



Review of Opportunities and Challenges of Agricultural Extension and Advisory Services among Rural Farm Households in Nigeria during Pandemics

**Chibuzo Uzoma Izuogu^{1*}, Robert Ugochukwu Onyeneke¹,
Loveday Chukwudi Njoku¹, Gillian Chidozie Azuamairo¹, Mary C. Atasi²
and Munonye, Jane Onuabuchi¹**

¹*Department of Agriculture, Alex Ekwueme Federal University Ndufu Alike, P.M.B. 1010, Abakiliki, Ebonyi State, Nigeria.*

²*Department of Agricultural Extension and Rural Development, Michael Okpara University of Agriculture, Umudike, P.M.B. 7276, Umuahia, Abia State, Nigeria.*

Authors' contributions

This work was carried out in collaboration among all authors. Author RUO conceived the need for this systematic review and suggested it to author CUI who initiated the process and did a good part of the review work. Authors LCN and GCA assisted in the write-up and preparation of the framework for the study. Author MJO motivated the researchers and proofread the work before it was forwarded for publication. All authors read and approved the final manuscript.

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ABSTRACT

There is urgent need for increased institutional investment in ameliorating the adverse effects of pandemics among rural households. These effects are multi-faceted with governmental and other concerned agencies ignoring the socio-economic outcomes among rural households. The number of confirmed cases of Covid 19 patients in Nigeria rose from an index case on 27th February to 30,476 by 10th July 2020. About 82 Million Nigerians live in poverty. With a score of 27.9, Nigeria is ranked 93rd out of 117 countries on the 2019 Global Hunger Index. The objective of this review is

*Corresponding author: Email: cu.izuogu@mouau.edu.ng, chibuzoizuogu@gmail.com;

to access the opportunities and challenges of agricultural extension and advisory services among rural farm households in Nigeria during pandemics. Data for the study were sourced from the World Health Organization, Food and Agricultural Organization, National Centre for Disease Control and other scientific documents. The identified impact of pandemics among rural households included increase in vulnerability, shortage of farm labor and worsening healthcare system etc. Dissemination of information in real time, encouraging healthy agricultural production system, providing market linkage for rural farmers, and effective interface with government were the major opportunities for rural advisory services. Extension must overcome the challenges of low utilization of modern technology by rural households, increasing housing deficit and poor infrastructural development in rural communities. The review recommends that more efforts should be targeted at ensuring that while the extension system is provided with all they need for optimal provision of services; policymakers are to develop more interest for rural development.

Keywords: *Pandemic; extension; rural advisory service; Covid-19; household; communication; lockdown.*

1. INTRODUCTION

Before the outbreak of the Covid-19 pandemic, rural livelihood in Nigeria was very alarming. Recently, there has been further spread of the Covid-19 outbreak in many countries leading to aggravation of already bad conditions of living. At the outbreak of the pandemic, many underestimated its effect on agricultural production while efforts were made to manage it as a health crisis. Depending on the level of national development, the effects of Covid-19 on rural households are evident all over the world [1]. Indeed, its global impact has increased the vulnerability of agricultural production. All over the world, governments are facing the challenge of reducing the dangerous health impact of the pandemic as well as ensuring that lives and livelihood are protected. Some of the approaches that have been adopted to control pandemics affect the agricultural sector severely.

The world has experienced different kinds of pandemic for centuries and would also experience more. Table 1 shows some of the major world pandemics since the 18th century.

Considering present alterations and future challenges to food production and supply chain, pandemics generate severe exposure in the agricultural firm [6]. Hence there is the need to ensure adequate mobilization of every institution, policymakers, and other stakeholders with the governmental and non-governmental organizations for effective response.

Universally, the practice of agricultural extension has been in transition in a bid to remain relevant to contemporary rural challenges [7]. This has led to reforms in its purpose and management strategies. These reforms gave rise to the concept of rural advisory services. Rural Advisory Services (RAS) includes all the forms of

Table 1. World pandemics from the 19th century

S/No	Name	Period	Death toll	Source
1	Cholera Six Outbreak	1817-1923	1 Million	[2]
2	The Third Plague	1855	12 Million	[2]
3	Yellow Fever	Late 1800	100-150 thousand	[2]
4	Spanish Flu	1918-1919	40-50 Million	[3]
5	Russian Flu	1889-1890	1 Million	[2]
6	HIV/AIDS	1981-Present	25-35 Million	[4]
7	Asian Flu	1957-1958	1.1 Million	[2]
8	Hong Kong Flu	1968-1970	1.1 Million	[4]
9	SARS	2002-2003	Less than 10,000	[4]
10	MERS	2015-Present	850	[2]
11	Ebola	2014-2015	11, 300	[4]
12	Swine Flu	2009-2010	200 Thousand	[3]
13	Novel Corona Virus	2019-Present		[5]

