Model Answer
Class : B.Sc. Forestry (Fifth Semester)
Paper: Introductory Crop Production and Meteorology
Department of Forestry, Wildlife & Environmental Sciences

Question 1: A. Choose the correct answer

i. The earth radiate energy in the form of

a. Short wavelength

b. Long wavelength

c. Both a &b

d. All of these

ii. The seed rate of chick pea recommended per hectare area is

a. 25-30kg

b. 40-50kg

c. 80-100kg

d. 50-60kg

iii. Preparation of homogenous soil bed for rice cultivation is termed as-

a. Puddling

b. Tillage

c. Roughing

d. None of these

iv. Tikka disease is found in

a. Urd bean

b. Ground nut

c. Chick Pea

d. Wheat

v. The instrument used for continuous record of atmospheric pressure is known as-

a. Hygrograph

b. Barograph

c. Thermograph

d. Anemograph

B. Fill in the blanks

i. One standard atmosphere is equal to-**1013** mb.

ii. Two green manuring plants are **SUNHEMP**- and **SESBANIA**

iii. CAZRI is located at --**JODHPUR**

iv. The highest distance cloud is known as-**CIRRUS**

v. The wilt disease in lentil is caused by fungi **FUSARIUM OXYSPORUM.**

Question 2.a. What is the tillage instruments used in agriculture?

b. Give the statements on importance of different types of seeds in agriculture.

Answer: a. **Tillage implements**

Tillage implements are broadly categorized into several groups depending on the purpose for which they are use:

Primary Tillage implements

Implements used for **opening and loosening** of the soil are known as ploughs. Ploughs are used for primary tillage. Ploughs are of three types: wooden ploughs, iron or inversion ploughs and special purpose ploughs.

Wooden plough or Indigenous plough

1. Indigenous plough is an implement which is made of wood with an iron share point.

2. It consists of body, shaft pole, share and handle.

3. It is drawn with bullocks.

4. It cuts a V shaped furrow and opens the soil but there is no inversion.

Soil Turning Ploughs

Soil turning ploughs are made of iron and drawn by a pair of bullocks or two depending on the type of soil. These are also drawn by tractors.

Mould board Plough

The parts of mouldboard plough are frog or body, mouldboard or wing, share, landside, connecting, rod, bracket and handle. This type of plough leaves no unploughed land as the furrow slices are cut clean and inverted to one side resulting in better pulverisation. The animal drawn mouldboard plough is small, ploughs to a depth of 15 cm, while two mouldboard ploughs

which are bigger in size are attached to the tractor and ploughed to a depth of 25 to 30 cm. Mouldboard ploughs are used where soil inversion is necessary. Victory plough is an animal drawn mouldboard plough with a short shaft.

Disc Plough

The disc plough bears little resemblance to the common mouldboardplough. A large, revolving, concave steel disc replaces the share and the mouldboard. The disc turns the furrow slice to one side with a scooping action. The usual size of the disc is 60 cm in diameter and this turns a 35 to 30 cm furrow slice. The disc plough is more suitable for land in which there is much fibrous growth of weeds as the disc cuts and incorporates the weeds. The disc plough works well in soils free from stones. No harrowing is necessary to break the clods of the upturned soil as in a mouldboard plough.

Mouldboard Plough

Mouldboard plough can handle the toughest ploughing job with outstanding performance. The under frame and unit clearances are adequate to cope with trashy conditions. Perfect alignment at the plough beams carrying the Mouldboard bottom is maintained by virtue of the frame construction. The Mould Board will work in any kind of soil whether it's tougher or simpler. The plough has special wear resistant steel bottoms with bar points for toughest ploughing jobs. Bar pointing bottom it really ensures the longer life.

Turn-wrest or Reversible or One-way Plough

The plough bottom in this plough is hinged to the beam such that the mouldboard and the share can be reversed to the left or to the right side of the beam. This adjustment saves the trouble of turning the plough in hilly tracts, but yet facilitates inversion of the furrow slice to one side only.

Subsoil Plough:

Subsoil plough is designed to break up hard layers or pans without bringing them to the surface. The body of the subsoil plough is wedge shaped and narrow while the share is wide so as to shatter the hard pan and making only a slot on the top layers.

Chisel Plough:

Chisel plough is used for breaking hard pans and for deep ploughing (60-70 cm) with less disturbance to the top layers. Its body is thin with replaceable cutting edge so as to have minimum disturbance to the top layers. It contains a replaceable share to shatter the lower layers.

