THE ROLE OF NON-WOOD FOREST PRODUCTS IN HOUSEHOLD FOOD SECURITY AND INCOME GENERATION IN TUNISIA

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Abstract

Recently, there is a growing interest in the contribution of Non Wood Forest Products (NWFPs) to livelihoods and food security among the local population. This study focuses on determining the contribution of Aleppo pine production in Tunisia (Siliana province) to household livelihood and food security. Data were obtained using structured surveys administered to 250 randomly selected rural households during the collection season. A logistic regression has been performed to evaluate the contribution of NWFPs to improving household living conditions. Results support evidence that there is a significant difference between the alternative sources of revenues. The utilization of Aleppo Pine was significantly influenced by age, gender, household size, distance to market, importance of off farm revenue. Finally, Aleppo Pine plays an important role in supporting livelihoods and provides an important safety net for local population throughout the year.

Keywords: Forest income, Food Security, Aleppo Pine, NWFPs, Tunisia.

1. Introduction

Tunisian Forests offer a wide range of products and services of which the most important are Non Wood Forest Products (NWFP). The collection of NWFPs offers an important subsistence support to local population living within forest areas representing the lion share of household income and providing multiple social and cultural values (Ojea et al. 2016). Despite the relevance of NWFP sector, there are very few empirical applications that analyze the contribution of NWFP to household income which can be attributed to data scarcity in developing countries (UN-ECE/FAO, 2000). Rural population worldwide have traditionally collected various NWFPs to fulfill livelihood needs. NWFPs contribute to household's income by providing subsistence and consumption needs (e.g., energy and nutrition) and ensuring regular cash income (Shackleton et al. 2007). Nevertheless, NWFPs could not be the most important source of income for local people living within forest areas (Ojea et al. 2016)

The forest area and woodlands in Tunisia represent more than one million hectares (DGF, 2014). The Aleppo Pine is the most common specie in Tunisian forests with 361 221 hectares representing 54% of Tunisian woodlands (DGF, 2014). Natural stands of Aleppo pine are mainly located in the semiarid areas of norther and central Tunisia (Daly-Hassen and Ben Mansoura, 2005). Aleppo Pine provides various products and services to the local population such as Aleppo Pine seeds, fuelwood, corns and forest employment. In Tunisia, all forests are state-owned and all usage rights are obtained from the general Directorate of Forest. This specie has a particular interest since it is the most widely seed source used for many human consumption and forestry purposes (Sghaier et al. 1997; Nasri et al. 2004; Khouja et al. 2000; Sghaier and Ammari 2012).

In spite of the relevant role of Aleppo Pine in Tunisian rural development, the literature on this sector in this country is very sparse. To the best of our knowledge, there is no study that focuses on socio-economic role of Aleppo Pine in Tunisian rural communities. Our work contributes to fill this gap. By conducting this analysis, we can assess the economic relevance of NWFPs in livelihood strategies of Tunisian rural communities and their contribution to household income. Several socio-economic characteristics of households can influence rural livelihood such as household size, access to the markets and infrastructure (Kamanga et al. 2009; Timko et al. 2010). In this study, we test the hypothesis, that incomes coming from forests is the most important income source for local population living within the forest areas in Tunisia. Additionally, we attempt to identify the factors that affect NWFPs harvesting and collection.

2. Methodological framework

The most relevant decision can be taken by economic agent that live in forest regions is whether to collect Aleppo pine seeds or to seek another economic activity. We assess this behavior as discrete decisions by making use of a logit model. As is well known, the logit technique is an econometric model where the dependent variable Y_i is a binary variable that represents two possible outcomes (Greene, 2000). In our

analysis, Y_i represents the decision of the i-th household to collect ($Y_i=1$) or not ($Y_i=0$) Aleppo Pine seeds. A vector, $\mathbf{X}_i = (X_{i1}, \dots, X_{ik})$, contains the explanatory variables that influence the outcome Y_i .

In order to identify factors that influence the collection of NWFPs by households, this relationship can be expressed as follows:

$$Y_i = f(X_i, \varepsilon_i) \quad (1)$$

The logit specification then provides a model of observing the probability of collecting NWFPs π_i . The logistic function is explicitly specified as follows:

$$\pi_i = \frac{\exp\{X_i' \beta\}}{1 + \exp\{X_i' \beta\}} \quad (2)$$

Where β is the vector of parameters to be estimated and ε_i is the error term assumed to follow a logistic distribution.

