickpea of NPOF experiment during 2012-13

Kharif

Organic Paddy

Rabi

Organic Chickpea mature stage

Himachal Pradesh

Prepared by:D. K. Parmar; J. K. Sharma; D. R. Thakur; R. S. Jamwal; R. K. Devlash; Vinod Sharma; Arpana; Neha; Brij Bala & S. D. SharmaCSK Himachal Pradesh Krishi Vishvavidayalaya, Hill Agricultural Research & Extension Centre, Bajaura 175125, Kullu

Suggested cropping systems (based on testing under NPOF)

1. Maize - Garlic
2. Cauliflower - Pea -Tomato
3. Coriander - Pea -Tomato

Details of Cropping Systems (based on testing under NPOF)

Cropping System 1: Maize-Garlic

Particulars	*Kharif*	*Rabi*
Crop	Maize	Garlic
Fortnight of sowing/planting	June	October
Fortnight of harvesting	October	May
Varieties suitable for organic farming	Girija	GHC-1

Crop *(kharif)*: Maize

Important features of suitable varieties

Parameters	Girija
Duration (days)	115
Average yield under organic condition (kg/ha)	4603
Source (s) of availability	CSK HPKV, Palampur
Suitable regions/districts in the state	Kullu, Mandi, Chamba
Specific tolerance to drought/water logging	Yes

Field preparation: Irrigate the field and then plough disc harrow and thereafter plough with power tiller twice and thereafter follow planking to maintain proper moisture in the field. Prepare plain beds and keep trenches in between and around the field for water drainage.

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	20-25	
Spacing (Row × plant) in cm	60 x 20	
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha
	FYM	16 t
	VC	12 t
	Rock phosphate	60 kg

Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Cow urine	60 L/600 L water/ha	30, 45, 60,90 DAS
	Panchagavaya	18 L/600 L water/ha	60,90 DAS
	Vermiwash	60 L/600 L water/ha	60,90 DAS
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	4-5	3-4 leaf stage, tasseling, grain filling etc.	4-5
Major weeds	Local name	Common name	Scientific name
	Doob grass	-	Cynadon dactylon
	Motha	Purple nutsedge	*Cyperus* spefies
	Baru	Johnson grass	*Sorghum halepense*
	Jhanda	Water grass	*Echinochloa colonum*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	4 leaf stage, 1 month after first weeding and at taselling	Manual	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Cut-worms	Through cultural practices like flood irrigation and formation trenches around the field	4- 5 flood irrigations and digging trench of size 20 cm deep and 20 cm wide
Optimum stage of harvesting	When the cob covering turns brown and the moisture in cobs is near 30%		

Yield and Economics

Parameters	**2004-05***	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
Economic yield	3143	2823	3030	3572	3800	5950	6018	5654	7440

(kg/ha)									
Price (Rs/kg) (consider 25 % premium on prevailing market price)	12.50								
Cost of cultivation*(Rs/ha)	34090								
Net returns* (Rs/ha)	58910								

*based on prices of 2013-14

Crop *(kharif)*: Garlic

Important features of suitable varieties

Parameters	GHC-1
Duration (days)	220
Average yield under organic condition (kg/ha)	8037
Source (s) of availability	University
Suitable regions/districts in the state	Kullu, Mandi, Solan, Shimla,Kangra
Specific tolerance to drought/water logging	Drought resistant

Field preparation: Irrigate the field to field capacity and then plough once with disc harrow and twice with power tiller and thereafter follow planking to maintain proper moisture in the field. Plain bed size is kept as land availability

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	500-600		
Spacing (Row × plant) in cm	20 x 10		
Recommended NPK and micro nutrient dose for the crop (kg/ha)	N 125: P75: K 60 20 -25 kg/ha sulphate of each Fe, Zn , Mn , Cu		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	22 t	
	VC	16 t	
	Rock phosphate	100 kg	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Cow urine	60 L/600 L water/ha	30, 45, 60,90, 120 DAS
	Panchagavaya	18 L/600 L water/ha	60,90, 120 DAS
	Vermiwash	60 L/600 L water/ha	60,90, 120 DAS
Irrigation practices	Number of	Most critical	Depth of irrigation

	irrigations	stages for irrigation	(cm)
	5-6	15 DAS, 3 leaf, initiation of clove formation, 30 days before harvesting	4-5
Major weeds	Local name	Common name	Scientific name
	Jaldhar	Corn Butter Cup	*Ranunculus arvensis*
	Poa grass	Annual blue grass	*Poa annua*
	Maina/Khukhni	Bur clover	*Medicago denticulate*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	3 leaf, clove formation, 35 days before harvesting	Manual	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Purple Blotch	Cow urine+ Butter milk	30 L/300 L water/ha+30 L/300 L water/ha
	Stemphylium blight	*Trichoderma viride* + *Pseudomonas fluorescence*	0.30 gm/m^2 each
Optimum stage of harvesting	When leaf colour changes to yellow and starts drying		

Yield and Economics

Parameters	**2004-05**	**2005-06**	**2006-07**	**2007-08***	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
Economic yield (kg/ha)	6082	4420	4600	9000	9640	9640	8644	10840	9450
Price (Rs/kg) (consider 25 % premium on prevailing market price)	31.25								
Cost of cultivation*(Rs/ha)	52000								

Net returns* (Rs/ha)	243313

*based on prices of 2013-14

Glimpses

Kharif	Rabi
	
Organic maize crop	Organic garlic crop
Kharif	***Rabi***
	
Harvested organic maize cob	Harvested organic garlic bulb

Cropping System 2: Cauliflower-Pea-Tomato

Particulars	*Kharif*	*Rabi*	Summer
Crop	Cauliflower	Pea	Tomato
Fortnight of sowing/planting	August	November	May
Fortnight of harvesting	October	April	July
Varieties suitable for organic farming	Hybrid- Swati	Var. Azad-P1	Hybrid-7730

Crop *(kharif)* : Cauliflower

Important features of suitable varieties

Parameters	Hybrid-Swati
Duration (days)	70
Average yield under organic condition (kg/ha)	8852
Source (s) of availability	Local Market
Suitable regions/districts in the state	Kullu and Mandi

Nursery raising practices (if applicable)

Area of nursery required for 1 ha	$30m^2$		
Nursery raising method	Raised seed bed		
Bed size (length × breadth in m)	3m × 1m		
Seed sowing rate/m^2	23g		
Pre-sowing seed/soil treatment	Materials	Quantity/kg of seed or per m^2area	Method of application
	Nursery bed treatment		
	Trichoderma virde/ Trichoderma harzianum	40 gm/ m^2	Drenching/broadcasting
	Plastic sheet	22 m^2	Soil solarisation
	Seed treatment		
	Trichoderma virde	5 gm/kg of seed	Seed coating
	Pseudomonas fluorescence	5 gm/kg of seed	

	Hot water Treatment for black rot		Seed soaking
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	FYM	5 kg	Basal application
	VC	2 kg	-do-
Irrigation practices	Watering can		
Weed management	Manual		
Organic plant protection practices	Name of pest/disease	Recommended organic material used for control	Quantity/ m^2area
	Blight/leaf spot	*Trichoderma virde* + *Pseudomonas fluorescence*	0.30 gm/m^2 each
	Black rot	*Trichoderma virde* + *Pseudomonas fluorescence*	0.30 gm/m^2 each
	Curd rot	*Trichoderma virde* + *Pseudomonas fluorescence*	0.30 gm/m^2 each
Optimum age of nursery (days)	38		

Field preparation: The field is irrigated and then plough once with disc harrow and thrice with power tiller to bring soil in to good tilth. The bed size is kept as per convenience.

Cultural practices

Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Seedling treatment		
	Trichoderma virde	3kg/ha	Root dip
	Pseudomonas fluorescence	3kg/ha	Root dip
Spacing (Row × plant) in cm	60 × 45		
Number of seedlings/ kanal ($400m^2$)	1480		

Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	22 t	
	VC	16 t	
	Rock phosphate	100 kg/ha	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Cow urine	60 L	15, 30, 45, 60 DAT
	Panchagavya	18L	30, 45, 60 DAT
	Vermi wash-10%	60 L/600 L water/ha	30, 45, 60 DAT
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	4-5	Transplanting and curd formation	4-5 cm
Major weeds	Local name	Common name	Scientific name
	Jhanda	Water grass	*Echinochloa colonum*
	Chhoti Jhan	Yellow foxtail	*Setaria glauca*
	Motha	Purple nutsedge	*Cyperus sp.*
	Ragi/Mandal	Goose grass	*Eleusine indica*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	2-3 (4 leaf stage, 2 times before curd formation)	Manual	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	1.Lepidopeterus larvae	Delta Sticky Traps having DBM (Diamond Back Moth) lure to be installed immediately after transplanting	25traps/ha
	2.Aphids	No need as the population remains below Economic Injury Level	-
Optimum stage of harvesting	When curds become compact and gain proper shape		

(in case of vegetables and green cob)	

Yield and Economics

Parameters	**2007-08***	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
Economic yield (kg/ha)	10670	9660	8330	9523	7570	7360
Price (Rs/kg) (consider 25 % premium on prevailing market price)	8.00					
Cost of cultivation*(Rs/ha)	34738					
Net returns* (Rs/ha)	24142					

*based on prices of 2013-14

Crop *(Rabi)*: Pea

Important features of suitable varieties

Parameters	Azad P-1
Duration (days)	140
Average yield under organic condition (kg/ha)	8941
Source (s) of availability	Deptt. of Agriculture
Suitable regions/districts in the state	Kullu

Field preparation: Irrigate the field to field capacity and then plough once with disc harrow and twice with power tiller and thereafter follow planking to maintain proper moisture in the field. Plain bed size is kept as land availability

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	75		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Soil treatment		
	Trichoderma virde	3.75 kg/ha	Broadcast
	Seed Treatment		
	Trichoderma virde	3.75 kg/ha	Seed coating of each
	Pseudomonas fluorescence	3.75 kg /ha	
Spacing (Row X plant) in cm	60 X 10		
Basal application of organic	Source	Quantity/ha	

manures including soil application of bio-fertilizers, bio-control agents etc	FYM	4.34t	
	VC	3.2t	
	Rock phosphate	87kg	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Cow urine	60L	30, 45, 60 DAS
	Panchagavya	18L	30, 45, 60 DAS
	Vermi wash-10%	60 L/600 L water/ha	30, 45, 60 DAS
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	2-3	Seed germination, flowering and pod formation	4-5cm
Major weeds	Local name	Common name	Scientific name
	Jaldhar	Corn Butter Cup	*Ranunculus arvensis*
	Poa grass	Annual blue grass	*Poa annua*
	Maina/Khukhni	Bur clover	*Medicago denticulate*
	Krishan neel	Scarlet pimpernel	*Anagallis arvensis*
	Khokhua	Chick weed	*Stellaria media*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	1.After 3-4weeks of sowing 2.Before flowering	Manual	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Ascochyta blight	*Trichoderma virde* + *Pseudomonas fluorescence*	3kg/ha each
	Powdery mildew	Ginger, Garlic and Chilli Extract	1.25 kg/ha ginger, 2.5 kg/ha garlic, 1.25 kg/ha chilli
	Powdery mildew	*Trichoderma virde* + *Pseudomonas fluorescence*	3kg/ha each
Optimum stage of harvesting (in case of vegetables and green cob)	When Pea pods attain dark green colour		

Yield and Economics

Parameters	**2007-08***	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
Economic yield (kg/ha)	10820	11290	5230	7420	10185	8700
Price (Rs/kg) (consider 25 % premium on prevailing market price)	25					
Cost of cultivation**(Rs/ha)	52845					
Net returns** (Rs/ha)	164655					

Crop *(Summer):* Tomato

Important features of suitable varieties

Parameters	Hybrid- 7730
Duration (days)	85
Average yield under organic condition (kg/ha)	10410
Source (s) of availability	Department of Agriculture
Suitable regions/districts in the state	Kullu, Mandi, Kangra, Solan
Specific resistance / tolerance to pest	No
Specific resistance / tolerance to disease	Bacterial wilt
Specific tolerance to drought/waterlogging	No

Nursery raising practices:

Area of nursery required for 1 ha	30 m^2		
Nursery raising method	Raised seed bed		
Bed size (length X breadth in m)	3m X 1 m		
Seed sowing rate/m^2	15 g		
Pre-sowing seed/soil treatment	Materials	Quantity/kg of seed or per m^2area	Method of application
	Seed Treatment		
	Trichoderma virde	5 gm/kg each	Seed coating
	Pseudomonas fluorescence		
	Nursery bed Treatment:		
	Trichoderma virde / *Trichoderma harzianum*	40 gm/ m^2	Drenching/ broadcasting
	Plastic sheet	30m^2	Soil solarisation
	Seedling Treatment		
	Trichoderma virde	0.30 g/m^2 each	Root dip
	Pseudomonas		

	fluorescence		
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	FYM	2 kg	Basal application
	VC	1 kg	-do-
Irrigation practices	Watering can		
Weed management	Manual		
Organic plant protection practices	Name of pest/disease	Recommended organic material used for control	Quantity/ m^2area
	Blights/leaf spots/fruit rots	*Trichoderma virde+ Pseudomonas fluorescence*	0.30 gm/m^2 each
	Wilt/root/collar rot	*Trichoderma virde***as soil treatment**	3.75kg/m^2
	Wilt/root/collar rot	*Trichoderma virde + Pseudomonas fluorescence* ***as foliar spray***	0.30 gm/m^2 each
Optimum age of nursery (days)	32		

Field preparation: The field is irrigated and then plough once with disc harrow and thrice with power tiller to bring soil in to good tilth. The bed size is kept as per convenience. Proper trenches around the field are formed for drainage of excess water.

Note: The land holding in the state is generally small and it is difficult to use tractor for ploughing. In such situation, the ploughing may be done preferably with bullocks or power tiller.

Cultural practices

Pre-sowing/planting treatment of seed/seedlings (only using organic inputs such as bio-fertilizer, bio-control agents, cow urine, panchagavya etc)	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Trichoderma viride+ Pseudomonas flourosence	3.75kg/ha each	Basal application
Spacing (Row X plant) in cm	60 X 45		
Number of seedlings/ kanal ($400m^2$)	1480		

Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	17.4 t	
	VC	12.8 t	
	RP	100 kg	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Cow urine	60 L/600 L water/ha	15, 30, 45, 60 DAT
	Panchagavya	18L	15, 30, 45, 60 DAT
	Vermiwash	60 L/600 L water/ha	15, 30, 45, 60 DAT
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	3-4	Transplanting, flowering and fruit setting	4-5
Major weeds	Local name	Common name	Scientific name
	Kulfa	Purslane	*Portulaca oleracea*
	Tipatia/khatibuti	Wood sorrel	*Oxalis latifolia*
	Poa grass	Annual blue grass	*Poa annua*
	Peeli buti	-	*Gallinsoga parviflora*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	After 2-3 weeks of transplanting and thereafter 45 and 60 DAT	Manual	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Fruit borer	i)Lipel/Dipel (*Bacillus thuringiensis sp. kurstaki*)	Lipel @1.0 kg/ha or Dipel 1.0 L/600 L/ water/ha
		ii)Neemban(0.15%)	3L/600 L water/ ha
		iii)Margosom (Azedarchtin 1.0%)	0.6L/600 L water/ ha
		iv) *Darek (Melia *azedarach*) or Karvi (*Roylea cinerea*) or kali basuti (*Eupatorium*) 5% aqueous leaf extract + cow urine 3% + emulsifier TritonX-100 (0.05%)	3L/600 L water/ ha

Optimum stage of harvesting	When ¼th lower part of tomato fruit turns red.

Yield and Economics

Parameters	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
Economic yield (kg/ha)	14970	15620	18580	1993	3700	7600
Price (Rs/kg) (consider 25 % premium on prevailing market price)	18.75					
Cost of cultivation*(Rs/ha)	55025					
Net returns* (Rs/ha)	142500					

*based on prices of 2013-14

Glimpses

Kharif	***Rabi***	**Summer**
		
Organic cauliflower crop	Organic green pea crop	Organic tomato crop
Kharif	***Rabi***	**Summer**
		
Organic cauliflower curds	Organic green pods	Organic tomato fruits

Cropping System 3: Coriander- Pea-Tomato

Particulars	*Kharif*	*Rabi*	Summer
Crop	Coriander	Pea	Tomato
Fortnight of sowing/planting	August	November	May
Fortnight of harvesting	September	April	July
Varieties suitable for organic farming	Mediterranea-Hybrid	Azad-P1	Hybrid-7730

Crop *(kharif)*: Coriander

Important features of suitable varieties

Parameters	Mediterranea- Hybrid
Duration (days)	91
Average yield under organic condition (kg/ha)	5717
Source (s) of availability	Local Market
Suitable regions/districts in the state	Kullu

Field preparation: Irrigate field and then plough once with disc harrow and thrice with power tiller to bring soil in to fine tilth. Plain beds are made keeping bed size as per convenience.

Cultural practices

Seed rate (kg/ha)	20 kg		
Spacing (Row × plant) in cm	30 x 5		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	13 t	
	VC	8 t	
	Rock phosphate	65 kg/ha	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Cow urine	60 L	30, 45, 60 DAS
	Bio dynamic (501)	2.5 g/40 L/ha	45 and 60 DAS
	Panchagavya	18L	30, 45, 60 DAS
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	5-6	-	4-5 cm
Major weeds	Local name	Common name	Scientific name
	Jhanda	Water grass	*Echinochloa colonum*
	Chhoti Jhan	Yellow foxtail	*Setaria glauca*
Weed management	Critical stage of weeding	Recommended practice for organic condition	

	2-3	Manual	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	No insect-pest problem found, hence no need of plant protection practices		
Optimum stage of harvesting	After 4-5weeks, twice at 15-20 days interval		

Yield and Economics

Parameters	**2009-10***	**2010-11***	**2011-12***	**2012-13***
Economic yield (kg/ha)	6396	9523	3512	6596
Price (Rs/kg) (consider 25 % premium on prevailing market price)	12.50			
Cost of cultivation*(Rs/ha)	25140			
Net returns* (Rs/ha)	57310			

*based on prices of 2013-14

Crop *(Rabi)*: Pea

Important features of suitable varieties

Parameters	Azad P-1
Duration (days)	140
Average yield under organic condition (kg/ha)	5956
Source (s) of availability	Deptt. of Agriculture
Suitable regions/districts in the state	Kullu

Field preparation: Irrigate field and then plough once with disc harrow and thrice with power tiller to bring soil in to fine tilth. Plain beds are made keeping bed size as per convenience.

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	75		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Soil treatment:		
	Trichoderma virde	3.75 kg/ha	Broadcast
	Seed Treatment		
	Trichoderma virde	3.75 kg/ha	Seed coating of each

	Pseudomonas fluorescence	3.75 kg /ha	
Spacing (Row X plant) in cm	60 X 10		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	4.34t	
	VC	3.2t	
	Rock phosphate	87kg	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Cow urine	60L	30, 45 and 60 DAS
	Bio dynamic (501)	2.5 g/40 L/ha	45 and 60 DAS
	Panchagavya	18L	30, 45 and 60 DAS
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	2-3	Seed germination, flowering and pod formation	4-5cm
Major weeds	Local name	Common name	Scientific name
	Jaldhar	Corn Butter Cup	*Ranunculus arvensis*
	Poa grass	Annual blue grass	*Poa annua*
	Maina/Khukhni	Bur clover	*Medicago denticulate*
	Krishan neel	Scarlet pimpernel	*Anagallis arvensis*
	Khokhua	Chick weed	*Stellaria media*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	1.After 3-4weeks of sowing 2.Before flowering	Manual	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Ascochyta blight	*Trichoderma virde* + *Pseudomonas fluorescence*	3kg/ha each
	Powdery mildew	Ginger, Garlic and Chilli Extract	1.25 kg/ha ginger, 2.5 kg/ha garlic, 1.25 kg/ha chilli

		Trichoderma virde + Pseudomonas fluorescence	3kg/ha each
Optimum stage of harvesting	When Pea pods attain dark green colour		

Yield and Economics

Parameters	**2009-10**	**2010-11**	**2011-12**	**2012-13**
Economic yield (kg/ha)	6485	5941	7150	4248
Price (Rs/kg) (consider 25 % premium on prevailing market price)	25			
Cost of cultivation*(Rs/ha)	52845			
Net returns* (Rs/ha)	53355			

*based on prices of 2013-14

Crop *(Summer):* Tomato

Important features of suitable varieties

Parameters	Hybrid- 7730
Duration (days)	85
Average yield under organic condition (kg/ha)	11151
Source (s) of availability	Department of Agriculture
Suitable regions/districts in the state	Kullu, Mandi, Kangra, Solan
Specific resistance / tolerance to pest	No
Specific resistance / tolerance to disease	Bacterial wilt
Specific tolerance to drought/waterlogging	No

Nursery raising practices

Area of nursery required for 1 ha	30 m^2		
Nursery raising method	Raised bed method		
Bed size (length X breadth in m)	3m X 1 m		
Seed sowing rate/m^2	15 g		
Pre-sowing seed/soil treatment (only using organic inputs such as bio-fertilizer, bio-control agents, cow urine, panchagavya etc)	Materials	Quantity/kg of seed or per m^2area	Method of application
	Seed Treatment :		
	Trichoderma virde	5 gm/kg each	Seed coating
	Pseudomonas fluorescence		
	Nursery bed Treatment:		
	Trichoderma virde / *Trichoderma harzianum*	40 gm/ m^2	Drenching/ broadcasting
	Plastic sheet	30m^2	Soil solarisation

	Seedling Treatment:		
	Trichoderma virde	0.30 g/m^2 each	Root dip
	Pseudomonas fluorescence		
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	FYM	2 kg	Basal application
	VC	1 kg	-do-
Irrigation practices	Watering can		
Weed management	Manual		
Organic plant protection practices	Name of pest/disease	Recommended organic material used for control	Quantity/ m^2area
	Blights/leaf spots/fruit rots	*Trichoderma virde* + *Pseudomonas fluorescence*	0.30 gm/m^2 each
	Wilt/root/collar rot	*Trichoderma virde* as soil treatment	3.75kg/m^2
		Trichoderma virde + *Pseudomonas fluorescence as foliar spray*	0.30 gm/m^2 each
Optimum age of nursery (days)	32		

Field preparation: Irrigate field and then plough once with disc harrow and thrice with power tiller to bring soil in to fine tilth. Plain beds are made keeping bed size as per convenience. For proper water drainage, trenches are made around the field.

Cultural practices

Pre-sowing/planting treatment of seed/seedlings (only using organic inputs such as bio-fertilizer, bio-control agents, cow urine, panchagavya etc)	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Trichoderma viride+ Pseudomonas flourosence	3.75kg/ha each	Basal application
Spacing (Row X plant) in cm	60 X 45		
Number of seedlings/ kanal ($400m^2$)	1480		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	17.38t	
	VC	12.8t	
	RP	100kg	

Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Cow urine	60 L	15, 30, 45, 60 DAT
	Bio dynamic (501)	2.5 g/40 L/ha	45 and 60 DAT
	Panchagavya	18L	15, 30, 45, 60 DAT
	Vermiwash	10 L	30, 45, 60 DAT
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	3-4	Transplanting, flowering and fruit setting	4-5
Major weeds	Local name	Common name	Scientific name
	Kulfa	Purslane	*Portulaca oleracea*
	Tipatia/khatibuti	Wood sorrel	*Oxalis latifolia*
	Poa grass	Annual blue grass	*Poa annua*
	Peeli buti	-	*Gallinsoga parviflora*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	After 2-3 weeks of transplanting and thereafter 45 and 60 DAT	Manual	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Fruit borer	i)Lipel/Dipel (*Bacillus thuringiensis sp. kurstaki*)	Lipel @1.0 kg/ha or Dipel 1.0 L/ha
		ii)Neemban(0.15%)	3L/ ha
		iii)Margosom (Azedarchtin 1.0%)	0.6L/ ha
		iv) *Darek (Melia *azedarach*) or Karvi (*Roylea cinerea*) or kali basuti (*Eupatorium*) 5% aqueous leaf extract + cow urine 3% + emulsifier TritonX-100	3L/ ha

		(0.05%)	
Optimum stage of harvesting	When ¼th lower part of tomato fruit turns red.		

Yield and Economics

Parameters	**2009-10**	**2010-11**	**2011-12**	**2012-13**
Economic yield (kg/ha)	24635	8086	3328	8555
Price (Rs/kg) (consider 25 % premium on prevailing market price)	18.75			
Cost of cultivation*(Rs/ha)	55025			
Net returns* (Rs/ha)	105381			

*based on prices of 2013-14

Glimpses

Kharif	***Rabi***	**Summer**
		
Organic green coriander crop	Organic vegetable pea crop	Organic tomato crop
Kharif	***Rabi***	**Summer**
		
Harvested organic coriander	Organic pea green pods	Organic tomato fruits

Glimpses (Photos) of Organic Production



FYM	Vermicompost	Vermiwash as nutrient supplement
		
Pheromone trap	Water trap	Yellow sticky trap
		
Leaf extract-*Roylea cinerea*	Leaf extract-*Meliaazedarach*	Trichoderma, Pseudomonas &Lipel
		
Neembaan	5% Melia, 1% Morgosom and 5% Eupatorium	

Details of Specific Practices/products used/recommended

Practice	Method Product	Method
Seed treatment for direct seeded crops	*Trichoderma virde* + *Pseudomonas fluorescence*	Make a paste or slurry of each adding 5 g in 10-20 ml of water or rice gruel. Pour 1kg of seed on to the paste or slurry and mixed properly to coat the seeds uniformly. Dry coated seeds for 20-30 minutes before sowing.
Nursery bed treatment for transplanted crops	*Trichoderma virde* / *Trichoderma harzianum*	Prepare a suspension by adding 40 g in 10 litres of water and drench the nursery bed soil. Mix 250 g in 2 kg cow dung / compost/FYM and spread over nursery bed and irrigate.
Soil Solarisation for	Plastic sheet	Solarisation is a simple, four-step

disease control		process, Stapleton says. **Step one:** Cultivate the soil, and collect and dispose of dead plants and other debris that might harbor pests. **Step two:** Level and smooth the soil surface. **Step three:** Irrigate the soil very well to at least 12 inches deep to increase its heat conductivity. **Step four:** Lay a clear plastic sheet on the soil surface. (25 micron plastic sheet works well). Anchor the edges of the sheet with soil. The closer to the soil surface the plastic is, the better the heating. Remove the sheet after 4 to 6 weeks and resume nursery raising. Do solarisation during summer for effective control of soil born diseases like wilt and damping off.
Disease control (cauliflower blight/leaf spot) using bio-agents	*Trichoderma virde* + *Pseudomonas fluorescence*	Make a paste by adding 10 g in 15 ml water and then add the paste to 1 litre of water. Mixed properly before spraying on the plant parts. Spray during evening and repeat the sprays after 7- 10 days interval considering disease severity. It is effective for reducing blight/leaf spot disease of cauliflower
Panchagavya as nutrient supplement and disease control	Cow dung, Cow urine, Cow ghee, Milk, Curd, Gur, Ripened banana, Yeast (Use cow dung, ghee, curd, urine of local cow)	Mix cow dung (10 kg) and cow ghee (1 kg). After 3 days add all other contents (cow urine 10L, milk 3 L, curd 3 L, gur 250 g, ripened banana 12 nos., yeast 100 g). Ferment for 15 days. Filter the contents. Use @ 2-5% solution as foliar spray. Note: Spray during evening and repeat the sprays after 7- 10 days interval considering disease severity.
Biodynamic as nutrient supplement	Biodynamic-501 formulation	BD 501 is “cow horn silica” and is made form quartz crystals ground to talcum power consistency, stuffed into a cow horn, buried during spring equinox, and taken out during autumn equinox. The material, stored in glass bottle, and exposed to the sun by the windowsill is used to prepare the BD 501 spray solution by dissolving 2.5 g in 40 L of water. Within an hour, the mixture is sprayed as a fine mist on the plant

		foliage (i.e., before 9.00 a.m.) either based on biodynamic calendar (when moon was opposite to Saturn in the biodynamic calendar) or applied at 30 and 60 days after transplanting.
Disease control through hot water seedling treatment	Hot water	Heat water at 52 ^{0}C and soak seeds for 30 minutes before sowing for effective control of black rot of cauliflower
Disease control of cauliflower curd rot/ Powdery mildew in pea/ Ascochyta blight	*Trichoderma virde* + *Pseudomonas fluorescence*	Make a paste by adding 10 g in 15 ml water and then add the paste to 1L of water. Mixed properly before spraying on the plant parts. Spray during evening and repeat the sprays after 7- 10 days interval considering disease severity for effective control of curd rot of cauliflower.
Ginger, Garlic and Chilli Extract for disease control	Ginger, garlic, chilli	1 kg of Garlic should be immersed in 100 ml kerosene and kept overnight. Next day, the outer skin should be removed and made into a paste. Likewise, ½ kg chilly should be mixed with 50 ml water and made into a paste and ½ kg of ginger should be made into a paste. Mix all the three mixtures together in 100 litres of water and 50 grams soap solution as emulsifier. This mixture should be stirred well and filtered before spraying.
Vermi wash as nutrient supplement	Earthworms, FYM and clay containers	Take earthen pot of 10kg capacity and fill it with pieces of stones up to 10cm height from the bottom. Then lay out a thick layer of FYM along with humus containing 1500-2000 worms. Keep moist the material by adding water in the pot regularly. Make a hole at the bottom of the pot and fix a water tap though which vermin wash is to be collected.
Mechanical control of insects	Pheromone, water trap, yellow sticky trap	Place 25 traps of each kind in one hectare at the time of sowing/transplanting of the crop.
Insect control through plant extracts/products (e.g. Leaf/seed/root)	Darek (*M. azedarach*), Karvi (*Roylea cinerea*)	For preparing plant extracts, leaves of the test plants (Darek and Karvi) were shade dried for 5-6 days. The dried leaves were then powdered in the mixer- grinder and powdered material was stored in the polythene bags at

		room temperature. About 48 hours before use, weighed quantity of the powdered test material was dissolved in the water in a bucket to which cow urine @ 3% was also added. Material in the bucket was stirred intermittently. Before spray, solution was sieved through muslin cloth. Residue in the cloth was thoroughly washed to remove all the extract. Final volume of the extract was made to the desired level depending upon the concentration of the extract to be sprayed.
	Lipel/Dipel (*Bacillus thuringiensis sp. kurstaki*)	Lipel @1.0 kg/ha or Dipel 1.0 L/ha For the control of fruit borer in tomato, dissolve 1.0kg of Lipel/ Dipel in 600L of water.

Jharkhand

Prepared by Dr. C. S. Singh, Dr. S. K. Singh and R. K. Verma Birsa Agricultural University, Kanke, Ranchi (jharkhand)

Suggested cropping systems (based on testing under NPOF)

1. Rice (basmati type)-wheat
2. Rice (basmati type)-lentil
3. Rice (basmati type)-linseed
4. Rice (basmati type)-potato

Cropping System 1: Rice -Wheat

Particulars	*Kharif*	*Rabi*
Crop	Rice	Wheat
Fortnight of sowing/planting	Transplanting in 1st fortnight of July	2nd fortnight ofNov.
Fortnight of harvesting	1st fortnight of Nov.	1st fortnight of April.
Varieties suitable for organic farming	Birsamati	K-9107

Crop *(kharif)*: Rice

Important features of suitable varieties

Parameters	Birsamati
Duration (days)	125-135 (Medium)
Average yield under organic condition (kg/ha)	3000-3500 kg/ha
Source (s) of availability	AICRP on Rice BAU, Ranchi.
Suitable regions/districts in the state	All district/Jharkhand
Specific resistance / tolerance to pest	Gall midge
Specific resistance / tolerance to disease	Bacterial leaf and sheath blight

Nursery raising practices

Area of nursery required for 1 ha	$1000m^2$		
Nursery raising method	Dry nursery		
Bed size (length X breadth in m)	$1x10m^2$		
Seed sowing rate/m^2	35 kg/ha		
Pre-sowing seed/soil treatment	Materials	Quantity/kg of seed or per m^2area	Method of application
	Pseudomonas fluorescence	5g/kg of seed	For seed dressing metal seed dresser / earthernpots or polythene bags are used

Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	FYM	1/2 kg	Soil application at the time of nursery preparation 10-15 days prior to sowing.
	Vermicompost	1/4 kg	Applied along with soil after sowing to cover the seeds.
Irrigation practices	As and when needed		
Weed management	1 Hand weeding		
Organic plant protection practices	**Name of pest/disease**	**Recommended organic material used for control**	**Quantity/ m^2area**
	Wilt, Blast, Blight	Nisarga/Monitor/Biosanjeevni (Trichoderma viride)	Seed- 5 g/litter/kg
Optimum age of nursery (days)	25-30 days		

Field preparation: The field was ploughed twice 15 days before transplanting the puddling of the soil was done two days prior to transplanting. The green manure crop dhaincha can be grown at seed rate of 40 kg/ha in May month with application of 250 kg/ha of rock phosphate. The dhaincha crop has to be incorporated at 40-45 DAS at 15 days prior to rice transplanting. This will able to meet out the 25-30 kg/ha of nitrogen requirement of paddy crop.

Cultural practices

Spacing (Row X plant) in cm	20x10 cm		
Number of seedlings/hill	2 seedlings/hill		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity (q/ha)	
	FYM	53.28	
	Karanj cake	6.66	
	Azolla	1 kg/m^2	
Top dressing of organic manures	Source	Quantity (q/ha)	Days after sowing/planting or stage of crop
	Vermicompost	26.66	15 DAT
	Panchagavya	10-12 lit/ha mixed in 500-600 litre of water	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	Need based	Tiller initiation, flowering and milky stage	3-5 cm standing water
Major weeds			
	Local Name	**English Name**	**Scientific Name**

	Motha	Nut sedge	*Cyperus differmis*
	Dub ghas	Couch grass	*Cynodon dactylon*
	Sawa	Water grass	*Echinochloa colona*
	Kodo	Goose grass	*Eleusine indica*
	Bhangra, Bhangaraiya	False daisy	*Eclipta alba*
	Bara-nagar-motha	Flat sedge	*Cyperus iria*
	Kankaua	Day flower	*Commelina benghalensis*

Weed management	Critical stage of weeding	Recommended practice for organic condition
	20-25 & 40-45 DAT	Hand weeding and summer ploughing

	Name of pest/disease	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
Organic plant protection practices	White ant, grubs	Kalichakra (metarhizium aniopliae)	Soil- 1-2kg/40 kg FYM/acre Foliar-1kg/kg jaggery in 200 litter/acer
	Soil born disease	Trichoderma viride	Vermicompost should be treated with Trichoderma to grow its mycelium and treated vermicompost in used
	Sheath blight and sheath rot	Pseudomonas fluorescence	10 gm/litter of water
	Stem borer	Trichocard	8 trichocard/ha (2 times)
	Blight and false smut	Neem or Karanj cake	500 kg/ha at the time of transplanting
	Blast	Bael+Black Tulsi	25 gm each in 1 litre of water
	Most of the insects leaf folder, stem borer, Gandhi bug	Neem seed kernel extract or Neem oil	Foliar 3-5ml/litre

Yield and Economics

Parameters	**1st year***	**2nd year**	**3rd year**	**4th year**	**5th year**	**6th year**	**7th year**	**8th Year**
Economic yield (kg/ha)	1970	1880	3191	3396	3945	3305	Abrupt weather	4050
Price (Rs/kg) (consider 25 % premium on prevailing market price)	15	15	15	15	15	15		15
Cost of cultivation**(Rs/ha)	26718	26718	26718	26718	26718	26718		26718
Net returns** (Rs/ha)	2832	1482	21147	24222	32457	22857		34032

*based on prices of 2013-14

Crop *(Rabi)*: Wheat

Important features of suitable varieties

Parameters	K-9107
Duration (days)	130
Average yield under organic condition (kg/ha)	2000-2500
Source (s) of availability	AICRP on wheat
Suitable regions/districts in the state	All district/Jharkhand
Specific resistance / tolerance to disease	Leaf blight

Field preparation: For field preparation of wheatone deep ploughing followed by 2 -3 harrowing with disc or tines and 2-3 planking should be given to prepare a well pulverised seed bed. Planking should be done after each ploughing.

