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• Rice crop cycle
• Nursery Management
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Understanding Rice

- **Rice** is the seed of the monocot plants *Oryza sativa* (Asian rice) or *Oryza glaberrima* (African rice).

- As a cereal grain, it is the most important staple food for a large part of the world's human population, especially in Asia and the West Indies. Rice is staple food for more than 70 per cent of population and a source of livelihood for about 120 – 150 million rural households in India.

- It is the grain with the third-highest worldwide production, after Maize (corn) and Wheat, according to data for 2009. It accounts for about 43 per cent of food grain production in the country.

- Rice is the most important grain with regard to human nutrition and caloric intake, providing more than one fifth of the calories consumed worldwide by the human species.

- At the current rate of population growth, rice requirement by 2020 would be around 125 million tones. Rice in India, is currently grown in an area of about 45.54 million ha with a production of about 99.18 million MT (2008-09) which needs to be increased almost 2 million MT every year to balance the food budget.
Understanding Rice

• Etymology:
  – First attested in English in the middle of the 13th century, the word *rice* derives from the *Old French* *ris*, which comes from Italian *riso*, in turn from the *Latin* *oriza*, which derives from the *Greek* Ὠρυζα (*oruza*). The Greek word is the source of all European words (cf. Welsh *reis*, Ger. *Reis*, Lith. *ryžiai*, Serbo-Cr. *riza*, Pol. *ryz*, Dutch *rijst*, Romanian *orez*). Ultimately the original source for those languages is from the Tamil word அரிசி (*arisi*)

• Rice can be grown in different environments, depending upon water availability
  – **Lowland, rain-fed**, which is drought prone, favours medium depth; waterlogged, submergence, and flood prone
  – **Lowland, irrigated**, grown in both wet season and dry season
  – **Deep water** or floating rice
  – **Coastal Wetland**
  – **Upland rice**, also known as 'Ghaiya rice', well known for its drought tolerance
Global Rice Production

<table>
<thead>
<tr>
<th>Production of rice (paddy) by country — 2007 (million MT)</th>
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<tbody>
<tr>
<td>People's Republic of China</td>
</tr>
<tr>
<td>India</td>
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<tr>
<td>Indonesia</td>
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<tr>
<td>Bangladesh</td>
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<td>Vietnam</td>
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<td>Japan</td>
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<tr>
<td>Pakistan</td>
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<tr>
<td>United States</td>
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</table>

Source: [Food and Agriculture Organization](http://www.fao.org)
Growth phases of rice Plant

- The duration of the vegetative phases differs with variety.
- The reproductive and ripening phases are fairly constant for most varieties.
- The reproductive phase last about 35 days;
- the ripening phase last about 30 days.
- The time from sowing to harvest ranges from 80 to 180 days or longer.

Source: A Farmer’s Primer on Growing upland Rice, IRRI
Climatic requirements

• RICE requires high temp., high humidity, prolonged sunshine and assured water supply.
• A temperature range of 20 to 37.5°C is required for its optimal growth.
• The crop requires a higher temperature at tillering than that during early growth. The temp requirement for blossoming ranges between 26.5 and 29°C.
• The humidity needs vary according to the variety:
  – Early types- 83 to 85% &
  – Late one types- 67 to 68 %
Soil type

- Heavy soils like clay loam are the most suitable for growing paddy crop.
- It should be avoided to grow on sandy/light/low lying area of soils.
- To avoid the mixing of varieties in the field, do not grow the rice nursery at the site of the last year’s threshing or last year Basmati sown field.
SEED TREATMENT

• Dip the seed in 10% salt solution. Remove the floating seed & then wash the remaining seed 2 - 3 times with fresh water.

• For 6 kg / acre of seed, make a solution of Emisan 6%(20g) / Bavistin @ 2 g per kg seed and ( + ) Streptocycline @ 1 gms in 10 L of water. Soak the seed for 8-12 hours.
SEED TREATMENT

• Place the above treated seed on wet gunny bag and spread the seed in form of 5-6 cm layer and cover it with wet gunny bags. Leave it for 24 to 36 hours for pre-germination of seed.
• Broadcast the pre-germinated seed in nursery beds in standing water in the evening time.
• Always irrigate the nursery fields in the evening time. There should be no standing water in the field.

