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AN OVERVIEWV OF THE ROLE OF AGRICULTURAL EXTENSION AGENTS IN ADOPTION OF PLANT BREEDING PRACTICES FOR SUSTAINABLE DATE PALM PRODUCTION IN NIGERIA

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Abstract
The study reviews the role of agricultural extension agents in plant breeding for sustainable production of Date Palm in Nigeria. It is a known fact that plant breeding has significantly contributed towards increasing the level of production of various crop plants in Nigeria. However, researches and improved innovations in plant breeding require strong and sound linkages to the farmers to increase crop production for sustainable livelihood in Nigeria. This paper discussed the concept of plant breeding, its techniques and impact towards improving the productivity of both the food and cash crops in Nigeria. The paper also outlined the qualities and role of agricultural extension agents towards adoption of crop plant breeding techniques for sustainable and optimum production of date palm in the country. The review concluded that the production status of date palm in Nigeria can be improved through plant breeding practices by the use of effective and efficient agricultural extension agents and it is also recommended the need to set up a National Date Palm Research Centre/Institute where researchers are stationed with Agricultural extension officers that are mandated to not only spread the innovations of the researchers but must also listen to the needs and concerns of the date palm farmers across date palm producing States of Nigeria.
Keywords: Overview, Extension Agents, role, adoption, date palm, production.

1.0 Introduction

Date Palm (*Phoenix dactylifera L.*) is one of the oldest fruit tree plants domesticated by man (Sanusi *et.al*, 2014,Wisegeek, 2011). Date Palm is a perennial dioecious monocotyledon tree crop plant, which has been cultivated not only for their valuable fruits (dates), but also for producing fuel, fibre and as shelter for ground crops. It plays an important role in the ecology of various desert and semi-desert environments by providing a shelter to the ground, thereby helping to protect the soil against harsh weather, control erosion and improve the soil fertility by conserving water (Sanusi and Adeleye, 2018). Furthermore, in the areas where it is cultivated, the Date Palm contributes to the creation of a micro-climate that enables agricultural development of other species. According to Isma'il and Abdoulbaseet (2019), the centre of origin of Date Palm is still uncertain even though there are several claims that it originated from Babel in Iraq, from Dareen or Hofuf in Saudi Arabia or Harqan and also from an island on the Arabian Gulf in Bahrain. According to FAO (2021), presently, world production of Date Palm is approximately 9.8 million metric tonns on an area of over a million hectares and the world leading Date Palm producing countries in the year 2021 are Egypt with annual production of 1,694,813 Million Metric Tonns (MT), Saudi Arabia (1,645,362 MT), Iran (1,065,704 MT), Algeria (1,029,596 MT), Iraq (615,211 MT), Pakistan (494,601 MT), Sudan (439,120 MT), Oman (348,642 MT), UAE (671,891 MT) and Tunisia (241,000 MMT). The statistic of Date Palm production of the major producing countries is shown below:

