

CRP322 COURSE COMPACT

Course

Course code: CRP 322

Course title: PRODUCTION OF PERMANENT CROPS (2 UNITS)

Course status : (compulsory)

Course Duration

E.g. Three hours per week for 12 weeks (36hours)

Lecturer Data

Name of the lecturer: MR AFOLABI MICHAEL SEGUN

Qualifications obtained: M. Sc. (Agronomy)

Department: CROPS AND SOIL SCIENCES

Faculty: AGRICULTURE

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Office Location: NEW COLLEGE BUILDING, WING B OFFICE NUMBER B014

Consultation Hours: 2 DAYS IN A WEEK, WENESDAY AND FRIDAY 1-2 PM.

Course Content

establishment, management, processing, storage, utilization and improvement of tree and plantation crops such as cocoa, kola, oil palm, rubber, coffee, citrus, coconut, cashew, banana and pineapples.

Course Description

This is a course deals with Crops which are domesticated and can be grown on our farms, orchards and gardens. Crops are domesticated plants that we grow on our farms, orchards and gardens. These crops vary in their nutritional requirements, soil and weather needs; susceptibility to pests and diseases, etc. Similarly, the parts of the crop that meet man's need equally vary. In this course therefore, the general principles of crop production and the factors that influence crop production will be death with. This includes environmental, soil/edaphic and economic factors that need to be put into consideration. In addition, pests and diseases constitute threat to production efforts; they therefore need to be considered before you finally decide on what crop(s) you will produce on your farm, orchard or garden.

Course Justification:

What man needs from the crop may be the tuber, leaves, fruits or even the stem. Therefore, the cultivation and production of crops are based on principles which have inbuilt guidelines that meet the nature of each crop type.

Course objectives

At the end of this course, students would be able to:

- i. Enumerate the factors that influence the production of crops
- ii. Distinguish between climatic and edaphic factors in crop production;

- iii. Identify economic factors which influence the types of crops can be grow in an area
Associate particular crop (types) to particular areas and climatic conditions.

Course Requirement

To derive maximum benefits from the course, the course requires that the students be familiar with principles , problems and prospect of crop
Being a practical course student is expected to indentify and propagate at least five permanent crops in his/her area.

Method of Grading-

S/N	Grading	Score (%)
1.	Test	20
2.	Assignment	5
3.	Practical (laboratory work)	5
4.	Final Examination	70
	Total	100

Course Delivery Strategies – Illustration below:

Lecturing method complimented with field work will be adopted. In the field permanent crops will be shown to student and they will be given seed of any to plant.

LECTURE CONTENT

For this section- the lecturer provides the topic of each week, objectives, description, study question and other information posted below.

➤ **Week 1: Factors Affecting Permanent Crop Production**

➤ **Objectives (list the objectives)**

The students at the end of the lectures for the week should be able to

1. Identify economic factors which influence the types of crops you will grow in your area;

?????????Distinguish between climate and weather

➤ **Description**

First hour: Climatic Factors

The average weather conditions of a place over a period of thirty five to forty (35- 40) years is called climate. The major elements that make up the weather are: rainfall/precipitation, temperature, relative humidity, wind, sunlight and solar radiation. The values of the above listed variables at any particular times constitute the weather of the place.

Second hour

PESTS and DISEASES

Crops respond to other environmental variables that do not constitute climatic elements. These variables include pests and diseases.

Third hour,

Edaphic / Soil Factors

Soil is the medium on which crops grow and maintain their existence – in other words, soil forms the home of crops.

Study Question:

Identify climatic elements and edaphic variables that influence crop production.

2. Discuss the classification of agricultural crops from:

- a. the farmer perspective.
- b. biological point.

Reading List –

Production. . New York: Macmillam Publishing Co., Inc

Ogunboyede, M.O, (2000): Introduction to Animal and Crop Production in the Tropics. Lagos: Peakey and Sons Publishers.

Ogunrinde, S.I. (1991): Food Crisis in Nigeria: A Paper presented at the 4th National Conference of Agricultural Educators of Nigeria at Ahmadu Bello University, Zaria.

Ogunrinde, S.I. (1996) The Earth Realms and Agriculture. Lagos, Transcorp Publishers. pp.278

Week 2

PRINCIPLES And OPERATIONS In TREE CROP PRODUCTION

- Objectives (List The Objectives)

At the end of the lecture, student should be able to:

☒☒ Describe basic principles in the selection of seeds, care of seeds, planting of seeds; growing of seedlings, and care for seedlings at the pre-nursery, nursery and the field levels

☒☒ Describe the management operations that are critical in the production of permanent crop seedlings—weeds, pests and disease, water and soil nutrient.

