

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

**ICAR-Network Project Organic Farming**



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## HIMACHAL PRADESH

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

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

### Details of crops in cropping systems

#### Maize (*Kharif*)

Particulars	<i>Kharif</i>
Crop	Maize
Fortnight of sowing/planting	June
Fortnight of harvesting	October
Varieties suitable for organic farming	Girija

### Important features of suitable varieties

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

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



## Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	20-25		
Spacing (Row × plant) in cm	60 × 20		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	16 t	
	VC	12 t	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/ planting or stage of crop
	Cow urine	60 L/600 L water/ha	30, 45, 60,90 DAS
	Panchagavaya	18 L/600 L water/ha	60,90 DAS
	Vermiwash	60 L/600 L water/ha	60,90 DAS
Irrigation practices	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	4-5	3-4 leaf stage, tasseling, grain filling etc.	4-5
Major weeds	Local name	Common name	Scientific name
	Doob grass	-	<i>Cynadon dactylon</i>
	Motha	Purple nutsedge	<i>Cyperus spiefes</i>
	Baru	Johnson grass	<i>Sorghum halepense</i>
	Jhanda	Water grass	<i>Echinochloa colonum</i>
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	4 leaf stage, 1 month after first weeding and at taselling	Manual	



Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Cut-worms	Through cultural practices like flood irrigation and formation trenches around the field	4- 5 flood irrigations and digging trench of size 20 cm deep and 20 cm wide
Optimum stage of harvesting	When the cob covering turns brown and the moisture in cobs is near 30%		

### Yield

Parameters	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Mean
Economic yield (kg/ha)	3143	2823	3030	3572	3800	5950	6018	5654	7440	4603

### Glimpses



Organic maize



Organic maize growth stage

## Garlic (*Rabi*)

### Important features of suitable varieties

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

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

### Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	500-600		
Spacing (Row × plant) in cm	20 × 10		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	22 t	
	VC	16 t	
Top dressing of organic manures	Rock phosphate	100 kg	
	Source	Quantity/ha	Days after sowing/ planting or stage of crop
	Cow urine	60 L/600 L water/ha	30, 45, 60,90, 120 DAS
Irrigation practices	Panchagavaya	18 L/600 L water/ha	60,90, 120 DAS
	Vermiwash	60 L/600 L water/ha	60,90, 120 DAS
	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	5-6	15 DAS, 3 leaf, initiation of clove formation, 30 days before harvesting	4-5
Major weeds	Local name	Common name	Scientific name
	Jaldhar	Corn Butter Cup	<i>Ranunculus arvensis</i>



	Poa grass	Annual blue grass	<i>Poa annua</i>
	Maina/Khukhni	Bur clover	<i>Medicago denticulate</i>
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	3 leaf, clove formation, 35 days before harvesting	Manual	
Organic plant protection practices	Name of pest/disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Purple Blotch	Cow urine+ Butter milk	30 L/300 L water/ha+30 L/300 L water/ha
	Stemphylium blight	<i>Trichoderma viride</i> + <i>Pseudomonas fluorescence</i>	0.30 gm/m <sup>2</sup> each
Optimum stage of harvesting	When leaf colour changes to yellow and starts drying		

### Yield

Parameters	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Mean
Economic yield (kg/ha)	6082	4420	4600	9000	9640	9640	8644	10840	9450	6964

### Glimpses



Organic garlic



Organic Chickpea pod setting stage

## Cauliflower (*Kharif*)

Particulars	<i>Kharif</i>
Crop	Cauliflower
Fortnight of sowing/planting	August
Fortnight of harvesting	October
Varieties suitable for organic farming	Hybrid- Swati

## Important features of suitable varieties

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

## Nursery raising practices

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





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	5 kg	Basal application
	VC	2 kg	-do-
Irrigation practices	Watering can		
Weed management	Manual		
Organic plant protection practices	Name of pest/ disease	Recommended organic material used for control	Quantity/ m <sup>2</sup> area
	Blight/leaf spot	<i>Trichoderma virde</i> + <i>Pseudomonas fluorescence</i>	0.30 gm/m <sup>2</sup> each
	Black rot	<i>Trichoderma virde</i> + <i>Pseudomonas fluorescence</i>	0.30 gm/m <sup>2</sup> each
	Curd rot	<i>Trichoderma virde</i> + <i>Pseudomonas fluorescence</i>	0.30 gm/m <sup>2</sup> each
Optimum age of nursery (days)	38		

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

### Cultural practices

Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	<b>Seedling treatment</b>		
	<i>Trichoderma virde</i>	3kg/ha	Root dip
	<i>Pseudomonas fluorescence</i>	3kg/ha	Root dip
Spacing (Row × plant) in cm	60 × 45		







