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Internal migration, rural livelihood strategies and sustainable forest management: Evidence from Bench Maji, Kaffa and Sheka Zones, South West Ethiopia

Mulatie Chanie*, Timkete Aleme

Department of Economics, Mizan Tepi University, Mizan Aman, Ethiopia

*E-mail address (*corresponding author): mulat2015@yahoo.com*

ORCID iD: Mulatie Chanie: <https://orcid.org/0000-0002-2784-9990>; Timkete Aleme: <https://orcid.org/0000-0002-9172-4957>

ABSTRACT

In south west Ethiopia, the numbers of immigrants from other parts of the country have been large over the last few years. This huge migration is considered to be a fundamental factor in the degradation of the natural forest because of the livelihood strategy difference of non-migrants and migrants. Thus, we investigated the link between internal migration, rural livelihood strategies and sustainable forest management in the study area. The study investigated the effect of internal migration and peoples' livelihood strategy choice on sustainable forest management systems. The research was based on both primary and secondary data. The primary data was collected from 392 household questionnaires. The descriptive analysis was supported with an empirical analysis using a multinomial logistic regression model. Internal migration is high because of push and pulls factors related to the migrant people. In addition, there is a livelihood choice difference between migrants and non-migrants. Migrants choose farm activities rather than a forest based livelihood means relative to non-migrants. These high population pressure and livelihood choice differences coupled with weak institutional frameworks have created a burden on the natural forest. Thus, informed policy options regarding internal migration, livelihood strategies and sustainable forest management would be a useful approach to reducing the burden on the natural forest.

KEY WORDS: internal migration, livelihood differences, rural households, forest management

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1. Introduction

Forest biodiversity has important economic, social and cultural roles in the lives of human beings. Rural households fill gaps in material and income flows from their on-farm resources by drawing on nearby areas of forest, woodland or scrubland. The UN data shows that over 1.6 billion people's livelihoods depend on forests. Trade in forest products was estimated at \$327 billion in 2009. In addition, forests are home to 300 million people around the world (UN, 2011).

Considering the agrarian base of the Ethiopian rural household economy, the dominant traditional farming methods and the people's dependence on natural resources, it can be expected that forest products have a significant role in rural livelihoods.

Case studies (MAMO ET AL., 2007) show that rural households around forests in Ethiopia obtain diverse forest products and earn a considerable part of their income (39%) from their use of forest resources. Despite this important contribution of forests, more than half of the forests of the world have been lost since the 1950s by the action of human beings for different reasons. In 1992 the FAO stated that Africa could lose all its existing forest in just 60 years (FAO, 1992).

Ethiopia is one of the countries in Africa in which environmental problems are severe. It has lost over two million hectares of its forests, with an annual average loss of 140, 000 hectares between 1990 and 2005 (FAO, 2010). In relation to resource depletion, Ethiopia is facing rapid deforestation and land degradation that has been fueled by an increase in

its population, which in turn has resulted in extensive forest clearance for agricultural use, overgrazing, exploitation of existing forests for fuel wood, fodder and construction materials, setting of fires to create pasture land and expansion of settlements.

In the study area, these resources are characterized by serious degradation and exploitation by both immigrants and indigenous peoples. The numbers of immigrants from other part of the country have been very large over the last few years. This has led to increased pressures upon agricultural, forest and water resources in the areas of settlements, disrupting existing fallowing systems and the use of forest resources. Thus, an important starting point towards understanding and proposing a solution to these aggravating problems lies in investigating the linkages between internal migration, rural livelihood strategies, and sustainable forest resource management in the Bench Maji, Sheka and Kaffa zones of south west Ethiopia.

2. Statement of the problem

The study area is located in the south west part of Ethiopia and includes Sheka, Kaffa and Bench-Maji administrative zones. The most remarkable feature of the area is the existence of forest ecosystem. For instance, the Sheka Forest Biosphere Reserve has a total area of 238,750 hectares and the United Nations Educational Scientific and Cultural Organization (UNESCO) added this forest to its global list of 599 Biosphere Reserves in 117 countries in 2012.

The livelihoods of the rural households of south west Ethiopia have largely relied on the natural forest resource. Despite such great actual and potential socio-economic and ecological benefits from the forest resources, they are under tremendous pressure from unsustainable utilization resulting in their rapid decline and in some areas complete disappearance. Many square kilometers of forest resources of in the region have been lost as a result of various factors. For instance, mapping an area covering North Bench, Sheko, and Yeki woredas resulted in an estimated loss of 46,940 hectares of forest (DEREJE, 2007). In addition, in the area covering Masha, Anderacha, Yeki, Sheko and North Bench woredas 6100 hectares of forest have lost (SUTCLIFFE, 2008).

