

Investigating the Role of the National Agricultural Extension and Research Liaison Services (NAERLS) in Promoting Organic Farming in Nigeria

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Abstract: Given that smallholder farmers can access agricultural information in various adopted villages through the Information Resource Centres (IRCs) under the Research Extension Farmer Input Linkage Systems (REFILS) policy implemented by NAERLS in Nigeria. The need for urgent shift to efficient farming systems capable of improving sustainable food production for the increasing population, with organic farming proven to be a viable and profitable alternative farming system that increases food production with zero or less dependence on agrochemical. This study investigated NAERLS activities in promoting organic farming practices amongst smallholder farmers in the southeast, Nigeria. In-depth interviews were conducted with 50 respondents comprising extension personnel at NAERLS Southeast Zonal Office and farmers from Umuakaobia, an adopted village in Imo state. Six extension coordinators and six extension subject matter specialist were purposively sampled. Whilst eight field extension agents and thirty farmers were selected using purposive random sampling technique. Findings show that there is a disconnection between NAERLS activities and Nigerian Government's policy in protecting the environment and improving farmers' livelihoods. NAERLS shows less concern in improving organic farming as a result of the agricultural transformation agenda. Policy-related factors, research and extension management, social, and geographical factors influence NAERLS's capacity to promote organic farming. This study concluded that there is need for clearly articulated organic agriculture policy that supports farmers, organic agriculture research intensified. The study recommended a participatory approach that incorporates farmers' traditional knowledge, strengthening agricultural information dissemination structure.

Key words: Organic agriculture development, extension services, smallholder farmers

Introduction

Feeding the projected nine billion people of the world in 2050 (FAO 2015) requires urgency in improving the adoption of efficient farming systems that are capable of boosting sustainable food production in all regions (Altieri et al. 2015; De Schutter 2010).

Nigeria is richly endowed with abundant human and material resources with the potential to boost agricultural production, in addition to an estimated land area of 923,768km² of which 37.3% is arable with different soil types and vegetation suitable for various agricultural purposes (Federal Ministry of Economic Matters, 2010). Despite these prospects and potentialities for food production, Nigeria has not been able to maximise its agricultural potential and produce enough food for its increasing population. Adequate food production and access to food in this context mean achieving an adequate diet and clean water reaching a state of nutritional well-being

that meets all physiological needs at all stages (Brandt, 2007). Nevertheless, minimising health risks such as obesity and malnutrition, and protecting the environment.

Smallholder farmers are responsible for about 95% of food production in Nigeria (Adesina, 2013). Altieri (2004) asserted that smallholder farmers have the reputation for willingly adopting new practices when they perceive that some benefits will be gained. However, smallholder farmers in Nigeria are still lagging behind in adopting organic farming, unlike their counterparts in other African regions. Oyeniran (2011) observed that countries such as Kenya, Tanzania, Cameroon, South Africa and Ghana are far ahead in the production of certified organic products. Even after various research and movements have proven it to be a viable and profitable alternative farming practice with reduced or zero reliance on high energy and agrochemical inputs (IFOAM, 2004; Loconto et al. 2015; NOAN, 2010; Mgbenka et al. 2015).

The organic agricultural sector in Nigeria is still underdeveloped and few farmers practise it. In addition to some other existing traditional methods of farming developed around specific geographic areas which are almost abandoned (Adebayo and Oladele 2014; Nwachukwu, 2010). Organic farming is an agricultural system that uses environment-friendly inputs to grow crops and raise livestock that are free from synthetic chemicals, growth hormones and antibiotics (Harris, 2000). The farming practice involves the application or use of various techniques such as crop rotations, green manuring, composting and bush fallow systems to improve soil nutrients and organic matter. Also, integration of livestock into cropping systems, use of native seeds and local breeds of livestock, natural farm water harvesting, biological pest and disease management, and polycultures are some of the widely accepted practices applied in small-scale family farms across the world in solving agricultural production challenges (Altieri and Toledo, 2011; Wezel et al. 2014). Conor (2004) stated that organic farming system developed as a response to what was perceived to be polluting the food supply by modern farming methods such as monoculture and use of agrochemicals, and the ensuing degradation of the ecosystem. The practice is based on ecology, health, fairness and care in managing a farm as an integrated system proven to help achieve sustainable food production (Huber et al. 2015; Pretty, 2008; Parmentier, 2014; Zehnder et al. 2007). Thus, promoting the adoption of organic farming practice is becoming a top priority in most developed and developing countries. Whilst conventional farming systems or the use of synthetic chemical inputs such as fertilisers, pesticides, transgenic crops and genetically modified organisms, and monoculture which are harmful to the ecosystem and injurious to human health are being gradually discouraged (De Schutter, 2014).

