

SOME INDIGENOUS CROPPING SYSTEMS OF EASTERN NIGERIA

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SUMMARY

In Eastern Nigeria, except in the dry zone, root crops are very important in all rotations and provide the basic staples. Whereas much early work on rotations was concerned with the fallow period and the way in which this restored fertility, little was done on the nutrition of the crops in the economic part of the rotation. A traditional rotational cropping system comprises a two-years arable phase followed by one or more years of natural bush fallow. In this part of Nigeria, in the rain forest zone, tuberous root crops dominate the cropping systems. For several reasons, the traditional arable rotation has been challenged and numerous variants have been developed and are in use in different agricultural zones.

RESUME

A l'Est du Nigéria, sauf en saison sèche les plantes à racine sont très importantes dans toutes les rotations et fournissent les denrées de basse.

Alors qu'un nombre important des premiers travaux consacrés aux rotations s'étaient consacrés à la période de jachère et comment celle-ci restaure la fertilité, peu de choses étaient faites sur la nutrition des plantes dans l'aspect économique de la rotation. Un système traditionnel de culture à rotation comporte un premier stade arable de deux ans suivi d'une ou de plusieurs années de jachère naturelle. Dans cette région du Nigeria, dans la zone forestière pluvieuse, les plantes à racine tubéreuse dominent les systèmes de culture. Pour plusieurs raisons, la rotation arable traditionnelle est en voie de régression et diverses variantes ont vu le jour et sont pratiquées dans les différentes zones agricoles.

RESUMEN

En Nigeria Oriental, excepto en la zona seca, los cultivos con raíces comestibles son muy importantes en todas las rotaciones y proveen los artículos básicos de consumo. En tanto que una gran parte de los primeros trabajos sobre rotaciones se refirió al período de descanso de la tierra y a como éste restaura la fertilidad del suelo, muy poco se hizo sobre nutrición de cultivos y el papel económico de la rotación. Una rotación tradicional de cultivos abarca una fase de dos años de uso, seguido por uno o más años de descanso. En esta parte de Nigeria, en la zona de bosque lluvioso, los cultivos con raíces tuberosas dominan como sistema de cultivo. Por diferentes razones, la rotación tradicional ha sido cuestionada y se han desarrollado numerosas variantes que están en uso en diferentes zonas agrícolas.

INTRODUCTION

The agricultural situation in South Eastern Nigeria is one of very heavy population and offers a challenging opportunity to study the problems encountered by the subsistence farmer in such regions of the humid tropics. As one moves from the more sparsely populated to the more densely populated parts of the Eastern Region of Nigeria, one witnesses a transition from the so-called 'shifting cultivation' to a more settled cropping system, employing bush fallow to maintain or regenerate soil fertility. Travelling along the major highways during the early part of the growing season, which extends from March to June, one observes also different soil management practices and an amazing combination of crops in mixed cultivation, with dominance of root crops, notably cassava, yams and cocoyams, in that order of importance.

Several writers have described the system of farming in South Eastern Nigeria, a good deal of which lies within what is generally known as the 'oil palm belt.' Vine¹⁵ and Sly¹¹ briefly described the system, but recently, Obi and Tuley⁸ gave a more detailed account of the different types of farms, as well as the structure and merits of the bush fallow. Early experiments in the maintenance of soil fertility were also described.

In the past, considerable attention has been devoted in Nigeria to the study of the fallow phase of arable crop rotations with a view to better understanding its role, and as a basis for devising an alternative based on green manures or planted fallows which could be as efficient as, or better than natural bush in maintaining soil fertility. A good account of earlier work is given in the Third West African Conference papers¹². More recently, Vine¹⁵, Nye and Hutton⁹, Nye¹⁰, Kowal and Tinker⁶, Tinker and Ziboh¹³ and Tinker¹⁴ continued the work but with special reference to oil palm production. Unfortunately, much less

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effort has been spent on the study of the cropping phase in the rotation which exploits soil fertility and converts it into crop products required by man. Consequently our knowledge about this equally important part of the cropping system in Eastern Nigeria is scanty.

Just as potentially valuable germplasm of a crop may be identified in the centre of diversity of a particular crop, so it is possible that a survey of the indigenous cropping systems developed over the years by hit-and-miss method may identify one or more of them as superior to all other systems practised in the area and capable of being applied more widely.

METHOD OF STUDY

This paper reports a cursory survey from observations and discussions while on journeys through the areas shown in the sketch map in Fig. 1. Only the superficial or macrofeatures of the cropping systems are revealed. Detailed analysis of the cropping systems of North East Nigeria will have to await a more scientific and carefully conducted survey.

THE BASIC ROTATION

The expression 'bush fallow rotation' used to describe the system of farming in the area emphasises the method adopted by farmers in the area to maintain the fertility of the soil rather than the actual crops. The term is a generic one covering a wide range of crop rotations which have developed, having in common only natural regeneration of bush for restoring soil fertility.

The cropping systems practised in the region are dominated by three basic food crops, yams, cassava and maize, though maize is of less significance than either of the tuberous crops.

A basic rotation referred to by previous writers is as follows:

*1st Year: yams icw early maize and vegetables ipw cassava.

