

RESEARCH ARTICLE

Analysis of the Non-Wood Forest Products Sector in Morocco - Case Study: The Itzer Forest

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ABSTRACT

Non-wood forest products (NWFPs) are wild plant and animal products harvested from forests. The aim of this study is to present a qualitative diagnosis, based on a qualitative value chain approach, of the use of NWFPs in the Itzer rural forest environment. The survey result based on -participatory workshops indicated that three categories of non-wood products (Aromatic and medicinal plants (AMP), Beekeeping, and Agro-pastoral sector) represent an essential source of income to the local population. Without NWFPs valuation, it is necessary to effectively manage and conserve NWFPs populations, by adopting appropriate management practices that can mitigate negative impacts. The contribution that NWFPs can make to the livelihoods of rural populations has encouraged the idea that more intensive management for these products could contribute to sustainable development and conservation objectives.

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1. Introduction

The diversity of Morocco's climatic and ecological conditions, and its position at the crossroads of European, Saharan, and Macaronesian flora, make it a floristic composition of undeniable diversity and complexity. This biodiversity results in a wealth of flora and fauna in the forests, which cover almost 9 million hectares (IFN, 2005). Among Morocco's noble forest species, Atlas cedar (*Cedrus atlantica* Manetti) forest is prized for its products and its technological, ecological, and biogeographical values (Laaribya & Belghazi, 2016; Laaribya & Alaoui, 2021).

Non-wood forest products (NWFPs) are wild plant and animal products harvested from forests. Millions of people

especially those living in rural areas in developing countries collect these products daily, and many regard selling them as a means of earning a living. NWFPs are used and managed in diverse socio-economic and ecological environments. Indeed, in forest areas, many NWFPs can be used for the subsistence of local populations, while others constitute the main or sole source of income. Some NWFPs have significant cultural value, while others have important medicinal value and contribute to the health and well-being of the community (Benabou et al., 2022; Laaribya et al., 2022).

The study of the forest's socio-economic potential and the development of non-wood forest products is a "value chain" issue. From production to marketing, and even consumption of the final product, several players are involved, often in different

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segments of the value chain. At each phase, or segment, added value resulting from a given economic activity (processing, transport, etc.) is generated and escapes the user populations, the actors closest to the source (Taylor, 2005; Hellin & Meijer, 2006; Belcher & Schreckenberg, 2007; Ahmad et al., 2007).

The economic role of these forest areas can be greatly enhanced if the products supplied are better valorized by local populations. A large proportion of these products are already used for immediate non-commercial or commercial purposes and are integrated into local practices. On the other hand, some can generate substantial cash income, provided certain conditions are met, in particular finding outlets on external markets or stimulating their use. However, in a context marked by global change (social, economic, and environmental), global warming is having an impact on ecosystems and the services they provide (IPCC, 2007, 2018).

Non-wood forest products often account for a significant proportion of production from forests, agroforestry plots, or trees outside the forest. They can be essential food supplements for example, or used in traditional medicine (FAO, 1989; 1991; Laaribya et al., 2022). But, they also play a variety of

environmental and socio-economic roles (Arnold & Pérez, 2001; Ticktin, 2004).

The aim of the study is to present a qualitative diagnosis, based on a value chain approach, of the use of non-wood forest products (NWFPs) in Morocco's rural forest environment, with a view to adding value to these products, which offers an opportunity for rural populations and stakeholders to increase their incomes in line with the sustainable management of forest resources. The work analyzes also the situation of NWFPs and the main benefits that local communities derive from them.

2. Materials and Methods

The study area belongs administratively to the rural communes of Itzer and Tanourdi in the Midelt province and covers an area of 12.020 ha (Figure 1). The study area is characterized by a hilly relief (Middle Atlas Mountains) and a topography that varies between 1600 and 2400 m, which has a direct impact on the spatial distribution of precipitation quantities (rain or snow). The prevailing climate is Mediterranean, mountainous, and continental, with irregular rainfall patterns.

