The Challenge of Sustainability of the Moroccan *Argan* Grove: A neo-Institutional analysis

Abstract

This paper aims at analyzing some issues related to the argan grove as a product of human construction and institutional arrangements. Despite its renowned resilience to drought, this ecosystem has experienced a decline due to various anthropogenic factors. Its contribution to ecological balance and biodiversity preservation has been seen to gradually slow down.

Faced with the weight of various stakeholders' private interests involved in forest exploitation, informal forest governance institutions have been gradually collapsed. At the same time, the existing relatively weak formal institutions turn to be inadequately effective to replace old ones. In addition, they were were not renewed to adapt to the new situation, with the aim of protecting the argan tree ecosystem. An institutional breakdown then occurred, paving the way for new irresponsible behaviors and harmful practices for the forest.

Key-words: *Argan* Grove, Sustainability, Biodiversity, Governance, Neo-Institutional,

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1. Introduction

The Argan grove[1] is an original forest ecosystem located in the arid and semi-arid zones of South West Morocco. This ecosystem has long played a vital role in ensuring ecological balance and preserving biodiversity. It has always contributed to maintaining the fertility of the soil, the sustainability of flora, fauna and people (aligned with goals 15 and 2 of the MDGs). It also offers substantial usufruct entitlements to local populations. Such rights include picking Argan fruit, growing cereals, grazing livestock, gathering wood and collecting building materials.

Despite its strategic importance, the argan tree ecosystem is highly fragile and vulnerable to external threats. Approximately 600 hectares of argan grove are lost each year, leading to a significant reduction in the tree density. In less than a century, over half of the forest has vanished, and the average density of trees per hectare has dropped from 100 to 30 (M'hirit et al. 1998). In reality, this ecosystem exhibits a high level of resilience to drought. Its degradation can only be attributed to long-term human impact on the natural environment. This pressure is largely caused by logging, deforestation, intensified agriculture, and overgrazing by both goats and camels.

In response to this ecologically worsening situation, Moroccan policymakers have historically supported an approach that involves delegating a part of forest governance to informal institutions. However, due to the combined impact of global warming and globalization, the various stakeholders involved have been compelled to disregard the customary rules that have long governed the proper management of the forest. As a result, these friendly informal institutions have gradually vanished, making room for new rules and practices that are hostile and detrimental to the forest.

With this in mind, our objective is to critically reassess Moroccan governance system concerning the argan tree in the midst of an environmental crisis. The goal is to understand why, despite the expressed political willingness, this hybrid approach to governing the argan grove is no longer functioning effectively.

Our hypothesis is that, beyond external factors, the failure of the governance system for the argan tree in Morocco has something to do with the gradual decline of informal customary institutions and the inability of formal institutions to fill the gap. This has led to the rapid emergence of new specific customary rules, with all their detrimental consequences for the forest.

For this purpose, we have employed conceptual tools of the so-termed “neo-institutional economics”, while relying on a “contextualizing approach”. Such heterodox branch of contemporary economics provides a suitable theoretical and methodological framework for gaining a deeper understanding of the governance systems of the argan grove, as a coùmunity-based resource. Specifically, we draw upon the research works by North (1991), regarding the dual nature of institutions (formal vs. informal institutions), and Helmke and Levitsky (2004), concerning typologies of informal institutions.

The remainder of this paper is structured as follows. Section 2 presents an overview of the Moroccan argan grove, which is seen here and hereafter as an endemic multifunctional ecosystem. Section 3 examines the issue of irreversible degradation of this ecosystem, with a specific focus on the role of anthropogenic factors. Section 4 analyzes the significance of the institutional dimension in understanding the governance failure of the

[1] The term "grove" is most appropriate to describe the aragnier area because the density of argan trees in the forest area is not very high (between 30 and 100 trees per hectare).

argan grove ecosystem in Morocco. Lastly, the concluding section offers a summary and discusses potential implications for economic policy.

