



Livelihood Diversification Strategies and Their Prioritization among Farmers in North Central Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author HS wrote the first draft and performed the statistical analysis. Author JNN conceptualized and designed the study. Authors AAAC, USM and MKS managed the literature review, data curation and editing. All authors read and approved the final manuscript.

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ABSTRACT

The importance of livelihood diversification cannot be over emphasized as it reduces risk by spreading income sources across different activities, households can mitigate risks associated with climate variability, market shocks, or other disruptions. While climate change adaptation is

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significant in enhancing agricultural productivity, reduces vulnerability and promote sustainable development.

Aims: This research examined the various livelihood options and the intensity of use among farmers in North Central Nigeria.

Study Design: Original research using primary data collected from sampled farmers who are basically into production of rice and cassava.

Place and Duration of Study: The study was conducted in North central Nigeria in 2023.

Methodology: The study used data obtained from administered questionnaire to 483 small scale farmers which were randomly selected. Data were analyzed using descriptive statistics and Analytic Hierarchy Process (AHP). AHP method where alternatives are compared with each other under various criteria is more accurate than cluster analysis which categorize households into distinct livelihood strategy groups based on the percentage contribution of individual income to the total household income and also the rating method using likert-type scale.

Results: Results revealed that all the farmers participated in crop farming with mean monthly income of N55,416.98 which has the highest priority weight of 22.14%. Other livelihood activities identified were livestock farming, petty trading, business, agricultural trading, aquaculture/artisanal fishing, agro-processing, handcraft, transportation services, tailoring/fashion design, health worker, telecommunication services, labour vending, artisans, blacksmith, domestic worker, construction worker and mining/quarry worker. Result of the AHP revealed that there was more intense use of crop farming among the livelihood options which was ranked first, then livestock farming, business and agricultural trading.

Conclusion: The study concluded that crop farming was the most important livelihood activity of the farmers. The farmers have diversified to take advantage of available opportunities to improve their livelihood security, reduce risk and improve their adaptation to climate change.

Keywords: Livelihood; analytic hierarchy process; central Nigeria.

ABBREVIATIONS

AHP : Analytic Hierarchy Process;

IFAD-VCDP : International Fund for Agricultural Development-Value Chain Development Programme.

1. INTRODUCTION

Agricultural sector is the largest employer in rural area, the largest income generator and the largest sources of raw materials, which plays a significant role in shaping the size and structure of the rural non-farm economy (Haggblade et al., 2016). More so, researchers agreed that agriculture is the most susceptible sector to climate change, considering the uncertainty that surrounds long-term patterns of environmental change and their likely impacts on the livelihood activities and options of the poor farm households (Brown and Crawford, 2018). However, livelihood diversification is seen as a means of adaptation that can be used as a coping strategy and also to reduce the impact of climate change on the welfare of farmers.

Shittu et al. (2005) revealed that non-farm source contributes about half of the rural farming households' income. In line with this (Awoniyi and Salman, 2012), "pointed out that farming

household which are not involved in non-farm activities are more vulnerable to poverty when compared with farming households that engaged in non-farm income. The non-farm sector offers potential to absorb a growing rural labour force, slow rural-urban migration, contribute to national income growth, and promote a more equitable distribution of income" (Fikru, 2008). The higher the degree of diversification of households, the better-off they are in terms of total income (Fikru, 2008). Lending credence to this, Delil (2011) pointed out that farm households who diversified their productive activities to off farm economy are found to be better off as compared to those who confined their operation to farm sector.

"Farming remains important but rural people are looking for diverse opportunities to increase and stabilize their incomes as a result many rural households find themselves pursuing second-best diversification strategies through the allocation of household labour" (Bhaumik et al.,

2016). Two fundamental causes of diversification are also frequently mentioned in the literature (Ellis, 2008); namely, seasonality and risk. Diversification is thus assumed to play a role in overcoming the consumption smoothing problem created by the seasonality of agricultural output patterns. All households, whether rural or urban, are prone to personal shocks of chronic illness, accidents and death. Risks are thus reduced by diversifying livelihoods.

