A VIABLE SEED ENTERPRISE FOR SUSTAINABLE CROP PRODUCTION AND FOOD SECURITY IN NIGERIA: A REVIEW

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ABSTRACT
Farmers depend on access to good quality seeds as the foundation for optimum crop yield. Easy access to quality seeds can be achieved and guaranteed only if there is a viable seed supply system to multiply and distribute seeds that have been produced and preserved. Most crops in developing countries are still planted with farmers' varieties and farm-saved seeds. Private seed companies tend to concentrate on production of hybrid seeds, especially of high-value crops grown by larger farmers and targeting those who are able to pay for the seeds. This paper seeks to emphasize on the need for viable seed enterprise for sustainable crop production and food security. It lists the types of seeds: Breeder, Foundation and Certified seeds; and outlines the role of the National Agricultural Seed Council (NASC). Some problems of the Nigerian seed industry have been outlined and the way forward for a viable seed enterprise for sustainable crop production suggested.
Keywords: **Breeder seeds, certified seeds, crop production, food security, viable seed**

INTRODUCTION

Seeds are the propagating organs formed in the sexual reproductive cycle of flowering plants. They are commonly used for commercial crop production. A seed is formed when a male gamete (pollen grain) fertilizes the female gamete (ovule). Seeds are therefore, a means of sexual reproduction which produces a remixing of genetic material and variability. Plant Breeders make use of the genetic variability within a seed to determine the potential for quantity and quality of the final crop. Seed quality describes the potential performance of a seed lot and high-quality seed should be pure (true to type) with good yield potential, high germination percentage and vigor, free from seed of other crops, inert matter, weed seeds, pests and diseases (Okpara, 2019). High quality seed lots should meet minimum standards for each of these characteristics, as seed is one of the most important inputs in all crop-based agriculture. A good seed is essential in crop production and has a central role to play in enhancing yield and in sustainable production. Despite its importance, efforts to develop an efficient national seed system have not yielded the desired results.

Sustainable crop production is a way of growing or raising food in an ecologically and ethically responsible manner. This includes adhering to agricultural and food production practices that do not harm the environment, that provide fair treatment to workers, and that support and sustain local communities. Sustainable crop production practices can lead to higher yields over time, with less need for expensive and environmentally damaging inputs.

Generally, the lack of efficient seed systems for multiplication, lack of improved varieties and inefficient production technologies constrain crop yields in Nigeria. Seed system is a critical factor in the food security of any nation and its quality and stability in the food environment are vital if food production will be sustainably managed. A viable or efficient seed system should provide farmers with planting materials in sufficient quantities, at the right time, of an appropriate physiological state, vigour and health, of superior genotypes appropriate to the farmer's purposes and at an affordable price (Gibson *et al*, 2011).

THE SEED ENTERPRISE IN NIGERIA

Seed systems are mostly mixtures of formal and informal systems and private and public. In Nigeria, the seed system is mostly informal and private sector with occasional formal distribution for disaster relief and of new varieties by government. While the formal seed sector has had considerable impact on the production and supply of hybrid maize seeds and seeds of other high value crops like rice and soybean, many small grain and other indigenous crops grown by small holder farmers have been neglected, largely because of their low financial returns (Okpara, 2019). Bearing in mind that these crops hold the key to household and national food security, denying small holder farmers continuous availability of high-quality seed implies that food security will remain unattainable (CTA, 2000). Langerak (1992) stressed that growth in agricultural output of any nation depends on a well-organized seed production system as it provides agriculture with great potentials for high yield of quality products. Mba (1991) however, observed that the agricultural sector in ACP (African, Caribbean and Pacific) countries must undergo transformation in the area of seed technology, if it is to meet the ever-increasing demand for food products owing to high population growth.

TYPES OF SEEDS

Breeder seeds: produced by the Plant Breeder. Breeder seed produced should meet all prescribed standards viz. genetic purity (99.9 % more), physical purity (98%). Germination (as per crop) moisture content (less than 12%).

Foundation Seeds: Obtained from the Breeder seed which can be clearly traced to Breeder. Produced by seed companies

Certified Seeds: This is the last stage, which actually reaches the farmer. Contract growers (farmers) obtain foundation seeds from seed companies to produce certified seeds

THE NATIONAL AGRICULTURAL SEED COUNCIL (NASC)

The National Agricultural Seed Council (NASC) formerly known as Nigerian National Seed Service was established in 1975 as UNDP/FAO assisted special project with the following objectives (Adeniji and Joshua, 1991):

i. Multiplication of breeders seed
ii. Provision of foundation seeds for state production agencies
iii. Making improved seeds reach farmers in all states of the federation
iv. National seed technology training programmes
v. Seed industry development with maximum private sector participation
vi. Coordination of seed production activities
vii. Interstate marketing activities

NASC is the principal institution for the implementation of National seed policy and its functions cover the administration of the National seed policy for the country including the regulation of the market towards competitiveness and quality control to protect the farm population and the environment. Presently, there are six zonal offices at Ibadan,

Zaria, Umudike, Asaba, Gombe and Jos with laboratories for seed testing and a molecular laboratory at Sheda, Abuja.

