Global Science Research Journals

ISSN: 2408-5499 Vol. 4 (12), pp. 383-391, December, 2016.

Global Journal of Agricultural Economics and Econometrics
http://www.globalscienceresearchjournals.org/

Full Length Research Paper

A study on diversification strategies of rural households' income sources in Burkina Faso

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Accepted 02 December, 2016

This article has used a multinomial logit model to analyze the determinants of diversification strategies of rural households' income sources in Burkina Faso. The main results have enabled the identification of three strategies of the income-source diversification, all carried out around agriculture. They are low, average, high diversification strategies. The outcomes reveal that the age of the household head, household size, dependency ratio, acreage, membership of a producer group, amount of credit, agricultural potential of the area, morbidity, distance to a main road, access to a radio, total income and technical assistance were the key factors in determining the level of income diversification. They indicate that the diversification of income sources is both a strategy for managing risk of fluctuations in agricultural income and a means to take advantage of opportunities in the production environment, given the constraints of rural households.

Key words: Multinomial logit model, diversification strategy, source of income, rural households.

INTRODUCTION

In most African countries, rural areas are increasingly marked by the diversification of income sources. Literature points out that these mutations can be explained by the willingness of rural households to respond to the opportunities of liberalizing agricultural markets (Delgado and Siamwalla, 1997) or face the risk of subsistence (Losch et al., 2011; Winters et al., 2010). These changes have important effects on the well-being and poverty reduction in rural households (Blocks and Webb, 2001).

Since the liberalization of the agricultural sector in Burkina Faso in 1992, rural households increasingly pursue the diversification of their income sources. Beyond the desire to take advantage of new market opportunities, the diversification of income sources can limit the fluctuations of income related to the volatility of agricultural prices and climate risk. However, agriculture remains the main source of income for most households. Savadogo et al. (2011) have found that farm income accounted for approximately 64% of the total rural household income.

The poverty profile shows that most of Burkinabe rural households live below poverty line. They draw the most essential of their subsistence from farming activities and represent almost 80% of the population (Ministère de l'Économie et des Finances, 2010). In this context, the ability of rural households to develop efficient diversification strategies of their income sources is an

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indispensable condition to improve the well-being and reduce poverty in rural areas (Dercon, 2005). The constraints on the choice of the business portfolios are crucial in explaining the persistence of rural poverty.

Despite the importance of the issue, there is virtually no work on the determinants of the choice of strategies to diversify the sources of income for rural households in Burkina Faso. Since there are no credit and insurance markets, the diversification of household activities plays an important role in risk management, the stabilization of income, and the smoothing of consumption (Ellis, 2000; Bardhan and Udry, 1999). Escobal (2001) stresses that access to credit can also significantly increase the probability of implementing an independent activity, whether agricultural or non-agricultural.

Reardon et al. (1992) have found that income diversification in Burkina Faso was encouraged by the need for households to cope with income fluctuations linked with poor harvests. In a more detailed analysis, Zahonogo (2011) indicates that in areas with low agricultural potential, the aim of involvement in non-agricultural activities is to fill the gap in agricultural income; whereas in the high-agricultural potential areas, the objective is to maximize the agricultural profit.

Reardon et al. (1993) have identified low yields, lack of irrigation, the short duration of the farming season, the underdevelopment of the credit market, and land constraints as the main factors of income diversification in Burkina Faso, Niger, and Senegal. Their results indicate that poor households adopt low levels of diversification, while rich households adopt high levels of diversification.

Feirrera and Lanjouw (2001) have found that being a man increases the probability of practicing non agricultural activities with a high productivity. However, Escobal's (2001) results indicate that gender does not influence the probability to participate in various forms of activities. Likewise, he shows that age has no influence on the form of activity. While Barrett et al. (2001) have found that age reduces the probability of participating in a non-agricultural activity; Ferreira and Lanjouw (2001) have shown that it has a positive effect on this probability.

