Module 2

Crop Production techniques for wet season production

Unit 1

Good Agronomic Practices?

45 mins

Objectives

1

To understand what **good agronomic means.**

2

To get familiar with the **two major family of crops.**

3

To know **the step by step procedures for Maize.**

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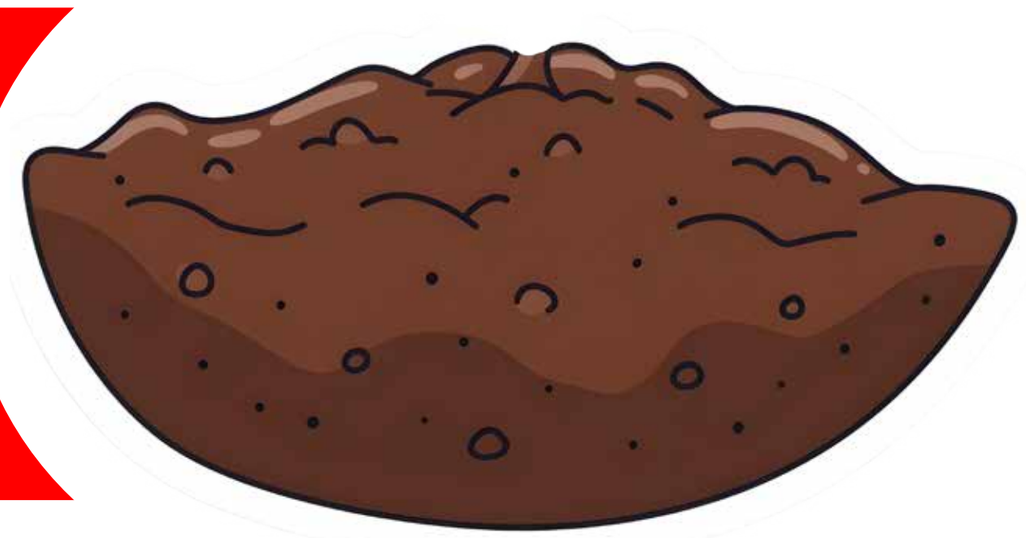
Definition of Good Agronomic Practices (GAP) ?

Good agronomic practices are a series of proven or verified steps to follow in ensuring safe and sustainable crop production. These steps might slightly vary depending on the crop type to be cultivated. We would be discussing each of the essential GAP for the focus crops promoted by SAA. Major good agronomic practices include:

1 Site selection

Choosing good sites with good soil type appropriate for cultivating crops (depending on which)



2 Variety Selection

In RA, due to the effect of climate change, its important to use improved climate resilient varieties that can strive through and also produce higher yield. Using improved maize variety is a KEY step in attaining high yield. This should be purchased from certified seed source or vendors.

3 Land preparation

It's also important to establish crops on a moderate, well-prepared field to support crop growth until harvesting.

4 Sowing

Planting method is a key determiner of the plant population and attainable yield. Therefore, this is vital in production.

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Definition of good agro-nomic practices (GAP) contd?

5 Fertilizer application

Crops need nutrients to help support their life cycle. Most of these nutrients aren't present in the soil, hence it has to be supplemented.

6 Weeding

When weeds compete with the main crop, it reduces yield and increases the cost of production.

7 Pest and disease management

Its important to treat pest and disease that infect crop as this could reduce yield.

8 Harvesting

This is usually the last stage before commencing post-harvest activities.

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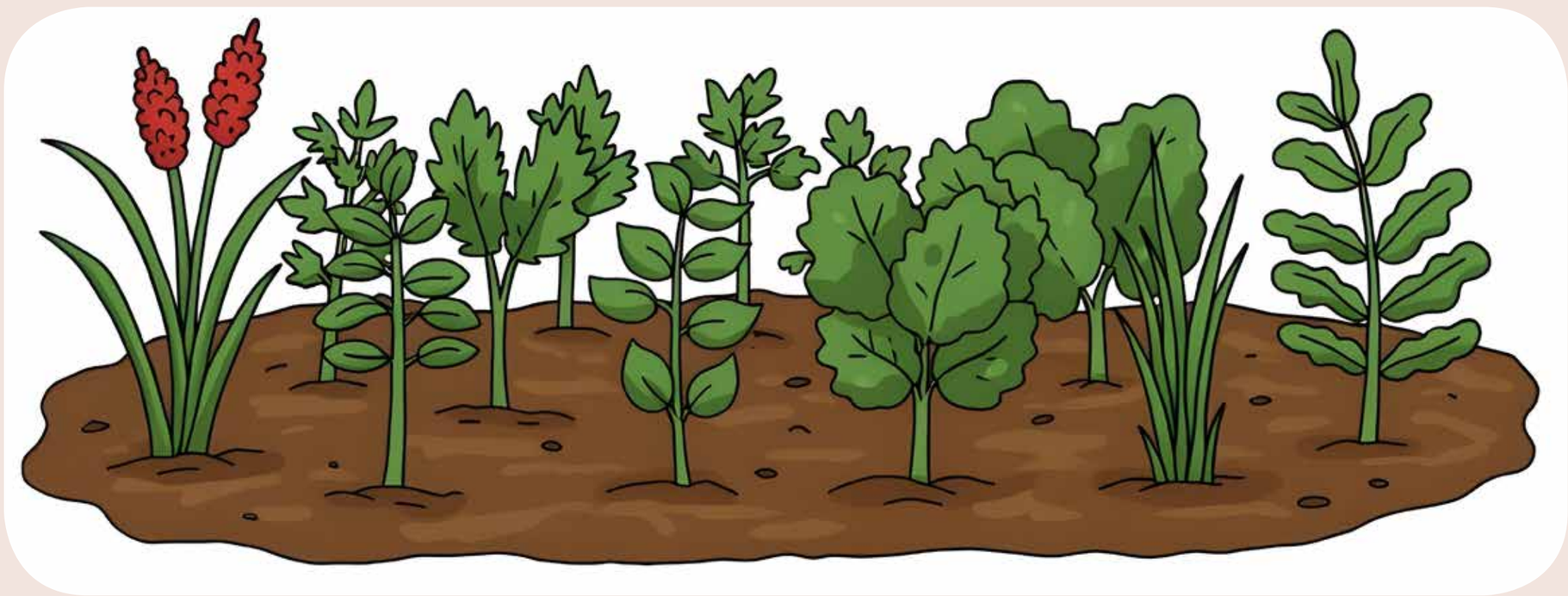
Major Families of crop

