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# A SURVEY OF INDIGENOUS FARMING SYSTEMS AND PRACTICES IN EBONYI STATE NIGERIA: IN SEARCH OF SUSTAINABLE PLANT DISEASE MANAGEMENT OPTIONS.

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## ABSTRACT

In Nigeria, the drive to boost food security and to fight off insect pests and diseases with other yield limiting factors is gradually introducing unhealthy production risks in agriculture. A cursory survey of the various indigenous farming systems and practices were carried out using a random sampling method of the thirteen local government areas of the state. The popular farming system comprise of Mixed Cropping/Intercropping or combination of crops in mixed cultivation with the dominance of root crops like cassava, yam and cocoyam then maize and vegetables in cycles of land rotations. Traditional farm practices adopted in Ebonyi State include the use of organic matter soil amendment, fallowing, use of simple farm tools, raising of large and high heaps of soil mounds, bush burning, legume cropping etc. The common feature of this system is the production of several species and varieties of crop plants in spatio-temporal discontinuity thus creating natural biological cycles and control with regard to host-pathogen interactions. This system of farming and practices are adjudged sustainable being cheap, efficient, providing high degree of stable and reliable yields. Adequate evaluation and research into this indigenous knowledge of agricultural production in Ebonyi State is therefore recommended so as to be incorporated into modern agriculture.

**Keywords:** Mixed cropping, Fallow, Sustainable, Biological control, Traditional practices.

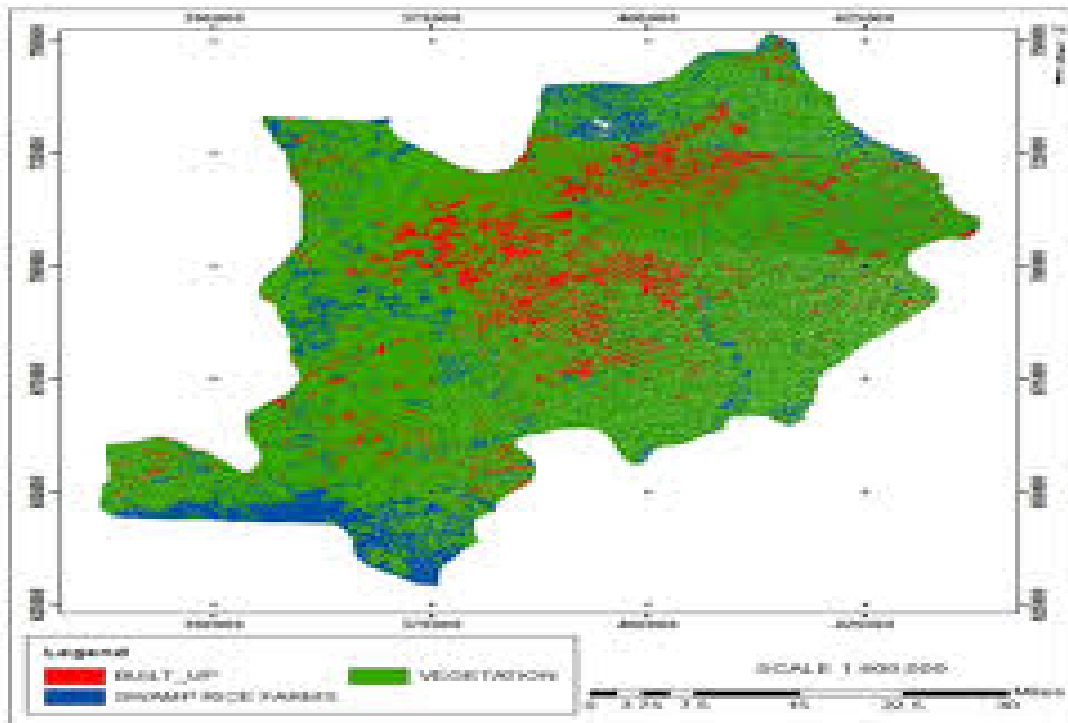
## INTRODUCTION

The vegetation of the state is a mixture of Savanna and semi tropical forest with agriculture as the mainstay of the. The soil is texturally clay loam, fairly to poorly drained with gravely subsoil in some locations especially the upland adjacent to lowland areas which make it very suitable for rice production. Major crops grown in the area include rice, yam, groundnut, cocoyam, vegetables cassava, maize and cowpea. Agriculture is mainly by use of local implements and subsistence in nature. However, the State Government has recently embarked on a large scale rice production intensification project. About 50,000 hectares of land have been set aside across the thirteen (13) local government areas for rice farming. Farm inputs like chemicals, fertilizers are provided to local farmers by the government as efforts to encourage farming in the State.

