MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END THEORY EXAMINATION
B.Sc. (Agri.)

Semester	:-	IV (New)	Academic year	:-	2018-19
Course No.	:-	AGRO-246	Title	:-	Crop production technology – II (Rabi crops)
Credits	:-	1+1 = 3	Total Marks	:-	40
Day & Date	:-		Time	:-	

Answer sheet (Section-A)

Q. 1 Give in detail information about Gram on following aspects.

A)ECONOMIC IMPORTANCE

Chickpea used for human consumption and feed to cattle. Whole or split grain is fried, boiled or cooked and eaten. Grains are also used as vegetable.

The flour of chickpea is use for the preparation of sweet. Chickpea is used in many forms as dal, sweet and snacks.

The husk and split grain are used as feed to animals. Fresh green leaves are utilized as green leaf vegetable. Haulms are used as an excellent green fodder to cattle.

The leaves consist of malic and citric acid which are used for stomach ailments and is a best blood purifier.

Chickpea contains 20.8% protein, 5.6% fat, 59.8% carbohydrate and 2.7% mineral in dal and 17.1% protein, 5.3% fat and 60.9% carbohydrates and 3.0% minerals in whole grains.

Fairly a good source of thiamine, nicotinic acid and calcium, iron, Vitamin C and Vitamin B_1.

B)SEEDS AND SOWING

The seeds are sowing in furrows behind the country plough or drilled to depth of 8 to 10 cm.

Row spacing 30 cm for desi type and 40 to 45 cm for kabuli type.

Seed rate of 75 to 100 kg/ha.

Seed treatment with carbendazim, Thiram, Captan @ 2 to 3 g per kg seed to control seed born diseases.

C)WEED MANAGEMENT

Chickpea is a short statured crop. Hence it is suffers by the infestation of weeds.

One hand weeding or intercultural with wheel hoe on 25 to 30 DAS and needed second weeding on 60 DAS is effective against wee.

Pre-emergence spray of fluchloralin @ 1.0 kg or pendimethalin @ 1.0 kg, or metalachlor @ 1.0 kg or isoproturon @ 1.0 kg/ha are effective. This is followed by one hoeing and weeding on 25 DAS.

D)HARVESTING, THRESHING AND YIELD

At maturity the leaves turn reddish brown and start shedding. The matured plants are either pulled out by hand or cut with sickle and dried under direct sun for five to six days.

The dried plants are threshed using sticks or trampled under the feet of bullocks to separate the grains.

Desi type produce 15 to 20 q grain yield ha.

Kabuli type produces about 25 to 30 q grain yield per ha.

Q. 2 Describe in details the cultivation of irrigated Wheat on following points.

A)CLIMATIC AND SOIL REQUIREMENT

The best wheat's are produced in areas favored with cool, moist weather during the major portion of the growing period followed by dry, warm weather to enable the grain to ripen properly. The optimum temperature range for ideal germination of wheat seed is 20 to 25^0 C through the seeds can germinate in the temperature range 3.5-35^0C. Rains just after sowing

hamper germination and encourage seedling blight. Areas with a warm and damp climate are not suited for wheat growing.

During the heading and flowering stages, excessively high humidity and low temperatures is conducive for rust attack. Wheat plant requires about 14-15^{0}C optimum average temperature at the time of ripening.

Soil :

The largest area under wheat is in alluvial soils of Indo-Gangetic areas where soil has generally loamy texture, good structure and moderate water holding capacity with pH from 6.0 to 8.5. Well drained loams and clayey loams are considered to be good for wheat. However, good crops of wheat are raised in sandy loams and black soils also. *T. durum* alone can survive in black soils and *T. aestivum* species can grown in any type of soil. The problem noticed in acid soils is aluminium toxicity. Highly porous and excessively drained soils or heavy soils with bad soil structure are not suitable.

B)SEEDS, SOWING AND SEED TREATMENT

Generally, a seed rate of 100 kg/ha is sufficient for normal sowing under favourable condition. Under late sown condition and for bold seeded varieties like Sonalika a seed rate of 125 kg/ha is followed. The seed rate for dibbling is 80 to 100 kg/ha for transplanting 35 kg/ha.

