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Agronomic Practices and Farming Systems Among Cassava Farmers in Oyo State, Nigeria

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Abstract: This survey aimed to evaluate agronomic practices and farming systems among cassava farmers in three selected local government areas (LGA) in Oyo State notable for cassava production and value addition. Ninety structured questionnaires were administered to cassava farmers in Iwajowa, Ogooluwa and Ido local governments with equal number of participants selected across the locations. Purposive gender equitable, social and inclusive sampling comprises of adults, youths, male and female cassava farmers was adopted. Data were collected on planting method, portion of cassava stem planted, cropping method, weeding method or regime, use of fertiliser, spacing and other major cassava production attributes that enhance its productivity. Across locations, 60% of farmers' plant cassava on ridges and 90% uses slanting orientation. 88.9% of the farmers intercropped cassava with other crops. 23.2% of the sampled farmers used inorganic fertiliser. It was observed that 25.5% of cassava farmers used only manual (hoe) weeding method while 74.5% used both chemical and hoe weeding. It was also observed that 86.7% (55.1% men, 31.6% women) of the farmers grew cassava solely for the roots while 13.3% farmers (7.5% male and 5.8% female) engaged in both roots and stem cuttings business.

Keywords: *Cassava - Farmers – Inorganic Fertilizer – Weeding Method.*

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I. INTRODUCTION

Cassava (*Manihot esculenta* Crantz) is an extensively produced food security crop in the tropics. Cassava production is important to Nigeria's government due to population increase and local consumption (El-Sharkawy, 1993). In terms of carbohydrate yields and drought resistance, it is superior to maize or rice. However, its drought tolerance is second only to yams (IITA, 2010). According to Asante-Pok (2013), cassava offers calories to 37% of the daily energy requirements of 500 000 000 people in Africa and it is consumed by nearly one billion people worldwide (Prochnik *et al*., 2012). Cassava can also be called hunger, conflict and drought crop due to its multipurpose use and adaptability to harsh environments (Pearce, 2007).

Nigeria has more potential to enhance cassava production than Thailand and Indonesia if suitable measures such as government subsidies on farm inputs (fertilisers, seeds, stems, seedlings, and so on) are put in place (Edamisan *et al*., 2020). Cassava is commonly propagated by stem cuttings. The portion, size of stem cuttings and planting pattern adopted during cultivation of cassava has effect on sprouting, survival, ease of harvest and root yield root production at harvest.

The choice of planting method is determined by ease of planting, harvesting and expected yield (Lebot, 2009). A mature cassava stem has three stem sections, namely, the hardwood (basal portion), semi-hardwood (middle portion) and shoot tip (top portion). Cutting sizes and quality in terms of age, thickness, and number of nodes per stalk are vital for obtaining greater yield in any productive system (Toro and Atlee, 1984).

Orientation of planting and environmental conditions determine the suitable planting position that could be adopted, which varies across agro-ecological zones. Cassava cuttings are usually planted in the field in three different orientations, which are upright in vertical position, upright at an angle (slant) or horizontally beneath the soil (Narmilan and Puvanitha, 2020). The orientation of the cuttings influences several growth characteristics of cassava like the number of leaves and leaf area (Legese et. al., 2011).

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Cassava grown on ridges produced higher root yields, and increased number of roots plant^{-1} is a main contributor (Ennin, *et al*., 2009). With the nodes facing upward, angular or horizontal planting position of cassava cuttings is effective. In regions with high water table, however, angular (slanted) planting on mounds or ridges (raised beds) is required (Polthanee and Wongpichet, 2017). Climate, soil type, topography, and cropping system all influence the land preparation methods, such as mounds, ridges, flat-tilled or not-tilled (Lebot, 2009).

For maximal root production in fertile soils, cassava stakes (15 to 30 cm long) planted at 1 m inters and intra row to give 10,000 plants ha^{-1} is utilized and up to 2 m inter-row spacing and about 0.5 m intra-row spacing are utilized when cassava is intercropped with other crops (Iijima et. al. 2004). Plants planted closer together produced more roots and yielded more than those with a higher population (> 12,500 plants ha^{-1}) (Villamayor *et al*., 1992).

