

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

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Day & Date	:	Time	: Total Marks : 40

MODEL ANSWER

SECTION "A"

Q.1 Define Agriculture and explain in brief scope of Agriculture in India and Maharashtra.

Ans: Agriculture is defined as an art, the science & the business of producing crops & livestock for economic purposes.

SCOPE OF AGRICULTURE IN INDIA AND MAHARASHTRA

India has basically been an agricultural country and it is likely to continue to be so for a long time to come unless some miracle happens at some stage. In spite of this the country has been unable to be assured of needed supplies of food grains and other agricultural products. Therefore the scope of agriculture is very vast in India and also in Maharashtra, as it is the most important enterprise in India economy (agriculture sector contribute 30 % GDP).

India is the only country in the world having all type of soils & climatic conditions suitable for growing variety of crops. If proper attention is being paid to exploit all the agricultural resources and technology developed in the field of agriculture, India will be at the top in the world.

India is exporter of fruits, tea, coffee, basmati rice and so many other agricultural commodities, which help for getting foreign exchange. Foreign exchange of worth Rs. 60 billion is earned accounting 25 % of countries total exchange earnings.

In Asian countries figures of 2002 indicated that India has largest area under rice, however production was highest in China due to less productivity (2915 kg/ha) of Indian rice than China (6266 kg/ha). India has the potential to become the number one rice producer in the world. It is expected to play a crucial role in rice production and technology & focus has to be on tapping the production potential in the North Eastern region. New high yielding varieties and area under hybrid rice should be extended beyond the frontiers of South India. In Maharashtra there is also scope for increasing rice productivity of 1751 kg/ha to around 3000 kg/ha as observed in potential areas of A.P., Punjab and Tamilnadu.

As well as potential of ethanol production from sorghum grains & jaggery production from juice of sweet sorghum have to be tapped.

Among the pulses 90 % of world's pigeon pea produced in India as well as acreage (1.02 thousand ha.) in Maharashtra is highest among all states but the productivity is still lower (757 kg/ha) compared to Uttar Pradesh (1142 kg/ha) this has to be increased through modern technologies.

Now-a-days agriculture includes all aspects of crop production (field crops, plantation and fruit crops), livestock farming, processing and preservation of agriculture products such as food grains, fiber, vegetables, fruits and animal products, fisheries, forestry, apiculture, sericulture etc.

No doubt, we have achieved the goal of green revolution (for increasing production of wheat, sorghum & rice as major food crops, with introduction of Mexican varieties in India by Nariman E. Borlaug in 1965-1970), yellow revolution (with launching of technology mission on oilseeds in 1986), white revolution (increasing milk

production with breeding with exotic breeds & developing potential cross-bred cows) blue revolution (increasing fish production) and rainbow revolution ICAR given motto (for increasing production of horticultural crop through National Horticultural Mission in 2002-03). There are new challenges or problems faced by the farmers like water logging, salinity and micro-nutrient deficiency symptoms particularly zinc which cause khaira disease of rice, as well as new pest problem in sugarcane like wooly aphids. To overcome these problems, appropriate water management, fertilizer management and pest management through integrated approach are developed. Now a days it is necessary to evolve the varieties of field crops, vegetables, fruit crops etc. with quality and high yield potential, and resistant to pests and diseases with wider adaptability under different eco-units. An animal breeding for increasing milk and meat production is essential. It is also essential to initiate and strengthen the researches on cropping systems rather than individual crop to exploit fullest potential of natural resources.

Similarly, research on agro-forestry system suitable to different agro-ecological units for proper land use, environment protection / conservation and increasing agricultural production. Preparation of value added products (e.g. Baby corn which fetches higher price, use of safflower petals as a ayurvedic medicine) and processing and preservation techniques particularly for different agricultural products. Use of genetically modified plants by means of biotechnology for increasing agricultural production.

All these are the recent challenges in the field of agriculture. Therefore, continuous research and development in field of agriculture is non-ending and continuous process. In India State Agricultural Universities so also huge network of National Agricultural Research System is in operation under ICAR and is looking for research, education and extension activities. Similarly in Maharashtra, four Agricultural Universities, Department of Agriculture, ICAR funded KVK's and several Non-Government Organization (NGO's) like Pani Panchayat are engaged in education, research and transfer of technology as well as motivating farmers for awareness of modern technologies in the field of production per unit area without degradation of natural resources.

