MAHARASHTRA AGRICULTURE UNIVERSITIES EXAMINATION BOARD, PUNE

SEMESTER END THEORY EXAMINATION

B.Sc. (Hons.) Agriculture

Semester	: IV(New)	Term	: **II**	Academic Year	: **2023-24**
Course No.	: AGRO-246	Title	: Crop production technology-II (Rabi Crops)		
Credits	: **2 (1+1)**				
Day & Date	:	Time (hrs.)	: **2 hrs.**	**Total Marks**	: **40**

Note : 1. Solve **ANY EIGHT** questions from **SECTION 'A'.**
2. All questions from **SECTION 'B'** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

Model answer paper

Q.1Write in detail the cultivation of irrigated timely sown wheat on following points

1) climate (1Marks)

climate: It is temperate crop but can be grown in tropical and subtropical region. It requires cool, moist weather during its major portion of growing period followed by dry warm weather towards maturity. Temperature requirement at various growth stages of Wheat is as follows.

1) Germination - 20 - 25^{0}C
2) Tillering - 16 - 20^{0}C
3) Grain filling - 23 - 25^{0}C
4) Av. Temp - 20-25^{0}C

Wheat can be grown effectively where annual rainfall is 700 to 1600 mm. Rains after germination results into seedling blight. Warm and damp climate is not suitable. For maximum number of effective tillers, wheat requires about 55 – 60 days of cool climate during early stages of growth. When cloudy weather is coupled with high temperature then crop suffers from rust disease.

2) Seed and sowing (1 Marks)

Sowing Time-Timely sown irrigated Wheat -01–15th November.Delayed sowing causes reduction in yield.

Method of sowing: - Drilling with the help of two bowl seed drill or seed cum ferti drill.

Seed rate: - 1. Timely sown irrigated Wheat- 100 to 125 kg/ha.3

Depth of sowing: - 1. Irrigated Wheat 4 – 5 cm.Mexican dwarf varieties of wheat should be sown at shallow depth because of short coleoptile length. **Spacing: -** i) Timely sown irrigated Wheat-22.5 cm bet^n row to row. **Plant population / ha:** -18 – 20 lacs/ha.**Sowing direction:**-North-South

Seed treatments to Wheat Seed: -

Thiram @ 3g/kg seed to control fungal diseases.

Vitavax @ 2g/kg seed or solar heat treatment to control loose smut.

Azotobactor @ 25g/kg seed to fix atmospheric nitrogen asymbiotically.

Apply 10 to 15 t of FYM or compost before last harrowing.

NPK dose for Wheat is as follows.

1. Timely sown irrigated Wheat -120 : 60 : 60 kg NPK/ha.
2. Under limited irrigation - 60 : 30 : 00 kg NPK/ha.
3. For Tall Niphad varieties - 75 : 50 : 50 kg NPK/ha.

For rainfed Wheat full dose of NPK should be applied at the time of sowing.

However, under irrigated condition half dose of nitrogen and full dose of P & K should be applied at the time of sowing with the help of two bowl seed drill. Remaining half dose of nitrogen should be broadcasted at the time of first irrigation i.e. 18 – 21 DAS

4) Irrigation management: (1 Marks)

Requires about six irrigations, excluding pre-sowing irrigation. Total 30-50 ha –cm. Depth of each irrigation should be 6 cm. Scheduling of irrigation based on critical growth stages is as follows

1.Crown root initiation	-16 to 20 DAS
2.Maximum tillering	-30 to 35 DAS
3.Late jointing	-45 to 50 DAS
4.Flowering	-65 to 70 DAS
5.Milk stage	-80 to 85 DAS
6.Dough stage	-95 to 100 DAS

Quantity of irrigation is limiting , then managed as under

1. Only one irrigation	-21 DAS
2. Two irrigations	-21 and 65 DAS
3. Three irrigations	-21, 42 and 63 DAS
4. Four irrigations	-21,42, 63 and 84 DAS

Q2A) Write about the seedbed preparation, seed and sowing of rabi sorghum

Seedbed preparation (1 Marks)

One ploughing 20-25 cm deep with M.B. plough in summer, 2-3 harrowing, 10-15 C.L. of FYM , Require firm and compact seed bed, For rabi crop of jawar after harvest of kharif crop like udid or mung harrow the soil with 2-3 harrowing and prepare the seedbed.