Barrett et al. (2001) have shown that the size of a household has no significant effect on the participation in a non-agricultural wage-earning activity together with agricultural activities. However, it increases the likelihood that household members work as agricultural workers, besides the activities of the family's farm. The results of Abdulaï and CroleRess (2001) have also indicated that the size of the household increases the probability of participating in a non-agricultural activity.

The results of Evans and Ngau (1991) establish that a high level of education promotes participation in non-agricultural activities and reduces the probability of participation in agricultural activities. However, Yunez-Naude and Taylor (2001) show that a low level of education is positively associated with a non-farm work.

A more detailed analysis of Feirrera and Lanjouw (2001) indicates that a high level of study has a positive effect on the participation in a qualified non-agricultural employment, while a low level of education positively influences participation in an unskilled non-agricultural employment.

The importance of social capital in the diversification and sustainability of livelihoods has been demonstrated by Smith et al. (2001). The works of Abdulaï and CroleRess (2001) have highlighted the positive effect of the acreage of the operations on the participation in non-agricultural activities. However, Reardon et al. (2000) note that inequalities of access to a land can be converted into inequalities of access to non-agricultural activities. Lay et al. (2008) find that declining farm sizes and related to declines in soil fertility force land poor households to diversify into nonfarm activities to ensure survival.

Socioeconomic opportunities play an important role in the explanation of the forms of household activities. Debalen et al. (2004) note that if there is no local market, the probability of developing non-agricultural activities in addition to the farm decreases, while the quality of the roads increases. In the same way, the results of certain researchers have found that the distance to the city or the market reduces the probability of participation in a non-agricultural activity (Winters et al., 2009).

Generally, these various studies resort to two main directions of modeling the diversification of activities. The first one, which objective is to model the participation in various activities, uses as many regressions as there are diversification activities.

Thus, the logit binimial model is the most used one (Yunez-Naude and Taylor, 2001; Debalen et al., 2004). However, Escobal (2001) has used a double censorship of a Tobit model of the share of the various activities in the household income.

The second orientation modeling diversification of activities most often uses a qualitative choice model multinomial logit (Abdulai and CroleRess, 2001; Barret et al., 2001) to model a portfolio. This approach, in addition to considering the nature of rural households multiple activities, identifies the determinants of the choice of strategy to diversify sources of income. The present study uses a multinomial logit model to analyze the factors explaining the choice of strategy of diversification of income sources from data collected in 2011 on 540 rural households in Burkina Faso.

The rest of the article is structured in four parts; the first part presents the modeling choice of strategy to diversify income sources and the method of data collection. The second part presents the typology and characteristics of strategies to diversify sources of income adopted by households. The third part analyzes the factors explaining the choice of strategies to diversify sources of income. Finally, the fourth section draws conclusions and implications of the study in terms of economic policies.

MODELING THE CHOICE OF THE STRATEGY OF INCOME DIVERSIFICATION

The theoretical model of the strategy choice to diversify sources of income, the variables selected for the analysis and method of data collection for the study are presented here.

Specification of the multinomial logit model

The choice of the strategy to diversify the sources of the household-income source is based on expected utility. The household adopts a given strategy only if its expected utility is higher than the rest of the strategies. The expected utility (U_{ij}) by household i by choosing strategy *j* among the *j+1* possible strategies is an unobserved underlying variable that depends on characteristics related to the households (X_{ij}). The choice model of the strategy to diversify the sources of household income is defined by:

$U_{ij}^{*} = X_{ij}'\beta + \varepsilon_{ij}$, $i = 1, \ldots, N$ and $j = 0, \ldots, J$

$y_i = j$ if $U_{ij}^{*} = \max(U_{i0}, U_{i1}, \ldots, U_{iM})$, adoption of the strategy j,

Where y_i represents the adopted strategy, β is a vector of unknown parameters and ε_{ij} a random error

The multinomial logit model assumes that error terms are independent random variables with one another and identically distributed according to Gumbell's law. In this case, the probability that i household will adopt j strategy is defined by:

$$P(y_i = j) = \frac{e^{\beta_j' x_i}}{\sum_{k=0}^{J} e^{\beta_k' x_i}} j = 0, \ldots, J$$