2. The Argan Grove in Morocco: An endemic ecosystem in centralwest Morocco

The argan grove, known as "*l'Arganeraie*," is a natural ecosystem spreading over the arid and semi-arid regions of centralwest Morocco, as well as isolated areas in southwestern Algeria. It covers an area of approximately 800,000 hectares. The dominant species in this forest consist of the so-scientificall called "Argania spinosa", which plays a crucial role in maintaining ecological balance, combating desertification, and preserving biodiversity.

2.1. A brief description of the argan tree

The argan tree is a significant and indigenous tree characterizing the abundant forest resources of west-central Morocco. One of its characteristics is that it bears thorny branches (Argania spinosa) and wide crown, belonging to the Ebénales order and Sapotaceae family (Wahidi et al., 2013). At maturity, it can reach a height of up to 10 meters. The argan tree has well-developed, often spreading roots and a lifespan ranging from 125 to 150 years, with some of them living up to 250 years (Rieuf, 1962:13). Its trunk is short (2 to 3 meters), twisted, and often composed of multiple intertwined stems.

The argan tree is well-known for its resilience, with a good adaptation to climatic changes from the Tertiary era to the present day. It is xerophilous, enabling it to withstand prolonged droughts; and this explains its presence in continental areas with arid climates (Chakhchar et al., 2017). Additionally, the argan tree is thermophilic, thriving in high temperatures of up to 50 degrees Celsius. It can tolerate slight negative temperatures, but its distribution is limited to around 1,300 meters in the Anti-Atlas and 900 meters in the High Atlas of Morocco.

Regarding air humidity, some studies reveal that the argan tree is found only slightly inland, beyond 150 kilometers from the Atlantic Ocean (Nouaim, 2005). The argan tree is adaptable to various soil types, including clay, limestone, and siliceous soils, with the exception of loose sand (Aafi and Benabid, 2015). It can even grow in nutrient-poor and slightly saline skeletal soils.

The argan tree can naturally regenerate through seed sowing, which is the most suitable method for maintaining and preserving the argan grove. However, natural regeneration is rare due to the challenging conditions for seed germination, as seeds are enclosed in a hard shell (Boudy, 1952). Furthermore, the systematic collection of the argan fruit by users, herds, and rodents dramatically hinders the regeneration process of the tree. Apart from seedling regeneration, the argan tree can also regenerate naturally through stump sprouting, which continues even at an advanced age (Soulères and al., 1998). Artificial regeneration is also being increasingly utilized in protected areas such as the Admin forest, located approximately fifty kilometers east of the Moroccan city of Agadir.

The distribution of the argan tree forms a triangular shape, with a coastal segment stretching from the north of Essaouira (Oued Tensift) to the south of Agadir (Oued Noun), and extending inland towards Taroudant around Aoulouz, west of Jbel Siroua. The largest argan tree stands are primarily found in the northeast of Essaouira, extending to the Souss valley.

2.2. Ecological function and biodiversity of the Argan grove

The argan grove serves important ecological functions and supports a diverse range of biodiversity. Ecologically, the forest plays a crucial role in mitigating the impacts of

climate change. The argan trees help stabilize the soil, preventing erosion caused by rain and wind. Without the presence of these trees, water would seep into the deeper layers of the soil or flow into the oceans, resulting in a harsh and arid environment. The argan grove acts as a protective barrier against desertification in the pre-Saharan regions of west-central Morocco.

The argan tree is well-suited for arid and semi-arid regions, making it a valuable resource for sustainable land use practices. Its deep taproot allows it to access groundwater up to 30 meters deep, which is crucial in areas with limited surface water. Additionally, the argan tree can recover water due to the presence of microscopic fungi that can grow in both the roots and the soil (endomycorrhiza).

In addition, the argan tree serves a dual purpose in mitigating the effects of climate change. Firstly, it enhances soil fertility by enriching it with nutrients and, most importantly, increasing its organic matter content, which aids in carbon sequestration. Similar to other trees, the argan tree absorbs CO2 from the atmosphere and converts it into oxygen and plant material through photosynthesis. The tree's expansive canopy and dense foliage offer shade and encourage moisture retention, creating a microclimate that supports the growth of other plant species.