☒☒ Describe major field operations in permanent crop production-- weeds, pests and disease management, water and soil nutrient management, harvesting, processing and storage.

- **Description**

First hour: Nursery activities and Operations

Nurseries are places where seedlings are raised for planting purposes. In the nursery the young seedlings are tendered to develop in such a way as to be able to endure the hard field conditions. Nursery seedlings become the planting material for plantations.

Nursery

seedlings are found to have better survival rate than seeds sown directly in the field.

Second hour

Choice of site for the nursery

When the site of a nursery is to be selected, four questions usually arise:

- i. What is the type of the nursery?

- ii. What is the size of the nursery?
- iii. Seedling demand.
- iv. Transport or distance from the nursery to places of seedling demand.

Third hour.

Design of the nursery

Having decided on the site and size of the nursery, the site is carefully levelled, fenced, and a shelter from the prevailing wind is established.

Study Question:

1. In what crops are pre- nursery operations necessary?
2. What constitute nursery operations in permanent crops?.

Reading List –

Appleton, Bonnie L. and Susan C. French. (2000). Weed suppression for container-grown willow using copper-treated fabric disks. HortTechnology. January-March. p. 204-206.

Arent, Gale L. (1996). The greenhouse wastestream. HortTechnology. October-December p. 365-366.

Biddinger, Eric, Dave Beattie, and Robert Berghage. (1999). The effects of copper-treated fiber containers on the growth of four commercial plant species. Greenhouse Product News. October. p. 22, 24-27.

Week 3

STIMULANT/BEVERAGE CROPS

Objectives :

At the end of the lecture, student should be able to:

- ☑☑ Identify a cacao tree.
- ☑☑ Identify the different types and varieties grown in your area.
- ☑☑ Describe the operations performed:
 - o at the nursery level,
 - o at the field level,
 - o during grading,
 - o during storage of dry beans.
- ☑☑ Describe fermentation processes.
- ☑☑ List some of the products derived from cocoa.

➤ **Description**

First hour: **Botany of Cacao**

Scientific classification of cocoa

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Malvales

Family: Sterculiaceae

Genus: Theobroma.

Species: cacao

Binomial name: **Theobroma cacao Lineus (L)**

Second hour

Cocoa tree (CACAO) varieties

Criollos dominated the market until the middle of the eighteenth century but today only a few, if any, pure Criollo trees remain. Criollo cacao typically has red or yellow pods, some being green or white (as in the case of Porcelana). The pods have bumpy or warty skin with pointed tips.

The beans, on the other hand, vary from light purple to white in color, and they are plump and full. In general, the beans from criollo cacao are considered to have a finer flavor than that of other varieties of cacao. The criollo trees are not very disease-resistant, and hence they are hard for farmers to grow and keep healthy.

Third hour,

Cocoa Flowers

It is interesting to note that the cacao flowers have no smell. It is for this reason that bees and other pollinating insects do not fertilize the cacao flowers but instead leave pollination to other insects.

Pollination of the cacao flower occurs by the actions of midges and other jungle insects. Midges are a type of gnat that live on the jungle floor under leaves and other debris.

Study Question:

1 Distinguish between the three breeds of cocoa

Reading List –

Appleton, Bonnie L. and Susan C. French. (2000). Weed suppression for container-grown willow using copper-treated fabric disks. HortTechnology. January-March. p. 204-206.

Arent, Gale L. (1996). The greenhouse wastestream. HortTechnology. October-December p. 365-366.

Biddinger, Eric, Dave Beattie, and Robert Berghage. (1999). The effects of copper-treated fiber containers on the growth of four commercial plant species. Greenhouse Product News. October. p. 22, 24-27.

Week 4

STIMULANT/BEVERAGE CROPS (CONTD)

Objectives :

At the end of the lecture, student should be able to:

- ☐☐ Identify a cacao tree.
- ☐☐ Identify the different types and varieties grown in your area.
- ☐☐ Describe the operations performed:
 - o at the nursery level,
 - o at the field level,
 - o during grading,
 - o during storage of dry beans.
- ☐☐ Describe fermentation processes.
- ☐☐ List some of the products derived from cocoa.