Seed treatment creates tolerance to seed borne diseases like blast, blight and root rot diseases etc.
METHOD OF RAISING NURSERY

You can prepare nursery as follows:

- Select 1/20th of a hectare for transplanting a hectare paddy crop.
- Give first ploughing with soil turning plough, followed by desi plough & planking.
- Add FYM @ 30-35 kg per bed at 15 days before puddling
- Flood water & do puddling once or twice.
METHOD OF RAISING NURSERY

- Divide the field into small beds of preferably 2 m width & 10 m length.
- Apply 26kg Urea, 60kg SSP and 40 kg Zinc per acre to Nursery. Add 26kg Urea after 12-15 days of sowing nursery as to get the seedling ready for transplanting in 20-25 days.
- If the seedling in the nursery show the yellowing of leaf-tips, spray them twice times with 0.5 to 1 per cent ferrous sulphate Solution( 0.5 to 1kg Ferrous Sulphate dissolved in 100 liters of water per acre) at weekly interval.
WEED CONTROL IN NURSERY

Major weeds: Swank and some other annual grasses

- Application of SOFIT 37.5 EC (Pretilachlor + safner ready mix) @ 500 ml per acre as sand mix 1-3 days after sowing of pre-germinated rice seed.

- Application of Butachlor 50 EC @ 1200 ml or Thiobencarb 50EC per acre mixed with 60 kg sand after 7 days of broadcasting pre-germinated seed.
CHECKLIST IN UPROOTING NURSERY

• The seedling should be ready when they are 20-25 cm tall or with 6 to 7 leaves.
• You should irrigate nursery in previous evening, so that soil becomes loose.
• Uproot nursery in the next morning. Please ensure that roots should not be damaged.
• Wash properly to remove all mud (to avoid the attack of foot rot / bakane disease)
Preparation of land for transplanting

• Deep Plouging with soil turning plough. Add FYM @ 5 MT per acre in the soil
• Mix the FYM in the soil with the help of desi plough
• Flood the field & puddle the soil 2-3 times with the help of puddler or tractor with plank or bullock drawn plough and plank in the last.
• At the time of last puddling, apply half dose of Urea & full dose of DAP, MOP.
**Transplanting**

**Dates of Transplanting:** Time of transplanting is a very important factor which influences rice yield. Savannah hybrids should be transplanting preferably during first fortnight of June.

**Age of seedling:** We should transplant seedling at 20 to 25 days as late planting of short duration hybrids reduces the yield drastically. No. of tillers per plant fixes within 4 to 6 weeks after transplanting.
Spacing between plant-to-plant and row-to-row depends on various conditions.

- In normal soil fertility, Line to line spacing should be 20 cm and plant-to-plant distance should be 15 cm. There should be 33 to 44 hills per sq.m.
- Generally, you should transplant 1-2 seedlings per hill,
- seedling should be transplanted upright and about 2-3 cm deep.
FERTILIZER - transplanted paddy

Draining water before fertiliser application

A farmer topdressing fertiliser after draining field
**FERTILIZERS RECOMMENDATIONS**

**Nitrogen (Urea):**

**Dose:** Apply Urea at the rate of 150 kg per acre.

**Time of Application:** Maximum Urea should be applied at early stage of growth as it is very critical for tillering and growth of plant which results in higher yield. As the crop is short duration the recommended time of application is:

- Dose 1: (33% dose - 50kg/acre) as basal dose within 7 days after transplanting
- Dose 2: (33% dose - 50kg/acre) at active tillering stage, i.e., 15 days after transplanting
- Dose 3: (33% dose - 50kg/acre) at panicle initiation stage, i.e., 35-40 days after transplanting.

**Caution:** Excessive use of nitrogenous fertilizers particularly during flowering causes sterility and consequently heavy reduction in yield.
FERTILIZERS RECOMMENDATIONS

Phosphorous (DAP/SSP):

**Dose:** DAP - 25 kg/acre or SSP - 75 kg/acre.

**Time of Application:** 100% DAP/SSP should be applied as Basal dose after a week of transplanting or 3-4 days after weedicide application.

Potash (MOP):

**Dose:** Apply MOP at the rate of 25 kg per acre.

**Time of Application:** 50% MOP should be applied as Basal dose, i.e., after 7 days of transplanting or 3-4 days and balance 50% dose at the start of panicle initiation (50-60 days after transplanting).
FERTILIZERS RECOMMENDATIONS

Zinc (Zinc Sulphate): Seedling with zinc deficiency remains stunted and tillerless.

