**LIVELIHOOD STRATEGIES AND IMPLICATIONS FOR POVERTY REDUCTION AMONG SMALLHOLDER RICE FARMERS IN KANO STATE, NIGERIA**


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**Abstract**

Poverty and environmental degradation remain central issues in political debates in many developing countries. Rural development in Nigeria is complicated due to biophysical constraints including low and uncertain levels of precipitation, infertile soils, and steep slopes. This paper empirically examined determinants of livelihood diversification strategy among smallholder rice farmers in Kano State, Nigeria. Multistage sampling techniques was used for the study. Primary data were collected from a sample of two hundred and fifty four (254) smallholder rice farmers using structured questionnaire. The data collected were analyzed using descriptive and inferential statistics such as frequency and percentage table, Cluster Analysis, One-way analysis of variance and Multinomial Logit regression. Results of this study categorize smallholder rice farmers into four livelihood strategies groups out of which three were market-oriented strategy and one subsistence related strategy. Livelihood diversification to self-employment strategy was found to be common (42%) among the smallholder rice farmers. livelihood diversification to self-employment, livestock production and market oriented/subsistence crop production strategy, were observed to be more lucrative strategies and more relevant to poverty reduction in the study area. Socio-economic and locational factors such as age, access to skill development training, total land cultivated, number of livestock owned, number of physical assets owned, membership to non-governmental organization, distance to nearest facilities and location factor represented by Garun-Mallam were the major determinants of choice of dominant existing livelihood strategies in the area. It is therefore recommended that rural development policies aimed to support rice farmers should strengthen skills acquisition training programs to ensure that farmers practice farming along with a wide range of income generating activities to improve their wellbeing.

**Keywords:** Livelihood Strategy, Poverty, Smallholder, Rice Farmers, Multinomial Regression

**Introduction**

Poverty and environmental degradation remain central issues in political debates in many developing countries (Cao et al., 2010), and such issues are still emerging in Nigeria. Despite the various efforts of government through different poverty alleviation programs and sustainable alternative farming system, rural development in developing countries including Nigeria is still complicated. This could due to biophysical constraints, including low and uncertain levels of precipitation, infertile soils, and steep slopes (Kalantariat et al., 2008). Almost two-thirds of the world’s poor people reside in the rural areas of low-income countries, mainly depending on subsistence farming and other natural resources for their livelihood (World Bank Group, 2015).

However, low productivity in farming and limited accessibility to non-farm income sources have been increasing vulnerability of these people who are often poor and deprived with a minimum standard of life (Rigg, 2006; Dixon, 2001). Although poverty is a multi-dimensional issue, it is directly associated with a household’s income, asset holding, and other economic activities that mutually generate a household’s livelihood strategy and outcomes (Thorbecke, 2007). Hence, it is important to underpin the underlying mechanism related to rural poor’s livelihood strategies in order to achieve the international goal of poverty reduction (Rigg, 2006).

In-view of the foregoing, smallholder rural households are compelled to combine a diverse set of income generating and social activities and construct a portfolio of livelihood activities to meet and, if possible, to enhance their livelihood outcomes (Davis et al., 2010). Extensive and low yield agricultural activities often mixed cropping and livestock rearing were the dominant livelihood strategies followed by the households in the sub-Sahara Africa region as indicated by Famiertal. (2007).

Rice (Oryza sativa) constitutes one of the major crops produced in Nigeria in general and Kano State in particular. According to Babafada, (2003) rice is the fourth major cereal crop in Nigeria after sorghum, millet and maize, in terms of output and cultivated land area. It is a major staple and most popular cereal crop of high nutritional value grown and consumed in all ecological zone of the country (Ohakaet al., 2013; Raufu, 2014; Ajah and Ajah, 2014). Rice is mainly
cultivated by resource poor smallholder farmers with production capacity of 0.10 to 4.99 hectares (Federal Office of Statistics, 1999), marginalize in terms of accessibility, resources, information, technology, capital and assets with a great variation in the degree to which each of these applies (Murphy 2010).

