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Maize



Sorghum



Cumbu



Ragi

**Minor Millets**

Panivaragu



Samai



Tenai



Varagu



Kudiraivali





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## Crop Production :: Maize

### Maize (*Zea mays L.*)

#### Videos on Maize NEW

- [Maize growing districts of Tamil Nadu](#)
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Updated on May 2023



**TNAU AGRITECH PORTAL**




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**Season and Varieties :: Maize**

### MAIZE - Season and Varieties

#### SEASON AND VARIETIES

S.No.	Agro ecological zones	Districts	Season	Maize Single Cross Hybrids
	Irrigated: June - July (Aadi Pattam), Nov - Dec (Karthigai Pattam), Jan – Feb (Thai pattam), April – May (Chittirai pattam) Rainfed: Sep - Oct (Puratassi Pattam)			
1.	<b>North Eastern Zone</b>	Villupuram, Vellore, Thiruvallur, Ranipet, Thiruvannamalai, Cuddalore, Thirupathur, Kallakurichi	June – July (Aadi pattam) Sep – Oct (Puratassi pattam) Nov – Dec (Karthigai pattam) Jan- Feb (Thai pattam),	(please click here Season and Varieties) <b>COH(M) 6, COH(M) 8, COH(M) 11</b>
2.	<b>North Western Zone</b>	Salem, Namakkal, Dharmapuri, Krishnagiri	June – July (Aadi pattam) Sep- Oct (Puratassi pattam) Nov – Dec (Karthigai pattam) Jan- Feb (Thai pattam)	
3.	<b>Western Zone</b>	Coimbatore, Thiruppur, Dindigul, Erode, Karur	June – July (Aadi pattam) Sep- Oct (Puratassi pattam) Nov-Dec (Karthigai pattam) Jan- Feb (Thai pattam)	
4.	<b>Cauvery Delta Zone</b>	Trichy, Perambalur, Ariyalur (New Delta) Thanjavur, Thiruvarur, Mayiladuthurai (*Delta),	June – July (Aadi pattam) Sep- Oct (Puratassi pattam) Nov-Dec (Karthigai pattam) Jan- Feb (Thai pattam) Apr – May (Chittirai pattam)*	
5.	<b>Southern Zone</b>	Pudukkottai, Madurai, Dindigul, Theni, Virudhunagar Sivagangai, Ramanathapuram, Tenkasi, Thirunelveli and Thoothukudi	June – July (Aadi pattam) Sep- Oct (Puratassi pattam) Nov-Dec (Karthigai pattam) Jan- Feb (Thai pattam)	

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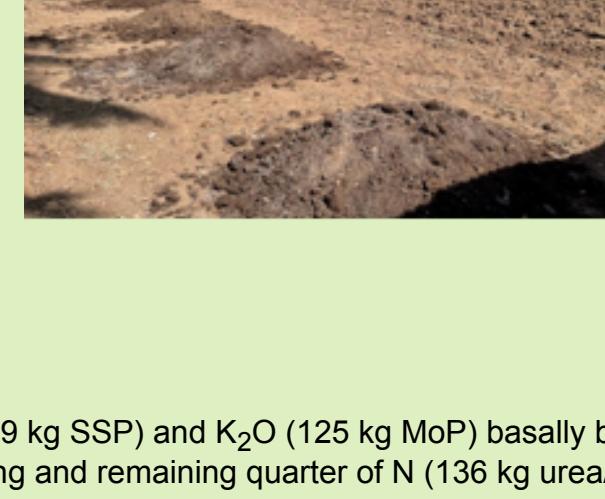
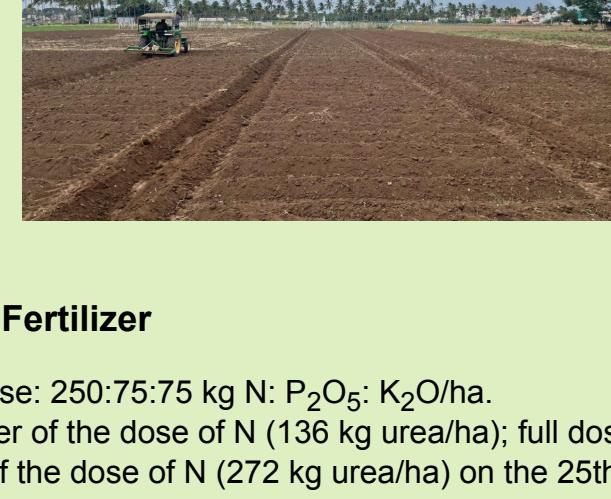
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### Irrigated Maize

#### Field Preparation

- Plough the field thoroughly with disc or mould board plough once followed by cross ploughing with cultivator to get fine tilth.
- Apply 12.5 t/ha of FYM or compost with 10 packets of Azospirillum (2000 g/ha) before last ploughing.
- Form ridges and furrows using bund former or ridge plough with 6 m long and 60 cm apart.



#### Application of Fertilizer

- Fertilizer dose: 250:75:75 kg N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O/ha.
- Apply quarter of the dose of N (136 kg urea/ha); full dose of P<sub>2</sub>O (469 kg SSP) and K<sub>2</sub>O (125 kg MoP) basally before sowing.
- Place half of the dose of N (272 kg urea/ha) on the 25th day of sowing and remaining quarter of N (136 kg urea/ha) on the 45th day of sowing.
- Apply TNAU MN mixture @ 30 kg/ha as enriched FYM (Prepare enriched FYM at 1:10 ratio and incubate for one month under shade).

**Sulphur deficiency :** Apply 40 kg sulphur as elemental sulphur along with FYM for calcareous soils.

#### Micronutrient deficiency

##### Zinc

- Apply 50 kg FeSO<sub>4</sub> along with FYM for calcareous soils.
- Apply 12.5 kg of micronutrient mixture formulated by the Department of Agriculture, Tamil Nadu mixed with 37.5 kg of sand.
- Apply 50 kg FeSO<sub>4</sub> + 12.5 t FYM ha<sup>-1</sup> along with 40 kg of elemental sulphur for calcareous soils.

##### Iron

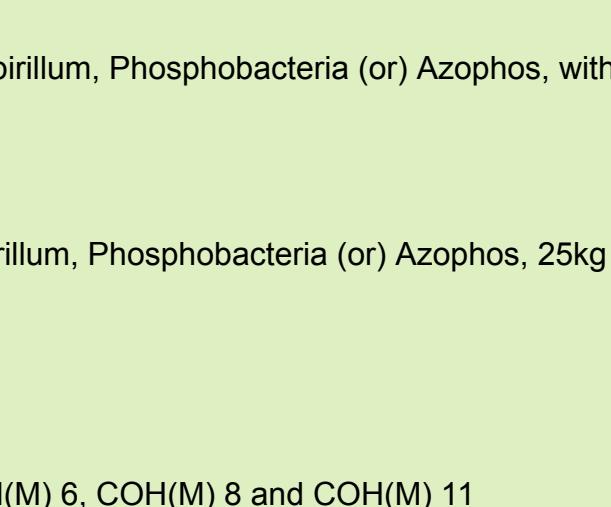
- Maize is milled by a dry or wet process. In both processes, the germ is separated from the grain in order to extract and recover germ oil. The germ oil is a valuable product, but if allowed to remain a constituent of maize meal would lead to the development of rancidity.

##### Boron

- Apply 10 kg borax along with FYM for specific respective nutrient deficiency in soils.

