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Full Length Research Paper

Research on yam production, marketing and consumption of Nupe farmers of Niger State, central Nigeria

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Questionnaire survey was conducted to obtain information from lowland rice cultivation based Nupe farmers in Niger State, central Nigeria regarding the current practices of yam production, marketing and consumption. In order to intensify yam production in Africa, scientists have developed various technologies to control growth cycle of yams for dry season production on wetlands. With appropriate natural environment and tradition of wetland utilization, the Nupe farmers in Niger State are targeted for introducing the new technologies to initiate dry season yam cultivation. Farmers can harvest ware yams during months when market prices of yam tubers are high, which would improve their incomes. Cassava as the current major dry season crop in the region may be replaced by yams which have far higher market and nutrition values. This research thus attempts to obtain basic information for future project planning. The findings suggest that, although in small scale, yams have been incorporated into the cropping system of Nupe farmers. Yams were mainly cultivated for self-consumption, so it was not market-oriented and resources inputs were limited. There were discrepancies between complex villages and upland villages in terms of production scale, variety, cultivating calendar and time pattern for sale and consumption.

Key words: Yams, Nupe, farming system, inland valley utilization, off-season production.

INTRODUCTION

Yams (*Dioscorea* species) constitute the predominant starchy staple in sub-Saharan Africa where food security for a growing population is a critical issue. The five West African countries listed in Table 1 are located in the traditional "Yam Zone" and accounted for 93% of the total yam production of the world in 2008 (Coursey, 1967; FAO, 2010). Although with fewer exogenous supports, yam production and consumption of Africa has substantially increased in the last few decades (Figure 1), which reflects the irreplaceable popularity of the crop over the continent. In addition to the food and market values, yams play vital roles in traditional socio-culture, rituals and religions that the ethnocentric attachment to the crop remains strong for some ethnic groups in Africa (Breemer, 1989; Coursey, 1977; Coursey and Coursey, 1971; Hahn et al., 1987). Increase in yam production of Africa has been achieved dominantly through expansion in cultivated area but little improvement in productivity (Nakasone et al., 2006). The traditional production systems of the region are under growing pressure to adapt short fallow periods owing to limited availability of new lands to support shifting cultivation. Global annual yam production is probably reaching the plateau of growth as estimated by Manyong et al. (1996) and it decreased by 11.5% in 2007 as indicated in Figure 1 (FAO, 2010). Low soil fertility, increased pest problems and backward farming technology of the top yam producing countries were attributed to the slump. Majority of yam farmers in Africa are smallholder farmers with limited resources to struggle further with their traditional methods. To meet the ever enlarging demand for food yams of the fast growing population and to tackle the threats that further harm yam production, new technology that target African smallholder farmers are of urgent need.

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Table 1. Summary of yam production data of the world of 2008.

Location	Cultivated area ('000 ha)	Yield (t/ha)	Production ('000 t)	Percentage of world
World	4,928	10.5	51,778	100.0
Africa	4,718	10.6	49,833	96.3
West Africa	4,443	10.8	48,101	93.0
Nigeria	3,045	11.5	35,017	67.7
Cote d'Ivoire	820	8.5	6,933	13.4
Ghana	299	11.9	3,550	6.9
Benin	205	8.8	1,803	3.5
Togo	63	10.2	638	1.2

Source: FAO, 2010.

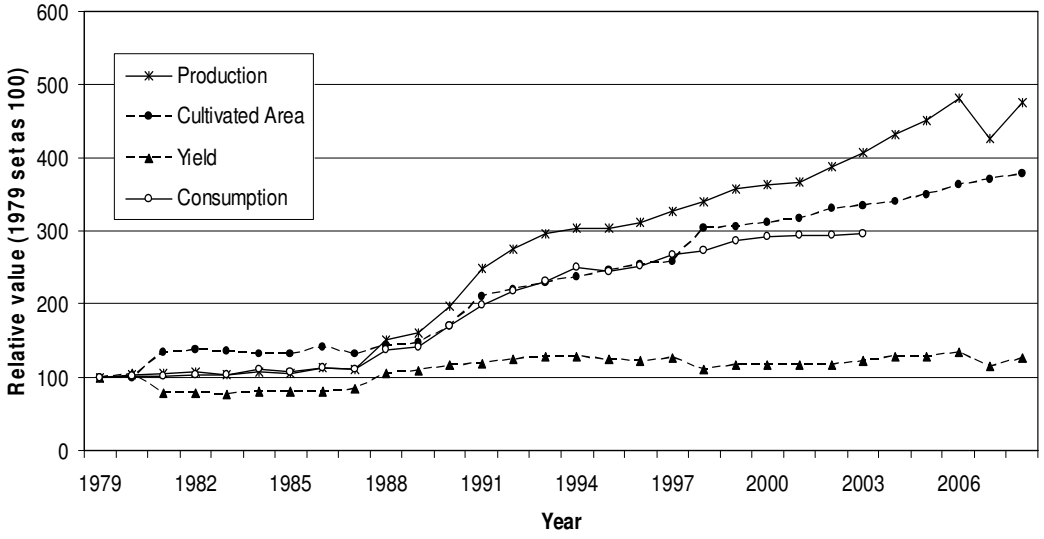

Figure 1. Change of yam production, cultivated area, yield and consumption of Africa (Source: FAO, 2010).

Agriculture (IITA) have developed various new technologies to produce yams in Africa during dry season (Shiwachi and Toyohara, 2005; Shiwachi et al., 2008). Yam tubers have dormancy which is an important mechanism for ecological adaptation (Craufurd et al., 2001). By obtaining seedling from tissue culture plantlets or vine cutting, or by applying plant growth regulators to shorten or extend dormancy period, growth cycle of yams can be adjusted which allow production period to be shifted from rainy season to dry season when irrigation is available (Ekanayake and Asiedu, 2003; Nnodu and Alozie, 1992; Shiwachi et al., 2003; Kikuno et al., 2010). Fringe and bottom of inland valley are the potential planting areas for dry season yam production because of water availability. Results of on-farm experiments testified to the feasibility of cultivating dormancy adjusted water yams (*Dioscorea alata* L.) and white yams (*Dioscorea rotundata* Poir.) during dry season in inland valleys of central Nigeria (Shiwachi et al., 2008; Kikuno et al., 2010). Nigeria is the largest yam producer in the world which accounted for 68% of the global production in 2008 (FAO, 2010). Yam production was indigenous to the forest areas of the country (Coursey and Coursey, 1971; Hahn et al., 1987). But in recent times yam production has shifted to the Guinea and even Sudan savanna zones due to shortage of arable land in the forest areas under increasing population pressure (Manyong and Oyewole, 1997).