There is a growing literature on livelihood diversification studies in developing countries such as Nigeria (Fang et al., 2014; Babuloet et al., 2008; Smith et al., 2001). Taking the cognizance of the contributions of the past studies, this study attempts to add to the existing body of knowledge by providing empirical information on the dominant existing livelihood strategies and its implication on the poverty of smallholder ricefarmers in Kano State, Nigeria. However, to the best of our knowledge, we are not aware of any study of such kind in the study area. This paper specifically aims to: (1) assess livelihood strategies adopted by rural households, (2) explore the determinants of households’ choice of better livelihood strategies. This information may have greater policy implications in formulating and implementing more effective actions targeted at alleviating poverty and improving smallholder rice farmerslivelihood.Several scholars studied household livelihood strategies through different approaches to assess their relevance to poverty reduction (Barrett et al., 2005; Barrett et al., 2001; Van den Berget al., 2010). Some of the scholars classified household livelihood strategies based either on income quartiles (Barrett et al., 2001).households’ asset ownership (Van den Berg, 2010), major livelihood activities (Iiyama, 2008),or based on income composition (Xu et al., 2015). To build upon the existing literature, the present study adopts income share from household livelihood activities as in Jansen et al. (2003).

Materials and Methods

Study Area

The study was conducted in some selected Local Government Areas(LGAs) of Kano State. The state was created in July, 1967. It lies between $9^\circ30’$ and $10^\circ33’$ North and longitudes $7^\circ34’$ to $9^\circ25’$ East. The state occupies a total land area of about 45,711.19 Km square with a total of 44 LGAs and a population of about 9,522,023 with a growth rate of 2.9% per annum (National Population Census, 2006). This gives a projected population figure of 11,582,387 in the year 2015. Agriculture is the dominant source of livelihood to the local people in which cropyou such as rice, millet, sorghum, maize, cowpea, soybean, and groundnut and livestock such as cattle, sheep/goat, poultry and fish are the major farm activities in the study area. These are supplemented by rural non-farm activities such as blacksmith, carpentry, dyeing, weaving, thread making, car and tricycle driving, vulcanizers, brick-laying, non-farm business activities, and public and private service activities.

Sampling Procedure

Multistage sampling technique was adopted for the study. First and second stages involved purposive selection of three LGAs (namely Bunkure, Kura and Garunmallam LGAs) and three villages (namely Bunkure, Kura and Dakasoye) respectively based on the intensity of smallholder rice production, diversity in terms of access to off-farm work opportunities and experience/exposure to labor market participation (particularly, variations in the nature and extent of participation). The third stage involved simple random selection of 254 smallholder rice producing households from 726 sample frame of smallholder rice producing households identified in the study area using Raosoft sample size calculator (Raosoft, 2004). The calculated sample was proportionately distributed according to the estimated number of smallholder rice producing households in each of the three selected villages. Primary data was used for the study and the data were collected using structured questionnaires. The breakdown of the sampling procedure is given in table1.

<table>
<thead>
<tr>
<th>LGAs</th>
<th>Villages</th>
<th>Sample Frame</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bunkure</td>
<td>Bunkure</td>
<td>201</td>
<td>70</td>
</tr>
<tr>
<td>Kura</td>
<td>Kura</td>
<td>285</td>
<td>100</td>
</tr>
<tr>
<td>G/mallam</td>
<td>G/mallam</td>
<td>240</td>
<td>84</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>726</td>
<td>254</td>
</tr>
</tbody>
</table>

Source: preliminary survey, 2018
Tool of Analysis

Cluster analysis

Cluster analysis is a statistical data reduction method for summarizing large number of observations to a smaller, tractable number of distinct groups or “clusters” of observations latent, common features exist in the data. (Dercon and Krishnan, 1996). Cluster analysis was therefore used to categorize rice farmers into distinct livelihood strategy and each strategy was named based on the income share of different activities.

\[ J(V) = \Sigma_{i=1}^{r} \Sigma_{j=1}^{C_i} (x_i - v_j)^2 \]  
(1)

Where;

\( J(V) \) = Number of clusters produce

\( x_i - v_j \) = Euclidean distance between \( x_i \) and \( v_j \)

\( C_i \) = number of data point in \( i^{th} \) cluster

\( C \) = number of cluster Centre’s

One-Way analysis of variance (ANOVA)

One way analysis of variance (ANOVA) was used in this study to determine the superior livelihood strategy pursued by rice farmers in Kano State, in terms of daily mean per capita consumption expenditure (DPCEXP) among five distinct livelihood strategies.