The fundamental factor which is threatening and fueling the degradation of the forest ecosystem is the huge population pressure as a result of immigration from other parts of the country. Since the early 1980s, peoples have been migrating from the drought stricken areas of central and northern Ethiopia to the relatively fertile, largely forested and lower populated areas of south western Ethiopia such as

the Bench-Maji, Sheka and Kaffa Zones. Between 1985 and 1988 about 150,000 households with approximately 750,000 people were relocated formally, or informally, to this south west region (ALEMNEH, 1990). For instance, one of the resettlement sites i.e. Guraferda woreda, in the Bench Maji zone, has lost 42.4% of its forest resource.

There is an opinion that the livelihoods of the local community (of indigenous people) are dependent on non-timber forest products like honey, bamboo, wild coffee and spices and they are more environment friendly relative to the use by immigrants. On the contrary, the livelihoods of the immigrants are highly dependent on crop cultivation by clearing the natural forest. The socio-economic, institutional and environmental condition in their area of origin which is intense agro-based livelihood is extremely different from the area of destination i.e. a forest-based livelihood system.

The degradation of the rain forest in south western Ethiopia may not only be due to immigration and the immigrants demand for land but also to the weakening of an institutional framework that promoted relatively effective and sustainable forest management systems. Moreover, the absence of recognition about the multidimensional values of the forest ecosystem for both global and local communities and hence the weak implementation of the national forest policy or strategy are the other fundamental reasons that aggravate the depreciation of these resources.

In general, many forest areas have been converted to agricultural land as a consequence of high migration, the absence of appropriate and enforced formal or informal institutions, inadequate allocation of budgets and the high level of encroachment of expanding agricultural land (AGRAWAL, 1995). Therefore, integrating issues of livelihood strategy and local forest management institutions in both the region of origin as well as the region of destination is crucial. To address the gap, this study was conducted by examining the linkages between internal migration, rural livelihood strategies and sustainable forest management in the Bench Maji, Sheka and Kaffa Zones of south west Ethiopia.

3. Research aims

The main aim of this study was to analyze the linkages between internal migration, rural livelihood strategies and sustainable forest management in the Bench-Maji, Sheka and Kaffa zones of south west Ethiopia. It addressed the following specific objectives;

- To investigate rural household livelihood strategies of both indigenous and migrant peoples

- To identify the determinants of the choice of households' alternative livelihood strategies
- To examine the effect of internal migration and livelihood strategies on sustainable forest resource management.

4. Review of related literature

Migration is a broad term which incorporates all kinds of movements of people from one place to another. It incorporates all kinds of permanent or temporary movement of the people. Migration can take place within or beyond a particular geographical boundary of a country or political territory. Migration can also be defined as the people's movement from one territory to another for employment or establishment. According to MAHMOOD & RANIS (1992), migration is an act of people's movement to an overseas country for a certain period of time and with explicit purpose. MEYER & CLYED (1970) made a distinction between mobility and migration.

One of the key areas of recent literature on the impacts of migration on rural livelihoods has focused on the differences between migrant and non-migrant households in livelihood systems in rural areas. A number of studies that have examined the influence of migration on rural household agricultural technology use also present opposing perspectives. The pessimistic view argues that labour scarcity resulting from rural out-migration leads to the decay and abandonment of traditional labour-intensive agricultural technologies by migrant households and prevents the adoption of innovative agricultural technologies (ZIMMERER, 1993), (MAZAMBANI, 1990). By contrast, OBERAL, (1987) argues that migration leads to technological improvement in rural areas through investment of remittances in modern technologies and the stimulating effects of new ideas and knowledge brought back by labour migrants. Generally, there is a common view that migrants differ significantly from non-migrants in terms of resource use behaviour, resource extraction technologies, and knowledge of local ecosystems in rural areas of the destination (BROWDER, 1995). However, consistent support for such differences between migrants and non-migrants in natural resource use is not always found in empirical research. And although it is often claimed that settlement of agricultural migrants in, or near, environmentally sensitive areas such as rainforest and wetlands leads to serious deforestation and

environmental degradation (BILSBORROW, 2002), some studies have shown that environmental degradation is not particularly associated with migrant households (SIERRA, 1999)

Rural-to-rural migration in Ethiopia continues to occur along traditional lines of marriage and is increasingly occurring as an adaptation strategy to poor agricultural and living conditions. The 1998 Migration, Gender, and Health Survey was conducted in five regions of Ethiopia among 1554 household heads to gain an understanding of the impact of internal migration in Ethiopia (MBERU, 2006). The study compared living conditions between permanent migrants, temporary migrants, and non-migrants. The results indicated that high levels of internal migration were occurring as both an adaptation mechanism and a survival strategy.