The ecological constraints of the savanna zones have been overcome by the spontaneous effort of farmers to pick out the early maturing cultivars that adapt to short rainfall period (Orkwor and Asadu, 1998). Figures 2 and 3 show the scale of yam production and yam cultivated area of Nigerian states of year 2007. Niger State has the highest yam production and the largest yam cultivated area over the country. Yam cultivation has excessively expanded over time in Niger State. In 1978, the estimated yam production of the state was 230,107 tonnes (Adeniyi, 1980), and it grew by 1.936% to 4,685,810 tonnes in 2007 (NFRA, 2007). The middle-belt

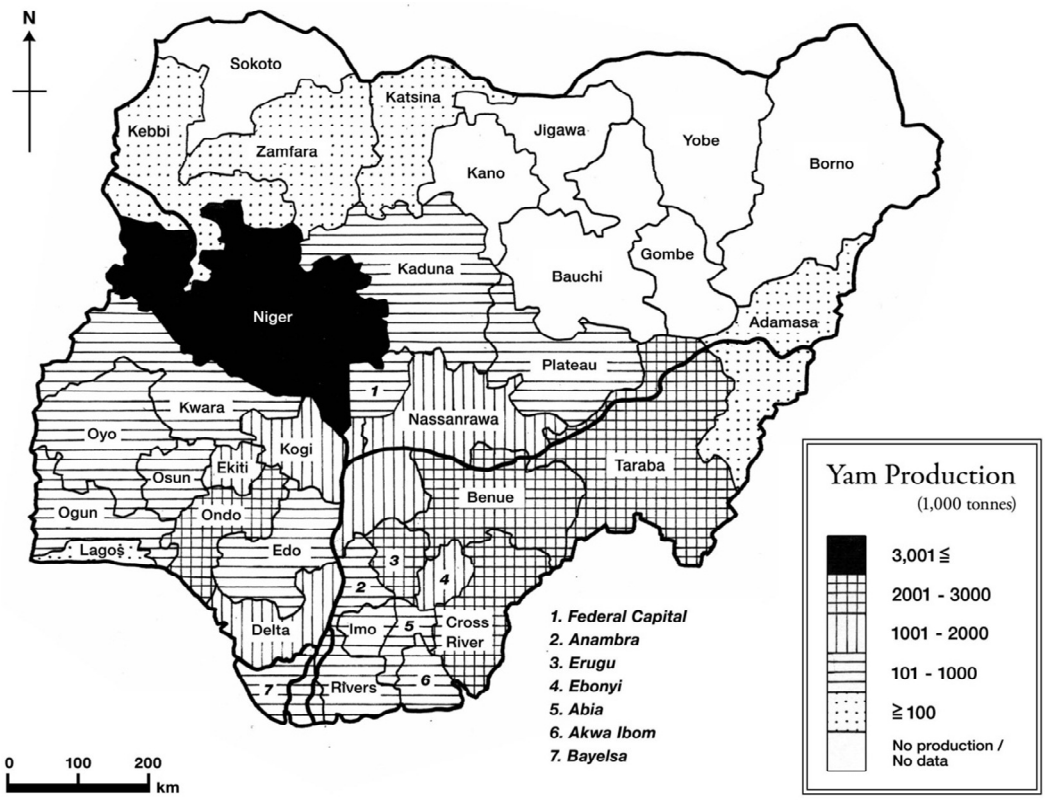

Figure 2. Yam production of Nigerian states of 2007. (Source: Produced by authors based on data of the NFRA, 2007).

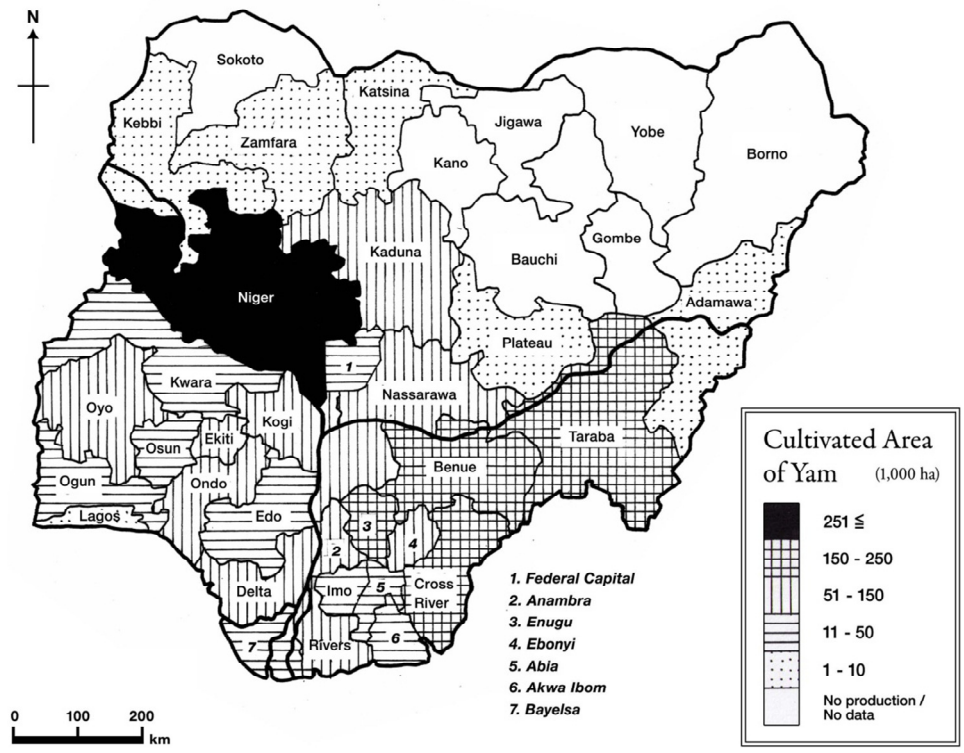

Figure 3. Yam cultivated area of Nigerian states of 2007 (Source: Produced by authors based on data of the NFRA, 2007).