Mean square formula

\[ MS_{(factor)} = \frac{SS_{(factor)}}{DF_{(factor)}} \]  
(2)

\[ MS_{(error)} = \frac{SS_{(error)}}{DF_{(error)}} \]  
(3)

Where:

\( MS \) = Mean square

\( SS \) = Sum of square

Sum of square calculation

\[ SS_{(factor)} = \Sigma \bar{Y}_{i} \bar{y}_{ij} - \bar{y}^2 \]  
(4)

\[ SS_{(error)} = \Sigma \bar{Y}_{i} \bar{y}_{ij} - \bar{y}'^2 \]  
(5)

\[ SS_{(total)} = \Sigma \bar{Y}_{i} \bar{y}_{ij} - \bar{y}'^2 \]  
(6)

Where:

\( \bar{y}_{ij} \) = mean of observation at the \( i^{th} \) factor level

\( \bar{y}' \) = mean of all observations

\( y_{ij} \) = value of \( j^{th} \) observation at the \( i^{th} \) factor level

Degree of freedom

\[ DF_{(Factor)} = r-1 \]  
(7)

\[ DF_{(Error)} = nT-r \]  
(8)

\[ DF_{(Total)} = nT-1 \]  
(9)

Where:

\( nT \) = total number of observation

\( r \) = number of factor level

F-value

\[ F = \frac{MS_{(factor)}}{MS_{(error)}} \]  
(10)

Multinomial logit regression model

Multinomial logit (MNL) regression was applied to analyze households’ livelihood choices (Greene, 2003). Following the livelihood approach, it was assumed that households' livelihood strategies are explained by the households’ assets, environmental state and infrastructure. The assumption is that in a given period at the disposal of household asset endowment, environmental state and infrastructure a rational household head chooses among the four mutually exclusive livelihood strategies that could offer the maximum utility. The multinomial Logit model is specified as;

\[ P(Y_{i=j}) = \frac{e^{(\beta_i X_i)}}{\sum_{j=0}^{2} e^{(\beta_j X_j)}} \quad j = 0, 1, 2 \]  
(11)

\( Y_i \) represents four (4) unordered categories of livelihood strategies;

\( Y_0 \) = Subsistence plus market oriented crop production strategy (reference category)

\( Y_1 \) = Self-employment strategy

\( Y_2 \) = Subsistence crop production strategy

\( Y_3 \) = Livestock production strategy

\( P \) = is the probability of an economic activity,

\( j \) = is the livelihood category,

\( e \) = is the natural log,

\( \beta \) = is the coefficients associated with \( X_i \) (independent variables).

Independent variables are:

\( X_1 \) = Age of the rice farmers (Years)

\( X_2 \) = Sex (Male =1, 0 if otherwise)

\( X_3 \) = Agric training (if received training =1, 0 if otherwise)

\( X_4 \) = Skill development training (if received training =1, 0 if otherwise)

\( X_5 \) = Education (Formal education =1, 0 if otherwise)

\( X_6 \) = Total land cultivated (ha)
Results and Discussion

Dominant Livelihood Strategies Practiced by Rice Farmers in Kano State

There are different methods of identifying livelihood strategies; but most commonly, economists group households’ livelihood strategies by shares of income earned from different sectors of the rural economy (Brown et al., 2006). The study identified five (4) distinct clusters of livelihood strategies (LSs) through K means cluster analysis, namely: market-oriented plus subsistence crop production; self-employment; subsistence crop production; livestock production. The clusters were named based on income distribution characteristics of the livelihood strategy group and the result is presented in Table 2.
Table 2: Income sources and final clusters of different livelihood strategies pursued by rice farmers in Kano State