To give the conceptual basis for this study, the following conceptual framework is adapted (Fig. 1). This framework shows how the household choice of livelihood diversification is linked with the resources they are endowed with and varies according to socio-demographic factors including migration status. Conceptually, the different assets of the rural households including social, economic, and demographic factors impacts the decision to engage in different livelihood choices. The combinations of all these activities determine the livelihood outcomes of the rural households such as better income, improved welfare and, self-esteem, good health status, food security and reduced vulnerability.

Fig. 1. Conceptual framework of rural households' livelihood strategies (Source: adopted from DFID, 2000)

5. Research methodology

The study area covers three administrative zones in south west Ethiopia namely the Bench Maji, Sheka and Kaffa zones (Fig. 2). The data for this study was obtained from both primary and secondary sources.

The primary data on internal migration, rural livelihoods and forest management systems was collected from a sample of respondents using household questionnaires. Secondary data was collected from documents from relevant federal, regional, zonal and district offices.

Fig. 2. Map of the study area

The study area has 23 rural woredas. The total number of the rural population in the three zones according to the 2016 population projection using the 2007 Census is 1,989,966 people and there are 397,993 rural households. To draw a representative sample from the target population, first, 9 woredas are selected from a total of 23 Woredas based on number of migrants. In the second stage, the kebelles in each woreda were listed based on the number of migrants and 18 sample Kebeles were purposively selected. In the third stage, all households in each Kebele were stratified in to migrants and non-migrants to take representative samples from each group and a simple random sampling technique was

applied to draw sample households from each group according to the number of households in each strata (Table 1). Finally, a total of 400 sample households were selected from all sample Kebeles based on the YEMANE (1967) sample determination formula.

$$n = \frac{N}{1 + N(E^2)}$$

n = sample size

N = number of populations

E= margin of error (5%)

$$n = \frac{397,993}{1 + (397,993)(0.05)^2} = 400 \text{ sample households}$$

Table 1. Sample of rural households (Source: Own survey, 2019)

	Zone	Sample Woreda	Rural population			Selected sample respondent		
			Non-migrants	Migrants	Total	Non-migrant	Migrant	Total
1	Bench Maji	Guraferda	2154	3902	6056	5	10	15
		Debub Bench	16109	3818	19927	40	11	51
		Sheko	5877	3157	9034	14	10	24
		Shay Bench	20524	2248	22772	48	7	55
2	Kaffa	Decha	20829	3855	24684	50	10	60
		Gimbo	12451	3605	16056	30	11	41
		Chena	26303	3061	29364	59	11	70
		Bitu	11509	2857	14366	27	9	36
3	Sheka	Yeki	14636	7301	21937	28	20	48
Total			115892	33804	149696	301	99	400

The survey data was analyzed based on both descriptive and empirical data analysis techniques using STATA 14 software package. The descriptive analysis included mean, percentage value, graphs and tables. On the other hand, mean difference was used to see whether there were significant differences between migrants and non-migrants regarding livelihood strategies and different socio-economic characteristics. The descriptive analysis was supported with an empirical analysis using multinomial logistic regression model.

Model Specification: To show whether there was a livelihood strategy choice difference between migrant and non-migrants and to identify determinants of livelihood strategy choices in the study area, the following multinomial logistic regression model was developed. The dependent variable was the selection of different livelihood strategies by rural households which takes artificial 0 and 1 values; 1 if the household choose a given strategy and 0 otherwise. So, four mutually exclusive livelihood diversification strategies were

identified, these were farm income only, farm plus forest income, farm plus non-farm income, and farm plus forest plus non-farm income. The assumption here was that in a given period at the disposal of its asset endowment, a rational household head would have chosen from among the four mutually exclusive livelihood strategies that could offer them maximum benefit.

