MODEL ANSWER
MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION
B.Sc. (Hort.)

Semester : V (Old)	**Academic year :** 2019-20
Course No. H/HORT-354	**Title :** Introductory Agro forestry and Horti-silvipasture
Credits : 2 (1+1)	**Total Marks :** 40
Day & Date :	**Time :** 2.00 hrs.

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

SECTION "A"

Q.1. Enlist different systems of agroforestry and describe horti -silvipastural system.

Ans. Systems of agro forestry 4 marks

1) Agri-silviculture system - cultivation of agril crop + tree crops eg. rice with teak plantation or Taungya system
2) Silvipastural system – cultivation of trees crops + fodder crops. eg. Grewia spp shivan + fodder grasses
3) Hort-silvipastural system – cultivation of hort. crops + forest trees + grasses eg mango + teak + fodder grasses.
4) Hort-silviculture system – cultivation of hort crops + forest crops eg. mango + teak
5) Agri-silvipastural system – cultivation of agril crops + forest crops + fodder grasses eg. wheat, cowpea + fruit crops + fuel wood crops + grasses.
6) Agri-horticulture system – cultivation of agril. crops + fruit crops eg pulses with coconut /Arecanut.

Other system - home stead garden eg. Kitchen garden/nutritional garden/Agril fishery – fish rearing in paddy fields.

Hort-sivipastural system – This is land management system for concurrent production of fruits forest crops with pasture. Cultivation of horticultural crops + forest trees + grasses.

Q.2. Define agroforestry. Describe objectives of agro forestry.

Ans. Answer should cover the following points.

Definition of agro forestry. 1 marks

Agro forestry has been defined as a suitable land management system which increase the yield of the land, combines the crop including tree crops and forest plants or animals, simultaneously on the same unit of land and applies management practices that are compatible with the cultural practices of the local population

Objectives of agroforestry 3 marks

1) To manage land efficiently so that its productivity is increased and restored.
2) To use available resources efficiently and economically.
3) To generate employment opportunities for rural peoples.
4) To provide raw material for small cottage industries in rural areas.

5) To raise the supply of fuel wood in the rural areas at convenient distance for consumer.
6) Agro forestry aims to raise the supply for small timber used by villages for agricultural implements, house construction and other domestic purposes .
7) One of the main objectives of agro forestry is to raise the production of food crops, legumes and tuber to meet the rapidly growing food requirements of the Indian population.
8) Agro forestry aims at promoting production of vegetables, pulses, milk and meat.
9) Agro forestry programme helps in obtaining an ecological balance in rural areas and thus it may be consider a matter of great significance for a country like India.
10) Preservation of humidity in cultivable lands and check soil erosion.
11) Supply of fodder for vast population of livestock.

Q.3. Explain in brief the characteristics of tree species suitable for agroforestry.
Ans. The answer should cover following point. 4 marks

1. Fast growth rate, erect and light branching.
2. No competition with field crops.
3. Nitrogen fixation ability.
4. Easy decomposition of litter.
5. Ability to regenerate.
6. High yield of food and fodder.
7. Multiple use of wood.
8. Plant with deep root system.
9. Tolerant to side shade and permit the penetration of light to the ground.
10. Easy in establishment and ability to coppice
11. Capacity to glow under wide range of environment, soil types and rainfall etc.
12. It should be wind firm.

Q.4. Discuss in brief about alley cropping with suitable examples.
Ans. This is system involves managing rows of closely planted woody plant with annual the annual crop planted in alley in between hedges. The woody plants are cut regularly and leaves and twigs are used as which on the cropped alley in order to reduce evaporation for the soil surface, suppress weeds and add nutrients to the soil, N fixing plants are the main component of the hedgerows. The primarily purpose of alley cropping is to maintain or increase crop yield by improvement of the soil and microclimate and weed control, farmers may also obtain the products from the hedgerows, including fuel, poles, food etc and fodder alley cropping usually works best in places where people feel a need to intensity crop production but face soil fertility problems. (2 marks)

Design : without doubt, trees compete with farm crops for soil nutrients, soil moisture and light. However, the right kind of trees at the right spacing, with proper management may actually produce a net increase in yield.
The position and specking of hedgerow and crop plants in an alley depend on plant species, climate, slope, soil conditions and convenience. In general, hedgerow should be placed in east west direction at the distance of 4 to 8m. The closer spacing is generally used in humid areas and the wider spacing in semi-arid regions. On sloping land hedgerows should always be placed on the contour Usually leguminous trees/shrubs are included to improve soil fertility. *Glyricida spp Sesbania, spp. Leucaena, leucocephala* (2 marks)

Q.5. Write short notes on (Any Two).
1) Shifting cultivation 2) Home garden 3) Advantages of energy plantation system

Ans. 1) Shifting cultivation 2 Marks

Shifting cultivation as the term implies, is a pattern of land use and a system of production of crops under which plots of land are cleared using a 'dao' or axe and fire, cultivated for a short period for raising one, two or three crops, after which the land is allowed to rest longer than the period of cultivation. However, during the period or rest the land reverts to some modified from of its original cover. It is a system of production almost without capital inputs, requiring primarily manual labour.