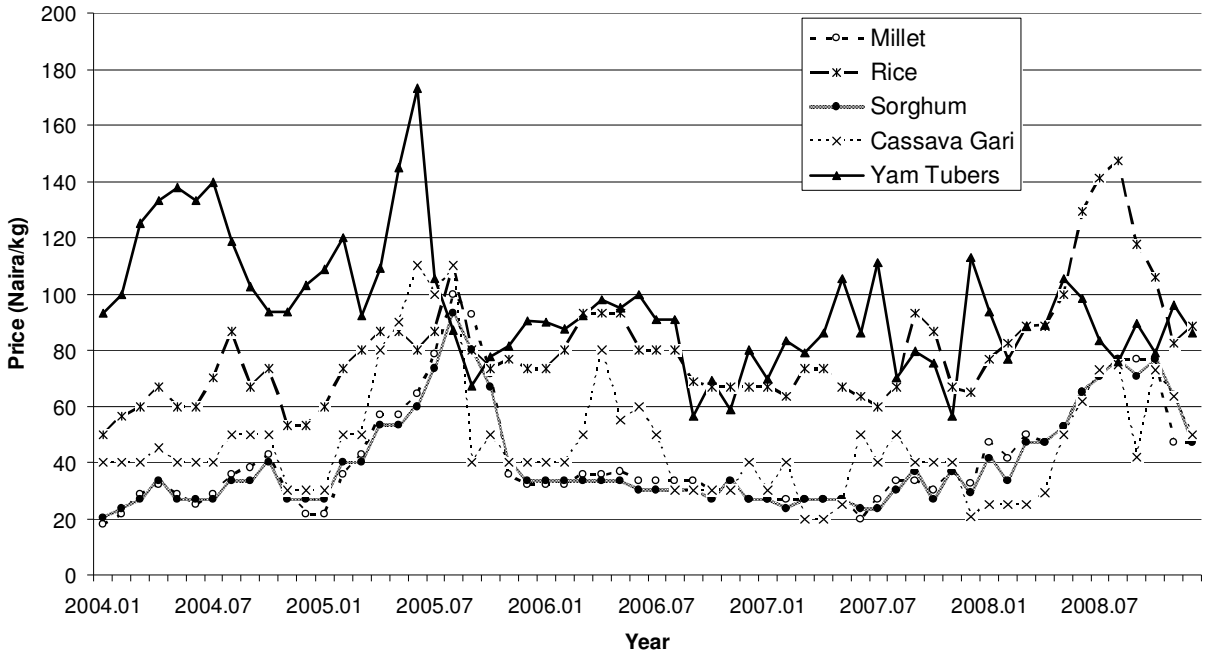

Figure 4. Retail market prices of major crops in Bida (2004 – 2008). Source: Niger State Agricultural Development Project, Nigeria. 1 Naira = US$0.008 (Average exchange rate from 2004 to 2008 based on data of the Central Bank of Nigeria).

Savanna has replaced the southern forest areas and becomes the production center of yams. Production cost of yam was generally lower in the savanna regions than in the southern forest areas, particularly for labor cost and planting material cost. With the high market value of the crop, more farmers in the savanna are incorporating yams into their farming systems (Hahn et al., 1987; Ekanayake and Asiedu, 2003; Anchirinah et al., 1996).

Niger State is the top rice (*Oryza sativa* L.) producer of Nigeria and Nupe has a high reputation in lowland rice production (NFRA, 2007; NSADP, 1997; Nadel, 1942). There are numerous rivers and streams running through the country, which make it rich in wetland resources. After harvesting rice, Nupe farmers cultivate various vegetables, legumes and tuber crops in inland valleys during dry season (Hirose, 2002; Fu et al., 2010). Cassava (*Manihot esculenta* Crantz) and sweet potato (*Ipomoea batatas* L.) are by far the most widely planted off-season crops, for only limited fields along upstream of water courses can farmers plant high value vegetables like tomato (*Solanum lycopersicum* L.*)* and sweet pepper (*Capsicum annuum* L.). Most of the cassava and sweet potato are for self-consumption because of their low market values (Fu et al., 2010). Yam has higher market value compared with other crops, such as cassava, in the region (Figure 4). Off-season yam cropping using the new technologies will provide farmers with another option to improve income, as the production period of yam can be adjusted to be the same as cassava. By harvesting ware yams during April to July when market prices of yam tubers are high (Figure 5), Nupe farmers can benefit from the higher market returns.

Other merits of off-season yam cropping are that it helps to secure food supply when there is food shortage in the midst of rainy season, and it also increases the diversity of inland valley utilization. There is no reference available concerning the role of yam in the farming system and the dietary habit of Nupe peasants. In order to identify the possibility to introduce off-season yam cropping with the new technologies to control growth cycle of yams among Nupe farmers, information on the current yam related practices would become important references. This research thus attempts to obtain basic information in the aspects of yam cultivation, marketing and consumption of Nupe farmers in the Bida region of Niger State.

METHODOLOGY AND SAMPLING

The findings of this study are based on a questionnaire survey conducted in Nupe villages around Bida (8°99' N, 5°99' E), the capital town of the Nupe, in Niger State, Nigeria, during January and February 2009. A questionnaire was designed to obtain information on a wide range of questions regarding yam production, consumption and marketing of farmers. Seven villages in the Lavun Local Government Area under the Bida Emirate were randomly selected for this study with the assistance of local farming extension officers (Table 2, Figure 6). Information of yam production of these villages was completely unknown prior to this study, so selection

