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ASSESSMENT OF YAM DIVERSITY AT COMMUNITY LEVEL IN ABIA STATE, NIGERIA

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ABSTRACT

Yam (*Dioscorea spp*) is widely grown in Abia State and it is the only crop that is celebrated amongst the people. Over 600 species exist but only few are cultivated as food for man's use. Nigeria is the world largest producer of yam, accounting for well over 65% of world total production. The yam belt of Nigeria stretches from the rainforest belt in the South to the Northern Guinea Savanna. Yam is nutritious, comprising of 15 - 23% starch, 1-2.5% protein, 0.05 - 0.2% fat and so forth. Several species exist in the different communities, basically due to consumers preferences. Land degradation and loss of biodiversity have long been perceived as serious problems and threat to development of this crop. Earlier survey carried out for collection and conservation of the crop could not be sustained in the field gene banks as a good number of the materials have eroded. As a result of a renewed vigor, there was the need for collaborative efforts by the Global Crop Diversity Trust (GCDT), International Institute of Tropical Agriculture (IITA) Ibadan and National Root Crops Research Institute (NRCRI) Umudike, to embark on a survey for the collection of landraces in some State known as yam belt in Nigeria, and to identify those that are extinct from the farming systems of the study areas. A Participatory Rural Appraisal (PRA) method was adopted for the survey which guided for the listing of yams cultivars grown in each community, their potential yield, agronomic characteristics, cultural and economic values, and their status using the four square analysis. Yam cultivation should be made more attractive as the high cost of production is a major constraint amongst yam producers. Incentives like financial assistance, agro-chemicals and other inputs to reduce the cost of production will boost production and encourage more people to cultivate yam, thereby reducing the risk of this important crop from being abandoned or going into extinction.

Keywords: yam production, yield, biodiversity, germplasm, inventory, cultivated varieties, field survey, Nigeria.

INTRODUCTION

Over 600 species of yams exist out of which six are economically important in terms of food and medicine (IITA, 2009). Yams are grown on about 5 million hectares of land in about 47 countries in the tropical and sub-tropical regions of the world with Nigeria as the leading world producer (FAO, 2005 and IITA, 2009). According to FAO (2009), Nigeria's yam production was 34 million metric tonnes in 2005 and by 2006; this has increased by 8% to 36.7 million metric tonnes. The yam belt of West Africa stretches from Cote d'ivoire, through Ghana, Togo, Benin, Nigeria to Cameroun. In Nigeria, the yam belt stretches from the humid rainforest in the south to the Northern Guinea Savannah of the Country. Yam in Nigeria is grown both in upland and low land ecologies as either sole or intercrop.

Yam nutrients composition is close to that of potato but with higher protein content. About 85% of a tuber is edible. This part is composed of 65 - 75% water, 15 - 23% starch, 1-2.5% protein, 0.5 - 1.5% fibre, 0.7 - 2.0% ash and 0.05- 0.2% fat (Janssens, 2001).

The planet's biodiversity is important to human beings in many ways. Man is wholly reliant on biodiversity for its potential resources for food, medicine, energy, industrial materials, building materials, vital services such as renewing the earth's atmosphere, absorbing pollutants and maintaining soil fertility (Okojie, 1997).

Land degradation and loss of biodiversity have long been perceived as serious problems and by many communities a threat to their very future. When a fragile ecosystem is exploited beyond its carrying capacity, the system breaks down. High demand for space due to population pressure on land has greatly reduced the fallow period of the traditional shifting cultivation which prevents adequate natural regeneration to occur. The use and over use of the fragile resource base have led to serious land degradation. Adeleye (1998) reported some of the human activities that have accelerated to soil erosion ranging from wrong crop cultivation practices, quarrying and some other mining operations, road construction without adequate attention to provision of safe side drains, ill-advised channelization of run offs, indiscriminate destruction of vegetative cover, use of poorly located foot paths to streams, farms, schools etc, over-grazing and trampling by livestock.

In most African countries where yam is currently grown, many potentially important varieties only exist in fields and there is a risk that they will disappear, destroyed by conflicts or natural disaster. To tackle this challenge, producers and scientists have launched an ambitious initiative to preserve yam biodiversity.