#### Soil test crop response –

#### IPNS based fertilizer recommendation for hybrid maize (Irrigated) ---([Please Click Here](#))



#### Biofertilizer application:

##### Powder formulation

- Two kgs each of biofertilizers viz., Azospirillum, Phosphobacteria (or) Azophos, with 25kg of FYM and 25kg of sand and broad cast uniformly at the time of last ploughing

##### Liquid Formulation:

- 500 ml each of biofertilizers viz., Azospirillum, Phosphobacteria (or) Azophos, 25kg of FYM and 25kg of sand and broad cast uniformly at the time of last ploughing

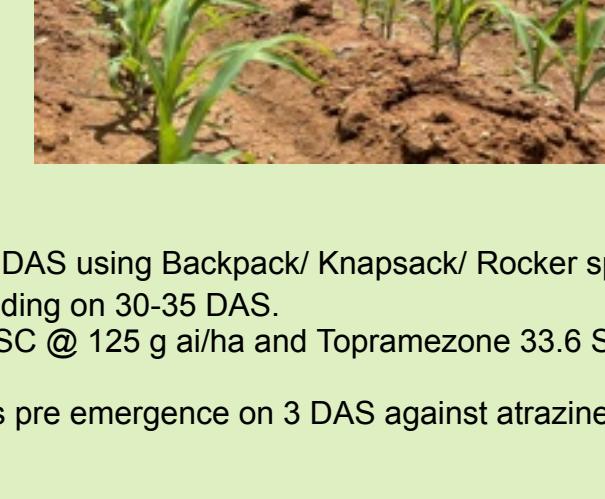
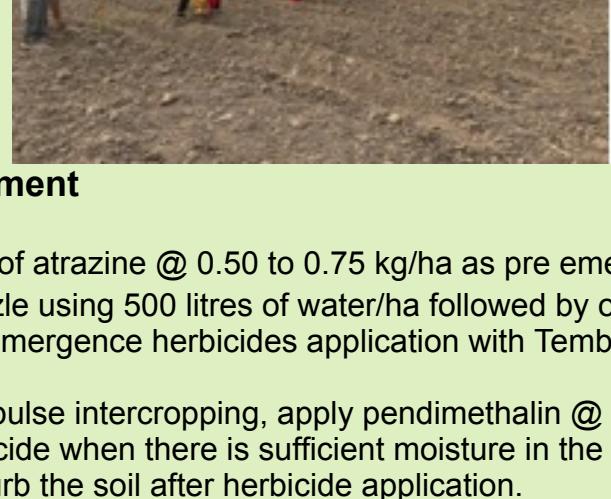
#### Seeds and Sowing

**Seed Rate:** 20 kg/ha for Maize hybrids COH(M) 6, COH(M) 8 and COH(M) 11

#### Seed treatment:

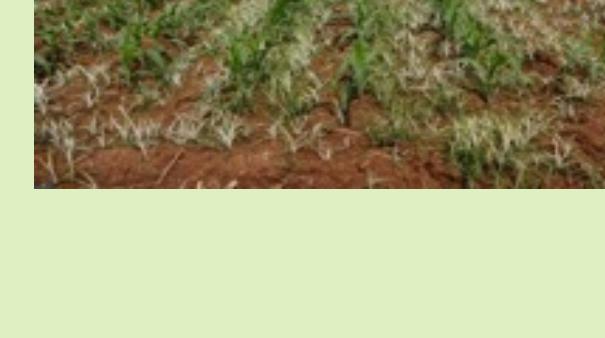
**Powder formulation:** Treat the seeds required for one hectare with 1 kg each of biofertilizers viz., Azospirillum, Phosphobacteria, (or) Azophos, using rice gruel, shade dry for 30 minutes before sowing.

**Liquid Formulation:** Treat the seeds required for one hectare with 125 ml of each biofertilizers viz., Azospirillum, Phosphobacteria (or) Azophos, shade dry for 30 minutes before sowing. Spacing: 60 cm X 25 cm



#### Sowing

- Dibble the seeds at a depth of 4 cm along the furrow in which fertilizers are placed and cover with soil.
- Put one seed per hole if the germination is assured otherwise put two seeds per hole



#### Weed management

- Application of atrazine @ 0.50 to 0.75 kg/ha as pre emergence on 3 DAS using Backpack/ Knapsack/ Rocker sprayer fitted with a flat fan nozzle using 500 litres of water/ha followed by one hand weeding on 30-35 DAS.
- Early post emergence herbicides application with Tembotrione 34.4 SC @ 125 g ai/ha and Topramezone 33.6 SC @ 30 g ai/ha at 25 DAS.
- In maize + pulse intercropping, apply pendimethalin @ 0.75 kg/ha as pre emergence on 3 DAS against atrazine.
- Apply herbicide when there is sufficient moisture in the soil.
- Do not disturb the soil after herbicide application.



#### After Cultivation

#### Thinning and Gap Filling

- Sow two seeds/hill
- Thinning and gap filling should be done on 12-15 days after sowing.
- Retain single healthy seedling/hill and remove others.
- Dibble presoaked seeds @ 1 seeds per hole where there is a gap and irrigated immediately.

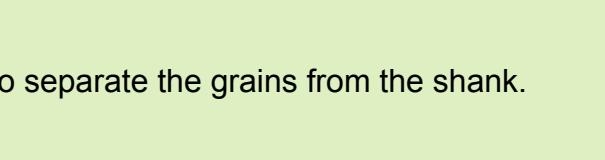
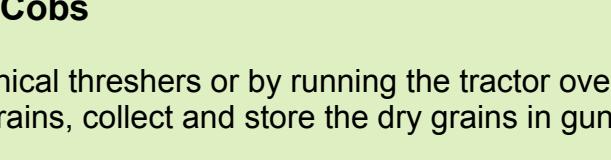
#### Hoeing, Hand-Weeding and Earthing Up

- Hoeing and hand-weeding should be done on the 30th day of sowing followed by earthing up for better anchorage.

#### Water Management

- Maize is sensitive to both moisture stress and excessive moisture.
- Ensure optimum moisture availability during critical stage (45 to 65 days after sowing).

Regulate irrigation according to the following growth phase of maize. Germination & establishment phase 1 to 14 days Vegetative phase 15 to 39 days Flowering phase 40 to 65 days Maturity phase 66 to 95 days



Stage	No. of irrigation	
	Heavy soils	Light soils
Germination & establishment	3 (after sowing, - 4th day as life irrigation,12th day)	3 (after sowing, - 4th day as life irrigation,12th day)
Vegetative	2 (25th, 36th day)	3 (22nd, 32nd & 40th day)
Flowering (Irrigate copiously)	2 (48th, 60th day)	3 (50th ,60th & 72nd day)
Maturity phase (Control irrigation)	2 (72nd, 85th day)	2 (85th, 95th day)

#### Harvesting

#### Stage of Harvest

- Crop is ready for harvest when cob sheath turns yellow in colour and seeds become hard and dry.

#### Threshing the Cobs

- Use mechanical threshers or by running the tractor over dried cobs to separate the grains from the shank.
- Clean the grains, collect and store the dry grains in gunnies.





## Rainfed Maize

### Field Preparation

- To break hard pan in rainfed alfisols, chisel ploughing once in three years.
- Plough the field with disc or mould board plough once followed by cross ploughing with cultivator.
- Apply 12.5 t/ha of FYM or compost with 10 packets of Azospirillum (2000 g/ha) before last ploughing.
- Form ridges and furrows using bund former or ridge plough with 6 m long and 45 cm apart.



### Application of Fertilizer

- Fertilizer dose (Rainfed Alfisols): 60:30:30 kg N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O/ha.
- Apply half of N (65 kg urea/ha), full dose of P<sub>2</sub>O (188 kg SSP/ha) and K<sub>2</sub>O (50 kg MoP/ha) basally with enriched FYM before sowing.
- Place remaining half dose of N (65 kg urea/ha) at tasseling stage.
- Fertilizer dose (Rainfed Vertisols): 40:20:0 kg N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O/ha.
- Apply half of N (43 kg urea/ha) and full dose of P<sub>2</sub>O (125 kg SSP/ha) basally with enriched FYM before sowing.
- Place remaining half dose of N (43 kg urea/ha) at tasseling stage.

### Soil test crop response –

**IPNS based fertilizer recommendation for hybrid maize (Rainfed) ---(Please Click Here)**

### Seeds and Sowing

- Seed Rate: 20 kg/ha for Maize hybrids COH(M) 6, COH(M) 8 and COH(M) 11 .
- Spacing: 45 cm X 20 cm

### Intercropping

- Maize + cowpea/maize + blackgram is suitable for red lateritic soils of Southern districts.
- Vertisols (Black soil) of Southern district, maize + redgram intercropping systems is ideal.



### Weed management

- Application of atrazine @ 0.50 to 0.75 kg/ha as pre emergence on 3 DAS using Backpack/ Knapsack/ Rocker sprayer fitted with a flat fan nozzle using 500 litres of water/ha followed by one hand weeding on 30-35 DAS.