Covid 19 figures are as at 10th July, 2020

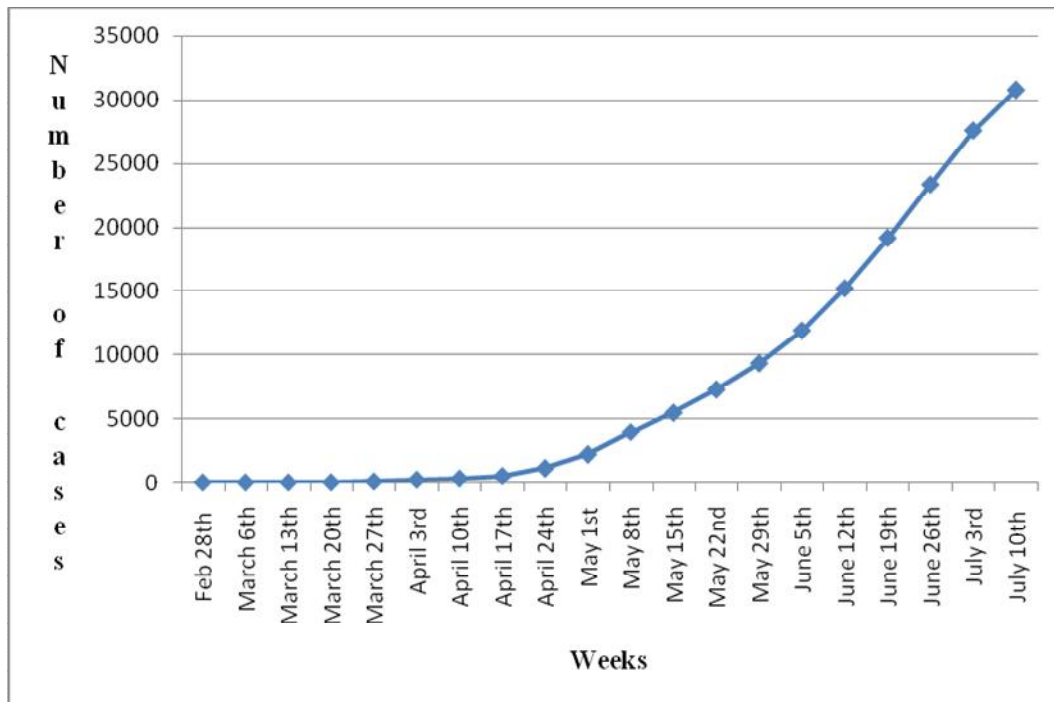


Fig. 1. Confirmed cases of Covid 19 in Nigeria

Source: NCDC, 2020

engagements targeted at availing farmers of the information and ideas that are useful to them and other participators in the food production chain and rural development. These services come in the form of managerial skills, technical and organizational efficiency, etc which seeks to improve the quality of life and well being of rural dwellers [7]. The core mandate of agricultural extension and rural advisory services is to transfer innovations from professionals to rural farmers who are not privileged to execute researches for increased agricultural productivity.

Among the 1.2 billion persons living in Africa, an estimated 20% are undernourished. The effect of Covid-19 has been projected to be more devastating among the vulnerable persons in the continent as a well-nourished individual are less susceptible [8]. Most developing countries rely on rural areas for their food security and sufficiency. Unfortunately, the pandemic has altered food production and availability thereby worsening the socio-economic outcome of the health emergency [9]

The first case of Corona virus was announced by the World Health Organization (WHO) on 31st December, 2019 in Wuhuan, Hubei region of China. The total number of confirmed cases of

Covid 19 in the world as at 10th July, 2020 is 12, 291,645. In Africa, Nigeria has the third highest number of confirmed cases (30, 748) after Egypt (79,254) and South Africa (238,339) [5]. Nigeria recorded her index case on 27th February, 2020. Since then, there has been increasing number of reported cases of Covid-19 in the country [10]. These challenges seem to worsen an already bad situation in Nigeria. Nigeria food security analysis shows that 7 million Nigerians will be food insecure by August 2020 [11].

About 40 percentage (82 Million) of Nigerians live in poverty. With a score of 27.9, Nigeria is ranked 93rd out of 117 countries on the 2019 Global Hunger Index [12]The United Nations 2018 Human Development Index (HDI) placed Nigeria on 158th out of 189 countries with a HDI index of 0.534. About 47.62 % (98,156.651) of these Nigerians live in the rural area and may be exposed to the adverse effects of the pandemic [12,13]. More so, rural households bear a good proportion of the cost of pandemics as an infected person usually travels to their places of origin when they are sick.

Other studies evaluated exact features of the fiscal effects of pandemics including its direct and extended cost such as loss of man hour,

cost of hospital bills and loss of productivity. Some of these studies were based in Europe [14.15], Asia [16.17] and the Americas [18-23]. [24] had studied the impact of Covid 19 on agricultural production in the world while [25] evaluated its effects on Ethiopian agricultural system and potentials for mitigation. Unfortunately, there are no existing studies on the need for the intervention of rural advisory services towards cushioning the effects of Covid 19 among rural households in Nigeria. This review seeks to provide direction for Governmental and non Governmental agencies as well as other policy makers in the rural advisory services towards alleviating the effects of the pandemic among rural households. Specifically, the review

1. Identified the impacts of Covid 19 on rural farm households in Nigeria
2. Ascertained the roles of extension and advisory services during pandemics
3. Described the challenges facing agricultural extension and advisory services during Covid 19
4. Made policy recommendations on the way forward.