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	125 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	PSB &Azotobacter	250gm/10 kg seeds each	Warm the water and add 100 gm of jiggery. Mix it well and allow to cool and then add azotobacter culture in it. Finally seed is well mixed with azotobacter culture solution. The treated seed is allowed to dry in shade. Similarly the seed is again treated with PSB and finally sowing is done

Spacing (Row X plant) in cm	Row 20cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity (q/ha)	
	FYM	66.66	
	Karanj cake	8.33	
Top dressing of organic manures	Source	Quantity (q/ha)	Days after sowing/planting or stage of crop
	Vermicompost	33.33	25-30 DAS
	Panchagavya	10-12 lit/ha mixed in 500-600 lit of water	
Irrigation practices	**Number of irrigations**	**Most critical stages for irrigation**	**Depth of irrigation (cm)**
	6	Crown root initiation, tillering, jointing, booting, flowering, milk and dough stages	5-6cm
Major weeds	**Local name**	**English name**	**Scientific name**
	Krishananeel	Red pimpernel	*Anagallis arvensis*
	Kateli	Bull thistle	*Cirsium arvense*
	Bathu	Common lambsquarters	*Chenopodium album*
	Motha	Nut sedge	*Cyperus difformis*
	Gehusa (gehu ka mama)	Canary grass	*Phalaris minor*
	Dub ghas	Couch grass	*Cynodon dactylon*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-25 & 40-45	Hand weeding and stale seed bed technique	
Organic plant protection practices	**Name of pest/disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	White ant, grubs	Kalichakra (metarhizium aniopliae)	Soil- 1-2kg/40 kg FYM/acre Foliar-1kg/kg jaggery in 200 litter/acer
	Most of the insects	Neem oil (Multinimore Vanguard)	Foliar 2.5ml/litre
	Soil born disease	Trichoderma viride	Vermicompost should be treated

			with Trichoderma to grow its mycelium and treated vermicompost in used
	Black rust, brown rust, yellow rust and leaf blight	Trichoderma herginum+ Pseudomonas fluorescence	5g/litre of water
	Loose smut	Trichoderma herginum or Trichoderma viride	Seed treatment 5gm/kg seed

Yield and Economics

Parameters	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Economic yield (kg/ha)	2048	2366	2528	2587	2000	1875	2240	1950
Price (Rs/kg) (consider 25 % premium on prevailing market price)	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5
Cost of cultivation*(Rs/ha)	36643	36643	36643	36643	36643	36643	36643	36643
Net returns* (Rs/ha)	-803	4762	7597	8629.5	-1643	-3830.5	2557	-2518

*based on prices of 2013-14

Details of Specific Practices/products used/recommended

Panchgavya preparation method

Panchgavya can be prepared by mixing 3 litre of cow urine, 5 kg of cow dung, 2 litre of cow milk, curd of 2 litres of cow milk, 1 kg cow ghee, 5 litre water, 500 gm honey, 1 kg jaggery in earthen pot. Then the earthen pot is covered and left for 3 weeks. The prepared Panchgavya should be used only after sieving the material, about 2 litre of Panchgavya should be well mixed in 100 litre of water and sprayed to the crop plants. The prepared Panchgavya would be sufficient 1.5ha of land.

Glimpses

Kharif	***Rabi***

	
Rice 100% Organic	Wheat 100% Organic

Cropping System2: Rice - Lentil

Particulars	*Kharif*	*Rabi*
Crop	Rice	Lentil
Fortnight of sowing/planting	Transplanting in 1st fortnight of July	2nd fortnight ofNov.
Fortnight of harvesting	1st fortnight of Nov.	2nd fortnight of March.
Varieties suitable for organic farming	Birsamati	PL-406

Crop *(kharif)*: Rice

Important features of suitable varieties

Parameters	Birsamati
Duration (days)	125-135 (Medium)
Average yield under organic condition (kg/ha)	3000-3500 kg/ha
Source (s) of availability	AICRP on Rice BAU, Ranchi.
Suitable regions/districts in the state	All district/Jharkhand
Specific resistance / tolerance to pest	Gall midge
Specific resistance / tolerance to disease	Bacterial leaf and sheath blight

Nursery raising practices

Area of nursery required for 1 ha	$1000m^2$		
Nursery raising method	Dry nursery		
Bed size (length X breadth in m)	$1x10m^2$		
Seed sowing rate/m^2	35 kg/ha		
Pre-sowing seed/soil treatment	Materials	Quantity/kg of seed or per m^2area	Method of application

	Pseudomonas fluorescence	5g/kg of seed	For seed dressing metal seed dresser/ earthernpots or polythene bags are used
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	FYM	1/2 kg	Soil application at the time of nursery preparation 10-15 days prior to sowing.
	Vermicompost	1/4 kg	Applied along with soil after sowing to cover the seeds.
Irrigation practices	As and when needed		
Weed management	1 Hand weeding		
Organic plant protection practices	**Name of pest/disease**	**Recommended organic material used for control**	**Quantity/ m^2area**
	Wilt, Blast, Blight	Nisarga/Monitor/Biosanjeevni (Trichoderma viride)	Seed- 5 g/litter/kg
Optimum age of nursery (days)	25-30 days		

Field preparation: The field was ploughed twice 15 days before transplanting the puddling of the soil was done two days prior to transplanting. The green manure crop dhaincha can be grown at seed rate of 40 kg/ha in May month with application of 250 kg/ha of rock phosphate. The dhaincha crop has to be incorporated at 40-45 DAS at 15 days prior to rice transplanting. This will able to meet out the 25-30 kg/ha of nitrogen requirement of paddy crop.

Cultural practices

Spacing (Row X plant) in cm	20x10 cm		
Number of seedlings/hill (in nursery crops only)	2 seedlings/hill		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity (q/ha)	
	FYM	53.28	
	Karanj cake	6.66	
	Azolla	1 kg/m^2	
Top dressing of organic manures	Source	Quantity (q/ha)	Days after sowing/planting or stage of crop
	Vermicompost	26.66	15 DAT
	Panchagavya	10-12 lit/ha mixed in 500-600 litre of water	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	Need based	Tiller initiation,	3-5 cm standing

		flowering and milky stage	water
Major weeds			
	Local Name	**English Name**	**Scientific Name**
	Motha	Nut sedge	*Cyperus difformis*
	Dub ghas	Couch grass	*Cynodon dactylon*
	Sawa	Water grass	*Echinochloa colona*
	Kodo	Goose grass	*Eleusine indica*
	Bhangra, Bhangaraiya	False daisy	*Eclipta alba*
	Bara-nagar-motha	Flat sedge	*Cyperus iria*
	Kankaua	Day flower	*Commelina benghalensis*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-25 & 40-45 DAT	Hand weeding and summer ploughing	

	Name of pest/disease	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
Organic plant protection practices	White ant, grubs	Kalichakra (metarhizium aniopliae)	Soil- 1-2kg/40 kg FYM/acre Foliar-1kg/kg jaggery in 200 litter/acer
	Soil born disease	Trichoderma viride	Vermicompost should be treated with Trichoderma to grow its mycelium and treated vermicompost in used
	Sheath blight and sheath rot	Pseudomonas fluorescence	10 gm/litter of water
	Stem borer	Trichocard	8 trichocard/ha (2 times)
	Blight and false smut	Neem or Karanj cake	500 kg/ha at the time of transplanting
	Blast	Bael+Black Tulsi	25 gm each in 1 litre of water
	Most of the insects leaf folder, stem	Neem seed kernel extract or Neem oil	Foliar 3-5ml/litre

	borer, Gandhi bug		

Yield and Economics

Parameters	**1st *year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Economic yield (kg/ha)	1970	1880	3191	3396	3945	3305	Abrupt weather	4050
Price (Rs/kg) (consider 25 % premium on prevailing market price)	15	15	15	15	15	15		15
Cost of cultivation*(Rs/ha)	26718	26718	26718	26718	26718	26718		26718
Net returns* (Rs/ha)	2832	1482	21147	24222	32457	22857		34032

*based on prices of 2013-14

Crop *(Rabi)*:Lentil

Important features of suitable varieties

Parameters	PL - 406
Duration (days)	115
Average yield under organic condition (kg/ha)	600-800
Source (s) of availability	Directorate of Seed & Farm, BAU.
Suitable regions/districts in the state	All district /Jharkhand
Specific resistance / tolerance to disease	moderately resistant wilt and rust

Field preparation: For field preparation of lentil one deep ploughing followed by 2-3 cross harrowing should be given. After harrowing, the field should be levelled by giving a gentle slope to ease in irrigation.

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	25-30 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	PSB & Rhizobium culture	250 g/10 kg seeds	Warm the water and add 100 gm of jiggery. Mix it

			well and allow to cool and then add rhizobium culture in it. Finally seed is well mixed with rhizobium culture solution. The treated seed is allowed to dry in shade. Similarly the seed is again treated with PSB and finally sowing is done
Spacing (Row X plant) in cm	25x 8cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity(q/ha)	
	FYM	14.0	
	Karanj cake	2.0	
Top dressing of organic manures	Source	Quantity(q/ha)	Days after sowing/planting or stage of crop
	Vermicompost	7.0	25-30 DAS
Irrigation practices	**Number of irrigations**	**Most critical stages for irrigation**	**Depth of irrigation (cm)**
	2	Pre-flowering stage	5-6
Major weeds	**Local name**	**English name**	**Scientific name**
	Krishananeel	Red pimpernel	*Anagallis arvensis*
	Kateli	Bull thistle	*Cirsium arvense*
	Bathu	Common lambsquarters	*Chenopodium album*
	Motha	Nut grass	*Cyperus difformis*
	Dub ghas	Bermuda grass	*Cynodon dactylon*
	Kheshari	Sweet pea	Lathyrus odoratus
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-25 & 40-45	Hand weeding and stale seed bed technique	
Organic plant protection	Name of	Organic material	Quantity (kg or

practices	pest/disease	recommended for control	litres/ ha)
	White ant, grubs	Kalichakra (metarhizium aniopliae)	Soil- 1-2kg/40 kg FYM/acre Foliar-1kg/kg jaggery in 200 litter/acer
	Most of the insects	Neem oil (Multinimore Vanguard)	Foliar 2.5ml/litre
	Soil borne disease	Trichoderma	FYM or Vermicompost treated with trichoderma and applied to the field

Yield and Economics

Parameters	**1st *year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Economic yield (kg/ha)	650	735	920	750	562	0	770	649
Price (Rs/kg) (consider 25 % premium on prevailing market price)	35	35	35	35	35	35	35	35
Cost of cultivation*(Rs/ha)	13567	13567	13567	13567	13567	13567	13567	13567
Net returns* (Rs/ha)	9183	12158	18633	12683	6103	-13567	13383	9148

*based on prices of 2013-14

Details of Specific Practices/products used/recommended

Panchgavya can be prepared by mixing 3 litre of cow urine, 5 kg of cow dung, 2 litre of cow milk, curd of 2 litres of cow milk, 1 kg cow ghee, 5 litre water, 500 gm honey, 1 kg jaggery in earthen pot. Then the earthen pot is covered and left for 3 weeks. The prepared Panchgavya should be used only after sieving the material, about 2 litre of Panchgavya should be well mixed in 100 litre of water and sprayed to the crop plants. The prepared Panchgavya would be sufficient 1.5ha of land.

Glimpses

Kharif	*Rabi*
	
Rice 100% Organic	Lentil 100% Organic

Cropping System 3: Rice – Linseed

Particulars	***Kharif***	***Rabi***
Crop	Rice	Linseed
Fortnight of sowing/planting	Transplanting in 1stfortnight of July	2nd fortnight ofNov.
Fortnight of harvesting	1stfortnight of Nov.	1st fortnight of April.
Varieties suitable for organic farming	Birsamati	Shekhar

Crop *(kharif)*: Rice

Important features of suitable varieties

Parameters	**Birsamati**
Duration (days)	125-135 (Medium)
Average yield under organic condition (kg/ha)	3000-3500 kg/ha
Source (s) of availability	AICRP on Rice BAU, Ranchi.
Suitable regions/districts in the state	All district/Jharkhand
Specific resistance / tolerance to pest	Gall midge
Specific resistance / tolerance to disease	Bacterial leaf and sheath blight

Nursery raising practices

Area of nursery required for 1 ha	1000m^2
Nursery raising method	Dry nursery
Bed size (length X breadth in m)	1x10m^2
Seed sowing rate/m^2	35 kg/ha

Pre-sowing seed/soil treatment	Materials	Quantity/kg of seed or per m^2area	Method of application
	Pseudomonas fluorescence	5g/kg of seed	For seed dressing metal seed dresser/ earthernpots or polythene bags are used
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	FYM	1/2 kg	Soil application at the time of nursery preparation 10-15 days prior to sowing.
	Vermicompost	1/4 kg	Applied along with soil after sowing to cover the seeds.
Irrigation practices	As and when needed		
Weed management	1 Hand weeding		
Organic plant protection practices	**Name of pest/disease**	**Recommended organic material used for control**	**Quantity/ m^2area**
	Wilt, Blast, Blight	Nisarga/Monitor/Biosanjeevni (Trioderma virde)	Seed- 5 g/litter/kg
Optimum age of nursery (days)	25-30 days		

Field preparation: The field was ploughed twice 15 days before transplanting the puddling of the soil was done two days prior to transplanting. The green manure crop dhaincha can be grown at seed rate of 40 kg/ha in May month with application of 250 kg/ha of rock phosphate. The dhaincha crop has to be incorporated at 40-45 DAS at 15 days prior to rice transplanting. This will able to meet out the 25-30 kg/ha of nitrogen requirement of paddy crop.

Cultural practices

Spacing (Row X plant) in cm	20x10 cm		
Number of seedlings/hill (in nursery crops only)	2 seedlings/hill		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity (q/ha)	
	FYM	53.28	
	Karanj cake	6.66	
	Azolla	1 kg/m^2	
Top dressing of organic manures	Source	Quantity (q/ha)	Days after sowing/planting or stage of crop
	Vermicompost	26.66	15 DAT
	Panchagavya	10-12 lit/ha mixed in 500-600 litre of water	
Irrigation practices	Number of irrigations	Most critical stages for	Depth of irrigation (cm)

		irrigation	
	Need based	Tiller initiation, flowering and milky stage	3-5 cm standing water

Major weeds	**Local Name**	**English Name**	**Scientific Name**
	Motha	Nut sedge	*Cyperus difformis*
	Dub ghas	Couch grass	*Cynodon dactylon*
	Sawa	Water grass	*Echinochloa colona*
	Kodo	Goose grass	*Eleusine indica*
	Bhangra, Bhangaraiya	False daisy	*Eclipta alba*
	Bara-nagar-motha	Flat sedge	*Cyperus iria*
	Kankaua	Day flower	*Commelina benghalensis*

Weed management	Critical stage of weeding	Recommended practice for organic condition
	20-25 & 40-45 DAT	Hand weeding and summer ploughing

Organic plant protection practices	**Name of pest/disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	White ant, grubs	Kalichakra (metarhizium aniopliae)	Soil- 1-2kg/40 kg FYM/acre Foliar-1kg/kg jaggery in 200 litter/acer
	Soil born disease	Trichoderma viride	Vermicompost should be treated with Trichoderma to grow its mycelium and treated vermicompost in used
	Sheath blight and sheath rot	Pseudomonas fluorescence	10 gm/litter of water
	Stem borer	Trichocard	8 trichocard/ha (2 times)
	Blight and false smut	Neem or Karanj cake	500 kg/ha at the time of transplanting
	Blast	Bael+Black Tulsi	25 gm each in 1 litre of water

	Most of the insects leaf folder, stem borer, Gandhi bug	Neem seed kernel extract or Neem oil	Foliar 3-5ml/litre

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Economic yield (kg/ha)	1970	1880	3191	3396	3945	3305	Abrupt weather	4050
Price (Rs/kg) (consider 25 % premium on prevailing market price)	15	15	15	15	15	15		15
Cost of cultivation*(Rs/ha)	26718	26718	26718	26718	26718	26718		26718
Net returns* (Rs/ha)	2832	1482	21147	24222	32457	22857		34032

*based on prices of 2013-14

Crop *(Rabi)*: Linseed

Important features of suitable varieties

Parameters	Shekhar
Duration (days)	140
Average yield under organic condition (kg/ha)	500-700
Source (s) of availability	Directorate of seed & farm, BAU.
Suitable regions/districts in the state	All district/Jharkhand
Specific resistance / tolerance to pest	Moderately resistant to bud fly
Specific resistance / tolerance to disease	Resistant to powdery mildew, rust, wilt and moderately resistant to alternaria blight

Field preparation: Field should be prepared by giving 1 ploughing by soil turning plough followed by 2-3 harrowing and finally planking.

Cultural practices

Seed rate (kg/ha)	25-30 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	PSB &Azotobacter	250 g/10 kg seeds each	Warm the water and add 100 gm of jiggery. Mix it

			well and allow to cool and then add azotobacter culture in it. Finally seed is well mixed with azotobacter culture solution. The treated seed is allowed to dry in shade. Similarly the seed is again treated with PSB and finally sowing is done
Spacing (Row X plant) in cm	Row 30cm		
Number of seedlings/hill (in nursery crops only)	-		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity (q/ha)	
	FYM	26.66	
	Karanj cake	3.33	
Top dressing of organic manures	Source	Quantity (q/ha)	Days after sowing/planting or stage of crop
	Vermicompost	13.33	25-30 DAS
Irrigation practices	**Number of irrigations**	**Most critical stages for irrigation**	**Depth of irrigation (cm)**
	3	Three irrigation at 35, 55 and 75 days after sowing proved very effective	5-6 cm
Major weeds	**Local name**	**English name**	**Scientific name**
	Krishananeel	Red pimpernel	*Anagallis arvensis*
	Kateli	Bull thistle	*Cirsium arvense*
	Bathu	Common lambsquarters	*Chenopodium album*
	Motha	Nut grass	*Cyperus difformis*
	Dub ghas	Bermuda grass	*Cynodon dactylon*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-25 & 40-45	Hand weeding and stale seed bed technique	
Organic plant protection practices	**Name of pest/disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	White ant, grubs	Kalichakra (metarhizium aniopliae)	Soil- 1-2kg/40 kg FYM/acre Foliar-1kg/kg

			jaggery in 200 litter/acer
	Most of the insects	Neem oil (Multinimore Vanguard)	Foliar 2.5ml/litre
	Soil born disease	Trichoderma	Trichoderma powder mixed with vermicompost of FYM to develop its mycelium and applied to whole field

Yield and Economics

Parameters	**1st***	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Economic yield (kg/ha)	492	350	420	400	550	700	790	795
Price (Rs/kg) (consider 25 % premium on prevailing market price)	21.25	21.25	21.25	21.25	21.25	21.25	21.25	21.25
Cost of cultivation*(Rs/ha)	14065	14065	14065	14065	14065	14065	14065	14065
Net returns* (Rs/ha)	-3610	-6627	-5140	-5565	-2377	810	2722	2829

*based on prices of 2013-14

Details of Specific Practices/products used/recommended

Panchgavya preparation method

Panchgavya can be prepared by mixing 3 litre of cow urine, 5 kg of cow dung, 2 litre of cow milk, curd of 2 litres of cow milk, 1 kg cow ghee, 5 litre water, 500 gm honey, 1 kg jaggery in earthen pot. Then the earthen pot is covered and left for 3 weeks. The prepared Panchgavya should be used only after sieving the material, about 2 litre of Panchgavya should be well mixed in 100 litre of water and sprayed to the crop plants. The prepared Panchgavya would be sufficient 1.5ha of land.

Glimpses

Kharif	***Rabi***

	
Rice 100% Organic	Linseed 100% Organic

Cropping System 4: Rice – Potato

Particulars	*Kharif*	*Rabi*
Crop	Rice	Potato
Fortnight of sowing/planting	Transplanting in 1st fortnight of July	2nd fortnight of Nov.
Fortnight of harvesting	1st fortnight of Nov.	2nd fortnight of Feb.
Varieties suitable for organic farming	Birsamati	Kufri Ashoka

Crop *(kharif)*: Rice

Important features of suitable varieties

Parameters	**Birsamati**
Duration (days)	125-135 (Medium)
Average yield under organic condition (kg/ha)	3000-3500 kg/ha
Source (s) of availability	AICRP on Rice ,BAU, Ranchi.
Suitable regions/districts in the state	All district/Jharkhand
Specific resistance / tolerance to pest	Gall midge
Specific resistance / tolerance to disease	Bacterial leaf and sheath blight

Nursery raising practices

Area of nursery required for 1 ha	$1000m^2$		
Nursery raising method	Dry nursery		
Bed size (length X breadth in m)	$1x10\ m^2$		
Seed sowing rate/m^2	35 kg/ha		
Pre-sowing seed/soil treatment	Materials	Quantity/kg of seed or per m^2area	Method of application
	Pseudomonas fluorescence	5g/kg of seed	For seed dressing metal seed dresser / earthern pots or polythene bags are

			used
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	FYM	1/2 kg	Soil application at the time of nursery preparation 10-15 days prior to sowing.
	Vermicompost	1/4 kg	Applied along with soil after sowing to cover the seeds.
Irrigation practices	As and when needed		
Weed management	1 Hand weeding		
Organic plant protection practices	**Name of pest/disease**	**Recommended organic material used for control**	**Quantity/ m^2area**
	Wilt, Blast, Blight	Nisarga/Monitor/Biosanjeevni (Trichoderma viride)	Seed- 5 g/litter/kg
Optimum age of nursery (days)	25-30 days		

Field preparation: The field was ploughed twice 15 days before transplanting the puddling of the soil was done two days prior to transplanting. The green manure crop dhaincha can be grown at seed rate of 40 kg/ha in May month with application of 250 kg/ha of rock phosphate. The dhaincha crop has to be incorporated at 40-45 DAS at 15 days prior to rice transplanting. This will able to meet out the 25-30 kg/ha of nitrogen requirement of paddy crop.

Cultural practices

Spacing (Row X plant) in cm	20x10 cm		
Number of seedlings/hill	2 seedlings/hill		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity (q/ha)	
	FYM	53.28	
	Karanj cake	6.66	
	Azolla	1 kg/m^2	
Top dressing of organic manures	Source	Quantity (q/ha)	Days after sowing/planting or stage of crop
	Vermicompost	26.66	15 DAT
	Panchagavya	10-12 lit/ha mixed in 500-600 litre of water	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	Need based	Tiller initiation, flowering and milky stage	3-5 cm standing water
Major weeds			

	Local Name	English Name	Scientific Name
	Motha	Nut sedge	*Cyperus difformis*
	Dub ghas	Couch grass	*Cynodon dactylon*
	Sawa	Water grass	*Echinochloa colona*
	Kodo	Goose grass	*Eleusine indica*
	Bhangra, Bhangaraiya	False daisy	*Eclipta alba*
	Bara-nagar-motha	Flat sedge	*Cyperus iria*
	Kankaua	Day flower	*Commelina benghalensis*

Weed management	Critical stage of weeding	Recommended practice for organic condition
	20-25 & 40-45 DAT	Hand weeding and summer ploughing

	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
Organic plant protection practices	White ant, grubs	Kalichakra (metarhizium aniopliae)	Soil- 1-2kg/40 kg FYM/acre Foliar-1kg/kg jaggery in 200 litter/acre
	Soil born disease	Trichoderma viride	Vermicompost should be treated with Trichoderma to grow its mycelium and treated vermicompost in used
	Sheath blight and sheath rot	Pseudomonas fluorescence	10 gm/litter of water
	Stem borer	Trichocard	8 trichocard/ha (2 times)
	Blight and false smut	Neem or Karanj cake	500 kg/ha at the time of transplanting
	Blast	Bael+Black Tulsi	25 gm each in 1 litre of water
	Most of the insects leaf folder, stem borer, Gandhi bug	Neem seed kernel extract or Neem oil	Foliar 3-5ml/litre

Yield and Economics

Parameters	**1st *year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**

Economic yield (kg/ha)	1970	1880	3191	3396	3945	3305	4050	
Price (Rs/kg) (consider 25 % premium on prevailing market price)	15	15	15	15	15	15	15	
Cost of cultivation*(Rs/ha)	26718	26718	26718	26718	26718	26718	26718	
Net returns* (Rs/ha)	2832	1482	21147	24222	32457	22857		34032

*based on prices of 2013-14

Crop *(Rabi)*: Potato

Important features of suitable varieties

Parameters	Kufri Ashoka (Potato)
Duration (days)	95
Average yield under organic condition (kg/ha)	18000-20000
Source (s) of availability	Ram Krishna Mission, Ranchi
Suitable regions/districts in the state	All district/Jharkhand

Field preparation: Land should be well prepared by deep ploughing with mould-bold plough followed by 3-4 cross harrow wings. Each harrowing should be followed by planking so that the soil is well pulverised and levelled.

Cultural practices

Seed rate (kg/ha)	300 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	PSB &Azotobacter	250 g/10 kg seeds	Warm the water and add 100 gm of jiggery. Mix it well and allow to cool and then add azotobacter culture in it. Finally seed is well mixed with azotobacter culture solution. The treated seed is allowed to dry in shade. Similarly the seed is again treated with PSB and finally sowing is done

Spacing (Row X plant) in cm	Row to row 50cm, tuber to tuber 20cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity (q/ha)	
	FYM	80.0	
	Karanj cake	10.0	
Top dressing of organic manures	Source	Quantity (q/ha)	Days after sowing/planting or stage of crop
	Vermicompost	40.0	25-30 DAS
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	4-5	1st irrigation at 4-5 days after seeding than after 10 days interval	5-6 cm
Major weeds	**Local name**	**English name**	**Scientific name**
	Krishananeel	Red pimpernel	*Anagallis arvensis*
	Kateli	Bull thistle	*Cirsium arvense*
	Bathu	Common lambsquarters	*Chenopodium album*
	Motha	Nut grass	*Cyperus difformis*
	Dub ghas	Bermuda grass	*Cynodon dactylon*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-25 & 40-45	Hand weeding and stale seed bed technique	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	White ant, grubs	Kalichakra (metarhizium aniopliae)	Soil- 1-2kg/40 kg FYM/acre Foliar-1kg/kg jaggery in 200 litter/acer
	Most of the insects	Neem oil (Multinimore Vanguard)	Foliar 2.5ml/litre
	Black Scurf	Trichoderma treated Neem cake	Soil application @ 5 q/ha

Yield and Economics

Parameters	**1st***	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**

Economic yield (kg/ha)	9110	17283	19500	20500	19166	18750	19000	19300
Price (Rs/kg) (consider 25 % premium on prevailing market price)	12.50	12.50	12.50	12.50	12.50	12.50	12.50	12.50
Cost of cultivation (Rs/ha)	64250	64250	64250	64250	64250	64250	64250	64250
Net returns (Rs/ha)	49625	151787.5	179500	192000	175325	170125	173250	177000

*based on prices of 2013-14

Details of Specific Practices/products used/recommended

Panchgavya preparation method

Panchgavya can be prepared by mixing 3 litre of cow urine, 5 kg of cow dung, 2 litre of cow milk, curd of 2 litres of cow milk, 1 kg cow ghee, 5 litre water, 500 gm honey, 1 kg jaggery in earthen pot. Then the earthen pot is covered and left for 3 weeks. The prepared Panchgavya should be used only after sieving the material, about 2 litre of Panchgavya should be well mixed in 100 litre of water and sprayed to the crop plants. The prepared Panchgavya would be sufficient 1.5ha of land.

Glimpses

Kharif	***Rabi***
	
Rice 100% Organic	Potato 100% Organic

Kerala

Package of Practices for Organic Crop Production

Prepared by G. Suja, A.N. Jyothi and J. Sreekumar, ICAR-Central Tuber Crops Research Institute, Sreekariyam, Thiruvananthapuram, Kerala

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Suggested cropping systems **(based on testing under ICAR-CTCRI)**

1. Elephant foot yam + green manure cowpea
2. Green manure cowpea-yams + green manure cowpea
3. Taro + green manure cowpea

Details of Cropping Systems

Cropping System 1: Elephant foot yam + green manure cowpea

Particulars	*Kharif*	*Rabi*	Summer
Crop	Elephant foot yam and green manure cowpea taken during summer continues	Elephant foot yam taken during summer continues	Elephant foot yam + green manure cowpea
Fortnight of sowing/planting			I fortnight of March planting elephant foot yam and sowing cowpea
Fortnight of harvesting	First fortnight of May harvesting and incorporating green manure cowpea	First fortnight of January harvesting elephant foot yam	
Varieties suitable for organic farming			Elephant foot yam: Gajendra, Sree Padma, Sree Athira, Peerumade local, Vegetable and Fruit Promotion Council Keralam (VFPCK) local Green manure cowpea: C-152

Crop: Elephant foot yam

Important features of suitable varieties

Parameters	Gajendra	Sree Padma	Sree Athira	Peerumade local	VFPCK local
Duration (days)	240-270	240-270	240-270	240-270	240
Average yield under	33.69	28.85	23.26	26.71	26.09

organic condition (t/ha)					
Source (s) of availability	ICAR-CTCRI	ICAR-CTCRI	ICAR-CTCRI	Locally from Peerumade Development Society (PDS), Pothupara, Idukki dt., Kerala	Vegetable and Fruit Promotion Council Keralam (VFPCK)
Suitable regions/districts in the state	Throughout the state	Throughout the state	Throughout the state	Throughout the state	Throughout the state

Field preparation: The land is ploughed to a depth of 15-20 cm and levelled.Pits of 60 cm x 60 cm x 45 cm size may be dug 90 cm apart. The topsoil is to be collectedup to a depth of 15-20 cm separately and filledin the pits.FYM : neem cake mixture (10:1) incubated with *Trichoderma* isapplied@ 3 kg pit^{-1} (36 t/ha) and mixed with topsoil.Neem cake is applied @ 1.0 t/ha(80 g/pit) at the time of planting. Corm pieces of 500 g with a portion of terminal bud treated with slurry containing cowdung, neem cake and *Trichoderma harzianam* (5g/kg seed) are planted in the pits. Immediately after planting elephant foot yam, green manure cowpea is sown @ 20 kg ha^{-1}.

Cultural practices

Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Bio-control agent Cowdung slurry mixed with neem cake and *Trichoderma harzianum*	*Trichoderma* 5 g/kg seed	Seed treatment
Spacing (Row X plant) in cm	90 cm x 90 cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source		Quantity/ha
	FYM + neem cake mixture (10:1) inoculated with *Trichoderma harzianum* (2.5 kg/ tonne of FYM: neem cake mixture) Neem cake		36 t/ha 1 t/ha
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop

	Green manuring with cowpea	20 – 25 t /ha	45-60 DAP
	Ash	3 t/ha	45-60 DAP (at the time of incorporation of green manure cowpea)
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	Rainfed. Life saving irrigation at twice per week until sprouting, if prolonged dry spell occurs.		
Major weeds	*Muthanga*- Purplenutsedge-*Cyperus rotundus* Thazhuthama-Spreading hog weed-*Boerhaavia diffusa* Kattukaduku-Wild mustard-*Cleome viscosa* Wild Indigo- Kozhinjil-*Tephrosia purpurea* Muyal chevian-Red tassel flower- *Emilia sonchifolia* Poovamkurunnu-Purple fleabane-*Vernonia cinerea* Kurumthotti-Common wire weed-*Sida acuta* Kurumthotti-Sida hemp-*Sida rhombifolia*		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	45 DAP and 75 DAP	Mulching immediately after planting and two hand weedings at 45 days and one month later	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Collar rot	FYM: Neem cake mixture (10:1) inoculated with *Trichoderma harzianum* Seed treatment with cowdung slurry mixed with neem cake and *Trichoderma harzianum*	*Trichoderma* (@ 2.5 kg/tonne of FYM: neem cake mixture) @ 90 kg/ha *Trichoderma* (@ 5 g/kg seed) @ 31.25 kg/ha
Optimum stage of harvesting	8-9 months		

Yield and Economics

Parameters	1st year*	2nd year	3rd year	4th year	5th year	6th year	7th year
Economic yield (t/ha)	65.87	70.63	56.95	57.23	34.81		
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs. 8/kg						
Cost of cultivation (Rs/ha)	Rs. 241000/ha						
Net returns (Rs/ha)	Rs. 215776/ha						

*based on prices of 2013-14

Glimpses

Cowdung: neem cake mixture inoculated with *Trichodermaharzianum*

Cost-effective practice of green manuring

Elephant foot yam + green manure cowpea

View of the experiment on Organic farming of elephant foot yam

Organic elephant foot yam corms

Cropping System 2: Yams + green manure cowpea

Particulars	*Kharif*	*Rabi*
Crop	Yams and green manure cowpea	Yams continue
Fortnight of sowing/planting	I fortnight of May planting yams and sowing green manure cowpea	
Fortnight of harvesting	II fortnight of June harvesting and incorporation of green manure cowpea	First fortnight of January harvesting yams

Crop: Yams

Important features of suitable varieties

Parameters	White yam	Greater yam	Lesser yam	Dwarf white yam
	Var. Sree Priya	Var. Sree Keerthi	Var. Sree Latha	Var. Sree Dhanya
Duration (days)	270 – 300	270 – 300	210-240	210-240
Average yield under organic condition (t/ha)	22.21	21.96	16.83	13.23
Source (s) of availability	ICAR-CTCRI	ICAR-CTCRI	ICAR-CTCRI	ICAR-CTCRI
Suitable regions/districts in the state	Throughout the state	Throughout the state	Throughout the state	Throughout the state

Field preparation: The land is ploughed to a depth of 15-20 cm. Pits of 45 x 45 x45 cm size is opened for planting greater yam and white yam at a spacing of 90 x 90 cm. Three-fourths of the pit is filled with top soil and FYM and reformed into mound. For raising lesser yam, mounds may be formed at a spacing of 75 x 75 cm after broadcasting FYM. In the case of

greater yam and white yam, tuber pieces of 250-300 g size can be used as planting material. For planting lesser yam, medium sized tuber of 100-150 g is sufficient.

Cultural practices

<table>
<tr><td>Seed rate (kg/ha)</td><td colspan="3"></td></tr>
<tr><td>Spacing (Row X plant) in cm</td><td colspan="3">White yam and greater yam : 90 x 90 cm
Lesser yam: 75 x 75 cm
Dwarf white yam: 60 x 60 cm</td></tr>
<tr><td>Number of seedlings/hill</td><td colspan="3">Not applicable</td></tr>
<tr><td rowspan="5">Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc</td><td>Source</td><td colspan="2">Quantity/ha</td></tr>
<tr><td>FYM</td><td colspan="2">15 t/ha</td></tr>
<tr><td>Neem cake</td><td colspan="2">1 t/ha</td></tr>
<tr><td>Biofertilizers
Azospirillum
Mycorrhiza
Phosphobacteria</td><td colspan="2">
3 kg/ha
5 kg/ha
3 kg/ha</td></tr>
<tr><td></td><td colspan="2"></td></tr>
<tr><td rowspan="4">Top dressing of organic manures</td><td>Source</td><td>Quantity/ha</td><td>Days after sowing/planting or stage of crop</td></tr>
<tr><td>Green manuring with cowpea</td><td>15-20 t /ha</td><td>45-60 DAP</td></tr>
<tr><td>Ash</td><td>1.5 t/ha</td><td>45-60 DAP (at the time of incorporation of green manure cowpea)</td></tr>
<tr><td></td><td colspan="3"></td></tr>
<tr><td>Major weeds</td><td colspan="3">Muthanga-Purplenutsedge-Cyperus rotundus
Karuka-Bermuda grass-Cynodon dactylon
Thazhuthama- Spreading hog weed-Boerhaavia diffusa
Muyal chevian-Red tassel flower- Emilia sonchifolia
Poovamkurunnu-Purple fleabane-Vernonia cinerea
Kurumthotti-Common wire weed-Sida acuta</td></tr>
<tr><td rowspan="2">Weed management</td><td>Critical stage of weeding</td><td colspan="2">Recommended practice for organic condition</td></tr>
<tr><td>45 DAP and 75 DAP</td><td colspan="2">Mulching immediately after planting and two hand weedings at 45 days and one month later</td></tr>
<tr><td>Optimum stage of harvesting</td><td colspan="3">White yam and greater yam: 9-10 months
Lesser yam and dwarf white yam: 7-8 months</td></tr>
</table>

Yield and Economics

Parameters	**1st**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**

	year*						
Economic yield (kg/ha)							
White yam	17.81	27.16	28.34	18.56	19.22		
Greater yam	19.47	26.30	17.29	21.67	25.07	46.45	
Lesser yam	8.59	24.95	23.57	10.92	16.12	19.28	
Dwarf white yam	12.60	12.28	14.79	16.38			
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Greater yam: Rs. 20/kg Lesser yam: Rs. 20/kg Dwarf white yam: Rs. 20/kg						
Cost of cultivation (Rs/ha)	Greater yam: Rs. 430020 Lesser yam: Rs. 330020 Dwarf white yam: Rs. 303900						
Net returns (Rs/ha)	Greater yam: Rs. 498940 Lesser yam: Rs. 55620 Dwarf white yam: Rs. 187620						

*based on prices of 2013-14

Glimpses

Yams + green manure cowpea

View of the experiment on Organic farming of yams (trailing genotypes)

View of the experiment on Organic farming of dwarf white yam

Green manure cowpea in between dwarf white yam mounds

	
Organic white yam	Organic greater yam
	
Organic lesser yam	Organic dwarf white yam

Cropping System 3: Taro + green manure cowpea

Particulars	*Kharif*	*Rabi*
Crop	Taro and green manure cowpea	Taro continues
Fortnight of sowing/planting	I fortnight of June planting taro and sowing green manure cowpea	
Fortnight of harvesting	II fortnight of July harvesting and incorporation of green manure cowpea	Second fortnight of November harvesting taro

Important features of suitable varieties

Parameters	Sree Kiran	Sree Rashmi	Local
Duration (days)	190-210	210	210
Average yield under organic condition (t/ha)	10.36	11.19	10.36
Source (s) of availability	ICAR-CTCRI	ICAR-CTCRI	VFPCK
Suitable regions/districts in the state	All regions of the state	All regions of the state	All regions of the state

Field preparation: The land is ploughed to a depth of 20-25 cm. Ridges and furrows are formed at 60 cm spacing. Cormels are planted at a spacing of 45 cm on the ridges. The cormels may be planted at a depth of 2.5-7.5 cm. About 37,000 cormels are required to plant one hectare. Approximately 800 kg of cormels is required to plant one hectare.