### Foliar nutrition:

- Foliar spray of TNAU Maize Maxim @ 3 kg/acre in 200 litres of water at tassel initiation and at grain filling stages improves grain filling, grain yield and drought tolerance.
- Water Stress: Foliar spray @ 500 ml/ha of PPFM (Pink Pigmented Facultative Methylotroph) during the critical stages of crop growth for mitigation of drought.

Updated on May 2023





## Nitrogen

### Deficiency Symptoms

- Older leaves become complete yellow
- Yellowing and drying starts at mid vein area which progress towards the leaf margins
- Stalks become slender Stunted growth .

### Correction Measures

- Foliar application of 1% urea (10 g / litre of water) two times at 15 days interval.

Updated on May 2023



## Phosphorus

### Deficiency Symptoms

- Older leaves are dark green or purplish green
- Spindly growth
- Delay of maturity and irregular ear formation .

### Correction Measures

- Foliar spray of 2% DAP.
- Foliar application of mono ammonium phosphate (MAP) 1% (10 g / litre of water) two times at 15 days interval.

Updated on May 2023



## Potassium

### Deficiency Symptoms

- Older leaves show yellow or yellowish green streaks
- Scorching of leaf tips and margins.
- Shortened internodes.
- Plants become weak and fall down
- Tip end of cobs are poorly filled.

### Correction Measures

- Foliar application of 1% KCl or  $K_2SO_4$  (10 g / litre of water) two times at 15 days interval..

Updated on May 2023



## Magnesium

### Deficiency Symptoms

- Older leaves become chlorotic at margins and between veins
- Interveinal chlorosis in older leaves.
- Streaked appearance of leaves.
- Inverted 'V' shape green colour at base of the leaf.
- Necrotic spots in leaves.

### Correction Measures

- Foliar application of 0.5% MgSO<sub>4</sub> (5 g / litre of water) two times at 15 days interval

Updated on May 2023



## Iron

### Deficiency Symptoms

- Interveinal chlorosis in younger leaves.
- Between vein showing chlorosis and veins remain green in colour
- Later the entire crop exhibits bleached appearance.

### Correction Measures

- Apply 50 kg FeSO<sub>4</sub> along with FYM for calcareous soils.
- Apply 12.5 kg of micronutrient mixture formulated by the Department of Agriculture, Tamil Nadu mixed with 37.5 kg of sand.
- Apply 50 kg FeSO<sub>4</sub> + 12.5 t FYM ha<sup>-1</sup> along with 40 kg of elemental sulphur for calcareous soils.

### Screening and evaluating maize hybrids for lime induced Fe chlorosis in calcareous soils

- Screening of maize hybrids and their parents for lime induced Fe chlorosis in calcareous soils revealed that the hybrids CO6, CO8 and CO7 were found tolerant to Fe chlorosis while the parent UMI 1230 was highly susceptible to Fe chlorosis in calcareous soils.
- Evaluation of tolerant maize hybrids with various Fe management strategies to improve the crop yield and soil health indicated that soil application of 40 kg S as elemental sulphur either with 5 kg of Fe EDTA or 50 kg FeSO<sub>4</sub> + 12.5 t FYM ha<sup>-1</sup> was effective in increasing the crop yields by 20-25 % besides improving the Fe availability in soil and its uptake by maize

Updated on May 2023





## Sulphur

### Deficiency Symptoms

- Complete chlorosis occurs in younger leaves.
- Including veins are showing chlorosis .

### Correction Measures

- Foliar application of 0.5% ferrous sulphate (5 g / litre of water) two times at 15 days interval.

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**Nutrition :: Maize**



## Zinc

### Deficiency Symptoms

- Leaves have yellow streaks or chlorotic striping between veins.
- White colour band arises from base to tip of the leaf.
- New leaves are white in colour known as “white bud”.
- Shortened internodes with rosette appearance.
- Unfolding of young leaves .

### Correction Measures

- Foliar application of 0.5% ZnSO<sub>4</sub> (5 g / litre of water) two times at 15 days interval.

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## Boron

### Deficiency Symptoms

- Abnormal leaf and cobs .

### Correction Measures

- Foliar application of mono ammonium phosphate (MAP) 1% (10 g / litre of water) two times at 15 days interval.

### TNAU Maize Maxim

- Dose : 3 kg / acre / spray
- Stages of spray : Tassel initiation and grain filling stages
- Cost : Rs. 315/kg

### Benefits

- Improves grain filling
- Increases grain yield up to 20 per cent
- Improves drought tolerance

Updated on May 2023



- Sorghum Consultative meeting VC Pune
- Directorate of Sorghum Research, Hyderabad



## I. SEASON AND VARIETIES

District	Season	Month	Variety/ hybrids
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1. Tiruchirappalli	Thirupattam	Jan - Feb	TNAU SORGHUM/HYBRID CO 5, BSR 1 BSR 1 TNAU SORGHUM/HYBRID CO 5
Chithirappatam		April - May	
Adipattam		June - July	
Puratasipattam		Sept - Oct	K Tall, CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1
2. Kanchipuram/Tiruvallur			
Thirupattam		January - February	KO (S) 26, TNAU SORGHUM variety CO 30, BSR 1, TNAU SORGHUM/HYBRID CO 5
Chithirappatam		April - May	CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1, TNAU SORGHUM/HYBRID CO 5
Adipattam		June - July	K Tall, CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1, TNAU SORGHUM/HYBRID CO 5
Puratasipattam		Sept - Oct.	K Tall, CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1
3. Vellore/Tiruvannamalai			
Thirupattam		January - February	CO (S) 28, TNAU SORGHUM variety CO 30, TNAU SORGHUM/HYBRID CO 5
Chithirappatam		April - May	
Adipattam		June - July	
Puratasipattam		Sept - October	K Tall, CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1, Payur 1
4. Cuddalore/Villupuram			
Thirupattam		January - February	CO (S) 28, TNAU SORGHUM variety CO 30, TNAU SORGHUM/HYBRID CO 5
Chithirappatam		April - May	
Adipattam		June - July	
Puratasipattam		Sept - Oct.	K Tall, CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1, Payur 2
5. Coimbatore/Tirupur			
Thirupattam		January - February	CO (S) 26, TNAU SORGHUM variety CO 30, TNAU SORGHUM/HYBRID CO 5
Chithirappatam		April - May	
Adipattam		June - July	
Puratasipattam		Sept - October	K Tall, CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1
6. Erode			
Thirupattam		January - February	CO (S) 28, TNAU SORGHUM variety CO 30, TNAU SORGHUM/HYBRID CO 5
Chithirappatam		April - May	
Adipattam		June - July	
Puratasipattam		Sept - Oct.	K Tall, CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1, Payur 2
7. Karaikudi/Parambikulam/Karikal			
Thirupattam		Jan - Feb	TNAU SORGHUM/HYBRID CO 5, BSR 1
Chithirappatam		April - May	
Adipattam		June - July	
Puratasipattam		Sept - Oct.	K Tall, CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1
8. Salem/Theni/Makkal			
Thirupattam		Jan - Feb	CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1, Payur 1
Chithirappatam		April - May	
Adipattam		June - July	
Puratasipattam		Sept - Oct.	CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1
9. Dharmapuri/Krishnagiri			
Thirupattam		Jan - Feb	CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1, Payur 1
Chithirappatam		April - May	
Adipattam		June - July	
Puratasipattam		Sept - Oct.	CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1, Payur 2
10. Pudukkottai			
Thirupattam		Jan - Feb	BSR 1 TNAU SORGHUM/HYBRID CO 5
Chithirappatam		April - May	BSR 1 TNAU SORGHUM/HYBRID CO 5
Adipattam		June - July	CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1, Payur 1
Puratasipattam		Sept - Oct.	CO (S) 28, TNAU SORGHUM variety CO 30, K Tall, BSR 1
11. Madurai/Dindigul/Theni			
Thirupattam		Jan - Feb	CO (S) 28, TNAU SORGHUM variety CO 30, TNAU SORGHUM/HYBRID CO 5
Chithirappatam		April - May	
Adipattam		June - July	
Puratasipattam		Sept - Oct.	K Tall, CO (S) 28, TNAU SORGHUM variety CO 30, K Tall, BSR 1, Payur 1
12. Ramanathapuram/Vinudhunagar/Sivaganga			
Thirupattam		January - February	CO (S) 28, TNAU SORGHUM variety CO 30, TNAU SORGHUM/HYBRID CO 5
Chithirappatam		April - May	
Adipattam		June - July	
Puratasipattam		Sept - Oct.	K Tall, CO (S) 28, TNAU SORGHUM variety CO 30, BSR 1
13. Tirunelveli/Theoothukudi			
Thirupattam		January - February	CO (S) 28, TNAU SORGHUM variety CO 30, TNAU SORGHUM/HYBRID CO 5
Chithirappatam		April - May	
Adipattam		June - July	
Puratasipattam		Sept - October	K Tall, CO (S) 28, TNAU SORGHUM variety CO 30, K Tall, BSR 1

