COURSE CODE:	*HRT 508*
COURSE TITLE:	***O**rganic and Urban Farming*
NUMBER OF UNITS:	*2 Units*
COURSE DURATION:	*Two Hours Lecture and Two Hours Practicals per week.*

COURSE DETAILS:

Course Coordinator: **Professor F. O. Olasantan**
Email:
Office Location:
Other Lecturers: **Dr. A. W. Salau, Dr. (Mrs) O. A. Babalola and Dr. J. J. Atungwu**

COURSE CONTENT:

Definition of organic and urban farming Major types of horticultural crops grown under organic and urban farming Organic and urban farming production system. Importance of organic farming and protected crop cultivation. Peculiarities of organic and urban farming. Concept of home gardening, market gardening and commercial gardening. Certification of organic horticultural products. Materials used in organic crop production.

Sources of organic fertilizer materials. Environmental and earthy implications of organic and urban farming. Influence of urbanization and environmental factors. Problems of organic, urban/dry season horticultural farming. Maintenance of soil fertility and crop protection and irrigation. Prospects of organic and urban/dry season horticultural farming.

COURSE REQUIREMENTS:

This is a **Compulsory** course for students in Horticulture department and for students of Water Resources Management and Agrometerology. Students are expected to participate in all the lectures and practical activities and have a minimum of 75% attendance to be able to write the final examination

READING LIST:

1. 1. Carroll, C., Halpin, M., Burger, P., Bell, K., Sallawaay, M.M. and Yule, D.F. 1997. The effect of crop type, crop rotation and tillage practices on runoff and soil loss on a Vertisol in central Queensland. Australia Journal of Soil Research. 35: 925-939.

2. Huang, M., Shao, M., Zhang, L. and Li, Y 2003. Water use efficiency and sustainability of different long-term crop rotation systems in the Loess Plateau of China. Soil and Tillage Research 72: 95-104.

3. Loch, R.J and Foley, J.L 1994. Measurement of Aggregate Breakdown under rain: comparison with tests of water stability and relationships with field measurements of infiltration. Australian Journal of Soil Research. 32: 701-720

4. Unger, P.W. and McCalla, T.M. 1980. Conservation Tillage Systems. Advances in Agronomy. 33: 2-53

LECTURE NOTES

Definition of Organic and Urban Farming

The term organic defines a substance as a living materials as a living material whether of plant or animal origin. Organic is therefore any chemical compound containing carbon or any substance derived from living organisms, be they plants or animals. Organic farming is a production system which avoids or largely excludes the use of synthetic compound such as fertilizer, pesticides, growth regulators, and livestock feed derivatives. Organic farming system recently rely on crop rotations, crop residues, animal manure, legumes, green manures, off-farm organic wastes and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrient and to control insects, diseases, weeds and other pests.

Urban farming refers to farming activities in a city where particular crops are grown or animals are raised for home consumption and for commercial purposes.

Distnction between Organic and Conventional Agriculture

	Conventional Agriculture	**Organic Agriculture**
1. **Quality**:	Size, Colour	Taste, nutrient content
2. **Plant nutrition**:	Urea, NPK, SSP	Fallow planting, leguminous cover
3. **Pest Control:**	Synthetic	Biological
4. **Weed Control:**	Herbicides	Cover crop| Mulching

The driving force in organic agriculture are:

Health Consideration: Poisonous residues from synthetic agrochemicals, fertilizers, growth regulators are harmful to man.

Sustainable environment: Guaranteeing the future safety of the environment.

Conservation of Bio-Diversity: Existence of different form of flora in the environment

Basic terms in Organic Agriculture

1**. Certification:** The process of certification is the compliance to agreed set of specification or procedure in handling of organic produce. It is an agreed standard that is transparent and well known to everybody.

2. **Treaceability:** This is the process| ability to track every activity that has gone on the production and handling of food and fibre.

3.. **Eutrophication:** Is a process by which plant growth increases in a pond or lake. It generally promotes excessive plant growth, decay, favour certain weed specie over others and is likely to cause severe reduction in water quality.

4. **Conversion:** is a process by which an enterprice that have been running on a conventional principle moves into organic agriculture.

Major types of Horticultural Crops Grown

These include fruit tree such as Mango, Coconut, Citrus, Cashew, Pear, Apple; Vegetables such as Leafy vegetables, fruit vegetables, spices; flowers and shade trees.

Home gardening: This is the principal source of fresh vegetable supplies for most home. Home gardeners grow various types of local vegetables that supply an important part of family needs.

Market Gardening: Its operation goes beyond family needs. It takes care of home consumption and city market. Market gardeners no longer grow local varieties of vegetables, but those which can be most profitably grown. There are competition in production and sales.

Commercial Production: This is the principal source of vegetables for big city markets for fresh consumption and seed processing. It is more extensive and specialized than market gardening and area of production is determined primarily by climatic and edaphic factors.

Production Systems

Mixed Farming: The practice of mixing crops and animals together on the same piece of land.