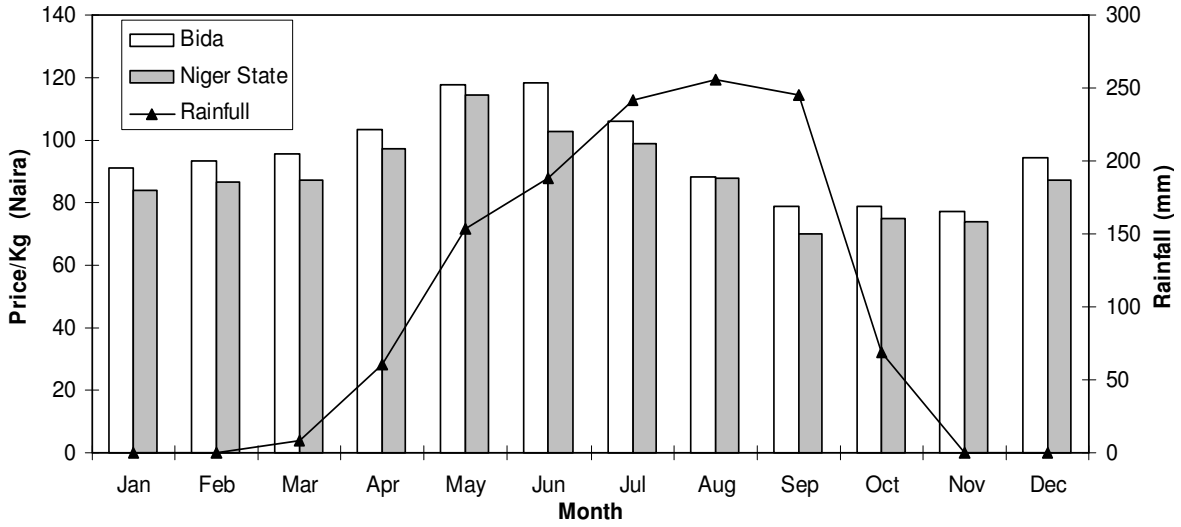

Figure 5. Average monthly retail market prices of yam tubers in Bida and Niger State, (2004 - 2008). Source: Niger State Agricultural Development Project, Nigeria. 1 Naira = US$0.008 (Average exchange rate from 2004 to 2008 based on data of the Central Bank of Nigeria).

Table 2. The seven villages selected for questionnaire survey.

Village	Village category*	No. of respondents	Latitude	Longitude	Elevation (m)
BatagiMuchita	Complex	20	N09.07370	E006.07318	74
Nassarafu	Complex	20	N09.00182	E006.04466	99
Ndaloke	Complex	11	N09.05175	E006.06234	82
Emitsudadan	Complex	20	N09.00328	E005.59171	161
Shabamaliki	Complex	20	N09.01125	E006.04251	98
Chatafu	Upland	20	N09.13060	E005.44031	125
Batati	Upland	20	N09.12197	E005.43415	137

* Villages with both upland and wetland topographies within the village territory are categorized as “complex village”, whereas villages with only upland topography within the village territory are categorized as “upland village”. The categorization follows the definition of Masuda (2002).

was randomly done primarily based on geographical location. The authors decided that the same quantity of interview should be conducted in each village because population data of Nupe villages was unavailable and it was impossible to set a standard ratio. 20 farmers were randomly selected for interview in each selected village, despite a village in which only 11 questionnaires could be filled due to logistic constraint. A total of 131 questionnaires have been obtained for this study. The findings of the survey were analyzed by statistical software SPSS. Descriptive statistics were derived and various statistical tests have been conducted.

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

Descriptive statistics are used to analyze the socio-economic features of all respondents (Table 3). All respondents were Muslim men as Nupe women in the region play limited role in cultivation. In order to identify the correlation between each characteristic and tendency of yam production scale, correlation coefficient between each characteristic and number of yam heap was derived. Household size, farming population, age and household head status of farmers have statistically significant positive correlation coefficient, indicating these factors may contribute to larger scale of yam production.

Basic comparison between complex village and upland village

For the purpose of comparison, the seven villages are categorized into (1) complex village: villages with both upland and wetland topographies within the village territory; and (2) upland village: villages with only upland

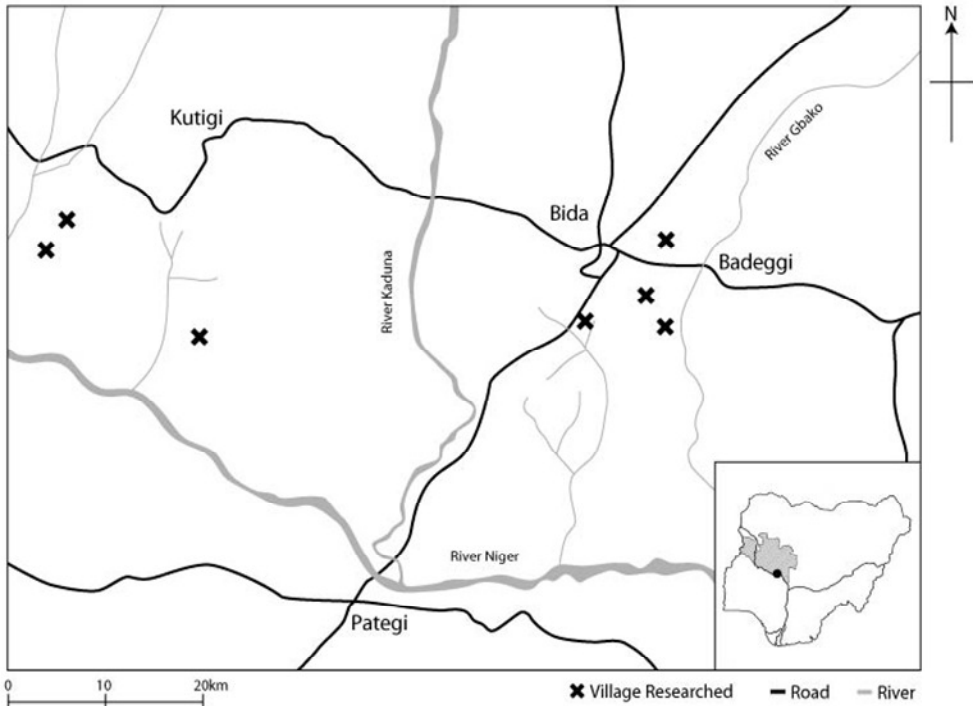

Figure 6. Map showing locations of the 7 researched Nupe villages in Lavun LGA of Niger State, Nigeria.

Table 3. Socio-economic characteristics of all respondents (Lavun LGA, Niger State).

