

SEED PRODUCTION IN PADDY



SEED

GRAIN

Seed is planting materials whereas grain is consumption purposes



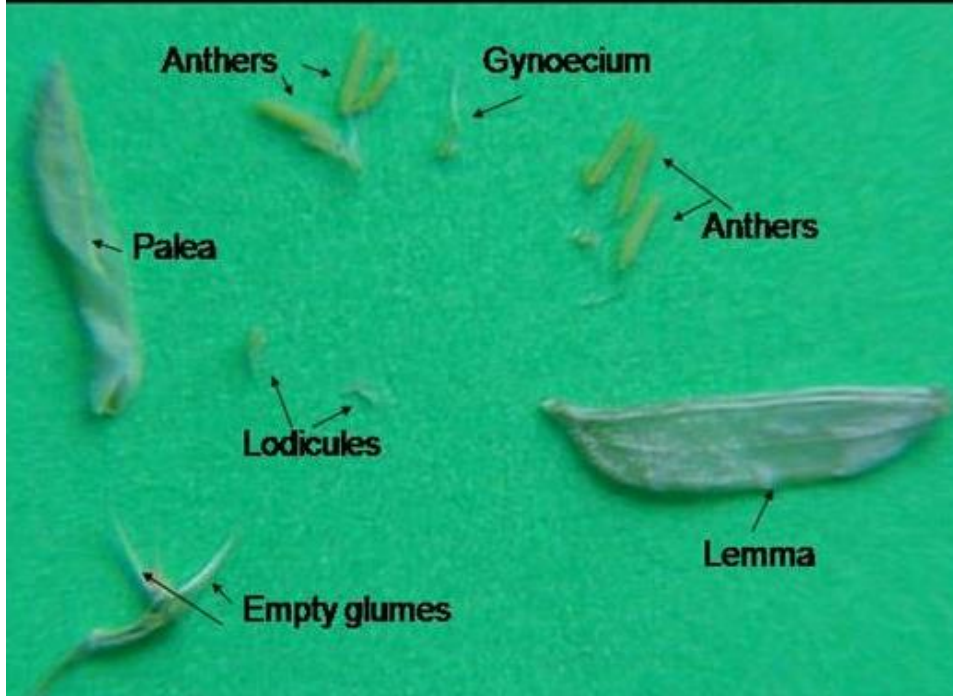
BOTANICAL INFORMATION

Botanical Name	: <i>Oryza sativa</i>
Chromosome number	:24
Family	: Poaceae
Inflorescence	: Panicle
Pollination	: Self-Pollination
Panicle Emergence	: 4-5 days APE
Flower Opening	: Tip of primary & secondary branches open and proceeds downward
Duration of Flowering	: 6-8 days
Time of Anthesis	: 7.00 –10.00 A.M
Temperature	: 24 -28°C
Favourable RH for flowering	: 70-80%
Stigma receptivity	: 3 days
Pollen viability	: 10 minutes