2. IMPACTS OF COVID-19 ON RURAL FARM HOUSEHOLDS

Pandemics are usually viewed as mainly health-related challenges. Unfortunately, they spread with far-reaching outcomes with socio-economic devastations on all strata of the society. The relationship between health and agriculture is bi-directional as health affects agriculture while agriculture affects health. In all cases, there are negative or positive effects that may give rise to good or bad outcomes.

Disease transmission can threaten rural livelihoods who are currently facing the challenges of climate change, inadequate information and health services, poor nutrition, and uneven access to infrastructure with low resilience. Hence, world food production has witnessed severe damaging effects from previous epidemics such as Ebola virus and HIV/AIDS [8]. The spread of pandemics among rural households are not easy to evaluate and maybe under-reported due to the absence of health care facilities, inability to access health centers, and weak monitoring system. This has made it difficult for policy formulators to involve the rural household [26]. Some of the impacts of Covid 19 on rural households include:

2.1 Increase in Rural Vulnerability to Poverty

It is pertinent to note that most of the vulnerable and marginalized persons reside in rural communities [9]. Unfortunately, in handling Covid-19 as a health crisis, there is a diversion of attention from agriculture (which is the major occupation of rural dwellers) due to concentration on health concerns. This has adversely affected food production among rural households while interrupting the supply chain [25]. The dwindling national revenue that characterizes the periods of a pandemic may raise the need for local authorities to reduce their budget estimates thereby retarding the much-needed upgrade and maintenance of local infrastructure while increasing the vulnerability of rural households [27]. Aside from on-farm activities, rural households also depend on non-farm activities for improvement in their livelihood. Restriction in movement has posed a disaster to sustaining safe continuity of off-farm activities within the rural communities. Apart from the immediate destruction of rural production and incomes, it has also affected the planning for the next farming season negatively [28]. Gains from agricultural production contribute essentially to cushioning the rising wave of poverty in rural communities. International support for agricultural production in Nigeria contributes much to the development of the sector in Nigeria. Unfortunately, this has lagged in recent years. With the restriction of movements, the prohibition of meetings, greater aid towards the health crisis, etc international support to agriculture in Nigeria has been interrupted [28]. Outbreaks of a pandemic can reverse the developmental gains of vulnerable countries. In such events, improvements made in infant and child mortality, life expectancy, health care development, household investment, etc may be significantly eroded.

Also, rural farmers are usually older and more vulnerable to the impact of pandemics especially considering their lack of access to health services. This makes them exposed to the destructive impacts of pandemics [26]. Unfortunately, the implementation of programs to contain the transmission of pandemics tends to concentrate within the urban centers while the rural areas are neglected. Since most developing nations have a majority of their population in the rural areas with weak health care systems, the number of persons infected with these pandemics may be more than those in

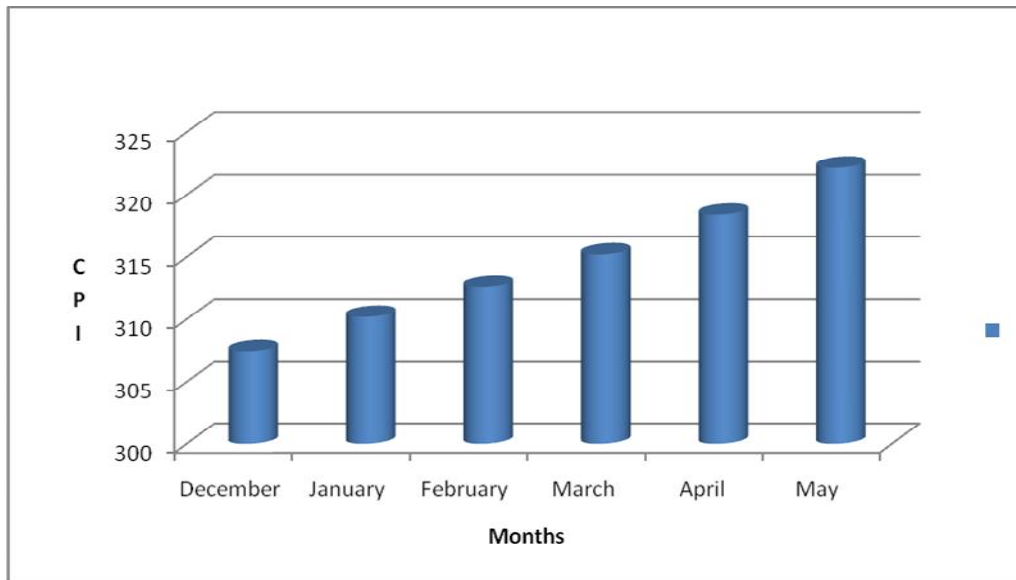


Fig. 2. Nigeria consumer price index from December 2019-May 2020
 Source: National Bureau of Statistics (NBS)

the cities. Reports from the National Bureau of Statistics (NBS) show that the Consumer Price Index (CPI) in Nigeria has been on the increase giving rise to inflation and a reduction in the purchasing power of rural households [12].