Characteristic	Mean (Standard deviation), %	Correlation coefficient[+]
Age (years)	39.2 (14.1)	0.19**
Household size (no)	11.9 (10.6)	0.28***
Farming population (no)	3.6 (4.3)	0.24**
Total farm (no)	6.0 (3.3)	0.53
Total livestock unit[1](no)	1.3 (2.3)	0.63
Married (%)	94.7	0.12
Household head (%)	56.5	0.18**
Formally educated (%)	43.5	- 0.12
With other source of income (%)	74.0	- 0.014

N=131, [+]correlation coefficient between each characteristic and number of yam heap, *** correlation is significant at the 0.01 level; ** at the 0.05 level.

topography within the village territory. This categorization followed the definition of Masuda (2002), and according to her complex villages are the most numerous in the Bida region. With random village selection, five complex villages (1) and two upland villages (2) were selected. Basic findings of the two village categories are summarized in Table 4 and disparities were identified. All respondents consumed yams and majority of them produced yams, however the chi-square statistics indicate that proportionally more farmers of upland villages produced and marketed yams as compared with complex villages. There were also relatively more farmers who sold at least half of their yams, thus more market oriented, in upland villages.

Yam production

Scale of yam production of respondents was generally small (Table 5). Farmers make heaps as the seedbeds for yams in West Africa, thus the number of yam heap is used as the indicator of production scale. There was great variation among informants: the smallest yam plot had just 25 yam heaps, while the biggest yam plot had

Table 4. Basic findings of the two village categories (Lavun LGA, Niger State).

Variable	Upland village (%) (N=40)	Complex village (%) (N=91)	Total (%) (N=131)	Chi-square statistic
Farmers planting yams	100.0	83.5	88.5	5.909**
Farmers selling yams	82.5	58.2	65.6	6.215***
At least half production of yam for marketing	70.0	28.6	41.2	18.010***
Farmers consuming yam	100.0	100.0	100.0	-

*** Chi-square statistic is significant at the 0.01 level;** at the 0.05 level.

Table 5. Number of yam heap of respondents by village category.

Variable	Mean	Standard deviation	Minimum	Maximum	T statistic
Upland village	1,025.0	1,180.5	100	6,000	
Complex village	648.7	550.7	25	3,000	- 2.343**
Total	778.5	838.2	25	6,000	

** T statistic is significant at the 0.05 level. N=40 for upland village; N=76 for complex village.

Table 6. Yam cultivating calendar of respondents by village category.

Month	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J
Upland village	L	M					P	P	P/M	M/P	S/W	W	W/K	W/K			H	H
Complex village									L/M	M/P	S/W	W	W/K	W/K			H	H

L=Land preparation; M=mound making; P=plantation; W=weeding; S=staking; K= early harvest (milking); H=main harvest.

6,000 heaps. A yam heap is about 0.77m^2 in size in the Guinea savanna zone (Nweke et al., 1991). The estimated average yam plot size was thus just about 600 m^2 as the average number of yam heap was 778.5. This figure is far below the zonal average (1.33 ha) and the national average (1.05 ha)[2]. Average scale of yam production of respondents was larger in upland village as verified by the t-test. Yams are not grown under irrigated conditions in the Bida region. Villages with different topography have slightly diverse cultivating calendars as presented in Table 6. Respondents of upland villages mostly had less involvement in lowland rice farming and thus could begin to make yam heap after finishing upland plantation in August and September for the next year. Heap making is the most labor-intensive tedious task and the longer period that upland village farmers have allowed some of them to achieve larger scale of production. Harvesting of yams takes places from December to January.

In addition to the main crop, 99% of yam producing respondents performed milking: the early harvest of some varieties in late August and September. By milking the immature tubers are harvested while keeping the plant intact. The milked plants are left to grow on until the natural end of the growing season. The yams obtained by milking are one of the earliest harvested crops in the midst of rainy season when there is always shortage of food. Most of these yams are sold for cash, firstly to buy sorghum and millet for food, and secondly for the capital for rice cultivation. However, the market price of yam tuber is the lowest in this period. Characteristics of yam production of respondents are presented in Tables 7 and 8. T-tests are conducted to identify if there is difference in mean number of yam heap between respondents with and without each characteristic. Slightly above half of the respondents obtained the land for their yam plots by inheritance.41.4% of respondents obtained their yam plots by leased/rented arrangement that provided them the chance to access to more fertile land. Yams require rich soils with high organic matter content so virgin land or land after long fallow are good for them (Ekanayake and Asiedu, 2003). Nupe farmers well acknowledge this requirement, but only 34.5% of respondents could get virgin land, and only 8.6% of respondents could utilize land long after fallow, for their yam farms. Masuda (2002) reported that unused land was limited in the Bida region due to population pressure, and the bush-fallow system was also shifting to longer cultivation and shorter fallow period.

Therefore, most of the respondents have to comprise with ordinary fertile land for their yam farms. About half of the respondents applied various forms of fertilizer on their yam farms. However, resource-poor Nupe farmers could hardly afford sufficient quantity of fertilizer. The most common types of fertilizer were NPK compound and Urea. Only 3 respondents indicated that they applied

Table 7. Characteristics of yam production of respondents – (a).

Characteristic	N=116 (%)	T statistic
Tenancy of yam farm		
Inherited	58.6	-1.27*
Leased/rented	41.4	1.87***
Land for yam farm		
Virgin land	34.5	-2.27***
Land after fallow	8.6	0.23
Ordinary fertile land	64.7	3.44***
Fertilizer application		
Applied fertilizer	49.1	0.76
Cropping system		
Sole cropping	25.0	0.92
Intercropping	81.0	0.75
Mixed cropping	79.3	-0.36
Labor for yam production		
Family labor	50.9	-0.13
Hired labor	79.3	0.21
Village community	30.2	1.68*
Reciprocal assistance	79.3	1.81***
Wives	14.7	-0.36
Yam variety		
White yam (*D. rotundata* Poir)	100.0	-
Yellow yam (*D. cayenensis* Lam.)	43.1	-0.86
Water yam (*D. alata* L.)	5.2	0.43

*** T statistic is significant at the 0.01 level; ** at the 0.05 level; * at the 0.1 level.

Table 8. Characteristics of yam production of respondents – (b).