Dose & Time of Application: Apply Zinc Sulphate 21% (Heptahydrate) @ 10kg per acre or Zinc Sulphate 33% (Monohydrate) @6.5 kg per acre at puddling stage.
Major weeds in Rice crop

- Echinochloa crusalli (swank)
- Echinochloa colonum (swanki)
- Leptochloa spp. (Gha)
- Cyperus difformis (motha)
- Cyperus compressus
- Cyperus iria
- Eclipta prostrata (jal Bhangra)
- Ipomoea aquatica (bel/makru)
Crop weed competition

- Due to weeds yield is reduced 20 - 25% in transplanted rice and 35 - 40% in direct seeded rice

- Crop weed competition depends on
  - Type of land - up land or low land
  - Method of crop establishment - transplanted or DSR
  - Cultivation practices - land preparation, puddled or un-puddled

- Critical period for crop weed competition
  - Transplanted rice - 30-45 days
  - Direct seeded Rice - 15-45 days
  - This depends on dry or wet season
Weed Management Practices

• Preventive method
  - Weed free seed
  - Weed free seed bed
  - Clean tools and irrigation channels

• Complementary practices
  - Land preparation - paddling
  - Planting method - straight row planting, transplanting
  - Plant density - higher density
  - Fertilizer application - Apply after weeding
  - Water management - Continue submergence

• Mechanical control
  - Hand weeding
  - By machine (weeder)
Weed control in transplanted crop-I

Use of Herbicide is both efficient & economical. The following herbicides are recommended for use in transplanted rice 2 to 3 days after transplanting

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Time of application</th>
<th>Dose/ acre</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Butachlor 50 EC /EW</strong> (Machete/Fastmix)</td>
<td>Pre-emergence</td>
<td>1200 ml</td>
</tr>
<tr>
<td><strong>Thiobencarb 50 EC (Saturn)</strong></td>
<td>Pre emergence</td>
<td>1200 ml</td>
</tr>
<tr>
<td><strong>Anilophos 30 EC (Arozin/Aniloguard)</strong></td>
<td>Pre emergence</td>
<td>500 ml</td>
</tr>
<tr>
<td><strong>Pendimethalin 30EC (Stomp)</strong></td>
<td>Pre emergence</td>
<td>1 to 1.2 Litres</td>
</tr>
<tr>
<td><strong>Pretilachlor 50EC (Rift/Erase)</strong></td>
<td>Pre emergence</td>
<td>600ml</td>
</tr>
<tr>
<td><strong>Pyrazosulfuron ethyl 10WP (Sathi)</strong></td>
<td>Pre emergence</td>
<td>60g</td>
</tr>
<tr>
<td><strong>Oxadiargyl 80WP (Topstar)</strong></td>
<td>Pre emergence</td>
<td>45g</td>
</tr>
</tbody>
</table>
Weed control in transplanted crop-II

- In light soil, reduce the dose of pendimethalin as compared to heavy soil.
- Mix any one of herbicide with 60kg of sand and broadcast uniformly in 4 to 5 cm standing water within 2 to 3 days of paddy transplanting.
- It is better to rotate the herbicides in alternate years.

**USE HAND GLOVES WHILE APPLYING THESE HERBICIDES.**
Weed control in Direct Seeded Rice

- **Pre planting herbicide**
  - Glyphosate  
    Use before 5-7 days of planting.  
    Dose – 1000 ml per acre  
    or
  - Paraquat  
    Use before 5-7 hr. of planting  
    Dose – 600 ml per acre
  - Use clean water and non metal tank

- **Pre emergence herbicide**
  - Pendimethalin 30EC  
    Use up to 3 days of sowing  
    Dose – 1000 ml per acre up to 5 days of sowing
  - Pyrazosulfuron ethyl 10WP  
    Use up to 3 days of sowing  
    60 g per acre in 4-5 days

High soil moisture is necessary for effective control.
Weed control in Direct Seeded Rice

- Post emergence
  - Nominee gold
    - After 20-25 days of sowing
    - Dose- 40 g per acre
    - Poor control of *Leptochloa* and *Cypres rotandus* or
  - Whip Super
    - After 20-25 days after sowing
    - Dose- 250 ml per acre
    - Poor in control of Broad Leaf Weed

- High moisture is necessary up to 3 days of application
- Depending on weed pressure, these above herbicide may be applied after 20-25 days of 1st application or manual weeding is also possible
Irrigation Management

- For effective water management, field should be levelled, no stagnation above 10 cm level.
- Keep 4-5 cm standing water in the field, 
  - 2 to 3 weeks after transplanting (Proper establishment & active tillering stage) and 
  - 6 to 9 weeks after transplanting (Panicle initiation stage)
- Otherwise, keep it for 2-3 cm only.
- After maximum tillering stage, Keep the soil moist to prevent unproductive tillers and also ensure the steady growth and development of plants.
- Before one fortnight of harvesting, water should be drained out.
- Drain away excess water before weeding, fertilizer application and irrigate the field after these operations.