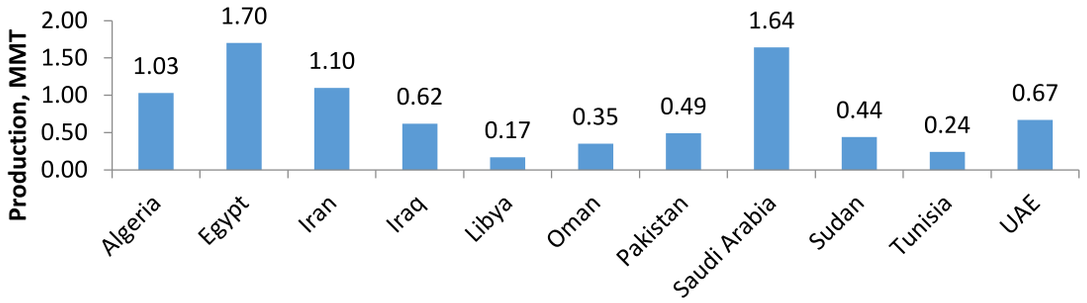


Fig. 1: Date palm producing countries

Other African countries involved in Date Palm production include Morocco, Mauritania, Libya, Mali, Nigeria and Chad. Improvement in crop production practices over the world could be attributed to access to information on innovations and techniques in production processes from the research institutions/centers through agricultural extension agents. This is very vital to adoption of plant breeding practices that are aimed at increasing Date Palm production in the country. Therefore, it is of paramount importance to examine the role of agricultural extension agents in disseminating information on plant breeding practices for sustainable livelihood through optimum production of Date Palm in Nigeria.

2.0 Objective of the Study

The aim of this study was to review date palm production level in Nigeria with a view to raise points that needs urgent attention and linking these points to how Agricultural extension agents can encourage the development of the Date Palm sub-sector in Nigeria.

The specific objectives of this study were to:

i. assess the production status of Date Palm in Nigeria.,
ii. identify plant breeding activities on Date Palm in Nigeria and
iii. identify the roles of agricultural extension agents in disseminating information towards the adoption of plant breeding practices among Date Palm farmers.

3.0 Production Status of Date Palm in Nigeria

Date Palm tree crop plant has been introduced into Nigeria in the early seventeenth century through the trans-Saharan trade route. Production of this tree crop plant has not gained so much attention from the farmers in Nigeria but the crop strives well in Northern parts of the country particularly regions above latitude 100^{o} North of the equator Okolo *et. al.* (2000). Production level of Date Palm in Nigeria is low (Sanusi *et al.,* 2016) but there is high demand for the fruits of the crop, which makes the country a net importer of Date Palm to meet local demand. Okolo, Okuwagwu and Ataga (2005) pointed out that Date Palm production in Nigeria is restricted to compound homestead and orchards in the Northern parts where it is considered as one of the most important tree crops. Map of Nigeria showing the location Date Palm producing state is presented below:

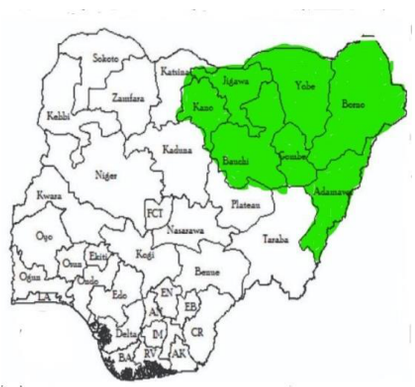


Fig.2: Map of Nigeria showing the location of major date palm producing States

Nigeria is not among the major producers of Date Palm and this may be the reason why many Nigerians have not taken advantage of this crop of high economic value. However, the country recorded an annual production of 21, 700 Metric tonns with a female Date Palm tree producing 10 kg – 75 kg of fruits annually at maturity with a mean population yield of 255.4kg (NIFOR, 2008). According to AbdulQadir *et al.* (2011), average annual Date Palm production from some of the Nigerian States is given below:

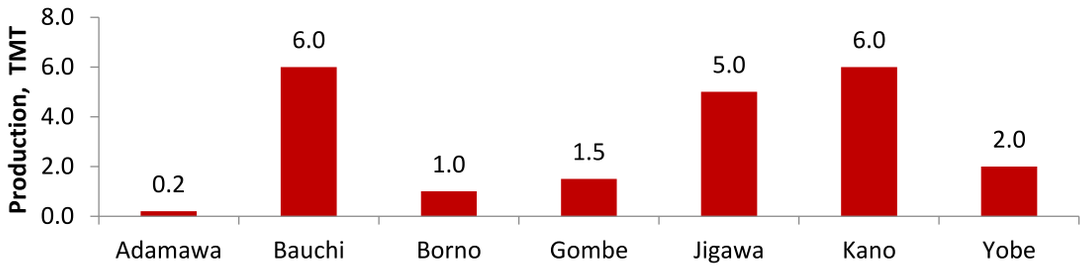


Fig. 3: Date palm producing states in Nigeria

Date Palm is essentially produced for its edible fruits, which are used in confectioneries, syrup, and baker's yeast production. The secondary products of Date Palm such as the leaves are used for making bags, baskets, beds, calf muzzles, and hats, while the trunks are used as buoyancy blocks for boats, in windows and door frames, and in ladders (Kabiru, Abiodun and Florence, 2017)). The most popular Date Palm varieties in Nigeria in commercial quantities are presented in the figure below:



Plot 1: Ajwan variety from Saudi Arabia



Plot.1: Dan – Mali North African Variety





Plot. 4: Khala date palm variety

4.0 Plant Breeding Practices on Date Palm in Nigeria

Plant breeding is the art and science of improving plant characteristics through hereditary dealing with genetic improvement in crop plants, the process also known as crop improvement. According to Acquaah (2012); Niazian & Niedbała (2020), plant breeding is an area of crop science mainly concerned with deliberate effort to change plants nature, and/or utilization of desired heritable variation that exist in the plant gene pool and its related wild species for the development of new improved varieties to increase crop productivity. Thus, plant breeding has the potential to resolve agricultural productivity problems to enhance food security for sustainable livelihood. Gbenga (2021) pointed out that understanding, knowledge and information on the genetic base of the traits to improve, its mode of inheritance, the extent of gene actions, heterosis, the combined abilities and mode of action are the key pillars that plant breeders use to make improvement on crop plants. The plant breeding programs in Nigeria]have evolved over time to identify new traits

beyond yields, diseases and pest resistance to include improved seed biology, abiotic and biotic stress tolerance/resistance, the threat of climate change, crop resource use efficiency, and new market-driven post-harvest/industrial qualities. The techniques and approaches for classical breeding crop plants include germplasm assemblage and population improvement, recurrent selection, generation of genetic stocks and hybrid development through heterosis (Kyetere, Okogbenin, Okeno, Sanni, Munyaradzi, Nangayo, Kouko, Oikeh, and Abdourhame, 2019). The concept of plant breeding aims to improve the characteristics of crop plants so that they became more desirable agronomically and economically. Plant breeding has been in practice for the various reasons to include crop higher yield, improve crop product quality, biotic and abiotic resistance, desirable agronomic characteristics, wider crop adaptability and the development of new cultivars.

Date Palm tree crop plant has undergoes different forms of plant breeding practices aimed at increased genetic diversity. Because of the economic importance of Date Palm products in the country, the Nigerian Institute for Oil-Palm Research (NIFOR) conducted various researches and development work on Date Palm new cultivars, the sprouting of the nuts through nursery practices, field establishment and management, as well as post-harvest activities (Omoti & Okolo, 2000; Sanusi, Omokhudu, Bello, & Yahaya, 2016). According to Yusuf, Culham , Aljuhani , Ataga, Hamza, Odewale and Enaberue (2015), the common cultivars available in Nigeria include Deglet Noor, Danmali, Zabeeya, Makekashi, Shuwaarin, Mangyare and Tirgal. The institute also embarked on several collections of land races and exotic varieties of Date Palm to establish a germplasm both for conservation against genetic erosion and for crop improvement studies. According to Ataga, Mohammed and Yusuf (2012), these collections have been used to establish seven gene banks. (Agwu, Onwubuya, Omamor, Osuhur, Abubakar, Aisagbonhi and Uyovbisere 2012) pointed out that some of these land races have been morphologically characterized based on fruit characters and broadly classified in to large, medium and small fruits and further evaluation of these land races identified superior genotypes of better performance and capable of producing more yield annually.

Plant breeding on Date Palm involves the crosses and backcrosses methodology which takes more time of an average of 30 years (El Hadrami and El Hadram, 2009). But through the adoption of tissues culture techniques and other biotechnologies, the breeding practices becomes easier and faster (Al-Khari, Naik,Jain, and Johnson, 2018). Some of the plant breeding practices on Date Palm include utilization of genetic variation, varietal characterization, gene-based characterization, biotechnologies (tissue culture) and sex determination.

