

# **Package of Practices for Organic Production of Crops and Cropping Systems**

**ICAR-Network Project Organic Farming**



**ICAR-Indian Institute of Farming Systems Research  
Modipuram, Meerut - 250 110 (UP)  
Phone: 0121-2888548; E-mail: [directoriifsr@yahoo.com](mailto:directoriifsr@yahoo.com)  
[www.iifsr.res.in](http://www.iifsr.res.in)**



## MAHARASHTRA

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

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

### Details of crops in cropping systems

#### Rice (*Kharif*)

Particulars	<i>Kharif</i>
Crop	Rice
Fortnight of sowing/planting	Nursery Sowing-Second fortnight of June Transplanting- Second fortnight of July
Fortnight of harvesting	Second fortnight of October
Varieties suitable for organic farming	Karjat-3, Karjat-4, Karjat-7 and Palghar-1

### 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 <i>Kharif</i> and <i>Rabi</i> seasons in Maharashtra.	Suitable for rainfed uplands as well as irrigated areas for <i>Kharif</i> and <i>Rabi</i> seasons in <i>Konkan</i> region of Maharashtra.	Suitable for rainfed uplands and irrigated transplanted conditions in Maharashtra State.	<i>Konkan</i> 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 <sup>2</sup> )		
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 <sup>2</sup>	45 to 50 g/m <sup>2</sup>		
Pre-sowing seed/soil treatment	Materials	Quantity/kg of seed or per m <sup>2</sup> area	Method of application
	<i>Trichoderma</i>	5g/kg of seed	Seed treatment
Source and optimum quantity of organic manures/other nutrient source/m <sup>2</sup> of nursery	Materials	Quantity/m <sup>2</sup> area	Method of application
	FYM	3 kg/m <sup>2</sup> area	Soil incorporation before nursery sowing
Irrigation practices	Rainfed		
Weed management	Mulching of <i>Glyricidia</i> green leaves and manual hand weeding		
Organic plant protection practices	Name of pest/ disease	Recommended organic material used for control	Quantity/m <sup>2</sup> 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 manured 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 <i>Azospirillum</i>	PSB 2.5 kg + <i>Azospirillum</i> 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	5000 kg /ha before puddling	
	Neem cake	500 kg /ha before puddling	
	<i>Glyricidia</i> 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
2.	Vermiwash	50 lit/ha	days after transplanting
Irrigation practices	Rainfed during <i>Kharif</i> and canal irrigation during <i>Rabi</i>		
Major weeds	<i>Echinochloa crusgalli</i> (Phakhad), <i>Echinochloa colonum</i> (Phakhad), <i>Cyperus iria</i> (Lavala), <i>Cyperus rotundus</i> (Lavala) and <i>Ischane globossa</i> (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	<ul style="list-style-type: none"> <li>• Ploughing and collection of stubbles and their composting after harvesting of rice.</li> <li>• Use of tolerant and resistant varieties.</li> <li>• Crop rotation with ground nut, <i>Dolichos</i> bean, cucumber and red pumpkin.</li> <li>• Harvesting of rice close to the ground with <i>Vibhav</i> sickle developed by DBSKKV; Dapoli to kill the hibernating larvae.</li> <li>• Use of pheromone traps @20 Nos./ ha</li> <li>• Release of <i>Trichogramma</i> @ 50000/ ha for 4 times.</li> <li>• Collection of egg masses and their destruction.</li> <li>• Conservation and preservation of frogs in the field</li> </ul>
	Case worm	<ul style="list-style-type: none"> <li>• Timely transplanting</li> <li>• Intermittent draining out water from the field</li> <li>• Flooding the field followed by dragging a rope across the field and draining out the water from the field</li> </ul>
	Brown Plant Hoppers (BPH), White Backed Plant Hoppers (WBPH) and Blue beetle	<ul style="list-style-type: none"> <li>• Use of tolerant and resistant varieties.</li> <li>• Intermittent draining out water from the field</li> </ul>



	Army worm	<ul style="list-style-type: none"> <li>• Judicious use of nitrogenous fertilizers.</li> <li>• Adoption of proper spacing (20x15cm)</li> <li>• Formation of alley ways for every three meters for penetration of sunlight and proper aeration</li> <li>• Deep ploughing after harvesting of crop to expose the hibernating stages of pest.</li> <li>• Everyday inspection of the field during dry spell and at maturity.</li> <li>• Keeping the bunds clean and free of weed in the beginning of the season.</li> <li>• Digging the trench and flooding it with water for preventing migration of larvae from one field to another field.</li> <li>• Erection of bird perches.</li> <li>• Harvesting the crop immediately after it attains the maturity.</li> <li>• Conservation and preservation of frogs in the field.</li> </ul>
Diseases	Leaf eating caterpillars Blast and sheath rot	<ul style="list-style-type: none"> <li>• Erection of bird perches.</li> <li>• Use of tolerant and resistant varieties.</li> <li>• Spraying of <i>Pseudomonas fluorescense</i> @ 8-10 g / lit of water [for 2-3 times] starting from maximum tillering to flowering stage.</li> </ul>
	Bacterial leaf blight	<ul style="list-style-type: none"> <li>• Use of tolerant and resistant varieties.</li> <li>• Intermittent draining out water from the field.</li> <li>• Judicious use of nitrogenous fertilizers.</li> <li>• Adoption of proper spacing (20x15cm)</li> </ul>