<table>
<thead>
<tr>
<th>Variable</th>
<th>Market oriented/Subsistence crop</th>
<th>Self-employment (Agric. &amp; Non-Agric.)</th>
<th>Subsistence crop</th>
<th>Livestock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash crop</td>
<td>0.54(^{(2,3,4)})</td>
<td>0.08(^{(1,3,4)})</td>
<td>0.04(^{(1,2,3)})</td>
<td>0.15(^{(1,2,3)})</td>
</tr>
<tr>
<td>Food crop</td>
<td>0.26(^{(2,3,4)})</td>
<td>0.16(^{(1,3)})</td>
<td>0.79(^{(1,2,4)})</td>
<td>0.17(^{(1,3)})</td>
</tr>
<tr>
<td>Livestock</td>
<td>0.05(^{(3)})</td>
<td>0.07(^{(4)})</td>
<td>0.08(^{(4)})</td>
<td>0.38(^{(1,2,3)})</td>
</tr>
<tr>
<td>Fish rearing</td>
<td>0.00</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Agric-self employment</td>
<td>0.05(^{(2)})</td>
<td>0.33(^{(1,3,4)})</td>
<td>0.03(^{(2,4)})</td>
<td>0.08(^{(2,3)})</td>
</tr>
<tr>
<td>Agric-wage employment</td>
<td>0.02(^{(2,3)})</td>
<td>0.05(^{(1,3)})</td>
<td>0.06(^{(1,2,4)})</td>
<td>0.04(^{(3)})</td>
</tr>
<tr>
<td>Non-Agric self-employment</td>
<td>0.03(^{(2)})</td>
<td>0.21(^{(1,3,4)})</td>
<td>0.02(^{(2,4)})</td>
<td>0.04(^{(2,3)})</td>
</tr>
<tr>
<td>Non-Agric wage employment</td>
<td>0.01(^{(2)})</td>
<td>0.06(^{(1,3)})</td>
<td>0.01(^{(2)})</td>
<td>0.07</td>
</tr>
<tr>
<td>Remittance</td>
<td>0.04</td>
<td>0.01</td>
<td>0.02</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Source: Field survey, 2018; Superscript numbers in parentheses = statistically significant difference between cluster no. x and the column cluster at 5% level.
Market-oriented plus subsistence crop production strategy is the largest strategy found among the four identified distinct clusters representing 42.13% of the total sampled rice farmers. The major share of total household income in this cluster was covered by cash crop production (54%) (rice, watermelon, onion, tomato and soya beans) and food crop production (26%) (sorghum, cassava, sweet potato and soya beans) respectively. This implies that participation in market-oriented crop production activities among farmers in this cluster could be due to increasing awareness on the opportunities associated with market oriented crop production activities and better access to market place. Market-oriented strategies either based on farm or non-farm strategies have greater likelihood of earning higher income and potential to alleviate poverty among farming household (PaudelKhatiwada et al., 2017).

Self-employment strategy was practiced by 17.32% of the rice farmers. The self-employed activities pursued by the farm households include: tailoring, carpentry, oil processing, transportation business operations, blacksmithing, petty trading etc. The major share of rice farmers’ household income in this cluster was covered by agricultural based self-employment (33%) and non-agricultural based self-employment (21%) respectively. The reasons for practicing this strategy could be to supplement their farm investment.

Subsistence crop production strategy was observed to be practiced by 24.02% of the rice farmers in the study area. The cluster three was dominated by rice farmers that earned most of their income from subsistence crop production (pearl millet, sorghum, cassava and sweet potato etc.). On average 79% of the income share in this cluster was accounted for by this strategy. Possible reasons for engaging in the activities is to meet the subsistence needs of farmers in terms of food security and accumulation of income to address risks associated with farming. The result is in conformity with that of Barrett et al., (2001).