Marginal effects at the sample mean have been computed to determine the effect on the probability of increasing a predictor by one unit while holding the other variables constant. Marginal effects for continuous variables measure can be approximated by the following expression⁷⁸:

$$\frac{d\pi_i}{dx_{ij}} = \beta_j \pi_i (1 - \pi_i) \quad (4)$$

3. Data collection

Siliana governorate has very large forests of Aleppo pine covering 80 thousand hectares of which 20 thousand hectares are used for APS production (DGF, 2014). The study was conducted in Kesra delegation, which is located in Siliana governorate. The vegetation of the study area is dominated by Aleppo Pine with presence of shrubs throughout the year providing favorable conditions for livestock grazing.

Data were collected by face to -face questionnaires during the period from March to June 2018 in the major Kesra Aleppo Pine regions. These regions were identified based on the recommendation of local official forest Organisms in Siliana. The dataset collected through interviews was complemented by a focus group discussion. Data available include information regarding the main actors involved in Aleppo Pine seeds collection, sources of households' income, contribution of this activity to interviewed households' livelihoods and the socio-economic characteristics of all household members.

4. Results

Collecting APS constitutes an important component of the rural households' economy. Household income is calculated by summing the income of all people in a particular household. It includes three main sources: The first source contains all Off-farm activities, all self-employment activities (craft activities, trading...), permanent job outside the farm (salary), capital gains and remittances. The second source is provided by agricultural activities and includes incomes from sales of crops and livestock. The last one is coming from forests and the most important activity in Kesra delegation was found to be the APS exploitation. ANOVA test is performed and means are computed based on the Fishers' least significant difference procedure (Hayter, 1986). Empirical findings suggest that the average incomes of households from off-farm activities is significantly higher than that from agricultural activities and APS exploitation. Similarly, the average incomes derived from agricultural activities are significantly higher than sales of APS.

Table 1. Multiple comparisons of mean household incomes from agriculture, off-farm, and forest products

Comparison of household income source		Mean differences	Standard Error
Agriculture income	Off-farm income	-244,386	93,652***
	Forest income	83,536	36,047**
Off-farm income	Agriculture income	244,386	93,652***
	Forest income	327,922	93,652***
Forest income	Agriculture income	-83,536	36,047**
	Off-farm income	-327,922	93,652***

Source: survey by authors, 2018 F-value = 7,268***significance level***(1%), **(5%)

⁷⁸ dy/dx for categorical variable is the discrete change from the base level.

Table 2 presents summary statistics for parameters in Logit model. Results show that collection of APS by Kesra habitants are influenced by the gender, farm size, distance to market, household size, livestock production and agricultural income share in total income. Gender has a significant effect on the decision to collect APS or not indicating that women mainly carry out this activity. Moreover, extension services could play an important role in providing local population with effective forest practices. In this context, attending more extension days would increase the likelihood that farmers will collect APS. On the other hand, people who participate in training programs tend to improve their technical and economic performance in other agricultural activities. Consistently, households with animal husbandry and high share of agricultural revenue are expected to reduce the probability to collect APS. In addition, distance to market has a positive impact on collecting APS. Selling APS locally, through intermediaries, is more in accord with the rural communities' philosophy, since it implies a reduction in transportation costs and other transactions costs such as gathering information on the regional market. This could be part of their economic viability strategy. Finally, the household size has a positive and significant influence. Farmers with a large family size tend to be more involved in APS collection. A large family size may indicate the presence of descendants (children) that could enhance economic viability of rural population.

Table 2. *Factors influencing household's collection of Aleppo Pine products*

Variable	Coefficient	Standard error	Marginal effects of APS collection and utilization
Constant	0.2913	1.0116	
Gender	-1.0125	0.1079**	-0.2390**
Attending extension days	0.0891	0.2379	0.0220
Participation in agricultural trainings	-1.3336	0.1207**	-0.3039**
Household size	0.1499	0.0213*	0.0371*
Farm size	-0.0138	0.0024	-0.0034
Agricultural income share in total income	-2.3872	0.1276***	-0.5917***
Distance to market	0.2629	0.0129***	0.0651***
Livestock production	-1.0330	0.0860***	-0.2499***

Source: survey by authors, 2018 $\chi^2 = 125.58^{***}$, log likelihood = -110.49, Pseudo R² = 0.36, N = 250, significance level ***(1%), *(5%)

5. Discussions and conclusions

Despite the relevant contribution of Non Wood Forest Products (NWFPs) to alleviate poverty and improving household livelihood of families collecting NWFPs in Tunisia, there is no study assess the socio-economic relevance of NWFPs in livelihood strategies and their contribution to household income. In this context, this study attempts to investigate the importance of Aleppo pine in livelihoods of rural communities. Consistent with previous research, results support evidence that there is a significant difference between the alternative sources of revenues. The collection of Aleppo Pine is significantly influenced by gender, household size, distance to market, importance of agricultural revenue and livestock production.

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