## II. PARTICULARS OF SORGHUM VARIETIES

PARTICULARS	CO (S) 26	TNAU SORGHUM variety CO 30	TNAU SORGHUM HYBRID CO 5
Parentage	Derivative of CO 23 x SPV 942	Derivative of APK 1 x TNS 291	Derivative of ICS 51A x TNS 30
Duration (days)	100-105	85-105	95-105
Area (Districts)	All districts	All districts	All districts
Source (Author)			
Rainfed	Adi, Puratisi	Adi, Puratisi	Adi, Puratisi
Irrigated	Thai, Chithrai	Thai, Chithrai	Thai, Chithrai
Stalk	Medium	Medium	Medium
Height (cm)	220-240	220-240	210-230
Sheath colour	Tan Green	Tan Green	Tan Green
Node	Green	Green	Green
Middle	Dull white	Dull white	Dull white
Earhead shape	Cylindrical	Cylindrical	Cylindrical
COMPACTNESS	Semi compact	Semi compact	Semi compact
Grain colour	White	White	Pearly white
Special features	Moderately resistant to shooftly, ear head bugs and grain mould	Moderately resistant to shooftly, grain mould and downy mildew	Moderately dry matter digestibility tolerance to shooftly, grain mould and downy mildew

PARTICULARS	PAYUR 1	K Tall	K II
Parentage	CO 19 x CO 24	2219A x IS 3541	X 7 x X 6552
Duration (days)	145 - 150	90	110-115
Area (Districts)	North east and north western districts	Southern districts and other districts	Southern districts
Season (Pattam)	All districts	All districts	All districts
Rainfed	Adi, Puratisi	Adi, Puratisi	Puratisi
Irrigated	Thai, Chithrai	Thai, Chithrai	...
Stalk	Juicy	Juicy	Thin, Juicy and Sweet
Height (cm)	160-190	220-240	200-215
Sheath colour	Green	Brown	Reddish purple at maturity
Node	Green	Green	Green, glabrous
Middle	Dull white	Dull white	Dull white
Earhead shape	Long cylindrical	Cylindrical	Elliptic
COMPACTNESS	Semi compact	Semi compact	Semi compact
Grain colour	Pearly white	White	Pearly white
Special features	-	-	Less incidence of leaf diseases; grain mould and sugary diseases

PARTICULARS	BSR 1	Payur 2	APK 1
Parentage	Derivative of CO 23 x SPV 942	Pureline selection	Hybrid derivative of CO 25 x SPV 942
Duration (days)	105 - 110	105-105	105 - 110
Area (Districts)	All districts	All districts	All districts
Season (Pattam)	All seasons	All seasons	All seasons
Rainfed	Adi, Puratisi	Adi, Puratisi	Puratisi
Irrigated	Thai, Chithrai	...	...
Stalk	Juicy	Juicy	Thin, Juicy and Sweet
Height (cm)	160-190	220-240	200-215
Sheath colour	Green	Brown	Reddish purple at maturity
Node	Green	Green	Green, glabrous
Middle	Dull white	Dull white	Dull white
Earhead shape	Long cylindrical	Cylindrical	Elliptic
COMPACTNESS	Open	Semi open	Semisopen
Grain colour	Pearly white	Cream pearly	Red colour, partially covering the grain
Special features	Resistant to drought, non lodging, photoperiod sensitive	Resistant to drought, non lodging, photoperiod sensitive	Resistant to drought, non lodging, photoperiod sensitive

PARTICULARS	CO 26	CO (S) 28	COH 4
Parentage	Derivative of IS 877 x IS 3691	Derivative of CO 25 x SPV 942	296A x TNS 30
Duration (days)	105-110	105-105	105 - 110
Area (Districts)	All districts	All districts	All districts
Season (Pattam)	All seasons	All seasons	All seasons
Rainfed	Adi, Puratisi	Adi, Puratisi	Puratisi
Irrigated	...	...	...
Stalk	...	...	...
Height (cm)	160-190	220-240	200-215
Sheath colour	...	...	...
Node	...	...	...
Middle	...	...	...
Earhead shape	...	...	...
COMPACTNESS	...	...	...
Grain colour	...	...	...
Special features	...	...	...

Note: Do not keep the seedlings in the nursery for more than 10 days. If older seedlings are used, establishment and yield are adversely affected. Do not water the seedlings in the nursery by applying excess water.

## III. MAIN FIELD PREPARATION FOR IRRIGATED CROP

1. PLOUGHING

Plough the field with an iron plough once or twice. Sorghum does not require fine tilth since it adversely affects germination and yield in the case of direct sown crop.

To overcome the subsoil hard pan in Affloids (deep red soils) chisel the field at 0.5 m intervals to a depth of 40 cm on both the directions of the field followed by disc ploughing and cultivator ploughing twice to help increase the yield of sorghum and the succeeding blackgram also. This was true with Sorghum followed by Groundnut also.

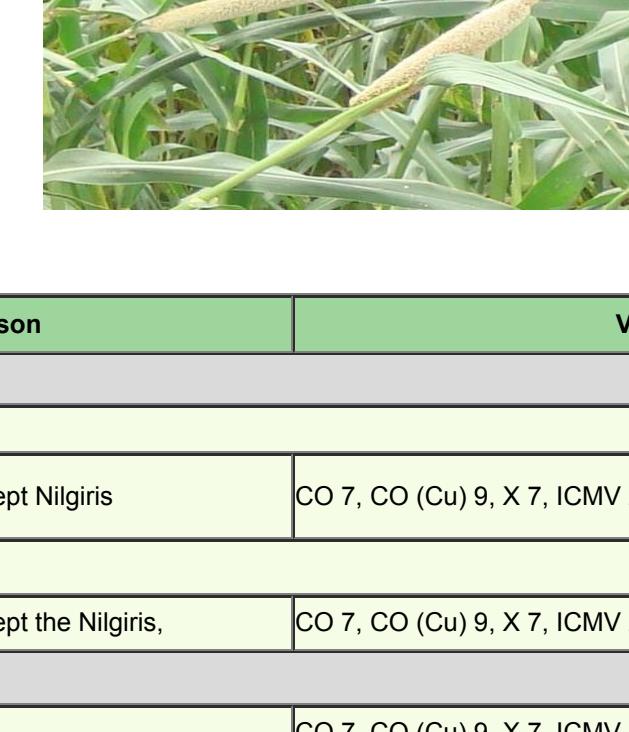
Application of FYM and recommended N can also be followed. In soils with sub-soil hard pan, chisel ploughing is recommended every year at the start of the cropping sequence to create a physical environment.

2. APPLICATION OF FYM TO THE NURSERY

• Apply 750 kg of FYM or compost for 7.5 cents nursery in 3x3 ft plots and 1000 kg of FYM or compost for 10x10 DAS.