In literature, Gecho (2017) and Addisu (2017) identified three livelihood diversification strategies among farm households namely: on farm, nonfarm and off farm. Crop farming and livestock farming were identified as major livelihood activities of on farm livelihood strategy. Contrary to the above classification Wondimagegnhua et al. (2016), "classified livelihood diversification strategies as on farm (crop and livestock production) and nonfarm. Off-farm activities were activities, which were carried out on someone else's farm such as wage labour, natural resource based activities like firewood/grass and charcoal selling" (Yona and Mathewos, 2017). Non-farm activities also include petty trade, handicraft (weaving, spinning, carpentry, house mudding, poet making), remittance, selling of local drinks and rent of pack animal like donkey for transportation (Gecho, 2017). "In addition, selling of unskilled labour force, mining and trading of small ruminants and cattle were nonfarm livelihood sources for smallholder farmers" (Asfir, 2016).

Climate change and extreme weather events present severe threats and erode essential needs, capabilities and rights more especially for the poor farm households and marginalized thereby redesigning their livelihoods (UNDP, 2017). A number of livelihoods are directly climate sensitive, such as rain fed agriculture, seasonal employment in agriculture and tourism (IPCC, 2014). "That is, almost all sectors in agriculture depend on weather and climate whose variability have meant that rural farmers who implement their regular annual farm business plans risk total failure due to climate change effects. Studies" (Antwi-Agyei, 2012; Ibitoye et al., 2014) have confirmed that food and livelihood security are severely threatened by climate change, which has a direct, often adverse influence on the quantity and quality of agricultural production in Nigeria. "More so, the vulnerability of developing countries like Nigeria is worsened by heavy reliance on renewable

natural resources for livelihoods, employment and incomes. Therefore, a change in climate has implications on the livelihoods of the farmers" (Nicholas et al., 2012).

However, limited empirical information is available on the various livelihood options and the intensity of use in North Central Nigeria. Therefore, this research will contribute empirically to this knowledge gap. In addition, the knowledge of livelihood options could enhance policy towards tackling the challenges climate change is imposing on Nigerian farmers. The result of this research will also help guide investment priorities in the study area, which if implemented will build resilience. In other to fill the knowledge gap, the study seeks to answer these questions: what are the various livelihood options in the study? And what is the intensity of use of the livelihood options? The objectives of the research were to describe the various livelihood options in the study area; and determine the intensity of use of the livelihood options.

2. THEORETICAL AND ANALYTICAL FRAMEWORK

According to the theoretical perspective of Musyoka and Onjala (2023), livelihood diversification plays a crucial role in managing risks and reducing vulnerability to climate shocks. Since the primary goal of risk management is to maintain stable consumption across various activities, vulnerability to such shocks is expected to decrease as the level and scope of livelihood diversification increase, aligning with the views of Rampini and Viswanathan (2016). Diversification effectively mitigates the adverse effects of climate shocks on household welfare by stabilizing incomes through a diverse portfolio of activities.

Several studies, Tesfaye et al. (2011); Soltani et al. (2012); Khatiwada et al. (2017) have used Principle Component Analysis (PCA) followed by cluster analysis to categorize households into distinct livelihood strategy groups based on the percentage contribution of individual income to the total household income. This might result to misclassification of observations at the boundaries between the clusters.

Saaty (2008) compared the result of analytic hierarchy process and rating method and the result of the study revealed that the two methods do not reveals the same priorities result. For the

rating method using likert-type scale the alternative priorities were very close, it was therefore concluded that AHP method where alternatives are compared with each other under various criteria is more accurate. In this study, Analytic hierarchy process which is a multiple criteria decision-making tool introduced by Saaty (1980) was used. It uses an Eigen value approach to the pair-wise comparisons (Goepel, 2013). The Analytic Hierarchy Process (AHP) is used to derive relative priorities on absolute scales (invariant under the identity transformation) from both discrete and continuous paired comparisons in multilevel hierarchic structures. AHP takes several factors into consideration simultaneously, allowing for dependence and for feedback, and making numerical tradeoffs to arrive at a synthesis or conclusion.