Characteristic	Mean	Standard deviation	Minimum	Maximum	Correlation coefficient[+]
Years of yam plantation	20.2	13.1	1.0	50.0	0.25***
Number of variety	3.4	1.5	1.0	8.0	0.27***

N= 116, [+] Correlation coefficient between each characteristic and number of yam heap, *** correlation is significant at the 0.01 level.

herbicide for weeding. Most of the respondents adopted intercropping and mixed cropping for yam cultivation. Only 25% of respondents solely cropped yam although the system is reported to yield the best. Yam farmers in the study area depend largely on hoe-cutlass labor. Yam production is labor intensive and various types of labor forces were used. They depended mostly on hired labor and reciprocal assistance, usually for heap making and weeding. Labor price in Bida area was about N 150 to N 300 (~ US$1.2 – US$2.4) per person per shift depending on the physical strength of the labor. A shift referred to about 3 h of farm work in the morning or in the evening. From the 59 respondents who provided the figures for hiring labor, the average cost that they spent was N 8, 110 (~ US$64.9), which was for hiring 17.2 labors for 2.3 work shift (~ 6.9 h) for the making of 810 yam heaps, thus about N 10 (~ US$0.08) per heap. There were 14.7% of respondents whose wives worked for their yam farms. Some respondents mentioned that it was in fact very common in the area for women to assist in carrying yam

Table 9. Number of yam variety of respondents by village category.

Characteristics	Mean	Standard deviation	Minimum	Maximum	T statistic
Upland village	4.5	1.5	2	8	
Complex village	2.9	1.1	1	6	-6.35***
Total	3.4	1.5	1	8	

***T statistic is significant at the 0.01 level. N=40 for upland village; N=76 for complex village.

Table 10. Local name of yam variety collected from respondents.

Yam variety	Percentage of respondent	Yam variety	Percentage of respondent
Kpakogi	97	Agibe	3
Malagbagi	50	Efiagi	2
Badiza	26	Kpanshianagi	2
Furu	22	Adoci	1
Gigada*	22	Bisan	1
Kpepe	17	Egagi	1
Wura*	17	Eyagikin	1
Suba	13	Gbayanpogi	1
Egbogi	12	Kadnnachi*	1
Kandu*	10	Korokuma	1
Ehzhikogi	8	Mariachi	1
Giwa	7	Mene	1
Wutsu*	6	Sudan	1
Jigada	6	Suru*	1
Bassaci**	4	Yagba	1
Achibiri	3		

N=116. All of them are White yam (*D. rotundata* Poir), apart from *=Yellow yam (*D. cayenensis* Lam.) and ** = Water yam (*D. alata* L.), based on the classification of farmers.

seed tubers to the farm and placing them on heaps for the men to plant inside. They also mulched yam heaps by grasses and leaf, trained vines on stalks, collected harvested yams and carried them from the farms to the yam barns. Marketing of yams was mainly the job of wives as well.

However, most of their husbands did not consider their contributions as “labor”. Years of yam plantation and number of yam variety are positively related to scale of yam production (Table 8). Respondents of upland village planted more yam varieties compared with respondents of complex village (Table 9). Respondents cultivated a large variety of yams and 31 yam varieties have been collected as listed in Table 10. Kpakogi was by far the most popular variety that was planted by almost all of the respondents and in all villages studied. It was the most preferable variety as food in rainy season, while some farmers indicated that Malagbagi gave a better taste after the tubers have lost some moisture after wind drying. The total number of yam variety identified in the upland villages (M=15.5, SD=0.7) far exceeded that of the complex villages (M=9, SD=1.2).

Yam marketing

In Nupe peasant society, it is common that when a farmer wants to sell his crops, he requests his wives to bring the crops to nearby towns and markets to sell on his behalf. As shown in Table 11, it was the most common way among respondents to let their wives market the tubers. Nupe females play major role in the trading of yam although they often have no power in decision-making and they benefit very little for their services. There are several markets in the area where yams are traded, such as the markets in Bida and Doko towns and some village markets which operate once in every few days. Yam tubers were mostly sold to merchants in these markets, and also directly to ordinary people and food vendors in town. There were merchants coming from other regions who went directly to three of the selected villages to purchase tubers directly from farmers. These merchants come from Minna, Mokwa and Mambe of the Niger State, and also distant cities like Ibadan and Ilorin in southern Nigeria. Harvested yams were mostly for self-consumption. Only 16.4% of respondents sold more than

Table 11. Characteristics of yam tuber marketing of respondents.

Characteristics	N=87 (%)
Yam tuber marketers*	
Wives of famers	50.6
Farmers	42.5
Household heads of farmers	9.2
Yam tuber consumers*	
Merchants in surrounding market	47.1
Ordinary household users, food vendors, etc.	40.7
Merchants coming directly to village	24.1
Other villagers	20.7
Proportion of harvested yam for sale	N=110, %
0	20.9
1/4	9.1
1/3	20.9
1/2	32.7
2/3	10.0
3/4	6.4
All	0.0

*Respondents could choose more than one option; therefore the combined percentages of all options are not 100%.

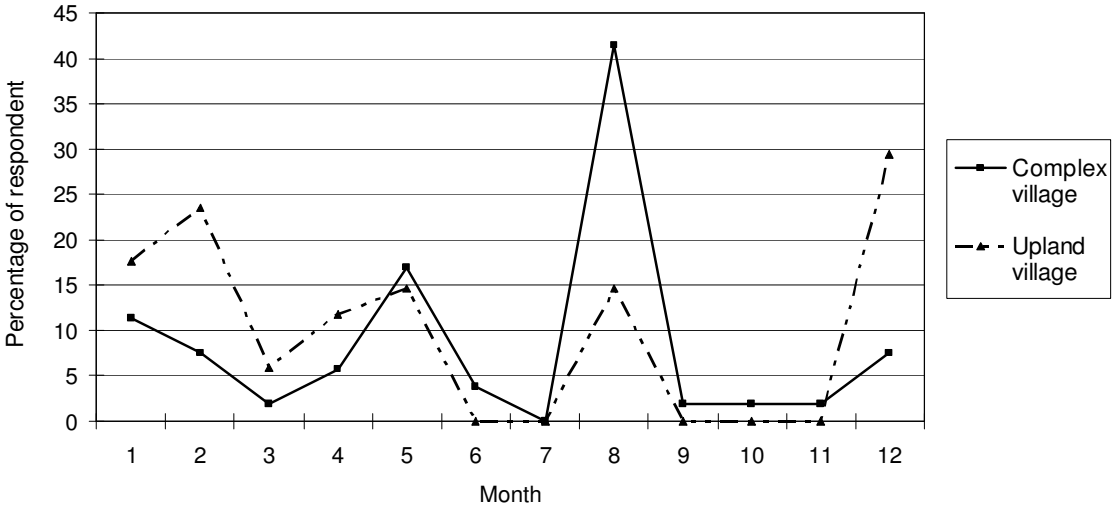

Figure 7. Month for major yam sale of respondents by village category.