The main feature of the improved fallow system of agro forestry is that trees and shrubs are not grown with crops on the same plot at the same time. The fallow periods vary from region to region but are presently becoming shorter due to an increasingly acuter and shortage. The best species for the follow system should induce good nitrogen fixation in the soil.

Species – While the main function of the fallow is to maintain or restore soil fertility and reduce, erosion, some plants can be introduced primarily for their economic value. Species choice should not be exclusively confined to 'Soil improvers' plants with marketable products should also be considered. plants included in improved fallows should be compatible with future crops, free of any negative physical or chemical effects on the soil and not in competition with the crops to be planted later on the same site.

Establishment : Improved fallows can be established in a variety of ways and at various stages of the fallows, methods might include.

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2) Home garden 2 marks

It is deliberate integration of trees, crop and animals in a same unit of land in some form of spatial and temporal sequence. This is one of the oldest agroforestry practices found in high rainfall area of South and South-East Asia. In India it is prevalent in Southern states like Kerala, Tamilnadu. Also common in North Eastern states like Tripura, Assom, West Bengal and part of Islands of Andaman and Nicobar. In India it is a common practice to plant trees around the habitation. It is also known as multilayered AFS. Area of homestead varies from 0.2-0.5ha Tall tree/timber tree occupy the top most layer followed by fruit tree. Small shrubs also form the parts of home garden. Shade loving vegetables find their place in the ground layer. Trees provide timber, fruits and also support climber such as pepper, cucurbits, clove,yam, sweet potato, colocasia etc. Pineapple is a common fruit grown in home garden. In hills, the common spp. for home gardens is *Grewia optiva*, *Ficus glomerata, Juglans regia* and *Punica granatum*. In rural areas, fruit trees and commercial tree spp., such as *Acacia* and Neem are of common occurrence in most of the country. Cattle and poultry are the main component of homesteads. Forage spp. like Stylo, Guinea grass, Guatemala, Napier and *Setaria cephalis* variety Kazungula also find their place in home garden.

3) Advantages of energy plantation system (2 marks)

a) Emit little or no sulphur and less nitrogen dioxide than fossil fuel
b) Helps in rehabilitation of degraded lands
c) Provide rural employment
d) Alive and active growing forest and other plant biomass absorb the green house gas in quantities broadly equivalent to amount emitted when plant material decay or burned. They are thus called as "Carbon neutral" fuel sources
e) Growing energy crops creates a "carbon sink" which includes storing carbon underground through the tree root system
f) Lower energy cost per unit area as lower inputs are require as compared to agriculture crops.
g) Energy plantations are thought to remove the entire nutrient from soil. However, by use of thermochemical process of biomass conversion it is feasible to recover all nutrients as ash which can be returned to the plantation sites
h) Dependable & renewable source of energy along with afforestation of marginal lands & employment generation.
i) Aesthetic value, Windbreak and Shelterbelts.
j) Fodder, NTFP etc.
k) Handling & disposal of by products is safe.
l) Energy plantations are both ecologically as well as sociologically much sounder Investments

Q.6. Write in brief the different constraints of agroforestry.

Ans. The answer should cover the following points. (4 marks)

1. There is a ban to cut some tree species without prior permission of the government. The farmers are unaware of the rules and regulations governing tree cutting and that they cannot cut at their own will. This result in discouragement to grow tree.
3. Lack of extension approaches in convincing farmers to adopt agro forestry practices.
4. Lack of knowledge to the farmers about establishment technologies, protection and management of plants.
5. Time required in managing the trees species in agro forestry. This requires additional labour which is outside the ability of many poor farmers.
6. lack of funding for agro forestry from credit and aid schemes.
7. Possible competition of trees with food crops for space, sunlight, moisture and nutrient which may reduce the food crop yield.
8. Damage to found crops during tree harvesting operations.
9. Potential of trees to serve as a host to insect pest that are harmful to food crops.
10. Resistance by farmers to displace food crops with trees especially for small farmers where the holdings are small.

