

# RICE

## Introduction

In Andhra Pradesh rice is the major food crop grown in 34.40 million hectares producing 105.40 m.t in both *kharif* and *rabi* seasons with an average productivity of 3.02 t/ha during 2010-11. At national level A.P is contributing 12.7% of rice production with 9.08% rice area. The increase in rice area, production and productivity mainly depends on the rainfall and availability of irrigation. The rice area, production and productivity for the last ten years are furnished.

(Table 1)

The main rice growing season of the state is *Kharif* (Wet season) with 60% of total rice being cultivated during the season. The season starts from May-June and ending November-December. The *Rabi* (Dry Season) falls between the months of November-December to March-April and 35% of rice is grown in *rabi*. Edagaru (Summer) is another season where rice is grown during summer from March-April to July-August. This is grown in some parts of Nellore, Chittoor, Srikakulam and Telangana districts.

**Table 1: Area, Production and Productivity of Rice in A.P during 2001-2011**

Year	Area (lakh ha)	Production (Lakh tonnes)	Productivity (t/ha)
2001-02	38.25	113.90	2.97
2002-03	28.22	73.29	2.59
2003-04	29.75	89.53	3.0
2004-05	30.86	96.01	3.11
2005-06	41.04	132.93	3.23
2006-07	39.79	132.6	3.33
2007-08	39.30	133.2	3.34
2008-09	43.87	142.10	3.24
2009-10	33.50	106.50	3.17
2010-11	47.52	144.20	3.03
2011-12	40.70	129.51	3.18
2012-13	34.59	114.0	3.29

### Suitable Varieties for Different Cropping Situations of A.P

S. No.	Cropping situation	Suitable varieties
1.	For Normal Sowing	Swarna, Vijetha, Indra, Chaitanya, Krishnaveni, Prabhat, Pushyami, Samba Mahsuri, Tellahamsa, Kavya, Warangal samba, Warangal sannalu, surekha, polasa prabha, sona mahsuri, swarnamukhi Cottondora sannalu, Tellahamsa, Erramallelu, Jagtial sannalu, Nellore Mahsuri, Taramati, Manair sona, Jagitial samba, Ramappa, Amara.
2.	For Late sowing	Vijetha, Pushyami, Swarnamukhi, Cottondora sannalu, Srikakulam Sannalu
3.	For Aged Nurseries	Swarna, Chaitanya, Indra, Swarnamukhi
4.	For BPH affected regions	Chaitanya, Krishnaveni, Indra, Cottondora sannlu, Vijetha, Amara
5.	For Saline soils	Swarna, Indra, Somasila, Deepti
6.	For submergence areas	Bhadava Mahsuri, Swarna sub1, Indra, Swarna
7.	For irrigated dry conditions	Vijetha, Swarna, Prabhat, Swarnamukhi.
8.	For Bacterial Leaf blight	Swarna, RP Bio 226

### Brief Description of Rice Varieties

Variety	Duration (days)	Yield (T/ac)	Pest/ Disease Resistance	Special Features
MTU 7029	150	3.0	BLB	Fine grain, high yield with low N
MTU 1001	140 (K) 120 (R)	2.53.0	BPH, Blast	Fine grain
MTU 1010	125	3.0	BPH, Blast (T)	Super fine grain
PLA 1100	160	2.5	-	Suitable for submergence conditions, fine grain
BPT 3291	145	2.5	Blast	Fine grain
Pushkala	105	2.0	-	Fine grain
Srikakulam Sannalu	165	3.0	Gall midge	Superfine grain, non lodging
Vasundhara	135	2.5	Gall midge	Suitable for late sowing

