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SOURCES OF INFORMATION ON REGENERATIVE AGRICULTURAL TECHNOLOGIES AMONG FARMERS IN BENUE STATE, NIGERIA

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Abstract
The study assessed sources of information on regenerative agricultural technologies in Benue State, Nigeria. All rural farmers constituted the population of the study, respondents, a multistage sampling procedure was used to select 180 respondents. Primary data were collected using a structured questionnaire; data collected were analysed using descriptive and inferential statistics. The findings revealed that majority (92%) of the respondents sourced information from interpersonal channels, non-governmental organisations (90.3%), financial institutions (77.3%) and 73.0 from extension agents. Respondents adopted regenerative agricultural technologies at various stages including zero or minimum tillage at adoption stage ($\bar{x}$=4.60), cover crops ($\bar{x}$=4.48), bush fallowing ($\bar{x}$=4.30) and compost/manure ($\bar{x}$=4.28). Adoption of synthetic fertilizer only when necessary (0.000), Application of pesticides only when necessary (0.000), use of herbicides only when necessary (0.000) and crop rotation (0.000) varies significantly across the eastern, northern and central agro-ecological zones of Benue state. The study concluded that information sources such as interpersonal channels, non-governmental organisations, financial institutions and extension agent were sources of information mostly use by regenerative agricultural farmers in Benue state. It is recommended that extension agents and non-governmental organisations should disseminate more information on regenerative agricultural practices including animal and crop integration, management of grazing, application of pesticides only when necessary and use of herbicides only when necessary.

***Keywords**: Information, Sources, Regenerative, Agricultural, Technologies*,

1.0 Introduction

Agriculture is an important sector of the Nigerian economy and a major source of livelihood for a large proportion of the rural population. However, agricultural production is increasingly affected by challenges such as declining soil fertility, land degradation, climate variability, erosion, loss of biodiversity and increasing production costs. These challenges have created the need for agricultural production approaches that can maintain farm productivity while restoring soil health and protecting natural resources. One approach receiving increasing attention is regenerative agriculture**.** Regenerative agricultural technologies refer to farming practices, techniques and innovations designed to restore and improve the health of agricultural soils, biodiversity, water systems and other ecosystem functions while supporting sustainable food production. The Food and Agriculture Organization (FAO, 2026) describes regenerative agriculture as a holistic approach to agroecosystem management that seeks to conserve and restore land, soils and biodiversity while strengthening ecosystem services. Similarly, Schreefel *et al.* (2020) describe regenerative agriculture as an approach to farming that uses soil conservation as an entry point for regenerating and improving multiple ecosystem services. Practices associated with regenerative agriculture include minimum or zero tillage, crop rotation, cover cropping, mulching, composting,

agroforestry, integration of crops and livestock, and other practices that improve soil health and resource-use efficiency (Newton *et al*., 2020).

An important factor influencing farmers' awareness and adoption of agricultural technologies is access to relevant and reliable information. Sources of agricultural information are the various channels through which farmers obtain knowledge, advice, ideas and technical information concerning farming activities and technologies. These sources may include agricultural extension agents, fellow farmers, farmer associations, research institutions, universities, non-governmental organisations, input dealers, radio, television, newspapers, mobile phones, social media and other digital platforms. Information is particularly important for regenerative agricultural technologies because farmers need adequate knowledge about the principles, application methods, costs, benefits and possible limitations of such practices before they can effectively incorporate them into their farming systems. Previous research among Nigerian farmers has identified radio, agricultural extension agents and fellow farmers as important sources of agricultural information (Monu and Omole, 2022). The increasing use of information and communication technologies has also created additional opportunities for the dissemination and exchange of agricultural knowledge among farmers (Aker & Mbiti, 2010).

The issue is particularly relevant in Benue State, widely associated with agricultural production and rural livelihoods in Nigeria. Farmers in the state obtain agricultural information through both traditional and modern channels. A recent study covering farmers in Benue, Nasarawa and Plateau States found that 90% of the 221 Benue respondents reported obtaining agricultural information through radio, while 69.7% reported contact with agricultural extension workers for agricultural information (Okocha, 2024). The study further observed that indigenous-language agricultural radio programmes and extension workers constitute important channels through which farmers receive information and agricultural innovations. These findings demonstrate the continued relevance of conventional information channels while also indicating opportunities for strengthening information dissemination through modern communication technologies.