1. Cereals
2. Legumes

Cereals

Cereals are classes of food that are richer in **carbohydrate** and are consumed for its edible grain. These family of crops **Don't** add nutrient from the soil when cultivated but rather **Use-up** the nutrients in the soil.



Major examples are

Maize

Rice

Millet

Sorghum

Wheat

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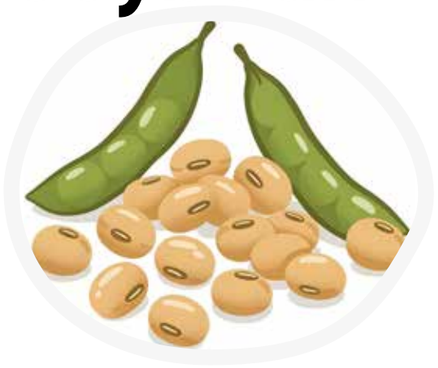
Legumes

Legumes are classes of food that are richer in **protein** and also consumed for it grain. These family of crops INCREASES nutrient in the soil unlike cereals. Legumes are known for it natural **nitrogen** fixation due to nature of it roots. (see below)

Hence, it is usually advisable to cultivate cereals and legumes in rotation and mixed on same piece of land. In this case, One crop type is taking nutrient **while** the other is **fixing back** nutrient. This helps to gradually regenerate the soil over the year.

Major examples include

Soybean



Groundnut

Cowpea

Bambara nut

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Good agronomic pratices for major cereal crops

Maize Production

The following are the good agronomic practices for maize:

- Site selection
- Variety selection
- Land preparation
- Sowing
- Fertilizer application
- Weeding
- Harvesting

1 Site Selection

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2 Variety Selection

Using improved maize variety is a **Key** step in attaining high yield. This should be purchased from certified seed source or vendors. There are several varieties depending on the color or climatic/ecological zone to be used in. These varieties include several traits or qualities like nutrient dense (e.g pro vitamin A maize, Quality protein maize), tolerant to climatic factors such as drought, flooding, dry spell or pest and diseases.

Varieties are majorly classified into:

Open Pollinated Varieties

and

Hybrid Variety

Seed Rate and Treatment

- It is important to treat your seeds with recommended chemicals against soil pests such as termites, wire worm, grubs, crickets, ants, army worm and fungal diseases.
- This ensures good germination of planted seeds in the field.
- Some of the recommended common chemicals in the Agro chemical companies and agro dealers are: Apron Star, Seed Plus, Dress Up etc.
- A sachet of 10 grams chemical can treat 3 to 4 Kg seed

3 Land preparation and RA

Step 1

a

In cases of dense bushes or notorious weeds, the first step is to manually clear or removing debris, stubble from previous crops before onset of rains.

Clearing a dense bush during land preparation

b

Using Chemical method, you can apply pre-emergence herbicide (e.g glyphosate total killer) to kill all the weeds or grasses.

Chemical method to kill weeds/grasses before tilling

AVOID burning during land preparation

The following should be adhered to:

- **a** **ENSURE** to apply the right **Quantity.**
- **b** **ENSURE** to allow the field until after **14days** of applying pre-emergence before tilling
- **c** **ENSURE** to take precautions when spraying, consider the wind direction and wear safety wears.

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Step 2

Minimum Tillage and Mechanized RA

a

Apply organic manure or compost after land clearing.

b

Practice minimum tillage by only tilling (plough and harrow) the top of the ridges where maize is to be planted (i.e after slashing the weed between one ridge and the other and ensuring thorough mulch cover)

OR

c

Use less heavy mount tractors or machines like power tillers to plough and harrow. (these machines are user friendly and less destructive of the soil).

Ridging

1. It involves heaping the soil to form a raised ridge on which seeds are planted.
2. It helps the crop to have a good bed for root establishment and to prevent lodging.
3. It helps maintain moisture and improve drainage in waterlogged areas.
4. It concentrates nutrients from topsoil near the crop for easy access.
5. Ridges can be done with hand operated ridger, animal or tractor drown ridgers.
6. Construct ridges of 75 cm apart and apply mulching material inter and intra row to hinder further weed growth.
7. In one (1) ha, you will have 133.33 ridges.

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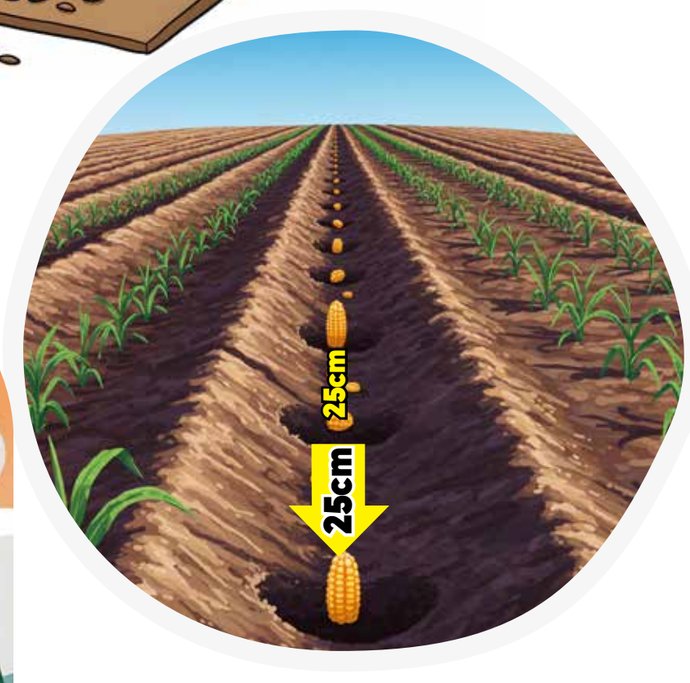
4 Sowing

Sowing Method

a Before sowing, ensure that seeds are sorted out by removing broken ones to avoid poor germination.