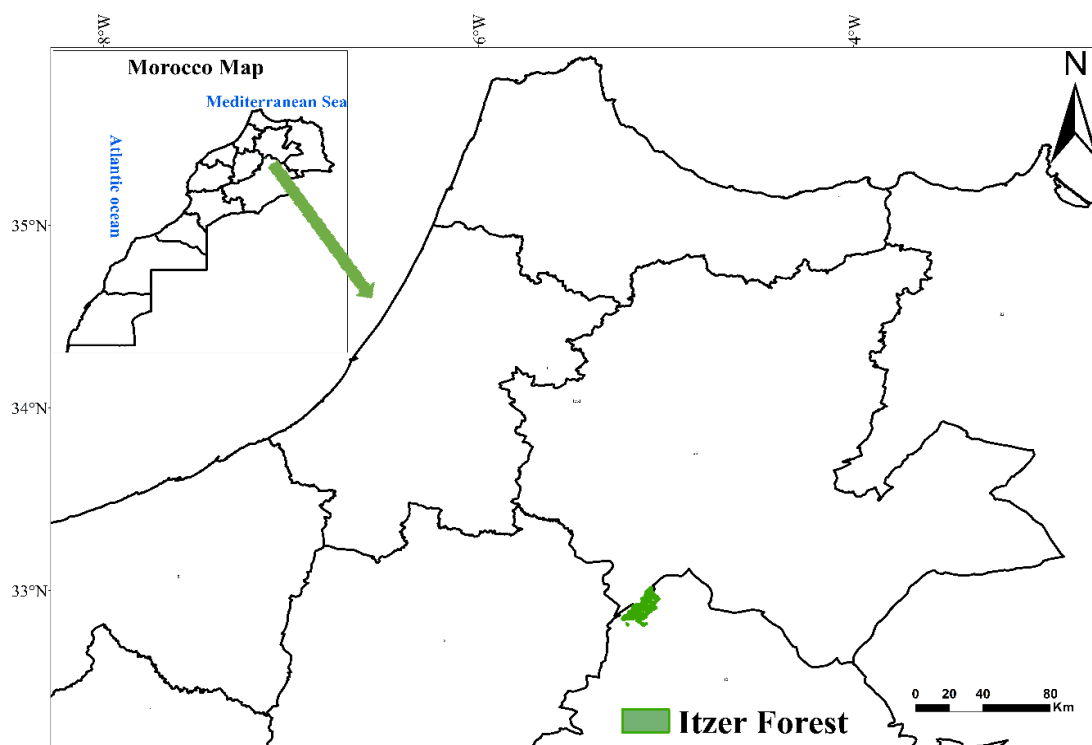


Figure 1. Study area: Itzer Forest Morocco.

Floristic diversity is essentially represented by the predominance of stands of Atlas cedar (*Cedrus atlantica* Manetti) and holm oak (*Quercus ilex* L.). Biodiversity in the study area plays a major role in the services provided by ecosystems through their “resource” and “carbon sink” functions.

Analysis of the non-wood forest product (NWFPs) sectors in the study area (aromatic and medicinal plants, beekeeping, mushrooms, etc.) will provide the essential elements for formulating the principles of concerted, efficient and sustainable management of forest and peri-forest areas to promote local, and communal economic and social development.

The method used to analyze the sectors identified took the following aspects into consideration:

- Defining and describing the value chain, analyzing its strengths and constraints;
- Stakeholders typology, with a view to understanding the strategies of the different types of stakeholders in the value chain;
- Opportunities offered by value chain development;
- SWOT analysis which is analysis is a strategic planning technique (Strengths, Weaknesses, Opportunities, and Threats) (Valentin, 2005).

The study of non-wood forest product value chains is based on stakeholder surveys and the results of 30 participatory workshops held in the area, both with the user population of each terroir and with the various actors involved (social organizations, departments concerned: Foresters, agriculture, livestock, etc.).

The participatory workshops focus mainly on presenting the development orientations to the various stakeholders in order to “validate” them with the local actors and a sample of the user population.

With regard to the feasibility of integrating the population, the analysis is based on a framework in the form of a matrix, which has enabled us to better organize our thinking on development axes in line with the territorialized value chain approach, covering each of the links starting with the end market and working up to production; in terms of strengthening links, improving links, redefining activities or developing new links.