2nd Year: cassava ctd fb bush fallow.

3rd-9th Year: bush fallow.

In the long past, before any population pressure developed, this rotation was probably the only one in use around the villages, i.e. there was no differentiation into compound land and distant farmland rotations as occurs now. More detailed characteristics of the basic rotation is as follows:

1. Yam is always planted as the first crop after fallow, and cassava is interplanted with other species though it is the last crop which phases out into the traditional bush fallow.
2. Minor crops such as maize, melons, yam beans, cowpeas, lima beans, okra, pumpkin, telfairia, castor and pigeon peas are interplanted through the yam garden as 'catch crops.' Cassava is generally interplanted into the last phase of the yam crop.
3. The cropping phase generally lasts not more than two years, and is followed by the bush fallow phase which is characteristically at least three times as long as the cropping phase.

Other rotations that now occur in the region are postulated as being derivatives which have evolved from the basic rotation under the particular agricultural situations of each zone of the region. The variants of the basic rotation which occur are now described.

DISTANT FARMLAND ROTATIONS

As population pressure develops a distinction begins to occur between the rotations practised on land near to settlements ('compound' rotations) and land remote from habitation ('distant' farmland). The further away the farmland is from the village, the less the extent of intercropping in the first course of the rotation, and generally, vegetables are omitted from the rotation. Also, even though the fallow period continues to be long, because of pressure of population on the land, the length of the regenerative part of the 'compound' rotation becomes reduced in some places to four or five years, whereas in the 'distant farmland' the basic rotation survives. Distant farmland rotations can still be found in use in most of the agricultural zones of the region.

The commonest distant farmland rotation is as follows:

1st Year: yams ipw cassava.

2nd Year: cassava ctd fb bush fallow.

3rd Year — 7th Year: bush fallow.

In some areas melon is occasionally intercropped through yam in the first course of the rotation.

*In this paper, cropping practices abbreviations used have the following meaning:

icw means the following crop is planted after, but within the previous crop and harvested before it (i.e. inter-catch-cropped-with)
ipw means that the following crop is inter-planted in the preceding (standing) crop and harvested after the crop into which it has been interplanted (inter-planted-with)
fb means followed by
ctd means the crop continues its growth from one planting season to the next.

COMPOUND LAND ROTATIONS

Here the basic rotation has undergone a series of fundamental and far-reaching changes and evolved into a variety of different crop rotations. In areas of dense settlement, especially in zone 3,4,5, and part of 6, practically all land is cropped with short cycle rotations, the curtailment in the length of the rotation having been achieved by a reduction in the number of years the land is rested under bush fallow. The most that can be attempted in this section is to give a few examples of the commoner compound land rotations and briefly to indicate the characteristics of six types that have been encountered.

- Type 1. 1st year: yams icw early maize ipw cassava.
2nd year: cassava ctd fb bush fallow.
3rd year: bush fallow.
4th year: bush fallow.
- Type 2. 1st year: yams and cocoyam icw early maize and vegetables ipw cassava.
2nd year: cassava ctd fb bush fallow.
3rd and 4th year: bush fallow.
- Type 3. 1st year: cocoyam icw vegetables ipw cassava.
2nd year: cassava ctd fb bush fallow.
3rd and 4th year: bush fallow.
- Type 4. 1st year: groundnuts ipw cassava.
2nd year: cassava ctd fb bush fallow.
3rd and 4th year: bush fallow.
- Type 5. 1st year: early maize ipw okra or groundnuts.
2nd year: yams icw early maize and vegetables, cassava.
3rd year: cassava ctd fb bush fallow.
4th year: bush fallow
- Type 6. 1st year: cocoyams or vegetables or both.
2nd year: yams or cocoyams icw early maize ipw cassava
3rd year: cassava ctd fb bush fallow.
4th year: bush fallow.

Wherever the farmland is sufficiently fertile to support a yam crop, the first year is generally yam as a principal crop.

The following characteristics apply to the set of types described above:

1. All the rotations are of short cycle types.
2. The bush fallow phase lasts generally between one to two years.
3. The first course of the rotation is generally heavily loaded with intercrops grown in different combinations.
4. Where yam beetle is a serious pest and tree shade is heavy, cocoyam displaces yam as the first crop in the first course of the rotation.
5. Domestic refuse thrown into the farm is the basic means of maintaining soil fertility. In some areas domestic refuse fortified with leaves collected from distant bush is made into compost by the farmer and applied to the first course of his rotation.
6. The use of mulch is widespread primarily to discourage poultry and village livestock from damaging the newly planted crops.

HIGH FOREST ZONE ROTATION

The high forest zone (zone 8) occurs in the east of the region stretching from the coast to the foothills of the montane zone (zone 9) in the north-east of the region. A smaller high forest area exists in the south-west as well as in the fresh water part of the Niger Delta. The main distinguishing features of this zone are the high rainfall, 254 cm (100 ins.) per annum, and sparse population density. Land is therefore plentiful for agricultural development and exploitation, and for the practice of long cycle rotations. It is in this zone also that plantation agriculture has great scope. Most of the large commercial oil palm and rubber plantations are located in this zone.