A concern raised by many researchers in a multinomial logistic model, however, is the assumption of the independence of irrelevant alternatives (IIA). The IIA assumption implies that the relative probabilities of two alternatives being chosen are unaffected by the introduction or removal of other alternatives. This means that, all else being equal, a person's choice between two alternative outcomes is unaffected by what other choices are available. This IIA assumption in the model was checked using a Hausman and McFadden test, (HAUSMAN & MCFADDEN, 1984). The multinomial logistic regression distribution function can be specified as:

$$P_{ij} = \frac{e^{X_i \beta_j}}{1 + \sum_{j=1}^3 e^{X_i \beta_j}}, j = 1, 2, \dots, 1$$

Where:

P_{ij} denotes the probability that a given i^{th} household strategy falls in j category;

X_i = a set of explanatory variables that influences livelihood strategy choice of households including migration status;

e is the natural base of logarithms and

β_j are the parameters to be estimated.

The coefficients of the logistic model are not directly interpretable. One way of giving meaningful interpretation of the logit coefficient is to put it in the form of an odds ratio or log odds ratio. The odds ratio can be defined as the ratio of the probability that the house hold chooses a give strategy (P_{ij}) to the probability that he/she is not chooses that strategy ($1-P_{ij}$). This model can be derived as follows. From equation (1) above p_{ij} is given as:

$$P_{ij} = \frac{e^{z_{ij}}}{1 + e^{z_{ij}}} \text{ and thus we can derive } 1-p_{ij} \text{ as: where } z_{ij} = \sum_{j=1}^5 \beta_j x_i$$

$$1-P_{ij} = 1 - \frac{e^{z_{ij}}}{1 + e^{z_{ij}}} = \frac{1 + e^{z_{ij}} - e^{z_{ij}}}{1 + e^{z_{ij}}} = \frac{1}{1 + e^{z_{ij}}} \dots \dots \dots 2$$

$$\text{Thus, the odds ratio, i.e. } \frac{p_{ij}}{1-p_{ij}} = \frac{\frac{e^{z_{ij}}}{1 + e^{z_{ij}}}}{\frac{1}{1 + e^{z_{ij}}}} = e^{z_{ij}} \dots \dots \dots 3$$

The stimulus index, Z_{ij} is also referred to as the log of the odds ratio in favour of a given livelihood strategy. Taking the log of both sides of the equation (3) we get log odds ratio as:

$$\ln \left(\frac{P_{ij}}{1-P_{ij}} \right) = \ln (e^{\beta_0 + \sum_{p=1}^m \beta_{ij} X_{ij}}) = Z_{ij} \dots \dots \dots 4$$

If the disturbance term ε_{ij} is taken into account the model becomes:

$$\text{Prob} (y_i=j/x_i) = Z_{ij} = \beta_0 + \sum_{j=1}^n \beta_{ij} X_{ij} + \varepsilon_{ij} \dots \dots \dots 5$$

Here $X_{ij} \beta_{ij}$ stands for the explanatory variables assumed to influence the household's choice of livelihood strategy. Therefore, equation 5 can be rewritten as:

$$Z_{ij} = \beta_0 + \beta_1 \text{Migration} + \beta_2 \text{Sex} + \beta_3 \text{Age} + \beta_4 \text{Education} + \beta_5 \text{Family} + \beta_6 \text{Landsize} + \beta_7 \text{Credit} + \beta_8 \text{Coopmembership} + \beta_9 \text{Roaddistance} + \beta_{10} \text{Saving} + \varepsilon_{ij} \dots \dots \dots 6$$

The parameters of the model were estimated using the iterative maximum likelihood estimation procedure. The issues of multicollinearity, heteroscedasticity, and model specification were checked using appropriate tests before the estimation of parameters (Table 2).

Table 2. Definition of the model variables

Variables	Variable type	Description	Expected result
Dependent variable			
Rural livelihood strategies/choice	Dummy	1 = Farm income only 2 = Farm plus forest 3 = Forest plus Non-farm 4 = Farm plus Forest plus Non-farm	-
Independent variables			
Migration	Dummy	Refers to the migration status of the household which takes an artificial value of 1 if migrant, 0 otherwise. It reflects whether a person has migrated to the current place of residence and has lived there for more than six months	Livelihood choice of the migrants is different from non-migrants. (Augustine, 2013)
Sex	Dummy	1 = Male headed 0 = Otherwise	Female headed households' are engaged in non-farming activities rather than farming activities, (Yenesew et al, 2015).
Age	Continuous	Age of the household head in years	When age increases households shifted towards forest related activities
Education level	Dummy	1 = Educated (with formal education) 0 = otherwise (no formal education and unable to read and write	The more educated they are engaged in non-farm activities relative to others (Waddington & Sabates-Wheeler, 2003)
Family size	Continuous	Number of families	A significant variable that influences livelihood choice of individuals, Harjes (2007)
Land size	Continuous	Land holding/size in hectare	Large agricultural land size favoured farming as a means of living rather than other livelihood strategies (Yenesew et al., 2015)
Credit	Continuous	Amount of credit in birr	If access to credit increases, they are expected to engage in farming activities relative to others
Cooperative membership	Dummy	1 = Membership 0 = otherwise	Important social assets which influences livelihood strategy choices
Road distance	Continuous	Distance from the nearest forest in km	Rural households nearer the natural forest are expected to depend on forest income relative to other livelihood options
Saving	Continuous	Money saved in financial institutions	Saving enables the farm households to invest in non-farm activities (Yenesew et al., 2015)