Ridge Plough:

Ridge plough has two mould boards, one for turning the soil to the right and another to the left. The share is common for both the mould boards i.e. double winged. These mould boards are mounted on a common body. The, ridge plough is used to split the field into ridges and furrows and for earthing up of crops. Ridge ploughs are used to make broad bed and furrows by attaching two ridge ploughs on a frame at 150em spacing between them.

Rotary Plough or Rotary Hoes:

Rotary plough cuts the soil and pulverizes it. The cutting of soil is done by either blades or tynes. The blade types are widely used. The depth of cut is up to 12 to 15 cm. It is suitable for light soils.

Secondary Tillage Implements

Different types of implements like cultivators, harrows, planks and rollers are used for secondary tillage.

Tractor Drawn Cultivator:

Cultivator is an implement used for finer operations like breaking clods and working the soil to a fine tilth in the preparation of seedbed. Cultivator is also known as tiller or tooth harrow. It is used to further loosen the previously ploughed land before sowing. It is also used to destroy weeds that germinate after ploughing. Cultivator has two rows of tynes attached to its frame in staggered form. The main object of providing two rows and staggering the position of tynes is to provide clearance between tynes so that clods and plant residues can freely pass through without blocking. Provision is also made in the frame by drilling holes so that tynes can be set close or apart as desirect. The number of tynes ranges from 7 to 13. The shares of the tynes can be replaced when they are worn out.

Sweep Cultivator

In stubble-mulch farming, it is difficult to prepare the land with ordinary implements due to clogging. Sweep cultivator is the implements useful under this condition. It consists of large inverted V shaped blades attached to a cultivator frame. These blades run parallel to soil surface at a depth of 10 to IS cm. They are armged in two rows and staggered. Sweep cultivator is used to cut up to 12 to 15cm depth of soil during first operation after harvest and shallower during subsequent operations. It is worked frequently to control weeds. It can also be used for harvesting groundnut.

Harrows

Harrows are used for shallow cultivation in operations such as preparation of seedbed, covering seeds and destroying weed seedlings. Harrows a~ of two types: disc harrow and blade harrow.

Disc Harrow

The disc harrow consists of a number of concave discs of 45 to 55 cm in diameter. These discs are smaller in size than disc plough, but more number of discs are arranged on a frame. These discs are fitted 15cm apart on axles. Two sets of discs are mounted on two axles. All the discs revolve together with axles. The discs cut through the soil and effectively pulverise the clods.

Blade Harrow

Blade harrows are used for different purposes like removal of weeds and stubbles, crushing of clods working of soil to shallow depth, covering the seeds, intercutivation and harvesting of groundnut etc. The blade harrows useful for intercultivation are discussed later. Blade harrows are two types viz. indigenous and improved.

Plank and Roller

Plank is a very simple implement and consists *of* a heavy wooden beam *of* 2 m in length. In addition, shafts and handle are fixed to the beams. When it is worked most *of* the clods are crushed due to its weight. It also helps in micro levelling and slight compaction necessary after sowing. Rollers are used mainly, to crush the hard clods and to compact the soil in seed rows.

b. Types of seed and its importance

Types of Seed

1. Nucleus Seed- This is a germplasm of newly produced seeds available to breeder for breeding programme. It is not available to farmers.

2. Breeder Seed- Breeder seed is the progeny of nucleus seed of a variety and is produced by the originating breeder or by a sponsored breeder.

Breeder seed is produced from nucleus seed under the supervision of a qualified plant breeder in a research institute of Agricultural University. This provide for initial and recurring increase of foundation seed. Breeder seed is monitored by a joint inspection team of scientists and officials of certification agency and National Seed Corporation. The genetic purity of breeder seed crop should be maintained at 100 per cent.

Foundation seed

Foundation seed is the progeny of breeder seed and is produced by State Farm Corporation of India, National Seed Corporation, State seed Corporation under technical control of qualified plant breeders or technical officers. Its production is supervised and approved by certification agency. The genetic purity of foundation seed should be maintained at 99.5 per cent.

Certified seed

Certified seed is the progeny of foundation seed and its production is supervised and approved by certification agency. The seed of this class is normally produced by the State and National Seeds Corporation and Private Seed companies on the farms of progressive growers. This is the commercial seed which is available to the farmers and its genetic purity should be 99 per cent.