Evidence of renewed global backing for the yam as a source of revenue and food security has come in the form of EU support since early 2010 with programme managed by IITA, Ibadan, Nigeria, in collaboration with 13 other research institutes from 6 countries; Benin, Cameroun, Cote d'Ivoire, Ghana, Nigeria and Togo. It seeks to offer a sub-regional research response to the challenges facing producers (SPORE, 2011).

Between 1974-1976, the National Root Crops Research Institute (NRCRI) Umudike carried out a survey of edible yams (*Disocore spp)* in major yam growing parts of the country (Okoli, 1976). The old Imo State, now made up of Abia, part of Ebonyi and Imo States were involved. Emphasis was on collection, characterization and classification of germplasm of these collected yams at NRCRI, Umudike.

Over the years, genetic erosion has taken great toll of these collected materials, hence a renewed vigor for another collection. Under the auspices of Global Crop Diversity Trust (GCDT), preserving past centuries of yam diversity became paramount as a way of assuring the crop's future.

The objectives of the study were to:

a) Carry out an inventory of the cultivated varieties in the different yam production zones of Abia State.
b) Assess their distribution and areas of concentration.
c) Understand the reasons that underlie the landraces loss and its variation across diversity.
d) Identify and prioritize the farmer's variety preference across zones
e) Document the cultivated varieties for the production of national yam database.

METHODOLOGY

The study centres on Abia State, one of the largest yam belts in Nigeria. Abia State is located on latitude $40^{o}30^{1}N^{o}$ - $60^{o}30^{1}N^{o}$ and 7° - $8^{o}E$ of the equator and Meridian, respectively (NRCRI, 2010). The state has a total land area of about 5,410 - 54854 sq. kilometer, with a human population of about 2, 833, 999 (NPC 2006). Politically, the state is made up of three political zones (Abia North, Abia Central and Abia South) and seventeen Local Government Areas (LGAs). Agriculturally, it is demarcated into three zones of Aba, Umuahia and Ohafia, going by the Agricultural Development Programme (ADP) structure.

Selection of the communities surveyed was very important as it was necessary to take into consideration a very good geographical area of yam production in Abia State. Based on this, the three major agricultural zones of Abia State were considered.

The choice of the places surveyed was through the guidance of the State ADP. Based on this, a community each from Ohafia and Umuahia zones were surveyed, while two communities were surveyed in Aba Zone. These were randomly sampled.

Structured questionnaire were used to elicit information from the farmers, made up of males and females. It was participatory in nature as the farmers were gathered together at a common venue to answer to questions posed, and data collected were based on the collective responses from the farmers.

Data were collected on the farmers' personal characteristics, age range, range of years of farming experience, number of farmers randomly selected and present at the meeting, yam varieties grown in the community, information on the four square analysis, agronomic characteristics of the yams, culinary characteristics, socio-cultural and economic attributes of the yams.

The Four Square Analysis takes into consideration the parameter frequency (i.e., relative frequency of the households cultivating the variety) and assesses the varieties within that since farmers know the situation of all the varieties. The four square analysis is divided into four quadrants (Kamara *et al*., 1996).

RESULTS AND DISCUSSIONS

A. Community one

Ogbala Ozu (Umugbalu) in Ikwuano LGA of Abia state is located in Umuahia agricultural zone of the state (Table-1). It is a major yam growing area of the state. The ages of the farmers ranged from 46-71 years, the range of years of farming experience was 6-60 years. Twenty three farmers were present at the meeting, all males.

Based on the result obtained, eight yam cultivars made up of six white yams (*D. rotundata)*, one yellow yam (*D. cayenensis)* and one water yam (*D. alata)* were listed in the area. Details of these are in Table-1, which are identified by their local names.

Quadrant 4 contains cultivars that are disappearing or eroding from the farming system of the community. It also contains varieties that may have been newly introduced in the community.

Agronomic characteristics

Agwa-oku and Oku are milked (topped) in September and finally harvested in December/January. Others are harvested once. The yield potential is as ranked in Table-1 based on the cultivars.