In terms of biodiversity, the argan grove encompasses a highly diverse ecosystem that serves as a habitat for a wide range of animal and plant species. The fauna in this ecosystem includes numerous mammals and other wild species. The rugged terrain provides a secure environment for significant populations of cuffed mouflon and Cuvier's gazelle (mountain gazelle) that still reside in the wild. Other species, such as wild boar, the African wildcat (Felix lybica), which is now rare, and the jackal (Canis aureus), the authentic African wolf, contribute to the forest's animal population in this region. Moreover, there are more than 83 species of land birds, including rare birds of prey, approximately 20 species of water birds, and around 30 species of reptiles and amphibians.

The flora in the argan grove is abundant and diverse. The argan tree coexists with over 300 plant species, including the gum tree, the dragon tree, and the date palm, as well as aromatic and medicinal plants like sagebrush, thyme, germander, wild sage, caper, coloquint, and lavender. Other species, such as acacia and Euphorbia, have been have been observed in these regions.

2.3. Economic multifunctionality of the argan grove

The importance of the argan grove in Morocco extends beyond its ecological functions: it turns also to empower the economic sphere. The forest plays a crucial role in supporting a rural population of approximately 3 million people by providing them with fruits, fodder, and wood. The fruit of the argan tree is highly prized due to its exceptionally high oil content. This oil, known as Morocco's "liquid gold," is one of the rarest in the world. It is rich in antioxidants and essential fatty acids, and has been utilized for centuries for culinary, cosmetic, and medicinal purposes. Its scientifically recognized benefits include its ability to prevent cardiovascular disease and its positive effects on the skin-health (Berrougui et al., 2006).

People who live in or near the forest utilize the timber from argan trees for various purposes. Due to its hardness, weight, and durability, argan wood is highly valued as structural timber and is considered as one of the best ecological insulators for use in hot climates. In addition, its density, lightness, and slow-burning properties make it a popular choice for fuel in the form of charcoal. Locally, the energy yield of argan wood is considered superior to that of other available energy items (Benzyane, 1989).

When the soil is left uncultivated, the argan grove serves as a crucial fodder reserve for livestock, especially goats and camels, which graze there throughout the year, even during drought periods. All parts of the argan tree are edible for livestock, including leaves, fruit pulp, undergrowth, and even by-products such as dried pulp and cake, which are nutritious animal feed (Fellat-Zarrouk et al., 1987). Furthermore, the residual pulp, known as oilcake, contains fat and protein, making it an ideal ingredient for fattening cattle (Charrouf, 1999).

In addition to these functions, the forest also serves a socio-cultural purpose. The argan forest is a recreational space for local communities, as well as for tourists and various development stakeholders operating in the region. It is regarded anouas an intangible cultural heritage and a traditional source of sustainable and resilient development. This recognition has been granted by UNESCO (United Nations Educational, Scientific and Cultural Organization) since 2018, with the designation of the endemic argan production area as an argan biosphere reserve. Similarly, in 2021, the United Nations declared May 10th of each year as "International Argan Day."

3. The argan grove in Morocco: an endangered ecosystem

In recent decades, the argan forest ecosystem in Morocco has faced increasing degradation due to human activities. This irreversible degradation is fundamentally characterized by a process of gradual reduction and deterioration of forested areas.

3.1. Overexploitation of the argan grove

Since the beginning of the 21st century, the value of argan products and by-products has experienced a significant increase. The labeling and restructuring of the industry around cooperatives have resulted in a surge in the prices of argan products, particularly argan oil. For instance, the price of a liter of culinary argan oil has risen from 3 dollars in the late 1990s to over 35 dollars in 2022. Cosmetic oil is even more expensive, as a substantial portion of production is intended for export. It is projected that exports will increase from less than 40 tonnes in 2003 to over 1,500 tonnes in 2022 (*Office des changes*, 2023).

In creasing demand for raw materials from cooperatives and other private companies has resulted in an intensified exploitation of the argan trees, accompanied by a tremendous predatory human behavior. This overexploitation has taken the form of deforestation, with all its treaths to the natural regeneration of the argan grove. Normally, the ripe fruits of the argan tree naturally fall to the ground and are collected. However, the predatory behavior involves a forcefully picking the the fruits, causing damage to flower buds and flowers themselves, and leading to injury and disease as sticks are used. The rate at which argan trees are harvested exceeds their rate of regeneration, which is already low or non-existent. Thereby, these actions contradict the traditional agro-sylvo-pastoral systems and the local governance model of the argan tree (Simenel and al., 2009), transforming local populations into agents of destruction (Faouzi and Martin, 2014).

