



Received: 10th May-2013

Revised: 18th May-2013

Accepted: 20th May-2013

Research article

ASSESSING THE LEVEL OF CULTIVATION AND UTILIZATION OF BAMBARA GROUNDNUT (*Vigna subterranea* (L.) Verdc.) IN THE SUMBRUNGU COMMUNITY OF BOLGATANGA, UPPER EAST REGION, GHANA

MM Akpalu¹, IA Atubilla² and D. Opong-Sekyere¹

¹Bolgatanga Polytechnic, Department of Ecological Agriculture, P. O. Box 767, Bolgatanga, Upper East Region, Ghana

²Bessfa Rural Bank Ltd. P. O. Box 160, Bawku, Upper East Region, Ghana
Corresponding Author Email address: danieloppongsekere@yahoo.com

ABSTRACT: A study was conducted in Sumbrungu, Bolgatanga Municipality of the Upper East Region of Ghana to determine the level of cultivation and utilization of Bambara groundnut. A survey involving the use of both open-ended and close-ended questionnaires and also interviews were administered. A total of 30 Bambara groundnut farmers were selected. Houses were chosen depending on the concentration of Bambara groundnut farmers. Data was collected on the following; Sex distribution, number of acreages cultivated, household sizes, marketing and utilization, constraints in production and farmer management of the crop. Data collected were analyzed by the use of descriptive statistics; mainly percentages. It was observed that more people cultivated lower acreages of the crop; 40% of the farmers cultivated acreages of land between 1 and 2, 37% cultivated 3 and 4, 17% 5 and 6 and 6% between 7 acres and above. All (100%) farmers complained of attack of pests and diseases that destroyed the crop in the field of which they had no control measures. 17% of the farmers applied inorganic fertilizer while 83% did not apply any fertilizer at all. 33% of the farmers reported that they obtained yields of between 100kg-150kg/acre, while 7% had yield between 700kg/acre and above. The crop is used for the preparation of dishes such as 'tubani', 'kose' and snack as well as for traditional rites (funerals). 64% uses Bambara groundnut for performance of funeral rites, 33% for medicinal purposes and 3% for gifts. The study showed that constraints to Bambara groundnut production in the community are low yields, pests and disease control methods, lack of improved varieties since weevils attack stored seeds. Bambara groundnut has a lot of potential, especially in the Northern Ghana, thus, the need to research into ways of managing the crop, in terms of pests and diseases, storage methods and chemicals, so that farmers can boost its cultivation on large scale basis.

Keywords: Bambara groundnut, chemical, cultivation, diseases, farmers, fertilizer, pests, Questionnaire, storage, survey

INTRODUCTION

Bambara groundnut is believed to have originated from the African continent, especially Central Africa, long before the introduction of groundnuts (peanuts) [12]. It belongs to the family *Leguminosae* and sub-family *Papilionoideae* [12, 13]. The climatic requirements are those required for groundnut. However, it survives in conditions which are more arid, that is, in the drier savannah areas with short periods of scanty rainfall of up to 750 mm per annum. The crop prefers, averagely day temperatures of 20°C - 28°C and full sun [8, 1]. Bambara groundnut is adapted to a wide range of soils especially light or sandy loam and does well on very poor soils where other crops fail. Bambara groundnut is a traditional indigenous crop mainly cultivated as a subsistence crop, usually for the resource poor men and women farmers. This is normally done on soils which are poor to support the growth of other crops, and to some degree, for income generation [4, 13]. The crop has the potential to contribute to food security in view of its ability to withstand drought. This becomes more important especially in Sub-Saharan Africa and some regions of the continent where rainfall is low to support most leguminous crops. Bambara groundnut is the most resistant pulse crop producing under conditions of high temperature and low rainfall where other pulses fail to survive [10, 4]. Bambara groundnut is mostly grown in the Coastal Savanna, Transition and Guinea Savanna agro-ecologies of Ghana. These areas are very low in rainfall compared to the high rainfall areas in the country. Rainfall pattern in the Northern and Upper Regions as well as the Transition zones of Ghana is erratic. In the Northern and Upper Regions, rainfall is unimodal with a long season of drought. Bambara groundnut therefore becomes a food security crop in these areas.