Multiple Cropping: It is the practice of growing two or more crops simultaneously on the same piece of land. Depending on crop intensification and arrangement, multiple cropping can be divided into mixed cropping or intercropping relay intercropping, strip intercropping sequential cropping and crop rotation.

Environmental Factors Influencing Organic Agriculture

These can be classified into Human environmental factor and Material Environmental factor. The two factors operate separately or dependently.

Human environmental factors: are made up of economic, institutional and social elements.

Economic Factors: Include policy which determine quantities, qualities and distribution of inputs and outputs. It influences the physical infrastructures such as transportation and roads, water and light supply, marketing, e.t.c

Institutional Factors: Include the laws of the land, credit and marketing conditions, contractual agreement, property right to land and water, distribution of fertilizer, planting material, grading and taxation.

Social factors: It deals with the culture and custom within a community. It determine the types of commodities grown which depends on the taste of the people.

Material environmental factors: consist of physical elements such as climate (rainfall, temperature, relative humidity, light etc), soil, topography and biological elements (Vegetation, weeds, plants, pests and diseases).

Urbanization|Socio-ecological factors: These factors are associated with the demographic growth i.e human population, availability of water, land etc.

Problems Associated with Organic Agriculture

There are several problems confronting organic and urban farming. These include soil fertility maintenance, weed control strategies, insect pest control strategies, disease control strategies, availability of fertile land in urban areas, source of planting materials processing and storage facilities e.t.c.

Soil fertility management

- A deliberate and careful management of soil fertility is crucial in organic farming
- Therefore an accurate knowledge of the soil fertility status is extremely important
- An appropriate management strategy must be adopted.
- High soil organic matter levels must be sustained

Tillage and cultivation practices

- The tillage and cultivation practices adopted must be able to maintain and/or improve the physical, chemical and biological conditions of the soil
- It must also maximize the soil biological condition, this is of special consideration under an organic farming system
- The soil chemical and physical conditions are given higher consideration in conventional crop production

Soil physical condition

- In a lay man's language this describes the softness, mellowness and workability of soil
- In technical terms it describes the:
- Bulk density
- Water retention
- Infiltration rate
- Water holding capacity etc

Benefits of good soil physical condition

- Plant roots can grow though the soil without restriction
- Air, water and nutrient move through the soil with ease
- Rainfall or irrigation water seeps into the soil
- Soil organisms thrive and disperse throughout the soil

Soil chemical condition

- This include the fertility
- Salinity
- Acidity
- Alkalinity of the soil

Benefits of soil in good chemical condition

- A near neutral pH
- Sufficient nutrients
- Nutrients are in available forms
- Availability of nutrient is balanced to promote crop growth and microbial activity
- The soil does not contain toxins or heavy metals in concentrations high enough to inhibit growth of plant and beneficial organisms
- Enough moisture to facilitate nutrient movement to plant root
- Sufficient oxygen for growth of plant and organisms
- Relatively high level of soil organic matter

Soil Biological condition

- Improving chemical and physical condition is important in both organic and conventional agriculture
- Improvement of biological condition is particularly important in organic system
- In lay man's language It is described as:
- earthy soil, soil crumbliness, greasy soil etc
- Scientists measure it as
- Microbial biomass (N,P & C)
- Microbial community (Population & diversity)

- Rate of organic matter decomposition
- Microbial respiration
- Enzyme activities

Benefits of good biological condition

- The plant and animal residues added to the soil are readily broken down to plant available nutrients
- The soil has a good structure
- It is well aggregated and clumps are held together
- Legumes form healthy nodules
- Plant have high resistance to soil-borne diseases

Minimizing soil erosion

- Erosion is the loss of surface soil to forces of wind and water
- Minimizing it is critical
- The top layer of soil has the physical, chemical and biological properties that favor crop production
- Top soil contain organic matter than other soil layers
- Organic producers must use tillage practices that maintain good physical, chemical and biological conditions of soil.
- Such practice should :
- Promote water infiltration
- Minimize compaction
- Minimize soil degradation
- Protect soil from erosion
- Minimally disrupt habitat of beneficial organism
- Return or add plant and animal residue to soil

Practices in organic farming

- Crop rotation and intercropping
- Cover cropping
- Green manuring
- Agroforestry and alley cropping
- Use of organic fertilizer
- Return of crop residues to the soil
- Inoculation of Rhizobium and mycorrhizal fungi
- Use of phosphate rock

Cover cropping

- The crops are planted to protect the soil during the off – season
- The residues are ploughed in to the soil to increase organic matter level
- They are grown to check erosion
- They can serve as green manure if ploughed in when fresh.