Note also that the flora in areas dominated by the argan grove has faced significant pressure due to overgrazing. The local population, whose history and culture are closely tied to goat breeding, have traditional rights to utilize forest resources. However, the population of goats has increased substantially, leading to a detrimental impact on the flora, especially the argan trees. Goats feed on the foliage of the trees and other shrubs that are vital components of the forest ecosystem's structure and architecture. Young argan shoots, with their delicate and unprotected leaves and stems, are particularly vulnerable to being consumed by goats. These agile animals are known to their high

capacity to climb trees in order to reach the highest leaves. Additionally, goats contribute to soil degradation by damaging other shrub and herb species and trampling on argan seedlings.

The issue of overgrazing is exacerbated by the progressive reduction of fallow land and the recurrence of drought cycles. The sale of livestock in areas affected by drought adds to the already excessive burden in regions that have relatively better access to water resources. Additionally, transhumant camel herds contribute significantly to the pastoral burden. As early as the beginning of the 21st century, this burden was estimated to be between 1.5 to 4 UPB/ha, depending on the forest zone, which is nearly three times the sustainable load (Bouzemouri, 2007). Presently, the situation is likely even more concerning. Despite being illegal, this pastoral activity is often tolerated due to the strong influence of herd owners, who typically hold positions as senior civil servants, businessmen, parliamentarians, elected representatives, political figures, tribal leaders, and major traders in southern Morocco (Boubrik, 2022:8).

Excessive timber harvesting is a significant cause of overexploitation in the argan grove. While tree-cutting is not as prevalent as it used to be, it still contributes to deforestation. Wood consumption hampers the natural process of regeneration. The disequilibrium between the argan grove's potential (350000 m3/year) and the actual harvest (1150000 m3/year, three times its potential) inevitably results in the depletion of the forest's wood resources (Charrouf, 2007:17).

3.2. Forest clearance

The forest ecosystem is severely impacted by the clearing of land for agricultural expansion, especially in areas where arable land is limited. Although this practice is considered as a violation of forestry laws, it is widely tolerated by public officials. It is carried out by both local communities, who have the right to use the land, and large-scale farmers.

Due to the authorities' leniency, small farmers have engaged in a competition to clear land and claim ownership. This has led to an increase in individual or family ownership of previously collective or state-owned land. As a result, traditional practices like crop rotation have been abandoned by local small-scale farmers. They now prioritize water-intensive crops and remove trees to facilitate mechanization.

The argan grove is also facing a new form of clearing, carried out by large-scale farmers who were granted permission in 1983 to cultivate intensive citrus and market gardening crops for export. In the Houara plain, for instance, numerous trees were cut down in the 1980s to make way for citrus fields. Some of the communal argan lands were privatized through doubtful practices. Apart from depleting the water table at an alarming rate, the industrial agriculture practiced on these new farms has resulted in the irreversible destruction of the crucial biodiversity (including flora and fauna), which has to drive the sustainable development of the affected geographical areas.

Clearing the argan grove has numerous consequences for the ecosystem. The most evident consequence is the threat it poses to biodiversity. As mentioned earlier, the argan grove is a habitat that supports a diverse range of flora and fauna. Human activities that destroy this natural environment put these species at risk. Additionally, clearing the forest weakens the soil. The forest plays a vital role in enriching the soil with organic matter and making it more resistant to weathering and erosion. Thus, when a forested area is destroyed, the soil gradually becomes more fragile, making the ecosystem more

susceptible to natural disasters like landslides or floods. Lastly, the destruction of argan trees lowers the ecosystem's ability to store CO2.

3.3. Uncontrolled urbanization

Urbanization rises another significant threat to Morocco's argan forests. Typically, while thinking urbanization, one would envision the expansion of large cities, small towns, and rural areas into previously forested regions. However, human infrastructure such as roads, bridges, and airports also contribute to the degradation of the argan tree's natural habitat.