For some years now in Ghana, there has been seasonal shortage of the grain; production and utilization have gone down. The crop has been neglected by research, for instance, as of now, there is no improved varieties (in terms of yield and quality) for adoption by farmers, the accessions under cultivation are landraces. Nevertheless, these landraces are associated with many challenges; they are mixtures of types, they lack uniformity, they are endemic to particular environments. This study would therefore provide an important first step at improving the crop in Ghana and also provide a foundation to enhance their potential use in the future. Doku, [11] stated that it was paradox; 'an indigenous African crop which produces almost completely balanced food and easy to cultivate and also makes very little demand on the soil', should be relegated in its own countries [1]. The objective of this study therefore was to obtain general information about farmers management practices of the crop; assess the constraints and other factors that influence the production of the crop and to assess the extent to which the crop is being utilized.

MATERIALS AND METHODS

The study was conducted in Sumbrungu, a community in Bolgatanga Municipality of the Upper East Region of Ghana. It shares boundaries with Kassena-Nankana district at the north, Bongo district at the East, south to Bolgatanga Municipality and West to Sirigu and is located 7km away from the Bolgatanga-Navrongo road. Sumbrungu is made up of three main communities, namely Kolgo, Kolbia and Amogrebisi. The main occupation of the people is livestock production and crop farming. The major food crops cultivated are millet, maize, groundnut, cowpea, Bambara groundnut, and the types of animals reared are cattle, pigs, small ruminants, donkeys and poultry birds such as guinea fowls. In the community, two categories of people are identified, the natives and the migrants. The natives are Frafras. Sumbrungu falls under Guinea savannah zone with erratic rainfall and common crop failures. Bambara groundnut is the best crop to cultivate under this condition. A survey was therefore necessary to determine the level of cultivation and utilization of the crop. This will, among others, provide information for interventions for boosting up production of the crop and even many others in these areas.

Sampling and Data Collection

A survey was carried out involving the use of questionnaires and interviews. The questionnaires were both open-ended and close-ended targeted at farmers in order to avoid digression, by offering the respondent(s) alternatives to choose from. Semi-structured interviews, such as meeting farmers individually, were utilized to elicit further information concerning Bambara groundnut farming in the community. Houses were chosen depending on the concentration of Bambara groundnut farmers. In all, 30 Bambara groundnut farmers were selected. Data was collected on the following: Producers and consumers of Bambara groundnut, household sizes, marketing of Bambara groundnut, utilization (uses, dishes, etc) of the crop, constraints in production of Bambara groundnut and farmer management of the crop. The data were analyzed by the use of descriptive statistics, mainly percentages, to determine the differences among various parameters investigated in the study.

RESULTS AND DISCUSSION

Land Tenure System

Responses on land tenure regime indicated that 87% of the farmers got access to land for farming through inheritance. That is, they farm their own or family land. Some 3% of the respondents got access to land through lease and kinship, and 7% through purchase. This statistics shows that land is readily available and that farmers could get access to land easily, even to expand production of the crop.

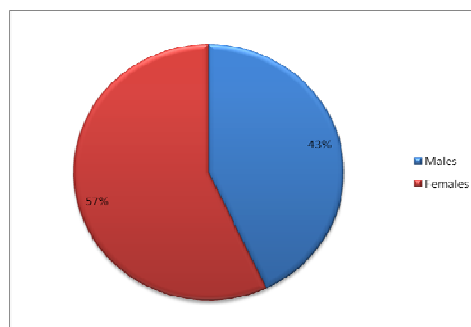


Figure 1: Sex Distribution of Bambara groundnut Farmers in the Sumbrungu Community

Figure 1 shows that 57% of females were involved in Bambara groundnut cultivation while only 43% of the males cultivated the crop. This shows that more females were involved in the cultivation of Bambara groundnut in the Sumbrungu community than men. This agrees with the research findings of [6], who observed that, in the two Northern Regions of Ghana, more females are involved in the production of Bambara groundnut than males. [3] also stated that, in the Northern Region of Ghana, females are involved in Bambara groundnut production. They also attributed this to the fact that Bambara groundnut, being a subsistence crop in the Northern Region, is considered as a women’s crop. This has implications for gender considerations for any technology aimed at improving Bambara groundnut cultivation, processing and utilization in these parts of Ghana.