Wheat is sown at spacing of 20 to 22.5 x 0 cm under normal sowing and 15 to 18 x 0 cm under delayed sowing.

Optimum sowing time : Irrigated – First fortnight of November
Rainfed – Middle of October

Depth of sowing :

Depth of sowing is very important aspect in successful cultivation of high yielding dwarf varieties of wheat.

The coleoptiles length is shorter in case of Mexican wheat as compared to tall varieties.

The coleoptiles length of high yielding Mexican dwarf varieties is about 5 cm. Therefore seeds of these varieties should not be covered not by more than 5 cm.

Seeds of semi-dwarf (one gene dwarf) varieties could be sown at the depth of 5-6 cm but seeds of three dwarf gene varieties should be sown deeper than 4 cm.

a) Solar heat treatment:-

The seed is soaked in cold water for 8 to 12 hours at night and in the month of May the seeds are thoroughly dried in hot sun on iron sheet in the afternoon. This seed treatment will protect the seed from loose smut disease of wheat.

b) Fungicide seed treatment:-

The seed is treated with 1% mercurial fungicide viz agrosan @ 2.5g/kg of seed or 3 g thiram/kg of seed or 2.5 g of Vitavax/kg of seed. This seed treatment will check the damage of crop from false smut, foot rot and wilt disease.

c) Azotobacter seed treatment:-

The seed of wheat are treated with azotobacter culture @ 250gm/10 kg of seed for enhancing the population of non symbiotic bacteria.

C)MANURES AND FERTILIZERS

Manures and fertilizers both play, important roles in wheat cultivation. Use of manures improves the general physical condition and structure of the soil and its capacity to hold water. The 10 to 15 tonnes of well rotted farm yard manures (FYM) or compost should be applied four to six weeks before sowing and worked well into the soil.

Fertilizer recommendations for wheat in different agro-climatic region

Condition	Zone	Recommended dose (kg/ha)			Time and method of application
		N	P_2O_5	K_2O	
Irrigated timely sown crop	All zones	120	60	40	Half of N and full quantity of P_2O_5 and K_2O should be drilled about 5 cm below the seed at the time of sowing. The remaining half N should be top dressed at first irrigation.
Irrigated late sown crop	All zones	80	40	20	Same as above
Irrigated timely sown followed by a legume crop of fallow in kharif	All zones	80	40	20	Same as above
Rainfed	Peninsular and central zone	60	30	20	Total quantity of N and P_2O_5 and K_2O should be applied 8-10 cm deep in soil at or before sowing
	Other zone	40	30	20	Same as above

D)IRRIGATION MANAGEMENT

The 1st irrigation to the standing crop could be given 20 to 25 DAS i.e. crown root initiation stage. The cooler regions like hilly tracts and in late sown wheat, it is desirable to apply 1st irrigation approximately 25 to 30 DAS. Delayed in giving this irrigation should be avoided as it would result in upsetting the synchronous tillering in theses varieties, abnormal heads, poor root system and finally poor grain yield. It is the most critical stage for irrigation.

Second irrigation :

At tillering stage, within 40 to 45 days after sowing.

Third irrigation :

At late jointing stage, within 70-75 days after sowing.

Fourth irrigation :

At flowering stage, within 90 to 95 DAS. Irrigation at this stage is also important because during this period plants suffer most from soil moisture deficiency. The grain number and grain size are reduced considerably.

Fifth irrigation : At dough stage, within 110 to 115 DAS.

Q. 3 Give in detail information about Rabi sorghum on following aspects.

A)SOIL AND CLIMATE

It is grown as *kharif* crop in northern India. Western and Southern parts of country it is grown also as *rabi* crop. The minimum temperature for germination of sorghum seeds is 7-10 ^{0}C. It needs about 26-30 ^{0}C temperature for optimum growth. Sorghum is a short day plant. Flowering is hastened by short days and delayed by long days. The time of heading in sorghum is influence by temperature as well as photoperiod. Higher day temperature and sunshine for 4 to 5 weeks after sowing increases yield.