### Economic yield (kg/ha)

Cropping systems	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14		Mean
							Grain	Straw	
Rice-Groundnut	1960	2873	3150	3543	3411	3842	3418	4032	3279
Rice- <i>Dolichos</i> bean	3148	2050	3940	2700	2780	3558	3324	3921	3178
Rice-Cucumber	2650	945	4175	3728	3565	3414	-	-	3225
Rice-Red pumpkin	3050	1260	4253	3676	3445	3236	-	-	3253





## Groundnut (*Rabi*)

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 <i>tikka</i> (leaf spot) and rust	Tolerant to <i>tikka</i> (leaf spot) and rust	Tolerant to <i>tikka</i> (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
	<i>Trichoderma</i>	5g/kg of seed	Seed treatment
	<i>Rhizobium</i> 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
2.	Vermiwash	50 lit/ha	60 days after sowing
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	<i>Physalis minima</i> (Ranpopati), <i>Portulaca oleracea</i> (Motha ghol), <i>Alternanthera sessilis</i> (Reshimkata), <i>Blumea lacera</i> (Bhamrud) and <i>Amaranthus viridis</i> (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
	<i>Tikka</i> (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	<ul style="list-style-type: none"> <li>• General yellowing of crop.</li> <li>• Blackening of inside portion of shell.</li> <li>• Development of ridges on pod</li> <li>• Colour development of kernel as per varietal character.</li> </ul>		

## Yield

Parameters	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Mean
Economic yield (kg/ha)	1671	3395	3648	2881	2584	2546	1876	2657





## Dolichos bean (*Rabi*)

Particulars	<i>Rabi</i>
Crop	<i>Dolichos</i> bean
Fortnight of sowing/planting	Sowing - Second fortnight of December
Fortnight of harvesting	First fortnight of February to second fortnight of March
Varieties suitable for organic farming	Konkan Bhushan

### Important features of suitable varieties: Konkan Bhushan

Parameters	Variety : <i>Konkan Bhushan</i>
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
	<i>Trichoderma</i>	5g/kg of seed	Seed treatment
	<i>Rhizobium</i> 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,	Source	Quantity/ha	
	FYM	4000 kg/ha	
	Neem cake	390 kg/ha	





bio-control agents etc.	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
2.	Vermiwash	50 lit/ha	60 days after sowing
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	<i>Physalis minima</i> (Ranpopati), <i>Portulaca oleracea</i> (Motha ghol), <i>Alternanthera sessilis</i> (Reshimkata), <i>Blumea lacera</i> (Bhamrud) and <i>Amaranthus viridis</i> (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 neemicide	3ml/lit
	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 to 100 days after sowing		

## Yield

Parameters	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	Mean
Economic yield (kg/ha)	5024	2998	3017	1904	4949	5627	4974	4070





## Cucumber (*Rabi*)

Particulars	<i>Rabi</i>
Crop	Cucumber
Fortnight of sowing/planting	Sowing – First fortnight of January
Fortnight of harvesting	First fortnight of March to first fortnight of April
Varieties suitable for organic farming	Hemangi and Sheetal

### Important features of suitable varieties: Hemangi and Sheetal

Parameters	Variety	
	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
	<i>Trichoderma</i>	5g/kg of seed	Seed treatment
	<i>PSB</i>	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 12 irrigations	Most critical stage of irrigation 12 irrigations at an interval of 7-8 days	Depth of irrigation (cm) 72 cm (6 cm/irrigation)
Major weeds	<i>Physalis minima</i> (Ranpopati), <i>Portulaca oleracea</i> (Motha ghol), <i>Alternanthera sessilis</i> (Reshimkata), <i>Blumea lacera</i> (Bhamrud) and <i>Amaranthus viridis</i> (Ranti math)		
Weed management	Critical stage of weeding 30-60 DAS	Recommended practice for organic condition Hand weeding	
<b>Organic plant protection practices</b>	<b>Name of the pest/disease</b>	<b>Organic material recommended for control</b>	<b>Quantity (kg or liters/ha)</b>
Insect pests	Red pumpkin beetle	• Application of neemicide.	3ml/lit
	Fruit fly	• Erection of <i>Rakshak</i> 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

Parameters	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Mean
Economic yield (kg/ha)	6044	8507	5509	5919	11357	12537	8312





## Red pumpkin

Particulars	Rabi
Crop	Red pumpkin
Fortnight of sowing/planting	Sowing – First fortnight of January
Fortnight of harvesting	First fortnight of April
Varieties suitable for organic farming	MPH-1

### 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
	<i>Trichoderma</i>	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	<i>Physalis minima</i> (Ranpopati), <i>Portulaca oleracea</i> (Motha ghol), <i>Alternanthera sessilis</i> (Reshimkata), <i>Blumea lacera</i> (Bhamrud) and <i>Amaranthus viridis</i> (Ranti math)		
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	30-60 DAS	Hand weeding	
<b>Organic plant protection practices</b>	<b>Name of the pest/ disease</b>	<b>Organic material recommended for control</b>	<b>Quantity (kg or liters/ha)</b>
Insect pests	Red pumpkin beetle	• Spraying of neemicide	3ml/lit
	Fruit fly	• Erection of <i>Rakshak</i> 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

Parameters	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Mean
Economic yield (kg/ha)	17421	3369	11024	8450	12561	12726	10925