Question 3.a. Explain the following: (Any two)

a. Diurnal variations in air temperature.

b. Rain gauge

c. Stratified layers of atmosphere

Answer:

a.**Diurnal Temperature Variation or Daily Temperature Cycle.**

The Diurnal Temperature Variation give rise to daily maximum and Minimum temperatures.

From the sun-rise, sun energy continuously supplied and the Temperature continuously rises, recording maximum at about 2.00 to 4.00.P. m. though the maximum amount of solar radiation is received at the solar None (i.e. 12.00 hrs). This delay in occurrence of maximum temperature is caused by gradual heating of the air by convective heat transfer from the Ground which is known as thermal lag or thermal inertia.

Similarly minimum air temperature occurs shortly offer sunrise due to lag in transfer of heat form the surface to the air / space.

B Horizontal Temperature Variation:

The rate of change of change of temperature with a horizontal distance is known as Temperature Gradient.

Maximum solar energy is received in equatorial region and therefore highest temperatures are observed in equatorial region. As the latitude Increases the solar energy received on the earth correspondingly decreases and so also temperature decreases with increase in latitude being lowest on the pole. The Sum crosses the equator twice in a year therefore two maxima And two minima are observed in annual cycle. Outside this zone only one Maxima and one minima is observed.

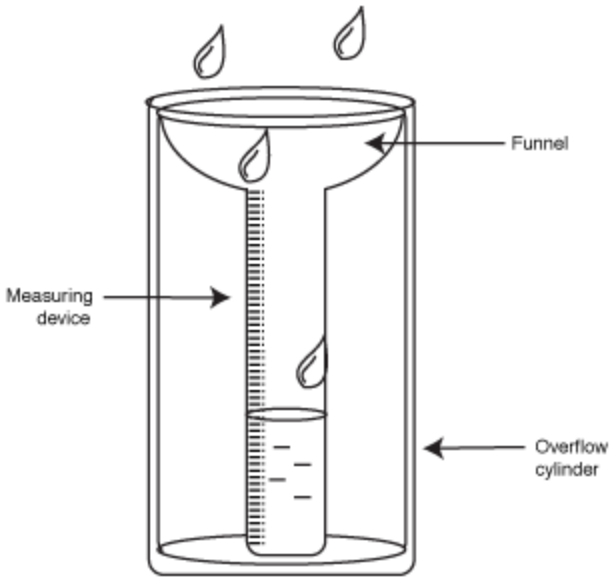
b. Rain gauge :

A rain gauge (also known as an udometer, pluviometer, or an ombrometer) is a type of instrument used by meteorologists and hydrologists to gather and measure the amount of liquid precipitation over a set period of time.

Most rain gauges generally measure the precipitation in millimeters. The level of rainfall is sometimes reported as inches or centimeters. Rain gauge amounts are read either manually or by automatic weather station (AWS). The frequency of readings will depend on the requirements of the collection agency. Some countries will supplement the paid weather observer with a network of volunteers to obtain precipitation data (and other types of weather) for sparsely populated areas.

Method to collect precipitation

The standard NWS rain gauge, developed at the start of the 20th century, consists of a funnel emptying into a graduated cylinder, 2 cm in diameter, which fits inside a larger container which is 20 cm in diameter and 50 cm tall. If the rainwater overflows the graduated inner cylinder, the larger outer container will catch it. When measurements are taken, the height of the water in the small graduated cylinder is measured, and the excess overflow in the large container is carefully poured into another graduated cylinder and measured to give the total rainfall.



c. Stratification of atmosphere

On the basis of the vertical temperature difference, the atmosphere can be divided into four horizontal layers or shells, namely.

A) Lower Atmosphere: 1. Troposphere and 2. Stratosphere
B) Upper Atmosphere: 1. Mesosphere and 2. Thermosphere**.**

A) Lower Atmosphere:

1. Troposphere:
The altitude of the troposphere changes according to latitude. It has an elevation of about 16 km at the equator and only 8 km at the poles. Its average altitude is about 11 km. It contains near about 75% of the gaseous mass of the total atmosphere, water vapour and aerosols. It is the realm of clouds, storm and convective motion, The outstanding characteristic of the troposphere is the filmy uniform degree in temperature with increase in altitude until minimum temperature of -50% ^{0}C-60^{0}C is reached. The isothermal layer marking the end of temperature decrease is called tropopause and it separates troposphere and stratosphere. Throughout the troposphere there is a general decrease of temperature with increase in height at a minimum rate of about 6.50C/km or 3.60F/1000 ft.0C

2. Stratosphere:
This is the second atmospheric layer above tropopause which extends upwards about 50 km. The stratosphere contains much of the total atmospheric ozone. The density of ozone is maximum at 22 to 24\5 km height approximately. The ozone at the upper layer of this sphere absorbs the ultraviolet rays

from the Sun and temperature may exceed 00C. In stratosphere the temperature increases with increase in height.