6. Results and discussion

6.1. Background information of sample respondents

The sex distribution of the sample households by migration status reflects the proportion of male to female heads is higher in both migrants and non-migrants (Table 3). The data indicate that male heads are more exposed for migration in the event of economic, social and political problems. This supports the findings of CODJOE & BILSBORROW (2011). Also KALOTRA (2010) finds that males are more migratory than females because of economic activity or employment. The CSA (2012) data also shows that in rural Ethiopia male headed households accounts for 78% of the households.

Age is considered to theoretically be the main determinant of migration status. Even though young

people are most likely to migrate, the field survey revealed that there was no significant age difference between migrants and non-migrants. This result corroborates the finding of WIDIANINGSIH ET AL. (2016), who found that the age variation across migrants and indigenous households are similar.

The average family size of migrants and non-migrants are 6.25 and 5.91 people with a mean difference of 0.1928, which is insignificant at the 5% level (Table 3). This shows that there is no significant family size difference between migrants and non-migrants. This result is inconsistent with the findings of WIDIANINGSIH ET AL. (2016) who found that the indigenous households had a higher average family size than migrants and the findings of CODJOE & BILSBORROW (2011) that revealed migrant households had a bigger household size than non-migrants.

Table 3. Background information of sample respondents (Source: Own survey, 2019)

	Variable	Migration status	Obs.	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
1	Age	Migrants	99	43.11	0.88	8.76	41.36	44.86
		Non-Migrants	293	43.52	0.57	9.84	42.39	44.66
		Combined	392	43.42	.48	9.57	42.47	44.37
		Difference	-	0.41	1.11	-	-1.77263	2.608428
2	Family Size	Migrants	99	6.25	0.2438	2.4258	5.768706	6.736345
		Non-Migrants	293	5.91	0.1544	2.6442	5.607229	6.215297
		Combined	392	5.99	0.1309	2.5920	5.740058	6.255484
		Difference	-	-0.34	0.3012	-	-0.9334695	0.2509446
3	Education Level	Migrants	99	0.929	.02589	.2576394	.8779077	.9806782
		Non-Migrants	293	.8259	.02218	.379811	.7822683	.8696088
		Combined	392	.8520	.01795	.3555133	.8167382	.8873435
		Difference	-	-.1030	.04104	-	-.1840593	-.0226494
4	Sex of the HH head		Migrants		Non-Migrants		Percent	
		Male headed	98		253		89.55	
		Female headed	1		40		10.45	
		Total	99		293		100	

Education is the main determinant of migration status of households according to the literatures (CODJOE & BILSBORROW, 2011; WIDIANINGSIH ET AL., 2016). This study shows that migrants have a better education on average relative to non-migrants. Studies by CODJOE & BILSBORROW (2011) and WIDIANINGSIH ET AL. (2016) confirm that migrant household heads compared to indigenous household heads have received more years of schooling. The findings of TEGEGNE ET AL. (2015) show that more highly educated household members tend to migrate in search of better options. HOSSAIN (2001), SINGH & YADAVA (1981) and SINGH (1985) illustrated that migrants with respect to their place of origin were generally more educated.

6.2. Economic characteristics of sample households

To explore some differences in economic variables between migrants and non-migrants, ordinary group-mean comparison (two sample t-tests) analysis was used. The result shows that migrants have significantly higher land holdings than non-migrants (Table 4). This might be because of the livelihoods of migrants are largely dependent on agricultural activities. CODJOE & BILSBORROW (2011), in their findings confirm that migrant households had bigger farm land holdings than non-migrant households (host population). Relative to migrants, non-migrant households have better credit access. In terms of savings amount, migrants are in a better financial position than non-migrants.