Yield and Economics

Parameters	**1st *year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (t/ha)	10.43	16.51	9.71	6.93	9.49	18.18	
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs. 20/kg						
Cost of cultivation (Rs/ha)	Rs. 189420						
Net returns (Rs/ha)	Rs. 174160						

*based on prices of 2013-14

Cropping Systems 3: Taro + green manure cowpea

<table>
<tr><td colspan="2">   </td></tr>
<tr><td colspan="2">View of the experiment on Organic farming of taro</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Green manure cowpea in between taro</td><td>Organic taro (var. Sree Kiran)</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Organic taro (var. Sree Rashmi)</td><td>Organic taro (Local var)</td></tr>
</table>

Madhya Pradesh

Prepared by AB Singh, K. Ramesh, S Ramana, JK Thakur and BL Lakaria, ICAR-Indian Institute of Soil science, Bhopal (Madhya pradesh)

Suggested cropping systems **(based on testing under NPOF)**

1. Soybean-Wheat
2. Soybean-Mustard
3.Soybean-Chickpea
4. Soybean-Isabgol/Linseed

Cropping System 1: **Soybean-Wheat**

Particulars	*Kharif*	*Rabi*
Crop	Soybean	Wheat
Fortnight of sowing/planting	July Fortnight	2nd fortnight of November
Fortnight of harvesting	October	2nd fortnight of March
Varieties suitable for organic farming	JS-335	Malwa Shakti

Crop *(kharif)*: Soybean

Important features of suitable varieties

Parameters	**Var. JS-335**
Duration (days)	95-100
Average yield under organic condition (kg/ha)	1100
Source (s) of availability	M.P. State govt.
Suitable regions/districts in the state	Central Zone (M.P.)
Specific resistance / tolerance to pest	Tolerant to stem fly
Specific resistance / tolerance to disease	Resistant to bacterial blight and tolerant to green mosaic
Specific tolerance to drought/waterlogging	Susceptible to water logging

Field preparation: Two ploughings are necessary before sowing. If necessary, broad bed furrow can be made wherever water logging is a problem.

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	80		
Pre-sowing/planting treatment of seed/seedlings	Rhizobium culture	5g/kg seed	Seed treatment
	Phosphate Solublizing Bacteria (PSB)	5g/kg seed	Seed treatment

	Trichoderma viride	5 g/kg seed	Seed treatment
Spacing (Row X plant) in cm	45 x 5 cm		
Number of seedlings/hill (in nursery crops only)	NA		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	Cow dung manure (0.95% Nitrogen)	5 t/ha	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	Rainfed crop		
Major weeds (give local, English and scientific name)	Doodhi Asthma herb (Euphorbia hirta), Motha Purple nutsedge(Cyperus rotundus),		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-30 days after sowing	Hand weeding	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Stem Girdle beetle	Neem oil (10000 ppm) 1% Azadirachtin	1 litre/ ha along with soap solution
	Tobacco caterpillar	Neem oil (10000 ppm) 1% Azadirachtin	1 litre/ ha along with soap solution
Optimum stage of harvesting	Physiological maturity stage of soybean		

Nutrient management –Nutrient were applied through Nitrogen equivalent basis

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	714	1399	918	1144	2009	2377	1103
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs. 37.5/kg						
Cost of cultivation*(Rs/ha)	11607/ha						
Net returns* (Rs/ha)	7244/ha						

*based on prices of 2013-14

Yield (Kg/ha)	**Cost of Cultivation (Rs/ha)**

1100	**11607**

Crop *(Rabi)*: **Wheat**

Important features of suitable varieties

Parameters	Malwashakti
Duration (days)	135-140
Average yield under organic condition (kg/ha)	3570
Source (s) of availability	M.P. state Govt.
Suitable regions/districts in the state	Malwa region of M.P.
Specific resistance / tolerance to pest	NA
Specific resistance / tolerance to disease	Resistant to rust
Specific tolerance to drought/waterlogging	NA

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	80-100 kg/ha		
Spacing (Row X plant) in cm	22.5 x 5 cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	Cow dung manure (0.95% Nitrogen)	4.5 t/ha	
	Vermicompost (1.41% Nitrogen)	3.5 t/ha	
	Poultry Manure (2.36% Nitrogen)	1.5 t/ha	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	2-3	Crown root initiation (21 DAS)	
Major weeds	Senji yellow sweet clover (Melilotus indica), Doodhi Asthma herb (Euphorbia hirta), Motha Purple nutsedge(Cyperus rotundus),Bathua Common lambsquarter (Chenopodium album)		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	30-40 days after sowing	Hand weeding	
Optimum stage of harvesting (in case of vegetables and green cob)	Physiological maturity stage		

Nutrient management –Nutrient were applied through Nitrogen equivalent basis

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**

Economic yield (kg/ha)	4160	4094	4110	4915	4406	3604	3136
Price (Rs/kg) (consider 25 % premium on prevailing market price)	20/ kg						
Cost of cultivation*(Rs/ha)	25171/ha						
Net returns* (Rs/ha)	34399/ha						

*based on prices of 2013-14

Yield (Kg/ha)	**Cost of Cultivation (Rs/ha)**
2722.2	**11514**

Glimpses

Cow dung Manure

Vermicompost

Kharif

A view of Soybean crop in the organic farming experiment

Rabi

A view of Wheat crop in the organic farming experiment

Kharif

Organic Soybean

Rabi

Organic Wheat

Cropping System 2: -Soybean- Mustard

Particulars	*Kharif*	*Rabi*

Crop	Soybean	Mustard
Fortnight of sowing/planting	July Fortnight	2nd fortnight of Octber
Fortnight of harvesting	October	1st fortnight of March
Varieties suitable for organic farming	JS-335	Pusa Bold

Crop *(kharif)*: Soybean

Field preparation: Two ploughings and Broad Bed Furrow if necessary under water logging conditions.

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	80		
Pre-sowing/planting treatment of seed/seedlings	Rhizobium culture	5g/kg seed	Seed treatment
	Phosphate Solublizing Bacteria (PSB)	5g/kg seed	Seed treatment
	Trichoderma viride	g/kg seed	Seed treatment
Spacing (Row X plant) in cm	45 x 5 cm		
Major weeds	Doodhi Asthma herb (Euphorbia hirta), Motha Purple nutsedge (Cyperus rotundus),		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-30 days after sowing	Hand weeding	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Girdle beetle	Neem oil (10000 ppm) 1% Azadirachtin	1 litre/ ha with soap solution
	Tobacco caterpillar	Neem oil (10000 ppm) 1% Azadirachtin	1 litre/ ha with soap solution

Nutrient management –Nutrient were applied through Nitrogen equivalent basis

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	714	1399	918	1144	2009	2377	1103

Price (Rs/kg) (consider 25 % premium on prevailing market price)	37.5/kg
Cost of cultivation*(Rs/ha)	11607/ha
Net returns* (Rs/ha)	7244/ha

*based on prices of 2013-14

Yield (Kg/ha)	**Cost of Cultivation (Rs/ha)**
1100	**11607**

Crop *(Rabi)*: Mustard

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	5-6 kg/ha		
Spacing (Row X plant) in cm	45 x 10 cm		
Recommended NPK and micro nutrient dose for the crop (kg/ha)	NPK -60:17.5:25 kg/ha		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	Cow dung manure (0.95% Nitrogen)	1.5 t/ha	
	Vermicompost (1.41% Nitrogen)	1.7 t/ha	
	Poultry Manure (2.36% Nitrogen)	1 t/ha	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	2	Flowering stage	5-6 cm
Major weeds	Nut sedge (Cyperus rotundus),Bathua Common lambsquarter(Chenopodium album) Doodhi Asthma herb (Euphorbia hirta), Motha Purple nutsedge		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	15-30 days after sowing	Hand weeding	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Mustard aphid (*Lipaphis erysimi*)	Neem oil (10000 ppm) 1% Azadirachtin	1 litre/ ha with soap solution

Nutrient management –Nutrient were applied through Nitrogen equivalent basis

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	1470	1421	1898	1948	2106	1142	1948
Price (Rs/kg) (consider 25 % premium on prevailing market price)	40/ kg						
Cost of cultivation*(Rs/ha)	23691/ha						
Net returns* (Rs/ha)	24438/ha						

*based on prices of 2013-14

Yield (Kg/ha)	**Cost of Cultivation (Rs/ha)**
1003.3	**10553**

Field preparation: Write here about the number of ploughings/harrowing /planking etc in running text and in sequence, Please specifically mention the practices of puddling, making ridges and furrows, raised beds if applicable along with distance also. Also mention about incorporation of green/green leaf manure

Glimpses

Kharif	***Rabi***
	
A view of Soybean crop in the organic farming experiment	**A view of Mustard crop in the organic farming experiment**

Kharif	***Rabi***

	
Organic Soybean	Organic Mustard

Cropping System 3: **Soybean-Chickpea**

Particulars	***Kharif***	***Rabi***
Crop	Soybean	Chickpea
Fortnight of sowing/planting	July Fortnight	2nd fortnight of October
Fortnight of harvesting	October	March
Varieties suitable for organic farming	JS-335	JG-130

Crop *(kharif)*: Soybean

Field preparation: Two ploughings are necessary before sowing. If necessary, broad bed furrow can be made wherever water logging is a problem.

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	80		
Pre-sowing/planting treatment of seed/seedlings	Rhizobium culture	5g/kg seed	Seed treatment
	Phosphate Solublizing Bacteria (PSB)	5g/kg seed	Seed treatment
	Trichoderma viride	g/kg seed	Seed treatment
Spacing (Row X plant) in cm	45 x 5 cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	Cow dung manure (0.95% Nitrogen)	5 t/ha	
Major weeds	Doodhi Asthma herb (Euphorbia hirta), Motha Purple nutsedge(Cyperus rotundus),		
Weed management	Critical stage of	Recommended practice for organic	

	weeding	condition	
	20-30 days after sowing	Hand weeding	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Girdle beetle	Neem oil (10000 ppm) 1% Azadirachtin	1 litre/ ha with soap solution
	Tobacco caterpillar	Neem oil (10000 ppm) 1% Azadirachtin	1 litre/ ha with soap solution

Nutrient management –Nutrient were applied through Nitrogen equivalent basis

Yield and Economics

Parameters	**1st***	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	714	1399	918	1144	2009	2377	1103
Price (Rs/kg) (consider 25 % premium on prevailing market price)	37.5/kg						
Cost of cultivation*(Rs/ha)	11607/ha						
Net returns* (Rs/ha)	7244/ha						
Yield (Kg/ha)			**Cost of Cultivation (Rs/ha)**				
1100			**11607**				

Crop *(Rabi)*: Chickpea

Important features of suitable varieties

Parameters	JG-130
Duration (days)	100-120
Average yield under organic condition (kg/ha)	1880
Source (s) of availability	M.P. state Govt.
Suitable regions/districts in the state	Malwa region of M.P.
Specific resistance / tolerance to disease	Resistant to fusarium wilt, moderately resistant to dry root rot
Specific tolerance to drought/waterlogging	Tolerant to helicoverpa

Field preparation: Two ploughings are necessary before sowing of the crops

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	75-80 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Rhizobium culture	5g/kg seed	Seed treatment
	Phosphate Solublizing Bacteria (PSB)	5g/kg seed	Seed treatment
	Trichoderma viride	2g/kg seed	Seed treatment
Spacing (Row X plant) in cm	30 x 10 cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	Cow dung manure (0.95% Nitrogen)	1.7 t/ha	
	Vermicompost (1.41% Nitrogen)	1.3 t/ha	
	Poultry Manre (2.36% Nitrogen)	0.5 t/ha	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	2	Flowering stage	
Major weeds	Bathua Common lambsquarter (Chenopodium album), Doodhi Asthma herb (Euphorbia hirta), Motha Purple nutsedge(Cyperus rotundus),Doob grass Bermuda grass (*Cynodon dactylon)*		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	30 days after sowing	Hand weeding	

Nutrient management –Nutrient were applied through Nitrogen equivalent basis

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	1736	1480	1720	1890	3348	1821	2018
Price (Rs/kg) (consider 25 %	37.5/ kg						

premium on prevailing market price)	
Cost of cultivation*(Rs/ha)	24130/ha
Net returns* (Rs/ha)	34031/ha

Yield (Kg/ha)	**Cost of Cultivation (Rs/ha)**
1477.8	**11516**

*based on prices of 2013-14

Glimpses

Kharif	***Rabi***
	
A view of Soybean crop in the organic farming experiment	**A view of Chickpea crop in the organic farming**
Kharif	***Rabi***
	
Organic Soybean	**Organic Chickpea**

Cropping System 4: Soybean-Linseed

Particulars	***Kharif***	***Rabi***
Crop	Soybean	Linseed
Fortnight of sowing/planting	July Fortnight	1st fortnight of October
Fortnight of harvesting	October	March

Varieties suitable for organic farming	JS-335	JL-9

Crop *(kharif)* : Soybean

Important features of suitable varieties

Parameters	JS-335
Duration (days)	95-100
Average yield under organic condition (kg/ha)	1100
Source (s) of availability	M.P. State govt.
Suitable regions/districts in the state	Central Zone (M.P.)
Specific resistance / tolerance to pest	Tolerant to stem fly
Specific resistance / tolerance to disease	Resistant to bacterial blight and tolerant to green mosaic

Field preparation: Two ploughings are necessary before sowing. If necessary, broad bed furrow can be made wherever water logging is a problem.

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	80		
Pre-sowing/planting treatment of seed/seedlings	Rhizobium culture	5g/kg seed	Seed treatment
	Phosphate Solublizing Bacteria (PSB)	5g/kg seed	Seed treatment
	Trichoderma viride	g/kg seed	Seed treatment
Spacing (Row X plant) in cm	45 x 5 cm		
Source	Quantity/ha		
Cow dung manure (0.95% Nitrogen)	5 t/ha		
Major weeds	Doodhi Asthma herb (Euphorbia hirta), Motha Purple nutsedge(Cyperus rotundus),		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-30 days after sowing	Hand weeding	
Organic plant protection	Name of	Organic material	Quantity (kg or

practices	pest/disease	recommended for control	litres/ ha)
	Girdle beetle	Neem oil (10000 ppm) 1% Azadirachtin	1 litre/ ha with soap solution
	Tobacco caterpillar	Neem oil (10000 ppm) 1% Azadirachtin	1 litre/ ha with soap solution

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	714	1399	918	1144	2009	2377	1103
Price (Rs/kg) (consider 25 % premium on prevailing market price)	37.5/kg						
Cost of cultivation*(Rs/ha)	11607/ha						
Net returns* (Rs/ha)	7244/ha						

Yield (Kg/ha)	**Cost of Cultivation (Rs/ha)**
1100	**11607**

*based on prices of 2013-14

Crop *(Rabi)*: Linseed

Important features of suitable varieties

Parameters	JL-9
Duration (days)	115-120
Average yield under organic condition (kg/ha)	1300
Source (s) of availability	M.P. state Govt.
Suitable regions/districts in the state	Sagar, Damoh Tikamgerh district of M.P.
Specific resistance / tolerance to disease	Resistant to powdery mildew

Field preparation: Two ploughings are necessary before sowing of the crops

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	25-30 kg/ha	
Spacing (Row X plant) in cm	30 x 5 cm	
Basal application of organic	Source	Quantity/ha

manures including soil application of bio-fertilizers, bio-control agents	Cow dung manure (0.95% Nitrogen)	3.4 t/ha	
	Vermicompost (1.41% Nitrogen)	1.7 t/ha	
	Poultry Manre (2.36% Nitrogen)	1 t/ha	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	2	30 day after sowing	
Major weeds	Bathua Common lambsquarter (Chenopodium album), Doodhi Asthma herb (Euphorbia hirta), Doob grass Bermuda grass (*Cynodon dactylon)*		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-30 days after sowing	Hand weeding	

Nutrient management –Nutrient were applied through Nitrogen equivalent basis

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	1823	1080	1228	1392			
Price (Rs/kg) (consider 25 % premium on prevailing market price)	42.5/ kg						
Cost of cultivation*(Rs/ha)	23922/ha						
Net returns* (Rs/ha)	39249/ha						
Yield (Kg/ha)	**Cost of Cultivation (Rs/ha)**						
1392.6	**10864**						

*based on prices of 2013-14

Glimpses

Kharif	*Rabi*
	
A view of Soybean crop in the organic farming experiment	**A view of linseed crop in the organic farming experiment**

Kharif	*Rabi*
	
Organic Soybean	Organic Linseed

Cropping System: Soybean-Isbgol

Particulars	*Kharif*	*Rabi*
Crop	Soybean	Isbgol
Fortnight of sowing/planting	July Fortnight	1st week of December
Fortnight of harvesting	October	March
Varieties suitable for organic farming	JS-335	GI-2

Crop *(kharif)*: Soybean

Important features of suitable varieties

Parameters	**JS-335**
Duration (days)	95-100
Average yield under organic condition (kg/ha)	1100
Source (s) of availability	M.P. State govt.

Suitable regions/districts in the state	Central Zone (M.P.)
Specific resistance / tolerance to pest	Tolerant to stem fly
Specific resistance / tolerance to disease	Resistant to bacterial blight and tolerant to green mosaic

Field preparation: Two ploughings are necessary before sowing. If necessary, broad bed furrow can be made wherever water logging is a problem.

Cultural practices

Seed rate (kg/ha)	80		
Pre-sowing/planting treatment of seed/seedlings	Rhizobium culture	5g/kg seed	Seed treatment
	Phosphate Solublizing Bacteria (PSB)	5g/kg seed	Seed treatment
	Trichoderma viride	g/kg seed	Seed treatment
Spacing (Row X plant) in cm	45 x 5 cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	Cow dung manure (0.95% Nitrogen)	5 t/ha	
Major weeds	Doodhi Asthma herb (Euphorbia hirta), Motha Purple nutsedge(Cyperus rotundus),		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-30 days after sowing	Hand weeding	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Girdle beetle	Neem oil (10000 ppm) 1% Azadirachtin	1 litre/ ha with soap solution
	Tobacco caterpillar	Neem oil (10000 ppm) 1% Azadirachtin	1 litre/ ha with soap solution

Nutrient management –Nutrient were applied through Nitrogen equivalent basis

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4t**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	714	1399	918	1144	2009	2377	1103
Price (Rs/kg) (consider 25 % premium on prevailing market price)	37.5/kg						
Cost of cultivation*(Rs/ha)	11607/ha						
Net returns* (Rs/ha)	7244/ha						
Yield (Kg/ha)		**Cost of Cultivation (Rs/ha)**					
1100		**11607**					

*based on prices of 2013-14

Crop *(Rabi)*: Isbgol

Important features of suitable varieties

Parameters	GI-2
Duration (days)	115-120
Average yield under organic condition (kg/ha)	1200
Suitable regions/districts in the state	Neemuch Mandsour and ratlam district of M.P.
Specific resistance / tolerance to disease	Resistant to fusarium wilt, moderately resistant to dry root rot
Specific tolerance to drought/waterlogging	Tolerant to helicoverpa

Field preparation:Two ploughings are necessary before sowing of the crops

Cultural practices

Seed rate (kg/ha)	4-5 kg/ha	
Spacing (Row X plant) in cm	30 x 5 cm	
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha
	Cow dung manure (0.95% Nitrogen)	1.2 t/ha
	Vermicompost (1.41% Nitrogen)	0.6 t/ha
	Poultry Manure (2.36% Nitrogen)	0.3 t/ha
Irrigation practices	Number of irrigations	Most critical stages for irrigation
	3-4	Immediate light irrigation after sowing
Major weeds	Bathua Common lambsquarter (Chenopodium album), Doodhi Asthma herb (Euphorbia hirta), Motha Purple nutsedge(Cyperus rotundus),Doob grass Bermuda grass (*Cynodon dactylon)*	
Weed management	Critical stage of weeding	Recommended practice for organic condition

	20-25 days after sowing	Hand weeding	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	White Grub	Neem oil (10000 ppm) 1% Azadirachtin	1 litre/ ha with soap solution

Nutrient management –Nutrient were applied through Nitrogen equivalent basis

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	1180	1126	1226	1249			
Price (Rs/kg) (consider 25 % premium on prevailing market price)	55/ kg						
Cost of cultivation*(Rs/ha)	20716/ha						
Net returns* (Rs/ha)	33657/ha						

*based on prices of 2013-14

Details of Specific Practices/products used/recommended
(Please give details of panchagavvya, cow urine, BD preparation and any other ITK products including its method of preparation etc)

Glimpses

Kharif	***Rabi***
	
A view of Soybean crop in the organic farming	**A view of Isbgol crop in the organic farming**

Maharashtra

Package of practices for Organic Crop Production

Prepared by Dr. L. S. Chavan, Dr. D. G. Jondhle, S. J. Mhatre, S. S.More and S. K. Kshirsagar.

Suggested cropping systems (based on testing under NPOF)

1. Rice-Groundnut
2. Rice-*Dolichos* bean
3. Rice-Cucumber
4. Rice-Red pumpkin

Details of Cropping Systems : 1 : Rice – Groundnut

Particulars	***Kharif***	***Rabi***
Crop	**Rice**	**Groundnut**
Fortnight of sowing/planting	**Nursery Sowing** -Second fortnight of June **Transplanting**- Second fortnight of July	**Sowing** - Second fortnight of December
Fortnight of harvesting	Second fortnight of October	Second fortnight of April
Varieties suitable for organic farming	Karjat-3, Karjat-4, Karjat-7 and Palghar-1	SB-XI, Konkan Guarav and Konkan Trombay Tapora

Crop (*Kharif*) : Rice

Important features of suitable varieties

Parameters	**Karjat-3**	**Karjat-4**	**Karjat-7**	**Palghar-1**
Duration (days)	115-120	110-115	115-120	125-130
Average yield under organic condition (kg/ha)	3500 to 3700	3300 to 3500	3400 to 3600	3900 to 4100
Source (s) of availability	RARS, Karjat	RARS, Karjat	RARS, Karjat	RARS, Karjat
Suitable regions/districts in the state	Suitable for rainfed uplands as well as irrigated areas for *Kharif* and *Rabi* seasons in Maharashtra.	Suitable for rainfed uplands as well as irrigated areas for *Kharif* and *Rabi* seasons in *Konkan* region of Maharashtra.	Suitable for rainfed uplands and irrigated transplanted conditions in Maharashtra State.	*Konkan* region and Maharashtra state
Specific resistance/tolerance	Tolerant to stem borer	Moderately resistant to	Resistant to leaf folder,	Moderately resistant to

to pest		leaf folder	BPH,WBPH and moderately resistant to stem borer	stem borer
Specific resistance/tolerance to disease	Resistant to blast and moderately resistant to BLB and brown spots.		Moderately resistant to blast and BLB	Moderately resistant to blast
Specific tolerance to drought/water logging	Suitable for high rainfall zone	Suitable for high rainfall zone	Suitable for high rainfall zone	Suitable for high rainfall zone

Nursery raising practices

Area of nursery required for 1 ha	0.10 ha (1000m^2)		
Nursery raising method	**Wet nursery /Mat nursery/Raised bed method** etc.		
Bed size (length x breadth in m)	Length as per slope of the land (sloppy land less length, plane land more length) - Breadth- 1 m		
Seed sowing rate/m^2	45 to 50 g/m^2		
Pre-sowing seed/soil treatment	**Materials**	**Quantity/kg of seed or per m^2 area**	**Method of application**
	Trichoderma	5g/kg of seed	Seed treatment
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	**Materials**	**Quantity/m^2area**	**Method of application**
	FYM	3 kg/m^2 area	Soil incorporation before nursery sowing
Irrigation practices	Rainfed		
Weed management	Mulching of *Glyricidia* green leaves and mannual hand weeding		
Organic plant protection practices	**Name of pest/disease**	**Recommended organic material used for control**	**Quantity/m^2 area**
	Different insect pests	Application of neem formulation	1500 ppm@5 ml/lit of water for two times
Optimum age of nursery (days)	22 to 26 days		

Field preparation:

Field is ploughed for solar heating in the month of May. Second ploughing and clod crushing is done before monsoon with wooden plough or tractor or power tiller drawn cultivator.Puddling is done by wooden plough or tractor or power tiller drawn puddler. Bullock drawn *Pankaj* puddler developed by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli should be used for better puddling.

The field should be mannured with FYM and Neem cake @ 5 and 0.5 tonnes/ha, respectively before puddling. Similarly, 4.5 tonnes/ ha of *Glyricidia* green leaf and 4.2 tonnes/ha of rice straw be incorporated into puddled field prior to transplanting.

Cultural practices

<table>
<tr><td rowspan="2">Pre-sowing/planting treatment of seed/seedlings</td><td>Material</td><td>Recommended rate (kg/ha or lit./ha)</td><td>Method of application</td></tr>
<tr><td>Phosphate solubilizing bacteria (PSB) andAzospirillum</td><td>PSB 2.5 kg + Azospirillum 2.5 kg + 100 lit of water/ha</td><td>Seedling root dip for 20 to 30 minutes in the slurry</td></tr>
<tr><td>Spacing (Row x Plant) in cm</td><td colspan="3">20x15cm</td></tr>
<tr><td>Number of seedlings/hill</td><td colspan="3">3-4 seedlings/hill</td></tr>
<tr><td rowspan="5">Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc.</td><td colspan="2">Source</td><td>Quantity/ha</td></tr>
<tr><td colspan="2">FYM</td><td>5000 kg /ha before puddling</td></tr>
<tr><td colspan="2">Neem cake</td><td>500 kg /ha before puddling</td></tr>
<tr><td colspan="2">Glyricidia Green leaves</td><td>4500 kg /ha soil incorporation before transplanting</td></tr>
<tr><td colspan="2">Rice straw</td><td>4200 kg /ha soil incorporation before transplanting</td></tr>
<tr><td rowspan="3">Top dressing of organic manures</td><td>Source</td><td>Quantity/ha</td><td>Days after sowing/planting or stage of crop</td></tr>
<tr><td>1. Cow urine</td><td>50 lit/ha</td><td rowspan="2">Spraying at 30 and 60 days after transplanting</td></tr>
<tr><td>2. Vermiwash</td><td>50 lit/ha</td></tr>
<tr><td>Irrigation practices</td><td colspan="3">Rainfed during Kharif and canal irrigation during Rabi</td></tr>
<tr><td>Major weeds</td><td colspan="3">Echinochloa crusgalli (Phakhad), Echinochloa colonum (Phakhad), Cyperus iria (Lavala), Cyperus rotundus (Lavala) and Ischane globossa (Dhur)</td></tr>
<tr><td rowspan="4">Weed management</td><td colspan="2">Critical stage of weeding</td><td>Recommended practice for organic condition</td></tr>
<tr><td colspan="2">20 Days after transplanting</td><td>Cono- weeder hoeing</td></tr>
<tr><td colspan="2">30 Days after transplanting (Tillering)</td><td>Cono- weeder hoeing and manual hand weeding</td></tr>
<tr><td colspan="2">60 Days after transplanting (Panicle initiation)</td><td>Manual hand weeding</td></tr>
</table>

Organic plant protection practices	**Name of the pest/disease**	**Organic material recommended for control**
Insect pests	Stem borer	• Ploughing and collection of stubbles and their composting after harvesting of rice. • Use of tolerant and resistant varieties. • Crop rotation with ground nut, *Dolichos*

		bean, cucumber and red pumpkin. • Harvesting of rice close to the ground with *Vibhav* sickle developed by DBSKKV; Dapoli to kill the hibernating larvae. • Use of pheromone traps @20 Nos./ha • Release of *Trichogramma* @ 50000/ha for 4 times. • Collection of egg masses and their destruction. • Conservation and preservation of frogs in the field
	Case worm	• Timely transplanting • Intermittent draining out water from the field • Flooding the field followed by dragging a rope across the field and draining out the water from the field
	Brown Plant Hoppers (BPH), White Backed Plant Hoppers (WBPH) and Blue beetle	• Use of tolerant and resistant varieties. • Intermittent draining out water from the field • Judicious use of nitrogenous fertilizers. • Adoption of proper spacing (20x15cm) • Formation of alley ways for every three meters for penetration of sunlight and proper aeration
	Army worm	• Deep ploughing after harvesting of crop to expose the hibernating stages of pest. • Everyday inspection of the field during dry spell and at maturity. • Keeping the bunds clean and free of weed in the beginning of the season. • Digging the trench and flooding it with water for preventing migration of larvae from one field to another field. • Erection of bird perches. • Harvesting the crop immediately after it attains the maturity. • Conservation and preservation of frogs in the field.
	Leaf eating caterpillars	• Erection of bird perches.
Diseases	Blast and sheath rot	• Use of tolerant and resistant varieties. • Spraying of *Pseudomonas fluroscence* @ 8-10 g / lit of water [for 2-3 times] starting from maximum tillering to flowering stage.
	Bacterial leaf blight	• Use of tolerant and resistant varieties. • Intermittent draining out water from the field. • Judicious use of nitrogenous fertilizers.

		• Adoption of proper spacing (20x15cm)

Yield and economics: q/ha

Parameters	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	
Economic yield (kg/ha)	1960	2873	3150	3543	3411	3842	Grain	Straw
							3418	4032
Price (Rs/kg) consider 25% Premium on prevailing market price	Grain : Rs.16.88/kg Straw : Rs. 2.50/kg							
Cost of cultivation (Rs/ha)	82327							
Net Returns (Rs/ha)	-14577							

*based on prices of 2013-14

Crop (*Rabi*): **Groundnut**
Important features of suitable varieties: **SB XI, Konkan Guarav and Konkan Trombay Tapora**

Parameters	**SB-XI**	**Konkan Guarav**	**Konkan Trombay Tapora**
Duration (days)	110-115	120-125	120-125
Average yield under organic condition (kg/ha)	1200 to 1500	1800 to 2000	1900 to 2100
Source (s) of availability	RARS, Karjat	RARS, Karjat	RARS, Karjat
Suitable regions/districts in the state	Maharashtra state	Konkan region of Maharashtra	Konkan region of Maharashtra
Specific resistance/tolerance to disease	Tolerant to *tikka* (leaf spot) and rust	Tolerant to *tikka* (leaf spot) and rust	Tolerant to *tikka* (leaf spot) and rust

Field preparation :

Plough the field after harvest of *Kharif* rice. Criss-cross cultivation and clod crushing with peg tooth cultivator to bring the soil into good tilth.

Cultural practices

Seed rate (kg/ha)	**SB XI-** 95 kg kernels/ha, **Konkan Guarav**- 110 kg kernels /ha, **Konkan Trombay Tapora**- 125 kg kernels/ha		
Pre-sowing/planting treatment of seed/seedlings	**Material**	**Recommended rate (kg/ha or lit./ha)**	**Method of application**
	Trichoderma	5g/kg of seed	Seed treatment

	Rhizobium strain	25g/ kg of seed	Seed treatment
	PSB	25g/ kg of seed	Seed treatment
Spacing (Row x Plant) in cm	30x15cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc.	**Source**		**Quantity/ha**
	FYM		1500 kg/ha
	Neem cake		160 kg/ha
	Vermicompost		560 kg/ha
Top dressing of organic manures	**Source**	**Quantity/ha**	**Days after sowing/planting or stage of crop**
1.	Cow urine	50 lit/ha	Spraying at 30 and 60 days after sowing
2.	Vermiwash	50 lit/ha	
Irrigation practices	**Number of irrigation**	**Most critical stage of irrigation**	**Depth of irrigation (cm)**
	10 irrigations at an interval of 10-12 days	Branching, Flowering, Pegging, Pod formation and Pod filling	60 cm (6 cm/ irrigation)
Major weeds	*Physalis minima* (*Ranpopati*), *Portulaca oleracea* (*Motha ghol*), *Alternanthera sessilis* (*Reshimkata*), *Blumea lacera* (*Bhamrud*) and *Amaranthus viridis* (*Ranti math*)		
Weed management	**Critical stage of weeding**		**Recommended practice for organic condition**
	20 DAS		Dry land weeder
	Flowering		Manual weeding at the time of earthing up.

Organic plant protection practices	**Name of the pest/disease**	**Organic material recommended for control**	**Quantity (kg or liters/ha)**
Insect pests	Aphids	• Application of neemicide	3ml/lit
	Tikka (leaf spot)	• Use of tolerant and resistant varieties.	
	Rust	• Use of tolerant and resistant varieties. • Judicious use of irrigation. • Timely	

		harvesting.	
Optimum stage of harvesting	• General yellowing of crop. • Blackening of inside portion of shell. • Development of ridges on pod • Colour development of kernel as per varietal character.		

Yield and economics: q/ha

Parameters	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Economic yield (kg/ha)	1671	3395	3648	2881	2584	2546	1876
Price (Rs/kg) consider 25% Premium on prevailing market price	Rs.75/kg						
Cost of cultivation (Rs/ha)	74333						
Net Returns (Rs/ha)	66367						

*based on prices of 2013-14

Rice-Groundnut cropping system economics:

Gross Returns (Rs/ha)	**Cost of cultivation (Rs/ha)**	**Net returns (Rs/ha)**	**B:C ratio**
208450	156660	51790	1.33

Cropping System 2: Rice-*Dolichos* bean

Details of Cropping Systems

Particulars	***Kharif***	***Rabi***
Crop	**Rice**	***Dolichos* bean**
Fortnight of sowing/planting	**Nursery Sowing** -Second fortnight of June **Transplanting**- Second fortnight of July	**Sowing** - Second fortnight of December
Fortnight of harvesting	Second fortnight of October	First fortnight of February to second fortnight of March
Varieties suitable for organic farming	Karjat-3, Karjat-4, Karjat-7 and Palghar-1	Konkan Bhushan

Crop (*Kharif*): Rice

Important features of suitable varieties

Parameters	**Karjat-3**	**Karjat-4**	**Karjat-7**	**Palghar-1**

Duration (days)	115-120	110-115	115-120	125-130
Average yield under organic condition (kg/ha)	3500 to 3700	3300 to 3500	3400 to 3600	3900 to 4100
Source (s) of availability	RARS, Karjat	RARS, Karjat	RARS, Karjat	RARS, Karjat
Suitable regions/districts in the state	Suitable for rainfed uplands as well as irrigated areas for *Kharif* and *Rabi* seasons in Maharashtra.	Suitable for rainfed uplands as well as irrigated areas for *Kharif* and *Rabi* seasons in *Konkan* region of Maharashtra.	Suitable for rainfed uplands and irrigated transplanted conditions in Maharashtra State.	*Konkan* region and Maharashtra state
Specific resistance/tolerance to pest	Tolerant to stem borer	Moderately resistant to leaf folder	Resistant to leaf folder, BPH,WBPH and moderately resistant to stem borer	Moderately resistant to stem borer
Specific resistance/tolerance to disease	Resistant to blast and moderately resistant to BLB and brown spots.		Moderately resistant to blast and BLB	Moderately resistant to blast
Specific tolerance to drought/water logging	Suitable for high rainfall zone	Suitable for high rainfall zone	Suitable for high rainfall zone	Suitable for high rainfall zone

Nursery raising practices

Area of nursery required for 1 ha	0.10 ha (1000m^2)		
Nursery raising method	**Wet nursery /Mat nursery/Raised bed method** etc.		
Bed size (length x breadth in m)	Length as per slope of the land (sloppy land less length, plane land more length) - Breadth- 1 m		
Seed sowing rate/m^2	45 to 50 g/m^2		
Pre-sowing seed/soil treatment	**Materials**	**Quantity/kg of seed or per m^2 area**	**Method of application**
	Trichoderma	5g/kg of seed	Seed treatment
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	**Materials**	**Quantity/m^2 area**	**Method of application**
	FYM	3 kg/m^2 area	Soil incorporation before nursery sowing

Irrigation practices	Rainfed		
Weed management	Mulching of *Glyricidia* green leaves and mannual hand weeding		
Organic plant protection practices	**Name of pest/disease**	**Recommended organic material used for control**	**Quantity/m^2 area**
	Different insect pests	Application of neem formulation	1500 ppm@5 ml/lit of water for two times
Optimum age of nursery (days)	22 to 26 days		

Field preparation:

Field is ploughed for solar heating in the month of May. Second ploughing and clod crushing is done before monsoon with wooden plough or tractor or power tiller drawn cultivator.Puddling is done by wooden plough or tractor or power tiller drawn puddler. Bullock drawn *Pankaj* puddler developed by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli should be used for better puddling.

The field should be mannured with FYM and Neem cake @ 5 and 0.5 tonnes/ha, respectively before puddling. Similarly, 4.5 tonnes/ ha of *Glyricidia* green leaf and 4.2 tonnes/ha of rice straw be incorporated into puddled field prior to transplanting.

Cultural practices

Pre-sowing/planting treatment of seed/seedlings	**Material**	**Recommended rate (kg/ha or lit./ha)**	**Method of application**
	Phosphate solubilizing bacteria (PSB) and*Azospirillum*	PSB 2.5 kg + *Azospirillum* 2.5 kg + 100 lit of water/ha	Seedling root dip for 20 to 30 minutes in the slurry
Spacing (Row x Plant) in cm	20x15cm		
Number of seedlings/hill (in nursery crop only)	3-4 seedlings/hill		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc.	**Source**	**Quantity/ha**	
	FYM	5000 kg /ha before puddling	
	Neem cake	500 kg /ha before puddling	
	Glyricidia Green leaves	4500 kg /ha soil incorporation before transplanting	
	Rice straw	4200 kg /ha soil incorporation before transplanting	
Top dressing of organic manures	**Source**	**Quantity/ha**	**Days after sowing/planting or stage of crop**

1.	Cow urine	50 lit/ha	Spraying at 30 and 60 days after transplanting
2.	Vermiwash	50 lit/ha	
Irrigation practices	Rainfed during *Kharif* and canal irrigation during *Rabi*		
Major weeds	*Echinochloa crusgalli* (Phakhad), *Echinochloa colonum* (Phakhad), *Cyperus iria* (Lavala), *Cyperus rotundus* (Lavala) and *Ischane globossa* (Dhur)		
Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**	
	20 Days after transplanting	Cono- weeder hoeing	
	30 Days after transplanting (Tillering)	Cono- weeder hoeing and manual hand weeding	
	60 Days after transplanting (Panicle initiation)	Manual hand weeding	

Organic plant protection practices	**Name of the pest/disease**	**Organic material recommended for control**
Insect pests	Stem borer	• Ploughing and collection of stubbles and their composting after harvesting of rice. • Use of tolerant and resistant varieties. • Crop rotation with ground nut, *Dolichos* bean, cucumber and red pumpkin. • Harvesting of rice close to the ground with *Vibhav* sickle developed by DBSKKV; Dapoli to kill the hibernating larvae. • Use of pheromone traps @20 Nos./ha • Release of *Trichogramma* @ 50000/ha for 4 times. • Collection of egg masses and their destruction. • Conservation and preservation of frogs in the field
	Case worm	• Timely transplanting • Intermittent draining out water from the field • Flooding the field followed by dragging a rope across the field and draining out the water from the field
	Brown Plant Hoppers (BPH), White Backed Plant Hoppers (WBPH) and Blue beetle	• Use of tolerant and resistant varieties. • Intermittent draining out water from the field • Judicious use of nitrogenous fertilizers. • Adoption of proper spacing (20x15cm) • Formation of alley ways for every three meters for penetration of sunlight and proper aeration
	Army worm	• Deep ploughing after harvesting of crop to expose the hibernating stages of pest.