Q. 2 Enlist classification of crops into different groups and explain the classification of crops based on use or Agronomic classification.

Ans: Classification of crops into different groups on the basis of
 1. Climate 2. Season 3. Life cycle 4. Source of Water
 5. Root system 6. Economic importance 7. Use or Agronomic classification
 8. Botanical or Morphological or Taxonomic classification.

On the basis of their uses the crops can be classified in the following twelve groups.

1. Cereal or Grain Crop: Crops grown for their edible starchy grains one-seeded fruits called caryopsis or monocot. They are adventitious rooted crops and belonging to the family Graminae e.g. rice, wheat, maize, sorghum, pearl millet, oat, barley hill millets like finger millet (Ragi Nachani), fox tail millet (rala), proso millet (vari), little millet (sava), kodo millet (kodra) and Banti. Millets are small grain cereal crops. Plants are smaller than sorghum, bajra and maize. While sorghum and bajra, which grow tall and have large grains are called major millets. Sorghum is also called **Great Millet** and bajra – **Pearl Millet**. **Minor Millets:** Plants which are shorter than these (except rice, wheat) and whose grains are smaller than the grains of major millets are called **minor millets**.

2. Legume or Pulse Crop: They belong to the family leguminoaceae are called legume crops and **edible legumes are called pulse crops**. Seeds are dicot and on splitting they produce dal, which is rich in proteins. All pulses are legumes, but all legumes are not pulses. The legumes are large group of plants second to cereals. They are tap rooted crop

- and fix atmospheric 'N' By 'N' fixing bacteria in the nodules found, generally, on the roots e.g. pigeon pea (Tur) or red gram or arhar, gram or chickpea, black gram (Udid), green gram (Mung), Kindey bean or moth bean (Mataki), cowpea, horse gram (Kulthi), lentil (Masur), Lathyrus (Lakh), Indian bean (wal), french bean, lima bean, double bean, broad bean etc. groundnut and soybean are used both as pulses and oilseeds.
3. **Forage or Fodder Crops:** This group mainly includes grasses such as gajaraj, marvel, guinea grass legumes like berseem and lucerne, cultivated crops like fodder sorghum, maize, bajra, cowpea etc. They are as used fodder, hay and silage purpose.
 4. **Root Crops:** e.g. radish, carrot, sugar beet turnip etc.
 5. **Tuber Crops:** The edible portion is not a root but a short thickened underground stem e.g. potato, sweet potato.
 6. **Fiber Crop:** Crops grown for getting fibre and making clothes, cordage and coarse fabrics are called fibre crop e.g. cotton, jute, sannhemp, deccan hemp or mesta (Ambadi), roselle (Tambadi Aambadi), agave, linseed (Flax), ramie etc.
 7. **Sugar Crops:** These crops are mainly grown for sugar e.g. sugarcane and sugar beet are important sugar crops of world. Sugarcane provides 75% of world's sugar and the rest comes from sugar beet.
 8. **Oil Seeds or Oil Crop:** Crop seeds are rich in fatty acids (oils) and are used for extraction of edible or non-edible oil e.g. groundnut (Peanut) sesamum, mustard, safflower niger, sunflower, soybean, linseed, castor etc.
 9. **Drug Crops:** Crops, which are used for preparation, of medicines or drugs e.g. tobacco, opium from plant *Papaver somniferum*, Indian hemp (Bhang). Smoking, snuffing or chewing of dried, cured and fermented leaves, inflorescence, roots and other parts of certain plants provide stimulation, sedation, temporary relief of worries, pains etc.
 10. **Spice Crops Or Spices and Condiments:** These are the crops used in small quantities for flavoring, increasing palatability/ taste/ piquancy and even as preservative of culinary and food items e.g. turmeric, ginger, chillies, garlic, onion, coriander, cumin (Jire), black paper (Miri), clove, cinnamon etc.
 11. **Vegetable Crops:** Vegetables are a distinct group of crops, the roots, stem, bulbs, corms, tubers, leaves or inflorescences or mature or ripe fruits are eaten either raw or cooked from eg. brinjal, tomato, cabbage, okra (Bhendi), leafy vegetables, cucumbers etc.
 12. **Green Manure Crops:** Crops, which are, buried in to the soil for improving organic matter and fertility of the soil e.g. sannhemp, dhaincha, sesbania, glyricidia and pulse crops like cowpea and green gram.