2.2 Worsening Healthcare System

Worldwide, over 736 million people are reported to be living in extreme poverty leading to ill health and social unrest. Already, 820 million people, majority of who are rural dwellers are devastated by hunger and malnutrition which denies them of their future while destroying their immunity against sickness and diseases [25]. The socio-demographic characteristics of rural areas especially in developing countries show that they have few organizational supports for the transfer of health care advices during the outbreak of pandemics. The majority of the avenues for communicating health issues that are provided by the government are usually less accessible for the rural households and the presentation of ideas may not be at their level [26]

2.3 Farm Labor Shortage

The agricultural sector, which is the major occupation of rural dwellers, is labor-intensive. Several farm activities such as planting, weeding, and harvesting, etc require movement which is restricted during pandemics. Rural communities in Nigeria utilize different forms of farm labour in

their agricultural production activities including hired, family, share cropping and reciprocal. Restriction of movement during pandemics leads to interruption of the rural labor collaborations among small scale farmers. Hence, the lockdown of the society and ban on interstate travels that characterized pandemic periods has led to insufficient labor supply and an increase in the prices of fresh foods from farms. The indigenous reciprocal sharing of labor is difficult to implement during pandemics due to physical distancing. This usually leads to increase in post harvest losses. Although the effect of this may be ameliorated by concentrating on family labour due to the closing down of schools, this does not ensure optimal labor availability and access for farm activities. Also, the reverse movement of labor from the urban centres to the rural communities will boost rural availability with the risk of increasing the spread of the pandemic. If the pandemic increases with the attendant migration of human and labour to the rural areas, it may also increase rural unemployment and competition for available food. Fluctuations in labor availability as a result of the pandemic scare and sickness can pose a major interruption which may affect farm production and other levels within the production chain [27]

2.4 Difficulty in Value Addition Processes

Another problem among rural farm households during pandemics is disruption of value addition

processes of farm produce and this causes increase in post harvest losses with reduction in farm income. A relationship exists between shortage of farm labor and the challenges of value addition. Farm produce are usually not harvested and properly processed and stored due to non-availability or non-affordability of labour to perform those on-farm and off-farm activities. According to [29], about a third of the food produced from different farms in the world are either lost or wasted. Outbreaks of pandemics usually worsen the already bad situation. These post harvest losses may either be qualitative or quantitative and in some cases may involve both. To add value to farm produce, farmers may need to transport their produce to storage sites, processing centers, parks, etc which may not be accessible [30]. The non – availability of market outlets for processed agricultural produce makes it difficult for processing firms to buy large quantities. Given this, they have reduced the volume of their normal production or discontinued production out rightly. This has led to market glut and reduced farm income.

2.5 Lack of Farm Inputs

In Nigeria, the use of fertilizer, planting of improved crop varieties and the rearing of modern breeds of animals are the most advertised innovations for increased productivity. Restriction of movement may affect suppliers of farm inputs such as fertilizers, seed, and agrochemicals, etc as firms that supply these inputs may close down or withdraw from the rural communities [28]. If the pandemic is not adequately addressed, farms would encounter insufficient supply of inputs. The adoption of several agricultural extension packages such as planting of improved varieties, use of approved agrochemicals, application of modern agronomic practices etc are essential for higher farm production and productivity among rural households. Although there are input producers such as fertilizer processing plants, seed production centres etc in Nigeria, the country still imports to argument local production. The lockdown of communities as a result of pandemics in the country and other producing nations may adversely influence the supply of these inputs in real time. This would unavoidably disrupt their delivery to the farmers. With the scarcity of farm inputs, inflation may set in for the available inputs in the market. Farm households may experience financial challenges to buy farm inputs and hire labor on schedule.

2.6 Increase in Gender Inequality

Globally, women in rural areas who play active roles in food production receive low wages and are vulnerable to pandemics. Their vulnerability is increased by lockdown which restricts movement and relationship. In addition to the responsibility of providing care in the families, women in rural areas would likely spend less time on the farm to carter for a sick member of the household [31]. Reports from the outbreak of the Ebola virus disease showed that transportation of goods and services was restricted making it difficult for women to engage in both on-farm and off-farm activities. This increased the rate of default on loans received from co-operative societies and reduced their envisaged economic growth [31]. The effects of pandemics are usually evident among the active age groups, then the vulnerable groups (women, children, rural poor) and it spreads across different gender.

2.7 Worsening of Rural Nutrition

Already, rural households in Nigeria are experiencing high level of nutrition insecurity due the adverse effects of climate change, conflicts, attacks by armed bandits and economic hardship. Rural nutrition is not also spared during the period of pandemics as consumers rarely go to markets to buy food and this adversely affects their nutritional choices and food consumption [30]. There is a direct relationship between individual income and food demand. Alterations in consumer's income may affect food demand across the production lines [27]. This implies that as the income of rural households decreases, there could be a negative effect on consumption [30].The absence of fresh agricultural products leads to an increase in malnutrition due to the consumption of junks. This increases the vulnerability of rural households to diseases.