By dividing the probability by $e^{\beta_0' x_i}$, it can be re-written as follows:

$$P(y_i = j) = \frac{e^{(\beta_{j-} \beta_0)' x_i}}{1 + \sum_{k=1}^{J} e^{(\beta_k - \beta_0)' x_i}} j = 0, \ldots, J$$

By definition, the sum of the probabilities is equal to 1. Therefore, any change in the probability associated with a strategy of income diversification must be offset in the opposite direction by the probability of one or several strategies. To identify the parameters of the multinomial model, it is necessary to impose a constraint of normalization of type $\beta_0 = 0$. The parameters are then interpreted as gaps in the vector of β_0 parameters. The probability associated with the reference 0 strategy is defined by:

$$P(y_i = 0) = \frac{1}{1 + \sum_{k=1}^{J} e^{(\beta_k)' x_i}}$$

The probabilities of adopting other strategies to diversify income sources are calculated in relation to the benchmark strategy. Thus, the sign of the variables' coefficients shows the direction of change of the probability of transition of the reference strategy for a given strategy. Odds ratio enables estimating the chances of going from the reference strategy to the other strategies. Odds ratio between a given diversification strategy *j*, and diversification strategy of reference 0, $j = 0, \ldots, J$ and $k = 0, \ldots, J$ and is defined by:

$$\frac{P_j}{P_0} = \frac{P(y_i = j)}{P(y_i = 0)} = \frac{e^{\beta_j' x_i}}{e^{\beta_0' x_i}} = e^{(\beta_{j-} \beta_0')x_i}$$

Under the standardization hypothesis $\beta_0 = 0$, $\frac{P_j}{P_0} = e^{\beta_j' x_i}$

If, $\frac{P_j}{P_0} > 1$, following the variation of an explanatory variable, the probability that the household will adopt a given diversification strategy varies from $\frac{P_j}{P_0}$ time in relation to the reference strategy and vice versa.

The parameters of the multinomial logit model presented can be estimated by the maximum likelihood method from household data.

Definition of the model's variables

The theoretical model and the empirical literature have enabled the identification of the variables that are likely to explain the choice of the strategy to diversify the rural households' sources of income. The dependent variable consists of three strategies for diversifying the sources of household income: (i) the low diversification of income sources; (ii) the average diversification of income sources; and (iii) the strong diversification of income sources. The strategy of the low diversification of income sources, due to its closeness with the specialization, has been chosen as the reference strategy. This helps to properly highlight the factors that influence the choice of the strategies for diversifying the sources of income.

Factors that can explain the choice of strategies to diversify the sources of household income can be grouped into three categories: (i) demographic characteristics of households that include the age of the head of the household (years), the size of the household (workforce) and the dependency ratio (number of household members supported by worker); (ii) capital endowments which consist of planted area (ha), possession of animal traction, the number of years of education of household head, membership in an association of producers and the amount of total credit received; and (iii) the socio-economic, technical and environmental opportunities that consider the agricultural potential of the area, the morbidity (probability of falling ill), distance from the residence of the household to a main road, access to a radio, total income, social assistance measured by agricultural subsidies and technical assistance received.

Method of data collection

The study data have been gathered by the Laboratoire d'Analyse Quantitative Appliqué au Développement – Sahel (LAQAD-S) as part of a collaborative research project with the International Food Policy Research Institute (IFPRI). The objective of the project called "Convergence» was to make a research on the increasing effect of the social service costs on the productivity of agricultural operations and incomes in African countries.

In order to consider all national differences, the entire rural area of Burkina Faso has been divided into six strata based on the quality of social characteristics (health, education, nutrition, access

to drinking water) of the populations and the concentration of non-governmental organizations in the community. Within these strata, 8 of the 45 provinces of Burkina Faso have been selected on the basis of their agricultural potential and the weight of each stratum.