Urbanization and the conversion of land into artificial structures are gradually causing the disappearance of the argan tree and other associated plant and animal species. Moreover, human infrastructure is leading to the fragmentation of natural habitats, creating isolated pockets of biodiversity. Consequently, some species are unable to find prey or food and face extinction, while others proliferate and become invasive due to the absence of natural predators. This observation aligns with the empirical findings of other authors, such as Allen and Barnes (1985) and Tole (1998), in the context of other developing countries.

An illustrative example is the rapid expansion of Agadir, a large city located on the Souss plain, which has encroached upon the forested areas inhabited by the argan tree. Since the relocation of the airport to an 815-hectare site within the forest in 1991, numerous industrial zones, residential districts, major infrastructure projects, and even unplanned settlements (such as Kloéa) have gradually replaced the argan trees. In the province of Chtouka Ait Baha, the construction of a new cement factory near the rural commune of Imi M'korne has resulted in the ruthless uprooting of many hectares of argan trees. Similarly, in the Agadir Ida Outanane prefecture, thousands of argan trees were cleared to build the initial section of the Agadir-Marrakech freeway in the rural commune of Ameskroud. The construction of the Agadir/Taroudant expressway, which passes through the Admin forest via the Al Massira airport, has also led to the destruction of significant areas of argan trees.

Indeed, the forest areas in question may not be densely populated with trees, but the lack of replacement for the felled trees raises ethical concerns. Despite the state's efforts to discourage tree cutting by local residents, it is paradoxically involved in this disrespectful act towards nature. Civil society, which should ideally advocate for forest protection, is inadequately engaged due to disorganization and, more significantly, its subjugation to political powers.

4. Understanding the governance failure in Morocco's argan forest ecosystem: an institutional response

The term "institutions" is used here to refer to the humanly devised constraints that structure the interactions among the different stakeholders involved in the exploitation of the argan forest, whether directly or indirectly. Such rules consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights). The purpose of these institutions is to establish order and define the guidelines for sustainable and inclusive governance. However, regrettably, achieving this objective remains a hard-challenging-issue.

4.1. Inefficiency and ineffectiveness of formal institutions

The argan grove ecosystem is unique and distinct from other types of forests in Morocco. This distinctiveness is reflected in the specific forestry regulations that apply to it, particularly the Royal Dahir of 1925. This law established the principle of the State's superior right over the *Arganeraie* while also ensuring the rights of local populations to enjoy its resources. According to the law, these rights are exclusively reserved for the indigenous tribes and groups who have traditionally utilized the argan groves. These rights encompass activities such as collecting dead wood, harvesting fruit, grazing livestock, utilizing the land, gathering firewood, producing charcoal and timber, cutting branches for fencing, and extracting earth, sand, and stone.

In contrast to these extensive rights, the restrictions imposed in the name of ecosystem protection are relatively limited and, more significantly, ambiguous. Hence, we can describe the ecosystem as quasi-privatized, governed by formal rules that are exceedingly generous and even lenient.

It is important to acknowledge that these rules were established nearly a century ago within a specific context. This context was characterized by low population density, limited urbanization, generally favorable climatic conditions, and, most notably, the colonial administration's aim to appease nationalist sentiments among the indigenous populations and mitigate the risk of popular uprisings against the French protectorate. As evidence of this, the architects of the law had intended for its implementation to occur gradually and only in regions where the political situation would permit it.

Interestingly, since the independence, the Moroccan government has not made any efforts to revise the 1925 Dahir in order to strengthen its regulations, despite the ongoing deterioration of the argan grove. In our view, this can be attributed to the emergence or reinforcement of rent-seeking behavior. The primary actor involved in capturing this rent is the State itself, which exploits the principle of the general interest to justify the annual felling of thousands of argan trees. This is done to accommodate urban expansion and create space for public infrastructure projects such as dams, airports, freeways, roads, and industrial zones.