The increasing wave of misinformation may negatively influence the consumption of certain foods especially animal products and sea foods thereby threatening rural household nutritional security. This emerging food crisis is impoverishing many rural households as they may not easily have access to quality food [1]

3. ROLES OF RURAL ADVISORY SERVICES

Agricultural advisory services (agricultural extension) is an essential service provider for the

revitalization of the agricultural sector. This system plays active roles in increasing farmer's productivity, sustenance of food sufficiency and security, raising the living standard of rural dwellers, as well as ensuring that agriculture takes the center stage of economic development in many African countries [32]. In its support services to rural households, agricultural extension and advisory services address the emerging challenges of rural livelihood through the introduction of innovations. It is expected that extension practice will assist rural households in addressing the challenges arising from pandemics and other health difficulties confronting rural households.

3.1 Encourage Healthy Agricultural Production and Rural Nutrition

The period of the pandemic offers the agricultural extension the opportunity to establish the most appropriate method to relate to rural farm households. Extension must emphasize that sustaining a healthy agricultural production system is a more viable option than ever in order to restrict the transmission of pandemics [26]. While the efforts to stem the effect of pandemics among rural households is commendable, there is the need to develop a system that will encourage the emergence of a 'new normal' which will improve the resilience, profitability, and inclusiveness of rural food systems[28]. Rural advisory services should encourage the government on avenues of developing community safety nets to sustain nutrition security of the vulnerable members of rural households.

3.2 Information Dissemination

Apart from providing early information on the spread of the pandemic to rural households, agricultural extension and advisory services must also play the indispensable role of creating awareness, assisting during sessions of emergency operations, disseminating accurate and real-time information to rural households, and teaching and encouraging farmers to practice all the essential preventive measures against Covid-19 as enumerated by the Centre for Disease Control (CDC) [6]. These include the regular washing of hands, keeping social distance, use of face mask especially when in public, avoid touching the nose, mouth, and eyes, use of alcohol-based hand sanitizers, monitoring the health status of farm workers,

educating farm workers on the ideal procedure when they are sick among others [26]. Advisory services must utilize very effective tools, native languages as well as the interplay of group dynamics in communicating ideas to the rural communities [33]. Where necessary, the organization should assist the rural households in procuring essential materials such as face masks and hand sanitizers. Emerging patterns of cooperation among operators in the agricultural industry should ensure that information and data sharing are optimized to facilitate understanding of the severity of the challenges as soon as possible [8].

3.3 Rural Advisory Service for Value Addition

The pandemic provides an opportunity to evaluate the activities of rural cooperative associations. These associations can encourage access to value addition technologies. Communities can be supported to carry out value addition activities at the farm level through their cooperative association leaders while ensuring that community spread of Covid 19 is minimized. To reduce losses among rural households, extension must advise them to purchase only the quantity they can consume. Using the strategy of first in first out, food materials that were purchased earlier should be consumed before the later.

3.4 Improvement in Labor Availability

The agricultural extension and rural advisory services can facilitate an interim response to guarantee labor availability by interfacing with other concerned agencies to achieve organized migration of occasional farm laborers to locations that are labour intensive. It is necessary to ensure that these migrant laborers are quarantined with the implementation of emergency structures. Also, rural households must be educated to encourage the returnees to participate in agricultural activities and support the establishment of agribusiness processing centres to counter any negative influence of reverse migration. Indigenous farm practices that are labor saving will also support rural households in the period of pandemics. Extension can assist in mobilizing labor resources to conquer occasional periods of high labour demand. Strategic procedure that would ensure labor availability at different departments of farm production activities can be implemented.

3.5 Effective Interface between Government and Rural Communities

Agricultural extension must heighten the campaign to ensure that agricultural production activities are included among the essential service which can go on even when other sectors of the economy are shut down [8]. This is because agriculture supports large scale economic development through job creation and improvement in the standard of living which consolidates the public healthcare system. This becomes more pertinent when we consider that today; rural households are facing the dual burden of inadequate healthcare and irregular extension services for livelihood sustenance.

3.6 Providing Links to Farm Input and Market

Agricultural extension and rural advisory services is expected to work out means of ensuring that farm inputs are available to their clientele in real time during farming periods at affordable prices. Working through the Ministry of Agriculture, extension should advice on the need for incentives to support rural farm households.

Extension services are expected to initiate projects with the target of improving the connection between agricultural producers and marketers to reduce post-harvest losses along the value chain. Considering that the inter-state lockdown and restrictions due to pandemics may affect the demand for agricultural produce from rural farm households, extension should become more pro-active in linking them with their customers. Such approaches may include altering the business model, meeting the needs of the customers through means that will not expose the farmers to diseases and continuous generation of income through alternative means [34]. Agricultural extension and rural advisory services must attend to the urgent need of supporting rural farmers, especially the vulnerable groups to conquer emerging challenges during the periods of a pandemic. Leveraging on the already established relationship of trust between them and rural producers, they can provide trusted links to input agencies, value addition centers, etc that will aid farm production during the pandemic [6]. Rural advisory services must be reinvigorated to build active partnerships and minimize the disruptions in the marketing of agricultural produce while ensuring that the supply chain functions adequately. This will ensure that critical challenges from the pandemic are addressed in

collaboration with other stakeholders in the agricultural sector. It will also pave the way for the emergence of the short agricultural value chain in the rural communities, improving access to value addition centers while advocating the implementation of e-commerce [6]

4. CHALLENGES OF AGRICULTURAL EXTENSION SERVICES DURING THE OUTBREAK OF PANDEMIC

While extension services in Nigeria must target to play active roles during the period of a pandemic. Certain challenges that are inherent within the Nigerian system could hamper its effectiveness.