Q3 Describe Indus Valley Civilization (Harappan Civilization)

Ans:	Date	Main Phase	Mehrgarh Phases	Harappan Phases	Other phases	Era
	7000-5500 BCE	Pre Harappan	Mehrgarh I (aceramic Neolithic)			Early Food producing Era
	5500-3300 BCE	Pre-Harappan /Early Harappan	Mehrgarh II - VI (aceramic Neolithic)			Regionalisation Era c.4000 - 2500/2300 BCE (Shaffer)
	3300-2800 BCE	Early Harappan c. 3300-2800 BCE		Harappan I (Ravi Phase : Hakra ware)		c. 5000-3200 BCE (Coningham & Young)

2800-2600 BCE	(Mughal) c. 5000-2800 BCE (Kenoyer)	Mehrgarh VII	Harappan 2 (Kot Diji Phase : Nausharo I)		
2600-2450 BCE	Mature Harappan (Indus Valley Civilization)		Harappan 3A (Nausharo II)		Integration Era
2450-2200 BCE			Harappan 3B		
2200-1900 BCE			Harappan 3C		
1900-1700 BCE	Late Harappan		Harappan 4	Cemetery Coloured pottery	Localisation Era
1700-1300 BCE			Harappan 5		
1300-600 BCE	Post Harraapan Iron Agr India			Painted Grey Ware (1200-600BCE)Vedic period (c. 1500-500 BCE)	Regionalisation c. 1200-300 BCE(Kenoyer) c. 1500-600 BCE (Coningham & Young)

Q.4 List out history of ancient India.

- Ans:
- ✓ 2800 BCE: the Indus valley civilization begins to emerge
 - ✓ 1700 BCE: the Indus valley civilization vanishes
 - ✓ 1500 BCE; ARYAN TRIBES BEING TO INFILTRATE INTO NORTHERN India from central Asia
 - ✓ 800 BCE: The use of iron and alphabetic writing begin to spread to northern India from the Middle east
 - ✓ 500 BCE: two new religions, Buddhism and Jainism are founded.
 - ✓ 327 BCE: Alexander the great conquers the Indus Valley : this leads to King Chandragupta Maurys of Maghada conquering the Indus valley from Alexander the Great successor (304 BCE)
 - ✓ 290 BCE: Chandragupta successor, Bindusara extends the Mauryan conquests into central India.
 - ✓ 269 BCE: Asoka becomes the Mauryan emperor
 - ✓ 251 BCE: a mission led by Mahinda, Asoka's son. Introduces Buddhism to the island of Sri Lanka.
 - ✓ 232 BCE: Asoka dies; shortly after the decline of the Mauryan empire

Q. 5 Explain society and Economy of ancient India.

Ans: The vedic age- Dark age. Time of violent, upheaval and no written records from that period have survived to shed light on it. Society is concerned the coming of Aryans into

ancient India, and their establishing themselves as the dominant group, gave rise to the caste system. This divided Indian society into rigid layers, underpinned by religious rule. Outside the caste system altogether excluded from Aryan dominated society were the untouchables. Aryan society evolved into the more settled and more urban society of ancient India these caste divisions persisted. New religious movement, Jains and Buddhists rebelled against it. As time went on, indeed, it became more complex and more rigid.

The economic history of ancient India is one of agricultural advance. The use of iron spread from Middle East from around 800 BCE, making farming more productive and populations grew. The iron-age farming gradually spread throughout the entire subcontinent. The spread of iron-age farming was crucial development in the history of ancient India as it led to the rebirth of urban civilization in the subcontinent. Cities grew up; trade expanded, metal currency appeared, and an alphabetical script came into use.

Q. 6

Need and importance for studying Agricultural Heritage

Ans:

Our agriculture has lot of inherited sustainable practices passed from one generation to other generation. And also agriculture in India is not an occupation; it is a way of life for many Indian populations. Hence the present day generation should be aware about our ancient and traditional agricultural systems and practices. This will enable us to build the future research strategy also.