Variety	Duration (days)	Yield (T/ac)	Pest/ Disease Resistance	Special Features
Srikurma	150-155	2.1	Gall midge, Blast	Fine grain
Somasila	105-110	2.5	Blast	Super fine grain
BPT 5204	150	3.0	-	Super fine grain, good cooking quality
NLR 34449	125	3.2	Blast	Dwarf, non-lodging, fine grain
MTU 1064	150	2.5	BPH, BLB	Non lodging, non shattering, medium slender grain
MTU 1075	135	2.5	BPH, BLB	Non lodging, fine grain quality
RNR 23064	130	3.0	Gallmidge, Stem rot	Fine grain, non lodging, cold tolerant
JGL 3828	130-145	2.5	Gall midge, RTV	Fine grain, suitable for late planted situations of Northern Telangana
JGL 3844	120-135	3.0	Gall midge	Fine grain with good cooking quality, non lodging and cold tolerant
WGL 23985	130	2.5	Gall midge	Non lodging, medium slender grain suitable for gall midge endemic regions
RGL 1880	110	2.0	Gall midge	Coarse grain, suitable for rainfed situations
<b>Situation/Location specific varieties</b>				
Swarna Sub1	150	3.0	BLB	Suitable for low lying areas and is having submergence tolerance for two weeks
RP Bio 226	150	3.0	BLB	Improved BPT 5204. Suitable for BLB endemic areas.





### Nursery Management (Wet)

- Select an area of nursery, which has good irrigation and drainage facility.
- Prepare the nursery field one month before sowing
- Prepare nursery field by ploughing twice in the summer subsequently by puddling 3-4 times at an interval of 5-6 days.
- Level the field after final puddling and prepare raised beds of one-meter width and of convenient length duly forming channels for irrigation and proper drainage.
- Apply well-decomposed FYM/ compost @ 200 kg/ 5cents nursery to improve soil condition.
- Soak the paddy seed for 16-24 hours and incubate for 24-36 hours before sowing of sprouted seed.
- Apply 2 kg Nitrogen (4.4 kg of Urea), 1 kg of 'P<sub>2</sub>O<sub>5</sub>' (6.25 kg of SSP) and 1kg of 'K<sub>2</sub>O' (1.6 kg of MOP) for a nursery bed of 5 cents ( 200 m<sup>2</sup>).
- Apply total 'P' & 'K' fertilizers and ½ 'N' as basal (before final leveling and thoroughly mixed in the soil).
- Apply the remaining ½ 'N' at 10-15 days after sowing depending up on seedling growth.

- Sow the sprouted seed @ 5 kg/cent (40 m<sup>2</sup>) in nursery bed and 20 kg seed is sufficient for one acre of main field.
- Broadcast sprouted seed uniformly in seedbeds by keeping thin film of water and drain the water next day morning for proper aeration.
- Maintain alternate wet and dry during first week, after that beds can be flooded 2-3 cm depth depending up on height of seedlings.
- Apply @ 75 ml Benthicarb or Pretilachlor with safener @ 40 ml or Butachlor @ 50 ml or Pyrazosulfuron ethyl @ 5 g in 10 litres of water as pre-emergence application for five cents nursery to overcome weed problem
- Apply *Cyhalo fop P butyl* @ 20 ml/ 10 litres of water at 12-15 DAS to control *Echinochloa spp.* effectively.
- At the time of uprooting, the nursery should be flooded two days before to avoid root damage

### Main Field

- Plough the soil once or twice in mid-summer prior to main field preparation; it will help in checking the weed growth by exposing the root system of weeds. It also exposes egg masses and hibernated stages of different pests and disease to the hot sun and helps soil to retain moisture received during summer.

- Under canal irrigation green manuring is very much suggested
- Initiate puddling at least 15 days before transplanting
- Tractor / power tiller puddling to a depth of 15 cm is enough.
- Level the field perfectly after final puddling and allow it to settle for 2-3 days before transplanting in heavy soils which helps in better water and weed control.
- Transplant 4-6 leaf stage rice seedlings of (25 days old).
- Avoid usage of over-aged seedlings for transplanting in rice as use of 60 or more days for long duration, while more than 40 days for medium duration and more than 30 days for short duration varieties reduce the yield drastically.
- Transplant 33 hills/m<sup>2</sup> during Kharif and 44 hills/m<sup>2</sup> during Rabi at 2-3 cm depth @ 2-3 seedlings /hill
- In less fertile soils and in the case of over aged seedlings, transplant 44 hills / m<sup>2</sup> to reduce the yield loss to some extent.
- Make 20 cm alleyways at every 2 metres apart to facilitate free aeration and for uniform application of fertilizers, weedicides and pest management practices.