3. Results and Discussion

Analysis of the situation in the area has shown that NWFPs are collected in the forest without the need to fall trees. With renewed interest in the local economy, this sector plays a major role in food systems, particularly during the lean season. Field investigations carried out in the Itzer forest, the subject of our work revealed three categories of non-wood products:

- Aromatic and medicinal plants (AMP)
- Beekeeping
- Agro-pastoral sector

3.1. Aromatic and Medicinal Plants (AMP)

The importance of the AMP sector has been continued to grow, in line with the sharp increase in demand for AMP and their by-products over recent decades, the growing number of users and the diversity of areas in which they are used (Taleb,

2017; Zrira, 2017). This sector is of great local interest to the local population, but remains poorly developed and organized. The local population and foresters declare that the plants that can be valorized in the Itzer forest area are:

- Lichen (Tmart noumghar as a local name)
- Woodland mushroom (*Tricholoma caligatum* (Viv.) Ricken (1915))
- Hawthorn (*Crataegus laciniata* Ucria): There is no formal hawthorn industry in the area. Harvesting is done informally by local residents.

The development of this AMP sector, in its initial phase, is of growing interest to the local population. A Taghaghat forestry cooperative has been set up (22 members). A partnership contract has been signed between this cooperative and the Middle Atlas Regional Water and Forestry Department, as part of the development and protection of the forest areas covered by the Itzer forest. The cooperative is to be supervised for a sufficiently long period to enable it to master the techniques of harvesting, adding value to, and marketing the products.

A study of the AMP sector in the Itzer forest reveals a high production potential that needs to be taken into account in management. The AMP sector represents a promising business opportunity in the area, given the potential it offers.

The Itzer forest area is rich in capital, mainly cedar Atlas, which is the mainstay of the AMP sector, providing raw material for a number of uses (cosmetics, food, etc.).

Forest stand management is the responsibility of local forest managers, in this case, the Midelt Provincial Directorate of Water and Forests and the Itzer forestry center, which provides close monitoring. The harvesting method falls short of managers' expectations. There has been a significant loss of raw material and a clear drop in value. Could this be due to a lack of suitable equipment and effective technical supervision?

The current situation offers a real opportunity for socio-economic development in the Itzer area, through the adoption of appropriate management of the AMP resource, in terms of management, exploitation, and valorisation. In fact, these are resources with high added value that can contribute to improving the living standards of the impoverished population. Despite these encouraging prospects, a number of constraints hinder the development of this sector.

The SWOT analysis enables managers to decide whether to intervene in this sector to ensure the conservation and development of the resource, on the one hand and the socio-economic development of the user population, on the other.

Table 1. SWOT analysis of the AMP sector.

Strengths	Weaknesses
<ul style="list-style-type: none"> -Ecosystems with good environmental conditions and local know-how, - Existence of significant AMP potential, - Existence of an evolving local and national AMP market, - Motivation of stakeholders. 	<ul style="list-style-type: none"> -Weak organization of players, - Low productivity/collector, - Low financial availability, which limits self-financing capacity and the possibility of investment in the AMP sector, - Lack of support and assistance for the target population in adding value to AMP.
Opportunities	Threats
<ul style="list-style-type: none"> - Significant local AMP potential that could be better exploited, and AMP-using industries in continuous development, - Significant increase in the number of AMP collectors (possibility of creating other AMP cooperatives), - Potential for diversification of production and processing, - Growing demand for local products. 	<ul style="list-style-type: none"> - Almost all AMP exploited and marketed is spontaneous, which threatens the resource and limits the sector's development potential, - Strong competition between collectors, - Climatic hazards are often unfavorable and influence product availability and the regularity of market supplies, - Risk of deterioration of local capital, - Lack of professional organization, with a high risk of the sector failing to evolve.

3.2. Beekeeping

Beekeeping is the art and science of breeding and caring for bees to exploit their products such as honey, bee pollen, bee bread, bee wax, bee venom, royal jelly, and bee queens. It is a branch of agriculture that has been practiced for thousands of years by traditional methods, and it has evolved and modernized over the years (Kohsaka et al., 2017).