AT ANY STAGE, HAIR CRACKING SHOULD NOT OCCUR IN THE FIELD
Disease management in Rice

• Due to diseases yield is reduced approximately 15-18% in rice crop
• Disease appear in various stages of the crop
• The causal organisms are bacteria and fungi
• It is better to go for preventive treatment/protective application of chemicals for control of diseases
• Some common diseases of rice crop are:

  **Bacterial Diseases:**
  - Bacterial blight: *Xanthomonas oryzae pv. oryzae = X. campestris*
  - Bacterial leaf streak: *Xanthomonas oryzae pv. oryzicola*
  - Foot rot: *Erwinia chrysanthemi*
  - Sheath brown rot: *Pseudomonas fuscovaginae*

  **Fungal Diseases:**
  - Blast: *Pyricularia oryzae, Magnaporthe grisea [teleomorph]*
  - Brown spot: *Cochliobolus miyabeanus, Bipolaris oryzae [anamorph]*
  - False smut: *Ustilaginoidea virens*
  - Kernel smut: *Tilletia barclayana = Neovossia horrida*
  - Root rots: *Fusarium spp., Pythium spp., Pythium dissotocum*
  - Sheath blight: *Thanatephorus cucumeris, Rhizoctonia solani [anamorph]*
  - Sheath rot: *Sarocladium oryzae = Acrocytindrium oryzae*
Blast
Causal organism - *Magnaporthe grisea*.

**Symptoms:**
Spindle shaped spots, with greyish centre and brown margin, are formed on the leaves at the stage of maximum tillering. Several spots unite and appear as irregular shape. It also causes black lesions at the neck of the panicle leading to its drooping known as neck-rot.

**Management:**
- Treat the seed before sowing nursery with 10 g of Bavistin + 1 g Streptocyclin in 10 litres of water for 10 - 12 hours.
- Avoid excessive N-fertilizers.
- Spray Hexaconalzole 5 EC @ 1 L/ha or BEAM (Tricyclazole) 75WP @ 300 – 400 g/ha at maximum tillering and panicle emergence.
Rice Diseases

**Bacterial leaf blight**

Causal Organism - *Xanthomonas campestris*

**Symptoms:**
Greenish yellow stripes appear along the leaf margins and extend both length wise and breadth wise. The leaf starts drying up from the tip, becomes white and in severe cases, dries up completely. Rainy, dull windy weather and temperature 20 – 26 degree C favours disease development

**Management:**
- Treat the seed before sowing nursery with 10 g of Bavistin + 1 g Streptocyclin in 10 litres of water for 10 -12 hours
- Avoid excess of nitrogen
- Do not pond water in the field
- Rice nursery as well as crop should not be grown in shade
Rice Diseases

False Smut

Causal Organism: *Ustilaginoidea virens*

**Symptoms:**
False smut is characterized by large orange to olive-green fruiting structures on one or more grains of the mature panicle. The symptoms of false smut are visible only after flowering. The pathogen grows in the ovary and transforms it into large, yellowish and velvety green balls, which become greatly enlarged at later stage. The spore balls are covered by a membrane in the early stages, which bursts with further growth and the loose velvety pseudomorphs become visible.

**Management:**
- Treat the seed before sowing nursery with 10 g of Bavistin+ 1 g Streptocyclin in 10 litres of water for 10 -12 hours
- Spray Copper oxychloride @ 1.25 kg/ha in afternoon hours (to avoid flower damage) at 10% panicle initiation
- Avoid application of organic manures and high doses of N-fertilizers
Brown Spot

Causal Organism: *Helminthosporium oryzae*.

**Symptoms:**
It produces oval, eye-shaped spots with a conspicuous dark-brown dot in the centre and light brown margin. The spot is surrounded by a yellow hollow. Spots are also produced on the grains. The disease occurs in poor soils. The pathogen survives on seed and debris in soil. The disease spreads rapidly if there are rains and storm, particularly at panicle heading stage.