### Water Management

- Proper water management facilitates good tillering, increased nutrient use and reduce weed infestation.
- Maintain shallow depth of water (1-2 cm) at the time of transplanting.
- Increase the water level up to 5 cm depth after transplanting till crop establishment
- Maintain shallow depth of water (2-3 cm) during tillering phase of crop.
- Maintain 5 cm of water during panicle initiation to physiological maturity (10 Days before harvest) of the crop.
- Crop should not face water stress at panicle initiation, flowering and milk stages.

### Nutrient Management

#### Recommended Fertilizers for Different Agro-Climatic Zones of A.P

Zone	Kharif (kg/acre)			Rabi (kg/acre)		
	N	P	K	N	P	K
North Coastal Zone	32	24	16-20	48	24	20
Godavari zone	36	24	24	72	36	24
Krishna zone	24-32	16	12-16	72	36	24
Southern Zone	32	24	16	48	24	16
Scarce rain fall Zone	64	32	32	-	-	-
Southern Telangana Zone	40-48	24	16	48	24	16
Central Telangana Zone	40	20	16	48	24	16
Northern Telangana Zone	40	20	16	48	24	16
High Altitude tribal zone	32	24	20	-	-	-

- Soil fertility and productivity of rice can be improved and maintained through integrated use of organic, inorganic and bio fertilizers in a balanced manner.
- 25-50% of recommended N through Green manures/compost /FYM/ poultry manures results in sustainable yields.
- Green manuring insitu with Sesbania / Crotalaria / Pillipesara or grain legume crop residues eg. black gram/ green gram can sustain the soil fertility and productivity.
- Bio-fertilizers like blue green algae, Azolla, Azospirillum Phosphobacteria can save about 10 – 20 % 'N' & 'P' requirement of rice crop.
- Apply N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O @ 90: 60: 60 kg /ha during *kharif* for varieties other than Swarna. For Swarna variety, apply @60-40-40 kg/ha and @ 180: 90: 60 kg /ha during *rabi*. Apply entire 'P<sub>2</sub>O<sub>5</sub>' & 'K<sub>2</sub>O' as basal while 'N' in three equal splits (Basal + Active tillering + Panicle initiation stage). In light textured soils apply 'K<sub>2</sub>O' in two splits-half at basal and half at panicle initiation along with 2<sup>nd</sup> top dressing of 'N'.
- Drain out the field before N topdressing and irrigate the field after 2 days only.
- Avoid top dressing of Phosphorus or Phosphorus containing complex fertilizers after 15 days of planting.
- Apply Zinc Sulphate @ 50 Kg / ha to avoid Zn deficiency. Deficiency in the standing crop can be corrected by spraying zinc sulphate @ 0.2% (2 g /L of water). The spraying should be repeated at 5 days interval depending on the severity of the problem.
- If Iron deficiency is noticed spraying of ferrous sulphate @ 20-25 g and citric acid @ 2-2.5 g/ L is suggested. 2-3 sprays at 5-day interval are needed.

## Weed Management

- The crop should be maintained weed free especially till 45 DAT.
- Hand weeding at 20 and 40 days after transplanting in areas where sufficient manual labour is available
- To overcome weed problem apply any one of the following herbicides keeping thin film of water. Butachlor @ 1.25 litres /acre (or) Anilophos @ 500 ml/acre (or) Pretilachlor @ 600 ml /acre (or) Oxadiargyl @ 40 grams (mixed with one litre of water) with in 3 to 5 days of of transplanting or spray Pyrazosulfuran ethyl @ 80-100 g/ acre at 8-12 DAT or Bensulfuron methyl @ 35 g /acre as pre to post emergence (3-25 DAT). 2,4- D SS @400 g / acre at 20-25 DAT to control broadleaved weeds .