India has made tremendous progress in agriculture and its allied fields, but the emphasis on intensive use of inputs without considering their adverse impact of long term basis has created several problems related to sustainability of agriculture. Irrational use of chemical fertilizers, insecticides and exploration of natural resources is threatening the agro eco systems. Soil is getting impoverished, water and air getting polluted and there is an increasing erosion of plant and animal genetic resources. Therefore, attention is now shifting to sustainable form of agriculture.

The indigenous technical knowledge (ITK) provides insight into the sustainable agriculture, because these innovations have been carried on from one generation to another as a family technology. There are several examples of valuable traditional technologies in India but unfortunately these small local systems are dying out. It is imperative that we collect, document and analyze these technologies so that the scientific principle/basis behind them could be properly understood. Once this done, it will be easier for us to further refine and upgrade them by blending them with the modern scientific technology.

Q. 7 Write in brief about the Neolithic Agricultural Revolution in Western India.

Ans:

Neolithic Agricultural Revolution in Western India : Western Asia (Israel, Jordan Iraq etc.) is considered to be the birth place of agricultural revolution, where wild ancestors of wheat and barley and domesticated animals like goat, sheep, pig and cattle are found. The period from 7500-6500 B.C. was in real sense the discovery of agriculture. Polished stone axe and sickle were used for the cultivation of crops like wheat, barley, rice, maize and millets. Domesticated horse and ass were used as draught and transport animals. Maize, Potato and Wheat, were domesticated in 4400, 3500, 3400 B.C., respectively.

The period from 300-1700 B.C. marked the spread of agricultural revolution to Egypt & subsequently to Indus valley. The scene of this revolution was in countries between rivers Niles and Gangas. Man invented plough to be used with the help of oxen. Stone implements were supplemented with copper and bronze. Mohenjodaro to Harappa territory was the centre of agricultural revolution in Indus Valley. It was that Indus valley civilization that spread to Punjab, Haryana, Jammu and Uttar Pradesh, Rajasthan, Gujrat and Madhya Pradesh. Harappans raised bread wheat, barley, sesame, peas, melons, cotton.

rape and mustard. Cattle, buffalo, goat, sheep, camel, ass, dog, and cat have special mention in the list of domesticated animals. Harappans agriculture also spread to Andhra Pradesh, Karnataka & adjoining areas.

About 1800-1600 B.C., Aryan migrated to India and overwhelmed the Harappans. Horses were the main domesticated animals beside cattle. Agriculture was very important profession during Vedic age (1500-1000 B.C.). Use of iron implements, particularly iron ploughs became prevalent. Besides barley, wheat, beans, sesame, millets and rice find frequent reference in Vedas written during the period.

Buddhist period (600 BC) marks the importance of trees. It can be called as period of Arboriculture (forestry) and Horticulture. During that period, Superintendents of Agriculture used to look after the agricultural progress. Two annual harvests-winter (wheat and barley) and summer (rice and millets) were common. Suitability of different lands to different crops was mentioned. Farming operations from ploughing to harvest of crops were systematically followed. Safflower, linseed and mustard were also under cultivation besides rice, wheat and millets. Irrigation from rivers, lakes and reservoirs was practiced and water rate was one-fifth of the produce.

Q.8 Write in brief about the Neolithic Agricultural Development in South India.