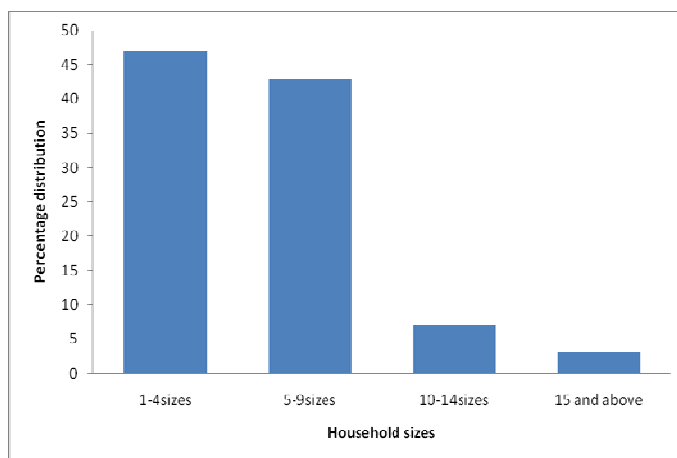


Figure 2: Household sizes of Bambara groundnut Farmers in the Sumbrungu Community

It was observed that about 47% of the farmers were between the household sizes of 1 and 4, 43% between 5 and 9, 7% between 10 and 14 and 3% between 15 and above.

This results demonstrate that Bambara groundnut been a subsistence crop, and that it is cultivated mainly by small family sizes whereas larger families are involved in commercial crop production. [13], for example, stated that Bambara groundnut is a crop grown in Ghana, and that it is a significant source of income for senior wives and female-headed households. It is also not too difficult to cultivate and its stores well on the farm. In the semi-arid areas, Bambara groundnut is an important source of edible protein, particularly lysine and is complementary to staple cereals which are low in amino acids.

Table 1: Acreages of Land Cultivated by Bambara Farmers in the Sumbrungu Community

ACREAGES	NUMBER RESPONDENSE	PERCENTAGE
1-2	12	40
3-4	11	37
5-6	5	17
7 and above	2	6
TOTAL	30	100

Table 1 shows that more people cultivated lower acreages of the crop. 40% of the farmers cultivated acreages of land between 1 and 2, 37% between 3 and 4, 17% between 5 and 6 and 6% between 7 acres and above. This may also contribute to the shortage of the crop in the market. Since bigger acreages are not cultivated, most of the lands are not fertile to support the growth of other crop as compared to Bambara groundnut hence the need to increase the total area of land for cultivation of the crop. Poor soil fertility in the Guinea Savannah zones coupled with low rainfall patterns as well as poor agronomic practices calls for the development of high yielding, drought resistant varieties and better extension education on the crop.

Landraces Planted

Farmers planted four (4) landraces in the community. These included: Nav Red, Nav White, Black Eye and Tom. Results indicated that there was preference for the white landrace (Nav White); 63% of the farmers' cultivated white landraces, 13% grew the cream and the black landrace seeds whereas 10% cultivated the red landraces. Most farmers within the community as well as the market women were interested in the white landraces because it matured faster, had good market price and was high in demand.

[5] stated that consumers of Bambara groundnut prefer white and cream-seeded Bambara groundnut types because they have the lowest tannin level, while the black-seeded types have the highest tannin content [1].

Time of Planting

In the Guinea Savannah zones of Ghana, rains start around March and peaks in June through to September. Most farmers in this region plant Bambara groundnut during this period. The results of the study indicated that 3% of the farmers sowed the crop between April and May, 23% between May and June and a majority 73% planted between June and July.

This results show that the period of high and low supply of the crop has implication for planting time of Bambara groundnut. The best time for planting Bambara groundnut has not been determined. [6] in their study on 'monitoring the genetic diversity of Bambara groundnut in two districts of the Upper West Region', stated that, farmers concentrate on their major staples like millet, sorghum, cowpea and maize, during the early parts of the rainy season (March to May) and then turn their attention to bambara groundnut around June to July.

CROP MANAGEMENT

Pests and Diseases

Majority of the farmers interviewed did not have knowledge on management practices of the crop, especially the diseases and pests that attack the crop, and also the recommended chemical(s) for controlling such diseases and pests. All farmers interviewed complained of attack of pests and diseases that destroyed the crop in the field of which they have no control measures. 77% said that they did not adopt any management practices since the crop is generally resistant to pests and diseases. This finding is in line with those of [3, 13], who stated Bambara groundnut is resistant to pests and disease attack as compared to cowpea. 17% of the farmers stated that they adopted regular weeding to reduce the incidence of diseases and pests. While 7% stated they sprayed the crop with chemicals.