Plant one seed per hole at 25cm between plants and 75cm spacing between ridges. This will have a plant population of 53,300 maize plant per ha.



- **MUST** ensure to Plant when rain is **WELL** established.
- Seed rate (20-25kg/ha – OPV) & (20kg/ha – Hybrid)
- Treat seed with seed dressing chemicals e.g. Apron plus @10grams for 4kg seeds

- Spacing: 75cm X 25cm (75cm between row & 25 cm between plants)
- Plant **ONE** seed/hole and **2-3cm** depth. (Note that distance between one seed and the other is **25cm**).

b Sowing in rows is highly recommended for UDP use as it allows better management of the placement and spatial distribution of the briquettes

c Sowing in rows also offers the possibility of using a rotary hoe (corn weeder) for weeding and helps control stocking density (number of plants per m2). Movements within the field for maintenance activities (hand weeding, fertilizer application, crop protection treatments) are then facilitated.

5 Fertilizer Application

a

If NPK-20:10:10 use 8 bags (50kg each) and 2 bags Urea per ha. Apply 8 grams at sowing or 7 days after planting between two stands.

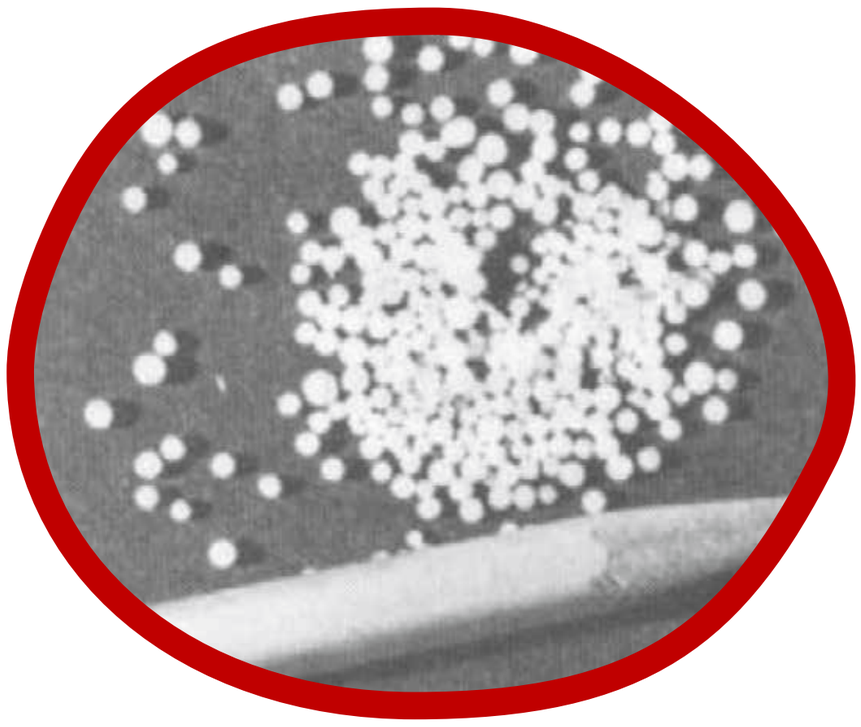
b

If NPK-15:15:15 use 6 bags + 3 bags urea (50kg each bag) per ha, apply 8 grams at sowing or 7 days after planting between two stands.

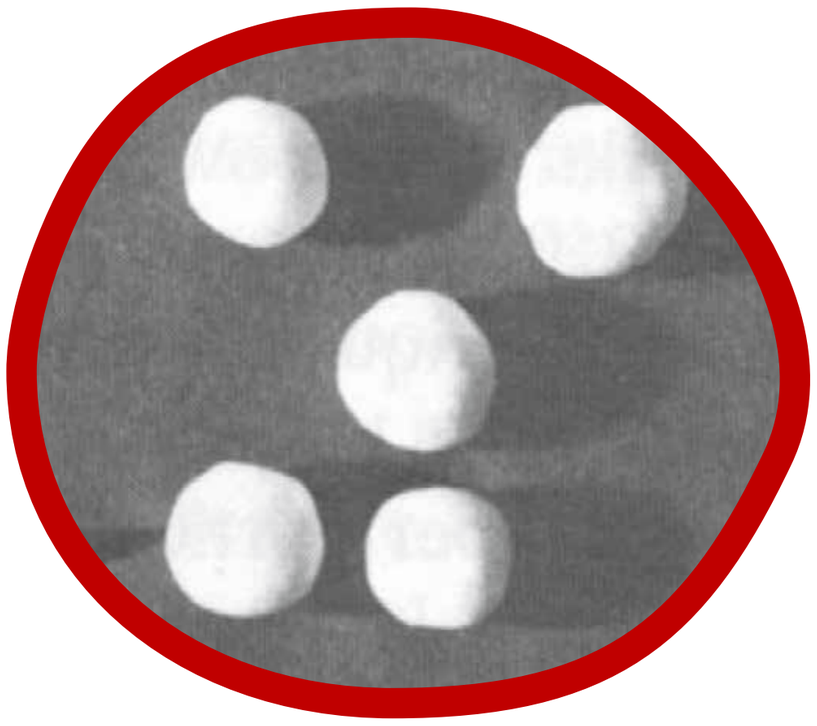
Ensure you BURY the fertilizers and not broadcast

c

For USG – 80-100kg/ha, apply one between 2 stands and bury at 4 weeks



Prilled Urea



USG (Briquettes)