Moreover, improving the adoption of any agricultural technique and encouraging farmers to positively respond to new or existing ideas, requires informed best practices in their farming activities. Agricultural extension plays a significant role in the development of agriculture globally and has remained a service or system that assists farmers in improving their farming techniques and adopting innovations, production efficiency and income as well as lifting their social and educational status, and a better standard of living (Lashgarara et al. 2010; Rivera and Qamar 2003; Zwane, 2012).

Although farmers have been blamed in many cases for their slow adoption of agricultural innovations due to their conservative nature (Agbarevo, 2013), their progress significantly depends on the availability of and access to reliable information

(Olajide, 2011). Effective agricultural extension delivery systems are prerequisite to farmers' adoption motivation. The responsibility for agricultural information dissemination in Nigeria lies with the National Agricultural Extension and Research Liaison Services (NAERLS). The organisation evolved through five stages from 1920 to present, and the zonal offices are located throughout the country depending on the agroecological division of the country, the zones include Southeast, Southwest, Northeast, Northwest and the Middle Belt (Nwachukwu, 2010). NAERLS coordinates national agricultural training activities; planning and development of extension liaison services throughout Nigeria; conducts research on technique transfer and adoption; and collaborates with research institutes in transferring existing knowledge and innovations (NAERLS 2015).

The NAERLS extension system is coordinated under the Research Extension Farmer Input Linkage Systems (REFILS) which is the structure and mechanism for cooperation in agricultural technology generation, adaptation, dissemination, and utilisation with roles and responsibilities assigned to all partners (Arokoyo, 1998). REFILS's main actors and partners are the private sectors, state agricultural development programmes, national research system, and the government for policy making (Sani et al. 2015). In 2010, NAERLS selected seven rural communities across Nigeria known as their "adopted villages" as mandated by the Agricultural Research Councils of Nigeria (ARCN) under the REFILS policy which states that research institutes should select villages in close proximity (Sani et al. 2015). The main aim of the "adopted village" project is to facilitate farmers' access to agricultural information and encourage adoption. In achieving effective extension delivery, NAERLS adopted the targeted information delivery approach by setting up Information Resource Centres (IRCs) in each community to care for their agricultural information needs (Nada et al. 2013).

Although NAERLS encountered various challenges, including inadequate funding to support field extension activities, unsteady policies, poor staffing, poor access roads, and lax attitude by the government (Madukwe, 2010; Izuogu and Atasi 2015). Anaeto et al. (2014) also posit that agricultural extension service presents 'a sordid tale of neglect' despite its potentials and contributions to the national economy. However, Sani et al. (2015) noted that farmers' access to information improved through IRCs in the various adopted villages.

Given that farmers' can access agricultural information in various adopted villages using IRCs, the need for urgent shift to organic farming, and NAERLS's mandate in facilitating adoption necessitated the aim of this study. Therefore, the study was designed to investigate the role of the National Agricultural Extension and Research Liaison Services in promoting organic farming practice amongst smallholder farmers with the specific objectives to;

- Investigate the activities of NAERLS towards organic agriculture information delivery
- Explore farmers' interest in the farming practices
- Determine the extent to which NAERLS has enhanced the adoption of organic techniques
- Ascertain farmers' satisfaction with the information delivery structure
- Identify the constraints hindering the practice

Materials and Methods

This research uses a qualitative research methodology as opined by Patton (2014) in keeping with the methodological tradition of political ecology that requires sensitivity to context, multiple views and social relations (Watts, 2000). Also, in identifying the major stakeholders involved in the implementation and receipt of the programme under study (Palys, 2008). The study location is in the south-eastern zone of Nigeria.