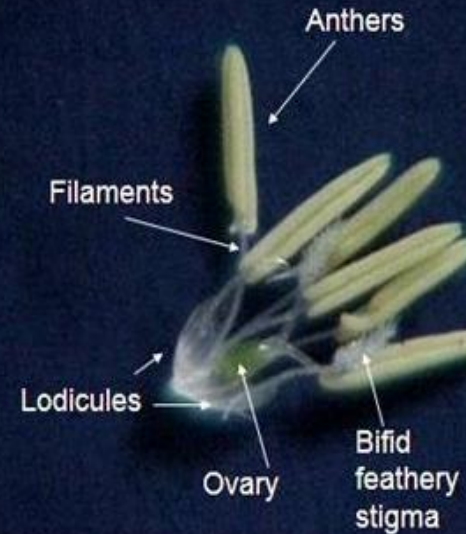
FLORAL BIOLOGY

PARTS OF SPIKELETS



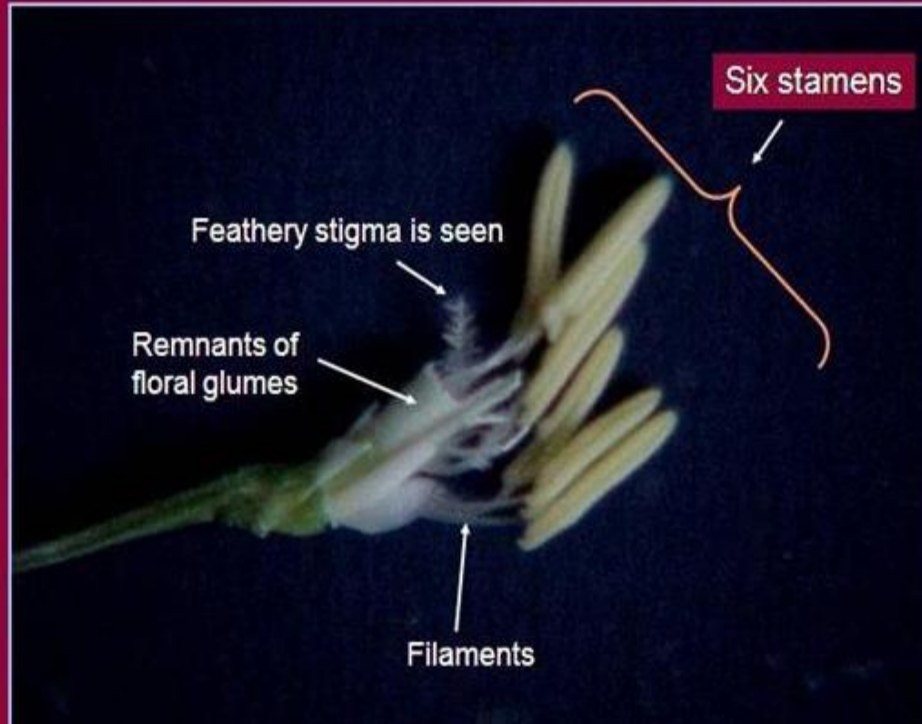
Androecium, Gynoecium & Lodicules

View 1



- ANTHERS: 6 stamens
- GYNOECIUM: bifid feathery stigma
- FLORAL PARTS: Lodicules, Lemma, Palea, Pedicel

Androecium



Gynoecium

View 1



INFLORESCENCE

The Panicle

(Close View)

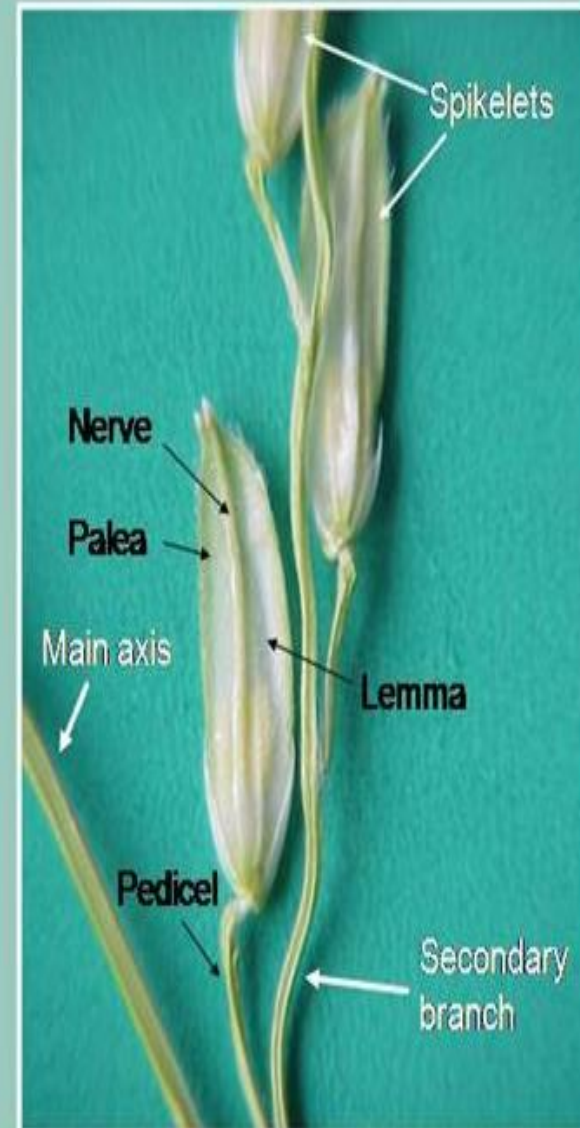
The panicle has a main axis, on which primary branches are borne. Secondary branches are borne towards the basal region of the primary branches. Tertiary branches, if any, are seen at the base of the secondary branches