Evidently, it has been the deliberate policy of the federal government of Nigeria to provide a conducive environment for the sustenance of a virile and market driven seed industry for the production, processing and marketing of high-quality seeds that are readily available, accessible and affordable in all parts of the country (Ojo, 2016). Despite the efforts of government, there have been limited successes and the issue of food security still remains grim, as our farm yields remain among the lowest in the world. The rapid transformation envisaged in the agricultural sector has however not been realized, with Nigeria being classified as one of the poorest countries in the world. Over 70 percent of the population is classified as poor, living on less than $1.25 a day, while 35 percent live in absolute poverty (The Sun, 29 August 2019).

In India, by comparison, at independence in 1947 suffered chronic food shortages caused by crop failure due to declining soil productivity, drought and monsoonal typhoons. With a burgeoning population, India with closely similar colonial history as Nigeria, had similar university and agricultural research systems but still suffered abysmal agricultural production and productivity shortfalls (Ezedinma, 1991). By 1960, India took the bold step to establish her first university of Agriculture at Uttar Pradesh while Punjab Agricultural University (PAU) was established in 1962. In a transformation dubbed 'Green Revolution', PAU played a revolutionary role in transforming a food deficient India into a food self-sufficient nation (Dhiman *et al.,* 2010). Fueled by scientific research, PAU has since inception in 1962, released more than 580 improved varieties and hybrids of field crops, vegetables, fruits and ornamentals. Specifically, by 1987, India had escaped from recurrent cycle of crop failures, food supply shortages and famine, to self-sufficiency in food grains. The situation today is that India can boast of surplus food grains which she can export or offer as food aid to needy nations.

NEED FOR VIABLE SEED ENTERPRISE

The Federal Ministry of Agriculture reported that Nigeria needs a seed industry revolution for quality seeds. The estimated annual seed demand in Nigeria for 2016 is about 350,000 metric tonnes (MT) for rice, maize and sorghum with an approximate seed industry value of N112b $564m. The 2015 annual production was about 122,000 MT valued at N43b or $216m. This, effectively translates into a supply/demand gap of about 228,000 MT valued at N81b or $409m (Ogbe, 2016; Okpara, 2019). The gap is filled through the massive use of low-quality seeds, such as seeds preserved by farmers, and supplies from unscrupulous seed merchants. Nigeria needs seed enterprises that continuously supply high quality seeds that are adapted to the growing environment; and should supply good quality seeds to both commercial and small-scale farmers in rural communities. There is need for an efficient seed production and distribution system that ensures sustainable crop production. The seed industry should provide farmers, including those in remote areas, with quality seeds of adapted varieties at the right time. There is need for increased investments in the seed sector and the involvement of more private sectors in the seed industry. However, the private sector has generally not taken up the challenge as expected. Seed production enterprises are very few, especially in Plateau state. Farmers and the private sector need to know that commercial seed production is profitable and a rewarding enterprise. It is a business with its own unique set of economics; ultimately having good returns.

Seed crop income varies with seed yield and crop price, but some seed crops are more valuable than others. Cereal seed crops typically have the lowest incomes while grass and legume seed crops with moderate incomes. Vegetable seed crops produce the highest income, though they are grown on a small land area. There is always an available market and a good price for vegetable seeds. Comparatively, income from vegetable seeds is triple to non-seed produce; e.g., rice seed is sold at #300/Kg

SOME LICENSED SEED ENTERPRISES IN NIGERIA

a. Maslaha Seeds Nigeria Limited, Gusau, Zamfara State
b. West African Cotton Company Limited, Funtua, Katsina State
c. Notore Seeds Ltd, Onne, Rivers State
d. Candel Seeds Ltd, Kaduna
e. Romary Seeds Ltd, Jos Plateau State

PROBLEMS OF THE NIGERIAN SEED SECTOR

The business of the seed industry is to provide quality seeds to achieve food security, reduce dependence on food imports, conserve foreign exchange and complement the efforts of government to diversify the Nigerian economy. In the first quarter of 2019, importation of grains and other agricultural products was valued at ₦236.33bn (The sun, 29 August 2019). This calls for more efforts by stakeholders to increase output to meet the national seed requirement, as the supply-demand gap is no doubt filled through massive use of low-quality seeds and supplies from unscrupulous seed merchants.