At planting, one yam sett, weighing about 1 kg (oku) and 0.5 kg for the other cultivars are planted on a moderate sized mound. The soil type in the area is sandy loam and poor soil affects the yield much. The time of planting determines the yield and this is usually from the first week of the month of March to the end of April for Oku and Agwa-oku. Others could be planted up to the month of May of the cropping season. Cases of drought are not common in the area and the planted yams require staking. There is no low land area (Fadama) in the Community.

Storage

The yams store very well in traditional barns as long as the tubers are not injured during harvest. Secondly, storage could be in the farm for sometime as they have high underground storage ability. Common storage pests were scale insects, mealybug and nematode. The severity of attack ranges from much to moderate. Again, weeds affect the yams much while growing in the field.

Culinary characteristics

Among the varieties listed, Oku is the best in terms of taste and pounds very well into fufu.

Socio-cultural and economic attributes

Ji-ike and Ji-ocha are used for ceremonies e.g., marriages, thanksgiving etc. Generally, there are no socio-cultural factors that affect the yams. The only taboo associated with yam cultivation in the area is that 'no real yam farmer" harvests and eats yam from his farm until "Ahia-Njoku', the god of yam, celebrates new yam in the community.

Mbala (*D. alata)* is said to have medicinal value and therefore consumed by diabetic patients because of its low sugar content and low starch grain.

However, it was observed that Ji-ike and Onyinta in quadrant 4 have eroded because of their poor yielding potentials.

Table-1. List of Yam cultivars grown in community one and result of four square analysis.

S. No.	Cultivar name	Species	Maturity period	Yield potential
1	Ogbodo	*D. rotundata*	2-8 yrs - SHV	HY
2	Agwa - Oku	-	6 months - DHV	HY
3	Ji – Ocha	-	8 months - SHV	MY
4	Ahekere	-	8 months - SHV	LY
5	Onyinta	-	8 months - SHV	LY
6	Ji – ike	-	8 months - SHV	LY
7	Oku	*D. cayenensis*	6 months - DHV	HY
8	Mbala: 1. Osokporo - anya 2. Mbala - Ocha 3. Nkerete	*D. alata*	8 months - SHV	LY

Quadrant 1 many households, large areas (++)	Quadrant 2 many households, small areas (+-)	Quadrant 3 few households, large areas (-+)	Quadrant 4 few households, small areas (--)
Agwa-Oku Oku	Mbela	Ogbodo	Ji-Ocha Ji-ike Ahekere Nkerete (cv. *D.alata)* Onyinta

Source: Field survey data, 2011: SHV- Single Harvest, DHV - Double Harvest, HY- High Yield, MY - Moderate Yield, LY - Low Yield.

B. Community two

The second community was Akanu Ukwu Ohafia in Ohafia agricultural zone (Table 2). The age range of the farmers was 45-82 years. Farming experience ranged from 14-37 years. Out of the thirty-five farmers that participated in the meeting, 22.8% were women.

Agronomic characteristics

The soil type is sandy loam in nature. Poor soil affects the yield of the yams to much extent. About 1.0 kg sett size of Oku and 0.5 kg of others are planted per mound. Planting commences in late March to April each year. Generally, the on-set of the rainy season determines the time of planting.

Storage

Harvesting of mature tubers starts in October through January the next year. Rot of tubers depends on the extent of wounds inflicted on them during harvest. However, mbela has the highest rate of storage even when inflicted with wounds at harvest. Rot due to late harvest is moderate. Storage pests included termites, squirrels and giant rats. Nematodes affect all the cultivars except mbela (*D. alata)* Weed infestation in the field affects the yield to much extent.

Culinary characteristics

Oruma is the most preferred in terms of taste, while Obiaoturugo and Oruma pound very well into fufu.

Socio-cultural and economic attributes

Akuru cultivar (*D. rotundata*) is used during yam festival since it is harvested early. Economically, oku and obiaoturugo make higher returns because of their high multiplication ratio when compared to other cultivars and obiaturugo commands higher market value. Mbela (*D. alalta*) is valued medicinally as it is consumed by diabetic patients because of its low sugar content. Traditionally, Ona cultivar (*D. dumentoruim*) is believed to cure malaria.

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Soil erosion is a major factor affecting yam cultivation in the area. On genetic erosion, Oruma and Agaogwu are on the danger list. Oruma has very low yield, while Agaogwu is spinny and requires high labour.