3. METHODOLOGY

3.1 Study Area

“The study was conducted in North Central Nigeria. The States that make up the north central zone are Benue, Kogi, Kwara, Nasarawa Niger, Plateau and Federal Capital Abuja. Central Nigeria covers a total land area of 242, 425.00 sq kilometres and lies between latitude 4⁰ and 14⁰ North of the equator and longitudes 3⁰ and 14⁰ East of the Greenwich meridian. The area has an estimated population of 20, 266, 257 people” (NPC, 2006).

3.2 Research Design and Sampling Techniques

Multi-stage sampling technique was employed in the collection of primary data for this study. For this study, farmers that participated in International Fund for Agricultural Development-Value Chain Development Programme were used because of the availability of the sample frame. In the first stage, the two (2) participating States in North Central Nigeria under the International Fund for Agricultural Development (IFAD) - Value Chain Development Programme (VCDP) were selected. In the second stage, five (5) participating Local Government Areas (LGAs) in each State were selected, giving a total of ten (10) LGAs. In the third stage, sampling of farm households in each community were determined proportionately using Krejcie and Morgan (1970) formula in equation (1) following Ardakani et al. (2012) to obtained data from 483 IFAD-VCDP farmers.

$$S = \frac{X^2 NP(1-P)}{d^2(N-1)+X^2 P(1-P)} \quad (1)$$

Where:

- S = The required sample size;
- X² = Table value of chi-square for 1 degree of freedom at the desired confidence level (1.96);
- N = Population size;
- P = Population proportion (assumed to be 0.80);
- d² = Degree of accuracy expressed as a proportion (0.05).

3.3 Tools for Data Collection and Analysis

Data for this study were collected using structured questionnaire and interview schedule. The data were analyzed using descriptive statistics and Analytic Hierarchy Process (AHP). The Analytic hierarchy process is a multiple criteria decision-making tool that uses an Eigen value approach to the pair-wise comparisons. Following Goepel (2013), AHP procedure, the components, criteria, and sub-criteria of intensity of use of the various livelihoods were converted into a multi-level hierarchical structure to facilitate pair wise comparisons using expert judgment at each level. The comparisons are made using a scale of absolute judgements that represent, how much more, one element dominates the other with respect to a given attribute. To make comparisons, scale of numbers are needed which indicates how many times more important or dominant one element is over another element with respect to the criterion or property with respect to which they are compared. The pair-wise comparison matrix was developed to show which alternative livelihood option is more important to the other on a 9 point scale using four sub-criteria of the frequency, period of the year, income realized per frequency and reason for engagement in the livelihood options for all the 483 farmers, in respect to each livelihood activities the farmers participated in. The weighted vector and criteria weight were computed from the normalized pair-wise comparison matrix. The weights were computed using the AHP (Eigen Vector Method (EVM) Multiple inputs) software, Goepel version 26.07.2013. The calculation of priorities were then converted into a judgmental matrix:

$$A_{ij} = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{nm} \end{bmatrix} \quad (2)$$

Where:

A_{ij} = the expert's comparison rating between element i and element j of a given level with respect to the upper level of the hierarchy with:

$$a_{ij} > 0; a_{ji} = \frac{1}{a_{ij}}; a_{ii} = 1 \text{ for all } i. \quad (3)$$

The priorities or weights of the elements were estimated by finding the principal eigenvector W of the matrix A which is:

$$AW = \lambda_{max} W \quad (4)$$

Where:

λ_{max} is the largest eigenvector of the matrix A , the vector W is then normalized to get the vector of priorities of elements of one level with respect to the upper level. The priorities served as weights of the elements at each hierarchic level.