• Spread the manure evenly on the unploughed soil and incorporate by plough





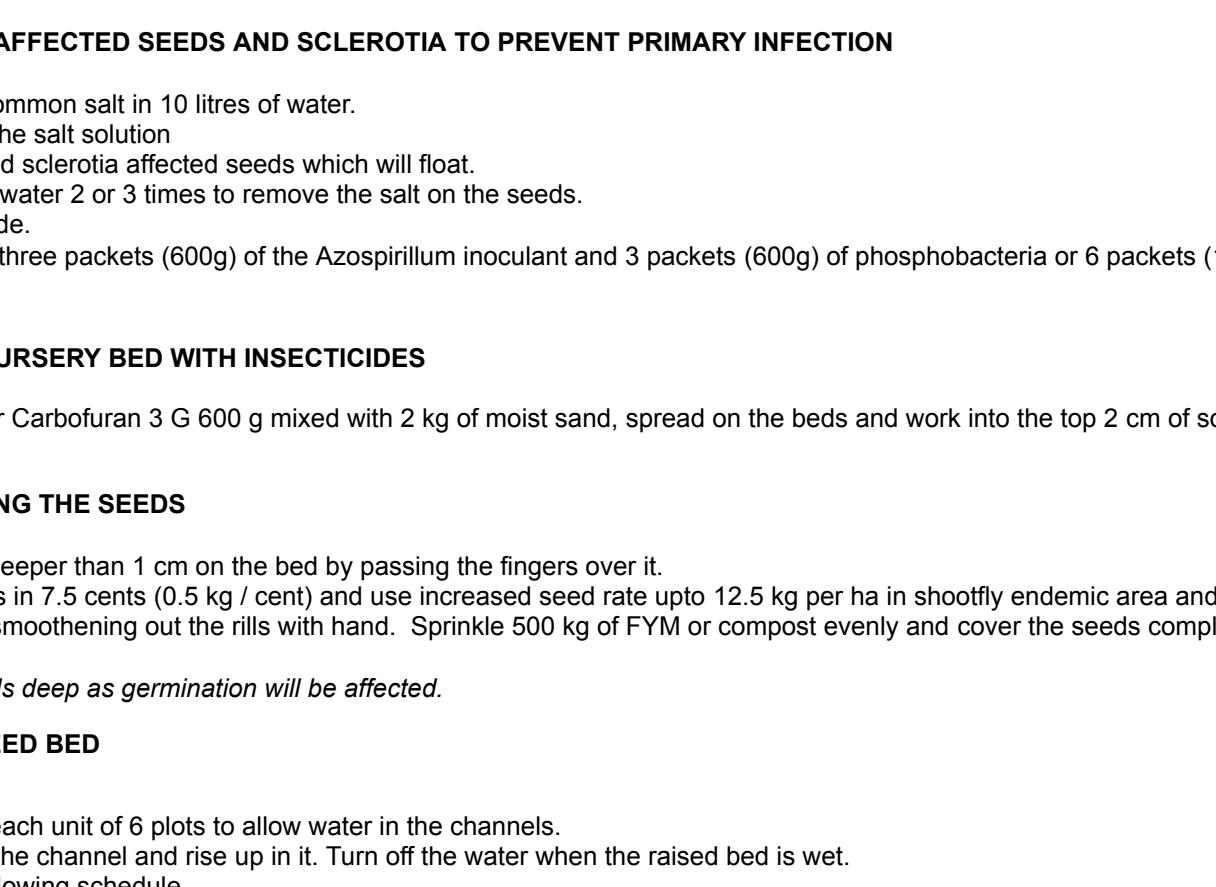
**I. SEASON AND VARIETIES**

Districts/Season	Varieties/Hybrid
<b>1. IRRIGATED</b>	
i. Chithiraiyattam (March-April)	
All pearl millet growing districts except Nilgiris	CO 7, CO (Cu) 9, X 7, ICMV 221, TNAU cumbo hybrid, Co 9
<b>ii. Masipattam (January-February)</b>	
All pearl millet growing districts except the Nilgiris,	CO 7, CO (Cu) 9, X 7, ICMV 221, TNAU cumbo hybrid Co 9
<b>2. RAINFED</b>	
i. Adipattam (June-July)	CO 7, CO (Cu) 9, X 7, ICMV 221, TNAU cumbo hybrid Co 9
ii. Purattasiyattam (September -October)	CO 7, CO (Cu) 9, X 7, ICMV 221, TNAU cumbo hybrid Co 9

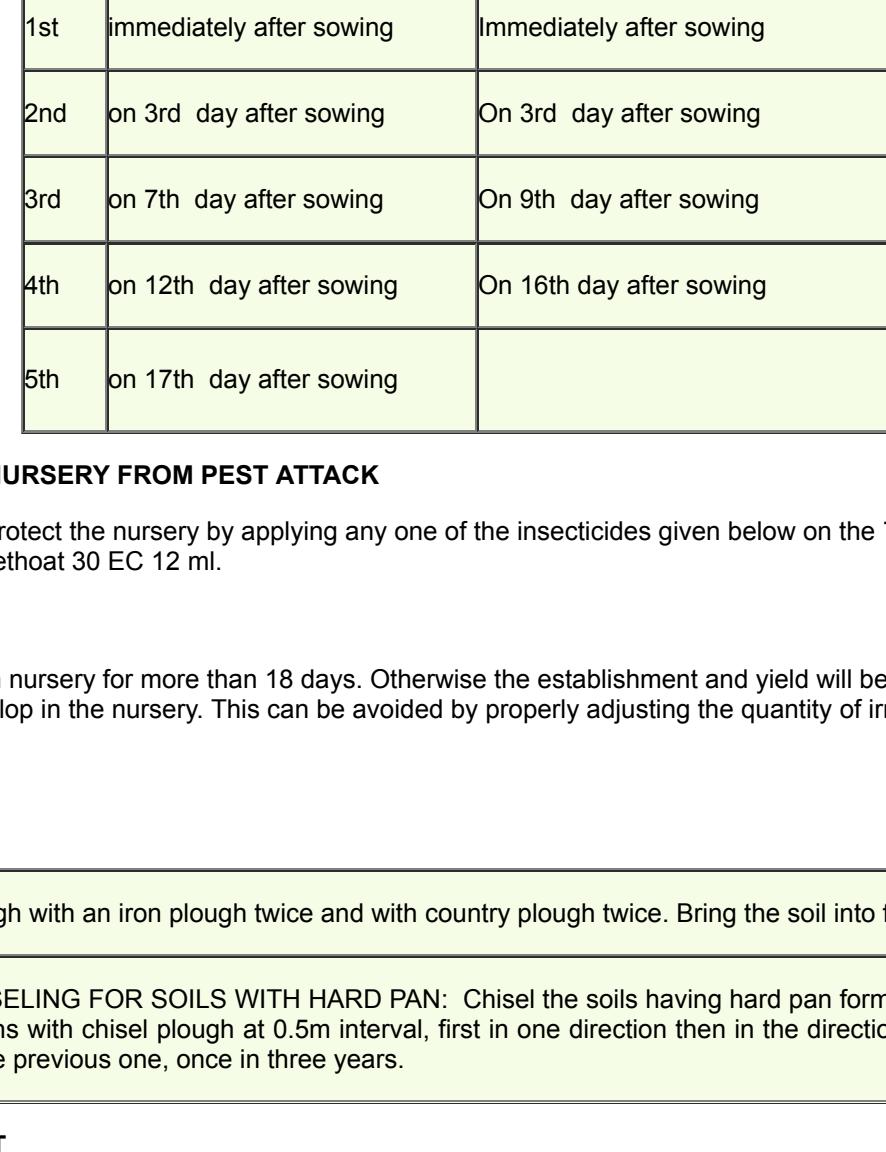
**II. PARTICULARS OF CUMBU HYBRIDS AND VARIETIES**

PARTULARS	CO 7	X 7	CO (Cu) 9
Parentage	(CO 6 x PK 560) PT 1921	L111 A x PT 1890	Selection from ICMV 93752
Season-irrigated/ rainfed	Both	Both	Both
Duration (Days)	90 - 100	90	80-85
Grain yield (kg/ha)			
Rainfed	2500 - 2800	2513	2354
Irrigated	3000 - 3500	3295	2865
Plant height (cm)	130 - 145	155 - 180	185-222
Tillers (No.)	6 - 10	4 - 7	3-6
Pigmentation	Green	Non-pigmented	—
Hairiness	Glabrous	Glabrous	Glabrous
Days to 50% bloom	65 - 70	50 - 55	50-55
Shape of earhead	Conical/ cylindrical/ spindle	Candle	Candle to cylindrical
Bristles	Nil	—	Absent
Length of earhead (cm)	22 - 26	25 - 35	33-39
Breadth of earhead (cm)	3 - 4	—	8-10
Grain colour	Slate colour	Slate	Grey seed with yellow base
1000 grains weight (gm)	6.8 - 7.2	8.0 - 9.0	9-11
Special features	Resistant to downy mildew	Resistant to downy mildew	Resistant to downy mildew