Table 4. Economic characteristics of sample households (Source: Own survey, 2019)

Source of income	Migrants	Non-migrants	Combined	Difference	[95% Conf. Interval]	
Average Land size	2.66	1.65	1.90	-1.01	-1.43227	-.590667
Credit access	0.35	0.63	.56	0.27	.1675725	.3881554
Average Saving	4205	2766	3129	-1438	-2702.051	-174.5211
Mean farm income	36784	8546	20627	-28,237	-13442.66	-3032.293
Mean non-farm income	2606	2209	2310	-397	-1697.403	902.9104
Mean forest income	3080	5333	4764	2253	329.7868	4176.43

In the study area, most of the migrants earn their income from agricultural activities through crop and livestock production. The result shows that farm income is significantly higher for migrants and non-migrants earn a relatively higher level of forest income than migrants (Table 4). This indicates that the livelihood strategies of non-migrants are based on forest resources while migrant households based their livelihood strategies on farm income. Our results are consistent with the findings of CODJOE & BILSBORROW (2011) and WIDIANINGSIH ET AL. (2016) who found that indigenous households compared to migrants were more dependent on forest resources and their livelihood strategies are derived primarily from forest income.

In addition, the result shows that huge portions of sampled households are largely dependent on non-farm activities as their main livelihood strategy. These rural households generate their income in the form of wages, small business/trade activities, formal employment (salary), income from renting of land and other assets, handicrafts, remittance from abroad and domestic, and other related sources of income.

6.3. Determinants of rural livelihood choice

To show whether there is a livelihood strategy choice difference between migrant and non-migrants and to identify other determinants of livelihood strategy choices, the multinomial logistic regression model was estimated for the 392 sampled households (of the total of 400 distributed questionnaires, 392 questionnaires were returned).

In this multinomial logit model, the dependent variable is the selection of different livelihood strategies by rural households. The most commonly used methods of identifying livelihood strategies are based on the shares of income earned from different sectors of the rural economy. Thus, four mutually exclusive livelihood diversification strategies were identified based on clustering the sources of income that were identified in the study area. A study by WIDIANINGSIH ET AL. (2016) also used this method of classification. These were farm activities only, farm plus non-farm activities, farm plus forest related activities, and farm plus non-farm plus forest activities. The assumption here is that in a given time period, a rational household head chooses from the four mutually exclusive livelihood strategies that could offer them maximum income/benefit.

In this study, farm activities were focused on both crop production and animal husbandry activities. Forest livelihood strategy refers to income related to forest and forest byproducts like fuel wood, charcoal,

timber for construction, medical plants, bamboo, tree bark, forest coffee and similar activities. Non-farm activities refer to activities outside farm and forest related works which include waged labour, own business, renting of assets, remittance, formal employment, handicrafts and related activities.

The multinomial logistic regression model was treated against potential variables that were assumed to affect livelihood choice of the rural household such as migration status, sex, age, education level, family size, farm land size, credit access, cooperative memberships, road distance from forest area and savings amount. Before opting for the estimation, the data was checked for multicollinearity and heteroscedasticity problems. In addition, post estimation tests were conducted on IIA assumption, model specification and model goodness of fit issues.

Concerning the overall significance of the model, the computed log likelihoods, chi-square value and its corresponding probability ($\text{Prob} > \chi^2 = 0.0000$) show that the overall model is significant and explained the observed behaviour of the model. In a multinomial logit model, the goodness-of-fit of the model can be checked using Pseudo R-square even though it does not convey the same information as the R-square for linear regression which is still the higher value is better. Pseudo R-square ranges from 0.2 – 0.4 for the case of excellent goodness-of-fit of the model (MCFADDEN, 1977). The McFadden's Pseudo R-square of 0.2134 showed that the model is a good fit.

The IIA assumption was checked using the Hausman and McFadden test. The result showed that the estimated coefficients of the general model were similar to the coefficients of the restricted model which implies the IIA assumption holds true. The mean VIF value of 1.17 demonstrated that the included explanatory variables were not linear and strongly correlated which shows no serious multicollinearity problem among the continuous independent variables. The Breusch-Pagan tests ($\text{Prob} > \chi^2 = 0.0377$) for the null hypothesis of error variances were equal across all observations and showed that the data had a heteroscedasticity problem and hence a robust regression was used to correct the problem. To check the model specification problem, an omitted variable bias test ($\text{Prob} > F = 0.1306$) and a link test (a significant $\hat{\mu}$ and insignificant $\hat{\mu}^2$) showed that the MNL model didn't have a specification problem. The parameters of the model we estimated using an iterative maximum likelihood estimation (MLE) procedure and the result are presented below (Table 5).