4. RESULTS AND DISCUSSION

4.1 Various Livelihood Activities Identified in the North Central Nigeria

The various livelihood activities identified in the North Central Nigeria are presented in Table 1, which reveal that all the farmers were into crop farming, with mean monthly income of ₦55,416.98. It is evident that crop farming was

the most important livelihood activity in the study area. Livestock farming, business and agricultural trading were also widely pursued livelihood activities accounting for 20.50%, 16.77% and 14.29% respectively. Transportation services, petty trading, artisans and agro-processing were relatively pursued by the farmers which accounted for 8.90%, 8.70%, 6.83% and 6.42% respectively. Other livelihood activities identified in the study area were aquaculture/artisanal fishing, handcraft, blacksmith, domestic worker, tailoring/fashion designer, health worker, telecommunication services, labour vending and mining/quarry worker. The finding further revealed that besides health worker, aquaculture, livestock farming and business has higher mean monthly income of ₦105127.30, ₦98515.15 and ₦77876.54. This implies that aquaculture, livestock farming and business are more lucrative in the study area. This indicates that the beneficiaries of IFAD-VCDP in the study area have diversified to take advantage of available opportunities to improve their livelihood security, reduce risk and improve their adaptation to climate change. This result is consistent with the findings of Yona and Mathewos (2017) who ascertained that apart from farming, majority of farm households are engaged in non-farm and off-farm activities such petty trading, making charcoal, daily labourer, contraband trading, wage and handcraft so as to increase their total earning. This is also in line with the findings of Majekodunmi et al. (2017)

Table 1. Various livelihood activities in North Central Nigeria

*Livelihood activities	Frequency	Percentage	Mean income	Rank
Crop farming	483	100	55,416.98	1
Livestock farming	99	20.50	98,515.15	2
Business	81	16.77	77,876.54	3
Agricultural Trading	69	14.29	44,688.41	4
Transportation services	43	8.90	46,532.56	5
Petty trading	42	8.70	64,252.38	6
Artisans	33	6.83	58,303.03	7
Agro-processing	31	6.42	48,870.97	8
Telecommunication services	12	2.48	54,808.33	9
Aquaculture/Artisanal fishing	11	2.28	105,127.30	10
Tailoring/Fashion designer	9	1.86	55,888.89	11
Labour vending	6	1.24	17,666.67	12
Hand craft	5	1.04	26,000	13
Health worker	5	1.04	547,081.40	13
Domestic worker	3	0.62	30,000	14
Blacksmith	1	0.21	12,000	15
Construction worker	1	0.21	40,000	15
Mining/quarry worker	1	0.21	10,000	15

Source: Field survey, 2023

Note: * Multiple responses from 483 farmers

who revealed that farm households pursued a variety of off-farm activities, including driving commercial buses or motorcycles, teaching and trading cattle, as practiced in many economies in Nigeria.

4.2 The intensity of use of the livelihood options

The priority weights obtained from Analytic Hierarchy Process (AHP) on intensity of use of the livelihood options is presented in Table 2. The pair-wise comparison matrix was developed to show which alternative livelihood option is more important than the other on a 9 point scale using four sub-criteria of the frequency, period of the year, income realized per frequency and reason for engagement in the livelihood options for all the 483 farmers, in respect to each livelihood activities the farmers participated in. The weighted vector and priority weight were computed from the normalized pair-wise comparison matrix. Result in Table 2 reveals that there was more intense use of crop farming among the livelihood options which was first with criteria weight of 22.14%. Livestock farming was second with 15.25%, followed by business which was third with 12.52% and then agricultural trading which was fourth with 10.79%.

To check for the consistency of the pair-wise ranking, that is, to show the likelihood that the ranking were done randomly, principal eigen value (λ_{max}) was computed. The principal eigen value (λ_{max}) was 18.25 with consistency index of 0.015 and random index for (n=18) was 1.61. The consistency ratio (CR) for the matrix was 0.90%. This implies that the responses of the farmers were highly consistent for the whole hierarchy. Since the decision criteria is that the consistency ratio should be less than or equal to 10%, otherwise the judgment need to be revised to improve the consistency. This could be attributed to the fact that IFAD-VCDP focuses mainly on crops that is, rice and cassava and also partly a reflection of subsistence nature of most of the farmers who produces mainly for home consumption. More so, crop farming does not required special skill to start, although they are climate dependent. High level of consistency in ranking would help guide the farmers in the choice of livelihood decisions. This is in consistent with the findings of Galadima (2016) who found out that crop farming constitutes the most important livelihood option among the beneficiaries of IFAD community-based agricultural and rural development programme in Yobe State, Nigeria. This is also in line with the findings of Mengistu (2016) who revealed