Apart from few farmers that obtain seeds from NASC zonal offices and research institutes in different parts of the country, agricultural production is mostly based on seeds saved from previous seasons crops rather than on improved or good commercial seeds. Commercial seeds that are available in the market are usually imported and marketed without any reliable guarantee of seed quality (Asiegbu, 2000). In fact, many of the commercial seeds are usually not well stored and, in some cases, have been kept for too long in conditions that are not ideal and therefore lose viability and fail to give satisfactory germination. This is partly because of the hot tropical climate and high humidity which reduce the longevity of seeds and pose a challenge for evolving local technology for seed storage and maintenance of seed quality. According to Vanek and Hoberg (1992), the ideal condition for storing seeds is almost unattainable under tropical conditions, especially in keeping the temperature low and the moisture content between 13 and 14 percent. In summary, the major problems in the Nigerian seed system include:

i. Inconsistent government policy resulting in the abandonment of previous governments laudable policies aimed at strengthening the seed system
ii. Poor funding of agriculture and agricultural institutions (Universities, research institutes, NASC)
iii. Inadequate trained personnel in breeding and aspects of seed technology which require specialized operations
iv. High cost of improved seeds e.g., hybrid seeds which may also not be readily available within the area of the farmer
v. Low multiplication ratio of vegetatively propagated crops such as cassava, yam and sweet potato. The planting materials of these crops are usually not available in sufficient quantities when needed
vi. Poor level of private sector involvement
vii. Inadequate processing and storage facilities
viii. Inadequate level of research

ix. Inadequate extension on matters of seed service to the rural farmers (especially with collapse of ADPs)
x. Farmers conservative attitude resulting in the traditional use of local seeds, saved from previous season's crop in preference to new improved seeds that have not been tested by the farmer
xi. The problems of seed pathology have not been given deserved attention by most farmers despite the fact that several tons of crop produce are lost annually in developing countries due to seed borne diseases.

THE WAY FORWARD

Productive crops and healthy plant food for people and livestock start with good seeds. In order to increase the productivity and competitiveness of Nigeria agriculture, and address critical challenges in the seed industry, the following areas require attention.

i. There is need for breeders or indigenous seed producers who will breed with our local problems and quality demands taken into consideration. Selection should be made for high yield and adaptation to local conditions or stress tolerance.
ii. Agronomic practices aimed at mass producing and retaining quality seeds should be intensified. Deployment of adapted varieties with yield potential of over 4t/ha compared to the average yield of 2t/ha for grain crops currently deployed to farmers' field is required. Seed multiplication should go with the necessary processing and handling to maintain viability.
iii. Post-harvest seed technology including cleaning, drying, seed testing and certification must be adhered to as stipulated in the National seed policy. Seed testing and certification help to avoid the use of inferior seed and involve testing for mechanical purity, germination capacity, moisture content and seed borne diseases. Seed security is food security and for seed to be accepted, it must be subjected to repeated field trials by the recognized official body (NASC, research institutes, universities) to identify varieties for distinctness, uniformity and stability to ensure registration and protection of breeder's right; as well as value testing for agricultural use. Value for cultivation and use provides information on the yield potential, resistance to pests and diseases and aspects of quality. These steps are conducted by officially recognized body in order to protect farmers against unsubstantiated claims as to the excellent performance of a seed lot.
iv. Seeds should be stored in a way to avoid loss of viability. Usually, a low temperature of 10 – 13^0C (50-55^0f) and 45 – 50% relative humidity are required for good storage (Nagur, 1985). The optimum moisture content of the seeds should be 10 – 12% for cereals, 7 – 9% for pulses, 6-7% for oil seeds and 5-6% for vegetables to ensure good storage. If a seed supply is not cared for properly, it will lose its ability to germinate or sprout, resulting in empty fields.
v. In order to ensure food security, the seed distribution system should be improved upon for quality seeds to reach farmers at the right time, while the extension system should be strengthened to educate farmers on the benefits of planting high quality seeds. Farmers need to discard the tradition of saving seed for planting from previous season's harvest in order to realize high yields and prevent cultivar degeneration. To reap the benefit of quality seed, farmers should form the habit of obtaining seed from commercial dealers, despite the high costs paid for such seeds. Good seeds are expensive but they pay in the long term.
vi. Private seed companies should be encouraged to engage in seed production as a business venture. One of the major problems in the seed industry is the lack of active private sector participation or interest. Langerak (1992) stressed that in Netherlands,

the seed sector became successful because of the efforts of the private sector seed industry in breeding, multiplication, processing and distribution. In this case, the support of the government was mainly in taking care of research in these areas and in ensuring effective seed quality control.

vii. In order to revitalize the seed sector there is need to provide training in seed production and seed technology and leaflets to guide farmers on high yielding varieties adapted to their agroecological zones. With our ever-increasing population, farmers require training in the production of hybrid seeds to help boost seed production and farmers income. Our higher institutions should also have a Programme for training in seed production and technology and not just in the general areas of plant breeding and genetics and crop protection to reflect the importance of quality seed in crop production.

viii. Strengthening collaboration with universities or Research and Development Institutes and the Private Sector through NASC is required to ensure farmers get quality seeds at the right price. In addition, these institutions should be well funded to effectively discharge their mandates. In India for instance, Punjab Agricultural University fueled by research has released more than 580 improved varieties and hybrids of field crops, vegetable, fruits, fodder and ornamentals since inception in 1962. As a result, almost the entire cropped area of Punjab state is under improved crop varieties because Punjab Agricultural University has one of the best seed production and delivery programmes among agricultural universities in India.

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