B) Upper Atmosphere:

1.Mesosphere:

This is the third layer of atmosphere. A thin isothermal layer called a stratopause is the boundary layer, which separates stratosphere and mesosphere. Above the warm stratopause, temperature decreases with increase in height to a minimum of about-900C at about 80 km height Pressure in this layer is very low and decreases from 1 Mb at about 50 km to about 0.01 mb at 80 km nearly. The thin isothermal layer, which separates mesosphere from thermosphere, is called mesopause.

2.Thermosphere:

Outermost shell is known as thermosphere. It lies above 80 km height . In this sphere the atmospheric densities are extremely low. In this sphere temperature increases with increase in height due to absorption of ultraviolet radiation from the Sun. probably it reaches to 9500C at 350 km to 17000 C at an underfined upper limit but these temperatures are essentially theoretical. Such temperatures are not felt by the hands exposed by astronaut or the artificial satellite because of rarefied air.

Figure:---------

Question 4. What is global warming? How it is going to affect agriculture in India.
Suggest the measures to mitigate the problem.

Answer : Definition: Gradual increase in the earth's surface temperature. Global warming is the rise in the average temperature of Earth's atmosphere and oceans since the late 19th century and its projected continuation. Earth's mean surface temperature has increased by about 0.8 °C (1.4 °F), with about two-thirds of the increase occurring since 1980.Warming of the climate system is unequivocal, and scientists are 95-100% certain that it is primarily caused by increasing concentrations of greenhouse gases produced by human activities such as the burning of fossil fuels and deforestation.

Causes

Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level" and, furthermore, they conclude with "very high confidence (at least a 9 out of 10 chance of being correct) that the globally averaged net effect of human activities since 1750 has been one of warming" of the Earth's climate system.

Sources

- Deforestation and degradation

- Burning of fuel wood, coal and biomass
- Decay of organic matter on forest floor
- Industrialization

Influences

1. Higher surface and atmospheric temperature.
2. Reduction in fresh water availability.
3. Global rising of sea level due to thermal expansion of water.
4. Melting of glaciers at polar region.
5. Acid rain
6. Increase in tropical storm such as hurricane etc.

Impact of Global Warming on agriculture

For any particular crop, the effect of increased temperature will depend on the crop's optimal temperature for growth and reproduction. In some areas, warming may benefit the types of crops that are typically planted there. However, if warming exceeds a crop's optimum temperature, yields can decline.

1. Higher CO2 levels can increase yields. The yields for some crops, like wheat and soybeans, could increase by 30% or more under a doubling of CO2 concentrations. The yields for other crops, such as corn, exhibit a much smaller response (less than 10% increase). However, some factors may counteract these potential increases in yield. For example, if temperature exceeds a crop's optimal level or if sufficient water and nutrients are not available, yield increases may be reduced or reversed.
2. More extreme temperature and precipitation can prevent crops from growing. Extreme events, especially floods and droughts, can harm crops and reduce yields.
3. Dealing with drought could become a challenge in areas where summer temperatures are projected to increase and precipitation is projected to decrease. As water supplies are reduced, it may be more difficult to meet water demands.
4. Many weeds, pests and fungi thrive under warmer temperatures, wetter climates, and increased CO2 levels. Currently, farmers spend more than 25% of production its cost to fight weeds and pest. This would cause new problems for farmers' crops previously unexposed to these species. Moreover, increased use of pesticides and fungicides may negatively affect human health.

Strategy for reduce emissions

A. Reduce the source of green house gases

- Introduction of agroforestry
- Decrease alteration of forest for non forestry purpose.
- Conservation of existing forest.
- Improve forest productivity of existing one and establishment of new plantations.

- the threat of global warming much more quickly than can technological solutions such as carbon capture and storage (CCS) from coal-fired power plants, according to experts. "We don't know how to do CCS.