According to Wahua [3], farming system can be defined as an agricultural enterprise activity in which a set of related and dynamically interacting elements is manipulated by a farmer or farming household to achieve a specific objectives. Mouneke [4] outlined the characteristics of farming systems of the tropics including Nigeria thus: (i) Small farm size of less than 5 hectares of land managed by the farmer's household. (ii) Simple farm tools use of farm tools such as cutlasses, axes and hoes for land preparation and tillage involving little or no disturbance of the fragile soil is common. (iii) Shortened fallow periods. Fallow is the most important means of sustaining soil fertility because of recycling of nutrients. (iv) Hard/Family labour: Most of the labour involves time consuming/manual labour for small size farms whose output is mostly subsistence. (v) Mixed farming and mixed cropping/ intercropping; various crops are raised in conjunction with animals resulting in crop products or its residue as feed for livestock and animal manures to grow crops. Traditional practices often provide effective and sustainable means of disease management. Traditional systems and their disease management practices are in danger of being lost as agriculture modernizes. They frequently resemble natural ecosystem [5]. Traditional farmers are not always interested in the highest yield but are concerned more with attaining reliable yields [6]. [5] outlined the various traditional practices adopted by farmers in developing countries to include altering of plant and crop architecture, fallowing, flooding, mulching, multiple cropping, using organic amendments, planting in raised beds, rotation, sanitation, manipulating shade and tillage. These farming practices are also sustainable in nature on the long run. Since there is scarcity of hard data on the present status of agricultural practices in Ebonyi State upon which informed decisions could be made, this study is aimed at : (i) Evaluating the major farming systems and their indigenous farming practices. (ii) Analyzing their plant protection benefits that could be incorporated in a possible integrated disease management programme in Ebonyi State and Southeastern Nigeria in general.

### AREA OF STUDY

Ebonyi State lies in the Southeastern part of the Nigerian geopolitical zone but within the Cross River plain approximately between  $7^{\circ} 30^I N$  and  $8^{\circ} 30^I N$  Latitude and  $5^{\circ} 40^I E$  and  $6^{\circ} 45^I E$  Longitude [1]. The State is located in the mosaic of lowland rainforest and secondary grassland vegetation zone, characterized by mean annual rainfall of between 2250mm in the south and 1500mm in the northern part of the zone, average temperature of about 270c with relative humidity of 85% [2].



### MATERIALS AND METHODS.

This paper reports a cursory survey from observations, discussions and questionnaires while on-field visits through the areas in Ebonyi State shown in the sketch map in fig.1. Using the stratified random sampling method, six (6) Local government areas out of the thirteen (13) in the State were visited; two from each Agricultural Development Zone. In each LGA, two villages were randomly selected whereby farmers fields were visited to observe cropping systems, farming practices identify crops and their associated diseases. Farmers were interviewed orally while some literate ones received structured questionnaires. The surveys were carried out during two consecutive farming seasons of between April- October 2016 and 2017.

## RESULTS AND DISCUSSIONS.

**Cropping Systems:** Various cropping systems were adopted, with increasing population density leading to more pressure on the land. There was a transition from the common Shifting Cultivation to more settled cropping systems of Bush Fallow Rotations incorporating the bush fallow method of maintaining and regenerating soil fertility. Two basic types were identified – Compound Land Rotation and Distant Farmland Rotations. The cropping systems are dominated mainly by the three tuberous crops – Yam, Cassava and Cocoyam together with maize. Basically, the characteristic crop regime is either Compound land rotation and Distant farmland rotations found in most places in Ebonyi State within the study time include:

- Yam crop planted first after fallow, cassava and other crops interplanted later within then cassava phasing out into the traditional bush fallow.
- Other minor crops such as maize, melons, yam bean, okro, Bambara, pumpkin, telfaria are interplanted with the yam as ‘catch crops’. Cassava is usually interplanted into the phase of the yam crop.
- The cropping phase generally lasts not more than two years, followed by the bush fallow phase lasting two or three years.