Weed Control

The study showed that 13% of the farmers weeded their farms once during the growing period, a majority 63% weeded twice and 24% tree times. This shows that weed management in Bambara groundnut may be quite easier and may be the reason women find it more appropriate to cultivate the crop since it less labour intensive. [6] observed that Bambara groundnut monocultures require less weed management than other crops and they speculated that weeds that germinate with the onset of the March-April rains would not have produced mature seeds that would have germinate in the June-July rains.

Fertilizer Application

The study showed that 17% of farmers applied inorganic fertilizers while a majority 83% did not apply any fertilizer at all. This study confirms that the crop does not require much fertilizer for its growth. This supports the reports on the ability of the crop to grow on poor soils that could not support the growth of other legumes [4].

Yield and Storage

About 33% of the farmers reported that they obtained yields of between 100kg-150kg/acre, 27% obtained 200kg/acre and 7% had yield between 700kg/acre and above. These yields were obtained without any fertilizer application and under low and erratic rainfall. The low yields obtained by farmers could account for the seasonal shortage of the crop since the farmers do not get enough for their household use. Therefore only a small percentage is marketed.

Results also showed that all the farmers interviewed faced the problem of storage. They reported attack by storage pests, especially weevils during storage of the crop, which affects quality of grain and reduces their market value. Some farmers stated that they treated their grain with only wood ash before storing.

Marketing

The results of the current study found out that all the farmers sold the crop in the market due to the fact that there was ready market or buyers. They stated that they sold in either bowls or bags, depending on the quantity. Majority of the market women sold in bowls if the quantity is small. Farmers sold their produce at varying amounts per a bag; GH¢100.00 (10%), GH¢120.00 (13%), GH¢130.00 (27%), GH¢140.00 (23%) and GH¢150.00 (27%). The different prices were quoted by the respondents because different market places have different prices for the produce. It was further observed that not all the landraces were sold with a higher price, like the white type, which is higher in demand, as compared to black eye, Nav red and the cream. The market women confessed they were interested in the white landraces because the demand was high with higher price. This might also be the reason why the farmers in the community prefer to grow the white landrace, since it attracted ready market and higher price than the others.

Utilization

Results indicated that farmers in the community used the crop for traditional performances as well as preparation of dishes. 64% used Bambara groundnut for performance of funeral rites, 33% for medicinal purposes and 3% for gifts. For the medicinal use, farmers said they mixed the white landraces with guinea fowl meat and 'dawadawa' and grind them all together for the control of diarrhea. They also grind the black landraces and mixed with water for a sick child to drink. The black landraces again could be ground and applied to a child's skin when it is suffering from skin rashes. The dry grains are also chewed to control swollen jaw disease.

With regards to the dishes prepared (Figure 3), 67% used Bambara groundnut for the preparation of 'tubani', 17% for 'kose' and another 17% for snacks. Dried seeds were mixed with maize or plantain and then boiled and eaten raw. The seeds may also be ground into flour and added to maize to enrich traditional preparations. On the other hand, the major constraint to utilization is time of cooking the dry beans. Farmers indicated it took a very long time to cook the dried beans of bambara groundnut as compared to cowpea, thereby resulting in the use of a lot of fuel wood which is not easily available, especially in this part the country (Northern Ghana) where it difficult to grow trees.