half of their harvested yam. The month for major yam sale of respondents is illustrated in Figure 7. The peak month of yam sale of respondents was August, which was mostly for sale of milked yam tubers. May, the month for sale of seed yams, and December, the month for yam harvesting, followed as second. Respondents of different village category showed different pattern in the time period for peak yam sale. There were far more respondents of complex villages that sold most of their immature milked yams in August.

The main reason was that these respondents needed money in August, firstly for the capital for rice cultivation on wetland, and secondly for buying food stuff as other crops were not yet ready. On the contrary, there were far more respondents from upland villages that sold most of their matured yams in December. It was because these

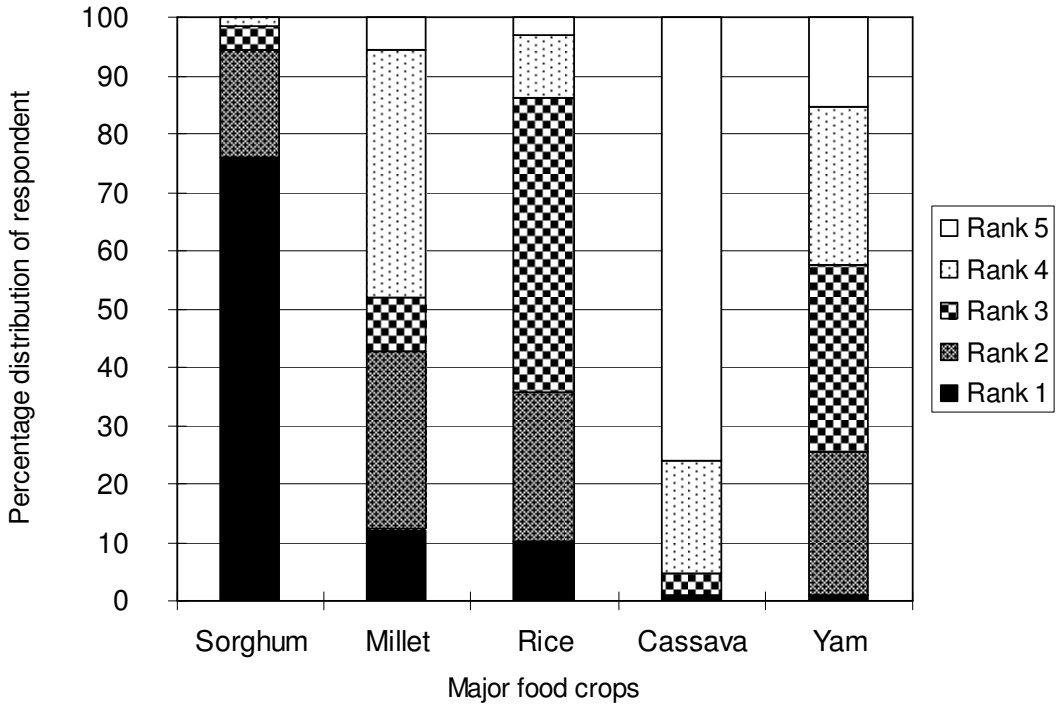

Figure 8. Ranking of major food crops according to their proportion in daily diet by respondents.

respondents produced in larger scale, so their tubers were sold in bulk to merchants when harvested in December. Lack of proper storage facility and threat of robbery push farmers to sell freshly harvested tubers immediately to merchants. The different patterns indicated that farmers of upland villages probably get better earning from yam as compared with farmers of complex villages because market prices of yam tubers were much higher in December than in August.

Yam consumption

Respondents compared and ranked the five most important staple foods of the region, namely: sorghum (*Sorghum bicolor*), millet (*Pennisetum glaucum*), rice, cassava and yam, in terms of proportion of daily diet and consumption preference. The findings of respondents are presented in Figures 8 and 9. Sorghum was the most important food crop in the daily diet of all respondents, and then followed by rice and millet. Yam was ranked mostly as the second and the third. Cassava was regarded as the least important. It has been observed in Nupe villages that people eat sorghum or millet everyday for both breakfast and dinner. For lunch they consume rice, legumes or root and tuber crops. This traditional pattern of food consumption is widely observed in the region. Yams are mainly consumed for lunch in the form of boiled yam and yam porridge. Roasted yam is also commonly consumed by farmers that they roast tubers during farm work and eat as lunch. Regarding preference, rice was the most preferable food for respondents. In the Nupe culture, rice is regarded as the food for traditional ritual and ceremony. It is the obligation of the host to serve rice meal, often pounded rice ball with stew, to guests in any ceremony and important traditional events. The irreplaceable cultural role rice plays makes it the most favorable food for respondents. By contrast, the role played by yam in the Nupe culture is minor, although it is traditionally important in most parts of Nigeria. Sorghum and yam were the second and the third most preferable crops for respondents, while cassava was the least preferred.

Figure 10 presents the month of yam consumption of respondents. Similar to yam marketing, most respondents consumed yams in August and December. Discrepancies are found between the two village categories that the peak of yam consumption for complex villages was in August, while it was in December for upland villages. The proportion of respondents consuming yams was higher for upland villages in every month, except during September to November. There was a lot more respondents of upland villages who consumed yam in May and June. The yams consumed in this period were mainly extra seed yams that were not used for plantation.