PARTULARS	ICMV 221	TNAU cumbohybrid CO 9
Parentage	ICRISAT Composite	ICMA 93111A x PT 6029-30
Season-irrigated/ rainfed	Both	Both
Duration (Days)	75-80	75-80
Grain yield (kg/ha)		
Rainfed	12% >ICTP 8203	2707
Irrigated	—	3728
Plant height (cm)	140-200	160-180
Tillers (No.)	3-5	4-6
Pigmentation	—	—
Hairiness	Absent	Glabrous
Days to 50% bloom	50-55	45-50
Shape of earhead	Semicompact to compact lanceolate to obovate	Candle to Cylindrical
Bristles	Usually non bristled	Absent
Length of earhead (cm)	—	25-35
Breadth of earhead (cm)	Wide in girth	3.1-3.6
Grain colour	Dark grey	Greyish yellow
1000 grains weight (gm)	10-15	13-14
Special features	Resistant to downy mildew	Short duration Resistant to downy mildew



**CUMBU (*Pennisetum glaucum* (L) R. Br.)**



**CROP MANAGEMENT**

**NURSERY**

**1. PREPARATION OF LAND**

- For raising seedlings to plant one has to select 7.5 cents near a water source. Water should not stagnate.
- Plough the land and bring it to the fine tilth.

**2. APPLICATION OF FYM**

Apply 750 kg of FYM or compost and incorporate by ploughing. Cover the seeds with 500 kg of FYM.

**3. FORMING RAISED BED**

- In each cent mark 6 plots of the size 3 m x 1.5 m with 30 cm channel in between the plots and all around.
- Form the channel to a depth of 15 cm.
- Spread the earth excavated from the channel on the beds and level.

NOTE: The Unit of 6 plots in one cent will form one unit for irrigation.

**4. REMOVAL OF ERGOT AFFECTED SEEDS AND SCLEROTIA TO PREVENT PRIMARY INFECTION**

- Dissolve one kg of common salt in 10 litres of water.
- Drop the seeds into the salt solution.
- Remove the ergot and sclerotia affected seeds which will float.
- Wash seeds in fresh water 2 or 3 times to remove the salt on the seeds.
- Dry the seeds in shade.
- Treat the seeds with three packets (600g) of the Azospirillum inoculant and 3 packets (600g) of phosphobacteria or 6 packets (1200g) of azophos.

**5. TREATMENT OF THE NURSERY BED WITH INSECTICIDES**

Apply phorate 10 G 180 g or Carbofuran 3 G 600 g mixed with 2 kg of moist sand, spread on the beds and work into the top 2 cm of soil to protect the seedlings from shootfly infestation.

**6. SOWING AND COVERING THE SEEDS**

- Open small rills not deeper than 1 cm on the bed by passing the fingers over it.
- Sow 3.75 kg of seeds in 7.5 cents (0.5 kg / cent) and use increased seed rate upto 12.5 kg per ha in shootfly endemic area and transplant only healthy seedlings.
- Cover the seeds by smoothening out the rills with hand. Sprinkle 500 kg of FYM or compost evenly and cover the seeds completely with hands.

NOTE: Do not sow the seeds deep as germination will be affected.

**7. IRRIGATION TO THE SEED BED**

- Provide one inlet to each unit of 6 plots to allow water in the channels.
- Allow water to enter the channel and rise up in it. Turn off the water when the raised bed is wet.
- Irrigate as per the following schedule.

Light Soil	Heavy Soil
1st      immediately after sowing	Immediately after sowing
2nd      on 3rd day after sowing	On 3rd day after sowing
3rd      on 7th day after sowing	On 9th day after sowing
4th      on 12th day after sowing	On 16th day after sowing
5th      on 17th day after sowing	

**PROTECTION OF SEEDLINGS IN THE NURSERY FROM PEST ATTACK**

If seed bed is not treated before sowing, protect the nursery by applying any one of the insecticides given below on the 7th and 14th day of sowing by mixing in 6 litres of water.; Methyl demeton 25 EC 12 ml, Dimethoate 30 EC 12 ml.

Note:

- The seedlings should not be kept in nursery for more than 18 days. Otherwise the establishment and yield will be affected adversely.
- Ensure that cracks should not develop in the nursery. This can be avoided by properly adjusting the quantity of irrigation water.

**PREPARATION OF MAIN FIELD**

**1. FIELD PREPARATION**

i. Plough with an iron plough twice and with country plough twice. Bring the soil into fine tilth.
ii. CHISELING FOR SOILS WITH HARD PAN: Chisel the soils having hard pan formation at shallow depths with chisel plough at 0.5m interval, first in one direction then in the direction perpendicular to the previous one, once in three years.

**2. APPLICATION OF FYM OR COMPOST**

Spread 12.5 t/ha of FYM or compost or composted coir pith uniformly on unploughed soil. Incorporate the manure by working the country plough and apply Azospirillum to the soil @ 10 packets per ha (2000 g) and 10 packets (2000g) of phosphobacteria (or) 20 packets (4000g) of azophos with 25 kg of soil and 25 kg of FYM.

**3. FORMING RIDGES AND FURROWS/BEDS**

- Form ridges and furrows (using 3 ridges) 6 m long and 45 cm apart. If pulses are intercropped, form ridges and furrows 6 m long and 30 cm apart.
- If ridge planting is not followed, form beds of size 10 m2 or 30 m2 depending upon water availability.
- To conserve soil moisture under rainfed condition, sow the seeds in flat and form furrows between crop rows during intercultivation on third week after sowing.

**4. APPLICATION OF FERTILIZERS**

Apply NPK fertilizers as per soil test recommendations as far as possible. If soil test recommendation is not available follow the blanket recommendation of 70:35:35 kg N, P205, K2O/ ha for all varieties. For hybrids, apply 80 kg N, 40 kg P205 and 40 kg K2O per ha. Apply the recommended N in three splits as 25:20:25 per cent at 0.15 and 30 DAS and full dose of phosphorus and potassium basally. Combined application of azospirillum and phosphobacteria or azophos along with 75 per cent of the recommended level of N and P is recommended for rainfed conditions.

**Method of application:** For transplanted crop, open a furrow 5 cm deep on the beds. Place the fertilizer (15 cm distance from the bottom), place the fertilizer (15 cm depth and cover upto 2 cm from the top and cover upto 2 cm. When azospirillum inoculant is used for seeds, seedlings use only 50 kg N/ha for variety, 60 kg N/ha for hybrid, as soil application in other words, reduce 25 % of soil test recommendations.

**5. APPLICATION OF MICRONUTRIENT MIXTURE**

Apply 12.5 kg/ha of micronutrient mixture formulated by the Department of Agriculture. Mix the mixture with enough sand to make 50 kg and apply on the surface just before planting/after sowing and cover the seeds. Broadcast the mixture on the surface to seed line. If micronutrient mixture is not available apply 25 kg of zinc sulphate per ha. Mix the chemical with enough sand to make 50 kg and apply as above.

**MANAGEMENT OF MAIN FIELD**

**1. TRANSPLANTING SEEDLINGS OR SOWING PRE-TREATED SEEDS Transplanted Crop**

- Pull out the seedlings when they are 15 to 18 days old.
- Adopt the spacing 45 x 15 cm for all the varieties.
- Plant seedlings on the side of ridge, half way from the bottom. Depth of planting should be 3 to 5 cm.
- Root dipping with bio-fertilizers: Prepare the slurry with 5 packets (1000 g)/ha of Azospirillum inoculant and 5 packets (1000g/ha) of phosphobacteria or 10 packets of azophos (2000g/ha) in 40 lit. of water and dip the roots of the seedlings 15 - 30 minutes before planting.

NOTE: Do not sow the seeds deep as germination will be affected.

**7. IRRIGATION TO THE SEED BED**

- Provide one inlet to each unit of 6 plots to allow water in the channels.
- Allow water to enter the channel and rise up in it. Turn off the water when the raised bed is wet.
- Irrigate as per the following schedule.