In each province, two departments have been chosen randomly and in each department 4 or 5 villages have been randomly selected. Thus, the survey has covered 36 villages and in each village, 15 households were selected randomly. In all, 540 households have been surveyed. The collected data have been obtained from the working members of farm households, in a single wave, from January to February 2011.

The survey has been conducted through questionnaires on a declarative basis of farm households, generally on a recall covering the last 12 months before the passage. The collected data have focused on the socio-economic, demographic, and institutional characteristics. Detailed data have been collected on the activities and the various sources of income of the rural households.

STRATEGIES OF DIVERSICATION OF HOUSEHOLDS' INCOME SOURCES

This section provides a typology of strategies to diversify the sources of income adopted by the Burkinabe rural households. It also highlights the characteristics of households according to their income diversification strategies.

Sources of household income

The economic organization of rural households in Burkina Faso is based on the multiple activities around agriculture. Diversification of income sources meets a need of households to take advantage of market opportunities, stabilize their incomes facing climate risks and price fluctuations of agricultural products. Households are likely to share a higher income against lower incomes, but less risky. Therefore, they combine various sources of income according to market opportunities in order to protect themselves against income fluctuations.

Table 1 shows that rural households choose their diversification strategies among four potential sources of income: (i) agricultural income including any income from agricultural activities; (ii) income from breeding composed of poultry breeding, livestock breeding, and closely related products; (iii) income from off-farm employment, which consists of income from labor in non-agricultural sectors; (iv) and other sources of income from the remuneration of the factors and migration of household members.

The results indicate that all the households derive, at least, a portion of their incomes from agricultural activities. However, very few rural households devote themselves exclusively to agricultural activities (6.1%). The form of diversification of the most common income that combines agriculture, livestock, off-farm employment and other sources of income is practiced by 30% of rural households. The combination of agriculture, with animal husbandry and off-farm employment, is the second most common form of diversification in terms of the occupation of households (21.8%). The other forms of combinations of income source that have been observed are practiced by less than 10% of rural households.

Typology of strategies to diversify sources of income

The number of agricultural-related income sources has been used to set up a typology of strategies for income diversification of rural households. Various portfolios of income diversification reflect the reality of the organization of the production system of rural households of Burkina Faso. Table 2 shows 3 types of strategies of diversification of income sources; they all depend on agriculture, but are characterized by degrees of agricultural specialization and different forms of diversification. The strategy of low diversification of income sources consists in practicing agricultural activities exclusively or to resort at most to one other source of income besides agriculture. This diversification strategy is characterized by the high dependence of the rural households that practice it in farm income. The agricultural income portion represents approximately 81.3% of the total income of these households. The strategy of low diversification of income sources is practiced by 30.9% of rural households.

The strategy of diversifying sources of average income is to develop around agricultural activities two other sources of income. Rural households that adopt this strategy derive about half of their income from agricultural activities (54.4%). Reducing the contribution of agriculture compared to the low diversification strategy is for the benefit of livestock (17.4%) and off-farm employment (23.4%) which becomes important sources of income for households. This diversification strategy is most adopted by rural households (39.1%).

The strategy of strong diversification of income sources is to derive its revenue from three additional sources of diversification in the margins of income from agricultural activities. Rural households that adopt this strategy take a little less than half of their income from agricultural activities (47.4%), but agriculture remains dominant relative to other sources of income. The declining share of agriculture in relation to the low diversification strategy is primarily for the benefit of livestock (16.9%) and off-farm employment (26.8%), but also for other sources income (8.9%). This diversification strategy is practiced by 30% of rural households.

Characterization of households according to their income diversification strategies

The choice of strategy to diversify sources of household income depends on their demographic characteristics, their capital endowments and socio-economic, technical and environmental opportunities. Table 3 indicates that

Table 1. Distribution of households by income sources.