This paper presents the findings in the aspects of the current practices of yam production, marketing and consumption of Nupe farmers in Niger State of central Nigeria. The findings suggest that although in small scale, yams have been incorporated into the cropping system of Nupe farmers in the Bida region. Yams were

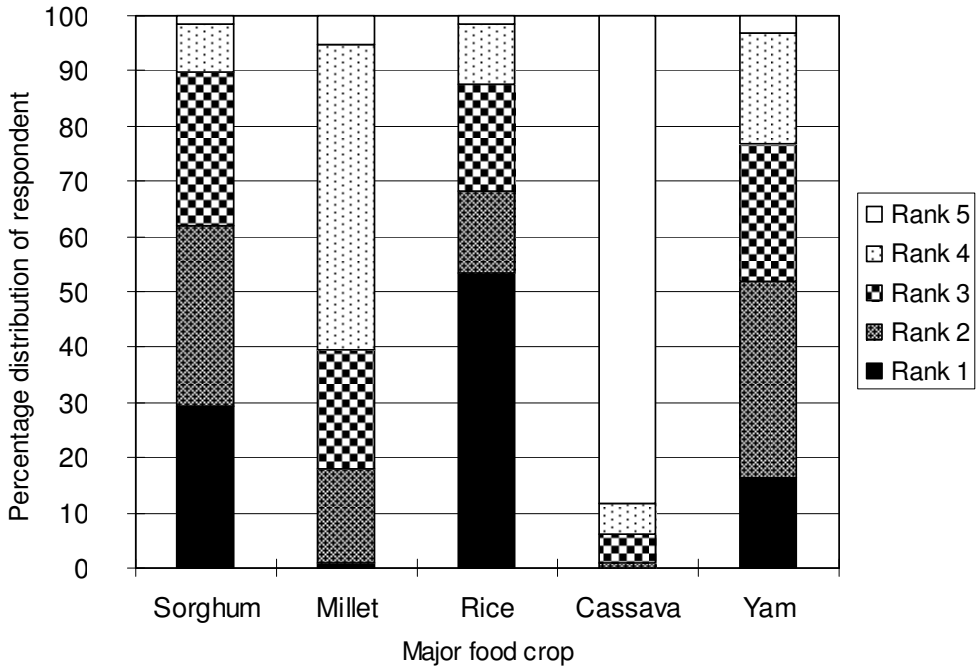

Figure 9. Ranking of major food crops according to preference of respondents.

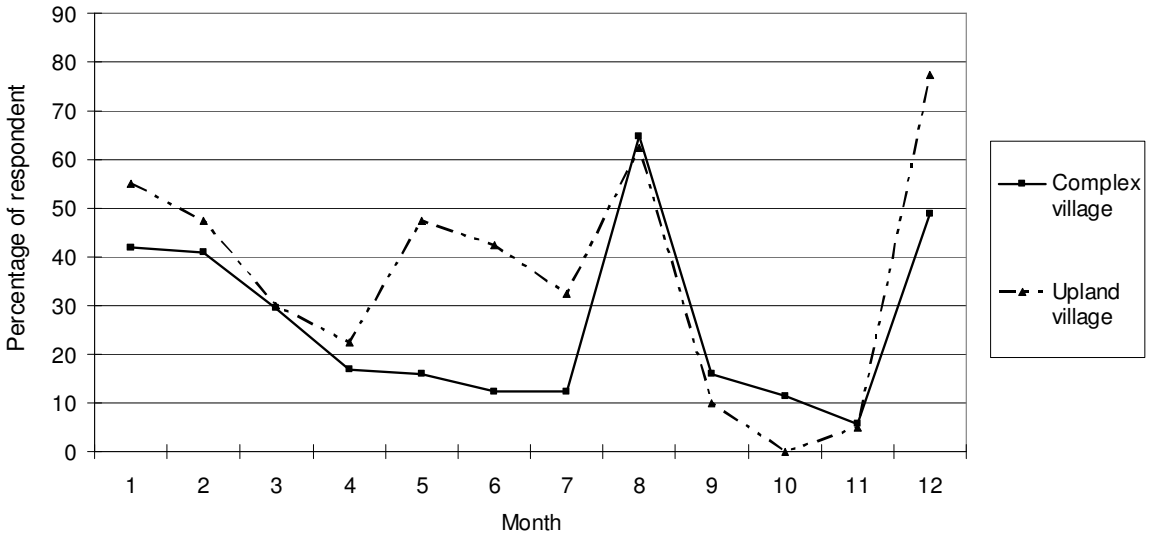

Figure 10. Month for yam consumption of respondents by village category.

mainly cultivated for self-consumption, so it was not market-oriented and resources input were limited. There were discrepancies between complex villages and upland villages that scale of production, yam variety, cultivating calendar and time pattern for major sale and consumption slightly differed. If the new technologies to shift growth cycle of yam for off-season yam production are successfully introduced into the region, the harvesting of yam can be shifted from November, December and January, to May, June and July, when yam market prices are the highest. Although early harvest milking is practiced by some farmers, tubers do not reach the full size for good sale and market prices are low. Nupe farmers currently widely cultivate cassava during dry season, but market value of the crop is low and its importance and preference as food is inferior. By adopting the new

technologies, growth cycle of yam can be adjusted to be the same as cassava and off-season plantation of yam offers an additional option for inland valley cultivation.It will not only improve the income of farmers, but will also provide them with a more preferable and better nutritious food. It will be a more efficient use of the valuable wetland resources of the Nupe farmers. Nevertheless the ethnocentric attachment to yam is yet to develop in Nupe culture as contrary to rice. Therefore, when introducing off-season inland valley yam cropping into the region, it is necessary to adopt strategies that will not affect rice cultivation, for example, to select early mature cultivator of rice or yam and to specify appropriate land. In order to develop the most suitable off-season yam cropping model which will smoothly replace cassava and have no conflict with rice, it is necessary to further investigate the year-round land use and labor allocation of inland valley farming of targeted area.

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NOTES

1. Livestock unit was calculated based on the scheme of FAO on Sub-Saharan Africa in which cattle=1, sheep/goat=0.1, Poultry = 0.01. Pigeon was assumed to be half of a chicken so the value was set to be 0.005. A higher livestock unit indicated that the farmer has more valuable livestock.
2. Calculation based on the survey result of the annual monitoring research project in the agricultural sector (NAMRP-AGRIC) of the Nigerian Institute of Social and Economic Research (NISER) from 2001 to 2004.

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