**Management:**
- Treat the seed before sowing nursery with 10 g of Bavistin + 1 g Streptocyclin in 10 litres of water for 10-12 hours.
- Apply adequate and balanced nutrition to the crop.
- Spray Tilt (Propiconazole) or Contaf (Hexaconazole) @ 500 ml/ha.
Sheath Blight

Symptoms:
Symptoms become apparent at tillering or flowering stage and affect all plant parts above water line. Spots or lesions first develop near the water level (in flooded fields) or soil (in upland fields) and spots initially appear on the leaf sheath. Spots may be oval or ellipsoidal and measure 1-3 cm long.

Management:
• Seeding rate or plant spacing should be optimized to avoid closer plant spacing or dense crop growth which favours the horizontal spread of the disease. Need-based or real-time application of nitrogen fertilizer is recommended in fields known to have a high amount of inoculum.
• Treat the seed before sowing nursery with 10 g of Bavistin + 1 g Streptocyclin in 10 litres of water for 10-12 hours.
• Spray Tilt (Propiconazole) or Contaf (Hexaconazole) @ 500 ml/ha or Validamycin 500 g/ha.

Causal Organism: *Rhizoctonia solani*. 
Rice Diseases

Sheath Rot

Symptoms:
The common symptoms of sheath rot are the non-emergence or partial emergence of panicle along with dark to chocolate coloured unfilled grains. In severe infection spots cover most of the leaf sheath resulting in sheath rot. Dew, cooler climate, high relative humidity and higher levels of N-fertilizers favour disease development.

Causal Organism: Sarocladium oryzae

Management:

• Treat the seed before sowing nursery with 10 g of Bavistin + 1 g Streptocyclin in 10 litres of water for 10-12 hours
• Spray Tilt (Propiconazole) or Contaf (Hexaconazole) @ 500 ml/ha or Validamycin 500 g/ha
Kernel smut/ bunt

Causal Organism: *Rhizoctonia solani.*

**Symptoms:**
A few grains in a panicle are affected. It is first observed as small black pustules and streaks which become more obvious on maturity of grains. Sometimes spores scatter over grains and leaves. The blackened grains replaced by smut spores are exposed outside husk.

**Management:**
- Treat the seed before sowing nursery with 10 g of Bavistin + 1 g Streptocyclin in 10 litres of water for 10-12 hours
- Treating the seed with Tilt (Propiconazole) also protects from disease onset
Insect & pest management in Rice

• Due to insects & pests yield is reduced approximately 20 – 24% in rice crop
• Insects and pest appear in various stages of the crop and cause damage to vegetative as well as reproductive parts of crop
• Some pests are also act as career for virus and bacteria which cause diseases
• New generation insecticides are available for control of these insects and pests, however, it is also advised to adopt Integrated Pest Management practice for healthy crop
• Some common Insects & Pests of rice crop are:

  Thrips: *Stenchaetothrips biformis*  
  Green leafhopper: *Nephotettix virescens*  
  Rice case worm: *Nymphula depunctalis*  
  Rice Stem borer: *Scirpophaga incertulas*  
  Swarming caterpillar: *Spodoptera mauritia*  
  Gall midge: *Orseolia oryzae*  
  Rice skipper: *Pelopidas mathias*  
  Leaf folder (or) leaf roller: *Cnaphalocrocis mainsails* / *Marasmia patnalis*  
  Rice horned caterpillar: *Melanitis ismene*  
  Spiny beetle / Rice hispa: *Dicladispa armigera*  
  Whorl maggot: *Hydrellia sasakii*  
  Green leafhopper: *Nephotettix virescens*  
  Brown plant leafhopper: *Nilaparvata lugens*  
  White backed plant hopper: *Sogatella furcifera*  
  Mealybug: *Brevennia rehi*  
  Rice earhead bug (Stink bug): *Leptocorisa acuta*
Insects of Rice Crop

Thrips: *Stenchaetothrips biformis*

**Symptoms of damage**
- Laceration of the tender leaves and suck the plant sap
- Yellow (or) silvery streaks on the leaves of young seedlings
- Terminal rolling and drying of leaves from tip to base
- It causes damage both in nursery and main field

**Management**
- Spray any one of the following in nursery stage per ha
  - Phosphamidon 40 SL 125 ml
  - Thiomethaxam 25 WG 100 g
  - Carbofuran 0.3 CG 25 Kg
Insects of Rice Crop

Green leafhopper: *Nephrotettix virescens*

**Symptom of damage**
- Yellowing of leaves from tip to downwards
- Vector for the diseases *viz.*, *Rice tungro virus*, *rice yellow & transitory yellowing*