Table 2. Intensity of use of the livelihood options in North Central Nigeria

Livelihood activities	Weighted vector	%Priority weight	Rank
Crop farming	3.984	22.14	1 st
Livestock farming	2.745	15.25	2 nd
Business	2.253	12.52	3 rd
Agricultural trading	1.941	10.78	4 th
Petty trading	1.277	7.09	5 th
Transportation services	1.277	7.09	5 th
Artisan	0.942	5.24	6 th
Agro-processing	0.917	5.09	7 th
Aquaculture/Artisanal fishing	0.472	2.62	8 th
Telecommunication services	0.471	2.62	8 th
Tailoring/Fashion Designer	0.431	2.39	9 th
Hand craft	0.239	1.33	10 th
Health worker	0.241	1.34	10 th
Labour vending	0.238	1.33	11 th
Domestic worker	0.175	0.98	12 th
Mining/Quarry worker	0.130	0.72	13 th
Blacksmith	0.129	0.72	14 th
Construction worker	0.129	0.72	14 th
λ_{max}	18.25		
Consistency Index (CI)	0.015		
Random Index (RI) (n=18)	1.61		
Consistency Ratio (CR)	0.009		

Source: Field survey, 2023

that the major farm household livelihood diversification activities were crop and livestock production, petty trading and remittance.

4.3 Policy Implications

Support for Livelihood Diversification: Policymakers should encourage and facilitate livelihood diversification for farm households. This can be achieved by providing training and resources for activities such as aquaculture, livestock farming, transportation services, and small-scale businesses. These initiatives can help mitigate risks and enhance resilience to climate change.

Strengthening Rural Infrastructure: Governments and NGOs should prioritize investments in rural infrastructure. Enhancing access to quality schools, potable water, rural electrification, and telecommunication services will not only improve the standard of living but also create an enabling environment for diverse economic activities.

Targeted Agricultural Programs: Programs like IFAD-VCDP should be expanded and tailored to meet the specific needs of farming communities. These programs should include components for capacity-building, access to markets, and climate-resilient agricultural practices.

Climate Change Adaptation: Policies must incorporate climate change adaptation strategies into rural development plans. By promoting adaptive farming techniques and other livelihood activities, policymakers can strengthen the resilience of farm households to climate-related risks.

Public-Private Partnerships (PPP): Collaboration between the government and private sector entities can drive investment in infrastructure and support the diversification efforts of farm households.

4.4 Limitations of the Study

The findings are based on a specific study area, limiting their generalizability to other regions with different socio-economic or climatic conditions. More so, the study might not fully capture how diverse climatic factors affect livelihood choices and outcomes across different areas.

4.5 Avenues for Future Research

1. Conduct comparative analyses of regions with and without similar programs like IFAD-VCDP to evaluate the broader impact of such interventions.

2. Economic Impact Assessment by Quantify the economic benefits of recommended diversification activities and infrastructure investments to build a robust case for policy advocacy.
3. Explore specific adaptation techniques and their success rates among farm households to tailor region-specific recommendations.
4. Examine the role of technology, such as mobile telecommunication services and digital marketplaces, in improving farm households' livelihood outcomes.

5. CONCLUSION

The study concluded that crop farming was the most important livelihood activity of the farmers. The beneficiaries of IFAD-VCDP in the study area have diversified to take advantage of available opportunities to improve their livelihood security, reduce risk and improve their adaptation to climate change. It was therefore recommended that farm households should diversify their sources of livelihood into activities like artisans, aquaculture, livestock farming, transportation services, business and agricultural trading in order to take advantage of available opportunities to improve their livelihood security, reduce risk and improve their adaptation to climate change. There is also need for expansion of rural infrastructure such as schools, pipe born-water, rural electrification and wireless telecommunication services by government and non-governmental organizations to achieve the goal of farm household livelihood security as well as rural development.