The increasing pressure on agricultural resources and the need for sustainable food production make access to information on regenerative agricultural technologies increasingly important. However, the availability of a technology does not necessarily mean that farmers are aware of it, understand its application or have sufficient information to adopt it. In Benue State, farmers obtain information from multiple sources, but the relative contribution, accessibility and usefulness of these sources for regenerative agricultural technologies remain insufficiently documented. While existing studies have examined general agricultural information sources, there is limited specific evidence on where farmers obtain information about regenerative agricultural technologies and the channels through which such information reaches them. This creates a knowledge gap concerning the major sources of information available to farmers, the frequency with which they use these sources and the extent to which the sources provide useful information on regenerative agricultural practices. Therefore, this study focuses on the sources of information on regenerative agricultural technologies among farmers in Benue State, Nigeria**,** with the aim of providing empirical information that can contribute to improved agricultural extension, communication strategies and promotion of sustainable farming practices in the state.

2.0 Objective of the Study

The broad objective was to assess sources of information on regenerative agricultural technologies among farmers in Benue State, Nigeria and the specific objective of the study were to;

i. identify sources of information on regenerative agricultural technologies among the regenerative agricultural farmers;
ii. ascertain stages of adoption of regenerative agricultural technologies by the farmers; and
iii ascertain the differences in the stages of adoption of regenerative agricultural technologies among farmers across the three agro-ecological zones of the study area.

3.0 Methodology

The study was conducted in Benue State, Nigeria. The State drives its name from River Benue, one of the longest rivers in the country. Benue State is one of the 36 States in Nigeria. The State lies between longitude $6^0 35'$ E and $8^0 10'$ E of the Greenwich Meridian and latitude $6^0 30'$ N and $8^0 10'$ N of the equator at an elevation of 97m above sea level in southern guinea Savannah agro ecological zone [National Population Census (NPC, 2006)]. The State has 23 Local Government Areas (LGAs), 423 council wards and three agro-ecological zones (Eastern Northern and Central zones) with administrative headquarters at Makurdi. The State covers landmass of 32,518 Km^2 with an estimated population of 6,286,170 people (World Bank, 2022). It lies in the North-Central region of Nigeria and shares boundaries with five other states; Nassarawa to the north, Taraba to the east, Cross-River to the south, Enugu to the southeast and Kogi to the west. The State also shares a common boundary with the Republic of Cameroon in the south-east [Benue State Agricultural Rural Development Authority (BNARDA, 2010)].

The State experiences tropical climate with two distinct seasons, the rainy and dry seasons, The State is made up of several ethnic groups including Tiv, Idoma and Igede. Others are Jukun, Etulo, Abakpa, Akyeya, Hausa, Igbo and Igala, among others. The State is estimated to have 75% of her population engaged in subsistence farming that is purely rainfed (BNARDA, 2010). Benue State is referred to as the "Food Basket of the Nation" because of the abundance of its agricultural resources. About 80% of the State population is estimated to be involved directly in agriculture (BNARDA, 2000). The state is a major producer of food and cash crops such as cassava, yams, rice, groundnut, melon and maize. Others includes sweet potato, millet, sorghum, sesame and wide range of others like soya bean, sugarcane, oil palm, mango, tomato, citrus and banana (BNARDA, 2010). Benue State is blessed with abundant mineral resources. These mineral resources are distributed in the local government areas of the State. Limestone at Tse-Kucha near Gboko and kaolinite at Otukpo are being commercially exploited. Other mineral deposits include baryte, gypsum, feldspar, wolframite, mineral salts and gemstones (BNARDA, 2010).

The population of the study comprised all farmers in Benue State, Nigeria. A sample size of 185 respondents was selected using multi-stage and simple random sampling techniques. In the first stage, the State was stratified into three already existing Agricultural Zones of Eastern, Northern and Central. The second stage involved purposive selection of one LGA from each Agricultural Zone based on soil nutrient depletion and the need to manage the soil nutrients for agricultural production. From Eastern zone Vandeikya Local Government Areas (LGA), Northern zone Tarka LGA and Central zone Okpokwu LGA were selected. The third stage involved the purposive selection of three rural communities from each LGA thus, in Vandeikya LGA Mbadede, Mbakaange and Mbagbera. In Tarka LGA Tongov, Mbaigba and Mbaayo. and from Okpokwu LGA Ugbokolo, Okpoga and Ojigo rural communities were selected accordingly.