**Management:**
- Use resistant varieties like IR 50, CR 1009, Co 46
- The vegetation on the bunds should also be sprayed with the insecticides
- Set up light traps
- Apply anyone of the following: Fipronil 0.3 Gr @ 25 kg, Thiomethaxam @ 100 g or Carbofuran 3CG @ 25 kg per ha

Adults: Green leafhoppers are green with black spot and black patch on wings.
Insects of Rice Crop

Rice case worm: *Nymphula depunctalis*

**Symptom of damage**
- Caterpillars feed on green tissues of the leaves and leave become whitish papery
- Tubular cases around the tillers by cutting the apical portion of leaves
- Floating of tubular cases on the water

**Identification of insect pest Larva**
- Pale translucent green with orange head
- It has filamentous gills on the sides of the body
- Adult: Moth is delicate white moth with pale brown wavy markings

**Management**
- Drain the water.
- Dislodge the cases – running rope
- Nursery - Mix 100 ml kerosene in standing water
- Spray Phenthoate 50 EC @ 1 L/ha
Insects of Rice Crop

Rice Stem borer: *Scirpophaga incertulas*

**Symptom of damage**
- Presence of brown coloured egg mass near leaf tip.
- Caterpillar bore into central shoot of paddy seedling and tiller.
- Causes drying of the central shoot known as “dead heart”.
- Grown up plant whole panicle becomes dried “white ear”.

**Identification of insect pest**
- Egg - Laid in a mass and covered with buff coloured hairs.
- Larva - Pale yellow with dark brown head.
- Pupa - White silken cocoon.
- Adult
  - Female moth - bright yellowish brown fore wings with a black spot possess a tuft of yellow hairs.
  - Male moth - Smaller with pale yellow forewings without black spot.

**Management**
- Avoid close planting and continuous water stagnation.
- Pull out and destroy the affected tillers.
- Set up light traps to attract and kill the moths.
- Harvest the crop up to the ground level and disturb the stubbles.
- Apply Fipronil 0.3 Gr @ 25 kg, Coragen 100 ml per ha, Thiometaxam @ 100 g or Carbofuran 3CG @ 25 kg per ha for control.
Insects of Rice Crop

Swarming caterpillar: Spodoptera mauritia

**Symptom of damage**
- Larvae cut the seedlings in large scale
- Severe infestation - cattle grazing appearance to the field
- They feed gregariously and march from field to field

**Identification of insect pest**
- Egg - Laid in masses on leaves and covered with grey hairs
- Larva - Caterpillar is cylindrical dark to pale green with lateral lines along the body
- Pupa - Pupates in an earthen cocoon in soil
- Adult - Moth is medium sized stoutly build. Dark brown with a conspicuous triangular spot on fore wings

**Management**
- Kerosenate the water while irrigation – suffocation
- Allow ducks into the field

Nursery
- Drain the water
- Spray Chlorpyriphos 20 EC @200ml/ha
Insects of Rice Crop

Gall midge: *Orseolia oryzae*

**Symptom of damage**
- Maggot feeds at the base of the growing shoot
- Causing formation of a tube-like gall that is similar to “onion leaf” or “Silver-shoot”
- Infested tillers produce no panicles

**Identification of insect pest**
- Egg: Reddish, elongate, tubular eggs just near the ligule of the leaf blade
- Larva: Maggot is pale to red colour feeds inside the gall
- Pupa: pupates at the base of the gall and moves to tip of the gall
- Adult: Adult is orange coloured mosquito-like fly

**Management**
- Early ploughing
- Harvest the crop and plough immediately
- Remove the alternate hosts and adjust the time of planting (early)
- Use early maturing varieties
- Optimum recommendation of potash fertilizer
- Setup light trap and monitor the adult flies
- Apply Fipronil 0.3 Gr @ 25 kg, Thiomethaxam @ 100 g or Carbofuran 3CG@ 25 kg per ha for control
Insects of Rice Crop

Rice skipper: *Pelopidas mathias*

**Identification of insect pest**
- Larva: Pale green with constructed neck
- Adult: Butterfly with brown coloured wings and curved antenna

**Symptom of damage**
- Edges of the leaves are fastened with webbing
- Backward rolling of leaves, caterpillar feeds from margin to inwards

**Management**
- Spray Chlorpyriphos 20 EC @ 2 L/ha
Insects of Rice Crop

Leaf folder (or) leaf roller: *Cnaphalocrocis mainsails / Marasmia patnalis*

**Identification of insect pest**
- Egg - Flat, oval in shape and yellowish white in colour
- Larva - Greenish translucent
- Adult - Moth is brownish with many dark wavy lines in centre and dark band on margin of wings