		• Everyday inspection of the field during dry spell and at maturity. • Keeping the bunds clean and free of weed in the beginning of the season. • Digging the trench and flooding it with water for preventing migration of larvae from one field to another field. • Erection of bird perches. • Harvesting the crop immediately after it attains the maturity. • Conservation and preservation of frogs in the field.
	Leaf eating caterpillars	• Erection of bird perches.
Diseases	Blast and sheath rot	• Use of tolerant and resistant varieties. • Spraying of *Pseudomonas fluroscence* @ 8-10 g / lit of water [for 2-3 times] starting from maximum tillering to flowering stage.
	Bacterial leaf blight	• Use of tolerant and resistant varieties. • Intermittent draining out water from the field. • Judicious use of nitrogenous fertilizers. • Adoption of proper spacing (20x15cm)

Yield and economics: q/ha

Parameters	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	
Economic yield (kg/ha)	3148	2050	3940	2700	2780	3558	Grain	Straw
							3324	3921
Price (Rs/kg) consider 25% Premium on prevailing market price	Grain: Rs.16.88/kg Straw : Rs. 2.50/kg							
Cost of cultivation (Rs/ha)	82327							
Net Returns (Rs/ha)	-16440							

*based on prices of 2013-14

Crop (*Rabi*): *Dolichos* bean

Important features of suitable varieties: **Konkan Bhushan**

Parameters	Variety : *Konkan Bhushan*
Duration (days)	100 days
Average yield under organic condition (kg/ha)	5000-5200 green pods kg/ha
Source (s) of availability	RARS, Karjat

Suitable regions/districts in the state	Maharashtra state
Specific resistance/tolerance to disease	Resistant to yellow mosaic virus
Special character	Dwarf, Does not require support

Field preparation:

Plough the field after harvest of *Kharif* rice. Criss-cross cultivation and clod crushing with peg tooth cultivator to bring the soil into good tilth.

Cultural practices

Seed rate (kg/ha)	25kg/ha		
Pre-sowing/planting treatment of seed/seedlings	**Material**	**Recommended rate (kg/ha or lit./ha)**	**Method of application**
	Trichoderma	5g/kg of seed	Seed treatment
	Rhizobium strain	25g/ kg of seed	Seed treatment
	PSB	25g/ kg of seed	Seed treatment
Spacing (Row x Plant) in cm	45 x 15 cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc.	**Source**		**Quantity/ha**
	FYM		4000 kg/ha
	Neem cake		390 kg/ha
	Vermicompost		1330 kg/ha
Top dressing of organic manures	**Source**	**Quantity/ha**	**Days after sowing/planting or stage of crop**
1.	Cow urine	50 lit/ha	Spraying at 30 and 60 days after sowing
2.	Vermiwash	50 lit/ha	
Irrigation practices	**Number of irrigation**	**Most critical stage of irrigation**	**Depth of irrigation (cm)**
	9 irrigations	Branching, Flowering and Pod formation	54 cm (6 cm/irrigation)
Major weeds	*Physalis minima* (*Ranpopati*), *Portulaca oleracea* (*Motha ghol*), *Alternanthera sessilis* (*Reshimkata*), *Blumea lacera* (*Bhamrud*) and *Amaranthus viridis* (*Ranti math*)		
Weed management	**Critical stage of weeding**		**Recommended practice for organic condition**
	25-40 DAS		Dry land weeder, One hand weeding

Organic plant protection practices	**Name of the pest/disease**	**Organic material recommended for control**	**Quantity (kg or liters/ha)**
Insect pests	Aphids	• Application of	3ml/lit

		neemicide	
	Pod borer	• Application of neemicide	3ml/lit
Diseases	Powdery mildew	• Use of resistant and tolerant varieties.	
Optimum stage of harvesting	Picking for green pods from 60 to100 days after sowing		

Yield and economics:

Parameters	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
Economic yield (kg/ha)	5024	2998	3017	1904	4949	5627	4974
Price (Rs/kg) consider 25% Premium on prevailing market price	Rs. 37.50/kg						
Cost of cultivation (Rs/ha)	131093						
Net Returns (Rs/ha)	55432						

*based on prices of 2013-14

Rice-*Dolichos* bean cropping system economics :

Gross Returns (Rs/ha)	Cost of cultivation (Rs/ha)	Net returns (Rs/ha)	B:C ratio
252412	213420	38992	1.18

Cropping Systems: 3: Rice – Cucumber

Particulars	*Kharif*	*Rabi*
Crop	**Rice**	**Cucumber**
Fortnight of sowing/planting	**Nursery Sowing** -Second fortnight of June **Transplanting**- Second fortnight of July	**Sowing** – First fortnight of January
Fortnight of harvesting	Second fortnight of October	First fortnight of March to first fortnight of April
Varieties suitable for organic farming	Karjat-3, Karjat-4, Karjat-7 and Palghar-1	Hemangi and Sheetal

Crop (*Kharif*): Rice

Important features of suitable varieties

Parameters	Karjat-3	Karjat-4	Karjat-7	Palghar-1

Duration (days)	115-120	110-115	115-120	125-130
Average yield under organic condition (kg/ha)	3500 to 3700	3300 to 3500	3400 to 3600	3900 to 4100
Source (s) of availability	RARS, Karjat	RARS, Karjat	RARS, Karjat	RARS, Karjat
Suitable regions/districts in the state	Suitable for rainfed uplands as well as irrigated areas for *Kharif* and *Rabi* seasons in Maharashtra.	Suitable for rainfed uplands as well as irrigated areas for *Kharif* and *Rabi* seasons in *Konkan* region of Maharashtra.	Suitable for rainfed uplands and irrigated transplanted conditions in Maharashtra State.	*Konkan* region and Maharashtra state
Specific resistance/tolerance to pest	Tolerant to stem borer	Moderately resistant to leaf folder	Resistant to leaf folder, BPH,WBPH and moderately resistant to stem borer	Moderately resistant to stem borer
Specific resistance/tolerance to disease	Resistant to blast and moderately resistant to BLB and brown spots.		Moderately resistant to blast and BLB	Moderately resistant to blast
Specific tolerance to drought/water logging	Suitable for high rainfall zone	Suitable for high rainfall zone	Suitable for high rainfall zone	Suitable for high rainfall zone

Nursery raising practices

Area of nursery required for 1 ha	0.10 ha (1000m^2)		
Nursery raising method	**Wet nursery /Mat nursery/Raised bed method** etc.		
Bed size (length x breadth in m)	Length as per slope of the land (sloppy land less length, plane land more length) - Breadth- 1 m		
Seed sowing rate/m^2	45 to 50 g/m^2		
Pre-sowing seed/soil treatment	**Materials**	**Quantity/kg of seed or per m^2 area**	**Method of application**
	Trichoderma	5g/kg of seed	Seed treatment
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	**Materials**	**Quantity/m^2 area**	**Method of application**
	FYM	3 kg/m^2 area	Soil incorporation before nursery sowing
Irrigation practices	Rainfed		

Weed management	Mulching of *Glyricidia* green leaves and mannual hand weeding		
Organic plant protection practices	**Name of pest/disease**	**Recommended organic material used for control**	**Quantity/m^2 area**
	Different insect pests	Application of neem formulation	1500 ppm@5 ml/lit of water for two times
Optimum age of nursery (days)	22 to 26 days		

Field preparation:

Field is ploughed for solar heating in the month of May. Second ploughing and clod crushing is done before monsoon with wooden plough or tractor or power tiller drawn cultivator.Puddling is done by wooden plough or tractor or power tiller drawn puddler. Bullock drawn *Pankaj* puddler developed by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli should be used for better puddling. The field should be mannured with FYM and Neem cake @ 5 and 0.5 tonnes/ha, respectively before puddling. Similarly, 4.5 tonnes/ ha of *Glyricidia* green leaf and 4.2 tonnes/ha of rice straw be incorporated into puddled field prior to transplanting.

Cultural practices

Pre-sowing/planting treatment of seed/seedlings	**Material**	**Recommended rate (kg/ha or lit./ha)**	**Method of application**
	Phosphate solubilizing bacteria (PSB) and*Azospirillum*	PSB 2.5 kg + *Azospirillum* 2.5 kg + 100 lit of water/ha	Seedling root dip for 20 to 30 minutes in the slurry
Spacing (Row x Plant) in cm	20x15cm		
Number of seedlings/hill	3-4 seedlings/hill		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc.	**Source**	**Quantity/ha**	
	FYM	6670 kg /ha before puddling	
	Glyricidia Green leaves	1220 kg /ha before puddling	
	Rice straw	5470 kg /ha soil incorporation before transplanting	
Irrigation practices	Rainfed during *Kharif* and canal irrigation during *Rabi*		
Major weeds	*Echinochloa crusgalli* (Phakhad), *Echinochloa colonum* (Phakhad), *Cyperus iria* (Lavala), *Cyperus rotundus* (Lavala) and *Ischane globossa* (Dhur)		
Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**	
	20 Days after transplanting	Cono- weeder hoeing	
	30 Days after transplanting (Tillering)	Cono- weeder hoeing and manual hand weeding	

	60 Days after transplanting (Panicle initiation)	Manual hand weeding

Organic plant protection practices	**Name of the pest/disease**	**Organic material recommended for control**
Insect pests	Stem borer	• Ploughing and collection of stubbles and their composting after harvesting of rice. • Use of tolerant and resistant varieties. • Crop rotation with ground nut, *Dolichos* bean, cucumber and red pumpkin. • Harvesting of rice close to the ground with *Vibhav* sickle developed by DBSKKV; Dapoli to kill the hibernating larvae. • Use of pheromone traps @20 Nos./ha • Release of *Trichogramma* @ 50000/ha for 4 times. • Collection of egg masses and their destruction. • Conservation and preservation of frogs in the field
	Case worm	• Timely transplanting • Intermittent draining out water from the field • Flooding the field followed by dragging a rope across the field and draining out the water from the field
	Brown Plant Hoppers (BPH), White Backed Plant Hoppers (WBPH) and Blue beetle	• Use of tolerant and resistant varieties. • Intermittent draining out water from the field • Judicious use of nitrogenous fertilizers. • Adoption of proper spacing (20x15cm) • Formation of alley ways for every three meters for penetration of sunlight and proper aeration

	Army worm	• Deep ploughing after harvesting of crop to expose the hibernating stages of pest. • Everyday inspection of the field during dry spell and at maturity. • Keeping the bunds clean and free of weed in the beginning of the season. • Digging the trench and flooding it with water for preventing migration of larvae from one field to another field.

		• Erection of bird perches. • Harvesting the crop immediately after it attains the maturity. • Conservation and preservation of frogs in the field.
	Leaf eating caterpillars	• Erection of bird perches.
Diseases	Blast and sheath rot	• Use of tolerant and resistant varieties. • Spraying of *Pseudomonas fluroscence* @ 8-10 g / lit of water [for 2-3 times] starting from maximum tillering to flowering stage.
	Bacterial leaf blight	• Use of tolerant and resistant varieties. • Intermittent draining out water from the field. • Judicious use of nitrogenous fertilizers. • Adoption of proper spacing (20x15cm)

Yield and economics: q/ha

Parameters	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	
Economic yield (kg/ha)	2650	945	4175	3728	3565	Grain	Straw
						3414	4097
Price (Rs/kg) consider 25% Premium on prevailing market price	Grain : Rs.15.63/kg Straw : Rs. 2 / kg						
Cost of cultivation (Rs/ha)	42016						
Net Returns (Rs/ha)	19539						

*based on prices of 2013-14

Crop (*Rabi*): **Cucumber**
Important features of suitable varieties: **Hemangi and Sheetal**

	Variety	
Parameters	**Hemangi**	**Sheetal**
Duration (days)	100-110	95-105
Average yield under organic condition (kg/ha)	11500-12000	12000-12500
Source (s) of availability	Government/private agencies	DBSKKV, Dapoli
Suitable regions/districts in the state	Maharashtra state	Maharashtra state
Specific resistance/tolerance to disease	Tolerant to powdery mildew and downy mildew	

Field preparation:

Ploughing the field after harvest of *Kharif* rice. Criss-cross cultivation and clod crushing with peg tooth cultivator to bring the soil into good tilth.

Cultural practices

Seed rate (kg/ha)	2.75 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	**Material**	**Recommended rate (kg/ha or lit./ha)**	**Method of application**
	Trichoderma	5g/kg of seed	Seed treatment
	PSB	25g/ kg of seed	Seed treatment
Spacing (Row x Plant) in cm	1.5 x 0.9 m		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc.	**Source**		**Quantity/ha**
	FYM		9000 kg/ha
	Neem cake		870 kg/ha
	Vermicompost		3000 kg/ha
Irrigation practices	**Number of irrigation**	**Most critical stage of irrigation**	**Depth of irrigation (cm)**
	12 irrigations	12 irrigations at an interval of 7-8 days	72 cm (6 cm/irrigation)
Major weeds	*Physalis minima* (*Ranpopati*), *Portulaca oleracea* (*Motha ghol*), *Alternanthera sessilis* (*Reshimkata*), *Blumea lacera* (*Bhamrud*) and *Amaranthus viridis* (*Ranti math*)		
Weed management	**Critical stage of weeding**		**Recommended practice for organic condition**
	30-60 DAS		Hand weeding

Organic plant protection practices	**Name of the pest/disease**	**Organic material recommended for control**	**Quantity (kg or liters/ha)**
Insect pests	Red pumpkin beetle	• Application of neemicide.	3ml/lit
	Fruit fly	• Erection of *Rakshak pheromone* trap designed by Dr. BSKKV, Dapoli	4 Nos. /ha
Diseases	Powdery and Downey mildew	• Growing tolerant and resistant varieties. • Crop rotation.	
Optimum stage of harvesting (in case of vegetables and green cob)	• 60-100 DAS.		

Yield and economics: q/ha

Parameters	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Economic yield (kg/ha)	6044	8507	5509	5919	11357	12537
Price (Rs/kg) consider 25% Premium on prevailing market price	Rs.15/kg					
Cost of cultivation (Rs/ha)	86505					
Net Returns (Rs/ha)	101550					

*based on prices of 2013-14

Rice-Cucumber cropping system economics:

Gross Returns (Rs/ha)	Cost of cultivation (Rs/ha)	Net returns (Rs/ha)	B:C ratio
249610	128521	121089	1.94

Cropping Systems 4: Rice-Red pumpkin

Particulars	*Kharif*	*Rabi*
Crop	**Rice**	**Red pumpkin**
Fortnight of sowing/planting	**Nursery Sowing** -Second fortnight of June **Transplanting**- Second fortnight of July	**Sowing** – First fortnight of January
Fortnight of harvesting	Second fortnight of October	First fortnight of April
Varieties suitable for organic farming	Karjat-3, Karjat-4, Karjat-7 and Palghar-1	MPH-1

Crop (*Kharif*): Rice

Important features of suitable varieties

Parameters	**Karjat-3**	**Karjat-4**	**Karjat-7**	**Palghar-1**
Duration (days)	115-120	110-115	115-120	125-130
Average yield under organic condition (kg/ha)	3500 to 3700	3300 to 3500	3400 to 3600	3900 to 4100
Source (s) of availability	RARS, Karjat	RARS, Karjat	RARS, Karjat	RARS, Karjat
Suitable	Suitable for rainfed	Suitable for	Suitable for	*Konkan*region

regions/districts in the state	uplands as well as irrigated areas for *Kharif* and *Rabi* seasons in Maharashtra.	rainfed uplands as well as irrigated areas for *Kharif* and *Rabi* seasons in *Konkan* region of Maharashtra.	rainfed uplands and irrigated transplanted conditions in Maharashtra State.	and Maharashtra state
Specific resistance/tolerance to pest	Tolerant to stem borer	Moderately resistant to leaf folder	Resistant to leaf folder, BPH,WBPH and moderately resistant to stem borer	Moderately resistant to stem borer
Specific resistance/tolerance to disease	Resistant to blast and moderately resistant to BLB and brown spots.		Moderately resistant to blast and BLB	Moderately resistant to blast
Specific tolerance to drought/water logging	Suitable for high rainfall zone	Suitable for high rainfall zone	Suitable for high rainfall zone	Suitable for high rainfall zone

Nursery raising practices

Area of nursery required for 1 ha	0.10 ha (1000m^2)		
Nursery raising method	**Wet nursery /Mat nursery/Raised bed method** etc.		
Bed size (length x breadth in m)	Length as per slope of the land (sloppy land less length, plane land more length) - Breadth- 1 m		
Seed sowing rate/m^2	45 to 50 g/m^2		
Pre-sowing seed/soil treatment	**Materials**	**Quantity/kg of seed or per m^2 area**	**Method of application**
	Trichoderma	5g/kg of seed	Seed treatment
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	**Materials**	**Quantity/m^2 area**	**Method of application**
	FYM	3 kg/m^2 area	Soil incorporation before nursery sowing
Irrigation practices	Rainfed		
Weed management	Mulching of *Glyricidia* green leaves and mannual hand weeding		
Organic plant protection practices	**Name of pest/disease**	**Recommended organic material used for control**	**Quantity/m^2 area**

	Different insect pests	Application of neem formulation	1500 ppm@5 ml/lit of water for two times
Optimum age of nursery (days)	22 to 26 days		

Field preparation:

Field is ploughed for solar heating in the month of May. Second ploughing and clod crushing is done before monsoon with wooden plough or tractor or power tiller drawn cultivator.Puddling is done by wooden plough or tractor or power tiller drawn puddler. Bullock drawn *Pankaj* puddler developed by Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli should be used for better puddling.

The field should be mannured with FYM and Neem cake @ 5 and 0.5 tonnes/ha, respectively before puddling. Similarly, 4.5 tonnes/ ha of *Glyricidia* green leaf and 4.2 tonnes/ha of rice straw be incorporated into puddled field prior to transplanting.

Cultural practices

Pre-sowing/planting treatment of seed/seedlings	**Material**	**Recommended rate (kg/ha or lit./ha)**	**Method of application**
	Phosphate solubilizing bacteria (PSB) and*Azospirillum*	PSB 2.5 kg + *Azospirillum* 2.5 kg + 100 lit of water/ha	Seedling root dip for 20 to 30 minutes in the slurry
Spacing (Row x Plant) in cm	20x15cm		
Number of seedlings/hill	3-4 seedlings/hill		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc.	**Source**	**Quantity/ha**	
	FYM	6670 kg /ha before puddling	
	Glyricidia Green leaves	1220 kg /ha before puddling	
	Rice straw	5470 kg /ha soil incorporation before transplanting	
Irrigation practices	Rainfed during *Kharif* and canal irrigation during *Rabi*		
Major weeds	*Echinochloa crusgalli* (Phakhad), *Echinochloa colonum* (Phakhad), *Cyperus iria* (Lavala), *Cyperus rotundus* (Lavala) and *Ischane globossa* (Dhur)		
Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**	
	20 Days after transplanting	Cono- weeder hoeing	
	30 Days after transplanting (Tillering)	Cono- weeder hoeing and manual hand weeding	
	60 Days after transplanting (Panicle initiation)	Manual hand weeding	

Organic plant protection	**Name of the pest/disease**	**Organic material recommended for control**

practices		
Insect pests	Stem borer	• Ploughing and collection of stubbles and their composting after harvesting of rice. • Use of tolerant and resistant varieties. • Crop rotation with ground nut, *Dolichos* bean, cucumber and red pumpkin. • Harvesting of rice close to the ground with *Vibhav* sickle developed by DBSKKV; Dapoli to kill the hibernating larvae. • Use of pheromone traps @20 Nos./ha • Release of *Trichogramma* @ 50000/ha for 4 times. • Collection of egg masses and their destruction. • Conservation and preservation of frogs in the field
	Case worm	• Timely transplanting • Intermittent draining out water from the field • Flooding the field followed by dragging a rope across the field and draining out the water from the field
	Brown Plant Hoppers (BPH), White Backed Plant Hoppers (WBPH) and Blue beetle	• Use of tolerant and resistant varieties. • Intermittent draining out water from the field • Judicious use of nitrogenous fertilizers. • Adoption of proper spacing (20x15cm) • Formation of alley ways for every three meters for penetration of sunlight and proper aeration
	Army worm	• Deep ploughing after harvesting of crop to expose the hibernating stages of pest. • Everyday inspection of the field during dry spell and at maturity. • Keeping the bunds clean and free of weed in the beginning of the season. • Digging the trench and flooding it with water for preventing migration of larvae from one field to another field. • Erection of bird perches. • Harvesting the crop immediately after it attains the maturity. • Conservation and preservation of frogs in the field.
	Leaf eating caterpillars	• Erection of bird perches.
Diseases	Blast and sheath rot	• Use of tolerant and resistant varieties. • Spraying of *Pseudomonas fluroscence* @ 8-10 g / lit of water [for 2-3 times] starting from maximum tillering to flowering stage.
	Bacterial leaf blight	• Use of tolerant and resistant varieties. • Intermittent draining out water from the field. • Judicious use of nitrogenous fertilizers.

		• Adoption of proper spacing (20x15cm)

Yield and economics: q/ha

Parameters	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	
Economic yield (kg/ha)	3050	1260	4253	3676	3445	Grain	Straw
						3236	3850
Price (Rs/kg) consider 25% Premium on prevailing market price	Grain : Rs.15.63/kg Straw : Rs. 2 /kg						
Cost of cultivation (Rs/ha)	42016						
Net Returns (Rs/ha)	16263						

*based on prices of 2013-14

Crop (*Rabi*): Red pumpkin

Important features of suitable varieties: **MPH-1**

Parameters	**Variety :MPH-1**
Duration (days)	95-100
Average yield under organic condition (kg/ha)	12500-13000 kg/ha
Source (s) of availability	RARS,Karjat
Suitable regions/districts in the state	Maharashtra state
Specific resistance/tolerance to disease	Tolerant to powdery mildew and downy mildew

Field preparation:

Ploughing the field after harvest of *Kharif* rice. Criss-cross cultivation and clod crushing with peg tooth cultivator to bring the soil into good tilth.

Cultural practices

Seed rate (kg/ha)	6.5 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	**Material**	**Recommended rate (kg/ha or lit./ha)**	**Method of application**
	Trichoderma	5g/kg of seed	Seed treatment
	PSB	25g/ kg of seed	Seed treatment
Spacing (Row x Plant) in cm	1.5 x 0.9 m		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc.	**Source**		**Quantity/ha**
	FYM		6670 kg/ha
	Neem cake		650 kg/ha
	Vermicompost		2230 kg/ha
Irrigation practices	**Number of irrigation**	**Most critical stage of irrigation**	**Depth of irrigation (cm)**
	10 irrigations	10 irrigations at an interval of 10 days	60 cm (6 cm/irrigation)
Major weeds	*Physalis minima* (*Ranpopati*), *Portulaca oleracea*		

	(*Motha ghol*), *Alternanthera sessilis* (*Reshimkata*), *Blumea lacera* (*Bhamrud*) and *Amaranthus viridis* (*Ranti math*)	
Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**
	30-60 DAS	Hand weeding

Organic plant protection practices	**Name of the pest/disease**	**Organic material recommended for control**	**Quantity (kg or liters/ha)**
Insect pests	Red pumpkin beetle	• Spraying of neemicide	3ml/lit
	Fruit fly	• Erection of *Rakshak pheromone* trap designed by DR. B.S.K.K.V. Dapoli.	4 Nos. / ha
Diseases	Powdery mildew and downy mildew	• Follow crop rotation. • Maintain field sanitation.	
Optimum stage of harvesting	• 90 – 100 DAS		

Yield and economics:

Parameters	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Economic yield (kg/ha)	17421	3369	11024	8450	12561	12726
Price (Rs/kg) consider 25% Premium on prevailing market price	Rs. 12.50kg/ha					
Cost of cultivation (Rs/ha)	85170					
Net Returns (Rs/ha)	73905					

Rice-Red pumpkin cropping system economics:

Gross Returns (Rs/ha)	**Cost of cultivation (Rs/ha)**	**Net returns (Rs/ha)**	**B:C ratio**
217354	127186	90168	1.71

*based on prices of 2013-14

Meghalaya

Package of Practices for Organic Crop Production

Prepared by Anup Das, Ramkrushna G.I., Jayanta layek, Bidyapati Ngangom and Dauni Suting, ICAR Research complex for North East Hill Region

Suggested cropping systems (based on testing under NPOF)

1. Rice-Carrot (Raised beds in lowland)
2. Rice-Tomato (Raised beds in lowland)
3. Maize + soybean- French bean (Upland)

Cropping System 1: **Rice-Carrot**

Particulars	***Kharif***	**Summer**
Crop	Rice	Carrot
Fortnight of sowing/planting	July (transplanting)	January (sowing)
Fortnight of harvesting	November	Last week of April
Varieties suitable for organic farming	Shahsarang 1, Lampnah	New Kuroda

Crop *(kharif)*: Rice

Important features of suitable varieties

Parameters	**Variety**	
	Shahsarang 1	Lampnah
Duration (days)	140-145	140-150
Average yield under organic condition (kg/ha)	3600	3400
Source (s) of availability	ICAR-RC NEH, Umiam	ICAR-RC NEH, Umiam
Suitable regions/districts in the state	Ri-Bhoi district (800-1200 m above mean sea level)	Ri-Bhoi district (800-1200 m above mean sea level)
Specific resistance / tolerance to pest	Tolerant to stem borer	Tolerant to stem borer
Specific resistance / tolerance to disease	Tolerant to blast	Tolerant to blast
Specific tolerance to drought/waterlogging	Tolerant to Iron toxicity and blast	Tolerant to blast

Nursery raising practices of rice:

Area of nursery required for 1 ha	400 m^2
Nursery raising method	Raised bed method

Bed size (length X breadth in m)	10 m Length x 1.25 m breadth x 15 cm Height		
Seed sowing rate/m^2	50 g per m^2		
Pre-sowing seed/soil treatment	**Materials**	**Quantity/kg of seed or per m^2 area**	**Method of application**
	Trichoderma harzianum	20 ml in 500 ml of water per acre	Seed treatment
	Neem cake	40 g per m^2	Soil application
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	**Materials**	**Quantity/m^2 area**	**Method of application**
	Farmyard manure (FYM)	1.5 kg/ m^2	Soil mixing @ 2:1 ratio
Irrigation practices	If continuous dry spell occurs for 4-5 days, then irrigation is advocated with rose can		
Weed management	Two hand weeding at 8 and 15 Days after sowing (DAS)		
Organic plant protection practices	**Name of pest/ disease**	**Recommended organic material used for control**	**Quantity/m^2 area**
	Leaf Hopper	Neem oil	3 ml/lt
Optimum age of nursery (days)	20 days		

Field preparation: The land is prepared thoroughly and well levelled with peripheral bunding. Puddling is done 2-3 times to make it weed free and water retentive. All weed biomass and crop residues of previous crop are incorporated with the soil during ploughing.

A nutrient dose of 80:60:40 kg/ha of N, P_2O_5& K_2O is recommended. To supply these amount, about 15 t/ha of FYM is applied at around 15-20 days before transplanting. Also to obtained the required P nutrient dose, about 150 kg/ha of rock phosphate is applied in addition to the soil during transplanting. These nutrients are applied on N and P equivalent basis.

Cultural practices of rice

Seed rate (kg/ha) (Not applicable for nursery crops)	25-30 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	**Material**	**Recommended rate (kg/ha or lit/ha)**	**Method of application**
	Azospirillium	100 ml in 10 Litres of water	Root dip treatment (seedling roots are immersed in *Azospirillium* slurry for about 30 minutes before planting).
Spacing (row X plant) in cm	20 cm x 15 cm		
Number of seedlings/hill (in nursery crops only)	2 seedlings		

Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	**Source**		**Quantity/ha**
	FYM		15 t/ha
	Neem cake		100 kg/ha
	Rock phosphate		150 kg/ha
Top dressing of organic manures	**Source**	**Quantity**	**Days after sowing/planting or stage of crop**
	Vermiwash	100 ml per litre of water	40-45 DAT (Days after transplanting)
	Panchagavya	3 litres per 100 litres of water	Flowering stage
Irrigation practices	**Number of irrigations**	**Most critical stages for irrigation**	**Depth of irrigation (cm)**
	An optimal irrigation practice is followed by managing rainfall. Continuous submergence of 2-5 cm is maintained during transplanting to maturity. However, water is drained out during tillering stage to facilitate better tillering. Water is drained permanently during physiological maturity. If dry spell occurs continuously for 10-12 days, life saving irrigation is recommended.		
Major weeds	**Scientific name**		**Common name**
	Spilanthus Acmella		Toothache plant
	Alternanthera philoxeroides		Alligator weed
	Rotala indica		Indian toothcup
	Echinicloa crusgalli		Barnyard grass
	Cyperus rotundus		Nutgrass
	Ageratum houstonianum		Floss flower
	Polygonum hydropiper		Water pepper
	Cuphea hyssopifolia		False heather
Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**	
	30-45 DAT	Two hand weeding and one Cono-weeding is recommended to manage weeds. First hand weeding is done at 20 DAT and second at 55 DAT. One cono weeding with the use of cono weeder is carried out at 35 DAT	
Organic plant protection practices	**Name of pest/ disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	Common insect- pests and diseases of rice	Pestoneem	3 ml/lt
		Derisom	2 ml/lt
		Neem cake (Soil	100 kg/ha

		application)	
Optimum stage of harvesting	The crops should be harvested at appropriate time. Over maturing reduces market demand		

Yield and Economics of rice

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	3900	3660	3198	3165	3800	3760	4470
Price of rough rice (Rs/kg)	Rs. 20/kg						
Cost of cultivation* (Rs/ha)	Rs. 53460						
Net returns* (Rs/ha)	Rs. 35940						

*based on prices of 2013-14

Crop *(summer)*: Carrot

Important features of suitable variety of carrot (New Kuroda)

Parameters	New kuroda
Duration (days)	95-100
Average yield under organic condition (kg/ha)	13600
Source (s) of availability	ICAR-RC Umiam
Suitable regions/districts in the state	Ri-Bhoi, Mid altitude of Meghalaya (800-1200 m ASL)
Specific resistance / tolerance to pest	No major insect-pest found
Specific resistance / tolerance to disease	No major diseases found
Specific tolerance to drought/waterlogging	Susceptible to water logging condition

Field preparation: After the harvest of rice, the land is configured into temporary raised bed of 30 cm height, 3m width and 7 m length to facilitate drainage for the growing of carrot crop. The soil is prepared by one deep ploughing with spade followed by harrowing. At least 1/3rd rice residues is retained and incorporated into the soil during ploughing. Planking is done to make the soil clod free. As the seeds of carrot are very small, the field is to be prepared up to a fine tilth. After the sowing of seeds in line, a mixture of soil and FYM (2:1) is spread over the seeds for covering.

Cultural practices of carrot

Seed rate (kg/ha) (Not applicable for nursery crops)	5-6 kg/ha	
Spacing (Row X plant) in cm	30 cm x 3-4 cm	
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	**Source**	**Quantity/ha**
	Phosphate solubilizing bacteria (PSB)	1.5 kg/ha

Top dressing of organic manures	**Source**	**Quantity/ha**	**Days after sowing/planting or stage of crop**
	Vermiwash	50 l/ha	Vegetative and flowering stage
Irrigation practices	**Number of irrigations**	**Most critical stages for irrigation**	**Depth of irrigation (cm)**
	In Meghalaya, after harvesting of rice, there is enough moisture in valley land due to seepage from surrounding hillocks, carrot grow normally under residual soil moisture. However, if required, life saving irrigation is given during dry spell.		

Major weeds	**Scientific name**	**Common name**
	Commelina benghalensis	Day flower
	Galinsoga parviflora	Gallant soldier
	Oxalis corniculata	Sleeping beauty
	Chenopodium album	Lamb's quarters
	Drymaria cordata	Tropical chick weed

Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**
	30-35 DAS	One hand weeding and hoeing along with earthing up at about 30-35 DAS is carried out to suppress weed growth. Thinning is also being done at the time of weeding.

Organic plant protection practices	**Name of pest/disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	Carrot fly, Bacterial blight, Powdery mildew	Pestoneem	3 ml/lt
		Derisom	2ml/lt
Optimum stage of harvesting	The root attain marketable stage when their diameter of tuber is 2-4 cm at the upper end		

Yield and Economics of carrot

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	7780	14060	11950	11860	11970	14100	12750
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs. 20/kg						

Cost of cultivation* (Rs/ha)	Rs. 70765
Net returns* (Rs/ha)	Rs. 184235

*based on prices of 2013-14

Glimpses

Fig: Collection of FYM from pit

Fig: Application of rock phosphate before sowing of rice

Fig: Vermiwash drum

<u>Few suitable organic pesticides used in all three cropping system</u>

Fig: Vermiwash

Fig: Derisom

Fig: *Tricoderma harzanium*

Fig: Pestoneem

Cropping System 2: Rice-Tomato

Particulars	***Kharif***	**Summer**
Crop	Rice	Tomato
Fortnight of sowing/planting	July (planting)	February
Fortnight of harvesting	November	May
Varieties suitable for organic farming	Shahsarang 1, Lampnah	Rocky, Avinash-2

Crop *(kharif)*: Rice

Crop *(Summer)*: Tomato

Important features of suitable varieties

Parameters	Rocky	Avinash 2
Duration (days)	100-105	105-110
Average yield under organic condition (kg/ha)	20425	21309
Source (s) of availability	ICAR-RC Umiam	ICAR-RC Umiam
Suitable regions/districts in the state	Ri-Bhoi	Ri-Bhoi
Specific resistance /tolerance to pest	-	
Specific resistance /tolerance to disease	Tolerant to *Fusarium wilt*, Grey leaf spot and *Verticillium wilt*	

Nursery raising practices:

Area of nursery required for 1 ha	200 m^2		
Nursery raising method	Raised bed method		
Bed size (length X breadth in m)	10 m Length x 1 m breadth x 15 cm Height *Rows are made at 10 cm distance along the width of bed with the help of bamboo stick. Vermicompost is applied on prepared beds and seeds are sown in line followed by covering with vermicompost or sand. Nursery bed is covered with dry grass or paddy straw or polythene for 3-5 days to induce early germination of seeds. The covering is removed immediately as soon as sprouts come out.		
Seed sowing rate/m^2	5 g/m^2		
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	**Materials**	**Quantity/ m^2area**	**Method of application**
	Vermicompost	4 kg/ m^2	Mixing with soil
Irrigation practices	After sowing of seeds, the nursery beds are irrigated with water and thereafter, light irrigation with rose can is given everyday morning and evening.		

Weed management	Two hand weeding is needed to suppress weed growth		
Organic plant protection practices	**Name of pest/disease**	**Recommended organic material used for control**	**Quantity/ m^2 area**
	No pesticides applied in nursery		
Optimum age of nursery (days)	25-30 days		

Field preparation: The land is configured into temporary raised bed of 30 cm height, 2m width and 8 m length after the harvest of rice, to facilitate the growing of Tomato crop. A well pulverized soil is obtained by ploughing the raised beds 2 times followed by harrowing. 30 % of rice stubbles is retained and incorporated into the soil during ploughing.