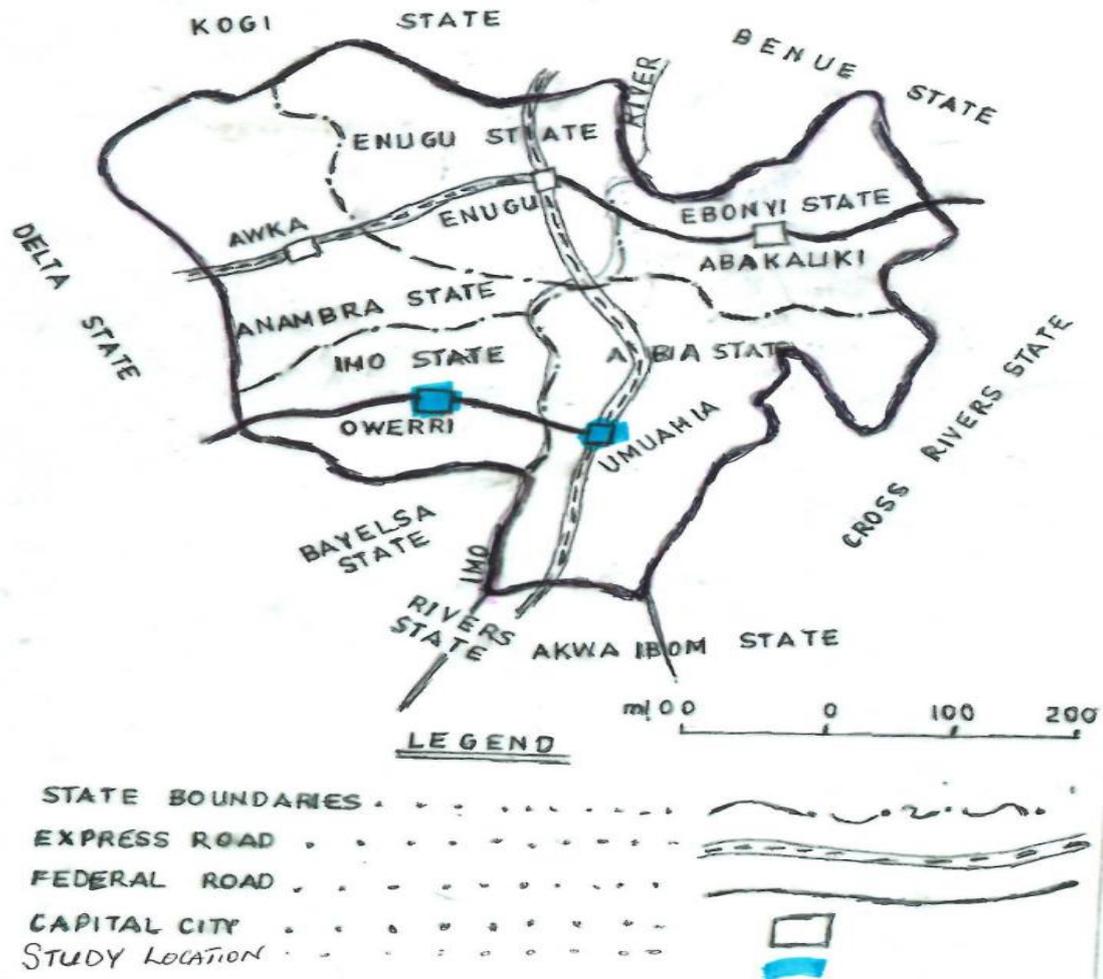


Figure 1: Map of the Study Area (modified from NAERLS SE Zonal Office n.d)

Data was collected through in-depth interviews with 50 respondents comprising extension personnel at NAERLS and farmers from one of the NAERLS adopted villages (Umuakaobia) in Imo State. Imo State is amongst the agricultural states serviced by the NAERLS Southeastern Zonal Office for agricultural extension advisory services. The farmers in the state rely on the extension personnel for agricultural information and advice on access to farm inputs through the State Agricultural Development Programmes. The southeast zonal office, although situated in the neighbouring state, Abia, is one of the NAERLS zonal offices with the mandate of supervising the agricultural extension activities in the five southeastern states namely; Abia, Anambra, Ebonyi, Enugu, and Imo. The office reports directly to the NAERLS Headquarters, Ahmadu Bello University, Zaria, Kaduna State, Nigeria.