**High Income Returning Livelihood Strategy**

Daily mean per capita income (DPCEXP) among the four livelihood strategy groups ranged greatly from ₦400 for self-employment, ₦334.15 for livestock production, ₦317.93 for market oriented/subsistence crop production to ₦257.62 for subsistence crop production strategy. Self-employment strategy was found to be the most remunerative strategy in terms of the highest (₦400) mean DPCEXP outcome followed by livestock production (₦334.15) and market oriented/subsistence crop production (₦317.93). Dominance of DPCEXP of market-oriented strategies either based on farm or non-farm strategies have greater likelihood of earning higher income and have the potential to alleviate poverty (Paudel Khatiwada et al., 2017). Results from one-way ANOVA showed significant differences (p = 0.0274) in DPCEXP among the four LS clusters. Furthermore, the result of the pairwise comparison of DPCEXP among the livelihood strategy clusters showed no significant difference between self-employment, livestock production and market oriented/subsistence crop production strategies. However, DPCEXP of these three strategies differed significantly with the other one cluster (Cluster 3) (Figure 1).

**Socio-Economic and Locational Factors Influencing Rice Farmers Choice of Livelihood Strategies in Kano State**

The estimated multinomial model had a likelihood ratio represented by chi-square statistics value of 161.66 and statistically significant at P<0.00. This indicates the fitness of the model. The pseudo R2 is 0.16, indicating that 16% of the choice of the livelihood strategy engaged by rice farmers is explained by the selected explanatory variables included in the model suggesting overall efficiency of the model and details of the result is presented in Table 3.
Figure 1. Livelihood strategy cluster
Table 3: Estimated multinomial logit regression model for socio-economic and location factors influencing rice farmers choice of livelihood strategy
(‘Market oriented/Subsistence crop production strategy’ as base category)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coeff.</th>
<th>Std.error</th>
<th>Z-value</th>
<th>Self-employment (Agric&amp; Non-Agric)</th>
<th>Coeff.</th>
<th>Std.error</th>
<th>Z-value</th>
<th>Subsistence crop production</th>
<th>Coeff.</th>
<th>Std.error</th>
<th>Z-value</th>
<th>Livestock production</th>
<th>Coeff.</th>
<th>Std.error</th>
<th>Z-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.06</td>
<td>0.02</td>
<td>-2.83***</td>
<td>-0.01</td>
<td>0.02</td>
<td>-0.52</td>
<td>-0.01</td>
<td>-0.01</td>
<td>0.02</td>
<td>-0.52</td>
<td>-0.01</td>
<td>-0.01</td>
<td>0.02</td>
<td>-0.52</td>
<td>-0.01</td>
</tr>
<tr>
<td>Sex</td>
<td>-0.90</td>
<td>0.84</td>
<td>-1.07</td>
<td>-1.04</td>
<td>0.73</td>
<td>-1.42</td>
<td>-0.38</td>
<td>0.89</td>
<td>-0.38</td>
<td>0.89</td>
<td>-0.38</td>
<td>-0.42</td>
<td>-0.38</td>
<td>0.89</td>
<td>-0.38</td>
</tr>
<tr>
<td>Agric. training</td>
<td>0.25</td>
<td>0.58</td>
<td>0.43</td>
<td>-0.77</td>
<td>0.61</td>
<td>-1.27</td>
<td>0.34</td>
<td>0.56</td>
<td>0.34</td>
<td>0.56</td>
<td>0.34</td>
<td>0.62</td>
<td>0.34</td>
<td>0.56</td>
<td>0.34</td>
</tr>
<tr>