The beekeeping sector is one of the most important economic activities in Morocco, elaborating several products such as honey, pollen, propolis, beeswax, and royal jelly. Indeed, honey production in Morocco exceeded 7000 tons in 2018 (Bouddine et al., 2022). Honey is a fluid, pasty, or crystalized functional food collected by bees from blossom nectar or sweet deposits (honeydew) from living plants, which is then modified and stored in honeycombs.

Honey from the study area is valued and sought after by consumers, given its rarity, dialytic, and medicinal qualities. Honey is used in the treatment of several debilitating diseases (Eteraf-Oskouei & Najafi, 2022), mainly due to the attributes of its enzymes and polyphenolic compounds. Production is carried out by transhumant beekeepers who come only during the summer season. Locally, this sector is very rare. As such, there is no real industry in the Itzer forest area.

Beekeeping in the study area is practiced by transhumant beekeepers¹ who come to settle during the warm season from May to September. In fact, around ten transhumant beekeepers from outside the area settle on state-owned forest and collective land. The transhumance phenomenon of beekeepers has also been mentioned in several works (Grillot, 2020; Vercelli et al., 2021; Martínez-López et al., 2022).

The main players are transhumant producers: Beekeepers (individuals), intermediaries from other towns, and buyers at local souks or in other transhumant producer towns (Gharb region, Beni Mellal). Beehives are looked after by local residents at a cost of 50 dirhams per day (5 dollars). It should also be noted that transhumant beekeepers come into conflict with local Itzer residents, which could compromise the future of this sector.

Table 2. Beekeeping and production in the study area.

Number of foreign beekeepers	15-30 depending on the season	Origin of transhumant beekeepers: Azrou city, Gharb and Beni Mellal region in particular
Number of apiaries (traditional)	2000	200 hives/beekeepers
Production in kg per rucher	4-6	-----
Total Production (kg)	10 000 - 15 000 kg	

Sources: Workshops and local investigations (2021).

Beekeeping is a rare activity in the study area, and the farmers who practice it do not have remarkable know-how based on a deep knowledge of the environment and its effects on bees, and in particular on an understanding of the seasonal cycles of colonies and the factors influencing swarming and productivity.

Transhumant beekeepers, on the other hand, know perfectly well how to build hives, which melliferous plants are appreciated by bees, and can assess the quantity of honey they can harvest depending on the state of the bee pasture. But when

¹Migratory beekeeping OR mobile beekeeping OR nomadic beekeeping OR transhumance beekeeping.

it comes to intensive management, they lack the knowledge, techniques, and marketing skills to make the most of their products. The modern beekeeping system based on transhumance is the most profitable in the region, especially with the cold weather lasting around 4 months. The bees are moved around the forest.

Sales are made outside the Itzer zone (regular and loyal customers of transhumants outside the Itzer zone). They sell to intermediaries, mainly in Beni Mellal and Gharb region. Prices per liter vary between 150 and 200 Dirhams (15 and 20 dollars). Production is transported to other towns bordering on the origins of the transhumant beekeepers.

The market is not at all organized; transhumant beekeepers exhibit their products in the souk outside the production zone, and it's the law of supply and demand that defines the price.

There are a few (rare) middlemen, who sometimes buy the product and transport it to other areas. In any case, almost all production is marketed outside the Itzer area. Indeed, transhumant beekeepers take almost all the production with them.

The local population is not involved in the beekeeping industry. Raising awareness and providing training in this sector could generate local added value. Organizing beekeeping cooperatives can contribute to local development while promoting the most profitable techniques and encouraging best practices. To ensure sustainable forestry and conserve biodiversity, native beekeeping is necessary in the region.

Below, it was reported on the strengths, weaknesses, opportunities, and threats (SWOT) of the Itzer Forest beekeeping sector.

Table 3. SWOT analysis of the beekeeping sector.