Weed has been a major constraints to cassava production with its impact on yield at harvest and implication on total production cost (Ekeleme and Hauser, 2017). In West Africa, less than 3% of cassava farmers use herbicides, due to its harmful impacts on development and yield of crop, and the environment (Ogundola and Liasu, 2006). Reduction in weed competition is possible by planting at the beginning of dry season and timely fertiliser application to enhance closure of plant canopy (Howeler, 2014).

Cassava is frequently intercropped with maize, cowpea, melon, okra, and green vegetables due to their growth habits (Leihner, 2002). Higher FRY was reported when cassava is grown with groundnut compared to cassava-cowpea and cassava-soybean systems (Mansaray *et al*., 2012). Hence, productivity of an intercrop system will differ with component variety and environment. Few cassava farmers in Africa apply fertilisers to soil due to transportation costs, logistic defects, delivery failures and other factors, and few fertiliser studies have been conducted with cassava (Idachaba, 2000). However, application of NPK fertiliser considerably enhanced DRY, total biomass, and LAI (Didier and Mabrouk, 1994). Crop yields are boosted and biological, physical, and chemical aspects of the soil, either directly or indirectly are altered when inorganic fertilisers, particularly N, P and K were applied. Hence, harvesting all parts of the plant removes 2.9–3.6, 0.8–1.3 and 5.3–7.9 kg Nitrogen, Phosphorus and Potassium per tonne fresh root weight respectively depending on cassava variety (Polthanee and Wongpichet, 2017).

Therefore the objective of this survey is to evaluate agronomic practices and farming systems among cassava farmers in three local government areas (LGA) in Oyo State.

II. MATERIALS AND METHODS

- *Field Survey on Cassava Farmers Practices*

Ninety structured questionnaires were administered to farmers in Elekokan, Pontela and Elere-Adeogun villages which are respectively in Iwajowa, Ogooluwa and Ido local government areas of Oyo State, Nigeria. The selection includes indigene and non-indigene cassava farmers in the areas and thirty questionnaires were administered per location.

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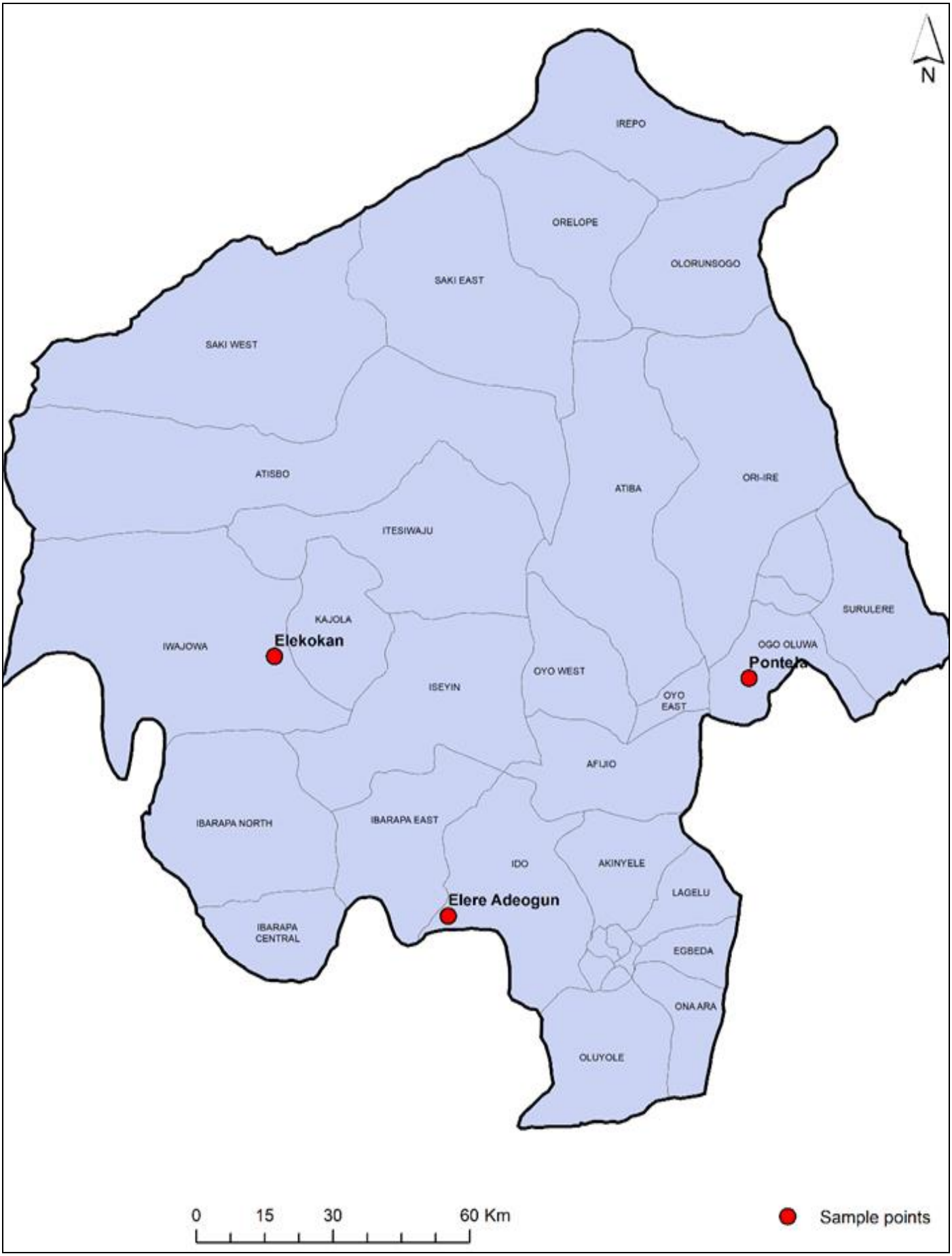