Six extension coordinators and six extension subject matter specialists were purposively sampled. Whilst eight field extension agents and thirty farmers were sampled using purposive random technique. The strategy was adopted to ensure the credibility of the sample selection and to reduce bias (Teddlie and Yu 2007). The population was chosen because they are the study focus based on their activities and believed to give useful information in achieving the research goal (NavaTurgo, 2010; Princeton, 1991).

Prior to the data collection, written informed consent was obtained from each participant as per ethical approval by Coventry University, United Kingdom. Ensuring a suitable environment for the interviewees, the researcher visited the participants in their public offices and own farms, accompanied by two facilitators who also assisted in the validity and review of the interview questions. Telephone calls were made to inform the respondents of the study aim and expected questions prior to visiting. The researcher adopted a systematic questioning technique to gain in-depth responses, questions were purposefully varied in wording to suit the English proficiency of individual respondents. All data collection took place between March, 2016 and March, 2017.

Interviews were audio-recorded with permission, notes taken simultaneously and transcribed verbatim to prevent bias (Pontin, 2000). The study adopted Miles et al. (2014) strategy by manually conducting the analysis using hand-coding, rather than relying on computer analytical software. This was achieved by revising through the raw data and codes were inductively derived, organised, and emergent codes linked into three broad themes (Miles et al. 2014).

Results

The results from the in-depth interviews are organised and presented in thematic categories based on the interview questions and also by respondent category. The results are presented in two formats, namely; verbatim quotations from the respondents which serve as low-inference descriptors; and summary of recurrent themes clarifying the most articulated themes (Miles et al. 2014).

Farmers' Perspectives

The local knowledge of the farmers cannot be undermined being that it constitutes the capacity needed for conserving the local ecosystems. According to Tella (2002) local or indigenous knowledge is the systematic body of knowledge or skills acquired by a people through accumulated experiences and informal experiment that help them to understand their environment. Indeed, organic farming combines traditional farmers' knowledge with modern ecology, soil management and crop production in designing and managing the ecosystem. It improves and sustains on-farm production fertility which in turn reduces farmers' reliance on external inputs and government subsidies helping vulnerable smallholder farmers less dependent on loans (Altieri and Nicolls 2015). Therefore, to ascertain how NAERLS has influenced the improvement of organic practices, farmers were interviewed based on their activities and experience with the extension agents.

A farmer explains that *“here in my farm I plant various crops in the same piece of land, but I buy and apply fertilizers and pesticides because the extension agents will always advise we use chemicals, even when you tell them our own method is good, they do not listen, they want us to do away with our ancestral ways of farming and adopt their style”* (Female, aged 54).

Another respondent explained that *“I use farm yard manure on my farm because I keep lots of goats, I even go as far as other neighbouring communities to source for other animal dung. But you see my problem is, is difficult to prepare especially when combining with other raw materials for composting. The agriculture people do not say how to do it or apply it, so I gave up with the large farm and do it only at my backyard farm which is small. The fertiliser application is easier, even if no one tells you, you can manage to do it yourself”* (Male, aged 60).

When asked what motivates him in using farmyard manure, he stated *“it is the best practice, the yield is more and better soil quality with high organic matter content”*.

Although most farmers are interested in organic farming, however, they lament that there is limited access to useful information on the availability, preparation and application of farm input such as the composting and manuring as they lack expertise in preparation, proper use and management.

Another respondent noted *“this is the practice we survived on earlier and I was happier doing it then, this time one spends a lot on seeds which you cannot even replant, they tell you not to because it will not germinate or it will multiply diseases, and the fertilizer application needs continuous efforts, when you do not apply it the yield goes down and our land has become porous. Sometimes these seeds do not even germinate that means you keep replacing them!”* (Male, aged 63).

Traditional family farmers tend to grow a variety of plants grown from the seeds passed from generation to generation, however, in the case of these farmers, their local crop varieties have been lost to transgenic crops.

A farmer noted that *“we used to have our own native seeds, like the maize and cassava varieties, but now it’s difficult to see one farmer who has such”* (Male, aged 34).