The Panicle

Spikelets

The spikelets are single-flowered, each with a short stalk known as pedicel. Each spikelet has.....



CRITICAL GROWTH STAGES

Growth phase		Stage	
I.	Vegetative (germination to panicle initiation)	•	Stage 0 from germination to emergence
		•	Stage 1 - seedling
		•	Stage 2 - tillering
		•	Stage 3 - Stem elongation
II.	Reproductive (panicle initiation to flowering)	•	Stage 4 - panicle initiation to booting
		•	Stage 5 - heading or panicle exsertion
		•	Stage 6 - flowering
III.	Ripening (flowering to mature grain)	•	Stage 7 - milk grain stage
		•	Stage 8 - dough grain stage
		•	Stage 9 - mature grain stage

SEED PRODUCTION

Land requirement: The land should be free of volunteer plants and the same crop or the other varieties of the same crop should not have been grown for the previous season

Isolation: 3 meters

Selection of seed: Seed should be from an authenticated source

Variety / type of cultivation	Seed rate
LOW LAND CULTIVATION (transplanting) Short duration varieties Medium duration varieties Long duration varieties	60 kg /ha 40kg /ha 30kg/ha
For low land cultivation by broadcasting	80-100 kg/ha
For rainfed rice	75-100 kg/ha



Figure 6: Nursery preparation and sowing of germinated seeds

NURSERY PREPARATION



TRANSPLANTING

- Stage of seedling 20-25 days old /when seedling attain 2-3 true leaves stage
- Line transplanting (15 cm x 25 cm) 10 cm x20 cm/15 cm x 20 cm/15 cm x 30 cm
- Alley planting (every 8-10 rows there will be a gap of 30-45 cm)



	Nitrogen (N)	Phosphorus (P)	Potash (K)
Short duration	120	38	38
Long and medium duration	150	50	50
Bio-fertilizer	Azolla @ 1t/ha 3-5 days after weeding		

- **Nutrient management:** Apply 25% of N and K as basal and remaining 75% in 3 split doses at tillering, panicle initiation, and at heading stages
- **Foliar spray:**
 - ✓ FeSO_4 0.5% to prevent yellowing of plants in calcareous soils.
 - ✓ DAP 2% to enhance seed set in paddy cultivars
 - ✓ GA_3 three times at panicle initiation stage for complete exertion of panicle
- Water, Weed and Pest management done as per recommendations
- **Rouging** should be done

FIELD INSPECTION AT MATURITY STAGE



- First inspection : At flowering stage after panicle emergence
- Second inspection : At maturity stage after grain development

IDENTIFIED OFF-TYPES AND ROUGING



PHYSIOLOGICAL MATURITY

- Seeds attain maturity with the visual symptom of turning of ear heads to golden yellow colour
- When 80% of the plants are exhibiting the symptom the crop is ready for harvest
- The moisture content of the seed will be 18-20-%
- **Harvesting and Threshing**
- **Seed Processing and Seed Treatment**