Light Soils	Heavy Soils
i. Germination	i. Germination
1st day after sowing	1st day after sowing
4th day	4th day
15th Day	17th day
28th day	30th day
40th day	42nd day
52nd day	55th day
65th day	58th day
77th day	



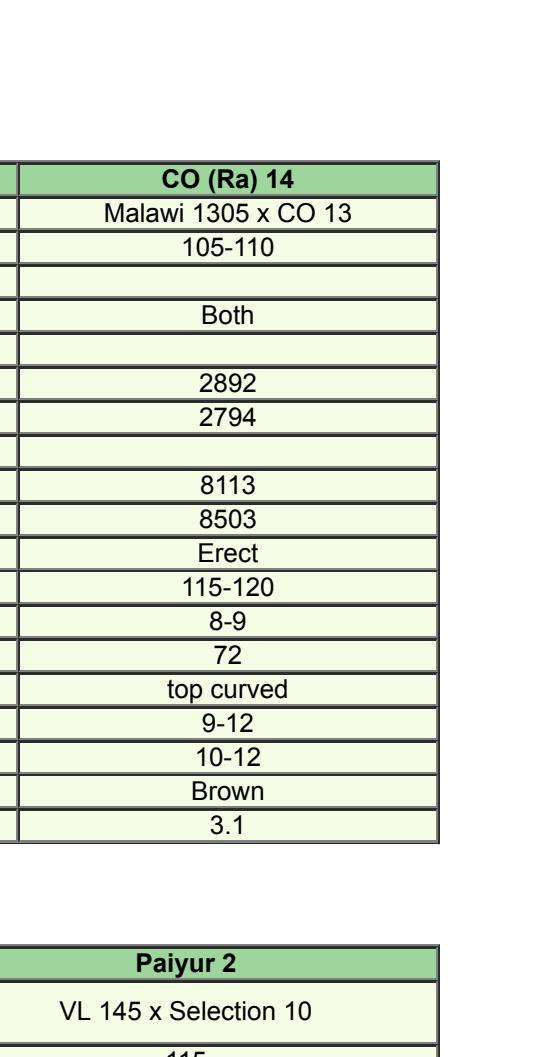
**Irrigated**

- Margazippattam (Dec - Jan)**

All districts except Kanyakumari & Nilgiris CO 9, CO 13, CO (Ra) 14, TRY 1

- Chithiraiippattam (April - May)**

All districts except Kanyakumari & Nilgiris CO 9, CO 13, CO (Ra) 14


**Rained**

- Adipattam (June - July)**

All districts except Kanyakumari & Nilgiris Palyur 1, CO 13, CO (Ra) 14, Palyur 2

- Purasajippattam (September - October)**

All districts except Kanyakumari & Nilgiris Palyur 1, CO 13, CO (Ra) 14

**PARTICULARS OF RAGI STRAINS**

PARTICULARS	CO 9	CO 13	CO (Ra) 14
Parentage	EX 4336 x PLR 1	CO 7 X TAH 107	Malawi 1305 x CO 13
Duration (days)	100-105	95 - 100	105-110
Season			
Rained/ Irrigated	Both	Both	Both
Grain yield kg/ha			
Irrigated	4500	3600	2892
Rained	3100	2300	2794
Straw yield kg/ha			
Irrigated	8000	10000	8113
Rained	6500	7500	8503
Stem	Erect	Erect	Erect
Height (cm)	75-80	85 - 90	115-120
Tillers	5-8	3 - 5	8-9
Days to 50% flowering	65-70	55-60	52
Ear size and shape	Incurved fingers	Open	top curved
Fingers	8-9	10-17	9-12
Ear length (cm)	8	8-10	10-12
Grain colour	White	Light Brown	Brown
1000 grain wt (g)	2.7	1.7	3.1

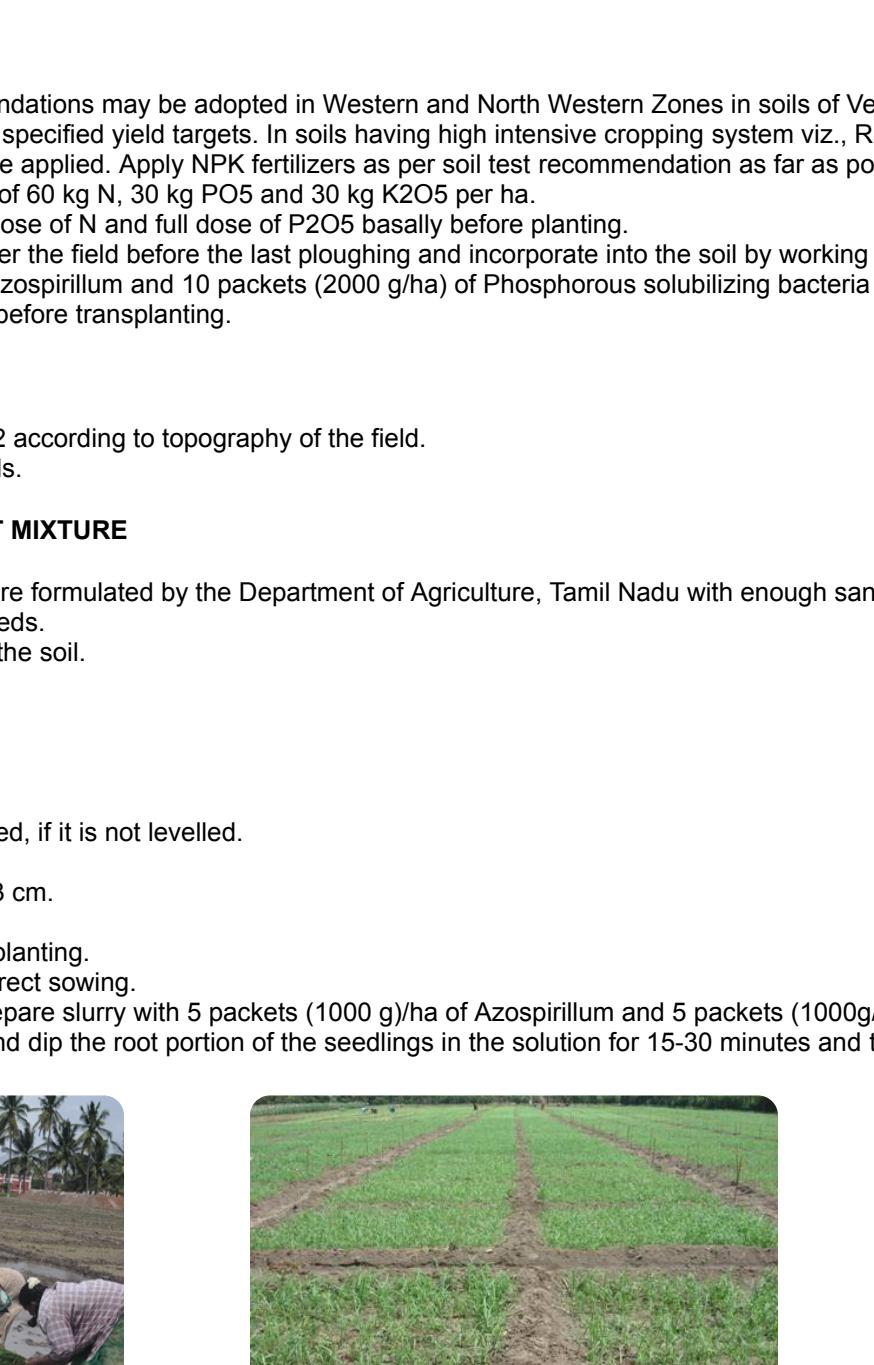
PARTICULARS	Palyur 1	TRY 1	Palyur 2
Parentage	Pureline selection from PR 722	Selection from HR 374	VL 145 x Selection 10
Duration (days)	115-120	102	115
Season			
Rained / Irrigated	Rained	Kharif irrigated Sodic/ saline soils	Rained
Grain yield kg/ha			
Irrigated	..	4011	--
Rained	3125	..	2527
Straw yield kg/ha			
Irrigated	6800	--	--
Rained	5750	--	4200
Stem	Erect	Erect	Erect
Height (cm)	110	100	90
Tillers	1 - 3	5 - 7	3-4
Days to 50% flowering	80	78	81
Ear size and shape	Open	Incurved	Incurved
Fingers	6 - 8	5-8	7-8
Ear length (cm)	8	7.6	7.0
Grain colour	Brown	Brown	Brown
1000 grain wt (g)	2.7	2.74	2.9

**IRRIGATED**
**CROP MANAGEMENT**
**I. PREPARATION OF NURSERY (IRRIGATED TRANSPLANTED CROP)**
**1. PREPARATION OF LAND**

- For raising seedlings to plant one ha of main field, select 12.6 cents (500 m<sup>2</sup>) of nursery area near a water source, where water does not stagnate.
- Mix 37.5 kg of super phosphate with 500 kg of FYM or compost and spread the mixture evenly on the nursery area.
- Plough two or three times with a mould board plough or five times with a country plough.