Number of seedlings/ kanal (400m <sup>2</sup> )	1480		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	22 t	
	VC	16 t	
Top dressing of organic manures	Rock phosphate	100 kg/ha	
	Source	Quantity/ha	Days after sowing/ planting or stage of crop
	Cow urine	60 L	15, 30, 45, 60 DAT
	Panchagavya	18L	30, 45, 60 DAT
Irrigation practices	Vermi wash-10%	60 L/600 L water/ha	30, 45, 60 DAT
	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
Major weeds	4-5	Transplanting and curd formation	4-5 cm
	Local name	Common name	Scientific name
	Jhanda	Water grass	<i>Echinochloa colonom</i>
	Chhoti Jhan	Yellow foxtail	<i>Setaria glauca</i>
	Motha	Purple nutsedge	<i>Cyperus sp.</i>
Weed management	Ragi/Mandal	Goose grass	<i>Eleusine indica</i>
	Critical stage of weeding	Recommended practice for organic condition	
	2-3 (4 leaf stage, 2 times before curd formation)	Manual	
Organic plant protection practices	Name of pest/ disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	1. <i>Lepidopeterus</i> larvae	Delta Sticky Traps having DBM (Diamond Back Moth) lure to be installed	25traps/ha



		immediately after transplanting
	2. Aphids	No need as the population remains below Economic Injury Level
Optimum stage of harvesting (in case of vegetables and green cob)	When curds become compact and gain proper shape	

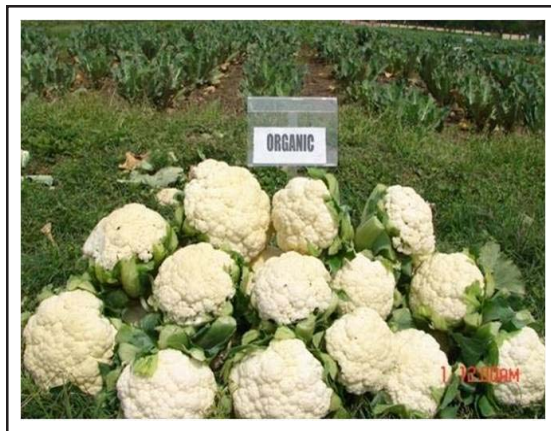
### Yield

Parameters	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Mean
Economic yield (kg/ha)	10670	9660	8330	9523	7570	7360	8852

### Glimpses



Organic cauliflower crop



Organic cauliflower curds

## Pea (*Rabi*)

### Important features of suitable varieties

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

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

### Cultural practices

Seed rate (kg/ha) (Not applicable for nursery crops)	75		
Pre-sowing/planting treatment of seed/seedlings	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	<b>Soil treatment</b>		
	<i>Trichoderma virde</i>	3.75 kg/ha	Broadcast
	<b>Seed Treatment</b>		
	<i>Trichoderma virde</i>	3.75 kg/ha	Seed coating of each
	<i>Pseudomonas fluorescence</i>	3.75 kg /ha	
Spacing (Row × plant) in cm	60 × 10		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	4.34t	
	VC	3.2t	
	Rock phosphate	87kg	
Top dressing of organic manures	Source	Quantity/ha	Days after sowing/ planting or stage of crop





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



**Economic yield (kg/ha)**

Year	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Mean
Cauliflower-Pea-Tomato	10820	11290	5230	7420	10185	8700	8941
Corainder-Pea-Tomato			6485	5941	7150	4248	5956

**Glimpses**



Organic pea green crop



Organic pea green pods



Organic pea green pods



## Tomato (*Summer*)

### Important features of suitable varieties

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

### Nursery raising practices

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





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	2 kg	Basal application
	VC	1 kg	-do-
Irrigation practices	Watering can		
Weed management	Manual		
Organic plant protection practices	Name of pest/ disease	Recommended organic material used for control	Quantity/ m <sup>2</sup> area
	Blights/leaf spots/fruit rots	<i>Trichoderma viride</i> + <i>Pseudomonas fluorescence</i>	0.30 gm/m <sup>2</sup> each
	Wilt/root/collar rot	<i>Trichoderma viride</i> <b>as soil treatment</b>	3.75kg/m <sup>2</sup>
	Wilt/root/collar rot	<i>Trichoderma viride</i> + <i>Pseudomonas fluorescence</i> <b>as foliar spray</b>	0.30 gm/m <sup>2</sup> each
Optimum age of nursery (days)	32		

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

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

### Cultural practices

Pre-sowing/planting treatment of seed/seedlings(only using organic inputs such as bio-fertilizer, bio-control agents, cow urine, panchagavya etc)	Material	Recommended rate (kg/ha or lit/ha)	Method of application
	<i>Trichoderma viride</i> + <i>Pseudomonas fluorescence</i>	3.75kg/ha each	Basal application