Table-2. List of yam cultivars grown in community two and result of four square analysis.

S. No.	Cultivars	Species	Maturity period	Yield potential
1	Obiaoturugo (Eze-ji or Ji-ocha)	*D. rotundata*	8 months - SHV	HY
2	Akuru	-	6 months - DHV	HY
3	Oku	-	8 months - SHV	HY
4	Nkwayi chi	-	8 months - SHV	MY
5	Mbela Ikoyiri (Yellow and White)	*D. alata*	8 months - SHV	HY
6	Ona (white and yellow)	*D. Dumentorium*	8 months - SHV	MY
7	Ogbodo (Abakiliki - introduced)	*D. rotundata*	8 months - SHV	MY
8	Oruma	-	-	LY
9	Agaogwu	-	-	LY

Quadrant 1 many households, large areas (++)	Quadrant 2 many households, small areas (+-)	Quadrant 3 few households, large areas (-+)	Quadrant 4 few households, small areas (--)
Akuru	Ji-ocha	Mbela	Ona
Oku	Agaogwu		Oruma
Obiaoturugo	Ogbodo		

Source: Field survey data, 2011: Field survey data 2011: Nine yam cultivars were listed in the community

C. Community three

The third community visited was Obuohia Ndoki in Ukwa East LGA which is located in Aba Agricultural Zone of the State (Table 3). The age range of the farmers was between 48 - 63 years, while the range of years of farming experience spanned from 15 - 29 years. Most of the farmers were retired Civil Servants. There were thirty-two respondents during the interview, out of which 34.4% were females.

Agronomic characteristics

There are two soil types existing in the community; clayey loam and sandy loam. The clayey loam exists in the lowland areas. One yam sett weighing about 500gm is planted on a mound between March and April. The yams have moderate tolerance to poor soil and staking of the yams is highly necessary for proper development of the crop. The yams also have moderate tolerance to drought. Land area planted by a farmer ranges from 0.3-0.5. Weed is a menace to the growing crops.

Storage

The time of harvest of the crops from the field do not have much effect on its storage. Harvest commences from October through December. Effect of nematode on stored tubers is high. The following animals are menace to the stored tubers; bush rats, giant rats and porcupine, while scale insect attack is moderate.

Culinary characteristics

Ayakata andOkpani are tasty when boiled. On the other hand, Obiaoturugo and Nwopoko are very good when pounded, while Nwanyi-eri produces lumps when pounded.

Socio-cultural and economic values

There is no special value attached to yam production in the area. The Oku cultivars command the highest market values and there are no taboos associated with yam production in the area.

Nne-ji (*D. alata*) is said to have medicinal value and is recommended for diabetic patients because of its low starch and sugar content.

The major environmental factors affecting yam production in the Community are erosion and flood.

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Table-3. List of yam cultivars grown in community three and result of four square analysis.

S. No.	Cultivar name	Species	Maturity period	Yield potential
1	Oku - ocha	*D. rotundata*	DHV	HY
2	Oku-Mmanu	*D. cayenensis*	DHV	HY
3	Okpani	-	SHV	MY
4	Nwanyi eri	-	SHV	MY
5	Mini	-	SHV	LY
6	Nwa-Enugu	-	SHV	LY
7	Ogbagburu-nkwu	-	SHV	LY
8	Onu	*D. dumentorium*	SHV	MY
9	Oku-Obu	*D. rotundata*	SHV	LY
10	Nne diri	-	8 years -SHV	LY
11	Nne ji	*D. alata*	SHV	MY
12	Nwopoko	*D. rotundata*	SHV	LY
13	Obiaoturugo	-	SHV	LY
14	Ayakata	-	DHV	LY

Quadrant 1 many households, large areas (++)	Quadrant 2 many households, small areas (+-)	Quadrant 3 few households, large areas (-+)	Quadrant 4 few households, small areas (--)
Oku-ocha	Nwanyi-eri	Okpani	Ayakata
Oku-mmanu	Onu		Nwaenugu
	Nne-ji		Mini
			Ogbagburu nkwu
			Nwopoko
			Obiaoturugo
			Oku-obu
			Nne-diri

Source: Field survey data, 2011: Field survey data, 2011: Fourteen yam cultivars were identified in the Community

D. Community four

Mgboko Community in Obingwa LGA was the last community visited in Aba Agricultural Zone of Abia State (Table 4). The age of the farmers ranged from 30-60 years, while the range of years of farming experience was from 10-30 years. Thirty-seven farmers were involved out of which 24.3% were women.