MANUAL THRESHING



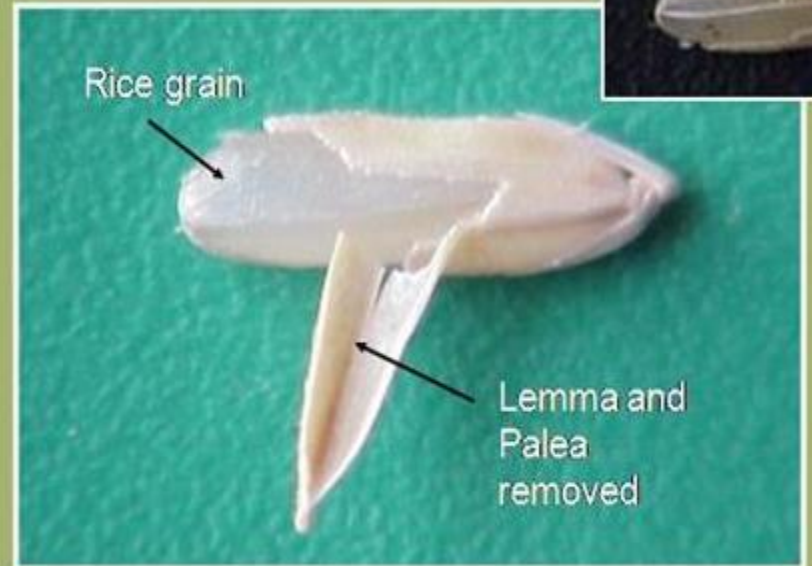
Mature Grain with Husk

View 3



Mature Grain with Husk

View 4

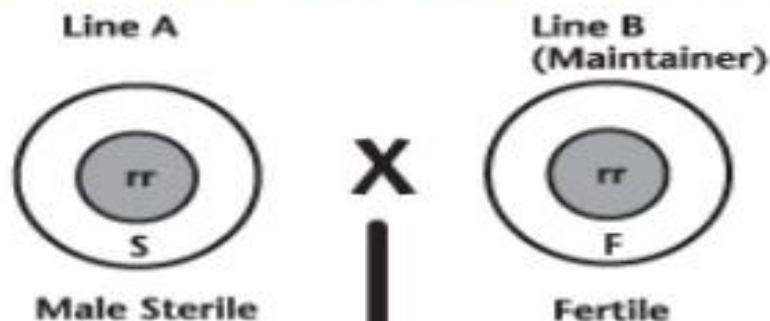


HYBRID SEED PRODUCTION

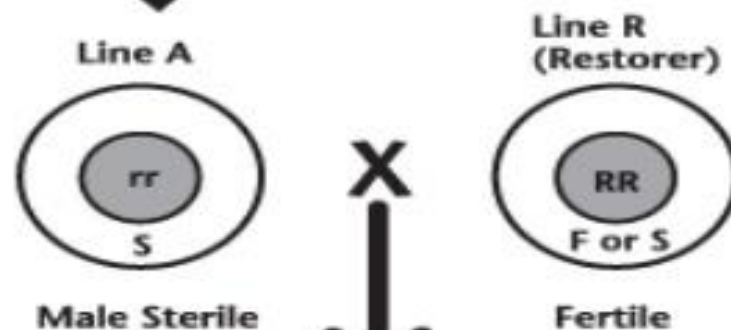
- Cytoplasmic genetic male sterility system
- **Three line method** (ABR line)
- **Two line method** or environmental genetic male sterility (EGMS) system that involve PGMS (photosensitive genetic male sterility) and TGMS (Thermosensitive male sterility system)
- **Land requirements** same followed
- **Isolation**: FS: 200 m CS: 100 m
- **Time isolation** : 20 days either earlier or later for other varieties compared with MS line
- **Seed rate**: Female- 20 kg /ha; Male- 10 kg /ha
- **Planting ratio**: 2:8

Hybrid seed production using CGMS system

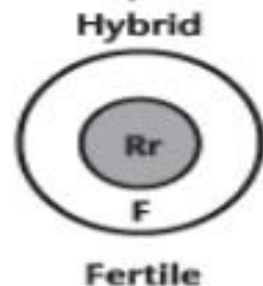
Step 1: Foundation seed crossing block to produce more Line A seed



Step 2: Hybrid seed crossing block to produce actual hybrid seed for commercial crops