It is grown in a variety of soils. Soils with clay loam or loam texture, having good water retention capacity are best suited for its cultivation. It does not thrive well in sandy soils but does better on heavier soils. It does well in pH range of 6.0 to 8.5 as it tolerates considerable salinity and alkalinity. The black cotton soils of Central India are very good for its cultivation.

B)SEEDS AND SOWING

Sowing Time : Rabi – Mid-September –Mid-October

Spacing And Seed Rate :
The plant population of 1.8 – 2.0 Lakh /ha is optimum. The recommended spacing to achieve this plant population is 45 cm between rows and 10-12 cm between plants within rows. Seed rate of 8-10 kg is recommended to obtain required plant population.

Sowing Method :
It is sown by drilling and dibbling method. In drilling method sowing is carried out by 45 cm seed drill. Dibbling is done at 45 x 10-12 cm spacing. The seeds should be sown at a depth of 3-4 cm.

Seed treatment :
Seed treatment with Thirum @ 3.0 g/kg of seed to control head smut disease.
Sorghum seeds are treated with 300 mesh fine sulphur powder @ 4 gm/kg of seed to control grain & loose smut disease.
Seeds are treated with Brine solution 30% (300 g NaCL in one litre of water) to control ergot disease.
Seeds are treated with 50% Carbofuron @ 100 g/kg of seed for the control of shoot fly in delayed sowing of hybrid sorghum.

C)MANURES AND FERTILIZERS
The fertilizer dose differs from type and nature of crop. The recommended dose of manures and fertilizers for sorghum is below.

Crop	Recommended doses		Time of application (N:P:K kg/ha)		Remarks
	Manures (t/ha)	N:P:K (kg/ha)	Basal dose	Top dress	
Rainfed	6-7.5	50-25-0	50-25-0	-	NPK at sowing
Irrigated	12-15	120-60-60	60-60-60	60	60 kg N at 30 Days

Zinc and Iron are the commonly deficient micro nutrient in sorghum. The foliar application of $ZnSO_4$ & $FeSO_4$ @ 2% & 0.15% respectively twice has shown beneficial results.

D)HARVESTING, THRESHING AND YIELD
The crop is harvested when it shows following signs of maturity
When the grain becomes hard and have less than 25% moisture.
A blackish spot develops at the top of the grain.
The earhead bearing peduncle turns yellowish.
At this stage the crop is harvested. The leaves of local varieties may turn yellowish, but the leaves of hybrid varieties remain green at this stage also.
The crop is harvested by nipping earheads or cutting the plants at ground level. Then the earhead are dried in the sun and they are either threshed by trampling under the feet of bullocks or by running the stone roller on them or by using threshing machine. After threshing the grain are separated by winnowing. Grains are sun dried to the moisture content of 12-13 % and stored in gunny bags or in bins.
Yield :Rainfed crop : 25-30 q/ha grain and 80-100 q/ha of dry fodder
Irrigated crop : 50 q/ha grain and 100-125 q/ha of dry fodder

Q. 4 Write in details about the cultivation of mustard on following points.

A) SOIL AND CLIMATE
Climate
- A crop of temperate
- Can be in higher elevation of tropics
- Rabi season crop in India, Sep-Oct
- Temperature range 3 to 40°C
- Optimum 18-25°C with cool, dry clear weather

- High RF, high humidity, cloudy atmosphere at flowering undesirable
- Most susceptible to frost

Soil

- Varying soil from sandy loam to clay
- Thrives well in light soil
- Mustard on any soil but rapeseed in light
- Well drained soil is more suitable
- Waterlogging conditions are unsuitable
- Saline alkaline soils are unsuitable
- pH 6.5 to 7.5, neutral soil is ideal

B)SEEDS AND SOWING

Sowing Time :

- Sowing starts from Sept. to ends in November
- Region wise season varies

Seed rate & spacing

- 4-6 kg depending upon seed weight
- 30 x 10 to 45 x 15cm

Sowing

- Treat the seeds with fungicides well before sowing (seeds are treated with Bavistin @ 2 g/ kg, captan @ 4 g/ Kg before sowing to protect the crop from root rot).
- May be behind the country plough
- Ferti cum seed drill
- Depth of sowing 3-4cm
- Avoid shallow sowing
- Cover the seeds after sowing