Since the soil of this region is acidic in nature, lime application is recommended @ 500 kg/ha during the final bed preparation. FYM @ 20 t/ha (on N equivalent basis) is applied in pits of 50cm x 50cm spacing at the time of transplanting. To supplement the requirement of Phosphorus, Rock phosphate @ 200 kg/ha (on P equivalent basis) is applied in the pits during transplanting time. Neem cake @ 150 kg/ha is also applied in the pits before transplanting to check soil borne diseases

Cultural practices of tomato

Seed rate (kg/ha)	400 g/ha		
Pre-sowing/planting treatment of seed/seedlings	**Material**	**Recommended rate (kg/ha or lit/ha)**	**Method of application**
	Trichoderma harzianum	100 ml in 10 Litres of water	Root dip treatment (seedling roots are immersed in *Trichoderma* slurry for about 30 minutes before planting).
Spacing (Row X plant) in cm	50 cm x 50 cm		
Number of seedlings/hill (in nursery crops only)	1 seedling per hill		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	**Source**	**Quantity/ha**	
	FYM	20 t/ha	
	Rock phosphate	200 kg/ha	
	Neem cake	150 kg/ha	
Top dressing of organic manures	**Source**	**Quantity/ha**	**Days after sowing/planting or stage of crop**
	Panchagavya	3 litres per 100 litres of water	25-30 DAT

Irrigation practices	**Number of irrigations**	**Most critical stages for irrigation**		
	During dry year, 2-3 life irrigation is required.	Vegetative, Flowering and Fruit formation stage.		
Major weeds	**Scientific name**		**Common name**	
	Drymaria cordata		Tropical chick weed	
	Galinsoga parviflora		Gallant soldier	
	Oxalis corniculata		Sleeping beauty	
	Commelina benghalensis		Day flower	
Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**		
	Vegetative stage	Hand hoeing		
Organic plant protection practices	**Name of pest/ disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**	
	Leaf miner, Fruit borer, White fly	Lantana leaf extract (10%)	100 ml in 1 litre of water	
		Pestoneem	2.5 ml/lt	
	Nematodes and Late blight	Derisom	2 ml/lt	
Optimum stage of harvesting	Pink to light red colour fruits			

Yield and Economics of tomato

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	29800	25000	24500	26200	19300	21300	20600
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs. 15/kg						
Cost of cultivation*(Rs/ha)	Rs. 112040						
Net returns* (Rs/ha)	Rs. 196950						

*based on prices of 2013-14

Glimpses

Fig: Mixing of FYM and soil for nursery bed preparation (2:1)

Fig: Preparing tomato pits for transplanting

Fig: Applying rock phosphate in tomato pit

Fig: Tomato grown under organic in raised beds

Fig: Fruiting of tomato

Fig: Harvested tomato from organic plot

Cropping System 3: **Maize+soyabean-Frenchbean**

Particulars	***Kharif***	**Summer**
Crop	French bean	Maize+soyabean
Fortnight of sowing /planting	August	April-May
Fortnight of harvesting	November	July-August
Varieties suitable for organic farming	Naga local, RCM-FB-18	Maize-DA-61-A, RCM-1-3 Soyabean- JS-80-21

Crop *(kharif)*: Maize+soybean (2:2 ratio)

Important features of suitable varieties

Parameters	Maize Varieties		Soyabean
	DA-61-A	RCM-1-1	JS-80-21
Duration (days)	110-115	110-120	145-150
Average yield under organic condition (kg/ha)	4200-4500	4000-4300	4800-5100
Source (s) of availability	ICAR-RC NEH, Umiam	ICAR-RC NEH, Umiam	ICAR-RC NEH, Umiam
Suitable regions/districts in the state	Ri-Bhoi district, Dimapur (Nagaland), Garo Hills district	Ri-Bhoi district, Dimapur (Nagaland), Garo Hills district	Ri-Bhoi district, Dimapur (Nagaland), Garo Hills district
Specific resistance/tolerance to pest	Tolerant to Stem borer		

Field preparation: Land is ploughed 2 times at a depth of 20-25 cm followed by 2 harrowing to obtain fine tilth. A properly levelled and uniformly graded field is required for good water management. Good drainage should be provided in maize field, because stagnation of water in the field is harmful to the crop. Lime @ 500kg/ha is mixed with the soil at final land preparation to improve soil health. It is to be noted that liming is carried out only once in 3 years.

Maize is intercropped with soyabean at 2:2 ratio (soyabean-maize-maize-soyabean-soyabean-maize i.e. 30-50-50-30-30-50 cm). To obtain the mentioned ratio, two lines of maize are grown at a distance of 50 cm apart alternated by two lines of soyabean at a distance of 30 cm apart. The Farmyard manure (FYM) @ 15 t/ha (on N equivalent basis), Rock phosphate @ of 150 kg/ha (on P_2O_5 equivalent basis) and neem cake @ 100 kg/ha are applied in the opened furrows and mixed well with the soil at the time of sowing. Seeds are placed in these furrow lines, at a distance of 25 cm for maize and 10 cm for soyabean and covered with soil.

When the soyabean crop reaches 40-45 days, leaving about 30 cm standing stalks upper portion of the soyabean plant is detopped and placed besides the maize plant for better plant nutrition. The soyabean biomass is then used for green manuring. Earthing up of maize is done after the detopping of soyabean for proper crop stand of maize and also for better incorporation of soyabean biomass into the soil.

Cultural practices of Maize

Seed rate (kg/ha) (Not applicable for nursery crops)	20-25 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	**Material**	**Recommended rate (kg/ha or lit/ha)**	**Method of application**
	Trichoderma viride	5 g/kg of seed	Seed treatment
Spacing (row X plant) in cm	50 cm x 25 cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	**Source**	**Quantity/ha**	
	FYM	15 t/ha	
	Neem cake	150 kg/ha	
	Rock phosphate	200 kg/ha	

Top dressing of organic manures	**Source**	**Quantity**	**Days after sowing/planting or stage of crop**
	Vermiwash	100 ml per litre of water	30 DAS
	Panchagavya	3 litres per 100 litres of water	Tasseling (60-65 DAS)
Irrigation practices	**Number of irrigations**		**Most critical stages for irrigation**
	Maize is grown under rainfed condition in Meghalaya. However, if prolong dry spell for 15-20 days occurs, life saving irrigation may be given at critical stages of the crop.		Knee high stage and Tasseling stage
Major weeds	**Scientific name**		**Common name**
	Alternanthera philoxeroides		Alligator weed
	Drymaria cordata		Tropical chick weed
	Commelina benghalensis		Day flower
	Ageratum conyzoides		Goat weed
Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**	
	Knee high stage and Tasseling stage	Two hand weeding is recommended to manage weeds. First hand weeding is done at 25 DAS and second at 50 DAS.	
Organic plant protection practices	**Name of pest/disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	Stem borer Cob borer Cut worms Leaf blight Brown spot	Pestoneem	3 ml/lt
		Derisom	2.5 ml/lt
		Lantana leaf extract	10 %
Optimum stage of harvesting	The cob is harvested when the plant has become straw coloured (light brown) and the grain hard, some of the cobs will droop downwards.		

Yield and Economics of maize

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	4500	3900	3700	5800	5100	5600	5700
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs. 20/kg						

Cost of cultivation* (Rs /ha)	Rs. 62360
Net returns* (Rs/ha)	Rs. 51640

*based on prices of 2013-14

Crop *(summer)*: French bean

Important features of suitable varieties of French bean

Parameters	Naga local	RCM FB-18
Duration (days)	90-95	85-90
Average yield under organic condition (kg/ha)	18000	16800
Source (s) of availability	ICAR-RC Umiam	ICAR-RC Umiam
Suitable regions/districts in the state	Ri-Bhoi, Mid altitude of Meghalaya (800-1200 m ASL)	Ri-Bhoi, Mid altitude of Meghalaya (800-1200 m ASL)

Field preparation: After the harvest of maize, maize stubbles are cut at 1 m height for recycling of residues. Two furrow lines are made in between each row of maize for sowing of French bean seed. FYM, Rock phosphate, Neem cake @ 15 t/ha, 150 kg/ha and 100 kg/ha (on N and P_2O_5 equivalent basis) respectively are applied in the furrow lines and mixed with soil. Seeds are placed at a distance of 15 cm plant to plant and the seeds are covered with soil immediately after sowing.

Cultural practices of French bean

Seed rate (kg/ha)	25-30 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	**Material**	**Recommended rate (kg/ha or lit/ha)**	**Method of application**
	Trichoderma viride	5 g/kg of seed	Seed treatment
Spacing (Row X plant) in cm	25 cm x 15 cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	**Source**	**Quantity/ha**	
	FYM	15 t/ha	
	Neem cake	150 kg/ha	
	Rock phosphate	200 kg/ha	
Top dressing of organic manures	**Source**	**Quantity/ha**	**Days after sowing /planting or stage of crop**
	Panchagavya	25 litre/ha	20-25 DAS
Irrigation practices	**Number of irrigations**	**Most critical stages for irrigation**	**Depth of irrigation (cm)**
	The crop is grown under rainfed condition. However, one life saving irrigation is given during dry spell		

Major weeds	**Scientific name**		**Common name**
	Drymaria cordata		Tropical chick weed
	Commelina benghalensis		Day flower
	Galinsoga parviflora		Gallant soldier
	Oxalis corniculata		Sleeping beauty
	Chenopodium album		Lamb's quarters
Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**	
	30-35 DAS	One hand weeding and hoeing along with earthing up at about 30-35 DAS is carried out to suppress weed growth	
Organic plant protection practices	**Name of pest/disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	Anthracnose Rhizoctonia blight Blister beetle Mites	Pestoneem	2.5 ml/lt
		Derisom	2ml/lt
Optimum stage of harvesting	Tender pods become ready for harvest from 55-60 DAS		

Yield and Economics of French bean

Parameters	**1st***	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	13400	12900	22920	18530	22400	18000	19560
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs. 15/kg						
Cost of cultivation**(Rs/ha)	Rs. 72500						
Net returns** (Rs/ha)	Rs. 220900						

*based on prices of 2013-14

Glimpses



Fig: Opening furrow lines

Fig: Applying rock phosphate in open furrow

Fig: Placing of seed in furrow lines

Fig: Maize+soyabean (2:2 ratio)

Fig: Maize at physiological maturity stage

Fig: Maize cob ready for harvest

Fig: FYM

Fig: Vermicompost

Fig: Placing of FYM in furrow lines

Fig: French bean (Naga local)

Fig: French bean (RCM FB-18)

Fig: French bean pod ready for harvest

Details of Specific Practices/products used/recommended

Name of the input	Source and Preparation	Time, rate and purpose of application
Panchagavya	It is a cow excreta based indigenous nutrient solution. Panchagavya consists of nine	3% solution was found to be most effective compared to the higher and

	products viz. cow dung, cow urine, milk, curd, jaggery, ghee, banana, Tender coconut and water. When suitably mixed and used, these have miraculous effects. The preparation steps of panchagavya is as follows; 1. 7 kg. cow dung and 1 kg. cow ghee is mixed thoroughly both in morning and evening hours and is kept for 3 days. 2. After 3 days, 10 lt. cow urine and 10 lt. water is added, mixed and kept for 15 days with regular mixing both in morning and evening hours. 3. After 15 days the following ingredients are added and mixed • Cow milk - 3 liters • Cow curd - 2 liters • Tender coconut water - 3 liters • Jaggery - 3 kg • Well ripened banana – 12 nos. Panchagavya is ready after 30 days.	lower concentrations investigated. 3 litres of Panchagavya to every 100 litres of water is ideal for all crops.
Lantana leaf extract 10%	Leaves of *Lantana camara* were collected from the nearby area of the farm and 10% aqueous leaf extract is prepared firstly by grinding the leaves and then soaking 100g of grinded leaves in 200 ml. distilled water for 24 hours at a room temperature of 30^{o}C. The aqueous extract was obtained by filtering the mixture (leaf and water) through a Whatman No .42 filter paper and diluted with distilled water to prepare 10% concentration.	The extract is diluted with water @ 10% before spraying. This foliar spray act as insect-pest repellent. It can be sprayed 3-4 times during the crop duration according to pest infestation.
Derisom	It is a bio-pesticide based on botanical extract of *Derris indica*.	It is applied as foliar spray @ 0.2% or 2 ml/lt. of water. It can be sprayed 2-3 times during the crop duration according to pest infestation. Derisom has Karanjin as active principle and acts as antifeedant and also acts on central nervous system of the Mites and Insect pests. Derisom works as Acaricide (Miticide) and Insecticide.

Pestoneem	Neem biopesticide is made from cold pressed neem kernels and its active azadirachtin 1500ppm is used as a general insecticide, fungicide and for coating urea for slow release	It is a bio-based pest controller containing 0.5% Azadirachtin and other vital bio-energizers. Application of pestoneem increase resistance to infestation of pest and disease.

Punjab

Package of Practices for Organic Crop Production

Prepared byC S Aulakh, Sr Agronomist, Amandeep Kaur, Research FellowPunjab Agricultural University, Ludhiana

Suggested cropping systems (based on testing under NPOF)

1. Maize-Potato-Summer moong
2. Turmeric-Onion
3. Basmati rice-Wheat-Green manure
4. Maize-Durum wheat-Cowpea (Fodder)
5. Maize-Berseem-Bajra fodder cropping system
6. Maize-Berseem-Maize+cowpea fodder cropping system

Details of Cropping Systems

Cropping System 1: Maize-Potato-Summer moong

Particulars	*Kharif*	*Rabi*	Summer
Crop	Maize	Potato	Summer moong
Fortnight of sowing/planting	2nd fortnight of June	2nd fortnight of Oct	1st fortnight of April
Fortnight of harvesting	1st fortnight of Oct	1st fortnight of March	1st fortnight of June
Varieties suitable for organic farming	Prabhat	Kufri Chandramukhi	SML 668

Crop *(kharif)*: Maize

Important features of suitable varieties

Parameters	Prabhat
Duration (days)	95
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab

Field preparation: Four ploughing (Disc harrow/Cultivator) and planking

Cultural practices

Seed rate (kg/ha)	20		
Spacing (Row X plant) in cm	60 x 20		
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)

	5	Tasselling	7.5
Major weeds	*Commelina benghalensis, Trianthema portulacastrum& Brachiaria reptans*		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	15-30 DAS	Hand weeding	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Stem borer	Tricho cards	40 cards/acre at 10-15 DAS

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	6120	7000	5320	5810	7110	-	-
Price (Rs/kg) (consider 25 % premium on prevailing market price)	12.25						
Cost of cultivation*(Rs/ha)	37,255						
Net returns* (Rs/ha)	49,843						

*based on prices of 2013-14

Crop *(Rabi)*: Potato

Important features of suitable varieties

Parameters	Kufri Chandramukhi
Duration (days)	80-90
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab

Field preparation: Ploughing (Mould board/ disc plough) and planking

Cultural practices

Seed rate (kg/ha)	3750	
Spacing (Row X plant) in cm	60 x 20	
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha
	FYM (1% N)	12.5 t/ha
	VC (1.5% N)	4.25 t/ha

Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	7	Tuber formation	7.5
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	30-45 DAS	Hand weeding	

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5t**	**6th**	**7th**
Economic yield (kg/ha)	15600	14850	15280	20440	17200	-	-
Price (Rs/kg) (consider 25 % premium on prevailing market price)	6.86						
Cost of cultivation*(Rs/ha)	74,350						
Net returns* (Rs/ha)	43,642						

*based on prices of 2013-14

Crop *(summer)*: Summer moong

Important features of suitable varieties

Parameters	SML 668
Duration (days)	60
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab
Specific resistance / tolerance to pest	Thrips
Specific resistance / tolerance to disease	Moongbean yellow mosaic virus

Field preparation: Two ploughing and planking (Disc harrow/Cultivator)

Cultural practices

Seed rate (kg/ha)	37.5		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Rhizobium	0.5	Mixing with seed
Spacing (Row X plant) in cm	22.5 x 7		
Recommended NPK and micro nutrient dose for the crop	12.5 N, 40 P_2O_5		

(kg/ha)				
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	Source	Quantity/ha
	FYM (1% N)	1.25 t/ha	FYM (1% N)	0.75 t/ha
			VC (1.5% N)	0.25 t/ha

Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	4	Flowering	7.5

Weed management	Critical stage of weeding	Recommended practice for organic condition
	30-40 DAS	Hand weeding

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	900	1580	1330	1160	1240	-	-
Price (Rs/kg) (consider 25 % premium on prevailing market price)	42.50						
Cost of cultivation*(Rs/ha)	19,525						
Net returns* (Rs/ha)	33,175						

*based on prices of 2013-14

Cropping System 2: Turmeric-Onion

Particulars	*Kharif*	*Rabi*
Crop	Turmeric	Onion
Fortnight of sowing/planting	1st fortnight of May	2nd fortnight of Dec
Fortnight of harvesting	2nd fortnight of Dec	2nd fortnight of April
Varieties suitable for organic farming	Pb Haldi 1	Pb Naroa

Crop *(kharif)*: Turmeric

Important features of suitable varieties

Parameters	Pb Haldi 1
Duration (days)	215
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab

Field preparation: Two plouging (Disc harrow/cultivatior) and planking

Cultural practices

Seed rate (kg/ha)	2000			
Spacing (Row X plant) in cm	30 x 20			
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	Source	Quantity/ha
	FYM (1% N)	15 t/ha	FYM (1% N)	10 t/ha
			VC (1.5% N)	3.25 t/ha
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)	
	15	Rhizome formation	7.5	
Major weeds	*Eleusine indica, Trianthema portulacastrum, cyperus rotundus, Digitaria ciliaris (*Takri gha*)*			
Weed management	Critical stage of weeding	Recommended practice for organic condition		
	30-45 DAS	Apply 10 t/ha rice straw mulch and if needed give one hoeing at 3 months of sowing the crop or give 3 hand weedings at 1, 2 and 3 months of sowing the crop.		
Optimum stage of harvesting	Complete yellowing and drying of plant			

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	62850	19750	25260	28650	27910	-	-
Price (Rs/kg) (consider 25 % premium on prevailing market price)	12.50						
Cost of cultivation*(Rs/ha)	65,550						
Net returns* (Rs/ha)	2,83,325						

*based on prices of 2013-14

Crop *(Rabi)*: Onion

Important features of suitable varieties

Parameters	Pb Naroa
Duration (days)	145

Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab
Specific resistance / tolerance to pest	Thrips, Heliothis
Specific resistance / tolerance to disease	Purple Blotch

Nursery raising practices

Area of nursery required for 1 ha	62.5 m^2		
Nursery raising method	raised bed method		
Bed size (length X breadth in m)	2.5m x 1m		
Seed sowing rate/m^2	1 g		
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	FYM (1% N)	5 kg	Broadcast
Weed management	Hand weeding		
Optimum age of nursery (days)	30 DAS		

Field preparation: One ploughing followed by planking

Cultural practices

Seed rate (kg/ha)	10			
Spacing (Row X plant) in cm	15 x 7.5			
Number of seedlings/hill (in nursery crops only)	1-2			
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	Source	Quantity/ha
	FYM (1% N)	10 t/ha	FYM (1% N)	6.75 t/ha
			VC (1.5% N)	2.25 t/ha
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)	
	12	Bulb formation	7.5	
Major weeds	*Phalaris minor, Medicago denticulate,Anagalis arvensis,Lepidium sativa*			
Weed management	Critical stage of weeding	Recommended practice for organic condition		
	30-45 DAT	Hand weeding		
Optimum stage of harvesting	Tops dry up and fall			

Yield and Economics

Parameters	**1st* year**	**2nd**	**3rd**	**4th**	**5th**

Economic yield (kg/ha)	13750	12650	16930	18050	14890
Price (Rs/kg) (consider 25 % premium on prevailing market price)	8.40				
Cost of cultivation*(Rs/ha)	69,385				
Net returns* (Rs/ha)	55,241				

*based on prices of 2013-14

Cropping System 3: Basmati rice-Wheat-Green manure

Particulars	*Kharif*	*Rabi*	Summer
Crop	Basmati Rice	Wheat	Sunhemp Green Manure
Fortnight of sowing/planting	1st fortnight of July	2nd fortnight of Nov	1st fortnight of May
Fortnight of harvesting	1st fortnight of Nov	2nd fortnight of April	2nd fortnight of July
Varieties suitable for organic farming	Punjab Basmati 2	PBW 621	PAU 1691

Crop *(kharif)*: Basmati rice

Important features of suitable varieties

Parameters	Punjab Basmati 2
Duration (days)	140
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab

Nursery raising practices

Area of nursery required for 1 ha	500 m^2		
Nursery raising method	Flat bed sowing		
Bed size (length X breadth in m)	10 m x 2 m plot size		
Seed sowing rate/m^2	40 g		
Pre-sowing seed/soil treatment	Materials	Quantity/kg of seed or per m^2area	Method of application
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	FYM (1% N)	12 kg	Broadcasting
Organic plant protection practices	Name of pest/disease	Recommended organic material used for control	Quantity/ m^2area
	Stem borer	Tricho cards	40 cards/acre

			at 5-6 times
Optimum age of nursery (days)	35-40		

Field preparation: Two ploughing (Disc harrow/Cultivator) and planking

Cultural practices

Seed rate (kg/ha)	20		
Spacing (Row X plant) in cm	20 x 15 cm		
Number of seedlings/hill (in nursery crops only)	1-2		
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	5	Panicle initiation	7.5
Major weeds	*Cyperus spp, Eleusine indica, Caesulia axillaris, Echinochloa crusgalli, Ischaemum rugosum, Sphenoclea zeylanica*		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	30-40 DAT	Hand weeding	

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**
Economic yield (kg/ha)	2990	3120	2420
Price (Rs/kg) (consider 25 % premium on prevailing market price)	15.63		
Cost of cultivation*(Rs/ha)	17,718		
Net returns* (Rs/ha)	20107		

*based on prices of 2013-14

Crop *(Rabi)*: Wheat

Important features of suitable varieties

Parameters	PBW 621
Duration (days)	158
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab
Specific resistance / tolerance to disease	Brown rust, Yellow rust

Field preparation: Three ploughing fallowed by planking

Cultural practices

Seed rate (kg/ha)	100			
Spacing (Row X plant) in cm	20 cm row spacing			
Basal application of organic	Source	Quantity/ha	Source	Quantity/ha

manures including soil application of bio-fertilizers, bio-control agents etc	FYM (1% N)	30 t/ha	FYM (1% N)	4.25 t/ha
			VC (1.5% N)	2.75 t/ha
			NEC(2.5% N)	1.65 t/ha

Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	5	CRI	7.5
Major weeds	*Chenopodium album, Phalaris minor, Convolvulus arvensis, Rumex dentatus, Malva neglecta*		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	30-45 DAS	Hand weeding	

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**
Economic yield (kg/ha)	3350	4440	4940
Price (Rs/kg) (consider 25 % premium on prevailing market price)	10.63		
Cost of cultivation*(Rs/ha)	12,658		
Net returns* (Rs/ha)	39,854		

*based on prices of 2013-14

Crop *(Summer)*: Sunhemp (Green manure)

Important features of suitable varieties

Parameters	PAU 1691
Duration (days)	45-60
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab

Field preparation: Ploughing and planking

Cultural practices

Seed rate (kg/ha)	50		
Spacing (Row X plant) in cm	22.5 cm row spacing		
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	3	-	7.5

Cropping System 4: Maize-Durum wheat-Cowpea (Fodder)

Particulars	*Kharif*	*Rabi*	Summer
Crop	Maize	Durum wheat	Cowpea
Fortnight of sowing/planting	2nd fortnight of June	2nd fortnight of Oct	2nd fortnight of April
Fortnight of harvesting	1st fortnight of Oct	1st fortnight of April	1st fortnight of June
Varieties suitable for organic farming	Prabhat	PDW 291	Cowpea 88

Crop *(kharif)*: Maize

Important features of suitable varieties

Parameters	Prabhat
Duration (days)	95
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab
Specific tolerance to drought/waterlogging	Lodging resistance

Field preparation: Four ploughing (Disc harrow/cultivator) and planking

Cultural practices

Seed rate (kg/ha)	20		
Spacing (Row X plant) in cm	60 x 20		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM(1% N)	4.25 t/ha	
	VC(1.5% N)	2.75t/ha	
	NEC(2.5% N)	1.65 t/ha	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	5	Tasselling	7.5
Major weeds	*Commelina benghalensis, Trianthema portulacastrum& Brachiaria reptans*		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20-40 DAS	Hand weeding	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Stem borer	Tricho cards	40 cards/acre at 10-15 DAS

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**
Economic yield (kg/ha)	5190	4540	4200

Price (Rs/kg) (consider 25 % premium on prevailing market price)	6.75
Cost of cultivation*(Rs/ha)	17,723
Net returns* (Rs/ha)	10,627

*based on prices of 2013-14

Crop *(Rabi)*: Durum wheat

Important features of suitable varieties

Parameters	PDW 291
Duration (days)	155
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab
Specific resistance / tolerance to disease	Yellow rust, Brown rust, Karnal Bunt & Loose smut

Field preparation: Two ploughings followed by planking

Cultural practices

Seed rate (kg/ha)	100		
Spacing (Row X plant) in cm	20 cm row spacing		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM(1% N)	4.25 t/ha	
	VC(1.5% N)	2.75t/ha	
	NEC(2.5% N)	1.65 t/ha	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	5	CRI	7.5
Major weeds	*Chenopodium album, Phalaris minor, Convolvulus arvensis, Rumex dentatus, Malva neglecta*		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	30-45 DAS	Hand weeding	

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**
Economic yield (kg/ha)	3570	5420	4870
Price (Rs/kg) (consider 25 % premium on prevailing market price)	10.63		
Cost of cultivation*(Rs/ha)	21,623		
Net returns* (Rs/ha)	30,145		

*based on prices of 2013-14

Crop *(Summer)*: Cowpea fodder
Field preparation: One ploughing followed by planking
Cultural practices

Seed rate (kg/ha)	50		
Spacing (Row X plant) in cm	30 cm row spacing		
Recommended NPK and micro nutrient dose for the crop (kg/ha)	18.75 kg N, 55 Kg P_2O_5		
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	4	-	7.5
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	30-40 DAS	Hand weeding	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**
Economic yield (kg/ha) (Green fodder)	24360	37270	31750
Price (Rs/kg) (consider 25 % premium on prevailing market price)	0.50		
Cost of cultivation*(Rs/ha)	6,552		
Net returns* (Rs/ha)	9,323		

*based on prices of 2013-14

Cropping System 5: Maize-Berseem-Bajra fodder cropping system

Particulars	*Kharif*	*Rabi*	Summer
Crop	Maize	Berseem	Bajra
Fortnight of sowing/planting	1st fortnight of Aug	1st fortnight of Oct	1st fortnight of June
Fortnight of harvesting	2nd fortnight of Oct	1st fortnight of June	1st fortnight of July
Varieties suitable for organic farming	J 1006	BL 10	PCB 164

Crop *(kharif)*: Maize

Important features of suitable varieties

Parameters	J 1006

Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab
Specific resistance / tolerance to disease	Maydis leaf blight, Brown Stripe downy mildew

Field preparation: Two ploughing (Disc harrow/Cultivator) and planking

Cultural practices

Seed rate (kg/ha)	75	
Spacing (Row X plant) in cm	30 cm row spacing	
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha
	FYM (1% N)	8.75 t/ha
Irrigation practices	Number of irrigations	Depth of irrigation (cm)
	8	7.5
Major weeds	*Commelina benghalensis, Trianthema portulacastrum& Brachiaria reptans*	
Weed management	Critical stage of weeding	Recommended practice for organic condition
Optimum stage of harvesting	50-60 DAS	

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Economic yield (kg/ha) (Green fodder)	16700	9620	12040	14760	14610	13330	24520	38900
Price (Rs/kg) (consider 25 % premium on prevailing market price)	1.3							
Cost of cultivation*(Rs/ha)	23600							
Net returns* (Rs/ha)	26970							

*based on prices of 2013-14

Crop *(Rabi)*: Berseem

Important features of suitable varieties

Parameters	BL 10
Source (s) of	PAU

availability	
Suitable regions/districts in the state	Punjab

Field preparation: Three ploughing and Planking

Cultural practices

Seed rate (kg/ha)	20		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Rhizobium	0.5	Mixing with seed
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM (1%N)	2.5 t/ha	
Irrigation practices	Number of irrigations	Depth of irrigation (cm)	
	6	7.5	
Major weeds	*Poa annua, Trianthema potulacastrum*		

Yield and Economics

Parameters	**1st*year**	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Economic yield (kg/ha)	78000	57370	67970	62760	62750	76810	61850	61100
Price (Rs/kg) (consider 25 % premium on prevailing market price)	1.00							
Cost of cultivation*(Rs/ha)	24350							
Net returns* (Rs/ha)	36750							

*based on prices of 2013-14

Crop *(Summer)*: Bajra

Important features of suitable varieties

Parameters	PCB 164
Duration (days)	50-60
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab
Specific resistance / tolerance to disease	Downy mildew

Field preparation: 2-3 ploughing

Cultural practices

<table>
<tr><td>Seed rate (kg/ha)</td><td colspan="3">20</td></tr>
<tr><td>Spacing (Row X plant) in cm</td><td colspan="3">22 cm row spacing</td></tr>
<tr><td>Recommended NPK and micro nutrient dose for the crop (kg/ha)</td><td colspan="3">50 kg N</td></tr>
<tr><td rowspan="3">Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc</td><td>Source</td><td colspan="2">Quantity/ha</td></tr>
<tr><td>FYM (1% N)</td><td colspan="2">5 t/ha</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="2">Irrigation practices</td><td>Number of irrigations</td><td colspan="2">Depth of irrigation (cm)</td></tr>
<tr><td>8</td><td colspan="2">7.5</td></tr>
<tr><td>Major weeds</td><td colspan="3">Commelina benghalensis, Trianthema portulacastrum& Brachiaria reptans</td></tr>
<tr><td>Optimum stage of harvesting</td><td colspan="3">40-55 DAS</td></tr>
</table>

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Economic yield (kg/ha) (Green fodder)	46500	75140	53470	31990	34130	26810	24270	34600
Price (Rs/kg) (consider 25 % premium on prevailing market price)	1.25							
Cost of cultivation*(Rs/ha)	13310							
Net returns* (Rs/ha)	29940							

*based on prices of 2013-14

Cropping System 6: Maize-Berseem-Maize+Cowpea fodder cropping system

Particulars	*Kharif*	*Rabi*	Summer
Crop	Maize	Berseem	Maize + cowpea
Fortnight of sowing/planting	1st fortnight of Aug	1st fortnight of Oct	1st fortnight of June
Fortnight of harvesting	2nd fortnight of Oct	1st fortnight of June	1st fortnight of July
Varieties suitable for organic farming	J 1006	BL 10	J 1006+cowpea 88

Crop *(kharif)*: Maize

Important features of suitable varieties

Parameters	J 1006
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab
Specific resistance / tolerance to disease	Maydis leaf blight, Brown Stripe downy mildew

Field preparation: Two ploughing (Disc harrow/Cultivator) and planking

Cultural practices

Seed rate (kg/ha)	75	
Spacing (Row X plant) in cm	30 cm row spacing	
Recommended NPK and micro nutrient dose for the crop (kg/ha)	87.5 kg N	
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha
	FYM (1% N)	8.75 t/ha
Irrigation practices	Number of irrigations	Depth of irrigation (cm)
	8	7.5
Major weeds	*Eleusine indica, Trianthema potulacastrum*	
Organic plant protection practices	Name of pest/disease	Quantity (kg or litres/ ha)
Optimum stage of harvesting	50-60 DAS	

Yield and Economics

Parameters	**1st year***	**2nd**	**3**	**4th**	**5th**	**6th**	**7th**	**8th**
Economic yield (kg/ha)	19400	8850	10410	16850	12880	12880	26250	38500
Price (Rs/kg) (consider 25 % premium on prevailing market price)	1.3							
Cost of cultivation*(Rs/ha)	23600							
Net returns* (Rs/ha)	26450							

*based on prices of 2013-14

Crop *(Rabi)*: Berseem

Important features of suitable varieties

Parameters	BL 10
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab

Cultural practices

Seed rate (kg/ha)	20	
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha
	FYM (1% N)	2.5 t/ha
Irrigation practices	Number of irrigations	Depth of irrigation (cm)
	6	7.5
Major weeds	*Poa annua*	

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Economic yield (kg/ha)	78800	56930	65490	71150	64500	79290	63490	61500
Price (Rs/kg) (consider 25 % premium on prevailing market price)	1.00							
Cost of cultivation*(Rs/ha)	24350							
Net returns* (Rs/ha)	37150							

*based on prices of 2013-14

Crop *(Summer)*: Maize + Cowpea

Important features of suitable varieties

Parameters	J1006, Cowpea 88
Source (s) of availability	PAU
Suitable regions/districts in the state	Punjab

Field preparation: Two ploughing and planking

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	37.5+37.5
Spacing (Row X plant) in cm	30 cm row spacing

Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha
	FYM (1% N)	8.75 t/ha
Irrigation practices	Number of irrigations	Depth of irrigation (cm)
	8	7.5
Major weeds	*Trianthema potulacastrum, Digitaria sanguinalis*	
Optimum stage of harvesting	50-60 DAS	

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**	**8th**
Economic yield (kg/ha)	43200	40610	33020	34740	29330	30000	29470	34600
Price (Rs/kg) (consider 25 % premium on prevailing market price)	1.3							
Cost of cultivation*(Rs/ha)	22287							
Net returns* (Rs/ha)	27633							

*based on prices of 2013-14

Tamil Nadu

Package of Practices for Organic Crop Production

Prepared by Dr. E. Somasundaram, Dr. S. Ramasamy and Dr. R. Parimala deviDepartment of Sustainable Organic Agriculture, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu.

Suggested cropping systems (based on testing under NPOF)

1. CS_1: Green manure-Cotton-Maize
2. CS_2: Green manure-Chillies-Sunflower
3. CS_3: Green manure-Beetroot-Maize

Details of Cropping Systems

Cropping System 1: Green manure-Cotton-Maize

Particulars	*Kharif*	*Rabi*	Summer
Crop	Cotton	Maize	Sunnhemp
Fortnight of sowing/planting	August 1st fortnight	February 1st fortnight	June 1st fortnight
Fortnight of harvesting	January 2nd fortnight	May 2nd fortnight	July 1st fortnight
Varieties suitable for organic farming	Suraj	CO(H)M6	Local

Crop *(kharif)*: Cotton

Important features of suitable varieties

Parameters	MCU 12	Suraj
Duration (days)	160	165
Average yield under organic condition (kg/ha)	2000 kg/ha	1799 kg/ha
Source (s) of availability	-	CICR, Coimbatore
Suitable regions/districts in the state	Coimbatore, Erode, Madurai, Dindigul, Theni, Dharmapuri, Salem, Namakkal, Erode	Coimbatore

Field preparation:

Prepare the field to get a fine tilth. Chiselling for soils with hard pan: Chisel the soils having hard pan formation at shallow depths with chisel plough at 0.5 metre interval, first in one direction and then in the direction perpendicular to the previous one, once in three years. Form ridges and furrows 10 m long with 60 cm spacing by using ridge plough or bund former.

Cultural practices

Seed rate (kg/ha)	7.5 kgs of delinted seeds		
Pre-sowing/planting treatment of seed/seedlings	*Material*	*Recommended rate (kg/ha or lit/ha)*	*Method of application*
	Azospirillum	600 g/ha	Seed treatment
	Phosphobacteria	600 g/ha	Seed treatment
	Pseudomonas	10 g/kg of seed	Seed treatment
	Trichoderma	4 g/kg of seed	Seed treatment
Spacing (Row x plant)	60 x 30 cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	*Source*	*Quantity/ha*	
	FYM	7.05 t/ha	
	Vermicompost	4.49 t/ha	
	Azospirillum	2kg/ha	
	Phosphobacteria	2kg/ha	
	Pseudomonas	2.5 kg/ha	
	Trichoderma	2.5 kg/ha	
Top dressing of organic manures	*Source*	*Quantity/ha*	*Days after sowing/planting or stage of crop*
	Vermicompost	1 t/ha	45 DAS
	Panchagavya	3% spray	30, 60 and 90 DAS
Irrigation practices	*Number of irrigations*	*Most critical stages for irrigation*	*Depth of irrigation (cm)*
	15-18 irrigations depending on the weather and soil type	Germination phase (1-15 days) Vegetative phase (16-44 days) Flowering phase (85-90 days)	
Major weeds	*Acalypha indica, Cyanodon dactylon, Cyperus rotundus, Digera arvensis,Chloris barbata, Trianthema portulacastrum, Parthenium hysterophorus*		
Weed management	*Critical stage of weeding*	*Recommended practice for organic condition*	
	Vegetative and flowering phase	Manual weeding Stubble mulching	
Organic plant protection practices	*Name of pest/disease*	*Organic material recommended for control*	*Quantity (kg or litres/ ha)*
	Fruit borer**:** *Helicoverpa armiger*a	Application of Nuclear Polyhedrosis Virus (NPV) in evening hours at 7th and 12th week after sowing • *Beauveria bassiana*	3 x 10^{12} POB /ha

		• Release of egg parasitoid, *Trichogramma* spp., •Egg-larval parasitoid, *Chelonus blackburnii* and Predator *Chrysoperla carnea* • ULV spray of NPV, for effective control of *Helicoverpa*	1.15% WP 400 g/ha 6.25 cc/ha at 15 days interval 3 times from 45 DAS 1,00,000/ha at 6^{th}, 13^{th} and 14^{th} week after sowing. 3 x 10^{12} POB /ha with 10% cotton seed kernel extract, with sticking agent
	Pink bollworm: *Pectin ophora gossypiella*	• Use pheromone trap to monitor the adult moth activity • Three weekly releases of egg parasitoid *Trichogramma* sp	@1,00,000/ha per release
	Cotton Stem Weevil: *Pemphere s* **(***Pempherulus)* *affinis* and Shoot weevil: *Alcidodes affaber*	Basal application of neem cake	250 kg/ha
	Tobacco Cutworm: *Spodoptera litura*	• Use of light trap • Growing castor along border and irrigation bunds • Removal and destruction of egg masses • Removal and destruction of early stage larvae • Hand picking and destruction of grown up caterpillars	
	Sucking pests	• Neem oil • Neem seed kernel extract • Fish oil rosin soap • Notchi leaf extract *Catharanthus rosea* extract	3% 5% 2.5 % 5% 5%
	Foliar diseases - Alternaria leaf spot: *Alternaria macrospora*	Neem oil *Bacillus subtilis*	3% 0.04% on 60, 90 and 120 days after sowing

	Wilt : *Fusarium oxysporum* f. sp. *vasinfectum*	• Seed treatment with *Trichoderma viride* formulation • Destroy the infected - plant debris. • Soil application of *Trichoderma viride*	4g/kg seed 2.5kg/ha
	Root Rot: *Rhizoctonia bataticola*	• Seed treatment with *T. viride* • Seed treatment with *Bacillus* • Soil application • Seed treatment with *Pseudomonas* • Soil application of *Pseudomonas*	@ 4 g/kg seed @ 10g/kg seed @ 2.5 kg/ ha at the time of sowing @10g/kg @ 2.5 kg/ha at the time of sowing
Optimum stage of harvesting	Boll bursting stage		

Yield and Economics

Parameters	**1st year***	**2nd year**	**3rd year**	**4th year**	**5th year**	**6th year**	**7th year**
Economic yield (kg/ha)	1323	1460	1175	1493	1515	1053	1165
Price (Rs/kg)	Actual price: 45 25 % premium price: 46.25						
Cost of cultivation*(Rs/ha)	40,110						
Net returns* (Rs/ha)	13,771						

Crop *(Rabi)* : Maize

Important features of suitable varieties

Parameters	**CO1**	**COH(M)6**
Duration (days)	10-110	110
Average yield under organic condition (kg/ha)	5200	7400 kg/ha
Source (s) of availability	TNAU	TNAU
Suitable regions/districts in the state	Coimbatore, Erode, Tirunelveli, Tanjore and Pudukottai	All maize growing areas

Specific resistance / tolerance to disease	Resistant to downy mildewOrange flint grains	Multiple disease resistance to Sorghum downy mildew, *Maydis* leaf blight, *Turcicum* leaf blight, Post flowering stock rot and Banded leaf and sheath blight

Field preparation:

Plough the field with disc plough once followed by cultivator ploughing twice, after spreading FYM or compost till a fine tilth is obtained. Form ridges and furrows providing sufficient irrigation channels. The ridges should be 6 m long and 60 cm apart using a bund former or ridge plough.