4.1 Pre-Covid 19 Challenges

Prior to the emergence of the Covid 19 pandemic, agricultural extension and advisory services in Nigeria has faced several challenges. Federal Ministry of Agriculture and Rural Development (FMARD) identified some of the major challenges to include:

- Absence of a legislated extension policy which has been compounded by policy inconsistencies in the sector
- Absence of adequate funds for extension activities. On few occasions where these funds are made available, they arrive behind schedule
- Absence of strong leadership and coordination. Donors usually encounter challenges given the absence of coordination and non-remittance of take-off funds from different levels of government in Nigeria.
- Inadequate level of involvement of the private sector in agricultural extension projects
- Very poorly linked Research-Extension-Farmer-Inputs Linkage system which is characterized by inefficient top-down, supply driven extension approaches [35].

4.2 Emerging Challenges

4.2.1 Low utilization of modern technology by rural households

The low level of utilization of modern technology among rural farm households possesses a great barrier to extension services. There are few electronic platforms for agricultural extension service providers in Nigeria. This has been

attributed to low infrastructural development such as the absence of steady electricity, lack of access to internet facilities, low literacy levels among rural farm households among others. This has made it difficult to reach these farmers through such social media as Facebook, WhatsApp, Twitter, Instagram, etc. The campaign for social distancing means that farmers cannot gather for agricultural extension advisory service till the pandemic is brought under control. This is likely to strain rural livelihoods and the agricultural value chain [6]. Extension and advisory services must aim more on household extension for the meantime through the use of Information and Communication Technology (ICT) [25].

4.2.2 Homogenous nature of the rural communities

Rural communities are usually homogenous in their characteristics. They tend to exhibit a high level of social cohesion which helps them to remain stable. Some of the advice from health professionals such as avoiding handshakes, maintaining social distance, staying indoors, etc may be difficult for the rural households to adhere to. Given this, it is expected that certain social issues may emerge among rural households which the extension system must address by promoting interrelationship with welfare and social protection service providers, build social safety nets and encourage farmers to adopt other available income generation ventures [6]. Hence, if a positive result must be attained, extension workers must exercise patience and professionalism in educating the rural dwellers.

4.2.3 Increasing housing deficit

The increasing housing deficit in rural areas has been ignored by government and development agencies. This is a severe challenge in ameliorating the challenges of pandemics among rural households. The emphasis on social distance and self-quarantine by concerned health agencies will not be possible among rural dwellers in Nigeria due to inadequate accommodation. Unfortunately, rural households in Nigeria do not have access to housing loans from the government and this leaves them at their peril.

4.2.4 Poor infrastructural development in rural communities

The poor level of infrastructural development in Nigeria's rural communities cannot be over-

emphasized. Rural areas in Nigeria are characterized by poor health care system, absence of good road network, lack of electricity, poorly developed educational systems, etc. These variables make it difficult to implement measures that would create a barrier to the spread of pandemics. The majority of Nigeria's rural dwellers do not have access to water. The dwindling rural economy makes it difficult for individuals to have access to face masks, alcohol-based sanitizers, etc.

5. CONCLUSION

The impact of pandemics among rural households cannot be over-emphasized. The campaign for increased laboratory analysis for Covid 19 is as important for community health same way as the assessment of the challenges and opportunities for agricultural extension and rural advisory services is crucial for rural livelihood. The increase in the number of confirmed cases of Covid 19 patients in Nigeria entails that all institutions must make cogent efforts to counter the impending adverse effects. Rural households are more vulnerable to these dangers due to the absence of adequate health care facilities, low per capital income, high level of cohesion and dependence of agricultural sector.. The agricultural sector is currently facing the challenges of climate change, bandits, rustlers etc. The rural advisory service system is an important institution at the frontline of responding to the outbreak of pandemics in rural communities. In a bid to adapt to the emerging challenges within stipulated guidelines, extension needs to urgently review its mode of operation. It is therefore essential that the rural advisory services in Nigeria should explore the existing opportunities while working out approaches to overcome the emerging challenges. Unfortunately, the outbreak and management of pandemics in Nigeria have shown a lack of contingency plans for rural advisory services in Nigeria. Agricultural extension and advisory services in Nigeria must think beyond her current practices.

6. RECOMMENDATION

The development of Information and Communication Technology (ICT) utilities should be an integral part of the Nigerian government's approach to boost effective extension service delivery. To increase the rate of technology adoption and transfer, user-friendly mobile devices and subject matters such as climatic

information, diagnoses of diseases and pests, e-commerce, etc should be developed in local languages for farmers' use. These improvements will ensure a smarter means of supporting rural farmers and close the gap between them and consumers. There is a need to reduce the cost of internet data packages to make it more affordable to extension workers and farmers so that critical information exchange can take place at a very low cost.