Ans: **Agricultural Development in South India :**

During the first century of Christian era and 300 A.D., the most important development in agriculture was irrigated cultivation of rice in South India. Cauvery river was the most important source of irrigation water. Cultivation of rice, finger millet, sugarcane, pepper and turmeric was quite common. After 300 A.D., Gupta period contributed significantly to the progress of agriculture. Amarkosha written during the period of Chandragupta II contains information on soil, irrigation, implements, classification of soils and land use and use of manures. Rice transplantation was practiced. Crops such as wheat, barley, rice, peas, pulses, spices, vegetables (onion, gourd, cucumber, pumpkin), sugarcane, cotton, pepper, cardamom, mustard, cloves, ginger, turmeric, beetlenut, tamarind, sesame, linseed, indigo etc. were grown. Mango, jack, plantain and coconut were most common. During Kanuj empire to Harsha (606-647 A.D.), a rice variety of large grains with extra ordinary fragrance called rice of grandees was grown in Magadha. Pomegranates and sweet oranges were grown every where. History of Agriculture from ninth to eleventh century is evident from Krishi Parashara written by Parashara (950-1150 A.D.). It explained the existing classification of land use, manuring, crop rotation, irrigation, tillage, implements, crop protection and agricultural meteorology. Anantaraja sagar (Porumamilla tank) in Cuddapah district of A.P. was built in 1367 by Vijaynagar King. In 1521 Krishnadevaraya did lot of work to improve irrigation to dry lands about Vijaynagar. He constructed the dam and channel of Korragal and the Basavanna channel both which are still in use and of great value to country. Rice, wheat, sorghum, barley, beans, greengram, horsegram etc. were grown in the area. During the same period (1336-1646 A.D.), Bahamanis constructed several canals such as Utpalpur, Nandashaila, Bijbhira etc. Babur laid the foundation of mughal dynasty in India. Except for gardens and flowers and provision of irrigation facilities particularly in South India, there was nothing special about agricultural development. The quest for spices resulted in introduction of new world plants to India by Portuguese during 1498-1580. Groundnut, tobacco, potato, cashew, guava, pineapple, chillies etc. were introduced. Much progress was not there during sixteenth and seventeenth centuries. However, Shahjahan restored the West Jammu canal which had been dug by Shah. Eastern Jammu canal was probably constructed during Mohammed Shah period. As regard the peasantry during Mughal period it was in most

stretched condition. They became disinterested in cultivation because of large sum tax ziziya) extracted from them. The peasants fled from many areas.

Q.9

Define the crop and give the classification of crops on the basis of life cycle.

Ans:

Crop – A plant of economic important if cultivated over large area for a purpose.

Classification on the basis of Life cycle of a crop

1. **Seasonal crops:** crop which complete its life in one season. ie. Kharif, rabi, summer eg. Rice, Pearl millet, Maize, Sorghum, Wheat, Oat, Chickpea, Groundnut Etc
2. **Two seasonal :** crop which complete its life in two seasons eg. Turmeric, Ginger, Long staple cotton.
3. **Annual crop:** crop which requires one full year to complete its life cycle eg. Sugarcane
4. **Biennial crop:** crop which complete its life cycle in two years, the crop complete vegetative growth in the first year and flowers fructifies and perishes in the next year. eg. Banana, Papaya. Etc.
5. **Perennial crop:** Crop which lives for several years eg. Mango, Guava, Orange, Grape etc.

Q.10

Write short notes on (Any two).

a) Physical Weathering

b) Soil types of India

c) Water resources of India

Ans:

a) Physical Weathering : Disintegration of rocks and minerals brought by mechanical action of factors (1) Temperature (2) Running water (3) Waves / Wind (4) Glaciers

1) Temperature : Rocks get heated at day time due to sun heat, on heating it expands. At night when the temperature falls, rocks get cooled. On cooling it contracts. Thus alternate expansion and contraction which produces the number of crack and rocks get broken in to big pieces, then to small the finally in the small particles. In cold climate water in crack and crevices of cracks freezes during winter, water as solidifies increase in volume by about 9 per cent and apply a tremendous pressure then rock splits and disintegration of rocks and minerals takes place.

2) Running water : Water act both mechanical and chemical on rocks. Water is the most potent agent in weathering of rocks. Mechanically when the water flows over ground in the form of streams and rivers it act as an erosive agent as well as the transformation of eroded materials. The pieces of rocks in suspension exert a grinding action, the grinding action of flowing water, depends upon to aspects.

i) Speed with which it flows

ii) Amount of material it carries in suspension.

3) Waves/Wind : Due to continuous action of the waves the rocks on the sea shore get broken into pieces. These broken pieces of rocks are lifted by waves and dashed against the rocks themselves, by this is broken in to small pieces wind carries dust, gravels and grinds away the surface of rocks.