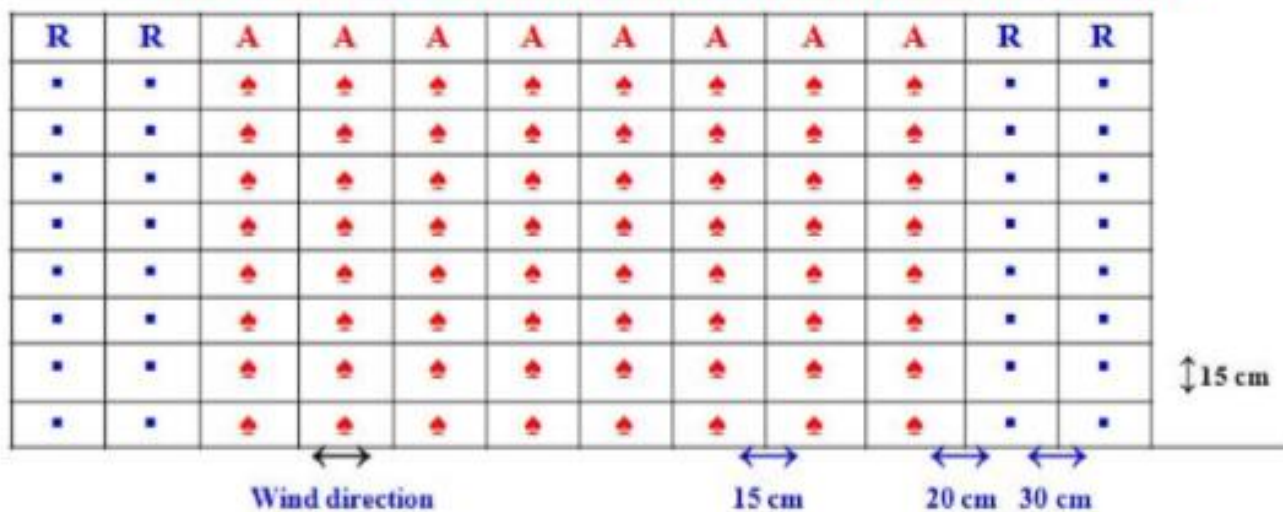
Step 3: Commercial canola production



S = sterile cytoplasm
 F = fertile cytoplasm
 rr = homozygous for maintainer gene
 RR = homozygous for dominant restorer gene
 Rr = heterozygous for restorer gene

(Self-pollinates to produce seed)

Scheme 1: Row Ratio, Row Direction and Planting Pattern for Hybrid Rice Seed Production (Male : Female ratio = 2 : 8)