More efforts must be geared towards improving food production. Giving the successes recorded by extension all over the world through the implementation of group dynamics, the development of alternative approaches for service delivery to farmers will assist in ameliorating the effects of the pandemic among rural households. It is expected that the Covid-19 pandemic presents an opportunity to emphasize the need to improve rural livelihood and advisory services as the rural dwellers cannot adjust to the crisis arising from the pandemic. The pluralistic extension system which engages both the private and public stakeholders must be strengthened using efficient channels of communication

Efficient approaches must be adopted by the government to improve its ability to handle the pandemic and reduce the exposure of rural households to its influence. Firm initiatives aimed at reinvigorating the livelihood of rural people must be implemented by concerned agencies. Such initiatives should include linking them with social protection and insurance schemes as well as promoting indigenous production of food species for improved nutrition. The ability of the agricultural extension system to succeed in Nigeria will be subject to the extent that new advisory functions are integrated into the extension organization. There is an urgent need for diversification of investment within the agricultural sector to improve their adaptive and buffer capacity to economic meltdown

The capacity of the agricultural extension and rural advisory services need to be improved through training of trainers to encourage the use of innovation platforms in disseminating improved practices for mitigation against pandemics. This will also entail equipping the sector with contemporary tools for efficient data collection, processing, and dissemination. More efforts should be targeted at ensuring that while extension staff is provided with all they need for optimal provision of services, policymakers

should develop more interest in the agricultural sector.

There is a need to create a more reliable linkage between farmers and consumers who may face a difficult task at the moment. This will provide efficient approaches to reduce post-harvest losses and ensure that healthy food is delivered to consumers thereby scaling up investments in rural areas.

Agricultural extension and rural advisory services in Nigeria must consider the need for stronger independence from international aids and programs, experts, and answers and consolidate on establishing more rural ownership and expertise. Farmers should be encouraged to become more autonomous, establish a stronger local market, and improve rural value chains. There is a need to build up the dimensions of rural firms linking farmers to urban markets to attain stability during future economic shocks.

For an effective response to pandemics, national and international collaborations must ensure that pandemics are managed at all sectors of the society including health, economic, education, social, agricultural, etc.

7. LIMITATIONS OF STUDY

The findings of this review have to be understood in view of the constraints on the research design which was encountered due to lack of previous studies on the opportunities and challenges of agricultural extension and advisory services among rural farm households in Nigeria during pandemics. Hence there is quite little reports on the topic.

Further studies may evaluate the implementation of participatory extension approach towards mitigating the adverse effects of pandemics in Nigeria.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Anderl F. Covid-19 and agriculture: the coming contradictory hunger pandemic, 2020; Available:<https://www.opendemocracy.net/en/can-europe-make-it/covid-19-and-agriculture-coming-contradictory-hunger-pandemic>

- (Accessed 10th July, 2020)
2. Lepan N. World Economic Forum A visual history of pandemics; 2020.
 3. Huremović D. Psychiatry of Pandemics, Springer Nature Switzerland AG 2019 Available: https://doi.org/10.1007/978-3-030-15346-5_2 (Accessed 10th July, 2020)
 4. World Health Organization. Managing epidemics: Key facts about major deadly diseases Geneva Licence: 2018. CC BY-NC-SA 3.0 IGO. [ISBN 978-92-4-156553-0]
 5. Johns Hopkins 2020 Coronavirus Resource Center. <https://coronavirus.jhu.edu> (Accessed 10th July, 2020)
 6. FAO Extension and advisory services: at the frontline of the response to COVID-19 to ensure food security. Rome; 2020a. Available: <https://doi.org/10.4060/ca8710en> (Retrieved 1th July, 2020)
 7. Blum ML. Coffin F. Sulaiman RV. Agricultural extension in transition worldwide: Policies and strategies for reform. Rome, FAO. 2020. Available: <https://doi.org/10.4060/ca8199en> (Accessed 9th July, 2020)
 8. Winter S. A different look at COVID-19; 2020. Available: <https://www.syngentafoundation.org/articles/recent-news/different-look-covid-19/>
 9. Resnick D. COVID-19 lockdowns threaten Africa's vital informal urban food trade; 2020. Available: <https://www.ifpri.org/blog/covid-19-lockdowns-threaten-africas-vital-informal-urbanfood-trade> (Accessed on 19 June 2020)
 10. National Centre for Disease Control COVID 19 Nigeria; 2020. Available: <https://covid19.ncdc.gov.ng/>
 11. FAO Food and Agricultural Organization of the United Nations in Emergency, Nigeria; 2020b. Available: <http://www.fao.org/emergencies/countries/detail/en/c/213439>
 12. NBS National Bureau of Statistics, Key index; 2020. Available: <https://www.nigerianstat.gov.ng/>
 13. UNDP National Human Development Report Achieving Human Development in North East Nigeria; 2018. Available: http://hdr.undp.org/sites/default/files/hdr_2018_nigeria_finalfinalx3.pdf
 14. Keogh-Brown MR. Smith RD. Edmunds JW. Beutels P. The macroeconomic impact of pandemic influenza: estimates from models of the United Kingdom, France, Belgium and The Netherlands. *Eur J Health Econ.* 2010;11(6):543–54. Available: <http://dx.doi.org/10.1007/s10198-009-0210-1> pmid: 19997956
 15. Keogh-Brown MR. Wren-Lewis S. Edmunds WJ. Beutels P. Smith RD. The possible macroeconomic impact on the UK of an influenza pandemic. *Health Econ.* 2010;19(11):1345–60. Available: <http://dx.doi.org/10.1002/hec.1554> pmid: 19816886
 16. Liu JT. Hammitt JK. Wang J-D. Tsou MW. Valuation of the risk of SARS in Taiwan. *Health Econ.* 2005;14(1):83–91. Available: <http://dx.doi.org/10.1002/hec.911> pmid: 15386665
 17. Simmerman JM. Lertiendumrong J. Dowell SF. Uyeki T. Olsen SJ. Chittaganpitch M. The cost of influenza in Thailand. *Vaccine.* 2006;24(20):4417–26. Available: <http://dx.doi.org/10.1016/j.vaccine.2005.12.060> [PMID: 16621187]
 18. Meltzer MI. Cox NJ. Fukuda K. The economic impact of pandemic influenza in the United States: priorities for intervention. *Emerg Infect Dis.* 1999;5(5):659–71. Available: <http://dx.doi.org/10.3201/eid0505.990507> PMID: 10511522
 19. Prager F. Wei D. Rose A. Total economic consequences of an influenza outbreak in the United States. *Risk Anal.* 2017;37(1):4–19. Available: <http://dx.doi.org/10.1111/risa.12625> [PMID: 27214756]
 20. Molinari N-AM. Ortega-Sanchez IR. Messonnier ML. Thompson WW. Wortley PM. Weintraub E. The annual impact of seasonal influenza in the US: measuring disease burden and costs. *Vaccine.* 2007;25(27):5086–96. Available: <http://dx.doi.org/10.1016/j.vaccine.2007.03.046> [PMID: 17544181]