➤ **Description**

First hour: **PESTS & DISEASE CONTROL IN COCOA**

Common pests on cacao area: termites, caterpillars, aphids, mealy-bugs and capsid bugs. They are more prevalent during the dry season. Insecticides as: Gammalin, Aldrex, Aldrin etc., should be used at the recommended dosages.

Second hour

FERTILIZER APPLICATION

Where the soil fertility is in doubt, complete fertilizer can be applied. The recommended complete fertilizer is 15-15-5 or 15-15-10. An old mature plantation however needs lots of phosphorus to maintain high level fruit level. Where complete fertilizers are not available, phosphorus is recommended Phosphorus requirement for growing cocoa Phosphorus is vital for the growth processes of cocoa trees but only a small quantity is required. In most soils, incorporation of phosphate in planting holes gives a significant improvement in early growth.

Third hour,

How long does it take for a cocoa pod to be ripe?

After successful pollination of the flowers the fruits containing the beans, known as cocoa pods, take 5 to 6 months to ripen.

Study Question:

1. Identify the major nursery operations in the raising of cocoa seedlings
2. Explain any four of the operations.
3. Why is shade management important in cocoa nursery?
4. Why is 'insitu' planting not encouraged in cocoa production?

Reading List –

Adomako, D., (1995). "Non-traditional uses of cocoa in Ghana". **Eighth meeting of the Advisory Group on the World Cocoa Economy**, 26th-30th June 1995, Yaounde, Cameroon, pp.79-85. ICCO, Adu-Ampomah Y., Novak F., Afza R. and van Durren M. (1987). "Embroid and plant production from cultured cocoa explants". **Proceedings of the Tenth International Cocoa Research Conference**, Santo Domingo, May, pp129-136
Amoah, J.E.K. (1995). **Development Of Consumption, Commercial Production And Marketing**. Jemre Enterprises,
Beckett S.T.,(1994). **Industrial Chocolate Manufacture and Use**. Second edition. Blackie Academic & Professional,
.Biscuit, Cake, Chocolate and Confectionery Alliance (BCCCA), (1996).**Cocoa Beans. Chocolate Manufacturers Quality Requirements.**

Week 5

STIMULANT/BEVERAGE CROPS (CONTD)

Objectives :

At the end of the lecture, student should be able to:

Distinguish coffee tree from other trees

☒☒ Identify the different species of coffee

☒☒ Describe the agro-climatic and edaphic requirements for the cultivation and production of coffee.

☒☒ Describe the nursery and field management operations necessary for the cultivation of coffee.

☒☒ Describe the Harvesting and Processing of coffee beans

☒☒ Identify the uses of coffee.**Description**

First hour:

BOTANY OF COFFEE

Coffee belongs to the family **Rubiaceae** and genus **Coffea**. There are two main species of the coffee plant, the older one being **Coffea arabica** while the second species is **Coffea canephora (robusta)**. Coffee is indigenous to south-western Ethiopia, specifically from

Kaffa, from which it may have acquired its name. **Coffea arabica** is more susceptible to disease, and considered by most to taste better than the second species, **Coffea canephora (robusta)**. Robusta, which probably originated in Uganda, contains about 40– 50% more caffeine, can be cultivated in environments where arabica will not thrive. For this reason it is used as an inexpensive substitute for arabica in many commercial coffee

blends. Compared to arabica, robusta tends to be bitter and has little flavor, with a telltale "burnt rubber" or "wet cardboard" aroma and flavour.

Second hour

Propagation of coffee/ Maintenance of a Coffee Crop:

Seed has good viability if stored properly and is considered an economical way to obtain trees that are sufficiently if not completely 'true' to the parent(s). Although seedlings have a good probability of producing good coffee, trees are grafted on seedling rootstock to

ensure reliable results. Grafting is done in the spring at or before leaf drop. Clonal reproduction is also done with cuttings.

Maintaining a coffee crop, outside of planting and harvesting, is not as involved as other activities in processing coffee. Unless the crop is in an area where annual rainfall must be augmented by irrigation, there are no irrigation needs for the crop. The usual weed and pest control measures are in place as they are with any agricultural operation. Fertilizer is applied to ensure the crop receives the proper required nutrients.

Third hour,

Pests and diseases

How long does it take foMany pests and diseases can affect the coffee plant or its fruits, the most dangerous

being:

☒☒ Fungal diseases

☒☒ Nematodes infestation of the roots

☒☒ Insect attack of the leaves

☒☒ Insect attack of the cherries

☒☒ Fungal disease of the seedr a cocoa pod to be ripe?