- Growing crops for fuel—known as biofuels—represents another potential way of cutting GHGs by replacing fossil fuels.

B. Government programme

- Expanding afforestation and reforestation.
- Prevent conversion of forest for developmental works.
- Improve the efficiency of biomass burning.
- Aware people participation to in reducing the level of GHGs and plantation activities.

Question5. Write notes on the following (Any Two)

a. Formation of precipitation
b. Monsoon
c. Agricultural drought

Answer:

a. F**ormation of Precipitation: There are two theories in formation of rain.**

1.Bergeron mechanism:

Water droplets having different positive and negative charges and different electrical charged droplet coalesced to form large droplet. The cloud having cold temperature is cold cloud. In these clouds Ice particles are formed due to very low temperature (-15^0C to -25^0C). These ice particles are grow rapidly by deposition of water vapors (sublimation) developing in to hexagonal shaped ice crystals. These ice crystals on collision form snow pellets and melt into water droplets when falling on ground through warm atmosphere. This mechanism is suggested by Swedish Meteorologist Bergeron in 1933. Artificial rain (silver nitrate) making is based on these mechanisms.

2.Collision and coalescence mechanism:

The cloud having slightly higher temperature is hot cloud. In these Clouds fine water droplets exist instead of ice particles. This fine water Droplets colloid and coalesce (combine) and grow into the larger size and fall on earth as rain drop.

b. **Monsoon**

An interchange of air between the land and oceans due to unequal heating and cooling of continents and oceans is known as monsoon winds.

It has an annual period of occurrence. During summer, the land is heated Very much as compared to the oceans which cause which oceans low pressure Over the land and the winds blow from the oceans to the continents. During winter, land cools down faster than the oceans causing high Pressure over continents and low pressure over the oceans and the wind Blows from continents to oceans. The Indian monsoon is the best known Example of this alternating circulation system. There are two types of Monsoons over India i.e. south – west monsoon and North- East monsoon.

1.**South – West Monsoon:**

India is positional situated in North – East trade winds and should have N- E winds throughout the year, but a low pressure through lies along the Ganges and upper India, due to which S.- W winds predominate. During April to September a low pressure center is formed over N – W India. The s-W trade winds of the Indian ocean blow to the equator and then turning to the right under carioles force and move on a S – W winds Around the low pressure center over India. [This monsoon blows from the African coast (150E)]. The moisture laden air while rising the mountain of Asia cools, condense and precipitate. As a result the pressure is lowered to increase the pressure gradient.

2. North – East Monsoon:
Complete reversal of the S – W monsoon winds takes place as the high pressure centre is located in eastern Asian (1035 mb) and low in about 1010 mb. During this time from North to South the cold season is established. This monsoon is active during October and November. The winds flow in North- East direction. This wind is generally dry but gives rains to AP, TN states. Monsoon winds also exist over west Africa, Brazil, eastern USA, Australia. Philippines etc.

c. **Agricultural drought:** This is the situation resulted from inadequate rainfall, when soil moisture falls to short to meet the water demands of the crop during growth. Thus affects crop may wilt due to soil moisture stress resulting into reduction of yield.

Strategy for agriculture drought
1. Preventing and recycling of excess runoff
2. Deep tillage to absorb and hold maximum moisture.
3. Timely weed management to control water loss by ET.
4. Planning for suitable cropping system.
5. Selection of short duration and drought tolerant crops.

Question 6.a. Write Botanical names of the following:

Answer

i. Soya bean (Glycine max)

ii. Wheat (Triticum aestivum)

iii. Chick pea (Cicer arietinum)

iv. Sugarcane (Saccharum officinarum)

v. Ground nut (Arachis hypogaea)

b. Write full form of the following:

i. CSWRTI

Central Soil and Water Conservation Research & Training Institute

ii. ICFRE

Indian Council of Forestry Research & Education

iii. IPM

Integrated Pest Management

iv. SRI

System of Rice Intensification

v. IIHR

Indian Institute of Horticulture Research

Question 7. Give details of area, productivity and production technology of Paddy.