In Nigeria schemes like Anchor Borrowers' Programme (ABP), Agricultural Transformation Agenda Support Program (ATASP-I), National Agricultural Land Development Authority (NALDA) Scheme, Nigeria Incentive-Based Risk Sharing System for Agricultural Lending (NIRSAL), IFAD Value Chain Development Programme (VCDP), Rural Electrification Agency (REA) Projects, Fadama III Additional Financing Project, National Social Investment Programme (NSIP), and National Agricultural Technology and Innovation Policy (NATIP) collectively support livelihood diversification, risk reduction, and resilience-building for farm households while contributing to rural infrastructure development. Government and NGOs should actively promote awareness and access to these programs among rural communities. More so, there is need for improvement of agricultural activities in the projects.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

- Addisu, Y. (2017). Livelihood strategies and diversification in western tip pastoral areas of Ethiopia. *Pastoralism: Research Policy and Practice*, 7(9), 1-8.
- Antwi-Agyei, P. (2012). Vulnerability and adaptation of Ghana's food production systems and rural livelihoods to climate variability. School of Earth and Environment, University of Leeds, UK.
- Ardakani, S. R., Ansari, A., & Ardakani, M. R. (2012). Organizational climate and commitment. *Research*, 4(12), 1-3.
- Asfir, S. (2016). Determinants of rural households livelihood strategies: Evidence from Western Ethiopia. *Journal of Economics and Sustainable Development*, 7(15), 103-109.
- Awoniyi, O. A., & Salman, K. K. (2012). Non-farm income diversification and welfare status of rural households in South West Zone of Nigeria. International Food Policy Research Institute (IFPRI) Paper. Pp. 1-14.
- Bhaumik, S. K., Dimova, R., & Nugent, J. (2016). Pulls, pushes and entitlement failure in labour markets: Does the state of development matter? IZA discussion paper No.2258. Institute for the study of labour (IZA), Bonn, Germany.
- Defiesta, G., & Rapera, C. L. (2014). Measuring adaptive capacity of farmers to climate change and variability: Application of a composite index to an agricultural community in the Philippines. *Journal of Environmental Sciences and Management*, 17(2), 48-62.
- Delil, H. (2011). The Determinants off-farm employment and its role in rural poverty alleviation. The case of Oromia Regional State, M.Sc. Thesis, School of Graduate Studies, AAU.
- Ellis, F. (2008). Household strategies and rural livelihood diversification. *The Journal of Development Studies*, 35(1), 1-38.
- Fikru, T. (2008). A Case study of non-farm rural livelihood diversification in Lume Woreda, Oromiya Regional State, M.Sc. Thesis, School of Graduate Studies Lume Woreda.
- Galadima, M. (2016). Impact of IFAD community-based agricultural and rural development programme on rural livelihood in Yobe State, Nigeria. An M.Sc. Thesis, Department of Agricultural Economics and Rural Sociology, Faculty of Agriculture, Ahmadu Bello University Zaria, Nigeria.
- Gecho, Y. (2017). Rural farm households' income diversification: The case of Wolaita Zone, Southern Ethiopia. *Social Sciences*, 6(2), 45-56.
- Goepel, K. D. (2013). Implementing the analytic hierarchy process as a standard method for multi-criteria decision making in corporate enterprises- A new AHP excel template with multiple inputs. *Proceedings of the International Symposium on the Analytic Hierarchy Process*. Kuala Lumpur, Malaysia.
- Hagglblade, S., Hazell, B., & Reardon, T. (2016). *The Rural Non-farm Economy: Pathway Out of Poverty or Pathway in? Transforming the Rural Non-farm Economy*. Paper prepared for the research workshop 'The Future of Small Farms', Withersdane Conference centre, Wye, Kent, UK, 26-29 June, 2006. Pp. 1-47. IFPRI, ODI, Imperial College.
- Ibitoye, O., Ogunyemi, A., & Ajayi, J. O. (2014). Constraints to climate variability adaptation among arable crop farmers in Ekiti State, Nigeria. In (eds). Amos, T. T., Imoudu, P. B., and Oseni, J. O. Proceedings of the 14th Annual National Conference of the Nigerian Association of Agricultural Economist.
- Intergovernmental Panel on Climate Change (IPCC) (2014). Climate variability, impacts, adaptation, and vulnerability. Working Group II, Fifth Assessment Report Phase I Report Launch, 31 March 2014.
- Khataiwada, S. P., Deng, W., Paudel, B., Khataiwada, J. R., Zhang, J., & Su, Y. (2017). Household livelihood strategies and implication for poverty reduction in