Fig 1 Map of Oyo State Showing the Three Communities where Survey was Carried Out

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➢ *Data Collection and Statistical Analysis*

Farmers practices such as planting method, weeding method, cropping method, spacing and major harvest interest was evaluated. All data collected were analyzed using SPSS and descriptive statistics. The qualitative data was analyzed using thematic and content analysis.

III. RESULT

The distribution of cassava farmers in Ibadan, Oyo State Nigeria based on the agronomic practices and farming systems they usually undertake is as shown in the figure below.

Agronomic methods and planting pattern adopted by participants in the study varied. About two-third of the participants planted on ridges (60%), more than average (54.4%) of the population surveyed used cassava stem cuttings not less than 20cm length for planting with less than half (46.7%) of the population plant the mid (semi-hardwood) portion of cassava stem. Majority (90%) of the participants adopted slant method for cassava planting. Cassava intercrop is a common practice among the surveyed population (88.9%) with half of the participants adopted spacing of 1 m x 1 m. The population surveyed explored multiple weed control methods, 25.5 % of the participants used hoe-weeding only while the rest of the population combined hoe-weeding and use of herbicides.

Use of inorganic fertilizer is not common among the farmers in the selected locations in the three local government areas of Oyo state. A very few (23.2%) adopted use of inorganic fertilizer on cassava farms. More than half (53.7%) of the selected farmers from the surveyed local government areas of Oyo state (53.7%) ratooned cassava stem cuttings before harvest and the major interest of engaging in cassava cultivation by farmers (86.7%) in the area was root production for sale.