C)WEED MANAGEMENT

- Hand hoeing is desirable, it aerates the soil
- Herbicides can also be used followed by one hand weeding
  - Pendimethalin pre-emergence 0.5-1.5 kg/ha based on soil
  - Fluchloralin 1.25kg pre-plant incorporation
  - Post emergence Isoproturan 0.75 kg /ha for
    - Wheat+mustard mixed systems

D)HARVESTING AND YIELD

Harvesting should be carried out as soon as the pods begins to turn yellow colour and seeds become hard. Seeds in the siliqua makes rattling sound. The crop matures in about 110 to 140 DAS. Harvesting should be done in early morning hours to avoid any shattering of seeds. Use sickle to cut the crop close to the ground.

Harvested plants should be tied in to bundles, keep them in sun for 5-6 days to dry. Threshing can be carried out by beating the plants with stick. Winnowing is done to separate the grain from husk.

Yield :

Under good nutrient management the crop produced about 10 to 15 quintals of grains per ha.

Q. 5 Give in detail information about Sunflower on following points.

A)ECONOMIC IMPORTANCE

- Sunflower content 21 to 27 per cent hull, 48 to 53 per cent oil, 14 to 19 per cent protein and 16 to 17 per cent crude fibre.
- Oil is rated as one of the best edible oil and good substitute for cooking oil. It is premium oil, pale yellow in colour and used as salad oil and in cooking and margarine.

- Sunflower yields poly unsaturated oil with high proportion of linoleic acid (40 to 70%) and oleic acid (22 to 50%). It is good for heart patients as it prevents deposition of cholesterol in coronary arteries.
- It is also used in industrial field for making cosmetic and pharmaceuticals.
- Sunflower protein has higher levels of essential amino acid *viz.*, lysine and methionine. The essential amino acid index of sunflower protein is 68 as against 79 for soybean and 100 for egg. The protein is highly digestative (90%) with a biological value of 60 per cent.
- The cake is obtained after oil extraction. Partially dehulled cake has about 37 per cent protein, 10 per cent oil and 16 per cent crude fibre. Sunflower cake is extensively used as feed for ruminant animals, swine's and poultry.
- The roasted kernels of sunflower are eaten. Fried sunflower seeds mixed with pepper and a delicacy in East European countries. Seeds are also used as diuretic and in treating certain disorder of respiratory tracts.
- Flower is nutritive and used in bakeries.
- The pericarp or hull is used as bed material for animals. Hulls can be used to generate stem/electricity or production of furfurol/ethyl alcohol.

B)SOIL AND CLIMATIC REQUIREMENTS

Climate :

- For the Sunflower crop photo period is not a limiting factor (photo insensitive crop) hence it can be grown in wide range of temperature(5°C to 40 °C) .
- Optimum 20 & 25°C
- Requires cooler (15-20°C) growing period and warmer maturing period (20-25°C)
- Base minimum is 10°C
- High temp (>38°C) in post-anthesis inhibit quantity and quality of oil
- Rainfall of 500mm, with 300 mm it can yield

Soil :

- Avoid flowering coincide continuous drizzle
- Can be in wide range of soils
- Any soil with good drainage is more important
- Neutral to moderately alkaline soils
- pH ranges 6.5 to 8.0
- Complete failure in sandy soil with pH 4.6

C)MANURES AND FERTILIZERS

- 5 to 6 tones of FYM/ Compost before last harrowing
- Under assured rainfall condition & for irrigated condition 60: 30 : 30 N : P_2O_5: K_2O Kg /ha 50% N + 100% P % K at the time of sowing 50% N 30DAS
- For Dry land 40 : 20 : 00

D)INTERCULTURAL OPERATIONS

Weed management

- Pre emergence herbicide application of pendimethalin @ 1.0 kg a.i. / ha or alachlor @ 1.5 kg/ha in 800 to 1000 lit of water followed by one hand weeding on 40 to 45 days after sowing is sufficient for better weed management.
- A weed free period upto 60 days is essential. Two hand hoeing are given on 20 and 40 days after sowing.
- Thinning to single plant and filling the gap at the early stage (before 15DAS)
- Nipping of central shoot to induce branching