Strengths	Weaknesses
<p><u>Production</u></p> <ul style="list-style-type: none"> - Local product, - Existence of a strong melliferous potential, - Good image of local honey, - Possibility of adopting modern production techniques, - Motivation of stakeholders. 	<ul style="list-style-type: none"> - Transhumant beekeepers in conflict with local residents, - Poor organization of players, - Low productivity/hive, - Little basic beekeeping knowledge, - Lack of hygiene standards, - New cooperatives with prospective but inexperienced beekeepers, - Low financial availability, limiting self-financing capacity and the possibility of investment.
<p><u>Marketing</u></p> <ul style="list-style-type: none"> - Flow of all honey produced regionally by transhumance, - National recognition and good reputation of regional honey, - High price of local honey. 	<ul style="list-style-type: none"> - Lack of good packaging, - Lack of a marketing strategy, - Local marketing in a traditional way, without valorization of the honey's specificities, - Absence of known potential markets that demand honey at a remunerative price for the beekeeper.
Opportunities	Threats
<ul style="list-style-type: none"> - Financial support for government programs and strategies, - Increasing the number of cooperatives, - Improved production techniques, - Growth in demand for quality products. 	<ul style="list-style-type: none"> - Unfavorable climatic conditions particularly low temperatures, - Strong competition between beekeepers and PAM, leading to degradation of the natural environment and Beekeeping potential, - Degradation of local genetic heritage due to massive importation of foreign bees in recent years, - Absence of a quality control system for production, - The risk of a fall in honey prices, leading to a devaluation of the product, - Honey fraud and consumer distrust of the product.

3.3. Agro-Pastoral Sector

The agro-pastoral system is not just a livestock-based livelihood strategy, it is also a way of life with socio-cultural norms and values and indigenous knowledge that revolve around livestock. In the developing region, demographic, economic, socio-political, and climatic pressures are driving many pastoralists to adopt non-livestock-based livelihood strategies. The changing contexts in which pastoralists operate raise the question of the sustainability of pastoral systems in the

drylands (Zhang et al., 2008; Ayantunde et al., 2011; Laaribya et al., 2014).

It is interesting to note that the agro-pastoral sector in the study area is not very efficient, with traditional livestock management essentially involving sheep and goats (cattle are rare). However, its development would have a major impact on the region, particularly for goats, whose market is beginning to expand rapidly. As part of the regional Green Morocco Plan, local red meat associations have been set up in the area to

promote the development of this sector. The action zone is landlocked between the Middle and High Atlas Mountain ranges, with a geographical position characterized by very rugged terrain and high altitude.

The actions to be implemented in favor of this sector in Itzer are designed to support the organization of pastoral activities, to coordinate activities in the field at both douar and massif levels, with the networking of players and the sharing of skills, to invest in pastoralism (pastoral improvements, etc.), and to structure and enhance the value of production sectors, in particular with a view to the collective organization of product processing, marketing, and promotion.

There are many different actors involved. A survey of local actors has enabled us to draw up a summary of the situation in the study area. These are:

Producers: Producers can be divided into two groups: farmers and breeders. Farmers produce independently of market demand, whereas professional breeders are more dependent on it. For this reason, fattening operations have been developed in major consumer regions. This reduces the problem of seasonal supply. Among the different types of feed consumed by livestock, we can distinguish between those taken directly from natural grazing land such as forest or from cultivated land (fallow stubble) and those provided to livestock at stabling time: Concentrated supplements, grasses and, above all, holm oak branches. It should be noted that grazing offenses are recorded every year in the Itzer forest. These offenses jeopardize any possibility of reconstituting the cedar forests.

Intermediaries: Several categories of intermediaries and traders have been identified in the region. Their areas of activity are limited to the production region. They buy animals in small markets where they maintain good relations with producers, then resell them on larger markets in the same region, notably Timahdit, Boumia, and Itzer.

Collectors: They collect animals from production markets, with or without the help of regional traders, and transport them to consumption areas.

Anchor: These are wholesale meat traders. They buy animals on the production markets or from “collector” traders. They generally keep and feed the animals for a certain period of time, thus maintaining the regularity of meat sales. Maquignons can be significant players, but they can only operate within a small radius and remain relatively small players in the local animal supply chain. However, they are not very dominant in the region.