## Insect Pests and Diseases

### Pests and Diseases Scenario in different Agro-Climatic Zones

**Krishna Zone** : Stem borer, Leaf folder, BPH, WBPH, Hispa, Cut worm, BLB, Blast, Sheath blight, Stem rot and Rodents.

**Godavari Zone:** Stem borer, BPH, WBPH, Leaf folder, Panicle mite, Cut worm, Hispa, BLB, Sheath blight, Red stripe, Stem rot, Blast and Rodents.

**Northern Telangana Zone** : Stem borer, Gall midge, Leaf folder, BPH, WBPH, Panicle mite, Blast, BLB, Sheath rot.

**Central Telangana Zone:** Gallmidge, Stem borer, Leaf folder, BPH, WBPH, Mealy bug, BLB, Blast, Sheath rot.

**Southern Telangana Zone** : Stem borer, Gall midge, BPH, WBPH, Gundhy bug, Cut worm, Mealy bug, Blast, BLB, Sheath rot.

**North Coastal Zone** : Gallmidge, Stem borer, Leaf folder, BPH, WBPH, Mealy bug, BLB, Blast, Sheath rot.

**Southern Zone:** Leaf folder, Stem borer, BPH, WBPH, Leaf mite, Mealy bug, Blast BLB, Stem rot, Sheath rot.

**Scarce rainfall zone** :Stem borer, Leaf folder, Leaf mite, Mealy bug, BPH, WBPH, Blast, Sheath blight, BLB.

**High Altitude and Tribal Zone** : Stem borer, Leaf folder, BPH, WBPH, Blast, Sheath blight, BLB.

**Cultural Practices recommended for reducing the build up of Insect Pests**

- Summer ploughing
- Grow suitable resistant varieties
- Use recommended doses of fertilizers
- Clipping of the leaf tips of seedlings while planting
- Adopt normal spacing
- Formation of alleyways
- Alternate wetting and drying
- Weed management

**Economic Threshold Levels of Insect Pests**

S. No.	Insect Pest	Stage of the Crop	Economic threshold level
1	Stem borer	Nursery and Tillering	One adult or one egg mass per one sqm or 5% of dead hearts per sqm.
2	Gall midge	Nursery and Tillering	One silver shoot per hill or 5% galls per sqm.
3	BPH/WBPH	Tillering	10-15 insects per hill
	After Flowering	20-25 insects per hill	
4	Leaf folder	All stages	One to two damaged leaves per hill
5	Hispa	Tillering stage	Two adults per hill or two damaged leaves per hill
6	Green leaf hopper	Nursery	One or two insects per sqm
	Tillering	10 insects per hill	
	Flowering	20 insects per hill	
7	Gundhi bug	Flowering	One to two adults per hill

**Chemical Control**

**Tillering Stage**

**Stemborer, Thrips and Hispa**

- Spray monocrotophos @ 36 SL 1.6 ml or chlorpyrifos 20 EC @ 2.5 ml or phosphamidon 40 SL@ 2.0 ml/litre of water.



### **Gallmidge**

- Apply phorate 10G @ 12.5 kg/ha or carbofuran 3 G @ 25 kg/ha at 15 DAT in 1– 2 inches of standing water.



### **Leaf folder**

- Spray profenophos @ 2.0 ml or chlorpyrifos @ 2.5 ml or monocrotophos 36 SL @ 1.6 ml/ litre of water.

### **Hispa**



- Spray profenophos @ 2.0 ml or chlorpyrifos @ 2.5 ml or monocrotophos @1.6 ml/litre of water

### **Leaf mite**

- Dicofol @ 5.0 ml or wettable sulphur @ 3 g /l of water.

### **Panicle Initiation to Booting Stage**

#### **BPH/WBPH**

- Spray acephate @ 1.5 g or monocrotophos @ 2.2 ml or ethofenprox @ 2.0 ml or fenobucarb @ 2.0 ml or imidacloprid @ 0.25 ml or thiamethoxam @ 0.2 g or Buprofuzin 1.6ml per litre of water.



- Spray fluid (200 litres/acre) should be directed towards the base of the plant.
- Avoid spraying of combination of insecticides and synthetic pyrethroids.
- If second spray is warranted alternate the previous chemical preferably belonging to another group.