Fertilizer Application and RA

Deep Placement of Urea Super granules (USG)

a

The quantity of USG to apply depends on the plant population

b

Plant spacing of 25cm between plants and 75cm spacing between ridges gives a plant population of 53,300 maize plant per ha, and 20 cm between plants and 90cm between ridges, 55,555 plants per ha.

c

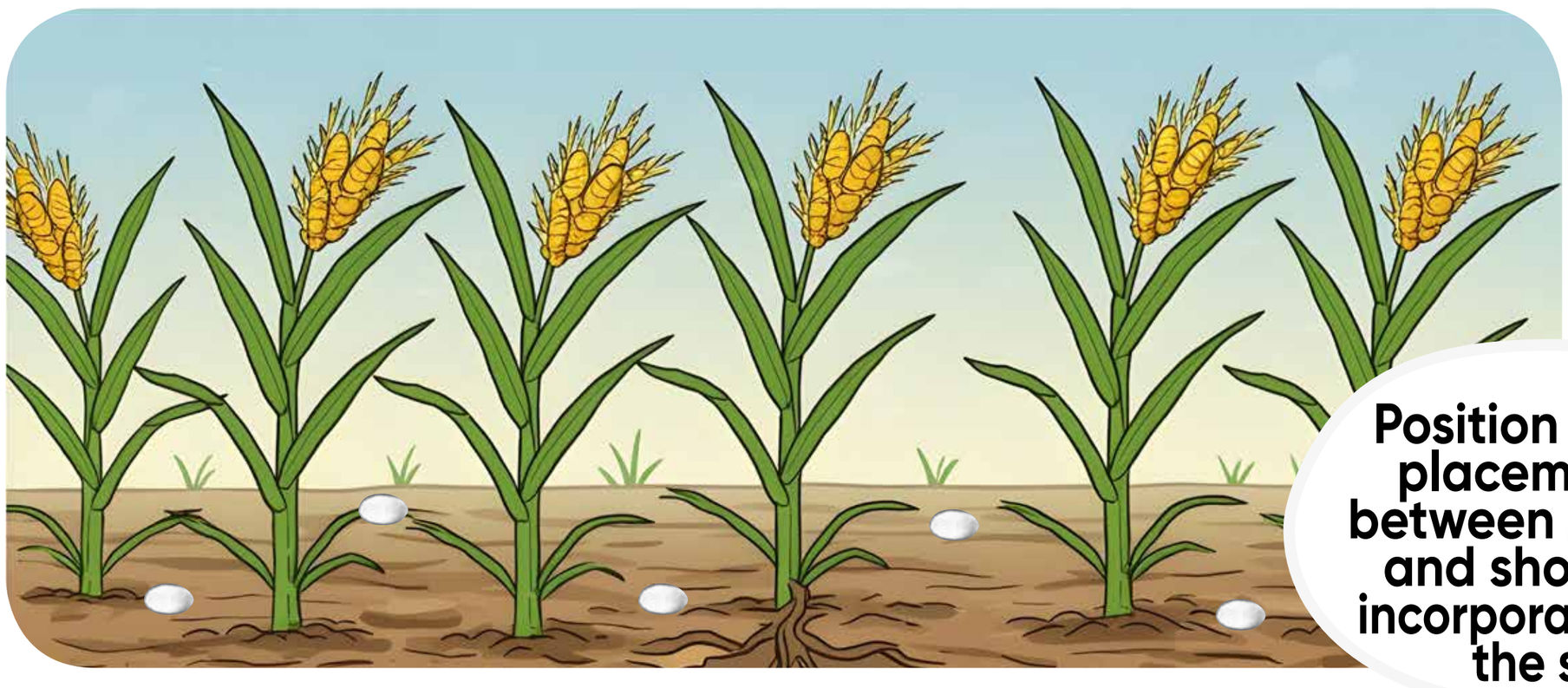
One briquette is applied for each maize plant/stand 20 days after sowing

d

Make a hole of 5cm deep at 7-10 cm away from the plant, put one USG and cover by pressing with soil.

e

Plant spacing of 25 cm x 75 cm requires about 96 kg USG of urea per ha with 1.8 g briquettes, and 144 kg with 2.7 g briquettes.



Position of UDP placement in between 2 plants and should be incorporated into the soil

6 Weeding Management and RA

In RA, a major way of weed management is by MULCHING. It is expected that after the first pre - emergence application before planting, once the field is PROPERLY MULCHED (inter and intra row) weeds would be greatly managed.

A well mulched maize field at different growth stage

a The application of USG reduces weed growth as urea is placed deeper in the soil and hence out of the reach of weeds' rooting zone.

The period between emergence and tasseling is the most critical period for weed competition in maize.

Cultural method

The use of a hand hoe or mechanization using a simple weeder to weed.

Weeding using a simple weeder and a hand hoe

b

Chemical method

In cases where mulching wasn't done, managing weeds can be done chemically, BUT should be applied judiciously (right time, right quantity/ quality and right way).

When and how much to apply?

Apply Atrazine 1-3 days after planting (Pre- Emergence) at 4 – 5 Lits per ha or apply Pendimethalin 1-3 days after planting (Pre-Emergence) at 3-4 Lits per ha.

- 1st weeding (14-21 days after planting)
- 2nd weeding (4-6 weeks after planting)

ENSURE to observe safety precautions when spraying.