After successful pollination of the flowers the fruits containing the beans, known as cocoa pods, take 5 to 6 months to ripen.

Study Question:

1. Why are nursery operations very important in coffee propagation?
2. What are the major coffee diseases at the nursery stage?
3. Why are pests and diseases control very important in coffee plantation maintenance?

Reading List –

Bunker, M. L.; McWilliams, M. (January 1979). "Caffeine content of common beverages". J. Am. Diet. Assoc. **74**: 28-32. Church of Jesus Christ of Latter-day Saints, Who Are the Mormons?, BeliefNet.com.

"Coffee, the Swedish Way" Coffee and Caffeine's Frequently Asked Questions from the alt.drugs.caffeine, alt.coffee, rec.food.drink.coffee Newsgroups, January 7, 1998 ^

Coffee: A Guide to Buying Brewing and Enjoying, 5th Edition, by Kenneth Davids
Coffee:Oxford English Dictionary in The Oxford English Dictionary Online CoffeeGeek -
So You Say There's a Coffee Crisis. Retrieved on 2006-08-26. ^

Week 6

OILPALM

Objectives :

At the end of the lecture, student should be able to:

Enumerate the botanical characteristics of palms

☐☐Enumerate the different types of palms that exist in your environment

☐☐Enumerate and describe the operations at the

☐☐Identify and describe field management operations as:

Description

First hour:

Oil palm History

Palm oil (from the African oil palm, *Elaeis guineensis*) was long recognized in **West African** countries, and among West African peoples it is in widespread use as cooking oil. European merchants trading with West Africa occasionally purchased palm oil for use in **Europe**.

Second hour

Propagation oil palm

Planting of oil palm seedlings should be done in May; as such the field planting must be prepared earlier. In planting with the ball of earth, the seedlings are lifted with a whole ball of earth in the nursery with a Wascot cylinder or spade.

Third hour,

Diseases of Oil Palms –

could be broadly classified under two headings, namely Parasitic diseases and Deficiency diseases.

.Study Question:

1. Describe the stage at which you can easily transfer seedlings to the permanent site.
2. What are the advantages of polybags in oilpalm nursery operations?

Reading List –

Hojgaard, A., Johansen, J., & Odum, S. (1989). A century of tree planting on the Faroe Islands.

Ann. Soc. Sci. Faeroensis Supplementum 14. Hornstra, 1990 'Effects of dietary lipids on some aspects of the cardiovascular risk profile'. In G. Ziant [ed.], LIPIDS AND HEALTH.

Week 7

CITRUS

Objectives :

At the end of the lecture, student should be able to:

Identify the origin and spread of the plant/crop called citrus.

☐☐Enumerate the original types that exist and their characteristics.

☐☐Identify the various breeds and varieties that exist in your area.

☐☐Enumerate the different types of nursery operations that are required in citrus cultivation.

☒☒ Enumerate the field operations needed in citrus production.

☒☒ Enumerate the uses of citrus bearing in mind, the various breeds and species.

Description

First hour:

History of citrus

While the origin of citrus fruits cannot be precisely identified, researchers believe they began to appear in Southeast Asia around 4000BC. From there, they slowly spread to northern Africa mainly through migration and trade. During the period of the Roman Empire, demand by higher ranking members of society and increased trade allowed the fruits to spread to southern Europe. Citrus spread throughout Europe during the Middle Ages and were then brought to the Americas by Spanish explorers. Worldwide trade of citrus fruits didn't appear until the 1800s and trade in orange juice developed as late as 1940.

Second hour

Propagation of Sweet Oranges

Planting Design - rectangular arrangements which eventually become tall hedgerows
Spacings are typically 20 x 25 for grapefruit and vigorous trees, 15 x 20 for oranges and tangerines, and 12-15 x 18-20 for limes and smaller cultivars. Tree densities are now about 100-110 trees/acre for grapefruit, and 130-140 for sweet orange.

Training and Pruning - very little training is needed. Young trees may be headed at 30 inches to induce branching, and stripped of trunk sprouts and suckers for the first 2 years. They may be defruited for a year or two to induce vegetative growth. At maturity, trees are mechanically hedged and topped to form hedges about 12 ft tall and wide. Almost no hand pruning is done.