Bird damage:

- By parrots at Isolated pockets
- Cultivate in contiguous block
- Bird scaring - morning and evening during

Hand pollination :-

Sunflower is a self-incompatible and depends on insects (mainly bees) for cross-pollination and seed-set, therefore, it is essential that adequate pollinators are present in the field, for pollen movement and seed-set. It is done by rubbing two flower together or by smearing hand on the individual flower, rubbing is carried out when crop is 50 to 60 days old. Rubbing should be done at 8.00 to 11.00 am hrs. in the morning and continue for 4 to 5 days . It is observed that due to hand pollination increases the yield to the extent of 25 %

Q. 6 Write in detail the cultivation of Adsali Sugarcane on following aspects.

A)SETS AND PLANTING

Adsali planting :- 15 July to 15 August

Planting material :- Sugarcane is propagated commercially by vegetative methods, which involve the planting of sections of the stem of immature cane. The cane used for planting should preferably be well grown immature plants of about 10 - 12 month old. It is an excellent practice to purchase planting material from well-established cane nursery for quality production, Plant material should be healthy, rich in nutrient status and free from pest and disease incidence.

Seed rate and spacing :-

25000 setts of 2 buds keep the spacing between two setts is 12 to 15 cm
30,000 setts of one buds keep the spacing between two setts is 30 cm

Seed treatment :-

Hot water and air treatment :-

1)Temperature of hot water 50 °C for 2 hrs or 52 °C for 30 minutes
2) Hot air treatment - air temperature 52 °C for 6 hrs
3) Moist air - 54 °C for 2 hrs
Grassy shoot, red rot ,and ratoon stunting.

Soaking in water :- By soaking the setts in water the fresh weight of seed material is increased by 2 to 4% which results in better germination. .

Lime water treatment :- This treatment is given if the seed material is of more age and dry eye buds. Setts are soaked in limewater for 24 hours.

Limewater is prepared by dissolving 500 g. of lime in 180 liters of water.
This treatment also improves germination of dry buds

Mercurial Compounds Seed Treatment:-

To protect the setts and crop from fungal diseases and to improve germination, the setts are dipped in 0.25% areton (6), or 0.5% agallol (3) or 0.2 % emulsion or 0.1% Bavistin for 2 to 3 minutes.

Setts treatment with Acetobactor Culture :- This treatment is given to the seed material for nitrogen fixation

B)MANURES AND FERTILIZERS

Apply 5 to 8 tones (20 cartloads) of FYM/ Compost /ha

Time of ferti.appl.	**Adsali**	**N**	**P**	**k**
At Sowing		40	85	85
At 6 to 8 Week		160	-	-
At 12 to 16 Week		40	-	-
Earthing up		160	85	85
Total		400	170	170

C)WATER MANAGEMENT

judicious use of water is one of the main factors which governs the cane yields and sugar recovery.

The life cycle of sugarcane plant is divided into four distinct phases namely

1) Germination phase (from planting to 60th day)

2)Formative phase (from 60th day of planting to 130th day)

3) Grand growth phase (from 130th day of planting to 250th day)

4) Maturity phase (from 250th days to 365th day)

The water requirement of the Adsali 340 cm/ha

The crop should be irrigated at 10 days interval during summer and 15 - 20 days interval during winter. Water should be withheld about 1 month before harvest for quality improvement

D)HARVESTING, THRESHING AND YIELD

The maturity is recognized by lower leaves generally drying then upper leaves. It is always better to use "Hand refractometer" for testing canes and if reading reaching is upto 20 is use for harvesting. Growth of cane is stop and arrow come out. Cane break easily at nodes. Cane produce metallic sound. Buds swell out of nodes and eye start sprouting. The cane is cut from the ground level, leaves striped. The top is cut.