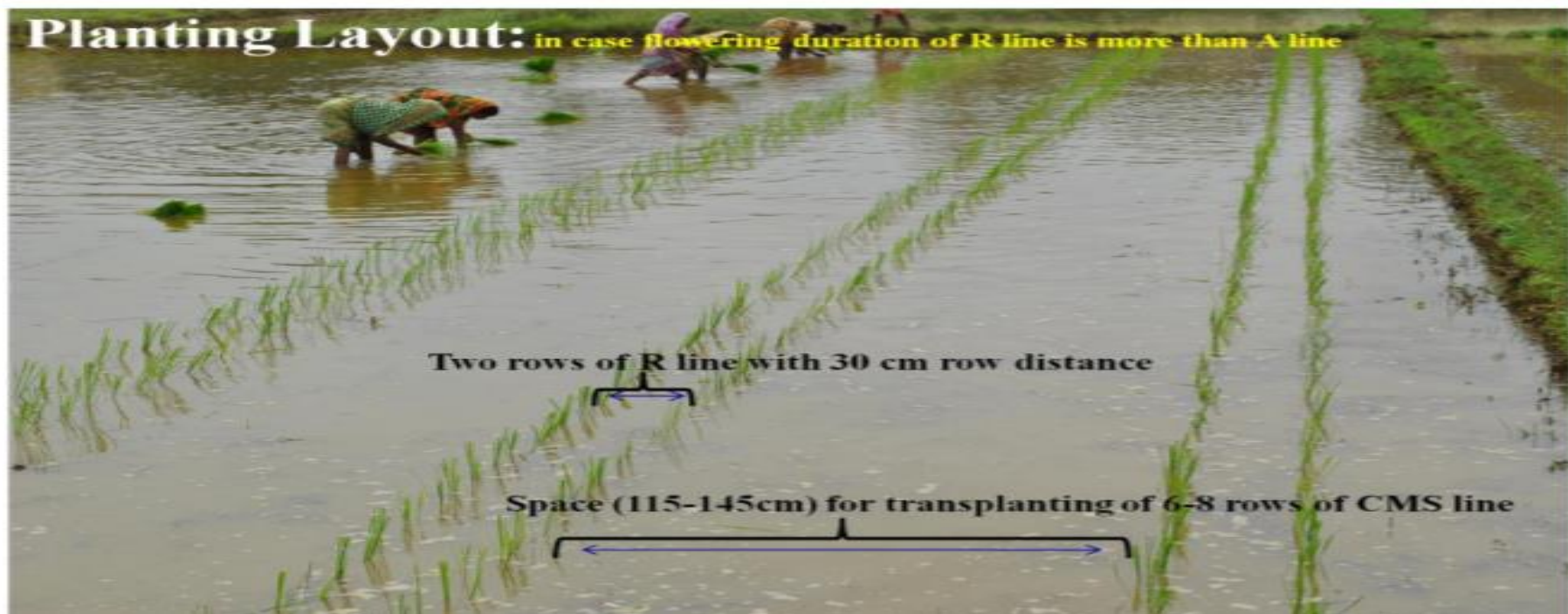
TRANSPLANTING

- Transplant 'A' line seedlings in blocks of 8 rows in between the paired rows of 'R' lines
- Transplant with 1-2 seedlings/hill at a spacing of 15 x 15 cm
- Always keep 20 cm wide space between A line rows and nearest R line row

Factor	Maximum permitted (%)	
Off types	0.050	0.20
Objectionable weed plants*	0.010	0.020

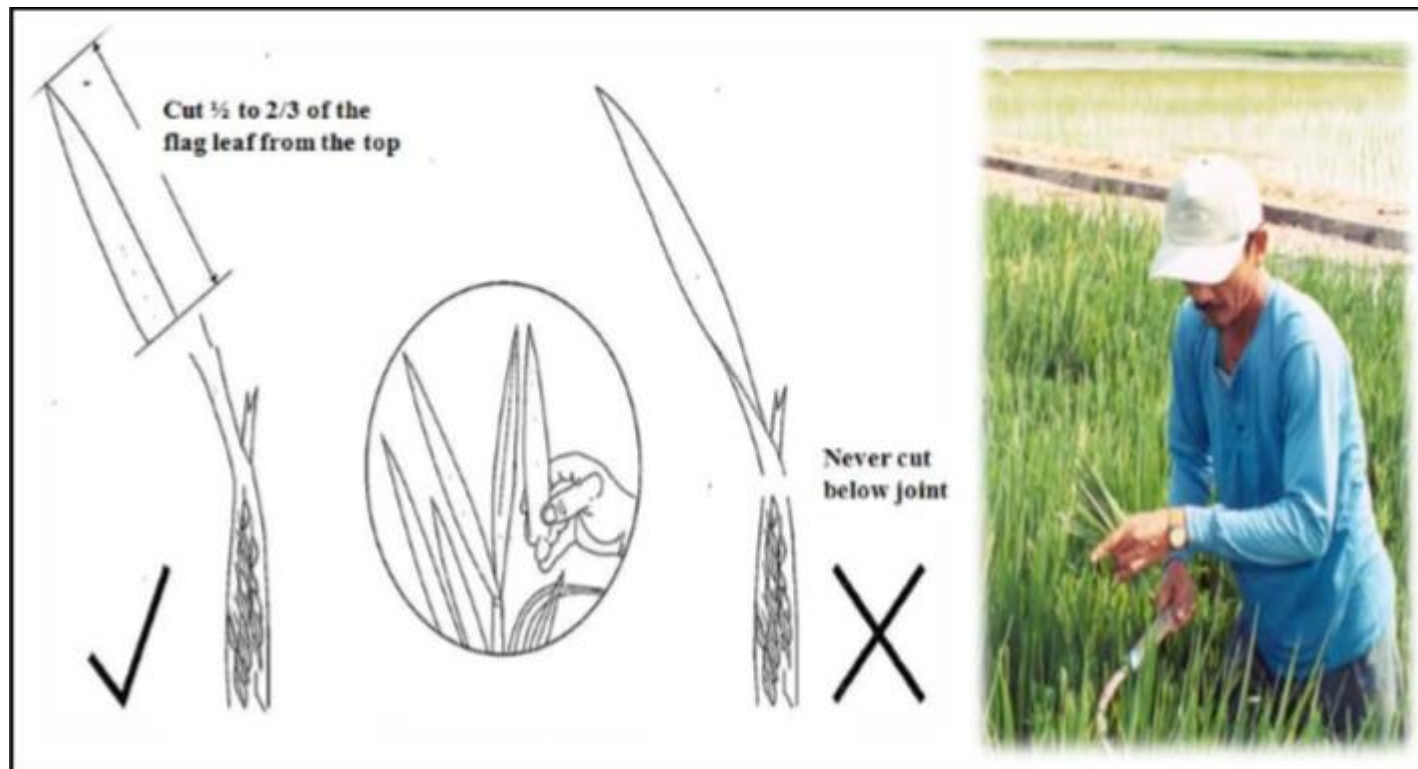
*Objectionable weeds are Wild rice (*Oryza sativa* L.var.*fatua* Prain
(*Syn.O.sativa* L.f. *spontanea* Rosch.)