Agronomic characteristics

It is believed that the time of planting determines the yield. Planting is at the commencement of the rain which is from the month of March. Sett sizes of 0.5 kg - 1.0 kg are planted one per mound. The soil type is sandy loam and there is no hydromorphic area in the zone. Poor soil affects yield so much. Planted yams require staking much. Drought is not a problem in the area but where it occurs and prolongs after the yams have been established, it affects them much. On the other hand, if the yams are established before there is a drought condition; the effect on them is not much. The land area cultivated by each farmer ranges from 0.5 ha - 1.0ha.

Storage

The yams have moderate underground storage ability in this community and storage in the barn is quite high as long as there are no wounds on the tubers during harvest. Common storage pests included scale insects (little) and nematodes which infect the tubers from the field (moderate).

Culinary characteristics

Ji igwe, oku and Abakilkiki are quite tasty when boiled. Ji igwe also pounds very well, while ji oku produces lumps when pounded.

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Socio-cultural and economic values

There are no socio-cultural values or taboos associated with yam cultivation in the community. For commercial purposes, ji oku and ji igwe command the highest market values.

Medicinally, ji mgbada (*D. alata*) is known to be good for diabetic patients. Environmental factors affecting yam is wind storm which affects staked yams.

Table 4. List of yam cultivars grown in community four and result of four square analysis.

S. No.	Cultivar	Species	Maturity period	Yield potential
1	Oke ji	*D. rotundata*	DHV	MY
2	Oku (Ocha/mmanu)	*D. cayenensis*	SHV	HY
3	Ji Ikpani (Okpani)	-	SHV	MY
4	Mgbada (Mbala)	*D. alata*	SHV	MY
5	Apu ji (Ji igwe)	-	SHV	MY
6	Ji Ocha	*D. rotundata*	SHV	LY
7	Ji Ipa	-	SHV	LY
8	Nwanyi-eri	*D. rotundata*	SHV	HY
9	Ominelu	*D. alata*	SHV	LY
10	Onu (Ocha/Nkwere)	*D. dumentorium*	SHV	LY
11	Ji ugwu (Obiaoturugo, Nwopoko)	*D. rotundata*	SHV	LY
12	Ji – Onitsha	-	SHV	LY
13	Ji Abakiliki	-	SHV	LY

Quadrant 1 many households, large areas (++)	Quadrant 2 many households, small areas (+-)	Quadrant 3 few households, large areas (-+)	Quadrant 4 few households, small areas (--)
Apuji (Ji igwe)	Oke ji	Abakiliki	Ji onitsha
Oku (White and yellow)	Ikpani	Ji-ugwu	Ominelu
		Mgbada (Mbala)	Nwanyi-eri
			Ji ocha
			Ji ipa
			Onu

Source: Field durvey data, 2011.

GENERAL OBSERVATIONS

It was observed that no yam farmer had up to 2 ha of land under yam cultivation in the areas surveyed. Two yam varieties were conspicuously absent from the areas under study. These were *D. bulbifera* and *D. esculenta*. The major constraints facing the farmers were high cost of labour, inadequate finance to expand production due to the intensive nature of growing the crop and inputs like agrochemicals. Most of the farmers were also advanced in age.

CONCLUSIONS

Yam is widely cultivated in Abia State right from history, though at small scale level, which may be attributed to the tenure system operating in the study area.

Most people engaged in yam cultivation in the state have advanced in age with few youths participating. It should be noted that yams listed in quadrant 4 are in the danger list and efforts should be made for their collection and conservation *in vitro* and *in vivo* to avoid their total loss through genetic erosion. The government should focus their attention to conserve the remaining genetic diversity of yams by empowering the institute with the national mandate on root and tuber crops research in the country (NRCRI, Umudike) and an International organization like IITA Ibadan to partner in this direction. Farmers should be empowered to increase their interest and make the enterprise more attractive for the youth to get involved.

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