Yield : **150 to 160 tons/ha**

Q. 7 Describe in detail the cultivation of Lemon grass on following aspects.

A)ECONOMIC IMPORTANCE

The oil is distilled from leaves and flowering tops of Lemon grass. The oil has strong lemon-like odour, due to high percentage (over 75%) of citral in the oil. The characteristic smell of oil makes its use in scenting of soaps, detergents, insect repellent preparations. However, the major use of oil is as a source of citral, which goes in perfumery, cosmetics, beverages and is a starting material for manufacture of ionones, which produces vitamin – A. The Citral rich oil has germicidal, medicinal and flavouring properties. An allied species called West Indian lemon grass (*C.citratus*) has low citral content in the oil and has meager trade in the country.

B)NURSERY RAISING AND PLANTING

The transplanting of nursery raised seedlings is found to be superior to direct sowing of seeds. The seeds are sown by hand on well prepared raised beds of 1m to 1.5m width at the onset of monsoon and are covered with a thin layer of soil. Although 2.5 kg. of seed produce enough seedlings, the seed rate is 4-5kg/ha. The bed should be watered immediately after sowing and care should be taken to maintain adequate moisture in the soil. Seed germinates in 5-6 days and the seedlings are ready for transplanting after a period of 60 days.

Planting :

Seedlings are planted at a distance of 40x40 cm., 40x30 cm., 40x60 cm. apart depending upon fertility of land and inter-culture implements used. It is better to plant on ridges in areas receiving high rainfall. In case of rooted slips one or two slips are placed into each hole, about 15 cm deep.

C)MANURES AND FERTILIZERS

It is recommended to apply 30 kg nitrogen, 30 kg P_2O_5 and 30 kg K_2O per ha basal dose at the time of planting. Remaining nitrogen (60 to 90 kg) can be applied as top-dressing in 3 to 4 split doses during the growing season. In soils having low fertility levels, the dose of nitrogen should be increased. In Zinc deficient soils of Uttar Pradesh, 25 - 60 kg Zinc sulphate per ha. is applied. Lemongrass crop is free from most pests or disease but may require micronutrients over marginal lands.

D)POST-HARVEST MANAGEMENT

Drying :

The grass is allowed to wilt for 24 hours before distillation as it reduces the moisture content by 30% and improves oil yield. The crop is chopped into small pieces before filling in the stills. It can be distilled in same distilleries as used for Japanese mint in India.

Distillation :

Oil is obtained through steam distillation. The oil has a strong lemon like odour. The oil is yellowish in colour having 75-85% citral and small amount of other minor aroma compounds. The recovery of oil from the grass ranges from 0.5 - 0.8 per cent. It takes about 4 hours for complete recovery of the oil.

Purification of Oil : The insoluble particles present in the oil are removed by simple filtration method after mixing it with anhydrous sodium sulphate and keeping it overnight or for 4-5 hours. In case the colour of the oil changes due to rusting then it should be cleaned by steam rectification process.

Storage and Packing of Oil : The oil can be stored in glass bottles or containers made up of stainless steel or aluminium or galvanized iron, depending upon the quantity of oil to be stored. The oil should be filled up to the brim and the containers should be kept away from direct heat and sunlight in cool/shaded places.

Q. 8 Write short notes on (Any ~~four~~ two)

A)MALTING IN BARLEY

For malting grains does not get injured or skinned in threshing. For malting seeds are soaked in water for over night. After imbibitions the seeds are tied in bags loosely and hang for germination . Germinated seeds are hot air dried and it is powered . For liquid malt extraction , the powered is cooked under pressure and malt is extracted by filter press. Malt is inoculated with yeast culture and is fermented for beers and alcoholic drinks

(One extra irrigation given at grain filling results in better quality grain for malting and no moisture stress condition during crop growing period.)

B)ECONOMIC IMPORTANCE OF SUGAR BEET

- Sugar beet is one of the most efficient converter of solar energy. It provides more than 45 per cent of world sugar requirement and is grown in 45 countries of the world.
- Sugar beet is 6 to 7 months crop and produces equal yield as that of one year crop of sugarcane in north India.
- Sugar content of sugar beet is about 15 to 16 per cent with 10 to 12 per cent sugar recovery. It produce about 35 to 50 tonnes of roots per ha.
- Sugar beet tops contain 10 per cent protein and 60 per cent total digestible nutrients. Beet pulp is good feed to animal.
- Dry pulp contains 60 per cent carbohydrates and 5 per cent crude protein. One ton of sugar bet produces 50 kg of dried and 300 kg wet pulp.
- The molasses are used as feed and for other industrial uses in the production of citric acid, yeast, antibiotics and products of fermentation industry.