Cultural practices

Seed rate	20 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	*Material*	*Recommended rate (kg/ha or lit/ha)*	*Method of application*
	Azospirillum	600 g/ha	Seed treatment
	Phosphobacteria	600 g/ha	Seed treatment
Spacing (Row x plant) in cm	60 x 25 cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	11.88 t/ha	
	Vermicompost	7.57t/ha	
	Azospirillum	2kg/ha	
	Phosphobacteria	2kg/ha	
Top dressing of organic manures	*Source*	*Quantity/ha*	*Days after sowing/planting or stage of crop*
	Vermicompost	1 t/ha	30 DAS
Irrigation practices	*Number of irrigations*	*Most critical stages for irrigation*	*Depth of irrigation (cm)*
	9 to 11 irrigations based on the weather and soil type	Germination & establishment phase-1 to 14 days Vegetative phase - 15 to 39 days Flowering phase - 40 to 65 days Maturity phase - 66 to 95 days	-
Major weeds	*Acalypha indica,* Cyanodon dactylon, Cyperus rotundus, *Digera arvensis,Chloris barbata, Trianthema portulacastrum, Parthenium hysterophorus*		
Weed management	*Critical stage of weeding*	*Recommended practice for organic condition*	
	• Vegetative phase Flowering phase	• Manual weeding • Stubble mulching	
Organic plant protection	*Name of*	*Organic material*	*Quantity (kg or*

practices	*pest/disease*	*recommended for control*	*litres/ ha)*
	Stem borer: *Chilo partellus*	Release egg p[arasitoid *Trichogramma chilonis* are desirable. Third release is to be accompanied with larval parasitoid *Cotesia flavipes* @ 5000/ha	@ 2,50,000 /ha (three releases at weekly interval)
	Corn worm/Earworm: *H elicoverpa armigera*	• Set up of light traps • Set up sex pheromone traps • Two applications of NPV along with crude sugar 2.5 kg + cotton seed kernel powder 250 g on the ear heads	@ 12/ha @ 1.5 x 10^{12} POB at 10 days interval along with crude sugar 2.5 kg + cotton seed kernel powder 250 g on the ear heads
	Sucking pests	Neem oil Neem seed kernel extract Fish oil rosin soap	3%
	Foliar diseases	Neem oil	3%
Optimum stage of harvesting	Observe the following symptoms, taking into consideration the average duration of the crop. i. The sheath covering the cob will turn yellow and dry at maturity. ii. The seeds become fairly hard and dry. At this stage the crop is ready for harvest.		

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	3753	4123	4078	3757	4064	4144	5481
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Actual price: Rs.12.5 25 % premium on prevailing market price:Rs.15.62						
Cost of cultivation*(Rs/ha)	Rs.48,678						
Net returns* (Rs/ha)	Rs.36,963						

*based on prices of 2013-14

Crop *(Summer)*: Sunnhemp

Important features of suitable varieties

Parameters	Sunnhemp
Duration (days)	150 days
Average yield under organic condition (kg/ha)	Green biomass: 13-15 t/ha
Source (s) of availability	TNAU
Suitable regions/districts in the state	All districts of Tamil Nadu

Field preparation: Plough the soil to fine tilth, broadcast the seeds and form ridges and furrows 60 cm.

Cultural practices

Seed rate (kg/ha)	25-35 kg/ha for green manure		
Pre-sowing/planting treatment of seed/seedlings	*Material*	*Recommended rate (kg/ha or lit/ha)*	*Method of application*
	Rhizobium	1 kg/ha	Seed treatment
Spacing (Row X plant) in cm	Broadcasted by mixing with 25 kg sand		
Irrigation practices	Once in 30 days		
Major weeds	*Trianthema portulacastrum, Parthenium hysterophorus*		
Weed management	Hand hoeing and removal		
Organic plant protection practices	Neem oil: 3% spraying		
Optimum stage of harvesting	Incorporation during flowering stage or 45 DAS		

Yield and Economics: Incorporated as green biomass at 45 DAS

Cropping System 2: Green manure-Chillies-Sunflower

Particulars	*Kharif*	*Rabi*	Summer
Crop	Chillies	Sunflower	Sunnhemp
Fortnight of sowing/planting	August 1^{rst} fortnight	February 2ndfortnight	June 2nd fortnight
Fortnight of harvesting	February 1^{rst} fortnight	June 1^{rst} fortnight	July 2nd fortnight
Varieties suitable for organic farming	PKM1	COSFV5	Local

Crop *(kharif)*: Chillies

Important features of suitable varieties

Parameters	PKM1	K1
Duration (days)	180	210
Average yield under organic condition (kg/ha)	3.08 tonnes/ha –dry pod	1.8 tonnes/ha- dry pod

Source (s) of availability	TNAU	TNAU
Suitable regions/districts in the state	Rainfed and irrigated conditions	Southern Districts of Tamil Nadu, Coimbatore

Nursery raising practices:
Seed rate
Varieties: 1.0 kg / ha.
Nursery area: 100 sq.m / ha.

Nursery raising: Protray nursery

- Mix sterilized cocopeat @ 300 kg with 5 kg neem cake along with *Azospirillum* and phosphobacteria each @ 1 kg. Approximately 1.2 kg of cocopeat is required for filling one protay. 300 protrays (98 cells) are required for the production of 29,000 seedlings, which are required for one hectare adopting a spacing of 90 x 60 x 45 cm in a paired row system.
- Sow the seeds in protrays @ 1 seed per cell.
- Cover the seed with cocopeat and keep the trays one above the other and cover with a polythene sheet till germination starts.
- After 6 days place the protrays with germinated seedlings individually on the raised beds inside the shade net.
- Water with rosecan everyday upto seed germination.

Field preparation:

Thoroughly prepare the field and form ridges and furrows at a spacing of 60 cm. Irrigate the furrows and transplant 40-45 days old seedlings, with the ball of earth on the ridges.

Cultural practices

Pre-sowing/planting treatment of seed/seedlings	*Material*	*Recommended rate (kg/ha or lit/ha)*	*Method of application*
	Azospirillum	400 g/ha	Seedling root dip
	Phosphobacteria	400 g/ha	Seedling root dip
Spacing (Row x plant) in cm	60 x 45 cm		
Number of seedlings/hill	2		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	*Source*	*Quantity/ha*	
	FYM	7.50 t/ha	
	Vermicompost	3.09 t/ha	
	Azospirillum	2kg/ha	
	Phosphobacteria	2kg/ha	
	Pseudomonas	2.5 kg/ha	
	Trichoderma	2.5 kg/ha	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Vermicompost	1 t/ha	45 DAS

	Panchagavya	3% spray	30, 60, 90 and 120 DAS
Irrigation practices	*Number of irrigations*	*Most critical stages for irrigation*	*Depth of irrigation (cm)*
	18-24 irrigations depending on the weather and soil type	Irrigation is done at weekly intervals	-
Major weeds	*Acalypha indica*, Cyanodon dactylon, Cyperus rotundus, *Digera arvensis,Chloris barbata, Trianthema portulacastrum, Parthenium hysterophorus*		
Weed management	*Critical stage of weeding*	*Recommended practice for organic condition*	
	Vegetative and flowering phase	Hand weeding once in 30 days after planting.	
Organic plant protection practices	*Name of pest/disease*	*Organic material recommended for control*	*Quantity (kg or litres/ ha)*
	Fruit borer	• Set up pheromone traps for *Helicoverpa armigera or Spodoptera litura* • Collection and destruction of damaged fruits and grown up caterpillars. • Spray *Bacillus thuringiensis*	@ 12 Nos./ha. @ 2 g/lit
	Sucking pests	Neem oil Neem seed kernel extract	3% 5%

	Damping off and anthracnose	• Seed treatment with *Trichoderma viride* or *Pseudomonas fluorescens* • Soil application of *Pseudomonas fluorescens* • Neem oil	@ 4 g/kg @ 10 g/kg @ 2.5 kg/ha @ 3%
Optimum stage of harvesting	Fruit maturation stage		

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	3168	5345	3153	5526	5812	4483	6215
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Actual price: 18 25 % premium price: 22.50						
Cost of cultivation*(Rs/ha)	92,560						
Net returns* (Rs/ha)	47,278						

*based on prices of 2013-14

Crop *(Rabi)* : Sunflower

Important features of suitable varieties

Parameters	**TNAU Sunflower Hybrid CO 2**	**COSFV 5**
Duration (days)	90-95	85-90
Average yield under organic condition (kg/ha)	2250	1700
Source (s) of availability	TNAU	TNAU
Suitable regions/districts in the state	Coimbatore, Erode, Salem, Namakkal, Tirunelveli, Dindigul, Dharmapuri, Tiruchirapalli, Perambalur, Karur, Cuddalore, Villupuram, Virudhunagar, Sivagangai , Ramanathapuram, Madurai, Theni, Thoothukudi,	Coimbatore, Erode, Salem, Namakkal, Tirunelveli, Dindigul, Dharmapuri, Tiruchirapalli, Perambalur, Karur, Cuddalore, Villupuram, Virudhunagar, Sivagangai , Ramanathapuram, Madurai, Theni, Thoothukudi

Field preparation:

Plough once with tractor or twice with iron-plough or three to four times with country-plough till all the clods are broken and a fine tilth is obtained. Spread 12.5 t/ha of FYM or compost or composted coir pith evenly on the field before the last ploughing and incorporate in the soil by working with a country plough. Form ridges and furrows 6 m long. Use bund-former or ridge plough to economise and form irrigation channels across and ridges according to the topography of the field.

Cultural practices

<table>
<tr><td>Seed rate</td><td colspan="4">6 kg/ha</td></tr>
<tr><td rowspan="4">Pre-sowing/planting treatment of seed/seedlings</td><td>Material</td><td colspan="2">Recommended rate (kg/ha or lit/ha)</td><td>Method of application</td></tr>
<tr><td>Azospirillum</td><td colspan="2">600 g/ha</td><td>Seed treatment</td></tr>
<tr><td>Phosphobacteria</td><td colspan="2">600 g/ha</td><td>Seed treatment</td></tr>
<tr><td>Trichoderma</td><td colspan="2">4g/kg</td><td>Seed treatment</td></tr>
<tr><td>Spacing (Row x plant) in cm</td><td colspan="4">45 cm x 30cm</td></tr>
<tr><td rowspan="5">Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc</td><td colspan="2">Source</td><td colspan="2">Quantity/ha</td></tr>
<tr><td colspan="2">FYM</td><td colspan="2">5.30 t/ha</td></tr>
<tr><td colspan="2">Vermicompost</td><td colspan="2">3.37t/ha</td></tr>
<tr><td colspan="2">Azospirillum</td><td colspan="2">2kg/ha</td></tr>
<tr><td colspan="2">Phosphobacteria</td><td colspan="2">2kg/ha</td></tr>
<tr><td rowspan="3">Top dressing of organic manures</td><td>Source</td><td colspan="2">Quantity/ha</td><td>Days after sowing/planting or stage of crop</td></tr>
<tr><td>Vermicompost</td><td colspan="2">500 kg/ha</td><td>30 DAS</td></tr>
<tr><td>Panchagavya</td><td colspan="2">3%</td><td>30, 45 and 60 DAS</td></tr>
<tr><td rowspan="2">Irrigation practices</td><td>Number of irrigations</td><td colspan="2">Most critical stages for irrigation</td><td>Depth of irrigation (cm)</td></tr>
<tr><td>10-12 irrigation depending on</td><td colspan="2">Seeding, flowering and seed development stage</td><td>-</td></tr>
</table>

	the weather and soil type		
Major weeds	*Acalypha indica*, Cyanodon dactylon, Cyperus rotundus, *Digera arvensis,Chloris barbata, Trianthema portulacastrum, Parthenium hysterophorus*		
Weed management	*Critical stage of weeding*	*Recommended practice for organic condition*	
	Vegetative phase Flowering phase	Manual weeding Stubble mulching	
Organic plant protection practices	*Name of pest/disease*	*Organic material recommended for control*	*Quantity (kg or litres/ ha)*
	Capitulum borer (Head borer): *Helicoverpa armigera*	• Sow trap crops like marigold at 50 plants/acre • Use of pheromone traps for pest intensity identification as well as to trap the male moths • Setting of light traps to know the range of pest incidence as well as to kill moth population • Release predators like coccinellids, *Chrysoperla carnea* • Release parasitoides like *Trichogramma* spp, (*Bracon* spp., *Campoletis* spp) • Spraying of 5% Neem oil or 5% Neem Seed Kernal extract before egg laying	4 traps/acre 1 light trap/5 acre @1larva/ head @ 20,000/acre
	Bihar hairy caterpillar: *Spilosoma oblique*	• Deep summer ploughing • Use of well rotten manures • Collection and destruction of larvae	
	Tobacco caterpillar: *Spodoptera litura*	• Hand pick the *Helicoverpa* larvae and destroy • Install bird perches per hectare for predatory birds	
	Leaf hopper (jassids): *Amrasca biguttula biguttula*	• Neem oil • Neem seed kernel extract	3% 5%
	Foliar diseases	Neem oil	3%
	Charcoal Rot: *Macrophomina*	Soil application of *P. fluorescens* or *T. viride*	2.5 kg / ha + 50 Kg of

	phaseolina		well decomposed FYM or sand at 30 days after sowing
Optimum stage of harvesting	Observe the bracts on the backside of the capitula. When they turn lemon yellow, the heads harden and the crop is ready for harvest.		

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**	**4th**	**5th**	**6th**	**7th**
Economic yield (kg/ha)	1252	1227	1023	1349	1602	1304	1373
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Actual price: 25 25 % premium on prevailing market price: 31.25						
Cost of cultivation*(Rs/ha)	21,918						
Net returns* (Rs/ha)	20,988						

*based on prices of 2013-14

Crop *(summer)*: Sunhemp

Important features of suitable varieties

Parameters	**Sunnhemp**
Duration (days)	150 days
Average yield under organic condition (kg/ha)	Green biomass – 13-15 t/ha
Source (s) of availability	TNAU
Suitable regions/districts in the state	All districts of Tamil Nadu

Field preparation: Plough the soil to fine tilth, broadcast the seeds and form ridges and furrows 60 cm.

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	25-35 kg/ha for green manure		
Pre-sowing/planting treatment of seed/seedlings	*Material*	*Recommended rate (kg/ha or lit/ha)*	*Method of application*
	Rhizobium	1 kg/ha	Seed treatment
Spacing (Row x plant) in cm	Broadcasted		

Irrigation practices	Once in 30 days
Organic plant protection practices	Neem oil: 3% spraying
Optimum stage of harvesting	Incorporation during flowering stage or 45 DAS

Yield and Economics: Incorporated as green biomass at 45 DAS

Cropping System 3: Green manure-Beetroot-Maize

Particulars	***Kharif***	***Rabi***	**Summer**
Crop	Beetroot	Maize	Sunnhemp
Fortnight of sowing/planting	July 1st fortnight	Novemebr 1st fortnight	March 1rst fortnight
Fortnight of harvesting	September 2nd fortnight	February 2nd fortnight	April 2nd fortnight
Varieties suitable for organic farming	Ruby queen	CO(H)M6	Local

Crop *(kharif)*: Beetroot

Important features of suitable varieties

Parameters	**Ruby queen**
Duration (days)	60-75 days
Average yield under organic condition (kg/ha)	
Source (s) of availability	Private industry
Suitable regions/districts in the state	Widely adaptable (Preferably cool weather)

Field preparation:

Land is ploughed to a fine tilth by thorough ploughing making it loose and friable. Clods are to be removed completely. Apply well decomposed farmyard manure at the time of final ploughing.

Cultural practices

Seed rate (kg/ha)	6 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	*Material*	*Recommended rate (kg/ha or lit/ha)*	*Method of application*
Spacing (Row x plant) in cm	30 x 10 cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	*Source*	*Quantity/ha*	
	FYM	3.75 t/ha	
	Vermicompost	1.55 t/ha	
Top dressing of organic	Source	Quantity/ha	Days after

manures			sowing/planting or stage of crop
	Vermicompost	500 kg/ha	45 DAS
	Panchagavya	3% spray	30, 45 and 60 DAS
Irrigation practices	*Number of irrigations*	*Most critical stages for irrigation*	*Depth of irrigation (cm)*
	8 - 10 irrigations depending on the weather and soil type	Irrigation is done at weekly intervals	
Major weeds	*Acalypha indica*, Cyanodon dactylon, Cyperus rotundus, *Digera arvensis,Chloris barbata, Trianthema portulacastrum, Parthenium hysterophorus*		
Weed management	*Critical stage of weeding*	*Recommended practice for organic condition*	
	Early stage of crop growth	Hand weeding once in 30 days after sowing	
Organic plant protection practices	*Name of pest/disease*	*Organic material recommended for control*	*Quantity (kg or litres/ ha)*
	Leaf miners, web worms, semi loopers	Neem oil	3%
	Cercospora leaf spot	Neem oil	3%

Yield and Economics

Parameters	1st year*
Economic yield (kg/ha)	24.8 t/ha
Price (Rs/kg)	Actual price: Rs.10 25 % premium price: rs.12.5
Cost of cultivation*(Rs/ha)	Rs.86,015
Net returns* (Rs/ha)	Rs.2,23,985

*based on prices of 2013-14

Crop *(Rabi)* : Maize

Important features of suitable varieties

Parameters	COH(M)6
Duration (days)	110
Average yield under organic condition (kg/ha)	7400 kg/ha
Source (s) of availability	TNAU
Suitable regions/districts	All maize growing areas

in the state	
Specific resistance / tolerance to pest	Moderately resistant to stem borer
Specific resistance / tolerance to disease	Multiple disease resistance to Sorghum downy mildew, *Maydis* leaf blight, *Turcicum* leaf blight, Post flowering stock rot and Banded leaf and sheath blight

Field preparation:

Plough the field with disc plough once followed by cultivator ploughing twice, after spreading FYM or compost till a fine tilth is obtained. Form ridges and furrows providing sufficient irrigation channels. The ridges should be 6 m long and 60 cm apart using a bund former or ridge plough.

Cultural practices

Seed rate	20 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	*Material*	*Recommended rate (kg/ha or lit/ha)*	*Method of application*
	Azospirillum	600 g/ha	Seed treatment
	Phosphobacteria	600 g/ha	Seed treatment
Spacing (Row x plant) in cm	60 x 25 cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	11.88 t/ha	
	Vermicompost	7.57t/ha	
	Azospirillum	2kg/ha	
	Phosphobacteria	2kg/ha	
Top dressing of organic manures	*Source*	*Quantity/ha*	*Days after sowing/planting or stage of crop*
	Vermicompost	1 t/ha	30 DAS
Irrigation practices	*Number of irrigations*	*Most critical stages for irrigation*	*Depth of irrigation (cm)*
	9 to 11 irrigations based on the weather and soil type	Germination & establishment phase-1 to 14 days Vegetative phase - 15 to 39 days Flowering phase - 40 to 65 days Maturity phase - 66 to 95 days	
Major weeds	*Acalypha indica,* Cyanodon dactylon, Cyperus rotundus, *Digera arvensis,Chloris barbata, Trianthema portulacastrum, Parthenium hysterophorus*		
Weed management	*Critical stage of weeding*	*Recommended practice for organic*	

		condition	
	• Vegetative phase Flowering phase	• Manual weeding • Stubble mulching	
Organic plant protection practices	*Name of pest/disease*	*Organic material recommended for control*	*Quantity (kg or litres/ ha)*
	Stem borer: *Chilo partellus*	Release egg parasitoid *Trichogramma chilonis* are desirable. Third release is to be accompanied with larval parasitoid *Cotesia flavipes* @ 5000/ha	@ 2,50,000 /ha (three releases at weekly interval)
	Corn worm/Earworm: *H elicoverpa armigera*	• Set up of light traps • Set up sex pheromone traps • Two applications of NPV along with crude sugar 2.5 kg + cotton seed kernel powder 250 g on the ear heads	@ 12/ha @ 1.5 x 10^{12}POB at 10 days interval along with crude sugar 2.5 kg + cotton seed kernel powder 250 g on the ear heads
	Sucking pests	Neem oil Neem seed kernel extract Fish oil rosin soap	3%
	Foliar diseases	Neem oil	3%
Optimum stage of harvesting	Observe the following symptoms, taking into consideration the average duration of the crop. i. The sheath covering the cob will turn yellow and dry at maturity. ii. The seeds become fairly hard and dry. At this stage the crop is ready for harvest.		

Yield and Economics

Parameters	**1st year***
Economic yield (kg/ha)	4015
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Actual price:Rs. 12.5 25 % premium on prevailing market price: Rs.15.625
Cost of cultivation*(Rs/ha)	Rs.49,209
Net returns* (Rs/ha)	Rs.11,625

*based on prices of 2013-14

Crop *(summer)*: Sunnhemp

Important features of suitable varieties

Parameters	Sunnhemp
Duration (days)	150 days
Average yield under organic condition (kg/ha)	Green biomass – 13-15 t/ha
Source (s) of availability	TNAU
Suitable regions/districts in the state	All districts of Tamil Nadu

Field preparation: Plough the soil to fine tilth, broadcast the seeds and form ridges and furrows 60 cm.

Cultural practices

Seed rate (kg/ha)	30 kg/ha for green manure		
Pre-sowing/planting treatment of seed/seedlings	*Material*	*Recommended rate (kg/ha or lit/ha)*	*Method of application*
	Rhizobium	1 kg/ha	Seed treatment
Spacing (Row X plant) in cm	Broadcasted		
Irrigation practices	Once in 30 days		
Organic plant protection practices	Neem oil: 3% spraying		
Optimum stage of harvesting	Incorporation during flowering stage or 45 DAS		

Yield and Economics: Incorporated as green biomass on 45 DAS

Uttar Pradesh

Package of Practices for Organic Crop Production
Prepared by Dr. N. K. Jat, Dr. R. S. Yadav, Dr. Sudhir Kumar Dr. Chandra Bhanu, Dr. Prem Singh and N. RavisankarICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut (UP)- 250 110

Suggested cropping system (based on testing under NPOF)

1. Basmati rice – wheat - *Sesbania* green manure
2. Corse rice– barley + mustard – mungbean
3. Maize (grain) – potato– okra
4. Maize (green cobs) – mustard + radish - *Sesbania* green manure

Cropping System 1:

Particulars	*Kharif*	*Rabi*	Summer
Crop	Basmati rice	wheat	*Sesbania* green manure
Fortnight of sowing/planting	First fortnight of July	Second fortnight of November	Second fortnight of April
Fortnight of harvesting	First fortnight of November	First fortnight of April	Incorporation in soil after 45 DAS
Varieties suitable for organic farming	Basmati-370	PBW-343	

Crop *(kharif)*: Basmati rice

Important features of suitable varieties:

Parameters	Basmati-370	Pusa Basmati- 6	Pusa Basmati- 2
Duration (days)	145-150 days	150-155 days	120 days
Average yield under organic condition (kg/ha)	3142	4300	3700
Suitable regions/districts in the state	Haryana and western UP	Punjab, Haryana, western UP and Uttrakhand	Punjab, Haryana, Delhi, Western Uttar Pradesh and Uttaranchal system

Nursery raising practices

Area of nursery required for 1 ha	100 m^2
Nursery raising method	Wet nursery
Bed size (length X breadth in m)	Keep saturated for initial 5 days & then maintain 5 cm water
Seed sowing rate/m^2	250 g (25 kg/ha)

Pre-sowing seed/soil treatment	**Materials**	**Quantity/kg of seed or per m^2 area**	**Method of application**
	Pseudomonas fluorescence	10 g/kg seed	Seed treatment
	Trichodermaharzianum	4 g/kg seed	
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	**Materials**	**Quantity/ m^2area**	**Method of application**
	FYM	2 kg	Soil incorporation
	Vermicompost	1 kg	Top dressing at 15 DAS
Irrigation practices	Keep saturated the soil for initial 5 days and gradually increase water up to 5 cm		
Weed management	One hand weeding at 15 DAS		
Organic plant protection practices	**Name of pest/disease**	**Recommended organic material used for control**	**Quantity/ m^2area**
	Seed borne diseases	Solar seed treatment	For 2 hrs. during mid day after pre-soaking for 2 hrs.
	Soil borne diseases	Seed & seedling treatment with *Pseudomonas fluorescence* & *Trichoderma harzianum*	*Pseudomonas* @ 10 g/kg seed & *Trichoderma* @ 4 g/kg seed
Optimum age of nursery (days)	25 days		

Field preparation: Firstincorporation of green manure should be done by two cross harrowing at least 20 days before transplanting. After incorporation, a heavy irrigation should be done which helps in decomposition of debris of green manure. Around 15 days after green manure incorporation, sufficient water should be applied in the field for puddling. Before puddling, about 30 cm high earthen bunds should be made around the field. Pudddle the field around 3-4 runs of puddler in standing water. After one or two days of pudling, divide the field in to narrow beds of 1.25 meter width and of any convenient length and transplanting should be done in 3-5 cm standing water.

Cultural practices

Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Pseudomonas fluorescence	2.5 kg/ha	Seedling treatment
	Trichoderma harzianum	5 kg/ha	

Spacing (row X plant) in cm	20 x 10		
Number of seedlings/hill	2		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc.	Source	Quantity/ha	
	FYM	12 t/ha	
	Azotobactor	10 kg/ha	
	PSB	10 kg/ha	
	Trichoderma	5 kg/ha	
	Neem cake	200 kg/ha	
Top dressing of organic manures	**Source**	**Quantity/ha**	**Days after sowing/planting or stage of crop**
	Vermicompost	4.84 t/ha	30
	Panchagavvya	15 lit./ha	Spray twice at 45 and 60 days after transplanting
Irrigation practices	**Number of irrigations**	**Most critical stages for irrigation**	**Depth of irrigation (cm)**
	10	Panicle initiation, flowering	5 (intermittent submergence)

Major weeds	**Local name**	**English name**	**Scientific name**
	Grasses		
	Makra ghas	Crow foot grass	*Dactyloctenium aegyptium*
	Takri	Crabgrass	*Digitaria ciliaris*
	Sewai/Sawa	Barnyardgrass	*Echinochloa colona*
	Samak/Sawa	Common barnyard grass	*Echinochloa crusgalli*
	Jharnpriya kodu	Indian Goose grass	*Eleusine indica*
	Kangni	Yellow foxtail	*Setaria glauca*
	Broad leaf weeds		
	Kalmua/Kalmi saag/Karemu	Morningglories	*Ipomoea aquatica*
	Agni Booti	Blistering ammania	*Ammannia bassifera*
	Kankaua	Dayflower	*Commelina benghalensis*
	Sedges		
	Motha	Rice sedge	*Cyprus* spp.
	Jhirua	Grass like Fimbry	*Fimbristylis miliacea*
Weed management	**Critical stage of weeding**		**Recommended practice for organic condition**
	20 days after transplanting		Hand weeding
	60 days after transplanting		Hand weeding
			Continuous water stagnation

		till jointing stage	
Organic plant protection practices	**Name of pest/disease**	**Recommended organic material/practices used for control**	**Quantity/ m^2 area**
	Diseases		
	Seed borne diseases (Bacterial leaf blight, brown spot, blast, sheath blight)	Seed treatment with hot water	At 52^0C for 15-20 minutes
		Seed treatment with *Pseudomonas fluorescence* and/or *Trichoderma* spp. Before sowing (after hot water treatment)	10g/kg seed
		Seedling dip for 2 hrs with *Pseudomonas fluorescence* and/or *Trichoderma* spp. Before transplanting	10g/L water
	Soil borne diseases	Soil application of *Pseudomonas fluorescence* and /or *Trichoderma harzianum*	5 kg/ha
		Growing nursery in soil solarized seed beds	
	Bacterial leaf blight, sheath blight and blast	Foliar spray with *Pseudomonas fluorescence* and/or *Trichoderma* spp. At tillering, mid crop and panicle emergence stage.	10g/L water (1000 L suspension/ha)
	Blast	Early sowing	By end of June to first week of July
		Foliar spray of	10% (two sprays at 10

		cow urine extract	days interval after appearance of disease)
	Brown spot	Provide proper nutrition to crop	Apply recommended NPK through organic manure
	Sheath blight	Foliar spray with *Pseudomonas fluorescence* and/or *Trichoderma* spp. At tillering, mid crop and panicle emergence stage.	10g/L water (1000 L suspension/ha)
		Destruction of alternative weeds host from border and within the crops	
	Bacterial leaf blight	Removal of water from field for few days immediately after appearance of the symptoms	
	Root knot nematode	Soil application of *Trichoderma harzianum*	5 kg/ha
		Grow nursery in soil solarized seed beds	
	Insect pests		
	Borers/ leaf folders	Pruning of leaf tip in nursery before transplanting	
		Release of *Trichogramma* (Trichocards)- egg parasitoid in standing crop based on monitoring of pest population through light traps	50000 parasitized eggs/ha (5-6 releases)
	Leaf eating caterpillars/leaf folders	Foliar spray of Ginger-chilli-garlic extract	Crush 10 kg garlic, 5 kg ginger and 5 kg green chilli in 70 L water. Apply extract @60L/ha
	Foliar pests	Foliar spray of cow	Spray two days

		dung-cow urine- neem leaf extract	fermented extract of 2L cow urine, 1kg cow dung and 2kg crushed neem leaves in 1000L water.
	Gundhi bug	Foliar application of garlic + green chillies paste	The extract of 2.5 kg garlic + 2.5 kg green pungent chillies paste + 500 g neem leaves + 500g ginger/ha sprayed during milky stage of rice.

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**	**4th**
Economic yield (kg/ha)	2450	2818	3560	3740
Price (Rs/kg) (25 % premium on prevailing market price)	35.0			
Cost of cultivation (Rs/ha)	48420			
Net returns (Rs/ha)	82480			

*based on prices of 2013-14

Crop *(Rabi)*: Wheat
Important features of suitable varieties

Parameters	PBW-343	PBW 373	UP 2526
Duration (days)	130 days	130 days	135 days
Average yield under organic condition (kg/ha)	3547		
Source (s) of availability	NSC	NSC, PAU	NSC
Suitable regions/districts in the state	Punjab, Haryana, Delhi, western UP	Western Uttar Pradesh	Western Uttar Pradesh

Specific resistance / tolerance to disease	resistant to stripe rust, leaf rust, karnal bunt	resistant to stripe rust (yellow rust), leaf rust (brown rust), karnal bunt	Loose Smut, Karnal Bunt, Stripe Rust, Stem Rust, Leaf Rust

Field preparation: Due to short turn around period after basmati rice, the field should be immediately irrigated after rice harvest. After around 10 days when field comes in condition, the FYM should be applied and the field should be ploughed 2-3 times with disc or mouldboard plough. After ploughing, two cross tilling with tines should be done each followed by planking. To ensure good germination, sowing should be done after 1-2 days of completion of field preparation.

Cultural practices

Seed rate (kg/ha)	100		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Solar seed treatment	For 2 hrs.	For 2 hrs. During mid-day after pre-soaking in water for 2 hrs.
	Pseudomonas fluorescence	10 g/kg seed	Seed treatment
	Trichoderma harzianum	4 g/kg seed	Seed treatment
Spacing (Row X plant) in cm	20 x 5		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	12 t/ha	
	Azotobactor	10 kg/ha	
	PSB	10 kg/ha	
	Trichoderma	5 kg/ha	
	Neem cake	200 kg/ha	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Vermicompost	4.84 t/ha	30
	Panchagavvya	15 lit./ha	Spray twice at 45 and 60 DAS
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	6	Crown root initiation, jointing, milking	5
Major weeds (give local, english and scientific name)	**Local name**	**English name**	**Scientific name**
	Grasses		
	Jangali Jai	Wild oat	*Avena fatua*
	Gullidanda/	Littleseed canary	*Phalaris minor*

	Baluri	grass	
	Daub ghas	Bermudagrass	*Cynodon dactylon*
	-	Bluegrass	*Poa annua*
	Broad leaf weeds		
	Jangli Berseem	Wild colver	*Trifolium spp.*
	Lunia	Common purslane	*Portulaca oleracea*
	Kateli	Creeping thistle	*Circium arvense*
	Bathua	Lamb's-quarters	*Chenopodium album*
	Hirankhuri	Field Bindweed	*Convolvulus arvensis*
	Peeli Senji	Yellow sweet clover	*Melilotus indica*
	Krishna neel	Blue Pimpernel	*Anagallis arvensis*
	Gajri	Fineleaf fumitory	*Fumaria paviflora*
	Sedges		
	Motha	Nut Grass	*Cyprus rotundus*

Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**
	30 DAS	1. Hand weeding
	45 DAS	2. Hand weeding
		3. Stale seed bed
		4. Higher plant stand

Organic plant protection practices	**Name of pest/disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	Diseases		
	Leaf blight disease	Zero tillage reduces the survival of pathogen in soil	
		Sowing of healthy seeds and seed treatment with *Pseudomonas fluorescence* or *Trichoderma harzianum*	5kg/ha before sowing
		Hot water treatment of seeds	At 52^0C for 10 min.
		Soil application of *Pseudomonas fluorescence* or *Trichoderma harzianum*	5kg/ha before sowing
		Foliar spraying of *Pseudomonas fluorescence* or *Trichoderma harzianum*	5g/L at mid crop stage

	Loose smut	Solar heat treatment of seeds before storage	soaking of seeds in water for 4 hrs followed by 8 hrs drying in clear sunny days in the month of June
	Rusts	Grow resistant varieties	
		Foliar spraying of sour buttermilk	5 L buttermilk diluted in 200 L water (1000 L solution for 1ha)
	Karnal bunt	Grow resistant varieties	
		Avoid excessive irrigation during ear formation	
		Foliar spraying of mustard-milk extract	1Kg mustard flour mixed in 5L milk and 100L water/ha at the time of flowering
	Ear cockle or seed gall	Use healthy seeds	
		Mechanical or physical cleaning of seeds	Dip the seeds in 20% brine solution and remove floating seed galls
		Hot water seed treatment	At 54^0C for 10 Min.
	Insect-Pests		
	Aphids	Spray of neem oil or neem – seed – kernel - extract	At 3% or 5% concentration, respectively, if aphid population observed
	Termite	Soil application of *Beauveria bassiana*	5kg/ha before sowing
		Application of neem leaf manure (5q/ha) or neem seed manure (1q/ha)	Before sowing
		Apply only fully	

		decomposed organic manures in the field	
	Army worm	Foliar spray of neem leaf extract	5% (5kg neem leaf crushed in 100L boiled water and diluted to 100L)
	Rats	Flour baits mixed with cement powder	-

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**	**4th**
Economic yield (kg/ha)	2662	3125	4070	4330
Price (Rs/kg) (25 % premium on prevailing market price)	22.5			
Cost of cultivation (Rs/ha)	44670			
Net returns (Rs/ha)	52755			

*based on prices of 2013-14

Crop *(summer)*: *Sesbania*green manure

Field preparation: After wheat harvest, the field should be immediately irrigated. When field comes in condition field should be prepared by two cross harrowing followed by two planking to ensure proper levelling. Sowing of Dhaincha (*Sesbania*) is done by broadcasting the seeds in field followed by irrigation.