**Symptom of damage**
- Leaves fold longitudinally and larvae remains inside
- Larvae scrapes the green tissues of the leaves and becomes white and dry
- During severe infestation the whole field exhibits scorched appearance

**Management**
- Clipping of the affected leaves
- Keep the bunds clean
- Avoid excessive nitrogenous fertilizers
- Light traps to attract and kill moths

**Apply**
- Fipronil 0.3 Gr @ 25 kg, or
- Carbofuran 3CG@ 25 kg/ ha or
- Lambdacyhalothrin 5EC @ 250 ml/ ha for control
Insects of Rice Crop

Rice horned caterpillar: *Melanitis ismene*

**Identification of insect pest**
- Egg - White eggs singly on the leaves is green
- Larva - Lightly flattened with two red horns processes on the head
- Two yellow processes in the anal end
- Pupa - Chrysalis, which suspends from the leaf
- Adult - dark brown with large wings having a black yellow eye like spot one on each of the fore wings

**Symptom of Damage**
- Larva feeds on leaf blades of rice
- Leaves are defoliated from the margin or tip irregularly

**Management**
- Spray Chlorpyriphos + Cypermethrin @ 1 L/ha or Chlorpyriphos 20EC @ 2 L/ha
Insects of Rice Crop

Spiny beetle / Rice hispa: *Dicladispa armigera*

**Identification of insect pest**
- Larva - Grub is minute, flat and yellow
- Adult - Blue - black shiny beetle with spines on the thorax and elytra

**Symptoms of damage**
- Adults feed on chlorophyll by scraping and causing white parallel streaks
- White patches along with long axis of leaf
- Grubs mine into the leaves and make blister near leaf tips

**Management**
- Leaf tip containing blotch mines should be destroyed
- Manual collection and killing of beetles – hand nets
- Spray Chlorpyriphos 20 EC @ 2 L/ha or Lambdacyhalothrin 5 EC @ 250 ml/ ha
Insects of Rice Crop

Whorl maggot: *Hydrellia sasakii*

**Symptom of damage**
- Maggot feeds on the tender tissue inside the whorl
- Yellowish white longitudinal marginal blotching with hole
- Leaves shrivelled plant stunted and maturity delayed.
- Drooping of young leaves near the tip

**Identification of the pest**
- **Maggot** - Yellowish white in colour.
- **Adult** - Small dull grey fly.

**Management**
- Remove the alternate hosts and adjust the time of planting (early)
- Use early maturing varieties
- Optimum recommendation of potash fertilizer
- Apply anyone of the following
  - Fipronil 0.3 Gr @ 25 Kg, or Chlorpyriphos 20EC @ 2 L/ha or Cartap Hydrochloride 0.4 Gr @ 20 to 25 kg/ha
Green leafhopper: *Nephotettix virescens*

**Identification of insect pest**
- Adults - are green with black spot and black patch on wings.

**Symptom of damage**
- Yellowing of leaves from tip to downwards.
- Vector for the diseases viz., Rice tungro virus, rice yellow & transitory yellowing

**Management**
- The vegetation on the bunds should also be sprayed with the insecticides
- Set up light traps
- Apply any one of the following
  - Fipronil 0.3 Gr @ 20 – 25 kg/ ha, Thiomethaxam 25 WDG @ 100 g/ ha or Carbofuran 3 CG @ 25 kg/ ha
Insects of Rice Crop

Brown plant leafhopper: *Nilaparvata lugens*

**Identification of insect pest**
- Adult: Brown body and chestnut brown eyes. It has two forms viz.,
  - Macropterous (long winged) and brachypterous (short winged).

**Symptoms of damage**
- Nymphs and adults congregate at the base of the plant above the water level
- Affected plant dries up and gives a scorched appearance called "hopper burn”.
- Circular patches of drying and lodging of matured plant
- It is vector of grassy stunt, ragged stunt and wilted stunt diseases

**Management**
- Avoid close planting
- Avoid use of excessive nitrogenous fertilizers & control irrigation by intermittent draining
- Conserve natural enemies like *Lycosa pseudoannulata*, *Cyrtohinus lividipes*
- Avoid synthetic pyrethroids, methyl parathion, fenthion and quinalphos causing resurgence
- Drain the water before the use of insecticides
- Apply any one of the following
  - Carbofuran 3 CG @ 20-25 kg/ha
  - Buprofenzin 25 SC @ 800 ml/ha
  - Thiomethoxam 20 WDG @ 100 g/ha
Insects of Rice Crop

White backed plant hopper: *Sogatella furcifera*,

Identification of insect pest
- Nymph - White in colour and pronotum is pale yellow.
- Adult - Possess a diamond like marking on the thorax and ovipositional site is black streaks.