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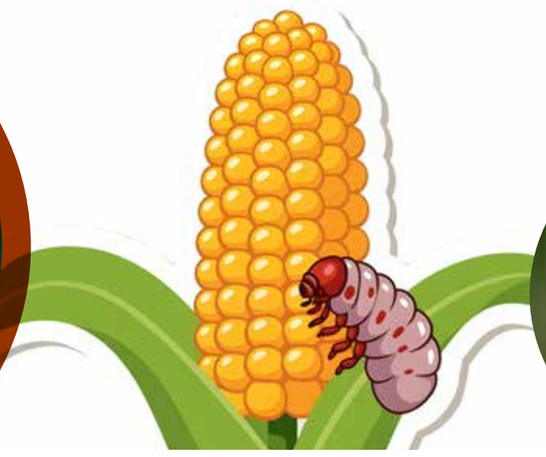
c Pest and disease control

a Pest



Sn	Pest	Description and damage	Control measures
1	Termites, Crickets, Grubs, Wireworms	These are mainly soil pests that damage germinating and young growing maize seedlings, resulting in poor germination	Burning or burying of crop residue Ploughing and Harrowing Early planting
2	American Armyworm, African Armyworm, Cutworms, Stem borers, Cob borers, Leafhoppers, Grasshopper	These are foliar pests that feeds and damage the leaves, leave whorls stalk, roots, cobs	Burning or burying of crop residue Ploughing and Harrowing Early planting Use of appropriate contact and systemic insecticides e.g., Uppercott, Best Action, Cyperdiforce, Lamder, Karate etc. Integrated Pest Management
3	Striga	Striga is a parasitic weed that feeds on maize through attachment to the roots, causing damage and yield loss	Timely planting and farm operations Use of organic manure Crop rotation of maize with soybean, groundnut or cowpea Removal of striga in the field before flowering and seeding Use clean maize seed free from striga infestation.

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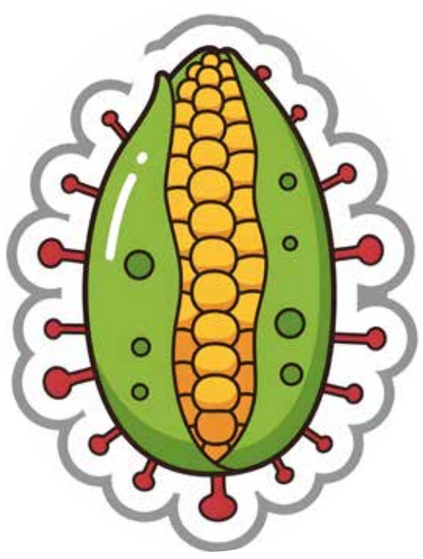
b Diseases






Sn	Diseases	Description and damage	Control measures
1	Leaf Blight	Long, spindle-shaped, greyish-green, water-soaked spots develop on leaves and later turn light purplish-brown or grey.	Use resistant cultivars Crop Rotation Use Fungicides
2	Maize Streak Virus	Fully elongated leaves develop chlorosis with broken yellow streaks along the veins, contrasting with the dark green color of normal foliage. Severe infection causes stunting, and plants that can die prematurely will not develop cobs.	Use resistant cultivars Crop Rotation Use Fungicides
3	Downy Mildew	Some species causing downy mildew induce tassel malformation, blocking pollen production and ear formation. Leaves may be narrow, thick and abnormally erect.	Use resistant cultivars Crop Rotation Use Fungicides
4	Maize Smut	This fungus causes the replacement of part or all of the cob, and often the tassel, with black masses of powdery spores.	Use resistant cultivars Crop Rotation Use Fungicides
5	Leaf Rust	Early-maturing (80-90) days), good yield potential (2.5-3 t ha-1), highly resistant to rosette and moderately resistant to ELS and LLS disease, with high oil content (51.5%)	Use resistant cultivars Crop Rotation Use Fungicides

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d Harvesting

1

Maize is mature when the kernels reach the dough hard stage

2

Bend cobs downward at maturity to hasten drying and minimize spoilage

3

Harvest by de-husking and removing cobs immediately from the field

4

Dry cobs properly on a tarpaulin before storage in a dry place

Unit 2

Good Agronomic Practices

Objective

To know the **step-by-step procedures for Rice**.

Rice Production

The following are the good agronomic practices for maize:

- Site selection
- Variety selection
- Sowing methods
- Nursery Establishment/ Land preparation
- Fertilizer application
- Weeding
- Harvesting

1 Site Selection

Soil type

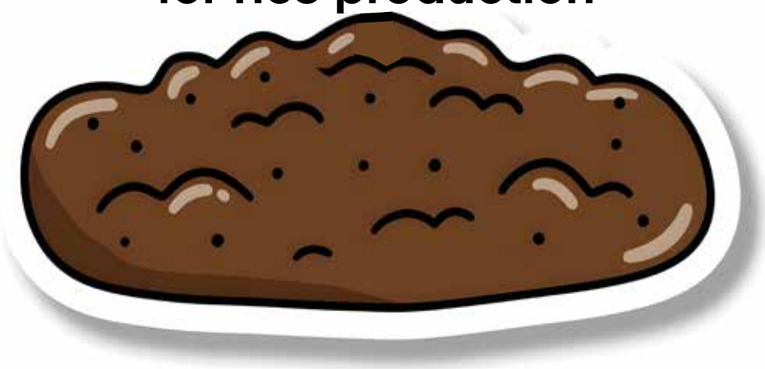
a

Sandy loam to heavy clay, but most suitable is clavev soil.

b

Good soil texture, preferably sandy-loam (upland) or loamy to clayey-loam (lowland).