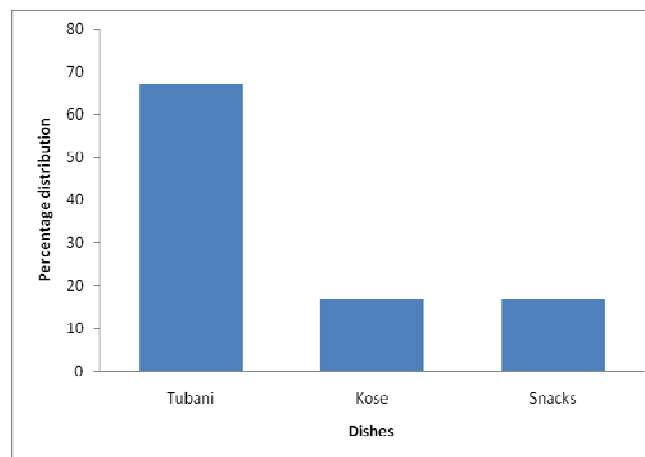


Figure 3 Dishes prepared from Bambara groundnut

Constraints to production

The most important constraints to Bambara groundnut production in the community were low yields, pests and disease/control methods, lack of improved varieties. Farmers stated that if improved varieties are available, they will prefer to grow them. Above all, the study indicated that the most serious constraint to the production of the crop in the community was storage. Weevils attacked the grain during storage thereby reducing their market value and even their germination capacity (viability), and as a result, farmers ended up losing income whenever there is no ready market at early harvest. Farmers stated that they run at a lost whenever their crops end up been destroyed by storage pests and this discouraged them from cultivating the crop.

Table 2: Constraints in Production of Bambara groundnut

Constraints	% of farmers
Land tenure	7
Improved varieties	20
Poor yield	23
Marketing	5
Storage	45

Table 3: Age distribution of Bambara groundnut Farmers in the Sumbrungu Community

Age	% No. of farmers
20-29	13
30-39	21
40-49	27
50 and above	39

About 13% of farmers were between the ages of 20 and 29 years, 21% between the ages of 30 and 39, 27% between the ages 40 and 49 and 39% between the ages of 50 years and above.

This results show that few of the farmers were young while majority were of old age. It was observed that Bambara groundnut farmers were mostly of old age and as such young men and women were not involved in the cultivation of the crop. For instant, [7] stated that the crop is cultivated by resource poor old male and female farmers on soils which cannot support the growth of other crops [1, 13].

Table 4: Educational Status and Religion of the Farmers

Educational Status	% No. of farmers
Primary School	13
Middle School	20
Junior High School	17
Non-formal Education	10
Illiterates	40

Table 4 shows that, 13% of the farmers were primary school levers, 17% junior high school levers, and 20% held middle school certificate. 10% of the farmers had non-formal education and 40% were illiterates. The results show that majority of the farmers were not educated. The high level of illiteracy among the farmers could also have resulted in the low production levels of the crop since this could affect their ability to put in proper management practices for higher yield. With respect to religious background, 47% of the farmers were Christians, 13% were Muslims and 40% were traditional worshipers. This shows the relative importance of Bambara groundnut in the Sumbrungu community, the crop plays a major role in the traditional religious functions of the people.

Marital Status of Farmers

Majority (77%) of the farmers who cultivated Bambara groundnut in the community were married while few (10%) were single and 13% divorced. Unmarried people did not have interest in cultivating the crop.

Summary and Implications of the Study

Bambara groundnut is cultivated by the people as main crop and the inhabitants of those who cultivate the crop were mostly males and females with females forming the majority. Most of the farmers in the Sumbrungu community cultivated the white landraces as compared to the black, brown and cream. This is because the white landraces were early-maturing and also had higher market demand. The crop used for traditional rites such as funerals, gifts and for medicinal purposes.

The dishes prepared from the crop by the people in the Sumbrungu community were 'tubani', 'kose' and snacks. But the majority of the inhabitants used it for the preparation of 'tubani'. Observation also showed that farmers in the community had little or no knowledge of the methods of managing the pest and diseases that affect the crops but research indicated that some used chemicals to spray their farm while others did regular weeding to control weeds, pest and diseases. The study revealed that the most serious constraint to production of Bambara groundnut in the community was storage. Attack by storage pests (weevils) reduced their market value and germination capacity (viability). The biggest constraint to utilization was time of cooking; the dry beans took a very long time to cook as compared to cowpea. Since Bambara groundnut is cultivated as a main crop on farmer's own lands, government and other agricultural organization should support farmers by giving them loans and awards so as to boost its cultivation in the community and the entire region. Depending on only the landraces as a source of planting material is not advantageous to the farmers. Since the landraces are not homogenous and are only adapted to certain environments, there is lack of uniformity in performance of these landraces if grown under varied environmental conditions. There is therefore the need to come out with improved varieties, to promote and enhance cultivation of Bambara groundnut across the region and the country at large. Further research has to be conducted to come out with other uses of the crop rather than funeral performances or rites, gifts and medicinal uses. There should be further research on the uses (dishes prepared from) Bambara groundnut so that this would help popularize the crop. Finally, there is the need to research into ways of managing pests and disease of Bambara groundnut so that farmers could boost the cultivation of the crop on large scale basis. Besides, there should be a recommended chemical for storage to enhance their shelf life.