Seed and sowing(1 Marks)

Seed treatment- brine solution 30% for ergot, thirum@3 g/kg for head smut, 300 mesh fine sulphur powder@4 g/kg for grain and loose smut, carbofuran @100 g / ten kg of seed, Azatobacter and PSB. Seedrate 7.5 to 10 kg/ha and for fodder 30-35 kg /ha. Spacing- 45 X 12-15 cm. Papulation 1.5 to 2 lakhs . Sowing time –25 th Sept. to 15 oct for rabi. Depth 3-4 cm and not more than 5 cm. Across the slope sowing

B) Give the detail economic importance , seed and sowing of barley crop

Economic importance(1 Marks)

- Is one of the most important cereal of world
- It is grown in almost all part of word except the tropical region
- Major food in cooler area
- Staple food for large number of people in Tibet, Nepal, and Bhutan
- In European country it is used for breakfast food
- Grains are fed to livestock and poultry
- As malt for manufacture of beer, and other liquors like whisky, brandy etc.

- As a food barley flour is used for preparation of chapattis
- Grain is roasted and grinded as sattu
- Pearl barley is used in soap
- Barley grain contains 12.5% moisture, 11.5%protein, 74%carbohydrates , 1.3 % fat, 3.9 % fibre and 1.5 % ash

Seed and sowing(1 Marks)

- Seed- good quality certified seed is selected
- Treatment-Soaked overnight for better and quicker germination in rainfed area
- Treat the seed with agroson or cereson @ 2g/kg of seed for seed born diseases and vitavex @ 2 g/kg of seed for loose smut and covered smut
- Time- middle of October to middle of Nov. Gradual decline in yield when delayed upto Dec.
- Rainfed area-second fortnight of October
- Irrigated first fortnight of November
- Seedrate 70-80 kg/ha for irrigated and 80-100 kg/ha for rainfed
- Spacing 22.5 cm R-R for irrigated and 23-25 cm for rainfed
- Depth 4-5 cm (irrigated), 6-8 cm (rainfed)
- Method of sowing- sarta attached to deshi plough or seed drill in rainfed area and hand dropping in furrow in irrigated area

Q.3 Give the information of chickpea on the following points

1)Differential characters between deshi and kabuli gram(1 Marks)

Deshi or brown gram *C. Arietinum* L	✓ Yellow to dark brown colour seed, ✓ seed size usually small , plants small, ✓ yield potential good, ✓ branching ability good
Kabuli or White gram *C. kabulium*	✓ White colour seed, ✓ bold and attractive , ✓ less yield compared to deshi, ✓ plants are taller than deshi, ✓ stand more or less erect

2)Collection of mallic acid (1 Marks)

- At 50-60 days age the gram plant secret the malic acid locally known as amb
- The malic acid dissolved in dews which accumulate on the tip of the leaves
- The malic acid is collected by running the soft cloth over a gram crop in the morning and squeezing it.
- The squeezed material contains 90-95% malic acid and about 5 to 7 lit of malic acid can be collected from one hectare
- It has medicinal value and it is used in stomach disorder

3) Irrigation management (1 Marks)

- Total WR 25-30 ha –cm. and 6-8 ha-cm at each irrigation
- Un-irrigated crop when sown at proper time gets benefit of from October rain. If no rains try to irrigate at flowering and at pod filling stage
- For irrigated crop-give pre-sowing irrigation if sufficient moisture is not available in soil
- In heavy moisture retentive soil-two irrigation-

- at flowering (35-40DAS) and
- at pod filling(75-80DAS)

➢ In medium soil-three irrigation-

- at branching (25-30 DAS)
- at flowering (45-50DAS) and
- at pod filling(75-80DAS

4) Nipping (1 Marks)

➢ It is the process of plucking or removal of apical or terminal buds of the crop from the main stem
➢ Done at 30-35 DAS(initiation of branches)
➢ Main object is to encourage the branching
➢ Nipping stops the apical growth and promotes the lateral branching
➢ Remove 3-4 cm top portion of plant
➢ Due to nipping the plant becomes more vigorous and more flowering and more pod and more yield

Q.4 Describe in detail the cultivation of linseed on following points

1) Economic importance(1 Marks)

➢ Important oilseed and fiber crop. Out of total production 5% is used for sowing, 88% for extraction of oil and 7% for fiber.
➢ Linseed fiber extracted from the stem is utilized for manufacture of twines, canvas suiting, shirting and various product for defense purpose is used for the manufacture of linen.
➢ Seed contain 37-47% oil , is edible.
➢ Due to quick drying properties(as it is rich in lenolenic acid which oxidize on exposer to air and that is reason for short life of the oil) is used for preparation of paints varnishes, printing ink, oil cloth, soap, leather and waterproof fabric.
➢ Oilcakes for cattle feed contains 36% protein, 85% of which is digestible
➢ Cake also used as organic manure it contains 5% N, 1.4% P_2O_5 and 1.8 %K_2O
➢ Straw from the seed is used for insulating materials , rugs, twine and paper