Table 5. Multinomial logit model estimation of households' livelihood choice

Variables	Rural livelihood choices (Base outcome = Farm)					
	Farm + Forest		Farm + non-forest		Farm + Forest + non-farm	
	Coef	P > Z	Coef	P > Z	Coef	P > Z
Migration	-.8585622	0.014	-.5947537	0.132	-.0940276	0.003
Sex	-14.37423	0.000	-12.66011	0.000	-13.92723	0.000
Age	.1651989	0.000	.1490475	0.000	.2162992	0.000
Education	-.2667429	0.715	-.2372657	0.745	-.4932645	0.518
Family	.2294077	0.012	.1905561	0.043	.3200111	0.001
Landsize	-.4054502	0.000	-.4950264	0.000	-.6246077	0.000
Credit	-1.011744	0.008	-.2651747	0.516	-.8573018	0.042
Coopmember	1.420889	0.000	1.357072	0.001	1.711568	0.000
Distance	-.2295776	0.000	-.1884661	0.004	-.3437625	0.000
Saving	-1.670006	0.963	.0000284	0.421	.0000350	0.339
_cons	10.12498	0.000	9.270461	0.000	7.487315	0.000

Number of obs = 392, Log likelihood = -410.24, LR chi2 (30) = 223.97, Prob > chi2 = 0.0000, Pseudo R2 = 0.2135

The results showed that migration status, sex of the household head, age of the household head, family size, land size, credit access, house distance from the forest area, and cooperative membership are important determinants of livelihood strategy choice. The coefficients of education and savings imply these variables never affect livelihood strategy choice in the study area. Credit access affects the choice between farm and farm plus forest activities, but it fails to explain the choice between farm and farm plus non-farm activities.

The migration status coefficient for farm plus forest livelihood relative to farm activities implies that migrants choose farm activities rather than a farm plus forest based livelihood relative to non-migrants in the study area. Even the farm plus forest plus non-farm relative to farm coefficient of migration status showed that migrants prefer a farm livelihood means rather than the combinations.

Actually, this is the expected result in the study area because of the socio-economic conditions of migrants in their area of origin being different from the area of destination. Thus, the livelihoods of the migrants highly depend on agricultural activities by clearing the natural forest while the livelihood of the non-migrants are dependent on forest and forest products which is environment friendly relative to the migrants. Previous studies by CODJOE & BILSBORROW (2011) and WIDIANINGSIH ET AL. (2016) support our findings that non-migrants are more dependent on forest income and forest related incomes.

The sex coefficient indicated that male headed households are more probably engaged in a farm livelihood strategy and less probably engaged in a farm plus forest livelihood diversification strategy. Even the coefficient of this variable implied that

male headed households were more engaged in a farm strategy relative to a farm plus non-farm livelihood means. A possible justification could be the division of labour in the study area. Mostly male headed households depend on farm activities rather than female headed households. In addition, the common non-farm activities such as preparing and selling local drinks, poetry work, petty trading, selling firewood and charcoal are traditionally defined activities designated for women. This result is also supported by YENESEW ET AL. (2015) who showed that male headed households are more probably engaged in an on-farm only livelihood strategy and are less probably engaged in a non-farm livelihood diversification strategy. Also research by BEDRU ET AL. (2008), in northern Tigray of Ethiopia confirmed that female headed households were more likely to engage in the collection of forest environmental products than farming activities.

The age coefficient showed that when age increased, households were more likely to be engaged in farm plus forest and farm plus forest plus non-farm activities relative to farm livelihood means. In addition, the model result showed that a larger household size was more likely to be engaged in farm plus forest and farm plus forest plus non-farm activities relative to farm activities. A possible explanation could be that large number of children might be involved in a number of livelihood activities, which creates a big potential labour force. This result was consistent with the findings of HARJES (2007), in which an increase in household size increased the likelihood of adopting different livelihood strategies. In the study area, credit access favoured rural households to choose farm activities relative to farm plus forest plus non-farm alternatives. This might be because of the credit access in the

study area is more of agricultural credit. The result is weak to explain livelihood choice difference between farm and farm plus non-farm activities.

The regression result showed that households with a large amount of farm land were more likely to engage in farm activities as a dominant strategy. This might be because a smaller land size is not enough for the households to make a sufficient living from farm production alone, which forces them to engage in supplementary forest and non-farm livelihood means. This result is supported by ADUGNA (2008) and FIKRU (2008) who showed that farmers with larger land size are more involved in farm activities relative to non-farm activities. Also research by BEDRU ET AL., (2008) showed that households with large plots of land were less likely to engage in forest extraction as their dominant livelihood strategy.