Green manures

- This is a type of cover crop
- It is grown for a specific period then plowed into the soil
- It perform function of soil improvement and cover
- It increases the organic matter and other soil parameter
- The root system of some grow deep into the soil and bring nutrients to the top soil

Organic fertilizer- compost

- This is the biological decomposition and stabilization of organic material
- The final product is free of pathogen and plant seeds
- Improves soil physical, chemical and biological conditions

- It has many uses
- Increase plant disease resistance

Benefits of composting

- It is an efficient method of managing farm waste
- Solves problems associated with pests and diseases including weeds
- Avoid losses of nutrients particularly N under semi-anaerobic condition and leaching
- Can also avoid temporary fixation of N and P in residues with high C/N ratio.

Benefits of compost

- Nutrient functions: stores nutrients by absorbing macro and micronutrients into the organic matter, microbial tissues and their waste products and release them slowly.
- Improves soil structure
- Stimulates soil organisms
- Strengthens resistance to pests and diseases
- It is made from renewable resources by farmers themselves
- It ensures longer-term soil fertility

Principles of composting

- Organisms: optimum conditions for microbial activities must be provided
- Materials: all organic materials including plants, dung, refuse, paper etc are suitable. Human excreta and feaces from carnivores require separate treatment. Materials with high C/N ratio decompose slowly and should be combined with low C/N ratio, ideally C/N ratio of composting materials should be 30:1
- Water: important for the process to flourish, water should be applied to the layers and at the end. The heap should contain between 50-60 % water.
- Ventilation, steps should be taken to improve ventilation within and around the compost.
- Temperature: A satisfactory temperature is the best indicator of a successful composting and can be maintained by insulating the system.
- pH: wood ash may be applied thinly to each layer of the compost

Indicators of a successful composting

- Rise in temperature
- Reduction in size
- Presence of moisture under the polythene cover

Agroforestry

- This is a collective name for land use systems in which woody perenials are grown in association with crops
- It evolved as a replacement to shifting cultivation
- Non nodulating trees, nodulating trees and actinorhizal trees are used
- The system has many benefits

Benefit of Agro-forestry

- Erosion control
- Additional soil cover
- Improve soil structure
- Increase soil fauna activities
- Help to close up nutrient cycle
- Help to prevent loss of nutrient flush

ORGANIC PEST MANAEMENT

Organic pest management discourages the use of chemicals in controlling pest. Anything done on organic agriculture helps in the management of pests and diseases.

Organic agriculture saves the use of money for health reasons. Organic agriculture don't destroy, they keep anything that mimic the natural system e.g Wall gecko, toad, spider etc are very useful in organic system. The populations of this organism are enhanced for their better growth and productivity.

Organic system is supposed to give better yield, while it is not so in traditional farming. Soil fertility is destroyed in traditional system while organic systems enhance soil fertility. Organic system is not conscious about pests and disease management but what to do to enhance them. Organic pest management (OPM) emphasizes on improved biodiversity.

In organic crop production system, Organic Pest and Disease Management is essentially concerned with the knowledge and understanding of the reason why plants are threatened by pest organism. On this basis, a local organic pest method or strategy are embarked upon to correct or minimize the underlying factor towards reducing the overall effect of organisms on the crop.

In organic system, it is important to look at pests and diseases in a balanced way, i.e, you must accept or recognise that you have to share your crop with some of these organisms. You must not think about the pests alone but also the condition of the grain.

OPM is not just about excluding or avoiding the use of synthetic pesticide and chemicals, it is not just about botanical or plant extracts but rather, it is a wholistic approach and ecological concept that ensures that nothing is wasted on the farm. The implication here is that OPM is based on waste recycling that enhanced bio-diversity. Consequently, in a standard organic farm, pest control is not a priority. Organic farmers do not bother themselves about pests and diseases because organic pesticides are effective against them since organic crop appears to be:

- More resistant or tolerant
- Vigorous
- Low insoluble N and AA
- Thicker cell wall

Practical Tips

1. In organic system, we tolerate higher densities of weeds because:

a. Conserve/encourage rare species

b. Encourage host to beneficial organism or natural organisms

c. Serve as trap for pests and diseases

2. **Tolerant**: You can also tolerate a few pest because it is an essential part of organic system that serve as natural means that pest and crop of other organisms exist harmoniously in a healthy ecosystem. Therefore, in a well established farm, pest exists but not at a disastrous magnitude. Pest must be allowed to take a little of our crop but the rule of thumb is to grow healthy and vigorous plant that cannot be completely destroyed by the pest.

3**. Survival of fittest**: The practical thing to do to a particular plot where plants continued to be plagued by pest is to leave it, if it survives, it is good for us and if not, replace with another crop. For instance, in a plot of tomato, if it is observed that all but some plants are being destroyed by pests and diseases, just allow the survivor to get to seeds and use such seeds to grow, and next season, crop. This is a natural way of allowing better and well adapted varieties to evolve and will at the long run enhance population of plants that are the fittest.

4. **Planting Pattern**: This is important to pest and diseases management. Cop diversity through mixture should be encouraged rather than monoculture that will enhance easy spread. Staggered planting should also be embarked upon to confuse or kill the pests and to support predators.

Bio-diversity will mimic natural ecosystem. Different foliage system of the crop makes it difficult for the pest to zero on susceptible crops..