2) Seed and sowing (1Marks)

➢ Seed treatment –treat with 1% mercurial fungicide Agroson GN @ 3 g/kg to control the seed borne diseases
➢ Sowing time –
➢ Rainfed –last week of sept to I st week of oct.,
➢ Irrigated –I st week of Oct. to November
➢ sowing method – drilling by seed drill and broadcasting in utera crop
➢ Seedrate 10-12 kg/ha for small seeded and 20-30 kg for bold seeded For paira or utera crop 25 kg/ha
➢ Spacing 30x5 cm
➢ Depth of sowing 4-5 cm
➢ Plant population 4.5- 5 lakh ha(ideal 6.66 lakh as per spacing)

3) Land preparation (1 Marks)

In M. S.s the linseed crop is taken as a single crop on the soil which are kept fallow during kharif season or as double crop after mung, udid, paddy etc. Linseed crop

requires a well pulverized but firm seedbed which is obtained by giving one ploughing and 2-3 cross harrowing

4)Harvesting and yield (1 Marks)

- Matures in 110-120 days
- Ready for harvesting when the capsules begin to dry up turning brownish
- The crop is harvested either by pulling or cutting close to ground with the help of sickle and then stacked on threshing floor for 4-5 days to dry. It is then threshed by beating with sticks or under bullock feet
- Yield 7-14 q /ha

Q 5. Describe the cultivation of **french bean** on following aspects

Climate

- It is cool weather crop , can be grown at sea levels to highlands , air temperature 20-25 ^{0}C,
- soil temp approximately 32.2^{0}C is essential for maximum vegetative growth
- Day neutral crop , but bright sunshine favours the crop growth
- Soil- it prefers light textured sandy to sandy loam soils but can be grown on well drained medium to heavy soils with pH of 6-8.5, free from soluble salt
- Highly sensitive to water logging

Land preparation

- A coarse seedbed is sufficient for French bean.
- Plough the land immediately after harvest of kharif crop up to 15 cm deep by deshi plough followed by 2-3 harrowing and levelling

Seed and sowing (1 Marks)

- Use certified or truthful seed
- Seed treatment with captan or thirum @2-3 g/ kg of seed against seed borne diseases
- PSB application
- Method- drilling
- Time-October-November is sowing time but best time is last week of October (23 rd oct to 1 st Nov.)
- Spacing 30X15 or 45X10 cm
- Seedrate for bold variety-120 kg/ha(PDR-14 & HUR-15) and for normal seed 85 kg/ha(VL-63 &HUR-137)
- Depth 5-7.5 cm

Manures and Fertilizer management (1 Marks)

- The crop does not nodules in the plains hence it require higher doses of nitrogen for better growth and yield
- FYM-15-25 tonnes/ha.
- 90-120:60:0 kg NPK/ha for irrigated with half N as topdressing and rest as basal dose along with 20 kg sulphur
- 25:50:0 for rainfed as basal dose

Q 6. Explain the cultivation of suru sugarcane on following points.

1)Selection of planting material (1Marks)

- Selection of succulent seed material free from pest & disease, have high viability.

- Seed material should be thick, juicy and healthy.
- Eye buds should be thick but not over matured and not covered by dry scale.
- Select from seed nursery.
- Select set from upper ½ to 1/3 rd portion of cane
- Change the seed material after 4-5 years
- Cut into set by cutting knife
- Select sets from 10-11 month age crop

2) importance and uses of sugarcane (1 Marks)

- Main source of sugar .
- Important cash crop.
- Sugar juice is used for making white brown (khandsary) color sugar & jaggary
- Earns foreign exchange .
- Byproduct- Bagasses-fuel & fibre boards paper & plastics and molasses in distillaries for alcohol, citric acids, rum and for livestock.
- Green tops best source of fodder
- Press mud used as manure.
- Sugar industry provide gainful employment to people

3) Seasons and Time of planting in India: (1 Marks)

Name	Time	Duration Month	Yield T/Ha	Remark
Spring	Mar-apri	6-8	60	In North India After Rabi
Seasonal, Suru, Eksali	Jan-feb	10-12	100	In Vidarbha
Pre-seasonal, Autumn, Ashwini	Oct- Nov	12-15	125	Best For Intercropping
Adsali	July-aug	15-18	150	In MS

4) harvesting and yield (1 Marks)

Harvesting and yield

- Stops irrigation before 15 days
- Cut the stalk at ground
- Strip the leaves and cut the tops
- Tie the bundles & do the transport
- Yield of Seasonal, Suru, Eksali sugarcane is 100 t/.
- .Harvesting time Dec-Jan.