Combination of revenue sources	Number ofhouseholds	Proportion(%)
Agriculture	33	6.1
Agriculture - livestock	52	9.6
Agriculture – employment	45	8.3
Agriculture - other sources	37	6.9
Agriculture - livestock - employment	118	21.8
Agriculture - livestock - other sources	43	8.0
Agriculture - employment - other sources	50	9.3
Agriculture - livestock - employment - other sources	162	30.0
Total	**540**	**100.0**

Source: Calculated from data of the project "Convergence" / Burkina Faso, 2011.

Table 2. Distribution of household incomes by diversification strategies (%).

Diversification strategies	Share of agriculture	Share of breeding	Share of employment	Share of other sources	Proportion of households
Low income diversification	81.2	6.7	8.3	3.8	30.9
Average income diversification	54.4	17.4	23.4	4.8	39.1
Strong income diversification	47.4	16.9	26.8	8.9	30.0

Source: Calculated from data of the project "Convergence" / Burkina Faso, 2011.

Table 3. Characterization of households according to their income diversification strategies.

Diversification strategies	Low diversification		Average diversification		High diversification	
	Average	Difference	Average	Difference	Average	Difference
Demographic characteristics of households						
Age of household head	44.7	-	45.4	-0.7	44.8	-0.2
Household size	8.1	-	8	0.2	8.2	-0.1
Dependency ratio	1.2	-	1.3	-0.1 *	1.3	-0.1 **
Capital endowment						
Area	3.7	-	3.7	0	3.2	0.5 **
Animal traction (1=yes)	0.5	-	0.5	0	0.5	0
Education of household head	0.5	-	0.5	0	0.9	-0.4 **
Member of a group (1=yes)	0.4	-	0.5	-0.1	0.4	0
Total credit	49358	-	34543	15143 *	22774	17466 *
Socio-economic, technical and environmental opportunities						
Agricultural potential (1=high)	0.4	-	0.2	0.2 ***	0.1	0.3 ***
Morbidity	0.2	-	0.3	0.0 *	0.3	-0.1 ***
Distance to a main road	6.8	-	9.6	-2.9 ***	6.6	0.2
Access to a radio (1=yes)	0.6	-	0.6	0	0.7	-0.2 ***
Total income	550921	-	686441	-133502 *	694414	-142014 **
Social assistance (1=yes)	0.4	-	0.2	0.2 ***	0.2	0.2 ***
Technical assistance (1=yes)	0.2	-	0.2	0	0.3	-0.1 ***

Source: Calculated from data of the project "Convergence" / Burkina Faso, 2011. Low-diversification strategy has been considered as the reference strategy in the calculation of difference tests. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

the head of a household is in average 45 years old and responsible of about 8 people. The dependence ratio

shows that each working member of a household has to take care of at least one non-working member of the household. The difference test indicates that rural households with the highest dependency ratios have degrees of diversification of income sources that are more significantly greater.

The results show that the farm area by rural household is around 3.5 ha; households practicing strong diversification strategies have significantly smaller agricultural areas. The data also show a low level of education of household heads. It is estimated at less than one school year. Households that adopt the strategy of strong income diversification are those where the heads of households have significantly higher education levels. However, the results indicate it is the rural households that have less access to credits that are more likely to diversify their sources of income.

The data indicate that households residing in areas with high agricultural potential are less likely to diversify their sources of income. Among the households that have adopted the strategy of low diversification, 40% come from areas with high agricultural potential. For those who have chosen the strategy of average diversification, 20% are from areas of high agricultural potential, and only 10% of households that adopted strategy of strong diversification live in areas with high agricultural potential. These results show that households in areas with low agricultural potential are significantly more likely to diversify their sources of income. Similarly, the morbidity indicates that the degree of diversification of income sources is significantly higher when the probability of falling ill increases.

Access to radio and technical assistance received help stimulate the diversification of income sources. However, rural households that receive social assistance are less willing to diversify their sources of income. The results also indicate that rural households with the highest incomes realize degrees of diversification significantly higher sources of income. We also note that the distance from the residence of the household to a main road plays an important role in the diversification of income sources.