Answer

- India is one of the world's largest producer(area-wise) of white rice and brown rice and second in production 85.31 million tonnes.
- It accounts 20% of all world rice production.
- Rice is India's preeminent crop and is the staple food of the people of the eastern and southern parts of the country.
- In India 41.66 million ha area comprise29.4% of global area.
- World paddy production 614.65 million tones and area 153.51 million ha with an average yield of 38.7 Q/ha.
- The world average of rice is from
  India – 20.5Q/ha, Japan – 65.20, China 62.4 Q/ha.
- Since 1950 the increase has been more than 350 percent. The per-hectare yield increased more than 262 percent between 1950 and 1992

METHODS OF CULTIVATION OF RICE

In India Rice is mainly grown in two types of soils i.e.

(i) uplands (ii) low lands.

- Factor for choosing the method of rice cultivation
- Situation of land
- Type of soils

- Irrigation facilities
- Availability of labours intensity
- Distribution of rainfalls.

Methods :-

Dry or Semi-dry upland cultivation

(a) Broadcasting the seed

(b) Sowing the seed behind the plough or drilling.

Wet or lowland cultivation

(a) Transplanting in puddled fields.

(b) Broadcasting sprouted seeds in puddled fields.

Selection of Seeds

The use of quality seeds in cultivation of rice is an important factor to get better crop yield. Seeds intended for sowing should satisfy the following requirements :-

1. The seed should belong to the proper variety, which is proposed to be grown.
2. The seed should be clean and free from obvious mixtures of other seeds.
3. The seed should be mature, well developed and plump in size.
4. The seed should be free from obvious signs of age or bad storage
5. The seed should have a high germinating capacity.

Before sowing the seed should be treated with fungicides which protects the seed against soil-born fungi and also give a boost to the seedlings. Carbandazim 1g/kg seed, Thiram, Cafton Trichoderma viride (Biofungicide) 6g/kg seed.

Methods of Nursery Raising

There are three major methods of raising nursery - viz.

1. Dry nursery -where the dry seed is sown in dry soil. This method is practiced in areas where water is not sufficient to grow seedlings in wet nursery

2. Wet nursery- where sprouted seed is sown on the moist puddled soil. Wet nurseries are preferred under irrigated condition

And the "dapog" method. This method of raising nursery has been introduced in India from Philippines.

"Dapog" method is commonly prevalent in Philippines. The essential feature of this method is to have a very thick stand of the nursery seedlings without any contact with the soil. Generally, seedlings become ready for transplanting in 12 to 14 days.

Seed Rate

The seed rate naturally influences the growth of the seedlings. Thin sowing gives strong and tillered seedlings, whereas thick sowing provides thin and tall seedlings without tillers. Thin sowing in nurseries is always better and it will produce strong and sturdy seedlings, which can withstand adverse climatic conditions better and produce better yields.

Seed rate= Weight of 1000seed (gm) X No. Of seedling per hill/Spacing (Cm^2)X100

Seed rate factors- Grain weight, germination percent, spacing adopted and number of seedling to be planted.

Therefore, 40 to 60 grams of seed per square metre should be sown in the nursery beds. About 500 square metre area of nursery is sufficient to transplant one hectare area. In case of late sowing of nursery, the nursery area should be increased to 750-1000 square metre.

Variety- MTU 7029, Basmati, Pusa basmati, JR-32, Kala namak, HMT (BPT 5204), Dubraj, IR 36, Sungrow 6444 (Hybrid)

Transplanting

Before transplanting, field should be puddled properly with bullock or tractor drawn puddlers.

1. Transplanting should be done with proper age of seedlings

Short duration varieties (21 to 28 days old).

Medium and long duration varieties (29-35 day old)

2. Always healthy seedlings should be used for transplanting at the four to five leaf stage or when they are about 15-20 cm high.

Spacing

Under good management and adequate nitrogen levels, the optimum spacing for varieties like IR-8 should be around 20x10 cms both for kharif and rabi crops. With excellent cultural practices, the spacing may be slightly wider (20x20 cm) but under sub-normal conditions, the spacing should be slightly narrower, say 15x10 cms.

Number of Seedlings per Hill

Transplanting two to three seedlings per hill under normal conditions is enough. The use of more seedlings per hill, besides not being any additional advantage, involves an extra expense on seedlings. In case of transplanting with old seedlings, the number of seedlings per hill can be increased.

Depth of Planting and Directions of Rows

- Depth of planting has assumed considerable importance after the introduction of high yielding varieties.
- The high yielding varieties are characterized with high tillering capacity.
- The high tillering potential of these varieties is, however, best expressed with shallow planting. The tiller buds formed at the basal node are not suppressed in case of shallow plantings. Therefore, the seedlings should be transplanted at 2 to 3 cm depth.
- Shallow planting gives better yields.
- The deeper planting results in an increased height of the plants besides delays and inhibits tillering.