Q 7 .Describe in detail the cultivation of Potato during the rabi on following aspects.

1)Economic importance (1 Marks)

- Staple food. Vegetable or snack- a versatile food
- Rich in starch, vitamins and minerals
- Carbohydrates 20.6%, fat 0.3%, 1.1% crude fiber, and 0.9% ash
- Used for several industrial purposes for production of starch and alcohol

- Potato starch is used in laundries and for sizing yarn in textile mills
- Dried food products like potato chips. Sliced potato

2) Climate (1 Marks)

Climate

- Temperate or cold loving crop
- Require low temp, lower humidity, less windy and bright sunny days
- Temp. germination 25 ^{0}C, for growth, tuberization and tuber development 17-20 ^{0}C
- Higher temp has adverse effect and above 30 ^{0}C and tuberization stops
- Cloudy days, rains and high humidity are very congenial for spread of fungal and bacterial diseases
- In Nilgiri condition cultivation throughout the year

3)Seed and sowing (1Marks)

- Selection of seed stock: vegetative propagation and diseases carried by mother plant and hence select pure and healthy seed
- Tuber must be uniform in shape and size
- Avoid surface diseased tuber-like wart, scab, brown rot and nematode infection
- Should not be shrivelled
- Must be in right stage of sprouting
- Sprouts must be about 1 cm long at the time of sowing
- Tuber diameter should be 2.5 to 5 cm
- Purchase seed from trusted agency
- Sowing time Plateau in Rabi-Oct-Nov. Sowing time should coincide - at temp of max.32 & min 18 ^{o}C

Seed size , spacing and seedrate:			
Size(dia)	Spacing	Seedrate	crop
2.5 to 3 cm(30 g)	45X15 cm	20 q/ha	Early crop
4 to 5 cm(50 g)	50X20 cm	25 q/ha	Seed crop
2.5 to 4 cm(30g)	60X25 cm	20 q/ha	Ware crop
2.5 to 3 cm diameter and 30-50 g wt. Seed are best . Potato yield increase with increase in seed size and decreasing the spacing			

4)Tuberization (1 Marks)

- Tuber- underground stem, have buds (for germination) and lenticels (respiratory structure that appear in the stem of other plant).These tubers are formed on the stolen tips appearing from the base of haulm or underground side shoots which resembles roots in early stages
- Tubers grow to harvestable size in two weeks but stolen continue to grow and branch and forms tubers which may be of small size at harvest
- Higher temp has adverse effect and above 30 ^{0}C and tuberization stops
- Growth promoters on haulm-retard tuberization
- Growth retardants accelerate tuberization

- The exposed underground tubers also do not accumulate starch and remain smaller because they synthesize anthocyanin /chlorophyll and start performing photosynthetic activities like leaves . They become bitter in taste and are harmful or lethal , if consumed

Q.8) Describe in brief the cultivation of mustard on following points.

1)Land preparation (1 Marks)

- A fine, firm and moist seedbed
- A clean and well pulverized seedbed of good tilth is needed for better germination
- Prepare the land well with deep ploughing followed by two cross harrowing
- If possible fallow planking after ploughing so that the soil is well pulverized and leveled

2) Irrigation management(1 Marks)

- Usually raised as rain fed on conserve moisture
- Give response to irrigation also
- Total water requirement is 25-30 ha-cm
- Number of irrigation 2-3
- One at flowering (45-50 DAS)
- Second irrigation at silique/ capsule formation (65-70DAS)

3) Soil (1 Marks)

Soil

- Rape seed and mustard are capable of growing under a wide range of soil conditions varying from sandy loam to clay loam soil but they thrive best on light loam soils with neutral pH(7.0). In MS it is grown on medium to heavy soils. They neither tolerate water logging condition nor do well on heavy soil though tolerant to saline and alkaline soil, often not fit for the crop

4)Economic importance (1 Marks)

- Major oilseed of India.
- Sarson and toria are generally termed as rapeseed.
- Rai or raya or laha is termed as mustard.
- Oil content 37-49 %.
- Seed and oil is used as condiments in the preparation of pickles
- Oil is used for human consumption in cooking, frying purpose
- It is also used in the preparation of hair oil and medicine
- Used in the soap making.
- Rape seed oil used in the manufacture of grease.
- Oilcake is used as a cattle feed and manure.
- Green stems and leaves are good source of green fodder for cattle,
- In the tanning industry, mustard oil is used for softening the leather.