Few farmers practice some of the widely accepted organic practices such as fallow systems, crop rotation, manuring, and mixed cropping. However, they are losing their confidence in the viability of these practices as they heavily depend on synthetic external farm inputs and discarding the traditional systems.

When asked to elucidate their perspective on the current activities of NAERLS in enhancing organic farming, the farmers explained that the extension and research institutes’ activities revolve around promoting the use of external inputs which include synthetic pesticides and fertilisers, monocropping, hybrid and genetically modified seeds. In which the extension services term as *“progressive ways of farming”*.

In terms of the constraints identified hindering increased adoption and practice of organic farming, farmers highlighted four important issues namely;

Policy/government factors: In this case, farmers’ interest/needs are least considered, as the extension services are being driven by government interests in increasing the quantity of food production and not quality. Which the farmers noted as a top-down approach that has less interest in promoting indigenous farming systems and local seed production. There are no incentives to motivate farmers to farm organically and no available markets for export.

Research/extension information dissemination management: Research focuses more on the hybrid seeds and animals, and their disease/pest infestation. The farmers explained that institutes’ exhibitions only showcase breakthroughs made with

genetically modified organisms. They further proclaimed that the extension agents have limited technical skills about organic farming, in addition to the inadequate supply of field extensions and resources needed. The farmers sometimes pay for the extension officers' transportation in order to access the extension services.

Community/household factors: Increase in household population affects farmers' sole reliance on organic farming as the positive results of farming organically manifest after a considerable period of time. Farmers noted being sceptical with the initial yield as they need immediate food availability to take care of their household. Also, rural-urban migration results in reduced labour force and farmers' inability in managing such labour-intensive farming system.

During the interview, land and labour scarcity also emerged as a constraint to maintaining the traditional ways of farming.

A farmer revealed *“you see, we are eleven in my household and our land is very small, because that is the portion I inherited from my father and no money to acquire more, so if we rely entirely on traditional systems, although it's sustainable, the yield is not immediate. Even the soil has poor quality, so I am forced to spend more on external inputs to ensure a decent yield and the required labour is expensive”* (Male, aged 63).

Geographical/environmental factors: The farmers noted some of the environmental factors such as heavy rains and storms that affect the local crop varieties. A farmer stated that *“some of our own crop varieties grow taller and rarely withstand storms, so the agriculture people insist we use improved varieties that mature quickly and dwarf in nature, but their own spoils quickly after harvest and tasteless”* (Female, aged 52).

Also, access to some organic farm resources is limited in some parts of the geographic area. One of the farmers noted that *“neem plant leaves which he was using ab initio for biological control of pests and diseases grow well in the northern part of the country”* (Male, aged 59). So this makes it less accessible for farmers in the other parts of the country who wish to use it on their farms.

Personnel Perspective

The extension personnel were questioned regarding the policies to encourage research and extension supports for agroecological farming systems (organic farming), and a general evaluation of the institutes' activities in improving organic farming extension.

A respondent explained that *“organic farming is not part of the farming system, no structure put in place for organic farming extension, however, some farmers actually practice it unknowingly. Farmers are guided on how to manage their farm crops and animals to maximise yield. The government implements policies on how extension services are run, so research is geared towards achieving the nation's mandate for food security”* (Female aged 50).

Another explained that *“the government is interested in providing and increasing food production for the populace so what matters is sufficient food, not how is produced or what is used. Although farmers find it hard to cope with the high priced external farm inputs, but we rely on what the government wants, so we advise them to put the right fertiliser to the right crop to increase yield irrespective of their interest in organic farming as there is no structure in place for such information”* (Male, aged 45).

Another respondent noted, *“some of these farmers have the indigenous knowledge already, but what they might need is for the information to come from the research and extension units, but we can’t offer such information unless the policy is amended at the federal level”* (Female, aged 53).

In terms of the role of the institute in promoting organic farming, the respondents noted that research and extension interventions widely promote conventional farming. They further identified some of the key constraints to enhancing organic farming that is also in line with the farmers’ observation. These include policies such as the top-down approach to extension interventions, quantity in place of a quality system that promotes the use of chemical farm inputs. The respondents pointed out that some of the extension agents are yet to be convinced about the effectiveness of farming organically and they have inadequate knowledge and skills in the practice. Also, no funding from the government for active engagement in organic farming research.