A well fertile soil for rice production



c

For high yield, select fertile land or soil with high clay content, which can hold a lot of water give the best results in rice production.

d

Rice is known to be water loving, select sites with heavy soils which can hold a lot of water and avoid sandy soils which are unsuitable for growing rice since they do not retain moisture.

e

Rice is adapted to a wide range of environmental conditions, from freely drained Upland ecology to lowland and deep flood ecologies.

e

The upland rice is grown as a rain-fed crop on naturally well-drained soil without surface water accumulation.

2 Variety Selection

	Type	Variety	Maturity days	Tolerance to blast	Tillering ability	Grain type	Potential yield (tons/ha)
1	Low Land	FARO 44 (Sipi)	110 to 120	Resistant	Very Good	Long	4.5 to 6.5
		FARO 52 (Wita 4)	125 to 130	Moderate	Very Good	Long	4.5 to 6.
		FARO 57 (TOX 4004)	125 to 130	Moderate	Very Good	Long	4.5 to 7
		FARO 60		Moderate	Very Good	Long	6 to 8
		FARO 66	130 to 140	Flood	Very Good	Long	6 to 8
		FARO 67	130 to 140	Flood	Very Good	Long	6 to 8
2	Up Land	Nerica 7 (WAB 450-20)	95 to 100	--	Good	Long	5.0
		Nerica 8 (WAB 450-136)	80 to 85	--	Good	Long	5.0

3 Land Preparation

1

Land for rice cultivation should be fairly levelled to allow for water retention.

2

Use systemic herbicides such as Glyphosate if the height of the weeds is between 25 to 60 cm. Note that must be used before land preparation.

3

Intensive soil tillage is very essential by repeated ploughing, harrowing and trampling to create the puddled condition which involves working up the soil to the consistency of a fine soft mud.

4

However, the land preparation for lowland rice involves banding and levelling the field to impound water to permit even flooding.

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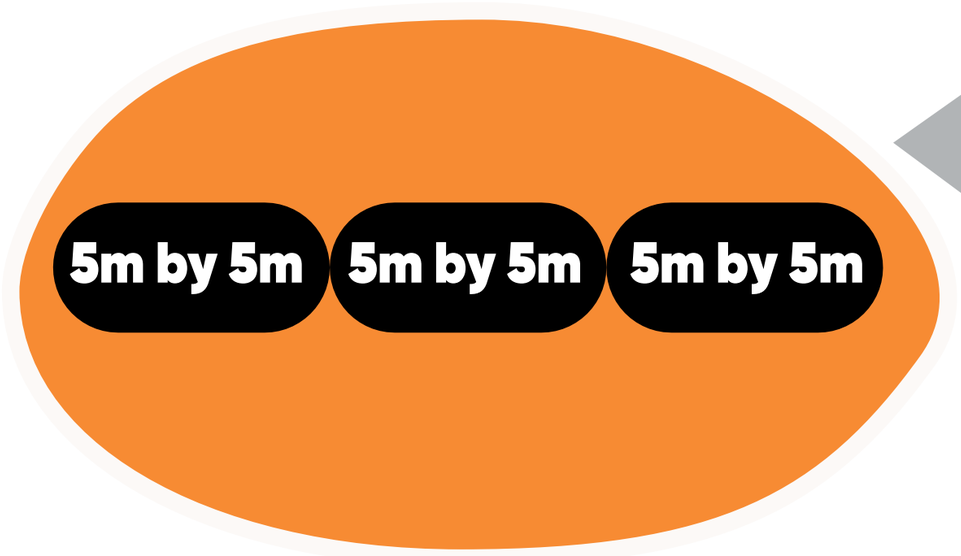
5

The land preparation for upland rice is the same as for other rain-fed cereals such as millet, maize and sorghum.



6

Prepare basins of 5m by 5m or make borders.

7

Avoid fields with poor drainage

8

For Upland rice, till the soil properly and pulverise to create uniformity before sowing.

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4 Sowing

Sowing/Planting Methods	Seed rate (kg/ha)	Spacing
1 Broadcasting	80-100	Spread uniformly or evenly
2 Dibbling	30-40	20 cm x 20 cm
3 Drilling	40-80	20 cm inter-row
4 Transplanting	25	20 cm x 20 cm

a Direct Seeding/ Sowing

For the wet season, several farmers practice direct seeding either by:

1 Broadcasting
– evenly spread

2 Dibbling
20 cm by 20 cm

3 Drilling
25 cm by 30 cm

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b Nursery Establishment

1. Cultivated the land thoroughly and fertilized with well-rotted farmyard manure.

2. Construct beds 1-1.5 m wide and of appropriate length.

3. The beds should be slightly raised.

4. For planting one hectare of field, seedlings are raised in nurseries of about 350-500 sq. m in area.

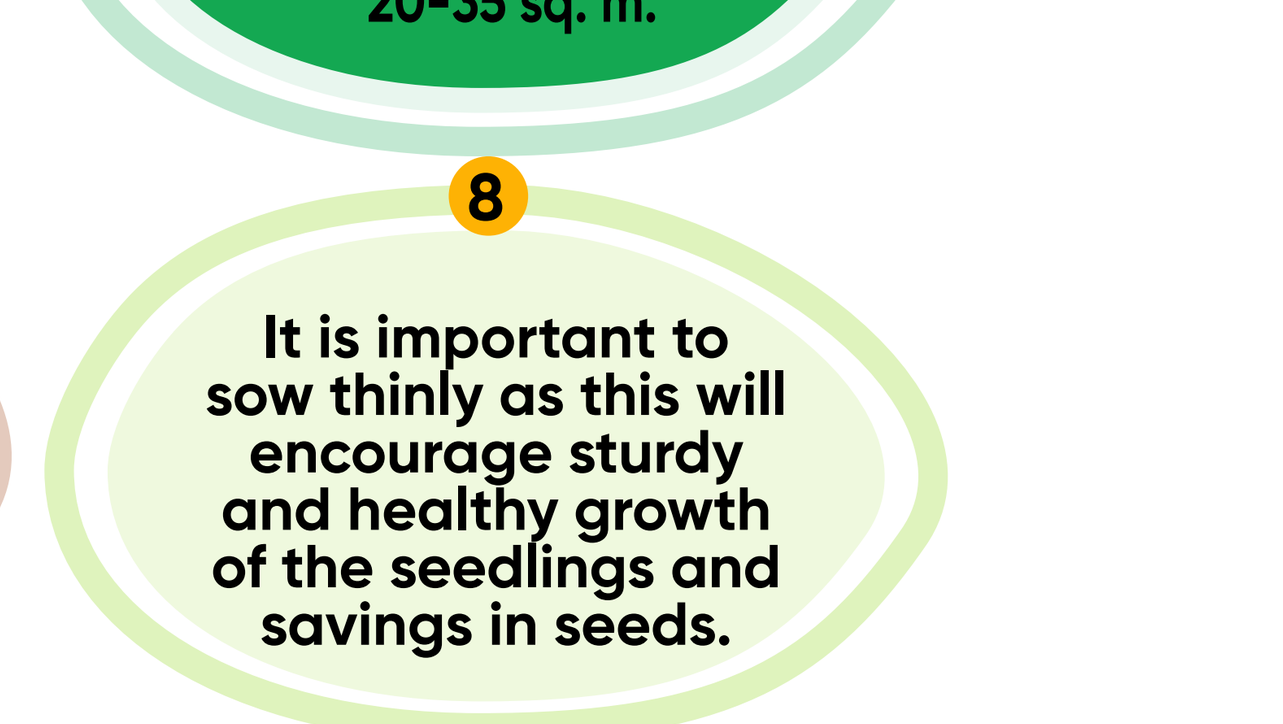
5. Fertilize adequately before sowing.

5. Pre-soaked seeds are broadcast or drilled (10cm apart) in the prepared nurseries at the rate of 1-2 kg per 20-35 sq. m.

7. The seed is covered with 2-3 cm of soil.

8. It is important to sow thinly as this will encourage sturdy and healthy growth of the seedlings and savings in seeds.

9. The sown seeds are to be covered with grass mulch and removed on the 7th day after the seedlings have emerged



Established nursery bed

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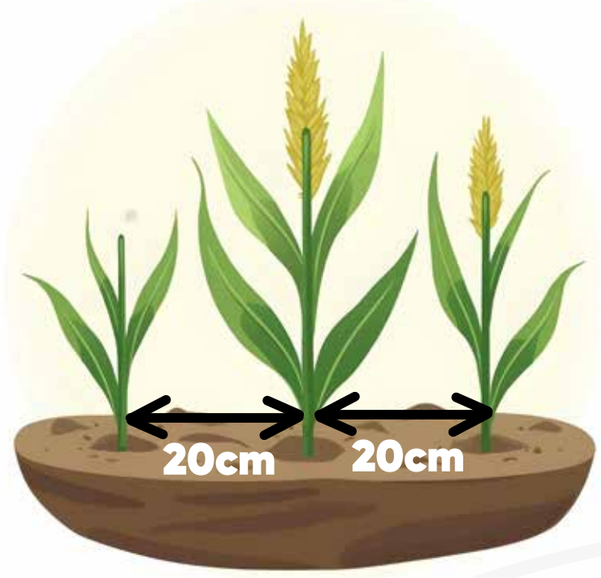
Transplanting for Rainfed and Irrigated Rice



a Seedlings should be ready for transplanting 2 – 3 weeks after planting or at the 4-5 leaf stage

b The best time for dry season rice transplanting starts first week of March

c Seedlings should be pulled out carefully, the roots washed, and tied into bundles before transplanting to the field.

d About 3 days before transplanting, a rotavator is used to break the soil into very fine particles.

e The soil should be drained to improve aeration.

f Transplant 1 (one) seedling at a line spacing of 20cm by 20cm between rows and between plants.

g Avoid transplanting older seedlings as they grow slowly than younger ones and may result in prolonged maturity, reduced tillering capacity with consequent reduction in yield.

h Flood the field with water after transplanting.

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5 Fertilizer Application

a

The new high-yielding cultivars are very responsive to nitrogen fertilizer.

b

At high Nitrogen-levels, the modern cultivars tiller heavily, produce more grains per unit area of land and remain standing until harvest.

c

Because of denitrification losses, Nitrogen should not be added in the nitrate form as a basal dressing. It may be used for supplemental dressings after the root systems are well developed and the Nitrogen can be immediately absorbed.

d

For 1st application

Fertilizer rates are: 70-120 kg N, 30-40 kg P_2O_5 and 30-40 kg K_2O per hectare depending on the fertility status of the soil and the ecology.