<td>Skill Dev.training</td>
<td>0.08</td>
<td>0.58</td>
<td>0.14</td>
<td>-1.39</td>
<td>0.68</td>
<td>-2.05**</td>
<td>-0.02</td>
<td>0.53</td>
<td>-0.02</td>
<td>0.53</td>
<td>-0.02</td>
<td>-0.04</td>
<td>-0.02</td>
<td>0.53</td>
<td>-0.02</td>
</tr>
<tr>
<td>Education</td>
<td>-0.05</td>
<td>0.57</td>
<td>-0.10</td>
<td>-0.53</td>
<td>0.46</td>
<td>-1.15</td>
<td>0.54</td>
<td>0.55</td>
<td>0.54</td>
<td>0.55</td>
<td>0.54</td>
<td>0.99</td>
<td>0.54</td>
<td>0.55</td>
<td>0.54</td>
</tr>
<tr>
<td>Land cultivated.</td>
<td>-0.25</td>
<td>0.19</td>
<td>-1.28</td>
<td>0.26</td>
<td>0.12</td>
<td>2.25**</td>
<td>-0.16</td>
<td>0.17</td>
<td>-0.16</td>
<td>0.17</td>
<td>-0.16</td>
<td>-0.94</td>
<td>-0.16</td>
<td>0.17</td>
<td>-0.16</td>
</tr>
<tr>
<td>Access to credit</td>
<td>0.48</td>
<td>0.47</td>
<td>1.02</td>
<td>0.08</td>
<td>0.42</td>
<td>0.18</td>
<td>0.62</td>
<td>0.46</td>
<td>0.62</td>
<td>0.46</td>
<td>0.62</td>
<td>1.36</td>
<td>0.62</td>
<td>0.46</td>
<td>0.62</td>
</tr>
<tr>
<td>Saving</td>
<td>0.00</td>
<td>0.00</td>
<td>0.01</td>
<td>0.00</td>
<td>0.00</td>
<td>0.76</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>-0.93</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Livestock No.</td>
<td>0.07</td>
<td>0.12</td>
<td>0.57</td>
<td>-0.16</td>
<td>0.14</td>
<td>-1.21</td>
<td>0.17</td>
<td>0.10</td>
<td>0.17</td>
<td>0.10</td>
<td>0.17</td>
<td>1.73*</td>
<td>0.17</td>
<td>0.10</td>
<td>0.17</td>
</tr>
<tr>
<td>Physical asset</td>
<td>-0.01</td>
<td>0.03</td>
<td>-0.23</td>
<td>-0.09</td>
<td>0.03</td>
<td>-2.77***</td>
<td>-0.01</td>
<td>0.03</td>
<td>-0.01</td>
<td>0.03</td>
<td>-0.01</td>
<td>-0.17</td>
<td>-0.01</td>
<td>0.03</td>
<td>-0.01</td>
</tr>
<tr>
<td>M. NGO</td>
<td>1.00</td>
<td>0.50</td>
<td>1.98**</td>
<td>1.56</td>
<td>0.51</td>
<td>3.09***</td>
<td>0.87</td>
<td>0.49</td>
<td>0.87</td>
<td>0.49</td>
<td>0.87</td>
<td>1.76*</td>
<td>0.87</td>
<td>0.49</td>
<td>0.87</td>
</tr>
<tr>
<td>D. market</td>
<td>-0.28</td>
<td>0.26</td>
<td>-1.08</td>
<td>0.14</td>
<td>0.12</td>
<td>1.14</td>
<td>-0.02</td>
<td>0.19</td>
<td>-0.02</td>
<td>0.19</td>
<td>-0.02</td>
<td>-0.13</td>
<td>-0.02</td>
<td>0.19</td>
<td>-0.02</td>
</tr>
<tr>
<td>D. facilities</td>
<td>-0.45</td>
<td>0.23</td>
<td>-1.97**</td>
<td>-0.17</td>
<td>0.15</td>
<td>-1.12</td>
<td>0.03</td>
<td>0.18</td>
<td>0.03</td>
<td>0.18</td>
<td>0.03</td>
<td>0.14</td>
<td>0.03</td>
<td>0.18</td>
<td>0.03</td>
</tr>
<tr>
<td>G/mallam</td>
<td>-0.44</td>
<td>0.55</td>
<td>-0.80</td>
<td>0.08</td>
<td>0.52</td>
<td>0.16</td>
<td>0.90</td>
<td>0.53</td>
<td>0.90</td>
<td>0.53</td>
<td>0.90</td>
<td>1.68*</td>
<td>0.90</td>
<td>0.53</td>
<td>0.90</td>
</tr>
<tr>
<td>Bunkure</td>
<td>-0.81</td>
<td>0.51</td>
<td>-1.58</td>
<td>-0.34</td>
<td>0.49</td>
<td>-0.69</td>
<td>-0.05</td>
<td>0.53</td>
<td>-0.05</td>
<td>0.53</td>
<td>-0.05</td>
<td>-0.09</td>
<td>-0.05</td>
<td>0.53</td>
<td>-0.05</td>
</tr>
<tr>
<td>_cons</td>
<td>3.45</td>
<td>1.46</td>
<td>2.35**</td>
<td>1.65</td>
<td>1.37</td>
<td>1.20</td>
<td>-1.74</td>
<td>1.43</td>
<td>-1.74</td>
<td>1.43</td>
<td>-1.74</td>
<td>-1.22</td>
<td>-1.74</td>
<td>1.43</td>
<td>-1.74</td>
</tr>
</tbody>
</table>