The crop planted with rows running in the north-south direction generally gives better yield particularly in rabi season. The adoption of this practice is worthwhile, since it does not involve any extra expenditure.

Different Methods of Seeding

Seeding is done in three different ways - viz. (i) drilling i.e. sowing in the furrow behind a plough, (ii) dibbling and (iii) broadcasting. The light soils which generally come into conditions quickly, any method can be adopted. Seeding with drilling method has got a greater advantage over other methods, because of the uniformity of the stand and the control of the population of the plants per unit area. Heavy soils which do not come in conditions quickly, other methods except broadcasting are not feasible. It has been found that drilling or dibbling always gives considerably better yields than broadcasting system.

Broadcasting Sprouted Seeds in Puddled Land

This method is adopted in an area where agricultural labourers are not easily available for transplanting or some time labourers are very expensive. In this method field is prepared and puddled just like in the case of transplanting. About 100 kg seed is required for one hectare area. In the puddled field sprouted seeds with radical length of one to two millimeter are uniformly broadcast by hand.

Manure and Fertilizer Application

Organic Matter-In upland fields 10-15 tones of Farm Yard Manure or compost should be applied in one hectare area preferably 4 to 6 weeks before sowing.

Organic manures should be spread evenly on the upper surface of the soil and ploughed in to get it well mixed in the soil.

Chemical fertilizers-Application of chemical fertilizers depends basically upon:

Application of fertilizer in transplanted rice field is quite different from upland rice. Due to variation in soil fertility, rainfall and climatic condition , a common dose of fertilizer can not be recommended for all regions. However, in general a level of 30 to 40 kg of nitrogen per hectare in kharif and 60 to 80 kg of nitrogen per hectare in rabi appears to be the optimum dose for the tall indicas and double that level for the high yielding varieties on soils of average fertility in the southern and eastern regions. In the northern region, where sunshine is available for longer hours, higher dose of nitrogen is beneficial in the kharif season.

The maximum efficiency can be obtained in the direct seeded upland rice by applying 50% nitrogen dose, three weeks after seeding, 30% at 45 days age and the rest at the boot-leaf stage.

In order to obtain better results, full dose of phosphorus, potash and half dose of nitrogen should be applied before last puddling. Remaining half dose of nitrogen should be applied in two equal doses, first at tillering stage and second dose at panicle initiation stage.

Water Management

The water requirement of rice crop is comparatively higher than any other crop of the similar duration. Assured and timely supply of irrigation water has a considerable influence on the yield of the crop. During the crop growth period, the water requirement is generally high at the initial seedling establishment stage. After the transplanting , water should be allowed to stand in the field at a depth of two to five centimeters till the seedlings are well established. The second, the most important critical stage is tillering to flowering and in this period the crop should not be subjected to soil moisture stress. The water supply should be ensured in required amount during panicle initiation to flowering stage. About five centimeters depth of water should be maintained in the field up to the dough stage of the crop. Before harvesting, water should be drained out from the field to allow quick and uniform maturity of grain.

Disease and Pests

Black Smut (Black color of grain during ripening) Fungal

Brown Plant Hopper (BPH) - Leaf spotted during growth

Sheath blight (fungal) Rotting of leaf near base due to waterlodgging – Carbandazim

Bacterial blight- Yellowing of color from tip region- Copper oxychloride and ampicilin

Pest: Stem borer, root weevils, gall midge.

Control method:

Carbandazim 1-2g/litre of water, CoC 3g/l, Hexaconazol 1ml. litre, Blitox, Soluble sulphur etc. for diseases

Indosulfon, monocrotophos, profenophos, Imedachlorprid , Corboryl etc.

Harvesting and Threshing

The right stage for harvesting as commonly understood by laymen is when panicles turn into golden yellow and the grains contain about 20 percent moisture. When the moisture in the paddy grains reaches 16-17% in the standing crop in the fields, the crop sustains a heavy loss owing to shattering and damage by birds and rodents.

The most common and old methods of threshing of paddy is trampling by bullocks or lifting the bundles and striking them on the raised wooden platform. Now pedal threshers are being used. Power driven stationary threshers are also used for quick threshing.