C)TOPPING AND DESUCKERING IN TOBACCO

- Removal of the terminal bud with or without some of the small top leaves just before or a after the emergence of the flower head is called as topping in tobacco.
- In M. S. bidi tobacco is topped by retaining 13 to 15 leaves on the plant.
- One week after topping branches are arise from the axils of the leaves known as suckers.
- These suckers are removed before attaining 5 cm length known as desuckering.
- Desuckering operation is done for two to three times.

- Both topping and desuckering operations help to divert the nutrients and energy towards the leaves.
- This results in increase in the size and quality of leaves.

D)SEEDS SOWING OF PEA

- Sowing should be done in rows 30 cm apart with help of ferti-seed drill or by seeding behind deshi plough.
- Seed rate of 60-80 kg/ha for normal sowing crop.
- If seed sown 20 cm apart about 100-125 kg seed required per ha area.
- Seed treatment with carbendazim @ 2.5 g/kg seeds.
- Depth of sowing 3 to 4 cm.
- Sowing time second fortnight of October.
- Seed inoculation with *Rhizobium leguminosarum* is necessary for nodulating pea.

Q. 9 Describe in detail the cultivation of sweet corn on following points.

a) **Soil :**

Very sandy soils rapidly respond to management practices than those that are fine textured. Intermediate texture of loam to silt loam in surface horizon and little higher content of clay as silt loam to silty clay loam in subsoil is the most ideal. Soil pH of 7.5-8.5 supports good crop growth, as the crop is grown under rainfed conditions it is important that soil must have good water holding capacity, with proper drainage system to avoid waterlogging conditions.

Climate :-

Maize is grown in a wide range of climatic conditions. It grows from sea level to 3000 m altitudes. It is grown throughout the year. *Kharif* season is the main growing season in northern India. However in south it is sown any time from April to October, as the climate is warm even in the winter. It requires considerable moisture and warm weather from germination to flowering. The most suitable temp. for germination is 21^0C and for growth 32^0C. Extremely high temp. & low humidity during flowering damage the foliage, desiccate the pollen and interfere with proper pollination, resulting in poor grain formation. The crop can be grown satisfactorily in the areas receiving an annual rainfall of 50 to 75 cm.

B) SEEDS AND SOWING

Sowing time :-

Date of sowing differs from place to place. However, the crop can be grown throughout the year due to availability of thermo and photosensitive varieties. In general three crops are grown in India *viz., Kharif, rabi* and summer.

The planting time is June-July in *kharif* (rainy) and September-October in *rabi*(winter) season.

Seed rate & spacing :-

The optimum plant population necessary for getting maximum yield. A plant population of 45,000 to 60,000 per ha is considered adequate.

Spacing :- 60 cm in between rows and 20 to 30 cm between plant.

Seed rate :- 10-11 kg/ha.

Seed treatment :- Seed should be treated with bavistin @ 3 g/kg of seed and Azotobactor 250 gm/10 kg seed

Method of sowing ;- Dibbling or drilling

c) Manures and fertilizers :

20-25 tons/ha FYM/compost added before last harrowing at the time of preparation of land. A balanced application of 225 kg N, 60 kg P and 60kg K/ha is recommended. Nitrogen was applied in three splits. 40 % N will be applied at the time of sowing and remaining 30 % N will be top dressed one month after sowing and 30 % at pre-tasseling stage and entire quantity of phosphorus, potassium should be applied 5-7 cm deep before sowing.

d) Harvesting :

The ears should be harvested at full and tender stage. General speaking, crop can be harvested at 75-90 days depending on the weather conditions, or 20 days after silking of the ear. When the silks are turning brown and dry, the kernels are full and the milk like liquid can be squeezed out by fingers from the kernels,that is ready for harvest.

Harvesting of Green Fodder: In addition to high market value for sweet corn one additional advantage is that immediately after harvest of green cobs, the plants remain green and can readily be used as fodder. It is estimated that up to 250-400 q/ha fodder may be harvested from one crop, which provides additional income to the farmers.