However, apart from the above commonly observed cropping systems, mainly in the sandy upland farms, there is also the Rice monocultures along the waterways, swampy wetlands under irrigation or rain fed.

### **Farming Practices:**

- a) **Land Preparation:** Well ahead of the planting season, from January farmers began to raise very large heaps or mounds of soils manually with hoes of circumferences of 2.4m and height of up to 1.0m before the rains began. After planting and series of rainfalls, each mound would also be reinforced by adding more soil to them. These have a way of covering the early emergent weeds thus conserving soil fertility.
- b) **Mixed Cropping:** Numerous varieties of each crop plants are sown during each cropping season. The various crops identified include yams, cassava, maize, cocoyam as annual crops, vegetables and perennial fruit trees are commonly intercropped with. These plants vary tremendously in maturity period, height, rate of establishment, growth resources etc. This observation collaborates with Fawusi [7], and Muoneke [4]. Okafor [8] observed the same practice in most farms in the southeastern Nigeria. According to Chhetry and Belbahri [9] the absence of spatial and temporal homogeneity in plants age, structure, host pathogen interactions associated with traditional mixed cropping or multiple is a potential plant disease management tactics. Sofia et. al. [10] identified and recommended the integration of similar indigenous practice to scientific communities in helping remedy the deficiencies of pest management in modern agriculture.
- c) **Use of mulches and crop residues:**

Yearly farmers return crop residues to depleted soils to improve the nutrient status. Large quantities of maize, groundnut as well as other fresh and dried forage are incorporated into the soil during ploughing or heap making. Apart from their effects as fertilisers, these residues have been found to improve soil physical properties and fauna population [4]. Ojeniyi [11] observed that about 45%N,40%P, 86%K, 92%Ca and 72%Mg removed from the soil by crops are contained in the residues when incorporated into the soil.

**d) Bush burning:**

As part of the land preparation prior to ridging or making mounds/heap: the entire field with dried debris, fallowed plants together with some live plants are burnt off killing resident pest and pathogens. Some of these plants and their debris serve as alternate host. This process of field sanitation and use of clean seeds reduces the pathogen population size as well as delays the onset and intensity of epidemics through inoculums availability [12].

**e) Use of organic manure/wastes:**

Farmers make use of organic manures and wastes such as cow dung, poultry, goat or pig manures, rice husks, household refuse, wood ashes etc. the addition of these materials helps to replenish depleted essential plant nutrients removed by erosion teaching, low organic matter content and high soil acidity common among tropical ultisols of Southeastern Nigeria [13].

**f) Legume cropping:**

Farmers in Ebonyi State cultivate cowpea, soya bean, groundnut, Bambara, African yam bean commonly in mixed cropping with other crops. These legumes because of their ability to fix nitrogen through symbiotic nitrogen fixation by the rhizobia in their roots [14].

**g) Fallowing:**

Allowing the land to revert to bush fallow allows the fertility of the soil to build up naturally. As an integral phase of rotation, bush fallowing in Ebonyi State is a common practice. The top soil is enriched by falling leaves vegetation while nitrogen fixation in legume components of natural or planted fallow is also common. Besides declining soil fertility, high incidence of pest and diseases may cause the farmer to abandon the farm in preference for a new ground [12].

## THE CHALLENGES OF MODERN AGRICULTURE

With the increasing global human population and declining arable land, food security has become a major challenge for the society [12]. Agricultural developments move from small scale traditional production methods typified by low inputs, single cycle annual cropping spatio-temporal diversification to highly mechanical intensification and reduced diversity (monocultures) [12]. These shifts impose crucial changes on patterns of host pathogen dynamics and generally favour more widespread rapid evolution of pathogen infectivity [15].