Symptom of Damage
- Suck the sap and cause stunted growth.
- "Hopper burn" is caused in irregular patches.

Management
- Avoid use of excessive nitrogenous fertilizers.
- Control irrigation by intermittent draining.
- **Apply any one of the following**
  - Fipronil 0.3 Gr @ 10 - 25 kg/ ha
  - Thiomethaxam 25 WDG @ 100 g/ ha
  - Carbofuran 3 CG @ 25 kg/ ha
Insects of Rice Crop

Mealybug: *Brevennia rehi*

**Identification of insect pest**

**Adult** –
- Small reddish white, soft-bodied wingless insect covered with filamentous materials

**Damage**
- Large number of insects remains in leaf sheath and suck the sap
- Plants become week, yellowish and very much stunted in circular patches
- Presence of white waxy fluff in leaf sheaths

**Management**
- During field preparation - remove the grasses from the bunds and trim the bunds
- Remove and destroy the affected plants
- Spray any one of the following insecticides in the initial stage of infestation
  - Dimethoate 30 EC 500 ml/ ha
  - Imidacloprid 17.8EC @ 150 ml/ ha
  - Conserve the natural enemies like *Scymnus* sp., *Anatrichus pygmaeus*, and *Mepachymerus ensifer*
Insects of Rice Crop

Rice earhead bug (Stink bug): *Leptocorisa acuta*

**Identification of insect pest**
- Eggs: Dark, reddish brown and laid in rows of 10-15 on the leaves or panicles
- Nymphs: Green to brown
- Adults: Slender with long legs and antennae
- They are brownish green in colour, while disturbing it emits stink odour

**Symptoms of damage**
- Sucking the sap from individual grains, which are in milky stage
- Individual grains become chaffy
- Black spots on the grains at the site of feeding puncture.
- Buggy odour in rice field during milk stage

**Management**
- Dust any one of the following at 25 kg/ha twice, the first during flowering and second a week later
  - Quinalphos 1.5 D / Carbaryl 10 D / Malathion 5 D
  - Spray any one of the above twice as above
Other pests in Rice crop

- Rat
- Birds damage
Other pests in Rice crop

Bird damage

Algae
Control of other pests

Control of birds

• Birds cause 2 type of damage
  – Cut the panicle
  – Puncture the grain
• Damage is more in early maturity varieties
• For control of birds- use bright color ribbon above side (7-8 ft height) for reflection
• Keep some models inside field

Control of Algae

• Drain the water from field and don’t irrigate for 5-6 days
• Apply Copper Sulphate as spray to minimize algae invasion
Control of other pests

Control of Rats

- Rats cause significant damage to paddy crops
- Close the holes
- Apply rodenticide like Zinc phosphide mix with tomato or dry fish or any other eatable food items.
- Apply Phorate 10 G, as precautionary on all surroundings of fields
- Also use 1 ft height polythene sheet surrounding the trial area
Cultivation in alkali soils

- Add Gypsum as per the soil test report.
- Do not puddle because water intake rate in these soils is very low.
- Transplanting seedlings a week earlier than the normal time of transplanting, because the initial growth of plants in alkali soil is slow.
- More seedlings per hill are recommended because of higher mortality in these soils.
- Apply 20-25% more nitrogen than in normal soils.
- If harvesting is delayed till the crop dead ripe, the shattering of grains occurs.
Harvesting, threshing and Milling

• It should be harvested when plants have turned yellow, the moisture at this stage will be 18-22%.
• If manual harvesting is done, leave the material for a day in the field.
• Paddy grain should be dried for 4-5 days in the field before threshing, when moisture is about 14-18% (ready for market)
• Before storage, leave the threshed grains for 8-10 days in the field (moisture should be 12-14%)
Harvesting, threshing and Milling

- Mechanical harvesters are combined for harvesting & threshing and are used extensively in North India.
- Subsequently, paddy needs to be dried to bring down the moisture content to less than 14% for milling.
- Milling is done by mills who either sun dry or use mechanical driers or both.
- Drying has to be carried out quickly to avoid the formation of moulds.
- A good mill can achieve a paddy-to-rice conversion rate of up to 70% but smaller, inefficient mills often struggle to achieve 60%.
THANK
YOU