Another group of rent seekers is the large transhumant camel herders, who exploit grazing lands by asserting a historical right to share natural forest pastures with local communities. However, the increasing size of camel herds is causing significant damage to the entire ecosystem. Their rapid mobility and extensive occupation of grazing areas not only impact land cover but also vegetation density and condition (Boubrik, 2022:11). These new camel owners form a powerful and cohesive interest group from the Saharan region. They receive implicit support from the government, even in the face of conflicts that frequently arise between them and the local population. These camel herders unlawfully seek to expand their operations without considering the ecological and social realities of the forest.

A final group of argan rent seekers consists of argan oil extractors. Typically, this activity is carried out by villagers who are often organized into cooperatives, which are the only form of organization allowed by the government. However, the success of argan oil in foreign markets has attracted numerous businessmen who are willing to bypass the law by presenting their profitable enterprises as cooperatives that are mostly composed of phantom members. These new private investors obtain their supplies from a network of intermediaries who criss-cross the villages, purchasing fruits directly from small farmers deprived of any bargaining power. The processed product generates exceptionally high revenues, while the cost is extremely low and there are no taxes. Another consequence of

this rent-economy is the increase in uncontrolled fruit picking. Families living in poverty compete fiercely to collect as much fruit as possible, which they sell to middlemen. This, of course, harms the trees, which are increasingly weakened due to the widespread use of inappropriate harvesting techniques such as galling of very young fruits.

The sanctions for violating the established rules in the argan grove area, such as abusive logging and land clearing, are relatively insignificant compared to the severity of the acts committed. For instance, the penalties are very low and imprisonment is only mandatory in serious cases like forest fires. In addition, the effectiveness of enforcement also relies on the availability of human resources to monitor and record infraction. Unfortunately, the number of forest rangers is insufficient to adequately protect the argan heritage (Nadir, 2008:96/97).

The governance rules for the argan grove area, which were established in 1925, were further enhanced by the provisions of law 22.07 on protected areas. The revision of this law in 2010 allowed for its expansion to include the *Arganeraie* Biosphere Reserve. The updated regulations have the objective of safeguarding the area by preventing degradation and any actions that may disrupt its diversity, composition, appearance, and evolution (Plancher, 2015). This approach enables us to view the management of protected areas as a means to conserve and promote biodiversity and sustainable development.

It is worth noting that, despite the law for the *Arganeraie* Biosphere Reserve being established in 2010, the implementing decree has not yet been issued. This decree is necessary to outline the responsibilities of different stakeholders, establish operational criteria (such as guidelines for the optimal use of the biosphere and limitations on the number of goats grazing in the forest), and clarify the mechanisms for mobilizing financial and human resources.

4.2. Informal Institutions in crisis

Historically, Moroccan local communities have established unwritten rules that have contributed to an effective system of community governance in the argan grove area. These rules are socially shared, usually unwritten, and are created, communicated and enforced outside officially sanctioned channels (Helmke and Levitsky, 2004:727).

Specifically, three main informal customary institutions have emerged as key elements of good argan governance: the *Jmaa*, the *Agdal*, and the *Mouchaa*. The *Jmaa*, as the first institution, is a traditional governance body developed to maintain social cohesion, manage internal village affairs, ensure adherence to customary rules, and facilitate conflict settlements. It possesses social and cultural legitimacy, as well as an organizational structure that helps prevent opportunistic behavior, as defined by Williamson (1985).

The second institution, known as the *Agdal*, refers to the practice of seasonally setting aside areas for grazing and harvesting, providing a form of biological rest for the forest. It consists of a set of rules that determine specific periods of opening and closing the argan area for designated rights holders, along with various rules for usage (Cordier and Genin, 2008). The forest is officially placed under the *Agdal* regime around May 15, after the harvest, to allow space for herds on the stubble fields. Starting from this date, grazing and collecting argan nuts are prohibited. The closure dates of the forest vary each year, with late August being the closure date in the case of insufficient rainfall, and late October if rainfall is considered sufficient (Bourbouze and El Aich, 2005).

In contrast to the *Agdal*, the *Mouchaâ* refers to areas where no one possesses the rights to the argan trees, and grazing rights are shared among all village inhabitants. These areas were exclusively managed by the *Jmaâ*, which regulated access for animals and the harvesting of fruit and wood.