- rural areas of Central Nepal. *Sustainability*, 9(6), 1-20.
- Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(1), 607-610.
- Majekodunmi, A. O., Dongkum, C., Langs, T., Shaw, A. P. M., & Welburn, S. C. (2017). Shifting livelihood strategies in northern Nigeria-extended production and livelihood diversification among Fulani pastoralists. *Pastoralism*, 7(1), 19-29.
- Mengistu, S. (2016). Challenges of livelihood diversification in pastoral lands of Ethiopia: evidence from South Omo pastoralists. *International Journal of Scientific and Technology Research*, 5(9), 147-153.
- Musyoka, P. K. and Onjala, J. (2023). Livelihood diversification and household vulnerability to climate shocks in rural Kenya. *International Journal of Economics Development Research*, 4(1): 27-47.
- National Population Commission (NPC) (2006). Population data in Nigeria. Retrieved on 20th February, 2017 from <http://www.population.gov.ng/population-data-in-Nigeria>.
- Nicholas, O., Kevin, U., & Wairimu, M. (2012). Climate change vulnerability and the use of indigenous technologies for adaptation among smallholder farming communities in Sub-Saharan Africa. *Journal of Agricultural Extension*, 16(2), 1-10.
- Rampini, A. A., & Viswanathan, S. (2016). Household risk management. National Bureau of Economic Research. Available on <https://www.nber.org/papers/w22293.pdf> Accessed on 16th November, 2024.
- Saaty, T. L. & Vargas, L. G. (2006). *Decision making with the analytic network process: economic, political, social and technological applications with benefits, opportunities, costs and risks*. Springer science + business media, LLC, 233 spring street, New York, NY 10013, USA.
- Saaty, T. L. (1980). *The analytic hierarchy process: planning, priority setting and resource allocation*. McGraw-Hill, New York.
- Saaty, T. L. (2008). Decision making with analytic hierarchy process. *International Journal of Services Sciences*, 1(1), 83-98.
- Shittu, A. M., Ashaolu, O. F., & Odunsanya, O. S. (2005). Off-farm labour participation and farm household livelihood strategy in Yewa Division, Ogun State, Nigeria: Paper Presented at the 19th Annual conference of the Farm Management Association of Nigeria (FAMAN), held at Delta State University, Asaba, Nigeria between 18-20 October, 2005. Theme: Economic Reforms and the Management of Nigerian Agriculture.
- Soltani, A., Angelsen, A., Eid, T., Naieni, M. S. N., & Shamekhi, T. (2012). Poverty, sustainability, and household livelihood strategies in Zagros, Iran. *Ecological Economics*, 79(1), 60–70.
- Tesfaye, Y., Roos, A., Campbell, B. M., & Bohlin, F. (2011). Livelihood strategies and the role of forest income in participatory-managed forests of Dodolaareainthebale highlands, Southern Ethiopia. *Policy Economics*, 13(1), 258–265.
- United Nations Development Program (UNDP) (2017). *Human Development Report 2017/18. Fighting climate change: Human solidarity in a divided world*. United Nations Development Programme (UNDP), New York, NY, USA, pp. 1-399.
- Wondimagegnhua, B., Nischalke, S., Alebachewa, M., & Beuchelt, T. (2016). Challenges and prospects of farm and non-farm livelihood strategies of smallholder farmers in Yayu biosphere reserve, Ethiopia. Paper presented at Conference on International Research on Food Security, organized by the University of Natural Resources and Life Sciences (BOKU Vienna), Austria.
- Yona, Y., & Mathewos, T. (2017). Assessing challenges of non-farm livelihood diversification in Boricha Woreda, Sidama zone. *Development Agricultural Economic*, 9(4), 87-96.

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