

# Practices Encouraging Optimum Ecosystem Services In Sustainable Agriculture: Why Do They Matter?

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# Outline

- **Introduction**
- Objectives
- Method
- Results and Discussions
- Conclusion and Recommendations

# Introduction

- Mankind's life does not only depend on the nature for survival but also for the best quality of life.
- Nature has different systems that interact among themselves either directly or indirectly thereby producing substances or materials that mankind benefits from directly or indirectly.
- Mankind, who is the chief organism and other organisms; plants and animals inclusive, both micro and macro in size as well as their environments make up the ecosystem.
- The services refer to the useful products and/or materials as well as favourable conditions which may act as catalysts for other reactions or activities in the environments provided by any organism in the environment.

# Introduction Cont.

- Recall the organism can be a plant or animal or even human.
- Most times the mention of ecosystem brings to peoples mind the natural vegetations,
- but it includes also the micro organisms in the soil,
- the aquatic organisms, terrestrial and arboreal organisms.

# Introduction Cont.

- Agricultural activities often depend on the ecosystem.
- And can be explained by the fact that the environment determines what to produce- the concept of **environmental determinism**.
- The ecosystems determine the type of crops or animals reared not necessarily the class of crop or animal.
- Thus farmers existing in these ecosystems have diverse experiences.
- Changes in farming systems reflect adaptation mechanisms to changes in ecosystem and climate as well as efforts to ensure sustainable production.

# Introduction Cont.

- Agriculture in any ecosystem needs to be sustainable so that the prospect of future generation producing their food with the same resources we use today will not be jeopardized.
- Sustainable agricultural production mainly bring to farmers' mind the conservation or maintenance of soil fertility but it include also production of healthy foods and seeds as well as good pests and diseases control measures.
- In the past before the increased pressure on arable lands due to population growth, long fallow length was a major process of reclaiming soil fertility.

# Introduction Cont.

- Today there are many threats to agriculture and the ecosystem
- Such threats include:
  - Climate change
  - Continuous cropping
  - Over grazing
  - Deforestations and urbanization
  - Pollution and erosion

# Aim and Objectives

- The paper aimed at examining agricultural practices that encourage optimum ecosystem services in food production, processing and storage. It further highlighted the importance of these practices.
- The objectives
- To examine minimum bush burning, mulching, taungya farming, fallowing with crop rotation, intercropping with legumes, organic fertilizer and organic pesticides usage.
- To highlight the benefits of some of these practices on the field such as: increasing activities of desirable micro and macro organisms for improved soil fertility
- To examine organic pesticides and usage with examples for field and storage operations as well as their biodegradable nature and non toxic residue on land or food stuffs.
- to show the advantages of natural fermentation process in food processing like cassava products, soy milk and ripening of the fruits.



# Method

- The study involved:
  - field experimentation,
  - literature review

Results are presented with

- Simple expression
- graphical images/ pictures

# Results and Discussions

- Agricultural practices that encourage optimum ecosystem services in food production,
- Minimum bush burning,
- This is a practice of gathering materials to be burnt in selected areas such that all the farm land is not exposed to fire.
- It helps to avoid burning most micro organisms and retain some organic matter in the soil; both decaying ones and sprouting seeds
- The micro organisms will increase the rate of decay of the organic matter which increase soil cat ions and available phosphorus

# A tractor on a minimum bush burnt field



# Taungya farming

- The taungya system is a type of agro forestry practice by which annual and or biannual crops are cultivated between rows of young perennial tree trees crops during their early establishment years.
- Useful insects like butterflies and bees are retained on the farm for necessary pollination
- Earth worms will find niches round the roots of the perennial tree crops
- Leaves falls from perennial crops increase soil fertility

# Taungya farming: Old and Young fields



# Mulching

- This is the act of using organic and sometimes inorganic materials to cover seeds planted in the field.
- Organic materials are preferable because they act as insulators, **reduce water loses** and decay of such mulch materials improve soil fertility.
- Very useful in yam cropping in Nigeria

# Fallowing with crop rotation

- Fallowing is an ancient practice of improving soil fertility. Lands are left uncultivated for about 7 years or much longer
- The increased pressure on land does not allow farmers to let land stay bushy for up to three years or more.
- The continuous cropping system where shallow rotted crops like cereals follow deep rotted crops like yams, cocoyam and cassava in a rotation can be improved by having part of the land lay fallow.