In the final stage, a sampling frame was developed for each of the rural communities and using a proportional allocation of 1.64 percent (0.0164) across board, a sample size of 185 respondents was selected for the study. Data for the study were collected from primary source, using structured questionnaire. Data collected were analyzed using descriptive and inferential statistics. Objective i, was analysed using percentages, objective ii was analysed using mean and standard deviation and objective iii was analysed using Kruskal Wallis

$$H = \frac{12}{N(N+1)} \sum_{i=1}^{k} \frac{R_i^{\,2}}{n_i} - 3(N+1)$$

H = Kruskal-Wallis test
N = Total number of observations
n_i = Sample size
R_i^2 = Square of the sum of the ranks for samples

$\frac{\sum Ri^2}{ni}$ = The square of sums of ranks divided by the corresponding sampling size (n_i) in the samples as are summed across all samples

4.0 Result and Discussion

4.1 Sources of Information on Regenerative Agricultural Technologies

Result in Table 1 depict that interpersonal channels (friends, family members, input dealers etc.) 96.2% and Non-governmental organizations 90.3%. Most (96.2%) of the respondents obtained information on regenerative agricultural technologies from interpersonal channels. Interpersonal channels of communication such as friends, family members were highly utilized among the farmers. This could be as a result of frequent interactions among farmers' relatives and friends. The finding is in agreement with Issa and Kagbu (2017) that interpersonal channels such as input dealers and fellow famers were the most utilize sources of information used by farmers in accessing agricultural information. Also, the finding is similar to Fomyol (2020) that interpersonal sources of information such as family, friends, marketers and colleagues accounted for most utilized information sources among farmers.

Table 1: Sources of Information on Regenerative Agricultural Technologies

Sources of information (n=185)	Frequency	Percentage
Interpersonal channels (friends, family members, input dealers etc)	178	96.2
Non-Governmental Organisations (NGOs)	167	90.3
Financial institutions	143	77.3
Extension Agent	135	73.0
Social media (facebook twitter, instagrametc)	84	45.4
Internet	79	42.7
Agricultural shows	72	38.9
Traditional media (town announcer, talking drum etc)	64	34.6
Schools/research institutions	63	34.1

**Multiple responses* *

4.2 Stages of Adoption of Regenerative Agricultural Technologies by the Respondents

Result in Table 2 indicated that apart from Use of herbicides only when necessary and silvopasture all the other technologies were reasonably adopted at various stage. For example, zero tillage ($\bar{x}$ = 3.928) with mean of ($\bar{x}$ = 4.60), Cover crops was at the adoption stage ($\bar{x}$ = 3.244) with mean of ($\bar{x}$ = 4.48), bush fallowing ($\bar{x}$ = 2.675) with mean of ($\bar{x}$ = 4.30), compost/manure ($\bar{x}$ = 2.752) with mean of ($\bar{x}$ = 4.28) among others. Farmers who practiced zero tillage have reduced the cost of tillage in their farming operations. In villages where the cost of manual labour is very high and the labourers are not easily gotten, this will go a long way in curtailing the time that might have been wasted looking for labourers. Use of cover crops ($\bar{x}$ = 4.48) does not require special skills before adoption. Use of cover crop is necessary to protect leaching of soil nutrient. Cover cropping serve as means of reducing the speed of drplet of rainfall and by extension prevents soil erosion. If leguminous crops are planted they also provide nutrients to the soil.

The finding is in agreement with Kughur *et al.* (2015) that technologies such as zero or minimum tillage, the use of cover crops and the use of compost/manure were the regenerative agricultural technologies adopted among farmers. The finding is also in agreement with Fuhrer (n.d) that regenerative agricultural technologies such as use of zero or minimum tillage, planting of cover crops, use of compost/manure, crop rotation, mulching, use of animal dung and intercropping were adopted among farmers. Schalau (2022) reported that famers make use of pesticides and synthetic fertilizer only when necessary, use of compost/manure, crop rotation, bush fallowing and zero or minimum tillage were the regenerative agricultural technologies adopted among farmers.