Planting Layout: in case flowering duration of R line is more than A line



Planting Layout: In case flowering duration of both parents are same

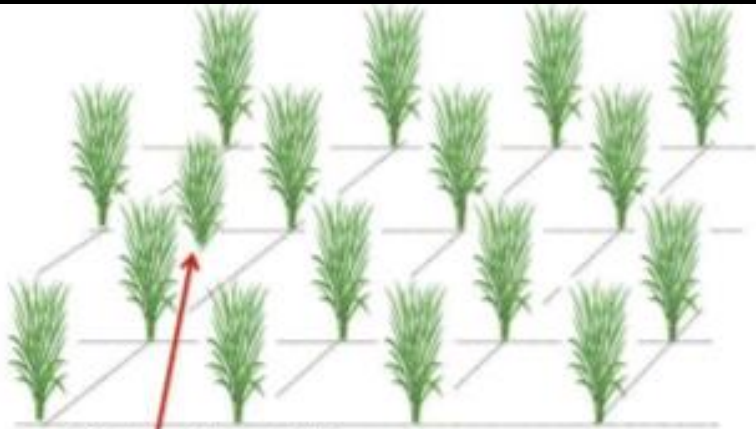




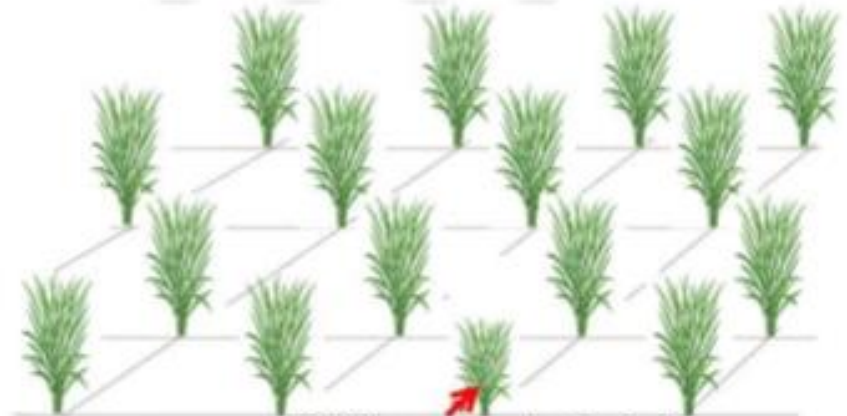
Flag leaf clipping:

- The clipping of flag leaf helps in free movement and wide dispersal of pollen grains to give higher seed production.
- Only half or two-third portion of flag leaf should be clipped at booting stage.

