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Towards Mapping Ecological Organic Agriculture (EOA) Research into use in Nigeria

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Abstract

Africa as the second largest continent after Asia is still struggling to feed her teaming population (1.1 billion; 15 percent of world's total population). Organic agriculture has been identified globally as a potential strategy to solve food and related problems affecting Africans because it integrates sustainability, biodiversity and ecosystem services, while producing affordable, nutritious and safe food. Pillar 1 (Research, Training and Extension) of the Ecological Organic Agriculture (EOA) Initiative is poised to oversee the conduct of relevant demand driven, end user oriented and easily adoptable research projects on EOA that will transform the continent's agricultural output. Consequently, an activity was carried out in 2016 to document recent researches relevant to EOA in various disciplines, identify the gaps in EOA researches across disciplines and recommend appropriate areas for further research activities to bridge the knowledge gaps in EOA researches. The activity covered 2013, 2014 and 2015 with emphasis on Nigeria. A total of 203 research articles were reviewed across eleven thematic areas/disciplines: Agronomy (Soil science, crop production and management), plant health (plant pathology, nematology, virology, bacteriology etc.), genetics and breeding, molecular genetics, physiology, food quality, extension, socio-economics, policy issues, organic livestock and organic aquaculture. The spread of research efforts revealed as follows: Agronomy (131=65%), Plant health (43= 21%), Food quality (4=1.9%), Extension (10=4%), Socio-economics (3=1.4%), Policy issues (3=1.4%), Organic livestock (5=2.4%) and Organic aquaculture (4=1.9%). No articles were found on genetics and breeding, molecular genetics and physiology. The implication of this spread is discussed in the paper.

Introduction

One of the daunting challenges facing the human race globally amongst others is how to feed 9 – 11 billion people with safe and nutritious food in the next three to four decades. The continent of Africa is the second largest in the world after Asia and has about 1.1 billion (15 percent of the world's total population). Despite the huge endowment of natural and favorable growth resources, and agricultural potentials such as 25 percent of the world's arable land, yet the continent produces just 15 percent of the global agricultural output (Jayaram *et al.,* 2010). This undesirable situation is further compounded by the fact that Africa accounts for 239 million (25%) out of 850 million people suffering from hunger in the world. In fact, the sub-Saharan Africa (SSA) region remains food-insecure partly because about 75% of the land is degraded with less than 4% under irrigation. Mc Intire (2014) recently documented comprehensively the multi-faceted problems facing Africa's agriculture as follows: (i) raising agricultural productivity to accelerate the delayed shift of labour and national product into industry and services; (ii) slowing high population growth, which leads to greater land pressure and progressively blocks the traditional avenue of rural growth via land expansion; (iii) seizing the opportunity provided

by economic growth in the service, industrial and natural resource sectors, which will expand demand and induce technical and land use changes, including both farm consolidation and farm fragmentation; (iv) addressing the chronic problems of food insecurity and malnutrition and their relation to the fiscal and management capacities of African states; (v) mitigating climate change, whose effects are projected to be especially adverse for Africa's agricultural potential; and (vi) developing public policies – investments and incentives – that reverse the historic discrimination against agriculture and stimulate it to reach its potential. In an attempt to overcome some if not all of the highlighted challenges, the African Heads of State unanimously took a decision (EX.CL/Dec. 621 (XVII) in 2011) to mainstream organic agriculture into the agricultural systems of all member states by the year 2020. This lead to the formation of a broad based initiative tagged "Ecological Organic Agriculture" in 2011. Since the pilot phase was carried out in 2012 in six African countries: Ethiopia, Kenya, Uganda, Tanzania, Nigeria and Zambia, it has extended to a total of eight countries now: eight (8) countries - four in Eastern Africa (Ethiopia, Kenya, Uganda, and Tanzania) and four in West Africa (Mali, Nigeria, Benin and Senegal). The EOA Initiative is hinged on six key priority areas (pillars) and Research Training and Extension is the first pillar aimed at coordinating conduct of research projects that will address the needs of EOA practitioners in the continent with a view to improving Africa's smallholder farms and thereby boost food security. Therefore, an activity was conducted in 2016 with an overall objective to document EOA research into use in Nigeria.

Methodology

A desk review of publications and reports related to EOA in the last previous years (2013 – 2015) was done in 2016 to update an earlier exercise carried out in 2013. The team sourced hard copies, accessed electronic copies and reviewed relevant journal articles published by Nigerian scientists in the last three years in local, national and international levels to bring out salient contributions to EOA. Proceedings of national and international conferences/workshops were also sourced and reviewed. Thereafter, the abstracts of relevant articles were complied and impact points of the researches highlighted. The activity focused on the following eleven thematic areas:

a. Agronomy (Soil science, crop production and management)
b. Plant health (plant pathology, nematology, virology, bacteriology etc.)
c. Genetic and Breeding
d. Molecular genetics
e. Physiology
f. Food quality
g. Extension
h. Socio-economics
i. Policy issues
j. Organic livestock
k. Organic aquaculture

A total of 203 articles were reviewed by the team from over forty local and international publications. Thereafter, a list of ten recommendations was compiled to enhance the impact of the initiative in the continent.