FACTORS EXPLAINING THE CHOICE OF THE STRATEGY TO DIVERSIFY SOURCES OF INCOME

The results of econometric estimation of multinomial logit model for the choice of strategy to diversify sources of income are presented in Table 4. The likelihood ratio test indicates that the estimated model is globally significant at 1% threshold. Individual significance tests indicate that most of the model's variables significantly influence the choice of strategy to diversify income at a threshold less than or equal to 10%. The model is well estimated and its results can be used for interpretation and analysis of economic policy.

The results indicate that demographic characteristics of households are crucial in the choice of their strategies for revenue diversification. The probability of adopting a strategy of strong diversification of income sources compared to the low diversification strategy significantly reduces at the threshold of 5% with the age of the household head. However, from 50.2 years this probability increases with the age of the household head. The odds ratio shows that the chances that this transition takes place decreases about 0.99 times when the age of the household head increases by one year.

The more the size of a rural household increases, the more the probability of choosing an average diversification decreases significantly at the threshold of 10%. The chances of achieving this transition decreases approximately 0.94 times when there is an additional member in the household. However, increasing the responsibility each working person raises significantly at the threshold of 10% the probability to practice a strong income-source diversification. The Odds ratio indicates that the chances of achieving this transition increases by 1.35 times when the dependency rate grows by one point.

The results have also highlighted the role of household capital endowments in the choice of strategy to diversify their income sources. The planted area increases significantly at the threshold of 10% the probability of moving from a low diversification strategy to a strategy of broad diversification. The chances for this passage to take place increase about 1.28 times when the area increases by one hectare. The fact of belonging to a group of producers significantly improves at 10% threshold the probability of choosing an average diversification related to the low diversification with an Odds ratio of 1.40 times.

The amount of credit received significantly decreases the probability of moving from a low diversification strategy to strategies of average or high diversification respectively at the threshold of 5 and 1%. The chances of achieving these passages decrease of approximately 0.99 times when the credit amount received increases a thousand CFA Francs. These results imply that rural households that can easily get credit to protect themselves against agricultural shocks are less likely to diversify their sources of income.

The results in Table 4 also show that socio-economic, technical and environmental opportunities play an important role in the choice of strategy to diversify sources of income. The probability that a household that resides in a high-agricultural-potential zone will go from a low- diversification strategy to average - or - high diversification strategies decreases very significantly at 1% threshold. Odds ratios indicate that the chances of achieving these transitions decrease respectively by about 0.24 times and 0.2 times, when this takes place in an area of high agricultural potential. These results indicate that rural households that are in areas with low agricultural potential mostly practice diversification of

Table 4. Determinants of the choice of strategy to diversify income.

	Average diversification		Strong diversification	
	Coefficient	**Odds ratio**	**Coefficient**	**Odds ratio**
Constant	0.4543	1.5751	1.2262	3.4084
Demographic characteristics of households				
Age of household head	-0.0130	0.9871	-0.1004 **	0.9045
Age of household head ²	0.0002	1.0002	0.0010 **	1.0010
Household size	-0.0643 *	0.9377	-0.0287	0.9717
Dependency ratio	0.1983	1.2193	0.3027 *	1.3535
Capital endowments				
Area	0.0338	1.0343	0.2453 *	1.2780
Area ²	0.0073	1.0073	-0.0144	0.9857
Animal traction (1=yes)	0.0436	1.0446	-0.1192	0.8876
Education of household head	-0.0608	0.9410	0.0001	1.0001
Education of household head ²	0.0059	1.0059	0.0074	1.0075
Member of a group (1 = Yes)	0.3371 *	1.4009	0.1660	1.1806
Total credit	-0.0028 **	0.9972	-0.0045 ***	0.9955
Socio-economic. technical and environmental opportunities				
Agricultural potential (1 = high)	-1.4439 ***	0.2360	-1.6207 ***	0.1978
Morbidity	0.4540	1.5746	1.0655 *	2.9024
Distance to a main road	-0.0694 **	0.9329	-0.1098 ***	0.8961
Distance to a main road ²	0.0033 ***	1.0033	0.0037 ***	1.0037
Access to a radio (1 = yes)	0.1763	1.1928	0.7715 ***	2.1631
Total income	0.0004 *	1.0004	0.0005 *	1.0005
Social assistance (1 = yes)	-0.2072	0.8128	-0.4665	0.6272
Technical assistance (1 = yes)	0.4245	1.5288	1.0148 ***	2.7588
Number of observations 540		Prob>Chi^2	0.0000	
LR Chi^2 (38) 125.74		Pseudo R²	0.11	
Log likelihood - 523.35				