Yield : No. of green cob yield 50000-66000 and 200 to 225 q/ha

Q. 10 Write in brief the cultivation of Potato on following points

a) Seeds and sowing

Planting Time

I) In Plains

Early Crop: Third week of September to first week of October.

Main crop: First week of October to third week of October.

Late Crop: Third week of October to first week of November

II. In Hills: Potato is planted in hills from the third week of February to second week of April.

Seed Rate, Methods of Sowing and Spacing

The seed requirements for a hectare on the basis of seed size are given below: Large size- 25-30 q/ha; Medium size- 15-20 q/ha; Small size- 10-15 q/ha

Diameter of tuber from longer axis	**Planting distance (row x seed)**
2.5-3.5 cm	50 x 20 cm or 60 x 15 cm
3.5-5.0 cm	60 x 25 cm
5.0-6.0 cm	60 x 40 cm

Seed treatment :

Before cutting of potatoes for planting the knife or chopper should be dipped in 0.3 % COC solution

Before planting potato seeds are dipped in 25gm Carbendenzim in 10 lits. Of water for 10 min. or Emidacloprid 200 sl 0.04 % 4 ml /10 lit. water.

2.5 kg Azotobacter and 500 ml liquid Azotobacter dissolved in 100 lit. of water for 20 qu. Of seeds deep for 30 min.

b) Interculturing operations :

- The Intercultural operations like hand weeding and earthing up are done to destroy weeds, to keep the soil loose for proper development of tubers and to cover the tubers with soil.
- First weeding is done when the plants are 15 to 20 cm high. At the same time, light earthing up is given to support the plant.
- Second weeding is done after three weeks and also earthing up is done with help of kudali to cover the developing tuber.
- All these operations should be done carefully without damaging roots and developing tubers.
- If the developing tubers are not covered, the exposed part of tubers turn green and become unfit for human consumption.
- Pre- emergence application of alachlor @.2.0 kg a.i./ha or post emergence application of propanil @ 1.0 kg a.i./ha may be used (800-1000 litre/ha). Care should be taken while spraying of post- emergence herbicides that they should not come in the contact to potato plants.

c) Irrigation management

- For rabi crop first irrigation is given immediately after planting.

- Other irrigations are given at 6 to 8 days.
- In all 8 to 10 irrigation are needed depending upon the soil type and variety.
- The irrigation water should be free from salt as potato cannot tolerate saline water.
- Heavy application of irrigation should be avoided as it may results in decaying of tubers.

d) Method of harvesting and yield :

- In Maharashtra potato crop becomes ready for harvesting in about 3 months after planning as mostly mi – late varieties are grown.
- The potato must be harvested at right stage of maturity when leaves turn yellow and dry.
- If there is a demand in market slightly early harvesting may be done.
- Irrigation is with held before harvesting and harvesting is done when soil becomes dry.
- Cut the plants at ground level eight days prior to date of harvesting.
- It is done with the help of kudali or potato digger or by polughing with deshi plough.
- Care should be taken to dugout the tubers without injury.
- Collect the exposed tubers and cleaned off by removing soil, roots, stolons etc.
- The damaged and diseased potatoes are sorted out and discarded.
- Remaining potatoes graded according to size and stored in shade to avoid sun injury.
- The diseases free, medium to big size potatoes are selected and stored separately for seed purpose.

Yield:

- The yield of potato varies from variety from variety season of planting and care taken during cultivation.
- Average yield of potato in Maharashtra is about 125 qt/ha.
- Average yield of potato in India is about 200 to 300 qt /ha.

SECTION "B"

Q.11 Fill in the blanks

1. French bean belongs to **leguminoceae** family
2. linseed contains **32-47 %** percent oil.
3. ***Medicago sativa*** is the botanical name of lucerne
4. **African Tall** Variety of maize is widely used for fodder purpose .

Q.12 Match the Pairs

"A"	"B"
1 Berseem	c) Legume fodder crop
2 Sugarbeet	d) Sugar crop
3 Mentha	b) Papermint
4 Safflower	a) *Carthamus tinctorius*