This threefold institutional arrangement, rooted in local customs, has played a crucial role in regulating the argan ecosystem for a significant period. It has been instrumental in preserving biodiversity and vegetation cover. This has been achieved through three legitimizing functions: exercising public authority independently of the state and its official institutions, providing specific services, and exerting authority over a well-defined territory and a clearly identifiable group of villagers. Generally, individuals adhere to informal institutions not only because of the functions they fulfill, but also thanks to the cost/benefit analysis, the system of sanctions in place, or simply out of habit.

Regrettably, the advent of globalization has significantly disrupted the traditional governance practices in the argan grove area, disturbing the long-standing balance of a system that had functioned effectively for over a century (Faouzi, 2016). On one hand, globalization has fostered individualism within village communities, where collective interests are often overshadowed by individual pursuits. On the other hand, globalization has transformed the forest into a commodity for appropriation and trade. It has played a significant role in promoting the benefits of argan oil on the international market, resulting in a surge in demand and prices for this product. Consequently, this situation has influenced the behavior of villagers, who have become more self-centered. In their pursuit of improving their standard of living, they are now willing to disregard the established social order and adopt a more aggressive approach towards the argan tree.

Meanwhile, the existing informal rules no longer provide adequate protection for villagers' forest resources (right of use) against the encroachment of transhumant camel herders, who disregard the designated areas during the argan fruit harvesting period. Due to the scarcity of grazing land and the growth in herd size, coexistence between these two communities has become increasingly challenging. Under these circumstances, driven by rationality and self-interest, villagers opt to harvest all the fruit indiscriminately, even before it is fully ripe, out of fear that it will be consumed by the camels. In both scenarios, the consequences are devastating for the forest ecosystem.

In fact, benevolent informal institutions no longer inspire trust, which is a crucial prerequisite for cooperative behavior within a society (Brunetto and Farr-Wharton, 2007). Thereby, these institutions are no longer respected and are unable to effectively shape individuals' behavior. The system of collective sanctions enforced by the Jmaa no longer serves as a rational incentive for adhering to established social norms, as the perceived benefits of violating these norms outweigh the expected punishment. As a result, these institutions will gradually be replaced by new parasitic practices, such as predation, vandalism, looting, pillaging, and parasitism. These practices are driven by pragmatism, as individuals establish them to serve their calculated purpose of improving their standard of living. Given the inefficiency and ineffectiveness of formal institutions, these illicit rules represent a second-best strategy for the people concerned (Helmke and Levitsky, 2004).

Obviously, these emerging practices cannot be considered as fully-institutions in the sense defined by North, as they are not yet widely shared and deeply ingrained in society. However, they are gradually undermining and displacing ethically acceptable rules and norms (the customs and values that safeguard the forest), rendering them ineffective. This

detrimental institutional dynamic can be attributed not only to the growth of a highly profitable argan oil market but also to the challenges associated with addressing ecological and biodiversity concerns within rural communities.

4.3. Interactions between Formal and Informal Institutions

Until the late 1980s, the argan grove was perceived as a space where two institutional logics coexisted, allowing for a certain equilibrium that was both rational from a human perspective and ecologically sustainable. On one hand, formal institutions were designed in a way that limited the involvement of the State in forest governance, with the forest's ownership being largely abstract. The State did not play a significant role in forest management or the exploitation of resources, including argan oil. On the other hand, effective informal institutions were established and developed within village communities to facilitate coordination among the individuals involved. These institutions provided an innovative model for conserving argan stands and promoting sustainable forest governance.

However, as the commercial success of argan oil increases, urbanization accelerates, and the influence of transhumant camel herders grows, the institutional framework governing the forest area has undergone a gradual transformation. While formal institutions are starting to adapt and, albeit cautiously, support the protection of the argan ecosystem, the once robust informal institutions that had effectively ensured this protection have significantly weakened, making way for predatory practices. Referring to Lauth (2000), the relationship between these two types of institutions can be described as "conflictual" since they are incompatible and pursue different objectives. In this dynamic, informal institutions exist at the expense of formal ones, partially occupying or completely infiltrating them, thus acquiring the status of "parasitic" informal institutions. Osei-Tutu et al. (2015:27) employ the concept of "void subversion" to characterize this situation.