Table 2: Stages of Adoption of Regenerative Agricultural Technologies by the Respondents in the last two years (2021-2022)

Technologies	Awareness ($\bar{x}$)	Interest ($\bar{x}$)	Evaluation ($\bar{x}$)	Trial ($\bar{x}$)	Adoption($\bar{x}$)	Mean($\bar{x}$)	STD
Zero or minimum tillage	0.322	0.051	0.101	0.198	3.928	4.60	1.000
Cover	0.193	0.170	0.170	0.703	3.244	4.48	1.000
Bush fallowing	0.348	0.512	0.138	1.045	2.675	4.30	0.677
Compost/manure	0.253	0.137	0.509	0.625	2.752	4.28	0.764
Animal dung	0.184	0.210	0.394	0.950	2.550	4.28	0.896
Intercropping	0.158	0.224	0.830	0.560	2.378	4.15	0.546
Crop rotation	0.469	0.111	0.222	0.999	2.310	4.11	0.620
Mulching	0.277	0.471	0.451	0.705	2.055	3.96	0.522
Animal and crop integration	0.585	0.419	0.510	1.004	0.859	3.38	0.559
Management of grazing	0.634	0.428	0.587	0.789	0.729	3.17	0.440
Application of pesticides only when necessary	0.753	0.588	0.302	0.470	0.992	3.11	0.609
Use of synthetic fertilizers only when necessary	0.860	0.563	0.233	0.349	1.059	3.06	0.678
Agroforestry	0.554	0.716	0.406	0.831	0.506	3.01	0.589
Use of herbicides only when necessary	0.847	0.423	0.516	0.409	0.705	2.90	0.559
Silvopasture	1.023	0.374	0.349	0.286	0.275	2.31	0.441

≥3.0 adopted
< 3.0Noted adopted
Grand mean = 55.1
Adoption index = 3.67
STD = Standard Deviation

4.3 Differences in Adoption level of Regenerative Agricultural Technologies across the agroecological zones

Result in Table 3 showed that the chi-square value was significant at 1% for all adoption level of regenerative agricultural technologies across the three agroecological zones in Benue State. This suggests that there exists a significant difference in adoption level of regenerative agricultural technologies across the three agroecological zones in Benue State. Therefore, the null hypothesis which stated that there is no significant difference in adoption level of regenerative agricultural technologies across the three agroecological zones in the study area was rejected and the alternative hypothesis accepted.

The findings reveal that use of compost/manure (0.004), crop rotation (0.000), management of grazing (0.006), use of synthetic fertilizer only when necessary (0.000), application of pesticides only when necessary (0.000), use of herbicides only when necessary (0.000), and inter-cropping (0.009) were all significant at 1%

This implies that adoption level of the above regenerative agricultural technologies highly differs from one agricultural zone to the other. The finding confirms Ranganathan *et al.* (2020) that use of synthetic fertilizer only when necessary, application of pesticides only when necessary, use of herbicides only when necessary, rotation, intercropping among others differs in adoption level within the agricultural zones.

Table 3: Adoption of Regenerative Agricultural Technologies by Agroecological Zones

Regenerative Technologies	Eastern Zone Mean Rank	Northern Zone Mean Rank	Central Zone Mean Rank	Chi-square	Asymp. Sig	Remark
Zero or minimum tillage	93.43	97.22	84.44	8.186**	0.017	significant
Planting of cover crops	89.82	97.36	89.29	2.566	0.277	not significant
Use of compost/manure	83.16	103.53	87.03	10.586*	0.004	significant
Crop rotation	109.97	98.15	59.22	47.176*	0.000	significant
Animal and crop integration	87.93	97.60	91.52	1.575	0.455	not significant
Management of grazing	79.23	103.68	92.42	10.289*	0.006	significant
Use of synthetic fertilizer only when necessary	67.23	99.67	116.99	32.027*	0.000	significant
Application of pesticides only when necessary	72.28	99.03	111.03	20.052*	0.000	significant
Use of herbicides only when necessary	81.25	77.91	138.09	56.812*	0.000	significant
Agroforestry	79.43	84.27	103.17	5.845**	0.054	significant
Silvopature	93.23	84.56	108.57	10.727*	0.005	significant
Mulching	95.80	91.16	92.49	0.507	0.776	not significant
Bush fallowing	93.87	93.44	90.94	0.235	0.889	not significant
Use of animal dung	82.67	101.58	91.49	8.621*	0.013	significant
Inter-cropping	105.85	84.10	91.53	9.432*	0.009	significant

Note: *, ** and *** significant at 1%, 5% and 10% level of probability respectively

5.0 Conclusion and Recommendations

5.1 Conclusion

The study concluded that information sources such as interpersonal channels, non-governmental organisations (NGOs), financial institutions and extension agents were used by regenerative agricultural farmers in Benue State.

5.2 Recommendations

It is recommended that extension agents and NGOs should disseminate more information on regenerative agricultural practices to farmers including animal and crop integration, management of grazing, application of pesticides only when necessary and use of herbicides only when necessary.

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