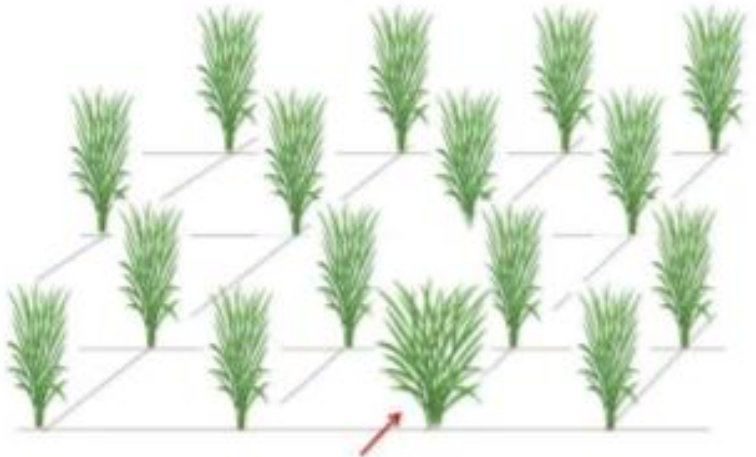
ROUGING



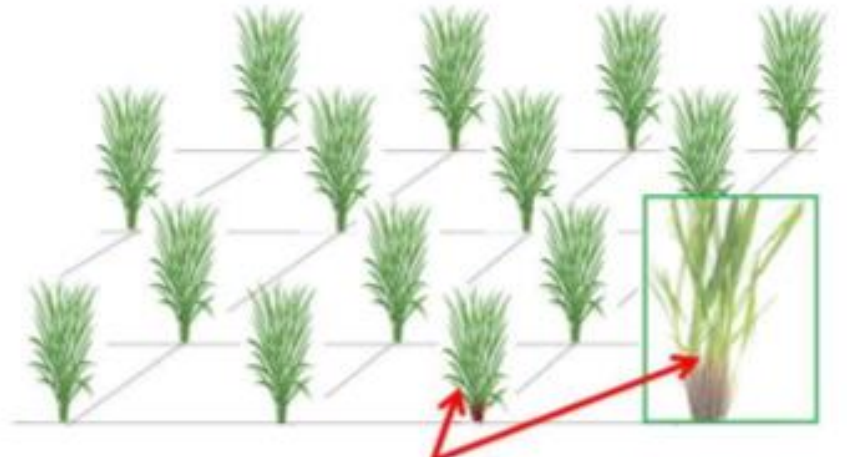
Out side of the row



Differences in height



Different plant type



Colored base and leaf sheath

SUPPLEMENTARY POLLINATION

- Technique of shaking the pollen parent so that the pollen is shed and effectively dispersed over the A line plants.
- Rope pulling or by shaking the pollen parent with the help of two bamboo sticks.
- The first supplementary pollination should be done at peak anthesis time i.e. **8.30AM to 10.30AM** when 30-40 % of the spikelets are opened.
- Process is repeated 3- 4 times during the day at an interval of 30 minutes
- It is done for 7-10 days during the flowering period.



Scheme 1: Supplementary pollination through stick shaking



Scheme 2: Supplementary pollination through rope pulling

SEED STANDARDS

Factor	<i>Standards for each class</i>	
	<i>Foundation</i>	<i>Certified</i>
Pure seed (minimum)	98.0%	98.0%
Inert matter (maximum)	2.0%	2.0%
Huskless seeds (maximum)	2.0%	2.0%
Other crop seeds (maximum)	10/kg	20/kg
Other distinguishable varieties (maximum)	10/kg	20/kg
Total Weed seeds (maximum)	10/kg	20/kg
*Objectionable weed seeds (maximum)	2/kg	5/kg
Seeds infected by paddy bunt (<i>Neovossia horrida</i> (Tak.) Padwick & Azmatulla Khan. (maximum)	0.10% (by number)	0.50% (by number)
Germination (minimum)	80%	80%
Moisture (maximum)	13.0%	13.0%
For vapour-proof containers (maximum)	8.0%	8.0%