In response to the weakening of informal institutions that have traditionally protected the argan ecosystem, such as the Jmaa and Agdal, it is expected that formal institutions would intervene to either replace or restore them through consultation with local communities. Unfortunately, this has not occurred. While the state has indeed promoted the establishment of modern local NGOs to fill the void left by the Jmaâ, this initiative has not revitalized collective action within village communities. Instead, it has inadvertently facilitated the development of rent-seeking behavior associated with the exploitation of argan trees.

The current formal institutions are not strong enough to modify the individual behaviors caused by the new predatory practices in the forest area. These practices have a persistent ability to survive. It seems that all the players involved in the exploitation of argan grove resources benefit from this status quo situation. Firstly, the villagers continue to attack the trees to extract as much fruit as possible. Secondly, the industrial firms, posing as cooperatives, make excessive profits by processing the fruit into oil for cosmetic use. Thirdly, the large-scale transhumant camel breeders practice overgrazing. Fourthly, the State adopts a lax attitude towards these practices and also practices deforestation to create more space for the expansion of towns and other basic infrastructures.

5. Conclusion

The argan grove serves as a model devoted to understand the interactive dynamics between the natural and socio-economic environments. It also helps to test the hypothesis that ecosystem degradation is due to the development of human activities associated with

harmful and opportunistic institutional dynamics. Four main human factors have contributed to the triggering and acceleration of this dynamic: the high demand and increasing prices of argan products, the growth of extensive transhumant camel farming, the expansion of intensive agriculture, and the uncontrolled expansion of urban centers at the expense of the forest.

The area occupied by the argan tree is not just a natural forest, but primarily an institutional and human creation. In the face of the influence of private interests from stakeholders involved in these factors, the informal institutions of forest governance gradually deteriorated. Simultaneously, the already weak formal institutions were not effective enough to replace them. They were also not updated to adapt to the new situation and enforce collectively desiable outcomes in the space of the argan ecosystem. Then, an institutional breakdown occurred, leading to irresponsible behaviors and practices that harm the forest.

Given the new constraints imposed by globalization, it appears challenging to restore the informal institutions that effectively governed the argan forest for over a century. Their complete collapse seems irreversible. This is because the ecosystem's stakeholders have adopted predatory rules of conduct that align with their own private interests. However, the incentive and sanction mechanisms established within the framework of informal institutions are not strong or credible enough to encourage these stakeholders to abandon these new rules of conduct. In these circumstances, only the State has the ability to develop a new, sustainable, and inclusive mode of governance. This mode of governance should be based on reclaiming the old informal rules and integrating them into a new forest law that combines prevention and enforcement. Additionally, this mode of governance should be founded on the principle of co-governance, which brings together decision-makers, scientists, experts, and local populations.

We believe that the new formal institutions should not only build upon the old informal institutions but also consider the new international recognition that has elevated the argan tree to a global heritage. This recognition includes the designation of the argan forest as a biosphere reserve by UNESCO in 1988 and the United Nations' celebration of International Argan Day on May 10. These new formal institutions should also incorporate the principle of "one tree felled equals at least 100 trees planted," which could contribute to the partial restoration of the argan heritage. Although the current law does not address this issue, the Société Nationale des Autoroutes du Maroc has already embraced this principle and planted approximately 200,000 argan trees on a 910-hectare area by 2021. Other stakeholders, such as urban planners, developers, and municipalities bordering the forest, could also adopt similar practices. However, it is important to acknowledge that this endeavor requires significant expertise and resources, given the challenges associated with argan reforestation and its historically low success rate.

The conclusions of our paper present new avenues for future research. The proposal is to explore the concept of "governance of the argan grove" through conducting case studies on the stakeholders engaged in forestry activities, while considering the unique characteristics of various natural environments and tribal structures. These studies would enhance our understanding of the issue and contribute to the establishment of multi-level governance strategies that aspire to reversing the degradation of the argan grove and strenghten its resilience.

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