Source: field survey, 2018; ***, **, * indicate significant at p<0.01, p<0.05, p<0.1
Results of the study indicate that there is a positive and statistically significant impact of membership to non-governmental organization at p<0.05 probability level in choosing self-employment strategy relative to market oriented plus subsistence crop production strategy. On the other hand, there is a negative and statistical significant impact of farmers age and distance to nearest facilities at p<0.01 and p<0.05 probability level in choosing self-employment strategy relative to market oriented plus subsistence crop production strategy. This implies that rice farmers who participate more in non-governmental organization activities, young in age and live near to facilities such as school, hospitals are more likely to engage in self-employment strategy relative to market oriented plus subsistence crop production strategy. Aligned with the previous findings (Soltani et al., 2012), our results also indicate a greater probability of adopting non-farm higher returning livelihood strategy by young age smallholder rice farmers.

Similarly, there is a positive and statistical significant impact of total land cultivated and membership to non-governmental organization at p<0.05 and p<0.01 probability level respectively in choosing subsistence crop production strategy. On the other hand, there is a negative and statistical significant influence of skill development training and physical asset respectively in choosing subsistence crop production strategy at p<0.05 and p<0.01 probability level respectively. This implies that rice farmers who received low level of skill development training, cultivate large amount of the total land holdings, own small quantity of physical asset and participate more in non-governmental organization activities have more likelihood of practicing subsistence crop production strategy compared to market-oriented plus crop production subsistence strategy in the study area. Subsistence crop production strategy is labour and strength demanding and is likely to be easier among young people as indicated by age and household size even though it is not statistically significant but has the expected sign. Our results contradict the previous findings of Nepal and Thapa (2009) who reported that households with larger land holdings were likely to adopt commercial farming.

The results of the study show that livestock number owned by the farmer, membership to non-governmental organization and location factor represented by GarumMallam exert positive and statistically significant impact on choosing livestock production strategy compared to market-oriented plus crop production subsistence strategy. This finding suggests that livestock production strategy is more likely to be practiced among rice farmers who hold large number of livestock, participate more in non-governmental organization activities and live in GarumMallamLGA related to Kura when compared with market-oriented plus crop production subsistence strategy in the study area. Geographical locations and elevation significantly impact on the choice of certain types of livelihood activities.

Conclusion and Recommendation

This study examined the dominant livelihood strategies adopted by smallholder rice farmers, their relevance to poverty reduction based on welfare outcome and the factors that influence adoption of higher returning livelihood strategies in Kano State, Nigeria. Results of this study categorize smallholder rice farmers into four livelihood strategies groups out of which three were market-oriented strategy and one subsistence related strategy. Less than half (42%) of the rice farmers diversified their livelihood to market-oriented plus subsistence crop production strategy. Livelihood diversification to subsistence crop production strategies is adopted by 24.02% of the rice farmers followed by self-employment and livestock production strategies which were practiced by 17.32% and 16.54% respectively of the sample farmers. Self-employment, livestock production and market-oriented/subsistence crop production strategies were observed to be more lucrative strategies and more relevant for poverty reduction in the study area. Socio-economic and locational factors such as age, membership to non-governmental organization, distance to nearest facilities, number of livestock owned, location factor represented by GarumMallam were the major determinants of choice of higher returning strategies in the study area. It is therefore recommended that rural development policies aimed to support smallholder rice farmers should emphasize building human capital through skills acquisition training programs to ensure that farmers practice farming along with a wide range of income generating activities to improve their wellbeing.
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