The introduction of genetically improved varieties of crops could lead to vulnerability of the plants to previously unimportant pathogens [16]. Increased nutrients and water availability can make crops more vulnerable to pathogen attack. High nitrogen levels generally favour mildew diseases of a range crops [15], while irrigation may favour the development and spread of soil borne diseases [17]. Similarly increasing the frequency of cropping as against land and crop rotation practiced in Indigenous Farming System of Ebonyi State, favours pathogen growth and reproduction by providing green tissue bridges across previous seasonal gaps and eventual epiphytotics.

## CONCLUSION AND RECOMMENDATION

In Ebonyi State majority of the traditional farming practices adopted comprise of cultural control efforts, this should be made to incorporate other plant disease management tactics such as host resistance, agrochemicals, biological agents. These should be used not individually but as a multidisciplinary collaborative programme. Sustainable agriculture as an integrated system of plant production practices aimed at satisfying human food and their fiber needs within the context of environmental quality and economic viability over a long term is a new socio economic paradigm. To achieve sustainable disease management, a shift in mindset away from just a safe focus on yield and productivity to multi-disciplinary interventions is needful. These traditional farming systems and practices which have lasted for years apart from high disease protection potentials are sustainable and should be studied more carefully and conserved before they disappear under the influence of modern technological practices to be operated by illiterate local farmers in Ebonyi State.

## REFERENCES

- [1] Nnamani, C.V., Oselebe, H.O, Agbututu, A. (2009). Assessment of nutritional value of three underutilized indigenous leafy vegetables of Ebonyi State, Nigeria. *African Journal of Biotechnology*. 8: 2321-2324.
- [2] Okam, C.Y., Yusuf, o., Abdulrahman, S. and Sulaiman, A.D.(2016). Comparative Analysis of profitability of Rice production among men and women farmers in Ebonyi State, Nigeria. *Asian Journal of Agricultural Extension, Economics and Sociology*. 10(1) 1-7.
- [3] Wahua, T.A.T. 2002. *Traditional Farming Systems: Bedrock of National Development in Africa*. An Inaugural Lecture, Series No. 9, at Rivers State University of Science and Technology, Port-Harcourt.
- [4] Igwe P.U., Onuigbo A.A., Chinedu O.C., Ezeaku I.I., Muoneke M.M.(2017). Soil Erosion: A Review of Models and Applications. *International Journal of Advanced Engineering Research and Science*(ISSN : 2349-6495(P) | 2456-1908(O)),4(12), 138-150. <http://dx.doi.org/10.22161/ijaers.4.12.22>
- [5] Haggag, M.W. (2002). Sustainable Agriculture Management of Plant Disease. *Online journal of biological sciences* 2(4):280-284

- [6] Zhan, J.; Thrall, P.H.; Papaix, J.; Xie, L. and Burdon, J.J. (2015). Playing on a pathogen's weakness: Using Evolution to guide sustainable Plant Disease Control Strategies. *Annual Review of Phytopathology* 53: 19-34.
- [9] Chhetry N., Kumar G. and Belbahri L. (2009). Indigenous pest and disease management practices in traditional farming systems in Northeast India: a review. *Journal of plant breeding crop science* 1(3): 028-038
- [10] Sofia, P.K.; Prasad R.; Vijay, V.K. (2006). Organic farming: tradition reinvented. *Indigenous journal of traditional knowledge* 5:139-142.
- [11] Zhan, J.; Thrall, P.H., Burden, J.J. (2014). Achieving sustainable Plant Disease Management through evolutionary principles. *Trends in Plant Science* 19:570-75.
- [12] Altizer S., Dobson A., Hussaini, P., Hudson, P., Pascual, M., Rohari, P.(2006). Seasonality and the dynamics of infectious diseases. *Ecological Letters* 9: 476-484.
- [13] Boudreau, M.A. (2013). Diseases in Intercropping Systems. *Annual Review of Phytopathology* 51: 499-519.
- [14] Brown, J.K.M. and Tellier, A. (2011). Plant-parasite co evolution: Bridging the gap between genetics and ecology. *Annual Review of Phytopathology* 49: 1-23.