21. Keren R. Zaoutis TE. Saddlemire S. Luan XQ. Coffin SE. Direct medical cost of influenza-related hospitalizations in children. *Pediatrics*. 2006;118(5):e1321–7. Available:<http://dx.doi.org/10.1542/peds.2006-0598> [PMID: 17079533]
22. Schoenbaum SC. Economic impact of influenza. The individual's perspective. *Am J Med*. 1987 2019;82(6A) Supplement 1:26–30. Available:[http://dx.doi.org/10.1016/0002-9343\(87\)90557-2](http://dx.doi.org/10.1016/0002-9343(87)90557-2) pmid: 3109239
23. Akazawa M. Sindelar JL. Paltiel AD. Economic costs of influenza-related work absenteeism. *Value Health*. 2003;6(2):107–15. Available:<http://dx.doi.org/10.1046/j.1524-4733.2003.00209.x> [PMID: 12641861]
24. Siche R. What is the impact of COVID-19 disease on agriculture?. *Scientia Agropecuaria* 2020;11(1): 3-6. DOI: 10.17268/sci.agropecu.2020.01.00
25. Forsido SF. Mitiku F. Lemessa F. Tolemariam T. Belew D. Berecha G. Garede W. Bekele Y. Geda F. Eneyew A. COVID-19 Probable impacts on Ethiopian agriculture and potential Mitigation and Adaptation Measures: No Food-No Health-No Life. 2020; Jimma, Ethiopia: Jimma University; 2020.
26. Daphne T. Jacques du G. Sustainable Agricultural/Rural Development and Vulnerability to the AIDS Epidemic. 1999; FAO and UNAIDS Joint Publication UNAIDS Best Practice Collection.
27. Alvaro JA. Durand-Morat W. Miller JP. Daniel RR. Rainey SS. Watkins W. COVID-19 Impacts on Arkansas' Agricultural and Rural Economies; 2020.
28. Johannes L. Lennart W. María B. Mary. Don't forget about the impact of COVID-19 on the rural poor and food security. International Maize and Wheat Improvement Center; 2020. Available:<https://www.cimmyt.org/blogs/dont-forget-about-the-impact-of-covid-19-on-the-rural-poor-and-on-food-security/>
29. FAO (Food Loss and Food Waste; 2019. Available:<http://www.fao.org/food-loss-and-food-waste/en/> (Retrieved 10th June, 2020)
30. Ranjan R. Covid-19: Increasing economic resilience of the agriculture sector; 2020.
31. CGIAR. Equality in a post-pandemic era: Gender, COVID-19, agriculture and climate change; 2020.
32. World Farmers Organization. Covid-19 Pandemic Outbreak: Overview Of The Impact On The Agricultural Sector: A Technical Assessment Of The Undergoing Situation; 2020. Available:www.wfo-oma.org
33. Choularton R. Mallory M. Opinion. How to address the impact of COVID-19 on global food systems; 2020. Available:<https://www.devex.com/news/sponsored/opinion-how-to-address-the-impact-of-covid-19-on-global-food-systems-96892>
34. Izuogu CU. Atasié CM. Ifenkwe GE. Perceived effects of environmental hazard on health conditions of rural farm households in Imo State, Nigeria. *International Journal of Advanced Research in Engineering & Management (IJAREM)*. 2015;1(4):11-23.
35. Federal Ministry of Agriculture and Rural Development (FMARD): The Extension Transformative Group. Final Report of the Agricultural Extension Transformation Component of the Agricultural Transformation Agenda. Nigeria: FMARD; 2012.

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