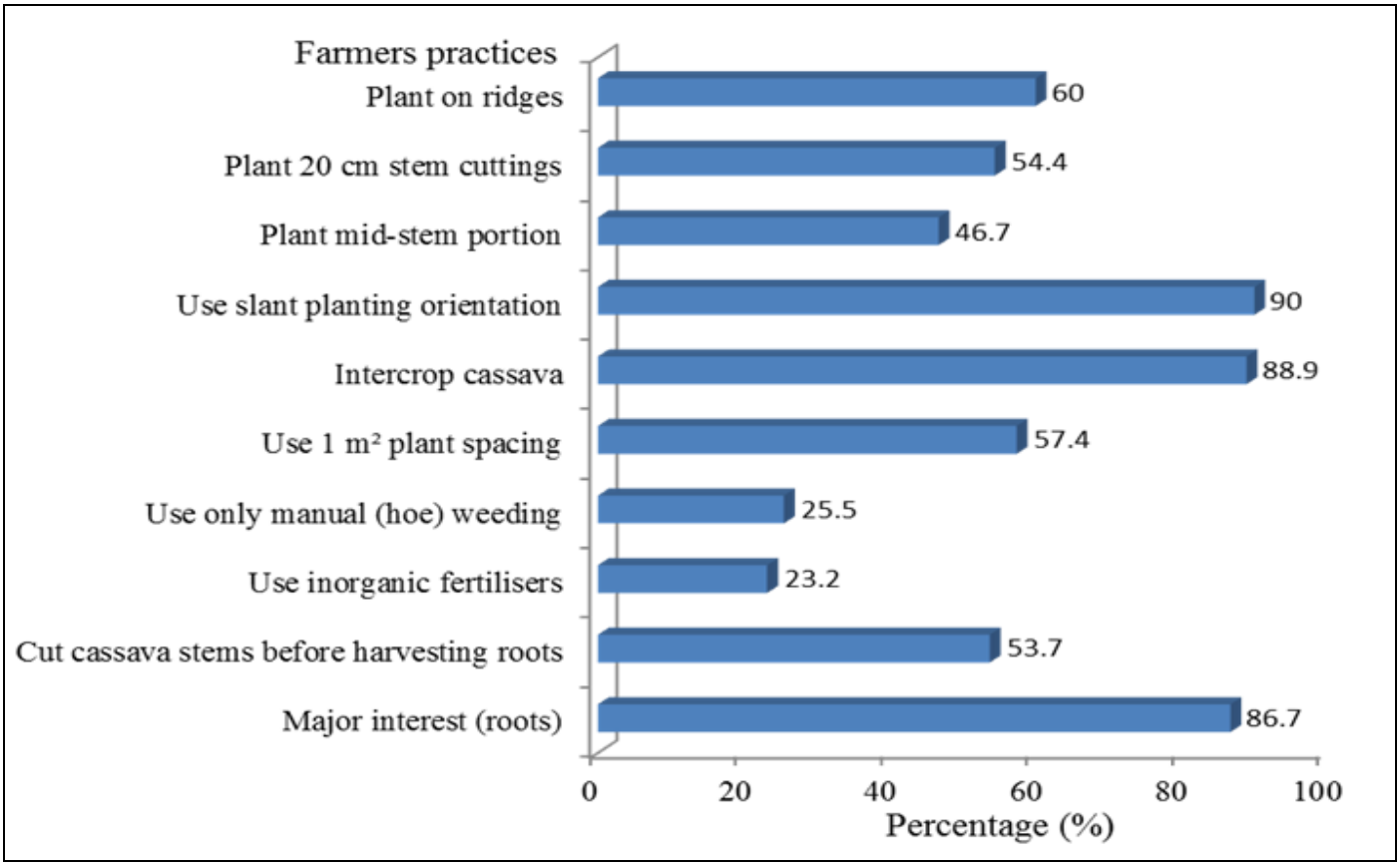

Fig 2 Farming Systems

Percentage of some agronomic practices and farming systems among 90 cassava farmers in Iwajowa, Ogooluwa and Ido Local Government Areas of Oyo State, Nigeria.

IV. DISCUSSION

Cassava is a resilient and food security crop in Africa. Its versatility of multiple uses and need of little or no production inputs make it inevitable crop cultivated by farmers across countries in Africa especially in Nigeria where mostly smallholder farmers grow it.

More than half of farmers in the surveyed areas adopted planting of cassava on ridges. This implies that farmers in the areas are knowledgeable about cassava farming and understand the significance of using ridges for the cultivation of root and tuber crops. Ridges enhance root formation, bulking and root size, which have implications on cassava yield and productivity. It has been confirmed that cassava planted on ridges does better in terms of aeration, root size, and root production as ridges ease stem penetration, anchor the planted stem properly, leading to better establishment and higher yield at harvest. Cassava

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also does well on a flat land well prepared with thorough ploughing. Okogbenin et al 1999 found that cassava planted slantly on ridges did better in terms of plant height, this will be a recommended method for Seed entrepreneurs.

On the portion and size of stem cuttings used in cassava cultivation, farmers in the surveyed area used semi-hardwood portion with about 20 cm long. Farmers planted different portion of cassava stem like greenish, semi-hardwood and hardwood portion. Greenish part germinates faster in the rainy season but survival rate is slow when encountered harsh climate change especially incessant rainfall after planting. Semi-hard and hardwood portion of cassava stem cuttings have better establishment and resilient to climate change. The length of stem cuttings, number of nodes and its closeness on cassava stem cuttings contributes to root production and yield recorded by cassava stands on the field leading to higher productivity and food security. Use of semi-hardwood of about 20cm long indicates that farmers in the surveyed areas know the implication and significance of better agronomic practice that enhance performance and productivity. It was suggested that long, moderately thick stalks, taken from the basal part of the plant, result in higher root yield. Cassava cuttings produced from different sections of the stem have a varying influence on subsequent growth and yield of cassava (Legese et. al., 2011). Long cassava stem cutting size produced four to six nodes; such stem size accumulate better carbohydrate reserves that enhanced survival and root length. This important factor influences rooting ability and growth performance (Adugna et. al., 2015).