The distance between the house of the household and the forest area had a negative effect on the likelihood of choosing the farm plus forest, farm plus non-farm and farm plus forest plus non-farm livelihood strategy. The amount of savings failed to explain the livelihood choice of rural households in the study area. This result is consistent with that of YENESEW ET AL., (2015) who found that this variable had a positive and significant influence on households' choice of non-farm relative to farm livelihood diversification. The difference may be explained by the fact that savings amounts of rural households is low in the study area.

Level of education was expected to have a positive significant effect on livelihood strategy choice. However, this variable was unexpectedly insignificant and did not explain the livelihood choice difference of rural households in the study area. This might be because all livelihood strategies are exercised traditionally and do not need an advanced education and skills. This result is consistent with the research of MACKENZIE (2014), where his coefficient for education was negative and statistically insignificant when explaining livelihood choice difference in Botswana. Similarly, some studies have suggested that education has an insignificant effect on diversification. BEYENE (2008) showed that education had no significant impact even though training skills had a positive impact. AUTHOR & BRYCESON (2002) reported that better educated farm households were found to participate less in livelihood diversification activities compared to the uneducated farm households in rural sub-Saharan Africa countries.

The estimated coefficient of cooperative membership showed that there was a positive relationship between membership to cooperatives and livelihood strategies other than farm only

activity. The result is in agreement with previous findings by KHATUN & ROY (2012). This might be because being a cooperative member promotes the sharing of knowledge, information, and experience regarding the value of different livelihood strategies to improve their livelihood. In addition, the coefficient of credit showed that rural households with credit access prefer to engage in farming activities relative to other livelihood strategies. This might be because of rural households take credit for purchasing different types of inputs such as fertilizer, improved seed, and livestock husbandry which increase agricultural income.

7. Conclusions and recommendations

7.1. Conclusions

The aim of this study was to link internal migration, rural livelihood strategies and sustainable forest management systems in the Bench Maji, Kaffa and Sheka zones in south west Ethiopia. The descriptive analysis indicated that there is a high level of internal rural migration in the study area. A huge number of people have migrated from different parts of the country to this area because of different pull push factors.

In the study area, rural households have combined a variety of livelihood strategies. The result showed that farm activities are the dominant livelihood strategy for most of the migrant households. In contrast, most of the non-migrant households depend on the forest and forest related activities such as honey, bamboo, wild coffee and spice production which are environment friendly compared to migrants. In addition, a significant portion of the sampled households were largely dependent on non-farm activities as their main livelihood strategy in the study area. The livelihood choice of rural households was determined by different socio-economic factors. The result showed that migration status, sex, age, family size, land size, education, credit access, house distance from forest area, and savings are important determinants of livelihood strategy choices in the study area.

In addition, many forest areas were cleared recently because of high population pressure especially due to immigration of people from different parts of the country to the study area. In addition, the institutional and legal frame works to manage forest resources in the study area are weak. Awareness creation programs for the local community about forest resource utilization and conservation by different governmental and non-governmental organization are limited.

7.2. Recommendations

The findings of this study have some important implications for policymakers, local government bodies, and other interested agents regarding the links between internal migration, rural livelihood strategies and sustainable forest management. Hence, based on the finding of this study, the following recommendations are suggested.

- There is a livelihood strategy difference between migrants and non-migrants. Migrants are more engaged in farm activities. Thus, special attention should be given to minimize the adverse effects of this internal migration on the natural forest. It is better to give priority to eco-friendly economic activities (like ecotourism, agro-forestry, livestock fattening, honey production and other forest byproduct related activities) to minimize additional demands of cultivable land at the expense of forests. In addition, it is better to promote non-farm employment activities like pottery, handicrafts, small trades and related activities for supplementing the income of farmers.
- To avoid deforestation and the inefficient utilization of forest resources, participatory forest management should be effectively practiced. That is, the local community should organize themselves and should be encouraged to actively participate in decision making regarding the management of forest resources.
- In addition, to reduce forest degradation and to utilize forests sustainably, awareness of the cultural, traditional and environmental importance of forest resources should be created through training, education, community discussion and other means.
- There should be well-organized and strong institutions to safeguard the natural forest through policy intervention. These policy interventions should attempt to encourage the active involvement of local communities for the effective conservation of natural forests in the area. Thus, well-defined property rights could be an important starting point to maintain the current forest cover and to prevent the depletion of the natural resource base.

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