#### **Stemborer**

- Cartap hydrochloride 50 WP 2.0 g or acephate 1.5 g or profenophos 2.0 ml Chlorantriniprole 0.4 ml/litre of water (or) apply cartaphydrochloride 4G @ 8 kg/acre when the adult moths/egg masses @ one/ sq.m are noticed in the field.

#### **Leaf folder**

- Spray cartaphydrochloride 2.0 g or acephate 1.5 g or profenophos 2.0 ml /litre of water.

#### **Panicle mite**

- Spray profenophos 2.0 ml or dicofol 5.0 ml/ litre of water

#### **Post Flowering**

#### **BPH/WBPH**

- The insecticides as recommended at boot stage should be used.

#### **Cutworm**

- Irrigate the field and spray in the evening hours with any of the following combinations of dichlorovos 1.0 ml + chlorpyrifos 2.5 ml/litre of water.



## Rice Diseases

Disease	Time of application	Fungicide	Dose	No. of applications & time interval
Sheath blight	At the initiation of the disease. Normally around 45 days after transplanting in <i>kharif</i> and 30 days after transplanting in <i>rabi</i>	Hexaconazole 5EC Validamycin 3L Propiconazole 25 EC	@ 2ml/l @ 2ml/l @ 1ml/l	2 sprays at 15-day interval
Blast a) Leaf blast	At the initiation of the disease under favourable weather conditions	Tricyclazole /  Isoprothiolane	75 WP @ 0.6g/ml  40 EC @ 1.5 ml/l	2 to 3 sprays depending on the severity & spread of the disease at 15 days interval
b) Neck blast	i) Under disease favourable weather conditions just before panicle emergence stage	Tricyclazole /  Isoprothiolane	75 WP @ 0.6g/ml 40 EC @ 1.5 ml/l	One spray
	ii) On appearance of the disease	Tricyclazole 75WP/ Isoprothiolane 40 EC	@ 0.6g/ml @ 1.5 ml/l	One spray
BLB	No chemical available. Management is mainly through rationalization of nitrogenous fertilizer application	-	-	-
Red stripe	At the appearance of the disease from advanced boot leaf to crop maturity stage	Carbendazim 50 WP	@ 1g/l	One spray
Sheath rot	At the appearance of the disease or at panicle emergence stage	Carbendazim 50WP	@ 1g/l	One spray
False smut	At flowering stage	Propiconazole 25 EC/Copper oxychloride 50WP/ Carbendazim 50WP	1.0ml/l 2.0g/l 1.0g/l	One spray during evening hours



## Rodent Control

### *For Endemic Areas*

- Destruction of rodent harborage and observe rat moment.
- Reducing the number and size of field bunds
- Complete the sowing and planting uniformly in one area.
- From puddling to one month after planting, setup local traps @ 20 /acre.
- Installation of permanent bait stations from planting to flowering stage @ 5 /ha; Four at corners of the field-one meter inside the cropped area from the field bund and one at the centre. Bromadiolone bait @ 30 g per bait station should be replenished twice in a week.
- During crop period baiting with bromadiolone 0.005% in baits prior to primordial initiation stage of the crop.
- From primordial initiation to crop harvest smoking of burrows with “burrow fumigator” developed by APRRI & RARS, Maruteru.

## **Management of Rodents with Bromadiolone**

### **0.005%**

- Identify live burrows and simultaneously place 15 gm freshly prepared bromadiolone (2% poison) loose bait in packets inside the burrow when LBC is 50/ha.
- Repeat bromadiolone (2% poison) loose baiting in the active /live burrows as and when the incidence is above ETL.

**Note:** Control schedules should be executed on community basis to check cross infestation through migration.

### **Harvesting and Storage**

- Harvesting should be done when at least 80% of the grains are matured. If the crop is

harvested without proper maturity it leads to loss of viability of grains and brokens in milling.

- The harvested material should be dried in the field for 2-3 days.
- The grain should be free from inert material after threshing and winnowing.
- The winnowed grains should be sun dried until the moisture content reaches less than 13%.
- Both over drying and under drying will lead to breakage of the grain during processing.
- High moisture content during storage leads to loss of viability due to increased grain respiration and attack of storage insects and pests.