Spacing (Row × plant) in cm	60 × 45		
Number of seedlings/ kanal (400m <sup>2</sup> )	1480		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	17.4 t	
	VC	12.8 t	
Top dressing of organic manures	RP	100 kg	
	Source	Quantity/ha	Days after sowing/ planting or stage of crop
	Cow urine	60 L/600 L water/ha	15, 30, 45, 60 DAT
	Panchagavya	18L	15, 30, 45, 60 DAT
Irrigation practices	Vermiwash	60 L/600 L water/ha	15, 30, 45, 60 DAT
	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	3-4	Transplanting, flowering and fruit setting	4-5
Major weeds	Local name	Common name	Scientific name
	Kulfa	Purslane	<i>Portulaca oleracea</i>
	Tipatia/khatibuti	Wood sorrel	<i>Oxalis latifolia</i>
	Poa grass	Annual blue grass	<i>Poa annua</i>
	Peeli buti	-	<i>Gallinsoga parviflora</i>
Weed management	Critical stage of weeding	Recommended practice for organic condition	
	After 2-3 weeks of transplanting and thereafter 45 and 60 DAT	Manual	
Organic plant protection practices	Name of pest/ disease	Organic material recommended for control	Quantity (kg or litres/ ha)
	Fruit borer	i) Lipel/Dipel ( <i>Bacillus thuringiensis sp. kurstaki</i> )	Lipel @ 1.0 kg/ha or Dipel 1.0 L/600 L/ water/ha





	ii) Neemban(0.15%)	3L/600 L water/ ha
	iii) Margosom (Azedarachtin 1.0%)	0.6L/600 L water/ ha
	iv) *Darek (Melia <i>azedarach</i> ) or Karvi ( <i>Roylea cinerea</i> ) or kali basuti ( <i>Eupatorium</i> ) 5% aqueous leaf extract + cow urine 3% + emulsifier TritonX- 100 (0.05%)	3L/600 L water/ ha
Optimum stage of harvesting	When ¼ <sup>th</sup> lower part of tomato fruit turns red.	

### Economic yield (kg/ha)

Cropping systems	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Mean
Cauliflower-Pea-Tomato	14970	15620	18580	1993	3700	7600	10411
Corainder-Pea-Tomato			24635	8086	3328	8555	11151

### Glimpses



Organic tomato crop



Organic tomato fruits



## Coriander (*Kharif*)

Particulars	<i>Kharif</i>
Crop	Coriander
Fortnight of sowing/planting	August
Fortnight of harvesting	September
Varieties suitable for organic farming	Mediterranea- Hybrid

### Important features of suitable varieties

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

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

### Cultural practices

Seed rate (kg/ha)	20 kg		
Spacing (Row × plant) in cm	30 x 5		
Basal application of organic manures including soil application of bio-fertilizers, bio-control agents etc	Source	Quantity/ha	
	FYM	13 t	
	VC	8 t	
Top dressing of organic manures	Rock phosphate	65 kg/ha	
	Source	Quantity/ha	Days after sowing/ planting or stage of crop
	Cow urine	60 L	30, 45, 60 DAS
	Bio dynamic (501)	2.5 g/40 L/ha	45 and 60 DAS
Irrigation practices	Panchagavya	18L	30, 45, 60 DAS
	Number of irrigations	Most critical stages for irrigation	Depth of irrigation (cm)
	5-6	-	4-5 cm



Major weeds	Local name Jhanda	Common name Water grass	Scientific name <i>Echinochloa colonum</i>
	Chhoti Jhan	Yellow foxtail	<i>Setaria glauca</i>
Weed management	Critical stage of weeding 2-3	Recommended practice for organic condition Manual	
Organic plant protection practices	Name of pest/disease  No insect-pest problem found, hence no need of plant protection practices	Organic material recommended for control	Quantity (kg or litres/ ha)
Optimum stage of harvesting	After 4-5weeks, twice at 15-20 days interval		

### Yield

Parameters	2009-10	2010-11	2011-12	2012-13	Mean
Economic yield (kg/ha)	6396	9523	3512	6596	6433

### Glimpses



Organic green coriander crop



Harvested organic coriander

### Glimpses (Photos) of Organic Production



FYM



Vermicompost



Vermiwash as nutrient supplement



Pheromone trap



Water trap



Yellow sticky trap



Leaf extract-*Roylea cinerea*



Leaf extract-*Melia azedarach*



*Trichoderma*, *Pseudomonas* & Lipel



Neembaan



5% Melia, 1% Morgosom and 5% Eupatorium