4) Glaciers : When the ice blocks are formed in cold and mountainous region on slope and hills side, it began to move. Such block of ice in motion is known as "Glaciers". They are very huge and varying in size from a few 100 feet to several 1000 feet in thickness and varies from a mile to 50 miles in length.

b) Soil types of India: The soils of India are classified into six broad groups which are as follows :

1) Alluvial Soils

2) Red Soils

3) Black Soils

4) Desert Soils

5) Lateritic soils

6) Forest and Mountain Soils

1) Alluvial Soils : These soils includes the coastal alluvial, coastal sands, deltaic alluvial and calcareous alluvial soils.

◆ They occupy an area of about 142.5 m ha accounting to about 43.5 % of total area.

- ◆ These soils are suitable for all types of cereals, pulses, oilseeds, cotton, sugarcane, vegetable and jute.

Distribution : These soils cover large parts of Rajasthan, Punjab, Uttar Pradesh, Bihar, West Bengal, Gujarat and some parts of Assam and Orissa.

2) Red Soils : These soils includes the red loam and red sandy soils.

- ◆ They occupy an area of 61 m. ha. accounting for about 18.6 % of the total area.
- ◆ These soils are suitable for crops like rice, ragi, tobacco, groundnut, sugarcane etc.

Distribution : Such soils are found in whole of Madras and Karnataka, part of Utara Pradesh, Madhya Pradesh, Bihar, Uttar Pradesh (Bunded Khand) and West Bengal (Birbhumi) and Rajasthan.

3) Black Soils : These soils includes shallow, medium and deep black soils.

- ◆ They occupy an area of 49.8 m ha. accounting for about 15.2 % of the total land area.
- ◆ These soils are suitable for crops like cotton, cereals, oilseeds (Linseed, sunflower etc.), vegetables, citrus fruits, sugarcane tobacco etc.

Distribution : The black soils are found in parts of Maharashtra, Gujarat, Madhya Pradesh, Andhra Pradesh, Karnataka and Tamil Nadu.

4) Desert Soils : These soils includes the regosols and lithosols.

- ◆ They occupy about 14.6 m ha of the total area.
- ◆ These soils are suitable for millet crops like jowar, bajra etc. for want of water.

Distribution : Desert soils are found in Rajasthan, South Punjab and in the rann of Kutch.

5) Lateritic soils : These soils occupy about 12.2 m. ha i.e. 3.7 % of the total area.

- ◆ These soils are suitable for crops like ragi, sugarcane, tapioca etc.

Distribution : Found in Maharashtra, Karnataka, Madhya Pradesh, Orissa and Uttar Pradesh.

6) Forest and Mountain Soils : These soils occupy an area of 11.7 m ha of the total area in India.

- ◆ These soils area suitable for crops like tea, coffee, species, tropical fruits, maize, barley, wheat etc.

Distribution : These soils are found in the Himalayan and other ranges of North and Hill slopes in Western and Eastern Ghats.

c) Water resources of India: Water is an important natural resource. It is vital for increasing the agricultural production. India is rich in water resource an endowed with a net work of great river and vest alluvial basins to hold ground water. Different sources of water available in India are :

- Rainfall : On an average India receives 119 cm. of rainfall annually. About 80 % of the rainfall India comes during the period of June to October. The total rainfall on the Indian territory is estimated to be 400 million ha. meters.
- Surface flow : The surface water resources contribute to the ground water recharge. The rivers carry runoff. The total surface water resources in India are estimated at 16.7 crores ha. meter, out of which 6.6 crores are available for irrigation.
- Ground water resources : It is estimated that about 43 million ha. meter per year ground water is available in India, out of which, 16 million ha. meter are available for irrigation and 7 million ha. meter for drinking purpose.

Table 2 : Annual water resources of India 1974 & 2025 :

Sr. No.	Particulars	Years (mi. ha. meters)	
		1974	2025
	Total precipitation	400	400
a.	Immediate Evaporation	70	70
b.	Run-off to surface water bodies	115	115

	c.	Percolation in soil	215	215
	d.	Water utilization of which		
		i) Ground water contributes	38	105
		ii) Surface flows	13	35
			25	70
Q.11	State True or False			
	1. True			
	2. True			
	3. True			
	4. False			
Q.12	Give the Full form of following.			
Ans:	1. IARI : Indian Agricultural Research Institute			
	2. ICRISAT: International Crop Research Institute for Semi Arid Tropics			
	3. SBI : Sugarcane Breeding Institute			
	4. IRRI : International Rice Research Institute			