REFERENCES

- [1] Alhassan, G.A., Kalu, B.A. and Egbe, O.M. (2012), "T Influence of planting densities on the performance of intercropped bambara groundnut with cowpea in Makurdi, Benue state, Nigeria", International Journal of Development and Sustainability, Vol. 1 No. 3 (In Press).
- [2] Adu-Dapaah, H, Berchie, JN, Nelson-Quartey, F, Plahar, WA, Yawson, IQW, Dankyi, AA and Haleegoah, J. (2006). Molecular, Environment and Nutritional Evaluation of Bambara groundnut (*Vigna subterranean* (L.) Verdc.) for Food Production in Semi-arid Africa and India. First Scientific Report (January 2006-December 2006). Pp 17-35.
- [3] Adu-Dapaah, HK, Asibuo JY, Danquah, AO, Owusu-Akyaw, M., Haleegoah, J and Amoatey, H., (2004). Bambara groundnut Improvement through Mutation Breeding in Ghana. Proceedings of the Final Research Coordination Workshop in Genetic Improvement of underutilized and Neglected Crops in Low income Food Deficit countries through Irradiation and Related Techniques, May 19-23, Pretoria, South Africa, Pp: 37-48.
- [4] Akpalu, MM. (2010), "Growth, yield and nutritional quality of five bambara groundnut (*Vigna subterranean* (L.) Verdc.) landraces to different plant population densities". Thesis (Master of Science), Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.
- [5] Amarteifio, JO, Karikari, SK and Moichubedi, E (1998). The Condensed Tannin Content of Bambara Seed. Proceedings of the 3rd International Workshop on Antinutritional Factors in Legume Seeds and Rape and Rapeseeds, (IWAFLSRR'98), European Association for Animal Production (EAAP) publication No. 93 Wageningen Press, Wageningen, Netherlands, Pp: 141-143.
- [6] Anchirinah, V. and Bennet-Lartey, SO (2002). Monitoring Genetic Diversity of Bambara Groundnut (*Vigna subterranea* (L.) verdc.) in Two Districts of the Upper West Region of Ghana through Ethno-botanic and Genetic Erosion Studies. In: promotion of Bambara groundnut (*Vigna subterranea* (L.) verdc.): Latest Developments of Bambara Groundnut Research, Begemann, F., I Mukema and E. Obel-Lawson, (Eds.). IPGRI, Nairobi, Kenya. Pp 46-65
- [7] Anchirinah, VM., Yiridoe, EK., and Bennet-Lartey, SO (2001). Enhancing Sustainable Production and Genetic Resource Conservation of Bambara Groundnut: A survey of Indigenous Agricultural Knowledge Systems. Outlook Agric., 30:281-288.
- [8] Brink, M. and Belay, G (2006). Plant Resources of Tropical Africa 1. Cereals and Pulses. PROTA Foundation Wageningen, Netherlands/Backhuys Publishers, Leiden, Netherlands/CTA, Wageningen, Netherlands.
- [9] Doku, E.V. and S.K. Karikari, S.K. 1971. Operational Selection in wild Bambara groundnut. Ghana Journal of Science 11: 45-56.
- [10] Doku, EV and Kakari, SK. (1971). Bambara groundnut. Econ. Bot .25(3):225-252.
- [11] Doku, EV. (1996). Research on Germplasm Collection, Temperature and Photoperiod Responses of Bambara groundnut. Pp: 40-42.

- [12] Goli, AE., (1997). Bibliographical review. In: J. Heller, F. Begemann and J. Mushonga, (Eds.), Proceedings of the Workshop on Conservation and Improvement of Bambara Groundnut (*Vigna subterranea* (L.) Verdc.), 14–16 November 1995, Harare, Zimbabwe. Institute of Plant Genetics and Crop Plant Research, Gatersleben, Department of Research & Specialist Services, Harare and International Plant Genetic Resources Institute, Rome, Italy.
- [13] Hillocks, RJ, Bennett, C and Mponda, OM (2012). Bambara Nut: A Review of Utilization, Market Potential and Crop Improvement. African Crop Science Journal, Vol. 20, No. 1, March, 2012, pp. 1-16.