Cultural practices

Seed rate (kg/ha)	20		
Spacing (Row X plant) in cm	Sown by broadcasting		
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	3	At the interval of 15 days	5
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	Not required		
Optimum stage of harvesting (in case of vegetables and green cob)	Soil incorporation 45 days after sowing		

Yield and Economics

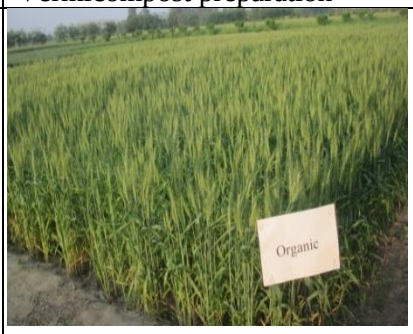
Parameters	**1st year***	**2nd**
Biomass production (kg/ha) on dry weight basis	52.4	51.1
Cost of cultivation (Rs/ha)	2600	

*based on prices of 2013-14

System economics

Parameters	2012-13		
	Basmati Rice	Wheat	*Sesbania* green manure
Economic yield (kg/ha)	3740	4330	
Cost of cultivation (Rs/ha)	48420	44670	2600
Total system cost of cultivation (Rs/ha)	95690		
Net returns (Rs/ha)	82480	52755	
System net returns (Rs/ha)	135235		

Glimpses

Kharif	***Rabi***	**Summer**
		
FYM preparation	Vermicompost preparation	Green manure incorporation
		
Organic Basmati rice	Organic wheat	*Sesbania* green manure

Cropping System 2: Coarse rice– barley + mustard – mungbean

Particulars	*Kharif*	*Rabi*		Summer
Crop	Coarse rice	Barley + mustard		Mungbean
Fortnight of sowing/planting	First fortnight of July	Second fortnight of November	Second fortnight of November	Second fortnight of April
Fortnight of harvesting	First fortnight of November	First fortnight of April	First fortnight of April	First fortnight of June

Varieties suitable for organic farming	Saket-4	Azad	Pusa bold	Pusa Vishal

Crop *(kharif)*: Coarse rice

Important features of suitable varieties:

Parameters	Saket-4
Duration (days)	110-120 days
Average yield under organic condition (kg/ha)	3926
Suitable regions/districts in the state	Uttar Pradesh, Bihar and Jammu & Kashmir
Specific resistance / tolerance to pest	moderately resistant to green leaf hopper and stem borer
Specific resistance / tolerance to disease	moderately resistant to Bacterial leaf blight
Specific tolerance to drought/waterlogging	resistant to lodging

Nursery raising practices:

Area of nursery required for 1 ha	100 m^2		
Nursery raising method	Wet nursery		
Bed size (length X breadth in m)	Keep saturated for initial 5 days & then maintain 5 cm water		
Seed sowing rate/m^2	250 g (25 kg/ha)		
Pre-sowing seed/soil treatment	**Materials**	**Quantity/kg of seed or per m^2 area**	**Method of application**
	Pseudomonas fluorescence	10 g/kg seed	Seed treatment
	Trichodermaharzianum	4 g/kg seed	
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	**Materials**	**Quantity/ m^2area**	**Method of application**
	FYM	2 kg	Soil incorporation
	Vermicompost	1 kg	Top dressing at 15 DAS
Irrigation practices	Keep saturated the soil for initial 5 days and gradually increase water up to 5 cm		
Weed management	One hand weeding at 15 DAS		
Organic plant protection practices	**Name of pest/disease**	**Recommended organic material used for control**	**Quantity/ m^2area**
	Seed borne diseases	Solar seed treatment	For 2 hrs. during mid- day after pre-soaking in water for 2 hrs.

	Soil borne diseases	Seed treatment with *Pseudomonas fluorescence* & *Trichoderma harzianum*	*Pseudomonas* @ 10 g/kg seed & *Trichoderma* @ 4 g/kg seed
Optimum age of nursery (days)	25 days		

Field preparation: Firstincorporation of green manure should be done by two cross harrowing at least 20 days before transplanting. After incorporation, a heavy irrigation should be done which helps in decomposition of debris of green manure. Around 15 days after green manure incorporation, sufficient water should be applied in the field for puddling. Before puddling, about 30 cm high earthen bunds should be made around the field. Pudddle the field around 3-4 runs of puddler in standing water. After one or two days of pudling, divide the field in to narrow beds of 1.25 meter width and of any convenient length and transplanting should be done in 3-5 cm standing water.

Cultural practices

Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Pseudomonas fluorescence	2.5 kg/ha	Seedling treatment
	Trichoderma harzianum	5 kg/ha	
Spacing (row X plant) in cm	20 x 10		
Number of seedlings/hill	2		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	12 t/ha	
	Azotobactor	10 kg/ha	
	PSB	10 kg/ha	
	Trichoderma	5 kg/ha	
	Neem cake	200 kg/ha	
Top dressing of organic manures	**Source**	**Quantity/ha**	**Days after sowing/planting or stage of crop**
	Vermicompost	4.84 t/ha	30
	Panchagavvya	15 lit./ha	Spray twice at 45 and 60 days after transplanting
Irrigation practices	**Number of irrigations**	**Most critical stages for irrigation**	**Depth of irrigation (cm)**
	10	Panicle initiation, flowering	5 (intermittent submergence)
Major weeds	**Local name**	**English name**	**Scientific name**
	Grasses		

	Makra ghas	Crow foot grass	*Dactyloctenium aegyptium*
	Takri	Crabgrass	*Digitaria ciliaris*
	Sewai/Sawa	Barnyardgrass	*Echinochloa colona*
	Samak/Sawa	Common barnyard grass	*Echinochloa crusgalli*
		Chinese sprangletop	*Leptochloa chinensis*
	Jharnpriya kodu	Indian Goose grass	*Eleusine indica*
	Kangni	Yellow foxtail	*Setaria glauca*
	Broad leaf weeds		
	Kalmua/Kalmi saag/Karemu	Morningglories	*Ipomoea aquatica*
	Agni Booti	Blistering ammania	*Ammannia bassifera*
	Kankaua	Dayflower	*Commelina benghalensis*
		Water primrose	*Ludwigia* spp.
	Sedges		
	Motha	Rice sedge	*Cyprus* spp.
	Jhirua	Grass like Fimbry	*Fimbristylis miliacea*

Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**
	20 days after transplanting	Hand weeding
	60 days after transplanting	Hand weeding
		Continuous water stagnation till jointing stage

Organic plant protection practices	**Name of pest/disease**	**Recommended organic material/practices used for control**	**Quantity/ m^2 area**
	Diseases		
	Seed borne diseases (Bacterial leaf blight, brown spot, blast, sheath blight)	Seed treatment with hot water	At 52^0C for 15-20 minutes
		Seed treatment with Before sowing (after hot water treatment)	*Pseudomonas fluorescence* 10 g/kg seed and *Trichoderma* spp. 10 g/kg seed
		Seedling dip for 2 hrs with *Pseudomonas fluorescence* and/or *Trichoderma* spp.	10g/L water

		Before transplanting	
	Soil borne diseases	Soil application of *Pseudomonas fluorescence* and /or *Trichoderma harzianum*	5 kg/ha
		Growing nursery in soil solarized seed beds	
	Bacterial leaf blight, sheath blight and blast	Foliar spray with *Pseudomonas fluorescence* and/or *Trichoderma* spp. At tillering, mid crop and panicle emergence stage.	10g/L water (1000 L suspension/ha)
	Blast	Early sowing	By end of June to first week of July
		Foliar spray of cow urine extract	10% (two sprays at 10 days interval after appearance of disease)
	Brown spot	Provide proper nutrition to crop	Apply recommended NPK through organic manure
	Sheath blight	Foliar spray with *Pseudomonas fluorescence* and/or *Trichoderma* spp. At tillering, mid crop and panicle emergence stage.	10g/L water (1000 L suspension/ha)
		Destruction of alternative weeds host from border and within the crops	
	Bacterial leaf blight	Removal of water from field for few days immediately after appearance of the symptoms	
	Root knot nematode	Soil application of *Trichoderma harzianum*	5 kg/ha
		Grow nursery in soil solarized seed beds	
	Insect pests		

	Borers/ leaf folders	Pruning of leaf tip in nursery before transplanting	
		Release of *Trichogramma* (Trichocards)- egg parasitoid in standing crop based on monitoring of pest population through light traps	50000 parasitized eggs/ha (5-6 releases)
	Leaf eating caterpillars/leaf folders	Foliar spray of Ginger-chilli-garlic extract	Crush 10 kg garlic, 5 kg ginger and 5 kg green chilli in 70 L water. Apply extract @60L/ha
	Foliar pests	Foliar spray of cow dung-cow urine- neem leaf extract	Spray two days fermented extract of 2L cow urine, 1kg cow dung and 2kg crushed neem leaves in 1000L water.
	Gundhi bug	Foliar application of garlic + green chillies paste	The extract of 2.5 kg garlic + 2.5 kg green pungent chillies paste + 500 g neem leaves + 500g ginger/ha sprayed during milky stage of rice.

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**	**4th**
Economic yield (kg/ha)	3100	3875	4260	4470
Price (Rs/kg) (25 % premium on prevailing market price)	15.6			
Cost of cultivation (Rs/ha)	46195			
Net returns (Rs/ha)	23649			

*based on prices of 2013-14

Crop *(Rabi)*: Barley + mustard (4:1)
Important features of suitable varieties

Parameters	**Barley**		**Mustard**
	Azad (six row)	DWRB-91 (two row)	Pusa Bold
Duration (days)	115-120 days	115 days	140 days
Average yield under organic condition (kg/ha)	4000	3800	1000
Source (s) of availability	CSA, University of Agriculture & Technology, Kanpur (UP)	DWR Karnal	IARI, New Delhi
Suitable regions/districts in the state	saline-alkaline soils of UP, Bihar and West Bengal		All India

Field preparation: Due to short turn around period after rice, the field should be immediately irrigated after rice harvest. After around 10 days when field comes in condition, the FYM should be applied and the field should be ploughed 2-3 times with disc or mouldboard plough. After ploughing, two cross tilling with tines and 2-3 planking should be done. To ensure good germination, sowing should be done after 1-2 days of completion of field preparation.

Cultural practices

Seed rate (kg/ha)	80		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Solar seed treatment	For 2 hrs.	For 2 hrs. during mid-day after pre-soaking in water for 2 hrs.
	Pseudomonas fluorescence	10 g/kg seed	Seed treatment
	Trichoderma harzianum	4 g/kg seed	Seed treatment
Spacing (Row X plant) in cm	20 x 5		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	8 t/ha	
	Azotobactor	10 kg/ha	
	PSB	10 kg/ha	
	Trichoderma	5 kg/ha	
	Neem cake	200 kg/ha	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Vermicompost	3.22 t/ha	30
	Panchagavvya	15 lit./ha	Spray twice at 45 and 60 DAS
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)

	4	Active tillering, flowering	5
Major weeds	**Local name**	**English name**	**Scientific name**
	Grasses		
	Jangali Jai	Wild oat	*Avena fatua*
	Gullidanda/ Baluri	Littleseed canary grass	*Phalaris minor*
	Daub ghas	Bermudagrass	*Cynodon dactylon*
		Bluegrass	*Poa annua*
	Broad leaf weeds		
	Jangli Berseem	Wild colver	*Trifolium spp.*
	Lunia	Common purslane	*Portulaca oleracea*
	Kateli	Creeping thistle	*Circium arvense*
	Bathua	Lamb's-quarters	*Chenopodium album*
	Hirankhuri	Field Bindweed	*Convolvulus arvensis*
	Peeli Senji	Yellow sweet clover	*Melilotus indica*
	Krishna neel	Blue Pimpernel	*Anagallis arvensis*
	Gajri	Fineleaf fumitory	*Fumaria paviflora*
	Sedges		
	Motha	Nut Grass	*Cyprus rotundus*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
		Hand weeding	
		Hand weeding	

Organic plant protection practices	**Name of pest/disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	Diseases		
	Covered smut of barley	Use of certified seeds and resistant variety	
		Crop rotation	
		Hot water treatment of seeds before sowing	At 52^0C for 11 Min.
	Rusts	Grow resistant varieties only	
		Foliar spraying of sour buttermilk	5 L diluted in 200L water (1000 L solution for 1ha)
	Stripe disease	Use of certified seeds and resistant variety	
		Crop rotation	
		Hot water treatment of seeds before sowing	At 52^0C for 11Min.
	Insect-Pests		
	Termite	Soil application of *Beauveria bassiana*	5kg/ha before sowing

		Application of neem leaf manure (5q/ha) or neem seed manure (1q/ha)	Before sowing
		Apply only fully decomposed organic manures in the field	
	Army worm	Foliar spray of neem leaf extract	5% (5kg neem leaf crushed in 100L boiled water and diluted to 100L)
	Rats	Flour baits mixed with cement powder	

Yield and Economics

Parameters	**1st year***	**2nd**
Economic yield (kg/ha) Barley + Mustard	2560+ 385	2830+ 334
Price (Rs/kg) (25% premium on prevailing market price)	14.4 + 37.5	
Cost of cultivation (Rs/ha)	33860	
Net returns (Rs/ha)	36009	

*based on prices of 2013-14

Crop *(Summer)*: Green gram

Important features of suitable varieties

Parameters	Pusa Vishal	Pant Moong-1	Pant Moong-2
Duration (days)	65-70	65-75 days	60-65
Average yield under organic condition (kg/ha)	735		
Source (s) of availability	IARI, New Delhi		
Suitable regions/districts in the state	Punjab, Haryana, Western UP, Rajasthan, J&K and Plains of Himanchal Pradesh		
Specific resistance / tolerance to pest	tolerant to jassids and whitefly		
Specific resistance / tolerance to disease	resistant to yellow vein mosaic	Resistant to yellow mosaic virus	Resistant to yellow mosaic virus
Specific tolerance to drought / waterlogging		resistant to shattering	

Field preparation: For summer season, a pre-irrigation immediately after harvesting of Rabi crop should be given. When the field comes in condition, prepare it by giving 2-3 cross harrowing followed by planking to make the field levelled.

Cultural practices

Seed rate (kg/ha)	15		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Rhizobium	25 g/ Kg Seed	Seed treatment
	Pseudomonas fluorescence	10 g/kg seed	Seed treatment
	Trichoderma harzianum	4 g/kg seed	Seed treatment
Spacing (Row X plant) in cm	30 x 10		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	4 t/ha	
	Rhizobium	10 kg/ha	
	PSB	10 kg/ha	
	Trichoderma	5 kg/ha	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Vermicompost	1.61 t/ha	30
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	3	Flowering and pod formation	5
Major weeds	**Local name**	**English name**	**Scientific name**
	Daubghas	Bermooda grass	*Cynodon dactylon*
	Motha	Nut grass	*Cyprus rotundus*
	Patharchatta	Horse purslane	*Trianthema portulacastrum*
Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**	
	25 DAS	Hand weeding	
Organic plant protection practices	**Name of pest/disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	Diseases		
	Yellow mosaic disease	Control of whitefly vectors by spray of neem oil or neem-seed-kernel-extract	At 3% or 5% concentration, respectively if, whitefly population observed
	Leaf eating insects	Spray of neem oil or neem-seed-kernel-extract	At 3% or 5% concentration, respectively, if, leaf damage observed

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**	**4th**
Economic yield (kg/ha)	976	208	871	886
Price (Rs/kg) (25 % premium on prevailing market price)	50.0			
Cost of cultivation (Rs/ha)	17790			
Net returns (Rs/ha)	26510			

System economics

Parameters	2012-13		
	Rice	Barley + mustard	Green gram
Economic yield (kg/ha)	4470	3830+395	886
Cost of cultivation (Rs/ha)	46195	32280+1580	17790
Total system cost of cultivation (Rs/ha)	97845		
Net returns (Rs/ha)	23649	22776+13233	26510
System net returns (Rs/ha)	86168		

Glimpses

Kharif	***Rabi***	**Summer**
		
Organic rice	Barley + mustard intercropping	Mungbean

Cropping System 3:**Maize (grain) – potato– okra**

Particulars	*Kharif*	*Rabi*	Summer
Crop	Maize	Potato	Okra
Fortnight of sowing/planting	First fortnight of July	Second fortnight of October	First fortnight of March
Fortnight of harvesting	First fortnight of October	First fortnight of March	Second fortnight of June
Varieties suitable for organic farming	Star-56	Chipsona-3	Arka Anamika

Crop *(kharif)*: Maize

Important features of suitable varieties:

Parameters	Star-56	PMH-3	PMH-4
Duration (days)	90-95 days	95 -100 days	
Average yield under organic condition (kg/ha)	7380	6200	6000
Source (s) of availability	Private sector variety	DRMR, New Delhi	DRMR, New Delhi
Suitable regions/districts in the state	North Western India	Delhi, Punjab, Haryana and Western UP	Delhi, Punjab, Haryana, Uttar Pradesh and Uttrakhand
Specific resistance / tolerance to pest		Resistance to Maydis	
Specific resistance / tolerance to disease		Resistance to leaf blight, erwinia stalk rot	Resistant against MLB, BLSB, BSDM and PFSR

Field preparation: The first ploughing should be done by 2-3 cross harrowing for the proper incorporation of okra debris in to soil. Then the field should be irrigated for proper decomposition of okra debris and ensuring proper moisture for maize germination. When the field comes in condition, 2 cross harrowing followed by two cross tilling with cultivators or should be done. After that 1-2 planking should be done to ensure proper levelling. For sowing maize broad beds of 60 cm width should be made with the help of soil shaper.

Cultural practices

Seed rate (kg/ha)	20		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Pseudomonas fluorescence	10 g/kg seed	Seed treatment
	Trichoderma harzianum	4 g/kg seed	
Spacing (Row X plant) in cm	60 x 20		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	10 t/ha	
	Azotobactor	10 kg/ha	
	PSB	10 kg/ha	
	Trichoderma	5 kg/ha	
	Neem cake	200 kg/ha	
Top dressing of organic	**Source**	**Quantity/ha**	**Days after**

manures			**sowing/planting or stage of crop**
	Vermicompost	4.0 t/ha	30
	Panchagavvya	15 lit./ha	Spray twice at 45 and 60 DAS
Irrigation practices	**Number of irrigations**	**Most critical stages for irrigation**	**Depth of irrigation (cm)**
	3	Silking, tasseling	5

Major weeds	**Local name**	**English name**	**Scientific name**
	Grasses		
	Makra ghas	Crow foot grass	*Dactyloctenium aegyptium*
	Sewai/Sawa	Barnyard grass	*Echinochloa colonum*
	Samak/Sawa	Common barnyard grass	*Echinochloa crusgali*
	Takri	Crabgrass	*Digitaria ciliaris*
	Doobghas	Barmuda grass	*Cynodon dactylon*
	Banchari	Johnson grass	*Sorghum helepanse*
	Broad leaf weeds		
	Baridhudi	Hairy spurge	*Euphorbia hirta*
	Chouli	Pig weed	*Amaranthus viridis*
	Pattharchatta	Horse purslane	*Trianthima portulacastrum*
	Lalmurga	Cockscomb,	*Celosia argentia*
	Kankoua	Dayflower	*Commelina benghalensis*
	Hulhul/Chilmil	Hurricane weed	*Phylanthus niruri*
	Makoi	Black nightshade	*Solanum nigrum*
	Lunia	Purslane	*Portulaca oleraceae*
	Sedges		
	Motha	Purple nutsedge	*Cyprus rotundus*

Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**
	30 DAS	Hand weeding
	50 DAS	Hand weeding
		Stale seed bed

Organic plant protection practices	**Name of pest /disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	Diseases		
	Soil borne diseases	Seed & seedling treatment with *Pseudomonas fluorescence* & *Trichoderma harzianum*	*Pseudomonas* @ 10 g/kg seed &*Trichoderma* @ 4 g/kg seed
	Leaf	• Crop rotation	

	spot/blight	• Deep summer ploughing • Clean cultivation	
	Rust	Foliar spraying of sour buttermilk	5 L diluted in 200L water (1000 L solution for 1ha)
	Banded leaf and sheath blight	Foliar spraying of *Pseudomonas fluorescence* and/ or *Trichoderma harzianum*	Two sprays at 10 days interval after appearance of symptoms @5g/L water
	Insect-Pests		
	1. Maize Stem borer	Release of *Tricogramma chilonis* (Tricho-cards)	Tricho-cards @ 1 lakh parasitized eggs/ha at 10 days intervals 5-6 times

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**
Economic yield (kg/ha)	4380	4860	4590
Price (Rs/kg) (25 % premium on prevailing market price)	18.8		
Cost of cultivation (Rs/ha)	40425		
Net returns (Rs/ha)	54075		

*based on prices of 2013-14

Crop *(Rabi)*: Potato
Important features of suitable varieties

Parameters	Mid duration		Early		
	Chipsona-2	Chipsona-3	Kufri Pukhraj	Kufri Ashoka	Kufri Chandramukhi
Duration (days)	90-110		70-90	70-80	80-90
Average yield under organic condition (kg/ha)		32400			
Source (s) of availability	CPRI	CPRI	CPRI	CPRI	CPRI
Suitable regions/districts in the state	North Indian plains	North Indian plains	Bihar, Gujarat, Haryana, Himachal Pradesh, Uttar Pradesh, Punjab, West Bengal		Bihar, Gujarat, Haryana, Himachal Pradesh, Uttar Pradesh, Punjab, West Bengal
Specific resistance / tolerance to disease	Resistant to late blight, immune to wart	Resistant to late blight	Resistant to early blight and moderately resistant to late blight	Tolerant to late blight	Tolerant to many diseases

Field preparation: To ensure fine and well pulverized seed bed for potato, field should be ploughed twice 20-25 cm deep with disc plough followed by two cross harrowing. After harrowing, the field should be cross tilled twice with tine cultivator each followed by planking. After field preparation, ridges are made in the field 60 cm apart with the help of ridger.

Cultural practices

Seed rate (kg/ha)	2500		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Solar seed treatment	For 2 hrs.	For 2 hrs. during mid-day after pre-soaking in water for 2 hrs.
	Pseudomonas fluorescence	10 g/kg seed	Seed treatment
	Trichoderma harzianum	4 g/kg seed	Seed treatment
Spacing (Row X plant) in cm	60 x 20		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	15 t/ha	
	Azotobactor	10 kg/ha	
	PSB	10 kg/ha	
	Trichoderma	5 kg/ha	
	Neem cake	200 kg/ha	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Vermicompost	6.0 t/ha	30
	Panchagavvya	15 lit./ha	Spray twice at 45 and 60 DAS
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	8	Tuber initiation to tuber maturity	5

Major weeds	**Local name**	**English name**	**Scientific name**
	Grasses		
	Jangali Jai	Wild oat	*Avena fatua*
	Gullidanda/ Baluri	Littleseed canary grass	*Phalaris minor*
	Daub ghas	Bermudagrass	*Cynodon dactylon*
	Poa ghas	Bluegrass	*Poa annua*
	Broad leaf weeds		
	Jangli Berseem	Wild colver	*Trifolium spp.*

	Lunia	Common purslane	*Portulaca oleracea*
	Kateli	Canada Thistle	*Circium arvense*
	Bathua	Lambsquarters	*Chenopodium album*
	Hirankhuri	Field Bindweed	*Convolvulus arvensis*
	Senji	Sweetclover	*Melilotus indica*
	Dudhi	Sowthistle	*Sonchus* spp.
	Jangali palak	Broadleaf dock	*Rumex obtusifolius*
	Sedges		
	Motha	Nut Grass	*Cyprus rotundus*

Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**
	30 DAS	Hand weeding
	50 DAS	Hand weeding

Organic plant protection practices	**Name of pest/disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	Diseases		
	Early blight	• Use of healthy seeds • Crop rotation • Provide proper nutrition to plant • Removal and burning of infested plant debris • Deep summer tillage • Avoid irrigation in cool cloudy weather • Foliar spraying of *Pseudomonas fluorescence* and *Bacillus subtilis*	5g/L water (1000L solution/ha)
	Late blight	• Use resistant varieties • Proper drainage in the field • Sowing of healthy seeds • Early planting can avoid the disease	-
	Black scurf and stem canker disease	Seed/tuber treatment with *Pseudomonas fluorescence* & *Trichoderma harzianum*	*Pseudomonas* @ 10 g/kg tuber &*Trichoderma* @ 4 g/kg seed
		Soil application of *Pseudomonas fluorescence* & *Trichoderma harzianum*	5 kg/ha in 100 kg precolonized well decomposed FYM
		Mulching of soil with rice husk (2-3cm) or polyethylene sheet	

	Virus diseases	Use virus free healthy seeds Rouging of infected plants	
		Control of aphid vectors by foliar application of neem oil or neem-seed- kernel-extract	At 3% or 5% concentration, respectively if, aphid population observed
		Dehaulming at-least 15days before harvesting	
	Insect-Pests		
	Aphids	Foliar application of neem oil or neem-seed- kernel-extract	At 3% or 5% concentration, respectively, if aphid populations observed
	Cutworms	Use of light traps Soil application of *Beauveria bassiana* before sowing	5kg/ha
	White grubs	• Deep summer ploughing • Install light traps in April-May • Soil application of *Beauveria bassiana* before sowing or *Metarrhizium anisoplae*	5kg/ha precolonized in 100kg FYM
	4.Nematodes	Soil application of *Pseudomonas fluorescence* and/ or *Trichoderma harzianum*	10kg/ha precolozized in well rotten FYM
Optimum stage of harvesting	Potato should be harvested when haulms start yellowing an falling on the ground. The digging of tubers should be done 15 days after cuttingthe haulms		

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**	**4th**
Economic yield (kg/ha)	9430	12083	21300	22300
Price (Rs/kg) (25 % premium on prevailing market price)	10.0			
Cost of cultivation*(Rs/ha)	114238			
Net returns* (Rs/ha)	108763			

*based on prices of 2013-14

Crop *(summer)*: Okra

Important features of suitable varieties

Parameters	Arka Anamika
Duration (days)	130-135 days

Average yield under organic condition (kg/ha)	10405
Source (s) of availability	IIHR, Banglore
Specific resistance / tolerance to disease	Yellow vein mosaic resistant

Field preparation: In the loose field left after potato digging, FYM should be applied. After that a pre-irrigation should be given after ensuring levelling by cross tilling with tine cultivator followed by planking. When the field comes in condition, field should be cross-harrowed once followed by one cross-tilling with tine cultivator and planking. For sowing, ridges are to be made in the field 60 cm apart with the help of ridger.

Cultural practices

Seed rate (kg/ha)	18			
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application	
	Solar seed treatment	For 2 hrs.	For 2 hrs. during mid-day after pre-soaking in water for 2 hrs.	
	Pseudomonas fluorescence	10 g/kg seed	Seed treatment	
	Trichoderma harzianum	4 g/kg seed	Seed treatment	
Spacing (Row X plant) in cm	45 x 30			
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha		
	FYM	12 t/ha		
	Rhizobium	10 kg/ha		
	PSB	10 kg/ha		
	Trichoderma	5 kg/ha		
	Neem cake	200 kg/ha		
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop	
	Vermicompost	4.83 t/ha	30	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)	
	9	Pod formation	5	
Major weeds	**Local name**	**English name**	**Scientific name**	
	Grasses			
	Makra ghas	Crow foot grass	*Dactyloctenium aegyptium*	
	Doobghas	Barmuda grass	*Cynodon dactylon*	

	Broad leaf weeds		
	Pattharchatta	Horse purslane	*Trianthima portulacastrum*
	Makoi	Black nightshade	*Solanum nigrum*
	Sedges		
	Motha	Nut Grass	*Cyprus rotundus*

Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**
	20 DAS	Hand weeding
	40 DAS	Hand weeding
	60 DAS	Hand weeding

Organic plant protection practices	**Name of pest/disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	Diseases		
	Cercospora leaf spot	• Grow resistant varieties • Crop rotation • Collection and destruction of infected crop debris	
	Fusarial wilt	• Long crop rotation • Deep summer ploughing • Soil solarisation • Soil application of *Pseudomonas fluorescence* & *Trichoderma harzianum*	5kg/ha in 100kg precolonized well decomposed FYM
	Powdery mildew	• Good nutrition to plants • Apply sprinkler irrigation to crop • Foliar spraying of neem oil or neem-seed- kernel-extract	At 3% or 5% concentration, respectively
	Yellow vein mosaic	• Grow resistant varieties • Grow okra in wide spaced rows or as border/intercrop • Rouging and destruction of infected plants • Control of whitefly vectors through foliar spraying of neem oil or neem-seed-kernel-extract	At 3% or 5% concentration, respectively If, whitefly population observed
	Root knot nematode	• Soil solarisation • Crop rotation with non-host crop • Soil application of *Trichoderma harzianum*	5kg/ha in 100kg precolonized well decomposed FYM

	Insect-pests		
	Jassids	• Grow okra in wide spaced rows or as border/intercrop • Foliar spraying of neem oil or neem-seed- kernel-extract	At 3% or 5% concentration, respectively if jassid populations observed
	Fruit borer	Foliar spraying of neem oil or neem-seed- kernel-extract	At 3% or 5% concentration,respectively
	Red spider mite	• Give sprinkler irrigation • Foliar spraying of neem oil or neem-seed- kernel-extract	At 3% or 5% concentration,respectively
Optimum stage of harvesting	Multiple pickings of fully grown tender pods		

Yield and Economics

Parameters	**1st year***	**2nd**	**3rd**	**4th**
Economic yield (kg/ha)	4551	1558	10280	10530
Price (Rs/kg) (25 % premium on prevailing market price)	22.5			
Cost of cultivation**(Rs/ha)	61070			
Net returns** (Rs/ha)	175855			

*based on prices of 2013-14

System Economics

Parameters	2012-13		
	Maize (grain)	Potato	Okra
Economic yield (kg/ha)	5040	22300	10530
Cost of cultivation (Rs/ha)	40425	114238	61070
Total system cost of cultivation (Rs/ha)	215733		
Net returns (Rs/ha)	54075	108763	175855
System net returns (Rs/ha)	338693		

Glimpses

Kharif	***Rabi***	**Summer**

photo of inputs		photo of inputs
title	Disease management of potato through bioagents	title
		photo of crop
Organic maize	Organic potato var. Chiopsona- 3	title
		
Organic maize cobs	Organic potato var. Chiopsona- 3	Okra var. Arka Anamika

Cropping System 4.Maize (green cobs) – mustard + radish - *Sesbania* green manure

Particulars	*Kharif*	*Rabi*		Summer
Crop	Maize (green cobs)	Mustard + Radish		*Sesbania* green manure
Fortnight of sowing/planting	First fortnight of July	Second fortnight of October	Second fortnight of October	Second fortnight of April
Fortnight of harvesting	First fortnight of October	First fortnight of March	First fortnight of March	Incorporation in soil after 45 DAS
Varieties suitable for organic farming	Star-56	Pusa Bold	Ivory white	

Crop *(kharif)*: Maize (sweet corn)
Important features of suitable varieties:

Parameters	*Madhuri*
Duration (days)	
Average yield under organic condition (kg/ha)	10000
Source (s) of availability	ANGRAU, Hyderabad
Suitable regions/districts in the state	Andhra Pradesh and other maize growing regions

Field preparation: The first ploughing should be done by 2-3 cross harrowing for the proper incorporation of okra debris in to soil. Then the field should be irrigated for proper decomposition of okra debris and ensuring proper moisture for maize germination. When the field comes in condition, 2 cross harrowing followed by two cross tilling with cultivators or should be done. After that 1-2 planking should be done to ensure proper levelling. For sowing maize broad beds of 60 cm width should be made with the help of soil shaper.

Cultural practices

<table>
<tr><td>Seed rate (kg/ha) (Not applicable for nursery crops)</td><td colspan="4">20</td></tr>
<tr><td rowspan="3">Pre-sowing/planting treatment of seed/seedlings</td><td>Material</td><td colspan="2">Recommended rate (kg/ha or lit/ha)</td><td>Method of application</td></tr>
<tr><td>Pseudomonas fluorescence</td><td colspan="2">10 g/kg seed</td><td rowspan="2">Seed treatment</td></tr>
<tr><td>Trichoderma harzianum</td><td colspan="2">4 g/kg seed</td></tr>
<tr><td>Spacing (Row X plant) in cm</td><td colspan="4">60 x 20</td></tr>
<tr><td rowspan="5">Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc</td><td colspan="2">Source</td><td colspan="2">Quantity/ha</td></tr>
<tr><td colspan="2">FYM</td><td colspan="2">10 t/ha</td></tr>
<tr><td colspan="2">Azotobactor</td><td colspan="2">10 kg/ha</td></tr>
<tr><td colspan="2">PSB</td><td colspan="2">10 kg/ha</td></tr>
<tr><td colspan="2">Trichoderma</td><td colspan="2">5 kg/ha</td></tr>
<tr><td></td><td colspan="2">Neem cake</td><td colspan="2">200 kg/ha</td></tr>
<tr><td rowspan="3">Top dressing of organic manures</td><td>Source</td><td colspan="2">Quantity/ha</td><td>Days after sowing/planting or stage of crop</td></tr>
<tr><td>Vermicompost</td><td colspan="2">4.0 t/ha</td><td>30</td></tr>
<tr><td>Panchagavvya</td><td colspan="2">15 lit./ha</td><td>Spray twice at 45 and 60 DAS</td></tr>
<tr><td rowspan="2">Irrigation practices</td><td>Number of irrigations</td><td colspan="2">Most critical stages for irrigation</td><td>Depth of irrigation (cm)</td></tr>
<tr><td>3</td><td colspan="2">Silking, tasseling</td><td>5</td></tr>
<tr><td rowspan="5">Major weeds</td><td>Local name</td><td colspan="2">English name</td><td>Scientific name</td></tr>
<tr><td colspan="4">Grasses</td></tr>
<tr><td>Makra ghas</td><td colspan="2">Crow foot grass</td><td>Dactyloctenium aegyptium</td></tr>
<tr><td>Sewai/Sawa</td><td colspan="2">Barnyard grass</td><td>Echinochloa colonum</td></tr>
<tr><td>Samak/Sawa</td><td colspan="2">Common</td><td>Echinochloa crusgali</td></tr>
</table>

		barnyard grass	
	Takri	Crabgrass	*Digitaria ciliaris*
	Doobghas	Barmuda grass	*Cynodon dactylon*
	Banchari	Johnson grass	*Sorghum helepanse*
	Broad leaf weeds		
	Baridhudi	Hairy spurge	*Euphorbia hirta*
	Chouli	Pig weed	*Amaranthus viridis*
	Pattharchatta	Horse purslane	*Trianthima portulacastrum*
	Lalmurga	Cockscomb,	*Celosia argentia*
	Kankoua	Dayflower	*Commelina benghalensis*
	Hulhul/Chilmil	Hurricane weed	*Phylanthus niruri*
	Makoi	Black nightshade	*Solanum nigrum*
	Lunia	Purslane	*Portulaca oleraceae*
	Sedges		
	Motha	Purple nutsedge	*Cyprus rotundus*

Weed management	**Critical stage of weeding**	**Recommended practice for organic condition**
	30 DAS	Hand weeding
	50 DAS	Hand weeding
		Stale seed bed

Organic plant protection practices	**Name of pest /disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	Diseases		
	Soil borne diseases	Seed & seedling treatment with *Pseudomonas fluorescence* & *Trichoderma harzianum*	*Pseudomonas* @ 10 g/kg seed & *Trichoderma* @ 4 g/kg seed
	Leaf spot/blight	• Crop rotation • Deep summer ploughing • Clean cultivation	
	Rust	Foliar spraying of sour buttermilk	5 L diluted in 200L water (1000 L solution for 1ha)
	Banded leaf and sheath blight	Foliar spraying of *Pseudomonas fluorescence* and/ or *Trichoderma harzianum*	Two sprays at 10 days interval after appearance of symptoms @5g/L water
	Insect-Pests		
	1. Maize Stem borer	Release of *Tricogramma chilonis* (Tricho-cards)	Tricho-cards @ 1 lakh parasitized eggs/ha at 10 days intervals 5-6 times
Fully grown cobs at milky grain stage when silk starts drying			

Yield and Economics

Parameters	**1st**	**2nd**	**3rd**

	year*		
Economic yield (kg/ha)	9160	9060	8860
Price (Rs/kg) (25 % premium on prevailing market price)	12.5		
Cost of cultivation**(Rs/ha)	40425		
Net returns** (Rs/ha)	74825		

*based on prices of 2013-14

Crop *(Rabi)* : Mustard + radish (1:2)
Important features of suitable varieties

Parameters	Mustard			Radish
	Pusa Bold	RH- 406	RGN- 229	Ivory white
Duration (days)	140 days			
Average yield under organic condition (kg/ha)	1000	2000	1950	14410
Source (s) of availability			SKRAU, Bikaner	
Suitable regions/districts in the state	All India	Delhi, Haryana, J & K, Punjab and parts of Rajasthan	Delhi, Haryana, J & K, Punjab and parts of Rajasthan	
Specific tolerance to drought / waterlogging		Lodging resistant	Tolerant to lodging, shattering, high temperature & salinity	

Field preparation: To ensure a clean and well pulverised seedbed for mustard, the land should be well prepared first by ploughing deep with soil turning plough, followed by two cross harrowing. Each harrowing should be followed by planking for ensuring proper levelling. After field preparation, ridges are made in the field 60 cm apart with the help of ridger. While sowing the mustard seed should be shown on the top and the radish can be sown on both the sides of rides.