# Intercropping with legumes

- When mixed cropping is practiced it is good to add legumes as they help to fix atmospheric nitrogen to the soil.
- The roots nodules of legumes support nitrogen fixation
- The activities of some micro organisms in root nodules of legums (nito bacteria- nitosomonas and, nitobacta ) in a process called nitrogen fixation convert nitrogen in the air in a form that plant can use them.



# Fields with and without Legumes



# Rich rice fields from long fallow periods



## Organic fertilizers and organic pesticides usage.

- **They are usually non toxic and biodegradable!**
- Most organic fertilizers are applied before planting
- Sources of organic fertilizers
  - Farm Yard manure
  - Animal dropping
  - Kitchen waste
  - Compost manure
  - Mulching material
  - Green manure - *the Tithonia (Tithonia glicidia) and many leguminous crops*

# Organic fertilizer and organic pesticides usage cont.

- Organic pesticides are mainly derived from plant.
- Examples of organic pesticides
- A number of cheap items such as pepper fruits, ash, lime, leaf, bark of *Eucalyptus spp* and Neem seeds, are active against pests of cereals and legumes such as weevils and beetles.
- A grinded mixture of two or more of the items applied at the rate of 10-20g per kg of the stored products offers protection for about one year

# Organic pesticides usage cont.

- Powdered cocoyam gives some protection against Flour beetles, due to the presence of calcium oxylate in its tissue
- Tithonia plant acts as a natural pesticide against nematodes and many are effective in controlling striga weeds.
- *Jatropha curcas* for controls of bollworm in cotton, weevils in stored grains, snails which infect rice farms, cockroaches and house flies
- *Annona muricata leaves* is contact poison for many household insect pests

# Organic pesticides usage cont.

- Tobacco leaves are used kill fleas, lice, ticks and mites on livestock.
  - dried tobacco leaves, crushed and mixed with water and spread the mixture which is rich in nicotine, over cattle, sheep and goats.
- Ash is used to control lice in poultry
- Ash also used to scare away soldier ants
- A mixture of ash and water is used in currying yams with wounds for storage or preserve
- Red palm oil is used to treat bloat and skin diseases in livestock

# Natural fermentation process in food: Good for health

- Cassava is a very important food staple in Nigeria.
- The bio chemical components of the crop makes it hazardous to human if it is not well processes.
- Cassava contained cyanide and this toxic chemical to human body can adversely affect the eyes especially as one gets older
- The process of fermentation of the product eliminates or reduces the cyanide to the acceptable level

## Natural fermentation process in food: good for health Cont.

- The processing of cassava to garri can be allowed to ferment for at least four days depending on the variety
- Small quantity of red palm oil are added the **grated** cassava or during frying
- When added before frying that is during fermentation and drying processes is better.
- The red oil as an oxidant helps in process of breaking the cyanide bounds.



# Natural fermentation process in food: good for health Cont.



# Natural fermentation of soymilk

- The soybeans also contain cyanide which need to be removed before consumption. How?
  - clean and wash dry soybean seeds,
  - **soak and remove outer cover and allow to stay overnight** while merged in water
  - then ground with water to a slurry
  - allow to settle and decant the excess water
  - Using **clean bag** with fine mesh drain further the mixture
  - The extracted soymilk is boiled and now fit for consumption.
- It is good food for children
- Some add pepper and fry it to increase shelf life

# Natural Ripening of fruits: good for health

- Ripening of fruits eg. mangoes, bananas and plantains, pineapple and others:
- The **mature fruits** are harvested,
- Cut into batches and covered with its leaves /polyethylene bags to generated heat to stimulate enzymes for ripening of the fruits.
- The fruits rip in about 4 days with shelf live of about five days
- But when ripped with ethylene gas mainly from Calcium carbide there is **quick ripping any dangers**

## Consequences of artificial induced ripping of fruits

- The texture is bad, the outside can look yellow but the inside is still strong.
- It will not last up to two days the fruit will spoil.
- Many health hazards can result such as:
- Stomach upset, vomiting, diarrhea, chest and throat burn, restlessness, headache, dizziness, mood disturbances and disorders , sleepiness, mental confusion,
- The gas can cause eye problems such as irritation, conjunctivitis, et c.

# Some traditional methods of food preservation



- Many Thanks