Q 9) Discuss scope of aromatic and medicinal farming over present farming.
(one mark for two points minimum 8 points -four marks)

1. Most of the plant are not affected due to pest and diseases. And some are itself herbicidal insecticide
2. More production and more cost compared to cash crop.

3. Most of plant being wild and belong to weed group can be cultivated on light and marginal soil and give production in less water or even in water stress.
4. Many of plant due to their intense and severe odour are not eaten by animal sand hence saving of watching charges.
5. Can be taken as intercrop in horticultural garden Ex Pudina in orange garden give additional yield as well as controls pest and 'Kolsi'
6. Peoples are diverting from synthetic artificial material to herbicidal material and more importance Ex herbal Cosmetic
7. Even after fragmentation of land, this cropping is feasible on small holding.
8. Due to degradation of forest, some aromatic and medicinal plants survival becoming difficult can be preserved by cultivation
9. Raw material can be provided in huge amount to medicinal industry.
10. Cottage industry may be developed and may generate the employment.
11. Due to selfsufficiency of India import will be reduced down.

Q. 10 A) Discuss the causes of low production of forage and measures to increase the fodder production.

Causes of low production of forage(1 Marks)

- Less attention of govt towards forage crops
- In green revolution / high intensity cropping forage crops sidetracked
- More attention to oilseed pulses and cereals; less to forage
- Low productive livestock hence less attention to forage for animals
- In research it is also neglected compare to grain crops
- Due to grazing farmer do not need necessary to raise fodder crop in fertile land.
- Lack fodder preservation technique i. e. silage and hay and hence more wastage

Measures to increase the fodder production(1 Marks)

- Increase in the area under forage crops
- Evaluation of high yielding fodder varieties with good nutritional qualities
- Growing short duration & high yielding varieties of fodder crops like cowpea, gaur bajra jawar maize etc. during summer under irrigation
- Popularizing fodder crops in rainfed areas
- Arranging for high quality seeds
- Adoption of agri-silvi-pasture & agroforestry system
- Development of pastures in tropics
- Adopting silivipastoral system

Q. 10 B) Describe the berseem cultivation with respect to seed and sowing and harvesting ~~and cutting~~ management.

Seed and sowing (1 Marks)

The crop is generally sown by broadcasting the seeds over the land. However the line sowing may also be done. For sowing the spacing row to row should be 20 cm. seed rate is 25 kg for small seeded and 50 kg /ha for bold seeded varieties. The seed treatment with brine solution and then seed soaking fallowed by Rhizobium culture may be done for disease free, early germination and nitrogen fixation. Optimum sowing time is September to end of October.

Harvestings (1 Marks)

The first cutting is generally taken60-70 days after sowing when the plants are about 30 cm tall .cutting is generally done 5 cm above the ground leve to avoid the cutting of young basal branches subsequent cuttings are taken at 25-30 days interval depending upon the growth and temperature. About 5-6 cuttings are obtained. Average yield from each cutting is about 175 q /ha, second and third cut 225 q/ha and fourth cut 175 q/ha, fifth cut give 175 q/ha and sixth cut gives 75 q/ha. Total yield per crop is 1000-1200 q/ha.

SECTION "B"

Q.11 Fill in the blanks with proper word.

1) Flowering in the sugarcane is called as **arrowing ...**.....

2)...**French bean/ Rajma**...is the pulse crop , but do not have root nodule for nitrogen fixation in the plains.

3) Botanical name of Sweet potato is ***Ipomoea batatas***.

4) **Fraz Carl Achard** discovered that white skinned and fleshy type sugarbeet had the sweetest juice and also was the first man to set up a sugarfactory for processing of sugarbeet root and making sugar out of it and is said to be Father of sugarbeet industry

Q.12 Match the pair by selecting the alphabet of proper answer from Column B for col.A

Column-A		Answers	Column-B	
1	Lucern	(B . *Medicago sativa*)	A.	*Beta vulgaris*
2	Barley	(C. Hardeum vulgare)	B.	*Medicago sativa*
3	Sugar beet	(A. *Beta vulgaris*)	C.	Hardeum vulgare
4	Deshi gram	(D. *Cicer arietinum*)	D.	*Cicer arietinum*

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