Butchers: Some butchers buy a limited number of animals each week or each day; others buy carcasses directly from the butchers.

Livestock management in the studied area is traditional and extensive, with limited genetic potential. Livestock products (meat and dairy products) play an increasingly important role in consumption in the area, especially as one of the government’s objectives is to increase the consumption of livestock products. Demand for red meats focuses on sheep and goats. Sheep (especially ewes) and goat meat are consumed according to people's standard of living and the season (autumn, winter, but also summer); demand beef is rare but high in summer when the area sees the arrival of summer visitors with a preference for beef. This may be due to consumer preferences as well as price and income effects, given the coincidence of high demand with periods of high production. In addition, there is a high demand for sheep and goats during a particular period of the year, the Eid El Kebir (Feast of the Sheep), when 75% of animals are destined for self-consumption. During Eid El Kebir, every household slaughters an animal, and for each christening, a goat or sheep is slaughtered. Meat demand would be 15 kg/capita/year if supply and consumer purchasing power were not limited. Sheep prices vary according to quality, with a marked increase during Eid El Kebir compared with other periods.

In order to assess the importance of the sector’s economic activity at the level of sheep farmers, we present the following estimates.

Most of the profits generated by the sylvo-pastoral sector are generated outside the area. Livestock farmers need to recover them in order to:

- (i) improve their income,
- (ii) conserve and develop forest resources,
- and
- (iii) provide a basis for local organization and co-management of the forest ecosystem.

The elements of the SWOT analysis are likely to guide local managers.

Table 4. SWOT analysis of the agro-pastoral sector.

Strengths	Weaknesses
<ul style="list-style-type: none"> - A strong attachment to livestock production and grazing, - High livestock production potential, - Significant potential for rangelands, - Significant gaps to be filled in terms of productivity and adding value to livestock production, - Significant potential for saving irrigation water, - The existence of know-how in livestock farming. 	<ul style="list-style-type: none"> - Lack of product certification, - Low efficiency in using the genetic potential of breeds from other regions, - Poor organization of breeders, - Traditional livestock management, - Under-financing of the livestock production sector, - Weak investment (especially private) in livestock production, - Low value-added from livestock production, - Over-exploitation of rangelands and forests, - Weak organization of the livestock circuit.
Opportunities	Threats
<ul style="list-style-type: none"> - The natural environment is favorable for animal production, - The role of the livestock sector in the government's rural development strategy, - The opening up of the national economy to foreign markets. 	<ul style="list-style-type: none"> - The severity of the climate, the structural nature of drought and cold, - The risk of environmental degradation (degradation of rangelands, decline in herbaceous production, etc.), - The adverse effects on vulnerable farms of opening up the national economy to foreign markets.

4. Conclusion

The Itzer forests are strongly influenced by the climate and the harsh conditions between the Middle and High Atlas Mountain ranges, whose geographical position is characterized by very rugged relief and high altitude. However, the non-wood forest products sector plays an important role in local development in Morocco. The sustainable development of these products would reduce human pressure on natural and forest resources, by creating income-generating activities and improving the incomes of local populations. Non-wood forest products account for a significant proportion of production in forest and peri-forest areas. They play a major role in the household economy and local development of the area. The challenge of conserving and sustainably developing forest resources lies in implementing integrated and participatory sustainable management of the ecosystems in question. Within the framework of concerted sustainable development, it is imperative to explore the possibilities for organizing the local population and the stakeholders concerned, as well as appropriate forms of partnership, in order to lay the foundations for co-management of the forest area and its resources. In this way, the effective participation of the population must first be expressed by their support, then by their ongoing mobilization in any action aimed at the conservation and development of the forest ecosystems. The results also showed that the proposition that increased use of NWFPs is compatible with the conservation of forest areas needs to be qualified and elaborated. In practice, it proved unlikely that the economic objectives of local populations and users would produce the same results as the conservation objectives of those concerned with preserving biodiversity. The prospects for certification of non-wood forest products would be a considerable asset in promoting the sustainable enhancement and conservation of biodiversity and the environment.

Conflict of Interest

The author declares no conflict of interest.

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