Maharashtra

Package of practices for Organic Crop Production

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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