Package of Practices for Organic Production of Crops and Cropping Systems

ICAR-Network Project Organic Farming

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UTTAR PRADESH

Suggested cropping system (based on testing under NPOF)

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

Basmati rice

Particulars	*Kharif*
Crop	Basmati rice
Fortnight of sowing/planting	First fortnight of July
Fortnight of harvesting	First fortnight of November
Varieties suitable for organic farming	Basmati-370

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
	Trichoderma-harzianum	4 g/kg seed	
Source and optimum quantity of organic manures/other	Materials	Quantity/ m^2area	Method of application
nutrient source/m^2 of nursery	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	Source	Quantity/ha	
manures including soil	FYM	12 t/ha	
application of bio-fertilizers,	Azotobactor	10 kg/ha	
bio-control agents etc.	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^2area
	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 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

Parameters	1st year	2nd	3rd	4th	Mean
Economic yield (kg/ha)	2450	2818	3560	3740	3142

Glimpses

Organic Basmati rice

Wheat *(Rabi)*

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	Source	Quantity/ha	
manures including soil application of bio-fertilizers,	FYM Azotobactor	12 t/ha 10 kg/ha	

bio-control agents etc	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/ 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	
	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^{0}C 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^{0}C 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

Parameters	1st year	2nd	3rd	4th	Mean
Economic yield (kg/ha)	2662	3125	4070	4330	3547

Sesbania green manure (*Summer*)

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

Parameters	1st year*	2nd	Mean
Biomass production (kg/ha) on dry weight basis	52.4	51.1	51.8

Glimpses

Green manure incorporation

Sesbania green manure

Coarse rice

Particulars	*Kharif*
Crop	Coarse rice
Fortnight of sowing/planting	First fortnight of July
Fortnight of harvesting	First fortnight of November
Varieties suitable for organic farming	Saket-4

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
	Trichoderma-harzianum	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: First incorporation 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^2area
	Diseases		
	Seed borne diseases (Bacterial leaf blight, brown spot, blast, sheath blight)	Seed treatment with hot water	At 52^{0}C 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. 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 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

Parameters	1st year	2nd	3rd	4th	Mean
Economic yield (kg/ha)	3100	3875	4260	4470	3926

Barley + mustard (4:1) *(Rabi)*

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^{0}C 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^{0}C 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

Parameters	1st year	2nd	Mean
Economic yield (kg/ha) Barley + Mustard	2560+385	2830+334	2695+360

Glimpses

Barley + mustard intercropping

Green gram (*Summer*)

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	Source	Quantity/ha	
manures including soil	FYM	4 t/ha	
application of bio-fertilizers,	Rhizobium	10 kg/ha	

bio-control agents etc	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

Parameters	**1st year**	**2nd**	**3rd**	**4th**	**Mean**
Economic yield (kg/ha)	976	208	871	886	735

Maize (grain) (*Kharif*)

Particulars	*Kharif*
Crop	Maize
Fortnight of sowing/planting	First fortnight of July
Fortnight of harvesting	First fortnight of October
Varieties suitable for organic farming	Star-56

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	Source	Quantity/ha	
manures including soil	FYM	10 t/ha	
application of bio-fertilizers,	Azotobactor	10 kg/ha	
bio-control agents etc	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	4.0 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 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

Yield

Parameters	1st year	2nd	3rd	Mean
Economic yield (kg/ha)	4380	4860	4590	4610

Glimpses

Organic maize

Organic maize cobs

Potato *(Rabi)*

Important features of suitable varieties

Parameters	Chipsona-2	Mid duration Chipsona-3	Kufri Pukhraj	Early Kufri Ashoka	Kufri Chandramukhi
Duration (days)	90-110		70-90	70-80	80-90
Parameters	**Chipsona-2**	**Mid duration Chipsona-3**	**Kufri Pukhraj**	**Early Kufri Ashoka**	**Kufri Chandramukhi**
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	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	Source	Quantity/ha	
manures including soil	FYM	15 t/ha	
application of bio-fertilizers,	Azotobactor	10 kg/ha	
bio-control agents etc	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

Parameters	1st year	2nd	3rd	4th	Mean
Economic yield (kg/ha)	9430	12083	21300	22300	16278

Glimpses

Organic potato var. Chiopsona- 3

Organic potato var. Chiopsona- 3

Okra *(Summer)*

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	Source	Quantity/ha	
manures including soil	FYM	12 t/ha	
application of bio-fertilizers,	Rhizobium	10 kg/ha	
bio-control agents etc	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

Parameters	1st year	2nd	3rd	4th	Mean
Economic yield (kg/ha)	4551	1558	10280	10530	6730

Glimpses

Okra var. Arka Anamika

Maize (green cobs)

Particulars	***Kharif***
Crop	Maize (green cobs)
Fortnight of sowing/planting	First fortnight of July
Fortnight of harvesting	First fortnight of October
Varieties suitable for organic farming	Star-56

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

Seed rate (kg/ha) (Not applicable for nursery crops)	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 manures	Source	Quantity/ha	Days after 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 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

Parameters	1st year	2nd	3rd	Mean
Economic yield (kg/ha)	9160	9060	8860	9027

Glimpses

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Mustard + radish (1:2) (*Rabi*)

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	Material of seed/seedlings	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 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	4.83 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, Downey mildew	Early sowing	By first fortnight of October
	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	Mean
Economic yield (kg/ha)	145+9580	6940+14200	6420+14620	4502+12800

Sesbania green manure (*Summer*)

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

Parameters	1st year*	2nd year	Mean
Biomass production (kg/ha) on dry weight basis	56.2	52.8	54.5