Source: Calculated from data of the project "Convergence" / Burkina Faso, 2011. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

income source.

The probability of moving from a low diversification strategy to an average or strong diversification strategies increases significantly at the threshold of 10% with the income of rural households. The chances of achieving these transitions increase 1 times when the total income increases by a thousand CFA francs. These results suggest that rural households with substantial incomes are more capable of taking advantage of market opportunities and investing in an income-source diversification.

Access to radio and technical assistance contribute very significantly to increase at the threshold of 1% the probability that rural households will develop different forms of activities. The Odds ratios show that the chances of moving from low diversification strategy to strong diversification strategy increase more than 2 times when a household has access to a radio or receives technical assistance. These results show that the access of rural households to information and technical training on the practice of new activities encourages the income-source diversification.

The probability that a rural household will adopt an average or strong diversification, with respect to the strategy of low diversification of income sources, significantly reduces at the thresholds respective of 5 and 1% with the distance from his residence to the main road. The Odds ratios indicate that the chances of achieving these transitions decrease by approximately 0.93 and 0.90 times when the distance of the residence of the rural household to the main road increases by 1 km. These results suggest that the market access facility encourages the diversification of income sources.

However, from 10.5 km for the average diversification and 14.8 for strong diversification, the probability that a rural household adopts a strategy of diversifying its sources of income increases significantly at the threshold of 1%. The Odds ratios show that the chances of

realizing these changes increase about 1 times with the distance adding 1 km more from these thresholds. These results indicate that beyond these distance thresholds, the market access facility is no more decisive in explaining the diversification of income sources of rural households.

The data indicate that the probability of adopting a strategy of strong diversification versus specialization increases significantly at 10% threshold with the probability that a household member contracts a disease. The odds ratio shows that the chances that this transition takes place increases by nearly 3 times when the morbidity increases by one point. These results indicate that the households most vulnerable to disease are more willing to diversify their sources of income.

CONCLUSION AND POLICY IMPLICATIONS

The study used a multinomial logit model to analyze the determinants of the choice of strategy to diversify sources of income for rural households in Burkina Faso. The econometric results indicate that the model is well specified and most of the estimated coefficients are significant at a threshold less than or equal to 10%. The results highlight three main strategies for diversifying income sources: low diversification strategy, average diversification strategy and strong diversification strategy. For all these strategies, agriculture remains the main source of income around which revolve the other sources of income of rural households.

The outcomes reveal that the age of the household head, household size, dependency ratio, acreage, membership of a producer group, amount of credit, agricultural potential of the area, morbidity, distance to a main road, access to a radio, total income and technical assistance have different significant effects on the probability that a rural household diversifies its income sources. Diversification of income sources seems to respond to both a logical survival through the management of agricultural income fluctuation risks and the desire to take advantage of opportunities in the production environment in view of the constraints of rural households.

These results allow us to draw several implications for public policy that are likely to improve the well-being of rural households. Policy makers should, in short-term, focus on the development of a system of social protection in rural areas to enable the households that are the most vulnerable in climate risks to choose the most profitable activities.

Thus, the network of the existing community institutions can serve as a springboard for the implementation of this policy. In the average-and long-terms, it would be necessary to develop markets for credit and insurance to enable the households to cope with agricultural risks in rural areas.

ACKNOWLEDGMENT

Author would like to thank “Convergence” project from International Food Policy Research Institute (IFPRI) for funding this research.

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