**2. FORMING RAISED BED**

- Mark units of 6 plots each of size 3 m x 1.5 m. Provide 30 cm space between plots for irrigation.
- Excavate the soil from the interspace and all around to a depth of 15 cm to form channels and spread the soil removed from the channels on the bed and level.


**Form Raised Bed of size 3 m x 1.5 m**
**3. PRE-TREATMENT OF THE SEEDS WITH FUNGICIDES**

- Seed treatment with Azospirillum may be done @ 3 packets/ha (600 g/ha) and 3 packets (600 g/ha) of Phosphobacteria or 6 packets of Azophos (1200 g/ha).
- Mix the seeds in a polythene bag to ensure a uniform coating of seeds with Thiram 4 g/kg or Captan 4 g/kg or Carbendazim 2 g/kg of seeds.

**4. SOWING AND COVERING THE SEEDS**

- Make shallow rills not deeper than one cm on the beds by passing the fingers vertically over them.
- Broadcast 5 kg of treated seeds evenly on the beds.
- Cover the seeds by levelling over the hand lightly over the soil.
- Sprinkle 500 kg of powdered FYM over the beds evenly to cover the seeds which are exposed and compact the surface lightly.

*NOTE: Do not sow the seeds deep as germination will be adversely affected.*

**5. WATER MANAGEMENT**

- Provide one inlet to each nursery unit.
- Allow water to enter through the inlet and cover all the channels around the beds. Allow the water in the channels to raise till the raised beds are wet and then cut off water.
- Adjust the frequency of irrigation according to the soil type.

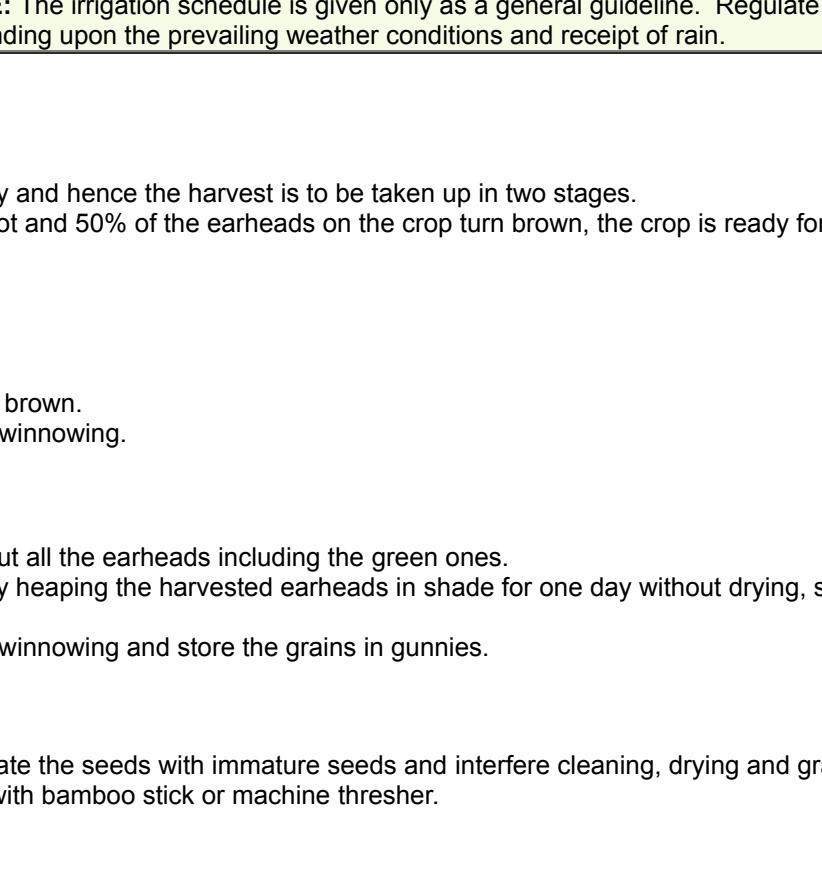
No. of irrigations	RED SOILS	HEAVY SOILS
1st	Immediately after sowing	Immediately after sowing
2nd	3rd day after sowing	4th day after sowing
3rd	7th day after sowing	9th day after sowing
4th	12th day after sowing	16th day after sowing
5th	17th day after sowing	..

**NOTE:**

- One irrigation is given on the 3rd day in the case of red soil to soften the hard crust formed on the soil surface and also to facilitate seedlings to emerge out.
- Do not allow cracks to develop in the nursery bed by properly adjusting the quantity of irrigation water.

**6. PULLING OUT THE SEEDLINGS FOR PLANTING**

Pull out seedlings on the 17th to 20th day of sowing for planting.


**II. PREPARATION OF MAIN FIELD**
**1. PLOUGHING THE FIELD**

Plough twice with mould board plough or thrice with wooden plough till a good tilth is obtained.

**2. APPLICATION OF FYM OR COMPOST**

Spread 12.5 t/ha of FYM or compost or composted coir pith evenly on the unploughed field and then plough and incorporate in the soil. NOTE: Do not spread and leave the manure uncovered in the field as nutrients will be lost.

**3. APPLICATION OF FERTILIZERS**

- Soil test based fertilizer recommendation may be adopted. In Western and North Western Zones in soils of Vertisols, Alfisols, Inceptisols and Entisols for different classes for specific crops. In soils having high intensive cropping system viz., Ragi-Maize-Cowpea, having high soil available K (310 g/ha) potassium need not be applied. Apply NPK fertilizers as per soil test recommendation as far as possible. If soil test recommendation is not available, adopt a blanket recommendation of 60 kg N, 30 kg P05 and 30 kg K2O per ha.
- Apply half the dose of N and full dose of N and full dose of P2O5 basically before plating.
- Broadcast the fertilizer mixture over the field before the last ploughing and incorporate into the soil by working a country plough.
- Apply 10 packets/ha (2000 g) of azospirillum and 10 packets (2000 g/ha) of phosphorous solubilizing bacteria or 20 packets of Azophos (4000 g/ha) after mixing with 25 kg of soil and 23 kg of YMF before transplanting.

**4. FORMING BEDS AND CHANNELS**

- Form beds of size 10 m<sup>2</sup> to 20 m<sup>2</sup> according to topography of the field.
- Provide suitable irrigation channels.

**5. APPLICATION OF MICRONUTRIENT MIXTURE**

- Mix 12.5 kg of micronutrient mixture formulated by the Department of Agriculture, Tamil Nadu with enough sand to make a total quantity of 50 kg/ha.
- Apply the mixture evenly on the beds.
- Do not incorporate the mixture in the soil.

**III. MANAGEMENT OF MAIN FIELD**
**1. TRANSPLANTING THE SEEDLINGS**

- Let water into the bed, level the bed, if it is not levelled.
- Plant 2 seedlings per 10 cm<sup>2</sup> area.
- Plant 18 to 20 cm apart old seedlings.
- Adopt a spacing of 30x10 cm for planting.
- Adopt 22.5 x 10 cm spacing for direct sowing.

Root dipping with Azospirillum prepare slurry with 5 packets (1000 g/ha) of Azospirillum and 5 packets (1000 g/ha) of Phosphobacteria or 10 packets of Azophos (2000 g/ha) in 40 litres of water and dip the root portion of the seedlings in the solution for 15-30 minutes and transplant.

*Note: Ragi responds well to water.*