Third hour,

Harvesting of Citrus

After citrus is packed, it is transported away from the packing house and enters [wholesale](#) and retail market channels. In addition to commercial production, citrus is widely grown for personal use in backyard orchards, roadsides, and in small [subsistence](#) plots. Growing citrus for this use is extremely variable. Trees may be grown from seed, grafted by the [grower](#), purchased from commercial sources, and so forth. Varietal selection is based on personal preference rather than economic factors. Citrus is also prized for its ornamental value and often serves a decorative purpose as well. There are some [cultivars](#) that are grown strictly as ornamentals, such as some variegated types and the Buddha's Hand citron. Citrus is hand harvested, whether processed or marketed fresh. Mechanical harvesters have been used for processed fruit in Florida and are increasing in popularity due to high labor costs and lack of labor availability.

Study Question:

1. What is the best method of harvesting oranges and at what stage should the fruits be harvested?
2. How do you effect uniform ripening in citrus?

Reading List –

Crop Protection Reference. 2002. C&P Press. New York. 2391 pp.

Insects and Mites of Louisiana Citrus. 2000. LSU extension publication 1261

Louisiana Commercial Citrus Production. 1994. LSU extension publication 2456
Louisiana Citrus Disease Spray Schedule. 2001. LSU extension publication
2002 Louisiana Citrus Spray Schedule. 2002. LSU extension publication
Document prepared by: Matt Shipp, Extension Associate, LSU AgCenter

Week 8 CASHEW

Objectives :

At the end of the lecture, student should be able to:

Identify and describe cashew as a crop.

- o Enumerate the agronomic requirements for cashew cultivation.
- o Describe nursery and field operations in the management of cashew production
- o Describe the harvesting and processing of cashew nuts and fruits.
- o Enumerate some of the uses of cashew fruits, nuts and tree.

Description

First hour:

Origin and Spread of Cashew

The first western people who sighted the cashew tree was by the Portuguese. They invaded Brazil in the 1500's. Portuguese seamen brought the seeds of the cashew nut tree from Brazil to be planted by the early settlers along the east coast of Africa. The trees took root and thrived. It was not long before cashew trees were growing wild along the entire coast of Mozambique. They spread to Kenya and Tanzania.

Second hour

Agro-Climatic and Edaphic Requirements for Cashew Trees

It requires a warm humid climate, with a minimum of 600mm rainfall, but well distributed rainfall is more important. Cashew thrives under a wide range of temperatures from 15o to 40o degrees Celsius. Cashew does not grow well in areas subject to frost and cold waves. It is also drought resistant. The cashew is a strong plant that is renowned for growing in soils, especially sandy soils that are generally unsuitable for other fruit trees. A spacing of 7.5m x 7.5m or 8m x 8m is recommended for cashew which gives a tree density of 175 and 156 trees per ha, respectively.

Third hour,

Harvesting Of Nuts and Cashew Yields

Bearing commences after the third year of planting and the trees will be in full production by the tenth year whilst the economic life of a tree is about 20 years. The main harvesting season is from February to May. Most farmers harvest their crop before they drop to prevent pilferage. This very often results in poor quality of the kernels. The optimum

stage of harvest is when nuts drop to the ground. High quality nuts are obtained when freshly fallen nuts are separated from the cashew.

Study Question:

1. Describe the nursery operations required in cashew cultivation.
2. Describe some of the field operations in the area of pests and diseases management in cashew plantation.
3. Discuss the processing of cashew nuts and fruits.

Reading List –

Azam-Ali, S.H. and E.C. Judge. 2001. Small-scale cashew nut processing. FAO, Rome.
Bhaskara Rao, E.V.V. and H.H. Khan (eds). 1984. Cashew research and development.
Indian Soc. Plantation Crops, Kerala, India.

Duke, J.A. 2001. Handbook of nuts. CRC Press, Boca Raton, FL.

Week 9

BANANAS AND PLANTAINS

Objectives :

At the end of the lecture, student should be able to:

Identify a banana plant

☑☑ Distinguish between the different types of cultivars of the Musa Spp.

☑☑ Discuss the cultivation of bananas

☑☑ Identify steps to combat and control diseases in banana plantations.

☑☑ Identify some of the uses of banana

☑☑ Discuss banana trade.

☑☑ Identify some scientific technologies in the improvement of banana cultivars

Description

First hour:

BOTANY OF BANANAS AND PLANTAINS

Musa (bananas and plantains)

Kingdom-Plantae; Division-Magnoliophyta; Class-Liliopsida;(Life; Embryophyta (plants);

Angiospermae (flowering plants); Monocotyledons); Order: Zingiberales;Family:

Musaceae; Genus: Musa.