The major food crops, plantain and cassava, continue to grow admixed with the invading bush fallow at the end of the cropping phase, the farmer harvesting both crops for food as and when required.

There is hardly any differentiation of the rotation into compound and distant farmland rotations. The range of food crops grown is narrow and the intensity of cropping is light. Plantain replaces yams as a major food crop.

The rotation:

- 1st year: plantain ipw cassava, sugar cane, early maize and okra.
2nd year: plantain, cassava, sugar cane ctd.
3rd year: cassava, plantain ctd fb bush fallow.
4th-11th year: bush fallow.

RIVERINE ZONE ROTATIONS

The riverine zone (zone 2) experiences annual river flooding. This zone is found around the Niger-Anambra and the Cross-River basins. The planting season begins in November of each year after the floods have receded. The residual moisture in the loamy of clay-loamy soil is normally sufficient for the raising of dry season vegetables and to allow the growth of early-planted long-term crops such as yams. All the crops mature and are harvested before the onset of river flood in September. It is in this zone that the largest and some of the best ware yams are grown. Here too the art of yam cultivation is most highly developed. Over most of the country the average size of yam setts planted is about 225 g (8 ounces). But in the riverine zones the 'seed' yams planted generally weigh about 450 g (1 lb) and over.

Continuous cropping is practised in this zone, apparently with no ill-effects on the soil and its fertility. Yam beetle is, however, a serious pest and aldrin dust is used extensively as a control measure. Fertility is replaced annually through silt deposited by floods and the organic matter added by grasses and herbs which colonise the soil as soon as the flood recedes. Three typical rotations for the riverine zone are:

Type 1. Root crop dominant rotation:

- 1st year: ware yams only, or icw early maize.
- 2nd year: " " " " " " "
- 3rd year: " " " " " " "
- 4th year: " " " " " " "
- 5th year: yams/sweet potatoes or groundnuts or early maize.
- 6th – 9th year: grass fallow.

Type 2. Cereal dominant rotation:

- 1st year: swamp rice
- 2nd year: " "
- 3rd year: " "
- 4th year: " "
- 5th year: yams icw early maize and vegetables ipw cassava.
- 6th year: cassava ctd fb fallow.
- 7th – 9th year: bush fallow.

Type 3. Legume dominant rotation:

- 1st year: groundnuts ipw early maize or melons or local vegetables
- 2nd year: groundnuts ipw local vegetables fb cassava.
- 3rd year: cassava ctd bush fallow.
- 4th – 8th year: bush fallow.

DRY ZONE ROTATIONS

The 'dry zone' of South Eastern Nigeria is part of the 'derived savannah' zone of Nigerian vegetation. Annual rainfall is generally below 203 cm (80 inches) being as low as 152 cm (60 inches) at the extreme north-western corner of the zone.

In the 'dry zone' grain legumes and other grain crops, such as castor, benniseed and sorghum become important crops and feature regularly and prominently in rotation with other basic food crops both in 'compound' and 'distant farmland' rotations. Some of the commoner rotations are as follows:

Type 1.

- 1st year: yam icw vegetable crops and maize ipw pigeon peas.
- 2nd year: pigeon peas ipw cassava.
- 3rd year: cassava ctd fb bush fallow.
- 4th – 6th year: bush or grass fallow.

Type 2.

- 1st year: yams icw melon ipw maize and vegetables.
- 2nd year: early groundnuts ipw cassava.
- 3rd year: cassava ctd fb bush fallow.
- 4th – 5th year: bush fallow.

Type 3.

- 1st year: yam icw early maize, melon and vegetables.
- 2nd year: benniseed/early groundnuts fb guinea corn or cowpeas or bambara groundnuts.
- 3rd – 5th year: bush fallow.

Table 4.

- 1st year: yams icw early maize and vegetables.
- 2nd year: upland rice fb bambara groundnuts.
- 3rd – 5th year: bush fallow.

Type 5.

1st year: bambara groundnuts or cowpeas or groundnuts.
2nd – 4th year: bush fallow.

DISCUSSION

The following general observations may be made on the cropping systems developed.

Short cycle rotations and intensive cropping are normally practised around the homestead. The universal dominance of root or tuberous crops (yam, cassava and cocoyam) is evident, and these constitute the basis of food supply for the population. Grain legumes occupy dominant positions in crop rotations only in the relatively 'drier' low rainfall northern strip of the region, while plantain replaces yams in the coastal high rainfall zone. Mixed cropping, which is now variously described in current agricultural literature as relay cropping or multiple cropping, is the traditional system of arable farming.

Mixed cropping was for long thought to be of low productivity, but recent research work has endorsed this practice. Alapaggan *et al.*¹, Evans and Sreedham⁴, Andrews² and Enyi³ have conclusively shown that, all things being equal, a higher aggregate yield is obtained from a mixed-cropped plot than from a sole or mono-cropped plot. Also Obi⁷ in his crop sequence studies reached supporting conclusions.

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FIG 1. PROVISIONAL AGRICULTURAL ZONES OF EASTERN NIGERIA