A respondent explained that *“I think what we need is better knowledge and skills of organic practice to be able to work with the farmers, we sometimes recommend the practice, but we need support from the government”* (Male, aged 37).

On the other hand, poor pre and post-harvest management affect farmers’ ability to recycle and sustain their indigenous crops, resulting in government’s lack of interest in local crop varieties.

A respondent noted that *“these farmers cannot feed themselves if left alone with their so-called indigenous farming practices, so the government is playing significant role in the distribution of fertilizers at subsidised rates, and we encourage them to buy improved seeds, because their own seeds get infested easily and cannot withstand drastic weather”* (Male, aged 43).

Discussion

The main findings of this research show that the National Agricultural Extension and Research Liaison Services shows less concern for the improvement of agroecological farming systems principally organic farming in Nigeria as a result of the recent trend in Nigeria tagged “Agricultural Transformation Agenda” and the notion of “food quantity and not quality for overpopulated nations”. Secondly, 75 percent of the farmers grow staple food crops such as maize, cassava, yam, okra, rice and vegetables that are susceptible to disease and pest infestation that encourages mono-cropping and transgenic manipulation. Only 25 percent of the farmers complemented these crops with other crops such as the nitrogen fixing leguminous crops. These findings are important because they must have influenced the radical shift from the traditional ways of farming classified as agroecology approaches to conventional approaches that have drastic effect on the environment. It was observed that farmers in the study area rarely practised solely organic.

Role of National Agricultural Extension and Research Liaison Services in Enhancing Organic Farming

Despite the fact that conversion of land into agricultural purposes contribute to ecosystem depletion and soil contamination, this study found that there are few practical activities by NAERLS to encourage farmers to sustain the environment. Their activities clearly promote commercial transgenic seeds, monoculture, chemical fertiliser, insecticides and pesticides in order to increase yield. Not minding the detriment to the natural farming resources they require for production. There is an overwhelming practical and policy disconnection between the aim of preserving the

ecosystem and the focus of the national extension services in Nigeria. The institute has made little or no efforts in discouraging the increasing use of chemical inputs amongst smallholder farming communities. This finding draws attention to the need to protect smallholder farmers' welfare and the ecosystem using an agroecological approach such as organic farming (DeSchutter, 2014).

Furthermore, the findings revealed that the extension personnel actively discourage farmers' reliance on indigenous knowledge systems both in farming practices and local seed preservation and use. This poses threat to the traditional locally relevant methods that have been developed and replicated over decades and further jeopardising the call for an urgent shift to agroecological practices globally.

The findings of the effectiveness of the NAERLS information delivery structure corroborate Sani et al. (2015) that farmers' access to extension services improved as a result of the Information Resource Centres (IRCs) implemented by NAERLS. However, farmers' reliance on external inputs significantly increased. Where some rely on the external sources that are often supplied to them at exorbitant costs.

Disparity between Extension Personnel and Farmers' Perceptions towards Organic Farming

The farmers stated that the indigenous farming practice is almost disappearing due to continuous reduction in soil quality, unfavourable weather conditions, high cost of labour, rural-urban migration, lack of awareness and access to basic information, and unavailability of local farm resources. Also, pressure from the government through the extension personnel to adopt conventional methods has reduced their interest in organic farming. Nevertheless, most farmers are willing to rejuvenate their existing traditional systems and are open to adopting other widely accepted agroecology practices.

On the contrary, the extension personnel associated these factors to the reason why the farmers should embrace the conventional agricultural system and abandon organic by default old or traditional systems of farming.

The findings revealed that the extension personnel ideology in overcoming food insecurity undermines the government policy which seeks to promote "*farmer's quality of life and environment-friendly practices*" (FMARD 2000). It also ignores a growing body of research that shows that smallholder, ecologically-based, organic and traditional knowledge systems can measure, match, and even exceed the productivity of conventional systems when measured by the number of people fed per unit of land (Ponisio et al. 2014).