Findings

Globally, organic agriculture still remains a "niche' because it occupies just less than 1 percent of the total land area under cultivation. Despite being a niche, organic agriculture is now worth about 100 billion US$ as against 72 billion US$ in 2013 (Rahmann and Aksoy 2014). Unfortunately, Africa still accounts for just 3 percent of organic land (43.1 million hectares in 2013 and 50 million in 2017) and 29 percent of entire producers in the world (Willer and Lernoud 2018). A sustainable strategy to raise the bar is to introduce innovations through demand driven and end user oriented research to current practices of the stakeholders across the value chains.

After the reviewing the 203 articles the spread was as follows: Agronomy (131=65%), Plant health (43= 21%), Food quality (4=1.9%), Extension (10=4%), Socio-economics (3=1.4%), Policy issues (3=1.4%), Organic livestock (5=2.4%) and Organic aquaculture (4=1.9%). No articles were found on Genetics & Breeding, Molecular genetics and Physiology. Apparently, scientists that organic agriculture biased are yet emerge from the academia. The review revealed that majority of the research efforts on the use of organic soil amendments made use of poultry manure. Poultry manure has been identified as an excellent source of nutrients and its composition varies with the type of bird, the feed ration, the proportion of litter to droppings, the manure handling system, and the type of litter. However, the poultry droppings should be properly cured before their application to the crop on the field in order to prevent multiplication of disease pathogens (Leytem *et al.* 2013). Therefore, it is necessary to sample and analyse the manure for specific nutrient content and ascertain its safety before any application to the soil. Unfortunately, most the studies where poultry manure was used, did not specify the type of birds the manure came from neither did they do nutrient analysis of the manure. Majority just applied different rates of the manure to the test crops. This undesirable trend should be corrected by the practitioners. The key to successful soil fertility management using any soil amendment is to match the nutritional requirements of the crop with nutrients available in the manure. It was suggested that scientists should now be weary of working on poultry droppings and be advised to step up by working on other emerging commercial organic fertilizers in the country. The organic fertilizers contain relatively stable concentration of nutrients and should also be analyzed before application.

More botanicals are now being put into use to control pests on organic farms in Nigeria. This accounted for the forty three articles reviewed in this activity. Most of the research works involved the use of neem oil and extracts of traditional plants. The scientists should be encouraged to develop branded products using some of the emerging botanicals in the country. Attempts should also be made to adapt some of these emerging technologies to the local environment. When properly adapted to the local environment, it will be easier for the end users of these technologies (especially farmers) to uptake the technologies. As such, the extension personnel should be advised to step up their activities from simple advocacy programmes to technology dissemination to the end users. Most of the papers on Extension were based on advocacy and base line evaluation of awareness of organic agriculture and nothing on technology adoption rate. More efforts should also be geared towards doing more on socio-economic studies and policy issues. Regular information should be provided for the Government through the Organic Agriculture Division of the Department of Input Service Support, Federal Ministry of Agriculture and Rural Development (FMA&RD). There is also a dearth of information on organic livestock and aquaculture accounting for just 2.4 and 1.9 percent, respectively in this activity. More work should be done to address the wide gaps in knowledge of ecological organic agriculture practices in Nigeria.

The socio-economists should endeavor to do more research activities that can demonstrate the potential of organic agriculture in order to be able to convince the policy makers. They should also step

up orgnaising massive advocacy programmes on the merit of organic agriculture over conventional. The vital role of the synergy between private and public sectors is yet to be properly documented in literature.

Conclusions and Recommendations

Arising from the review of the EOA research into use in the eleven thematic areas, the following recommendations were made:

1. More research efforts to be geared towards developing and evaluating branded organic fertilizers.
2. Scientists should be weary of using poultry manure as soil amendment without mentioning the bird and litter type where the manure is from.
3. Scientists should be compelled to state the nutrient content of any organic soil amendment to be used in any study.
4. More concerted research efforts should be geared towards developing resilient varieties for the staple food crops (cassava, maize, sorghum, rice, millet, yam etc) that are suitable for organic production systems.
5. Scientists in the areas of Genetics & Plant breeding, Molecular genetics and Crop Physiology should be encouraged to carry out research activities that can boost food production without breaking the rules and the four cardinal principles of organic agriculture (Care, Ecology, Fairness and Health), knowing that GMOs are not allowed in organic agriculture.
6. Livestock breeders should also be encouraged to develop breeds of livestock that can perform well under organic production systems.
7. Organic feeds for livestock and aquaculture should be developed for prospective stakeholders.
8. Simple training manuals for use by extension personnel must also be developed by subject matter specialists.
9. Position papers that demonstrate success stories on organic farming should be developed for the policy makers in order to assist them in articulating policies that will support organic farming in the country
10. The organic bill being prepared should be adequately followed up to a logical conclusion.

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