The planting method like slant planting and spacing adopted by farmers in the selected locations enhances cassava root production. Slant planting enhances better establishment, ease of pulling cassava at harvest while good spacing allow cassava to bulk properly. Adoption of slanting method of planting by most of the farmers (90%) surveyed in the selected areas buttressed that selected farmers were conscious of appropriate cultural practices that enhances cassava root production. This corroborated previous studies of Abdullahi et al. (2014) and Legese et al. (2011) that planting cassava in inclined or slanted position enhanced storage roots yield of cassava. Inclined planting methods produced cassava with higher germination and survival rates after planting. This is attributed to hormonal action on the orientation of stems during planting (Ogundare, 2017). Slanting method of planting cassava also enhances cassava plant height and increases root dry matter yield, number and weight of roots produced per stand (Mbah et. al., 2008; Ikeh et. al., 2023)

Conversion of existing farm settlement and most arable land to industrial and residential areas by land developers restricted farmers to cultivate within their homestead or adopted intercropping in Nigeria. Plant growth habits and spatial arrangement on the field determine crop combination adopted for intercropping (Oguzor, 2007). Farmers explored intercropping for better use of physical resources (solar radiation, mineral nutrients, water). Intercropping resulted in higher labour productivity, yield stability, alleviate weed problem, provide early income and avert risks of crops failure (Gebisa et. al., 2020). Intercropping of cassava with grain legumes and cereals resulted in greater land use efficiency and profitable cost-benefits (Gezahegn et. al., 2022). The benefits of intercropping and the restriction on land access prompted the farmers in the selected localities to adopt cassava-intercropping practices for optimal use of available and accessible land.

Rapid adoption and integration of cassava into the traditional farming and food systems of Africa was because of its supposed low inputs, relative ease of cultivation and processing. Cassava farmers in Africa are most interested in the bigger storage roots, which are processed and eaten by humans (Salick *et al*., 1997). Majority of cassava farmers in Oyo State planted only for the roots and intercropped cassava with short-term crops mostly maize, according to the findings of this study's survey. This was similar to the findings of Makinde and Ayoola (2007), who found that cassava farmers in south western Nigeria intercropped cassava with a variety of crops. Cassava (Manihot spp.) is one of Nigeria's key basic food crops, alongside yams, rice, maize, sorghum, and millet and it is primarily produced with several other crops in the tropics, according to NEEDS (2004). Slant planting was used by many farmers on ridges. Not too many cassava farmers in Ibadan use mineral fertilisers and herbicides on their farms' soils.

V. CONCLUSIONS AND RECOMMENDATION

Adoption of innovative technologies that enhance production and greater return on investment is important for agricultural sustainability. Farmers in the areas need to be informed on the importance of adoption of good agronomic practices that enhance cassava productivity. Agricultural training program, organization of framers Field day and establishment of cassava demonstration plot in the areas could be harnessed to change orientation of the farmers on use of fertilizer and best cultural practices to boast cassava production.

Furthermore, farmers in the area need training on the appropriate portion and size of stem cuttings suitable for cassava production to improve their yield and productivity. Youths can be introduced to the cassava seed system and train as Cassava Seed Entrepreneurs and women can be trained on cassava value addition to enhance their nutrition and livelihoods.

Government should discourage conversion of existing farm settlement into industrial and residential areas as well as attack on farmers. Proper security of the farm and farmers should be the priority of the government to prevent scaring of agile and productive youths and adults who engaged in farming as livelihood. This is imperative to create enabling environment to practice agriculture to produce food to feed the teeming population in the country.

High variation in growth and productivity of cassava crop in farmers' farm and researchers' field is basically due to inadequate agronomic practices and poor farming

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systems. Majority of cassava farmers in Oyo State does not apply fertiliser to the soil and always intercrop cassava. They also cut cassava stems before harvesting roots and use slant planting orientation. These explain the high variation in growth and productivity of cassava crop in farmers' farm and researchers' field. Hence, Cassava farmers in Oyo State should improve on their agronomic and farming systems for increased in yields.

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