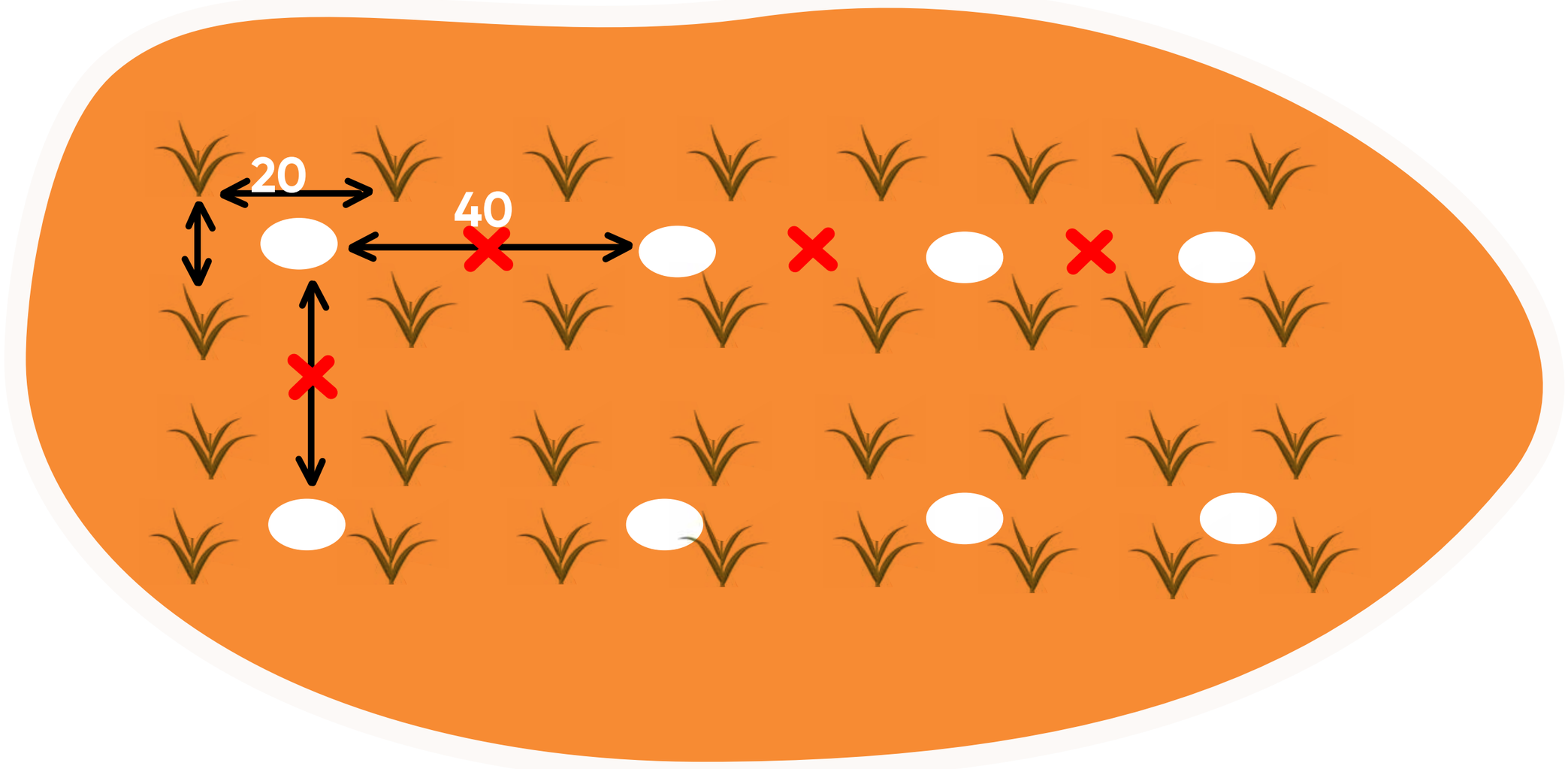
d

Apply 4 bags of NPK 20:10:10 or NPK 15:15:15 per hectare during planting or transplanting.

f

For 2nd application

Use USG 80-100kg/ha, 1 per 4 stands or 2 bags of urea at 10 days weeks after planting or transplanting.



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Water Management

Water is the most important factor in rice production.

It affects the physical characteristics of the rice plant, nutrient status of the soil, the nature and extent of weed growth and various cultural practices.

Rice plant height is directly related to the depth of water.

If the water is too deep at transplanting, the seedlings will be tall and weak at the same time, the fewer tillers will develop. Thus, the crop becomes more susceptible to lodging.

6 Weed control

a Yields of rice are seriously reduced by competition from weeds during the early growth stages.

b Two hoe or hand weeding at 2-3 weeks and 5-6 WAS or WAT will be adequate.

Chemical method to kill weeds/grasses before tilling

d Some common Herbicides include:

Pre-emergence herbicides are:
Butachlor, Propanil, Ronstar 25 EC, Basagrampl2,

Post-emergence herbicides are:
Orizoplus, 2,4 D, Glyphosate, etc.

Consult Extension Agents nearest to you for further advice on the use of herbicides.

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7 Pests and Diseases

Sn	Pest	Description and damage	Control measures
1	Termites, Crickets, Grubs, Wireworms	These are mainly soil pests that damage germinating and young growing rice seedlings, resulting in poor germination	Burning or burying of crop residue.Ploughing and Harrowing. Early planting.Seed treatment with fungicides.
2	Stem Borer, army worms, brown and green leaf hoppers, grasshoppers, thrips, gall midge and aphids.	These are foliar pests that feed and damage the leaves, whorls, stalks, roots, and cobs	Burning or burying of crop residue. Ploughing and Harrowing. Early planting. Use of appropriate contact and systemic insecticides, e.g., Uppercott, Best Action, Cyperdiforce, Lamder, Karate, etc. Integrated Pest Management (IPM). Crop rotation.
3	Rice Blast Disease	It is a fungal disease that produce spots or lesions on leaves, nodes and panicles and the grains	Plant resistant varieties. Plant disease free seeds. Seed treatment with fungicides.
4	Birds	Birds affect rice at milk and grain filling stage. They suck the sugary liquid leaving empty shell and white head	Birds scaring early morning and evening Use video tapes
5	Rodents (Rats, Grass Cutters)	Cut rice and feed on the grain	Clear the surrounding bush near the rice field. Set traps around the field

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e Harvesting of Rice

Rice is harvested when the panicles have turned yellow, that is, before full ripening, so that the losses of grain in harvesting, and breakage of dry grains during threshing are minimized.

Summary

Facilitator is to revise asking the farmers interactively questions on this unit to ascertain the level of understanding of the introduced technology.

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