4.1 Dissemination of Innovations and Information on Date Palm Breeding Practices

The transfer of information from research institutions/centers to farmers on new plant breeding practices and development of new cultivars is very vital and necessary for sustainable and optimum production of Date Palm. Despite the various breeding researches on new innovations and techniques on Date Palm there is insufficient data on the description and variability in Date Palms grown in different parts of Nigeria. Research information on Date Palm breeding is so critical that the productivity of other influencing factors is anchored on its reliability. **The Agricultural** extension agents are intermediaries between these plant breeding researches and the farmers. They operate as facilitators and communicators, helping farmers in their decision-making and ensuring that appropriate knowledge is implemented to obtain the best results with regard to optimum Date Palm production for sustainable livelihood. The qualities of Agricultural extension agents who are professionally trained are as follows:

1. *Commitment:* Agricultural extension agents are working in isolated rural areas with sense of dedication and determination to achieve the desired objectives.
2. *Confidence:* Agricultural extension agents relied on their abilities and determination to bring about new changes for improvement in agricultural production
3. *Reliability:* Agricultural extension agents extend agricultural services to reach the larger population of the farmers without close supervision of their superiors.

4. *Humility:* Agricultural extension agents are sensitive to the wishes and feelings of the farmers and at the same time respect their way of life.

Considering the above qualities, agricultural extension agents have to work with different people in a variety of different way to effectively perform their functions. Therefore, the role of agricultural extension agent towards improving date palm production for sustainable livelihood through plant breeding practices covers the following major areas:

1. Technology transfer on date palm breeding practices from agricultural research institutes/centers to the farmers at rural level for increased productivity.
2. Transformation of farmers attitudes and behavior towards change in modern production process through plant breeding
3. Sourcing for farmers the product of plant breeding on date palm such as new cultivars and improved management practices.
4. Communicating date palm breeding research outcomes on new innovations and techniques to farmers for increased productivity.
5. Practical demonstration to farmers the innovations and plant breeding techniques to bring production realities on the farmers filed.
6. Influencing farmers-decision making process on the utilization and adoption of date palm breeding outcomes.
7. Conveyance of farmer's needs and constraints related to utilization and adoption of date palm breeding outcomes.

5.0 Conclusion and Recommendations

5.1 Conclusion

Nigeria is an importer of date palm fruits and it products to meet local demand. This is due to the fact that the level of production of date palm in the country is very low because the production is concentrated in the North east- and North- west zones of the country. However, there are has been various plant breeding researches such genetic variation, tissue culture, varietal characterization, gene-based characterization and sex determination related to date palm breeding from national Institute for Oil palm Research (NIFOR), International Institute of Tropical Agriculture (IITA) and Jigawa Tropical Tree Research Institute (JTTRI). The outcomes of various researches from the research institutes can only reach the farmers through a good network of agricultural extension agents. Dissemination of research information on date palm breeding is the center point for increased productivity of this important tree crop plant for sustainable livelihood. The **agricultural** extension agents are the linkages between plant breeding researches outcomes and the farmers. They serve as educators, communicators and facilitators to helping farmers in the process of decision-making and utilization new plant breeding innovation and at the same time formulate immediate solutions to famer's problems related to optimum date palm production for sustainable livelihood.

5.2 Recommendation

This review recommends that:

1. the Nigerian government should copy the practice of the leading Date Palm producing countries of the world to set up and adequately fund an independent research institute for the development of date palm and its products in the country. .
2. Agricultural extension agents of the institute to be properly equipped to not only spread the innovations of the date palm breeding researchers but to convey constraints and the immediate needs and concerns of the date farmers across the date producing states of Nigeria.

3. Furthermore, agricultural policy formulators should design a National policy on Date Palm production as this will guide successive governments to make informed decisions that concerns optimum production of this economic crop in Nigeria.

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