This study further observes clear indications of non-interconnectedness between protecting the environment, improving farmers' livelihoods as stated in the Nigerian Government's agricultural policy objectives and the activities (research and extension services) of NAERLS. The situation requires that the extension practices and policies should be redirected to focus on supporting and empowering farmers in their decision-making process that is within the context of their environment, health and socioeconomic conditions.

The Constraints to Enhancing Organic Farming Practice

The findings show that policy-related factors, research and extension management, social, and geographical factors influence NAERLS' capacity to promote traditional/indigenous farming systems that are widely accepted as an agroecological

approach (Altieri et al. 2015). Scrutinising these factors gives insight into what is required to bring into consonance with the current extension services with the concerns of organic farming.

The current extension services still use a top-down and non-participatory approach with the framework of promoting sustainable agricultural practices, however, the lack of interconnectedness with environmental protection and promotion of farmers' livelihood forms a serious threat to the urgent call for farming organically. There is need to review and implement policies that will recognise the relationship of agricultural extension services and ecosystem conservation practices and create a means for the practical integration of this important aspect in attaining a food-secure state. This study further revealed a gap in the food chain as the farmers lamented unavailability of organic markets that can motivate organically produced crops whilst securing healthy food for their household.

The current research and extension management need to give farmers important, consistent, and impartial advice and services on how to make significant use of their indigenous/local knowledge for sustainable farming and food security to align with the government agenda to improve productivity. There should be incorporation of platforms for improving farmers' knowledge on ecosystem conservation in order to instigate participatory and collective action amongst farmers to engage in agroecological practices. Also, the extension personnel must be equipped with the knowledge and skills needed to support and advice on farming practices that are compatible with agroecology approaches. This study corroborates Mustapha et al. (2012) that the extension agents still believe in the positive impact of conventional systems, thereby ignoring organic farming practices with the notion of the later cannot solve food insecurity.

Given that agroecology approaches are labour consuming, this study found that increased rural-urban migration of the younger adult impacts on older farmers' engagement in the practice. It is important to acknowledge that farmers' level of experience and contact with their urban counterparts may have affected their move away from indigenous practices. Odoemelan and Ajuka (2015) observed that the rural farmers' irregular contact and interactions with their counterparts, limited the adoption of new technologies. This study contradicts both studies of Ogunnyene (2005) and Odoemelan and Ajuka (2015) that older farmers are less likely to adopt new technologies, rather in the case of the farmers in the study area, the extension agents had more influence on their decision-making in adopting intensive use of agrochemical inputs.

Furthermore, geographical factors such as poor soil quality, diseases and pests outbreak, and the intensity of weather conditions impact on farmers' engagement in organic farming which influences its improvement. This is as a result of the farmers' inability to tackle these issues in a more sustainable way, which could be attributed to their low technical know-how and lack of information to address such situations. The only available management methods offered by the extension personnel is the use of synthetic chemical inputs. For the farmers and extension personnel in the area, all farming issues are solved with chemicals.

There is indication that most extension personnel lack the necessary skills to support biological approaches that can replace the use of synthetic farming inputs that are compatible with the ecological conditions of the smallholder farmers. The findings revealed a clear bias from the training and research institutes in Nigeria towards high

input agriculture that has inspired the use of transgenic crops and agrochemicals. This study draws the attention of the agricultural universities in training the extension professional to acquire the relevant skills, knowledge and attitudes towards the promotion of sustainable and environmental-friendly farming systems. It is imperative that NAERLS should acknowledge these factors to inform their decision-making and policy implementation in the services delivered to the farmers. This is significant because farmers rely on the results of demonstrations.

Conclusion and Recommendation

There is a mismatch between the activities of the extension personnel and the agricultural policy objectives that can damage the ecosystem. This is as a result of different policies that have shaped the extension agents' perception in promoting food security. It is obvious that the extension personnel have influenced farmers' decision-making about their farming approach. Given that the farmers are willing to adopt organic farming, there is need for articulated information be provided. This study recommends that research in agroecology approaches should be intensified and extension personnel must be encouraged by providing adequate funding for working resources and updated training on ecologically compatible practices. In this regard, agricultural extension services should be reinvigorated through policies that are geared towards protecting the ecosystem. Drawing evidence from other countries where agroecology farming systems are widely practised, study also recommends a participatory approach that incorporates farmers' own traditional knowledge and methods.

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