Q.7. Describe in brief the role of forest in India.

Ans. Role of forest : (4 marks)

Forest serves two major roles *viz.*, productive role and protective role. The productive role includes timber, fuel, non-timber forests products (NTFP) like grasses, bamboo, gums, edible products etc. the protective role is that they protect and form natural resources. Through the process of photosynthesis forests renew the oxygen supply in the atmosphere

by absorbing atmospheric CO_2 and moderating the greenhouse effect. Forests provide an environment for many species of plants and animals, thus protecting and sustaining the diversity of nature. Forests clean the environment by muffling noises, buffering strong winds and stopping dust and gases. They regulate surface water runoff, moderate high and low temperatures and prevent soil erosion. In performing these functions, forests stabilize the climate and shape the landscape. Forests are also popular areas for relaxation and recreation.

Q.8. Explain in brief about criteria for good agroforestry design.

Ans. **Criteria of a good agroforestry design** (4 marks)

There is no substitute for good design. A good agroforestry design should fulfill the following criteria:

A. Productivity

There are many different ways to improve productivity with agroforestry: increased output of tree products, improved yields of associated crops, reduction of cropping system inputs, increased labour efficiency, diversification of production, satisfaction of basic needs, and other measures of economic efficiency or achievement of biological potential.

B. Sustainability

By seeking improvements in the sustainability of production systems, agroforestry can achieve its conservation goals while appealing directly to the motivations of low income farmers, who may not always be interested in conservation for its own sake.

C. Adaptability

No matter how technically elegant or environmentally sound an agroforestry design may be, nothing practical is achieved unless it is adapted by its intended users. This means that the technology has to fit the social as well as the environmental characteristics of the land use system for which it is designed.

Q.9. Define the term shelter belt and describe its benefits.

Ans. Answer should cover the following points. (4marks)

Definition of Shelterbelts : A belt of trees or shrubs are maintained for the purpose of shelter from wind, sun and snowdrift.

Benefits of shelter belt

1) They reduce the wind velocity blowing over the crops and this reduces the evaporation losses.
2) They reduce the wind velocity helps in higher photosynthetic activity which helps better and healthier growth of crops.
3) The few formation of sheltered areas increases by 200 per cent which helps the crops to thrive in winter season.
4) Shelter belts provides a place for snakes to live and multiply which in turn prey on the rats, the major cause of damage to grain.
5) The birds nesting on the shelter belts are agencies to prey on the insect pest which damage the crops. When crops harvested, the birds live on the seeds of weeds helps in reducing weed population in the field.
6) The birds nesting on the trees of the shelter belts, add good manure through their dropping.

7) Prevent the movement of the fine particles of top soil and effectively prevent the soil erosion.
8) The species provide yield fruit, fodder, fuel, small timber for the farmer and thus add to the agricultural income.
9) Regulate the weather by reducing high summer temperature.
10) Helps in increasing the precipitation.

Q.10. Give the advantages of agro forestry

Ans. Answer should cover the following points. (4 marks)

Advantages of agro forestry.

1. Rational use of land by using the land according to its capabilities.
2. More complete use of land by growing species which draw nutrients from different layers of the soil.
3. Increase in production of agriculture crops from areas not presently used for arable agriculture.
4. Increase in the production of fuel wood and small timber from the non forest areas.
5. Increased availability of industrial wood as a result of release of pressure of local demands on production of forest.
6. Availability of well grown pasture and fodder trees on marginal lands and village commons will improve the health of cattle and milk yield.
7. Provision of additional employment to rural community.
8. With proper extension approach, shifting cultivation can be minimized.
9. Suitably designed agro forestry systems can prevent soil erosion and site degradation of cultivated land, waste land and degraded forest areas to conserve the ecosystem.
10. Agro forestry practices can be devised for land scaping and beautification of the country side, providing suitable recreation facilities and environmental conservations.
11. This system is the best way to solve their problem of fuel, fodder and food.

SECTION "B"

Q.11. Match the pairs.

Ans. Each bit carry one mark. (4 marks)

"A"	"B"
1. Neem	d. Insecticide
2. Bamboo	a. Mat and Basket Making
3. Mulberry	b. Sericulture
4. Teak	c. Furniture wood

Q.12. Fill in the blanks.

Ans. Each bit carry one mark. (4 marks)

1. **Teak** is called as king of timbers.
2. Botanical name of khair is ***Acacia catechu***.
3. For the maintenance of proper ecological balance the forest policy aim **33** % of total geographical area.
4. Botanical name of nilgiri is ***Eucalyptus spp***.

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