The domestication of bananas took place in southeastern Asia. Many species of wild bananas still occur in New Guinea, Malaysia, Indonesia and the Philippines.

Second hour

Cultivated bananas are sterile (parthenocarpic), meaning that they do not produce viable seeds. Lacking seeds, another form of propagation is required. This involves removing and transplanting part of the underground stem (called a corm). Usually this is done by carefully removing a sucker (a vertical shoot that develops from the base of the banana pseudostem) with some roots intact.

Third hour,

Pests and diseases

While in no danger of outright extinction, the most common edible banana cultivar 'Cavendish' (extremely popular in Europe and the Americas) could become unviable for large-scale cultivation in the next 10-20 years. Its predecessor 'Gros Michel', discovered in the 1820s, has already suffered this fate. Like almost all bananas, it lacks genetic diversity, which makes it vulnerable to diseases, which threaten both commercial cultivation and the small-scale subsistence farming.

Study Question:

1. What is the difference between banana and plantain?
2. Bearing in mind the cultivation and propagation method of Bananas, how best can the cultivars be improved?
3. Describe the field maintenance operations in banana plantation.

Reading List –

Denham, T., Haberle, S. G., Lentfer, C., Fullagar, R., Field, J., Porch, N., Therin, M., Winsborough B., and Golson, J. Multi-disciplinary Evidence for the Origins of Agriculture

from 6950-6440 Cal BP at Kuk Swamp in the Highlands of New Guinea. Science, June 2003 issue.

Editors (2006). "Banana fiber rugs". Dwell 6 (7): 44.

Brief mention of banana fibre rugs FAO. Bananas Commodity notes: Final results of the 2003 season, 2004.

Week 10

Rubber

Objectives :

At the end of the lecture, student should be able to:

Identify and describe a rubber plant

☐☐ enumerate the different types available in Nigeria

☐☐ Describe the nursery operations in rubber cultivation

☐☐ describe field operations in maintenance of rubber plantation

☐☐ enumerate the tools used in tapping rubber latex

☐☐ describe the process of tapping and the processing of latex

☐☐ enumerate the uses of rubber

Description

First hour:

Botany of Rubber

It is a native of the Amazon basin and introduced from there to countries in the tropical belts of Asia and Africa during late 19th century. It can be termed as the most far reaching and successful of introductions in plant history resulting in plantations over 9.3 million hectares, 95 per cent of it across the globe in Asia.

Second hour

Agro-Climatic Requirements for Rubber Production

Climatic factors

Hevea brasiliensis is a tropical tree. It grows best at temperatures of 20-28°C with a well distributed annual rainfall of 1,800-2,000 mm. It grows satisfactorily up to 600 metres above sea level (but is capable of growing much higher - to at least 1000 metres near the Equator), and will perform on most soils provided drainage is adequate. *Hevea* tends to

be damaged by high winds. Its required temperature and rainfall define its prime growing area as between the 10° latitudes on either side of the equator, but is cultivated much further north (Guatemala, Mexico and China) and south (Sao Paulo region of Brazil).

Third hour,

Diseases and Pests

Crop losses resulting from ravages of disease causing agencies in rubber plantations are substantial. Timely plant protection operations ensure healthy growth and

economic production. The major diseases and pests of rubber are given below.

☐☐ Abnormal Leaf Fall

☐☐ Shoot Rot

☐☐ Powdery Mildew

☐☐ Colletotrichum Leaf Disease

Study Question:

1 What are the different types of nursery operations in rubber?

2. Discuss into details budding in rubber.
3. Identify the cover crops often planted into rubber plantations.

Reading List –

India, Ministry of Commerce and Industry. '**Rubber Cultivation'** **Rubber Board**

Bowers, J.E. (1990) Natural Rubber-Producing Plants for the United States. Beltsville, MD. National Agricultural Library.

[International Rubber Research & Development Board](#)

[History of the International Rubber Industry from 1870-1930 from EH.NET](#)

[Rubber Board Of India](#)

Rubber Research Institute of Nigeria.

Rubber Research Institute of India

Week 11

Topic: revision

Objectives:

To revise all that has been taught during the semester.

Reading List:

List of reference material

Week 12

Topic: Examination

Objectives:

To examine the students on all that has been taught during the semester.

List of reference material