Cultural practices

Seed rate (kg/ha)	Mustard- 4 kg, Radish- 10 kg		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Pseudomonas fluorescence	10 g/kg seed	Seed treatment
	Trichoderma harzianum	4 g/kg seed	Seed treatment
Spacing (Row X plant) in cm	45 x 10		
Basal application of organic manures including soil	Source	Quantity/ha	
	FYM	12 t/ha	

application of bio-fertilizers, bio-control agents etc	Azotobactor	10 kg/ha	
	PSB	10 kg/ha	
	Trichoderma	5 kg/ha	
	Neem cake	200 kg/ha	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Vermicompost	4.83 t/ha	30
	Panchagavya	15 lit./ha	Spray twice at 45 and 60 DAS
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	5	Pre-flowering and pod filling	5

Major weeds	**Local name**	**English name**	**Scientific name**
	Grasses		
	Jangali Jai	Wild oat	*Avena fatua*
	Daub ghas	Bermuda grass	*Cynodon dactylon*
	Baluri		*Phalaris minor*
	-	Bluegrass	*Poa annua*
	Broad leaf weeds		
	Chatrimatri	Chickling vetch	*Lathyrus sativus*
	Lunia	Common purslane	*Portulaca oleracea*
	Keteli	Creeping thistle	*Circium arvense*
	Bathua	Lamb's-quarters	*Chenopodium album*
	Hirankhuri	Field bindweed	*Convolvulus arvensis*
	Peeli Senji	Yellow sweet clover	*Melilotus indica*
	Gajri	Fineleaf fumitory	*Fumaria parviflora*
	Sedges		
	Motha	Yellow nutsedge	*Cyperus rotundus*

Weed management	Critical stage of weeding	Recommended practice for organic condition	
	30 DAS	Thinning and hand/mechanical weeding	
Organic plant protection practices	**Name of pest/disease**	**Organic material recommended for control**	**Quantity (kg or litres/ ha)**
	Diseases		
	Soil borne diseases	Neem cake	Soil application of 200 kg/ha
		P. fluorescence and *T. harzianum*	Seed treatment with @ 5 g/kg seed
	Alternaria leaf spot / blight, White rust,	Early sowing	By first fortnight of October

	Downey mildew		
	Insect-pests		
	Mustard saw fly	Foliar spraying of neem oil or neem-seed- kernel-extract	At 3% or 5% concentration, respectively
		Foliar application of *Beauveria bassiana*	At two leaf stage
	Mustard aphid	Early sowing	By first fortnight of October
		Foliar spraying of neem oil or neem-seed- kernel-extract	At 3% or 5% concentration, respectively just after appearance of aphid populations

Yield and Economics

Parameters	**1st year***	**2nd year**	**3rd year**
Economic yield (kg/ha)	145+9580	6940 + 14200	6420 + 14620
Price (Rs/kg) (25 % premium on prevailing market price)	37.5 + 6.3		
Cost of cultivation**(Rs/ha)	44190		
Net returns** (Rs/ha)	73848		

Crop *(Summer)*: *Sesbania*green manure

Field preparation: After wheat harvest, the field should be immediately irrigated. When field comes in condition field should be prepared by two cross harrowing followed by two planking to ensure proper levelling. Sowing of Dhaincha (*Sesbania*) is done by broadcasting the seeds in field followed by irrigation.

Cultural practices

Seed rate (kg/ha)	20		
Spacing (Row X plant) in cm	Sown by broadcasting		
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	3	At the interval of 15 days	5
Optimum stage of harvesting (in case of vegetables and green cob)	Soil incorporation 45 days after sowing		

Yield and Economics

Parameters	**1st year***	**2nd year**
Biomass production (kg/ha) on dry weight basis	56.2	52.8
Cost of cultivation**(Rs/ha)	2600	

System Economics

Parameters	2012-13		
	Maize (cob)	Mustard + radish	*Sesbania* green manure
Economic yield (kg/ha)	9220	711+14620	
Cost of cultivation (Rs/ha)	40425	35190+9000	2600
Total system cost of cultivation (Rs/ha)	87215		
Net returns (Rs/ha)	74825	73848	
System net returns (Rs/ha)	148673		

Glimpses

Kharif	***Rabi***	**Summer**
		photo of crop
Organic maize	Organic mustard var. Pusa Bold	title
	photo of harvested produce	photo of harvested produce
title	title	title

Uttarakhand

Package of Practices for Organic Crop Production

Prepared by D.K. Singh, K.P. Raverkar, Chadra Bhushan and Shilpi GuptaG.B. Pant University of Agriculture & Technology, Pantnagar

Suggested cropping systems (based on testing under NPOF)

1. Basmati rice- wheat-*Sesbania*
2. Basmati rice- Lentil-*Sesbania*
3. Basmati rice- Vegetable pea-*Sesbania*
4. Basmati rice- *Brassica napus –Sesbania*
5. Basmati rice- Chickpea –*Sesbania* (Under biodynamic practices)

Details of Cropping Systems

Cropping System 1.Basmati rice- wheat-*Sesbania*

Particulars	***Kharif***	***Rabi***	**Summer**
Crop	Basmati rice	wheat	*Sesbania*
Fortnight of sowing/planting	Ist fortnight of June(sowing) IInd fortnight of June (Transplanting)	IInd fortnight of November (sowing)	Ist fortnight of May
Fortnight of harvesting	IInd fortnight of October (Harvesting)	IInd fortnight of April (Harvesting)	IInd fortnight of June (incorporation)
Varieties suitable for organic farming	Pusa Basmati-1	PBW-343/PBW502	Pant Ses-1

Crop *(kharif)*:Basmati Rice

Important features of suitable varieties

Parameters	Pusa Basmati-1
Duration (days)	Medium (130-135days)
Average yield under organic condition (kg/ha)	3500 kg/ha
Source (s) of availability	In-situ organic field
Suitable regions/districts in the state	Udham Singh Nagar
Specific resistance / tolerance to disease	Blast

Nursery raising practices

Area of nursery required for 1 ha	1000 m^2
Nursery raising method	Wet nursery
Bed size (length X breadth in m)	5m x 2m
Seed sowing rate/m^2	30 g

Pre-sowing seed/soil treatment	Materials	Quantity/kg of seed or per m^2area	Method of application
	Common salt	1.65 kg salt/10 l of fresh water	Dipping the seeds
	Pant Bioagent-3 (mixture of *Pseudomonas* &*Trichoderma)*	10g/kg seed	Seed treatment
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	Sesbania green manuring	1.0-1.5 kg	Incorporation in soil
	FYM	2.5 kg/m^2	broadcast
	Leacheate of vermicompost + $ZnSO_4$	10% + 0.5 %	sprays at 10 & 20 days after sowing
Irrigation practices	3 irrigations		
Weed management	1 HW at 15 DAS		
Organic plant protection practices	Name of pest/disease	Recommended organic material used for control	Quantity/ m^2area
	Stem borer	Cow urine (10 %) + Neem cake (10 %) or neem oil (1-2%)	
	-	Precautionary spray of *Trichoderma* + *Pseudomonas* (each @ 5g/l) after 15 days or Pant Bioagent-3 @ 10 g/l of water	
Optimum age of nursery (days)	20-25 days		

Field preparation: For transplanted rice, in-situ *Sesbania* green manure grown and incorporated with the help of mould board plough followed by two round of puddling by puddler.Soil application of PSF &*Trichoderma* each @ 5g/l or Pant Bioagent-3 @ 10 g/l of water (5.0 kg Pant Bio-agent-3 with 500 l water/ha) after incorporation of green manure at the time of soil preparation.

Cultural practices

Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Pant Bioagent-3(*Pseudomonas*+ *Trichoderma)*	250 g/l water	Seedling treatment through root dipping
Spacing (Row X plant) in cm	20 x10cm		

Number of seedlings/hill (in nursery crops only)	2		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	Green manure	15-20 t/ha green biomass	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	V.C. (if FYM has not been applied)	2.5 t/ha	20 DAT
	Cow urine fortified with Neem leaves (one kg green leaves/ 10 l of urine)	50 l/ha (10 % with 500 litre water /ha)	3-4 sprays at 15 days interval start from 20-25 days after transplanting
	Or Cow urine + neem oil	10% + 1%	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	6-8	Transplanting, tillering, PI, flowering & grain filling	5.0-7.0 cm
Major weeds	**Scientific Name**	**English Name**	**Local Name**
	Echinochloa colonum	Wild rice	Chotta sawan
	Echinochloa crusgalli	Banyard grass	Sawan
	Leptochloa chinensis		*American ghas*
	Cyperus rotundus	Purple nut sedge	Motha
	Cyperus iria	Yellow sedge	Motha
	Cyperus difformis	Common sedge	Motha
	Ec*lipta alba*	false daisy	Jal bhangra
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20 & 40 DAT	One mechanical weeding by conoweeder at 15 DAT followed by one or two hand weeding 25 & 45 DAT	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Yellow stem borer, Leaf folder, Brown plant hopper	Pheromone traps	20 traps/ha
		Cow urine fortified with Neem leaves (one kg green leaves/ 10.0 l of	50 l/ha (10 % with 500 litre water /ha). 50 litre cow urine

		urine) or Cow urine + neem oil (10 % +1%)	+ 5 litre neem oil/ha.
	Bacterial leaf blight Sheath blight Sheath rot Brown leaf spot	Cow urine fortified with Neem leaves (one kg green leaves/ 10.0 l of urine) + *Trichoderma* + *Pseudomonas* (each @ 5g/l) after or Pant Bioagent-3 @ 10 g/l of water	50 litre cow urine + 5 kg Pant Bio-agent 3 in 500 litre of water /ha

Yield and Economics

Parameters	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012***
Economic yield (kg/ha)	2266	2344	2456	2963	3445	2885	3113	3715	3925
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs. 35.00								
Cost of cultivation*(Rs/ha)	Rs.26857 (year 2012)								
Net returns* (Rs/ha)	Rs.129156 (year 2012)								

*based on prices of 2013-14

Crop *(Rabi)*:Wheat

Important features of suitable varieties

Parameters	PBW-343
Duration (days)	Medium (135-150days)
Average yield under organic condition (kg/ha)	2911 kg/ha
Source (s) of availability	In-situ
Suitable regions/districts in the state	Indo Gangetic Plain (U.S.Nagar)
Specific resistance / tolerance to disease	Resistant to brown and yellow rust, tolerant to Karnal Bunt

Field preparation: After harvest of rice, **o**ne ploughing followed by two harrowing was done.

Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	100 kg/ha

<table>
<tr><td rowspan="3">Pre-sowing/planting treatment of seed/seedlings</td><td>Material</td><td>Recommended rate (kg/ha or lit/ha)</td><td>Method of application</td></tr>
<tr><td>Pant Bioagent-3 (mixture of Pseudomonas + Trichoderma)</td><td>10g/kg seed</td><td>Seed treatment</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Spacing (Row X plant) in cm</td><td colspan="3">22 cm</td></tr>
<tr><td rowspan="3">Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc</td><td colspan="2">Source</td><td>Quantity/ha</td></tr>
<tr><td colspan="2">FYM</td><td>10 t/ha</td></tr>
<tr><td colspan="2">Vermicompost</td><td>5 t/ha</td></tr>
<tr><td rowspan="2">Top dressing of organic manures</td><td>Source</td><td>Quantity/ha</td><td>Days after sowing/planting or stage of crop</td></tr>
<tr><td>Cow urine fortified with Neem leaves (one kg green leaves/ 10 l of urine)</td><td>50 l/ha (10 % with 500 litre water /ha)</td><td>Two sprays at 30 and 60 days after sowing</td></tr>
<tr><td rowspan="2">Irrigation practices</td><td>Number of irrigations</td><td>Most critical stages for irrigation</td><td>Depth of irrigation (cm)</td></tr>
<tr><td>3-4</td><td>Crown root initiation, tillering, flowering and grain-filling stage</td><td>5-6 cm</td></tr>
<tr><td>Major weeds</td><td colspan="3">Scientific Name English Name Local Name
Phalaris minor Bird’s seed grass Gehun ka mama
Chenopodium album Goose foot Bathua
Lathyirus aphaca Crow pea Chatri-matri
Melilotus alba White sweet clover Sufaid Senji
Melilotusindica Yellowsweetclover Zard Senji
Fumaria perviflora Fumitory Jungli gazar
Anagallis arvensis Blue pimpernel Krishna - neel</td></tr>
<tr><td rowspan="2">Weed management</td><td>Critical stage of weeding</td><td colspan="2">Recommended practice for organic condition</td></tr>
<tr><td>30 & 45 DAS</td><td colspan="2">Stale bed + one hand weeding or two hand weeding</td></tr>
<tr><td>Organic plant protection practices</td><td>Name of pest/disease</td><td>Organic material recommended for control</td><td>Quantity (kg or litres/ ha)</td></tr>
</table>

	Wheat aphid	Cow urine fortified with Neem leaves (one kg green leaves/ 10.0 l of urine) or Cow urine + neem oil (10 % +1%)	50 l/ha (10 % with 500 litre water /ha). or 50 litre cow urine + 5 litre neem oil/ha
	Brown rust, Yellow rust, Powdery mildew	Cow urine + Pant Bioagent-3 (mixture of *Pseudomonas* + *Trichoderma*)	10% cow urine + 10 g/l of water (50 litre cow urine + 5 kg Pant Bio-agent 3 in 500 litre water/ha)

Yield and Economics

Parameters	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
Economic yield (kg/ha)	1383	1735	2662	2359	2493	3645	3677	4103	4142
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs.16.90 (2012-13)								
Cost of cultivation*(Rs/ha)	Rs.33262.00 (2012-13)								
Net returns* (Rs/ha)	Rs.36655.00 (2012-13)								

*based on prices of 2013-14

Crop *(Summer)*: ***Sesbania***

Important features of suitable varieties

Parameters	***(Pant Ses-1)***
Duration (days)	50-55 days
Average yield under organic condition (kg/ha)	16000 kg/ha(green biomass); 3450 kg/ha (dry matter)
Source (s) of availability	Seed Production Centre, Pantnagar
Suitable regions/districts in the state	U.S.Nagar

Field preparation: After harvest of *Rabi* crops, field was harrowed and seeds of *Sesbania* were sown @ 30 kg/ha. It should be ensured that moisture availability should be there otherwise, irrigation should be given immediate after sowing of *Sesbania* seed.

Glimpses

		
Incorporation of *Sesbania* Green manure	**Salted water treatment of Basmati rice seed**	**Treatment of basmati rice with Pant Bioagent-3 (mixture of *Pseudomonas* + *Trichoderma*)**
		
Leachates of Vermicompost	**Cow urine fortified with neem leaves**	

Kharif	***Rabi***	**Summer**
		
Organic Basmati rice (var. PB-1)	**Organic wheat (PBW 343)**	**Sesbania green manure (var. Pant Ses-1)**

Cropping System 2: **Basmati rice- Lentil-*Sesbania***

Particulars	***Kharif***	***Rabi***	**Summer**
Crop	Basmati rice	Lentil	*Sesbania*

Fortnight of sowing/planting	Ist fortnight (FN) of June(sowing) IInd fortnight of June (Transplanting)	IInd FN of November (sowing)	Ist FN of May
Fortnight of harvesting	IInd fortnight of October (Harvesting)	Ist FN of April (Harvesting)	IInd FN of June (Harvesting)
Varieties suitable for organic farming	Pusa basmati-1	Pant Lentil-6	Pant Ses-1

Crop *(kharif)*:Basmati Rice (Information on rice has already been given in Cropping system-1)

Crop *(Rabi)*: **Lentil**

Important features of suitable varieties

Variety	Pant Lentil-6
Duration (days)	Medium (120-135)
Average yield under organic condition (kg/ha)	851 kg/ha
Source (s) of availability	In-situ
Suitable regions/districts in the state	U.S.Nagar
Specific resistance / tolerance to pest	Tolerant to pod borer
Specific resistance / tolerance to disease	Resistant to rust, wilt and Aschochyta blight

Field preparation: After harvest of rice, **o**ne ploughing followed by two harrowing was done.

Cultural practices

Seed rate (kg/ha)	30 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Pant Bioagent-3 (mixture of *Pseudomonas* + *Trichoderma*)	10g/kg seed	Seed treatment
Spacing (Row X plant) in cm	30 x 10cm		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	5t/ha	
	Vermicompost	2.5t/ha	

Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	Cow urine fortified with Neem leaves (one kg green leaves/ 10 l of urine)	50 l/ha (10 % with 500 litre water /ha)	Two sprays at 30 and 60 days after sowing
Major weeds	Scientific Name	English Name	Local
	Phalaris minor *Chenopodium album* *Lathyirus aphaca* *Melilotus alba* *Melilotusindica* *Fumaria perviflora* *Anagallis arvensis*	Bird's seed grass Goose foot *Crow pea* *White sweet clover* *Yellowsweetclover* *Fumitory* *Blue pimpernel*	Gehun ka Bathua *Chatri-* *Sufaid* *Zard* *Jungli* *Krishna -*
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	25 & 45 DAS	Stale bed + hand weeding or one mechanical + one hand weeding	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Wilt Rust	Cow urine + Pant Bioagent-3 (mixture of *Pseudomonas* + *Trichoderma*)	10% cow urine + 10 g/l of water (50 litre cow urine + 5 kg Pant Bio-agent 3 in 500 litre water/ha); 5-6 sprays are required in 15 days intervals

Yield and Economics

Parameters	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12***
Economic yield (kg/ha)	354	445	774	731	972	601	1234	1702

Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs.35.00 (2011-12)
Cost of cultivation*(Rs/ha)	Rs.25318(2011-12)
Net returns* (Rs/ha)	Rs.34252(2011-12)

*based on prices of 2013-14

Crop *(Summer)*:*Sesbania*(Information has already been given in cropping system 1)

Glimpses

Cropping System 3: Basmati rice- Vegetable Pea-*Sesbania*

Particulars	***Kharif***	***Rabi***	**Summer**
Crop	Basmati rice	Vegetable pea	*Sesbania*
Fortnight of sowing/planting	Ist FN of June(sowing) IInd FN of June (Transplanting)	IInd FN of November (sowing)	Ist FN of May
Fortnight of harvesting	IInd FN of October (Harvesting)	Ist FN of March (Harvesting)	IInd FN of June (Harvesting)
Varieties suitable for organic farming	Pusa Basmati-1	Arkel	Pant Ses-1

Crop *(kharif)*:Basmati Rice (Information on rice has already been given in Cropping system-1)

Crop *(Rabi)*:Vegetable pea

Important features of suitable varieties

Parameters	Arkel
Duration (days)	Early (90-120d)
Average yield under organic condition (kg/ha)	4331 kg/ha
Source (s) of availability	In-situ
Suitable regions/districts in the state	U.S.Nagar
Specific resistance / tolerance to disease	Susceptible to powdery mildew

Field preparation: After harvest of rice, **o**ne ploughing followed by two harrowing were done.

Cultural practices

<table>
<tr><td>Seed rate (kg/ha)</td><td colspan="3">80</td></tr>
<tr><td rowspan="2">Pre-sowing/planting treatment of seed/seedlings</td><td>Material</td><td>Recommended rate (kg/ha or lit/ha)</td><td>Method of application</td></tr>
<tr><td>Pant Bioagent-3 (Pseudomonas + Trichoderma)</td><td>10g/kg seed</td><td>Seed treatment</td></tr>
<tr><td>Spacing (Row X plant) in cm</td><td colspan="3">30 x 10cm</td></tr>
<tr><td rowspan="3">Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc</td><td colspan="2">Source</td><td>Quantity/ha</td></tr>
<tr><td colspan="2">FYM</td><td>5.0 t/ha</td></tr>
<tr><td colspan="2">Vermicompost</td><td>2.5 t/ha</td></tr>
<tr><td rowspan="2">Top dressing of organic manures</td><td>Source</td><td>Quantity/ha</td><td>Days after sowing/planting or stage of crop</td></tr>
<tr><td>Cow urine fortified with Neem leaves (one kg green leaves/ 10 l of urine)</td><td>50 l/ha (10 % with 500 litre water /ha)</td><td>3-4 sprays at 15 days interval start from 20-25 days after transplanting</td></tr>
<tr><td rowspan="2">Irrigation practices</td><td>Number of irrigations</td><td>Most critical stages for irrigation</td><td>Depth of irrigation (cm)</td></tr>
<tr><td>1</td><td>Pre-flowering</td><td>2-3 cm</td></tr>
<tr><td>Major weeds</td><td colspan="3">Scientific Name English Name Local Name
Phalaris minor Bird’s seed grass Gehun ka mama
Chenopodium album Goose foot Bathua
Chenopodium murale Fat hen Karund
Melilotus alba White sweet clover Sufaid Senji</td></tr>
</table>

	Melilotusindica *Yellow sweeclover* *Zard Senji* *Fumaria perviflora* *Fumitory* *Jungli gazar* *Cynodon dactylon* *doob-ghas*		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	25 & 45 DAS	Stale bed preparation + 1 Hand weeding or one mechanical + 1 HW at 25 & 45 DAS	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Rust, Powdery Mildew, Blight	*Pseudomonas florescence* & *Trichoderma spp.*	Each @ 5g/L at the time of soil preparation, before and after flowering to control disease.
	Pea leaf minor, Pod borer	Cow urine fortified with Neem leaves (one kg green leaves/ 10.0 l of urine) or Cow urine + neem oil (10 % +1%)	50 l/ha (10 % with 500 litre water /ha). 50 litre cow urine + 5 litre neem oil/ha.
Optimum stage of harvesting (in case of vegetables and green cob)	90-100 days		

Yield and Economics

Parameters	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
Economic yield (kg/ha)	3408	3198	2573	2479	3393	3941	5534	6272	6320
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs.12.50 (2012-13)								
Cost of cultivation*(Rs/ha)	Rs.28408/ha (2012-13)								
Net returns* (Rs/ha)	Rs.50592/ha (2012-13)								

*based on prices of 2013-14

Crop *(Summer)*:*Sesbania*(Information has already been given in cropping system 1)

Glimpses

	
Treatment of lentil with Pant Bioagent-3 (mixture of *Pseudomonas* + *Trichoderma*)	**Vegetable pea under organic mode**

Cropping System 4: **Basmati rice- *Brassica napus -Sesbania***

Particulars	***Kharif***	***Rabi***	**Summer**
Crop	Basmati rice	*B.napus*	*Sesbania*
Fortnight of sowing/planting	Ist FN of June(sowing) IInd FN of June (Transplanting)	Ist FN of November (sowing)	Ist FN of May
Fortnight of harvesting	IInd FN of October (Harvesting)	Ist FN of April (Harvesting)	IInd FN of June (Harvesting)
Varieties suitable for organic farming	Pusa basmati-1	GLS-1	Pant Ses-1

Crop *(kharif)*:Basmati Rice (Information on rice has already been given in Cropping system-1)

Crop *(Rabi)*:*Brassica napus*

Important features of suitable varieties

Variety	GLS-1
Duration (days)	Medium (135-150days)
Average yield under organic condition (kg/ha)	956 kg/ha

Source (s) of availability	In-situ
Suitable regions/districts in the state	U.S.Nagar

Field preparation: After harvest of rice, **o**ne ploughing followed by two harrowing were done.

Cultural practices

Seed rate (kg/ha)	2-3 kg/ha		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Pant Bioagent-3 (Pseudomonas + Trichoderma)	10g/kg seed	Seed treatment
Spacing (Row X plant) in cm	30X20		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	10.0 t/ha	
	Vermicompost	5.0 t/ha	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	V.C.	5 t/ha	20 DAS
	FYM	10t/ha	Basal
	Cow urine fortified with Neem leaves (one kg green leaves/ 10 l of urine)	50 l/ha (10 % with 500 litre water /ha)	3-4 sprays at 15 days interval start from 20-25 days after transplanting
	Or Cow urine+ neem oil	10% + 1%	
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)

Major weeds	Scientific Name	English Name	Local Name
	Phalaris minor	Bird's seed grass	Gehun ka mama
	Chenopodium album	Goose foot	Bathua
	Lathyirus aphaca	Crow pea	Chatri-matri
	Convolvulus arvensis	Field binweed	Hiran khuri
	Melilotus alba	White sweet clover	
	Melilotusindica	Yellow sweeclover	Sufaid Senji
		Fumitory	

	Fumaria perviflora Anagallis arvensis Cynodon dactylon	Blue pimpernel	Zard Senji Jungli gazar Krishna –neel doob-ghas

Weed management	Critical stage of weeding	Recommended practice for organic condition
	20 & 40 DAS	Stale bed + 1Hand weeding or one mechanical weeding + 1 HW

Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Root rot, White rust, Downey mildew	*Pseudomonas florescence & Trichoderma spp.*	*each @ 5g/L at the time of soil preparation, before and after flowering to control disease.*
	Mustard Aphid, Mustard Saw fly	Cow urine fortified with Neem leaves (one kg green leaves/ 10.0 l of urine) or Cow urine + neem oil (10 % +1%)	50 l/ha (10 % with 500 litre water /ha). 50 litre cow urine + 5 litre neem oil/ha.

Yield and Economics

Parameters	**2004-05**	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
Economic yield (kg/ha)	342	300	603	785	840	915	1158	1777	1886
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs.31.3 (2012-13)								
Cost of cultivation*(Rs/ha)	Rs. 29664/ha (2012-13)								
Net returns* (Rs/ha)	Rs.29274/ha (2012-13)								

*based on prices of 2013-14

Crop *(Summer)*:*Sesbania*(Information has already been given in cropping system 1)

Glimpses

	
Treatment of mustard seed with Pant Bioagent-3 (mixture of *Pseudomonas* + *Trichoderma*)	**Mustard crop under organic mode**

Cropping System 5: **Basmati rice- chick pea under biodynamic practices**

Particulars	***Kharif***	***Rabi***	**Summer**
Crop	Basmati rice	Chickpea	*Sesbania*
Fortnight of sowing/planting	Ist fortnight of June(sowing) IInd fortnight of June (Transplanting)	IInd fortnight of November (sowing)	Ist fortnight of May
Fortnight of harvesting	IInd fortnight of October (Harvesting)	IInd fortnight of April (Harvesting)	IInd fortnight of June (incorporation)
Varieties suitable for organic farming	Pusa -1121	Pant Kabuli Chana-1	Pant Ses-1

Crop *(kharif)*:Basmati Rice

Important features of suitable varieties

Parameters	Pusa 1121
Duration (days)	Medium (135-140 days)
Average yield under organic condition (kg/ha)	3958 kg/ha
Source (s) of availability	In-situ organic field
Suitable regions/districts in the state	Udham Singh Nagar

Nursery raising practices

Area of nursery required for 1 ha	1000 m^2
Nursery raising method	Wet nursery
Bed size (length X breadth in	5m x 2m

m)			
Seed sowing rate/m^2	30 g		
Pre-sowing seed/soil treatment	Materials	Quantity/kg of seed or per m^2area	Method of application
	Common salt	1.65 kg salt/10 l of fresh water	Dipping the seeds
	Pant Bioagent-3(mixture of *Pseudomonas* &*Trichoderma)*	10g/kg seed	Seed treatment
Source and optimum quantity of organic manures/other nutrient source/m^2 of nursery	Materials	Quantity/ m^2area	Method of application
	Sesbania green manuring	1.0-1.5 kg	Incorporation in soil
	FYM	2.5 kg/m^2	broadcast
	Leachates of vermicompost + $ZnSO_4$	10% + 0.5 %	sprays at 10 & 20 days after sowing
Irrigation practices	3 irrigations		
Weed management	1 HW at 15 DAS		
Organic plant protection practices	Name of pest/disease	Recommended organic material used for control	
		Leacheate of Vermicompost + Cow urine (10 %) + Neem cake (10 %) or neem oil (1-2%)	
		Trichoderma + *Pseudomonas* (each @ 5g/l) after 15 days or Pant Bioagent-3 @ 10 g/l of water	
Optimum age of nursery (days)	20-25 days		

Field preparation: For transplanted rice, in-situ *Sesbania* green manure grown and incorporated with the help of mould board plough followed by two round of puddling by puddler. Soil application of PSF &*Trichoderma* each @ 5g/l or Pant Bioagent-3 @ 10 g/l of water (5.0 kg Pant Bio-agent-3 with 500 l water/ha) was done after incorporation of green manure at the time of soil preparation.

Cultural practices

Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	Pant Bioagent-3(*Pseudomonas*+ *Trichoderma)*	250 g/l water	Seedling treatment through root dipping
Spacing (Row X plant) in cm	20 x 10cm		
Number of seedlings/hill	2		

(in nursery crops only)			
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	Green manure	16-20 t/ha	
	Soil application of BD-500 FYM E.C	62.5g/ha 5t/ha 5t/ha	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/planting or stage of crop
	V.C.	2.5 t/ha	20 DAT
	N.C.	0.5 t/ha	20 DAT
	BD-501	2.5g/ha	Flowering & seed-setting stage(as per biodynamic calendar)
	CPP	2.5kg/ha	Flowering & seed-setting stage
	Panchgavya	@0.3% (1.5 l Panchgavya in 500 l of water)	Flowering & 15 days after flowering
	Cow urine fortified with Neem leaves (one kg green leaves/ 10 l of urine)	50 l/ha (10 % with 500 litre water /ha)	3-4 sprays at 15 days interval start from 20-25 days after transplanting
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	6-8	Transplanting, tillering, PI, flowering & grain filling	5.0-7.0 cm
Major weeds (give local, english and scientific name)	**Scientific Name**	**English Name**	**Local Name**
	Echinochloa colonum	Wild rice	Chotta sawan
	Echinochloa crusgalli	Banyard grass	Sawan
	Leptochloa chinensis		*American ghas*
	Cyperus rotundus	Purple nut sedge	Motha
	Cyperus iria	Yellow sedge	Motha
	Cyperus difformis	Common sedge	Motha
	Ec*lipta alba*	false daisy	Jal bhangra
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20 & 40 DAT	One mechanical weeding by	

		conoweeder 15 DAT followed by one or two hand weeding 25 & 45 DAT	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Yellow stem borer Leaf folder Brown plant hopper	Pheromone traps	20 traps/ha
		Cow urine fortified with Neem leaves (one kg green leaves/ 10.0 l of urine) or Cow urine + neem oil (10 % +1%)	50 l/ha (10 % with 500 litre water /ha). 50 litre cow urine + 5 litre neem oil/ha.
	Bacterial leaf blight Sheath blight Sheath rot Brown leaf spot	Cow urine fortified with Neem leaves (one kg green leaves/ 10.0 l of urine) + *Trichoderma* + *Pseudomonas* (each @ 5g/l) after or Pant Bioagent-3 @ 10 g/l of water	50 litre cow urine + 5 kg Pant Bio-agent 3 in 500 litre of water /ha

Yield and Economics

Parameters	**2009**	**2010**	**2011**	**2012***
Economic yield (kg/ha)	3598	3144	4555	4535
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs. 35.00 (2012)			
Cost of cultivation*(Rs/ha)	**Rs.26897(2012)**			
Net returns* (Rs/ha)	**Rs.131868(2012)**			

*based on prices of 2013-14

Crop *(Rabi)*:Chickpea

Important features of suitable varieties

Variety	Pant Kabuli Chana-1
Duration (days)	Medium (120-135)
Average yield under organic condition (kg/ha)	1809 kg/ha
Source (s) of availability	In-situ
Suitable regions/districts in the state	U.S.Nagar
Specific resistance / tolerance to disease	Resistant to botrytis grey mould

Field preparation: After harvest of rice, **o**ne ploughing followed by two harrowing was done.

Cultural practices

<table>
<tr><td>Seed rate (kg/ha)</td><td colspan="4">30 kg/ha</td></tr>
<tr><td rowspan="2">Pre-sowing/planting treatment of seed/seedlings</td><td>Material</td><td>Recommended rate (kg/ha or lit/ha)</td><td colspan="2">Method of application</td></tr>
<tr><td>Pant Bioagent-3 (mixture of Pseudomonas + Trichoderma)</td><td>10g/kg seed</td><td colspan="2">Seed treatment</td></tr>
<tr><td>Spacing (Row X plant) in cm</td><td colspan="4">30 x 10cm</td></tr>
<tr><td>Recommended NPK and micro nutrient dose for the crop (kg/ha)</td><td colspan="4">20:60:40 NPK</td></tr>
<tr><td rowspan="4">Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc</td><td colspan="3">Source</td><td>Quantity/ha</td></tr>
<tr><td colspan="3">Soil application of BD-500</td><td>62.5g/ha</td></tr>
<tr><td colspan="3">FYM</td><td>2.0 t/ha</td></tr>
<tr><td colspan="3">E.C</td><td>2.0 t/ha</td></tr>
<tr><td></td><td colspan="3">V.C.</td><td>1.0 t/ha</td></tr>
<tr><td></td><td colspan="3">N.C.</td><td>0.2t/ha</td></tr>
<tr><td rowspan="6">Top dressing of organic manures</td><td>Source</td><td colspan="2">Quantity/ha</td><td>Days after sowing/planting or stage of crop</td></tr>
<tr><td>BD-501</td><td colspan="2">2.5g/ha</td><td>Flowering & fruit-setting stage(as per biodynamic calendar)</td></tr>
<tr><td>CPP</td><td colspan="2">2.5kg/ha</td><td>Flowering & fruit-setting stage</td></tr>
<tr><td>Panchgavya</td><td colspan="2">@0.3% (1.5 l Panchgavya in 500 l of water)</td><td>Flowering & 15 days after flowering</td></tr>
<tr><td>Cow urine fortified with Neem leaves (one kg green leaves/ 10 l of urine)</td><td colspan="2">50 l/ha (10 % with 500 litre water /ha)</td><td>Two sprays at 30 and 60 days after sowing</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td rowspan="2">Irrigation practices</td><td>Number of irrigations</td><td colspan="3">Most critical stages for irrigation</td></tr>
<tr><td>1</td><td colspan="3">Flowering or pod formation</td></tr>
<tr><td>Major weeds</td><td colspan="4">Scientific Name English Name Local</td></tr>
</table>

	Name *Phalaris minor* Bird's seed grass Gehun ka mama *Chenopodium album* Goose foot Bathua *Chenopodium murale* *Fat hen* *Karund* *Melilotus alba* *White sweet clover* *Sufaid Senji* *Melilotusindica* *Yellowsweetclover* *Zard Senji* *Fumaria perviflora* *Fumitory* *Jungli gazar* *Vicia sativa* *Common vetch* *Choti phalli/Akra* *Anagallis arvensis* *Blue pimpernel* *Krishna - neel*		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	20 & 40 DAS	Stale bed + hand weeding	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Wilt, Blight	Cow urine + Pant Bioagent-3 (mixture of *Pseudomonas* + *Trichoderma*)	10% cow urine + 10 g/l of water (50 litre cow urine + 5 kg Pant Bio-agent 3 in 500 litre water/ha); 5-6 sprays are required in 15 days intervals
	Pod borer	Cow urine fortified with Neem leaves (one kg green leaves/ 10 l of urine)	
		HNPV	1.5 l/ha

Yield and Economics

Parameters	**2009-10**	**2010-11**	**2011-12**	**2012-13***
Economic yield (kg/ha)	1458	1335	2003	2440
Price (Rs/kg) (consider 25 % premium on prevailing market price)	Rs.52.5 (2012-13)			
Cost of cultivation*(Rs/ha)	Rs.28869 (2012-13)			
Net returns* (Rs/ha)	Rs.99231 (2012-13)			

***Consider last year yield and cost of cultivation of the crop for calculating the economics**

Crop *(Summer)*: ***Sesbania*** (Information has already been given in cropping system 1)

Glimpses

		
Incorporation of *Sesbania* Green manure		**Preparation of Panchgavya**

Kharif	***Rabi***	**Summer**
		
Organic Basmati rice (Var. Pusa 1121)	**Organic chickpea (var. Pant Kabuli chana-1)**	***Sesbania* green manure (Var. Pant Ses-1)**

Details of Specific Practices/products used/recommended
(Please give details of *panchagavya*, cow urine, BD preparation and any other ITK products including its method of preparation etc)

Neem fortified cow urine: Cow urine was fortified with neem leaves @ 1kg fresh neem leaves in 10 l of cow urine kept for 10 to 15 days. Alternately, 1% neem oil can also be used for the fortification of cow urine at the time of spraying.

***Panchgavya*:** Panchgavya is basically the mixture of five main ingredients *viz.*, cow dung, cow ghee, cow urine, cow milk and cow curd. In addition to above five ingredients, tender coconut water, jaggery and well ripened banana can also be used for its preparation. For preparation of panchgavya, mix cow dung (7kg) and cow ghee (1kg) in a wide- mouthed plastic can and should be mixed in morning and evening hours and kept for 3 days. After 3 days, mix cow urine (10 l) and water (10 l) and keep it for 15 days with regular mixing both in morning and evening hours. After 15 days, mix cow milk (3 l), cow curd (2 l), tender coconut water (3 l), Jaggery (3 kg) and well ripened banana (12 nos.) and container should be kept open under shade and stock Panchgavya solution will be ready after 30 days.

BD-500 (Cow horn Manure): It is basically fermented cow dung which is buried in September-November and lifted in February-March. For the preparation of BD-500, cow horns and fresh cow dung from a lactating cow is needed (average 50-150g dung/horn). For this burial pits were prepared (18 inches deep) and the pit area should not be subject to flooding, vigorous root systems or earthworms. Filled cow horns with cow dung in October-November were placed in burial pits, 1 inches apart with base downwards, surrounded with 50% compost and soil and bury for 4 to 6 months keeping the burial pit soil moist and shaded at temperature approximately 20^0C and free from weeds and earthworms. After 4 months, check for dung fermentation (if green cow dung has turned into dark, smooth earthy smelling humus) and lifted.

BD-501(Cow horn Silica): It is finely ground quartz crystals especially prepared. The crystals used should be of good quality, shape and clear. It is buried in the similar manner to preparation of BD-500 but this time buried during the summer time (April-May and lifted in September). For the preparation of BD-501, cow horns and silica quartz crystals are needed (average 200-300g powdered quartz crystals/horn). Silica quartz is crushed and grinded to make a fine powder between two plate glasses and moisten with water to make a stiff paste to fill the horns and buried in soil pit, 1 inch apart with base downwards surrounded with 50% compost and soil.

Cow Pat Pit (CPP): It is cow manure mixed with crushed egg shell and basalt dust, which is put into 12 inches deep pit lined with bricks. The dung is fermented, together with preparation 502-507 for a period of 3 to 4 months. When mature, it is mixed with water, @ 1 kg in 40 litres of water per acre (1 CPP pit is sufficient to cover 40 acres) and 60 kg of cow dung gives about 30-35 kg of CPP after fermentation. CPP is applied in the evening during the cooler months.