International Journal of Sustainable Development and Planning
Vol. 19, No. 5, May, 2024, pp. 1883-1891
Journal homepage: http://iieta.org/journals/ijsdp

Biodiversity as an Asset for the Social and Solidarity Economy: Case of Bouhachem Natural Park, Northern Morocco

Nisrin Alami[1,2*], Maatouk Mustapha[1], Bouchta El Moumni[2]

[1] Research Team GeoTeCa, FSTT, Abdelmalek Essaadi University, Tetouan 93002, Morocco
[2] Research Team EREMRN, FSTT, Abdelmalek Essaadi University, Tetouan 93002, Morocco

Corresponding Author Email: nisrin.alami@etu.uae.ac.ma

https://doi.org/10.18280/ijsdp.190526

Received: 28 December 2023
Revised: 20 March 2024
Accepted: 11 April 2024
Available online: 29 May 2024

Keywords:
biodiversity, natural park, social and solidarity economy, sustainable development

ABSTRACT

The development of natural parks is a strong asset that highlights the preservation of biodiversity and its relationship with the social and solidarity economy (SSE). In this context, our objective in this work is to explore the relationship in Bouhachem Natural Park (BNP). Firstly, we threw light on the historical evolution of the richness of flora and fauna in this park. Secondly, we studied two main sectors linking biodiversity wealth to the SSE (cooperatives and rural tourism). The study showed that the plant formations and animal biodiversity making up the park have suffered from a considerable degradation. However, with the establishment of citizens' cooperatives that take into account the enhancement of the BNP biodiversity. This is particularly true of the apiculture cooperatives that make up 53% of the cooperatives operating in the BNP, and which, due to the pollination provided by bees, help to preserve and restore the biodiversity. Concerning the rural tourism, we identify five itineraries that show the natural, cultural, and gastronomic treasures of the BNP. In conclusion, the study underlines the importance of citizen cooperatives that could be an important solution for restoring and preserving the ecosystem.

1. INTRODUCTION

The development of natural parks is a strong asset that highlights the possibility of reconciling the three pillars of sustainable development: the economic development, the preservation of the environment and the social commitment [1]. The establishment of natural parks within a local development initiative, such as the case of Bouhachem Natural Park (Rif area of Northern Morocco), seeks to harmonize economic growth and community welfare through various missions and actions. In the case of Bouhachem Natural Park (BNP), these actions aim to enhance the community's living environment, bolster economic activities, foster territorial development, safeguard natural resources and landscapes, preserve cultural heritage, and increase public awareness [2, 3]. Consequently, numerous measures are implemented, including the enhancement of essential infrastructure, supporting agricultural and artisanal sectors, aiding local cooperatives, implementing environmental conservation strategies, conducting scientific research, restoring architectural heritage, providing educational and recreational activities, and promoting environmental education initiatives.

Thus, the fundamental principles of the Social Solidarity Economy (SSE), such as solidarity, cooperation and consideration of the social and environmental dimensions are naturally aligned with the objectives of natural park preservation [4]. Indeed, SSE initiatives promote local economic development within natural parks. Cooperatives, associations and other SSE structures, which are often based in these regions, help to create sustainable jobs by focusing on the responsible use of natural resources [5, 6]. For example, sustainable tourism and local product development projects can enable local communities to benefit economically from the natural wealth of their environment [7-10]. Moreover, local production cooperatives, particularly those situated in nature parks, adapt traditional agricultural methods to support natural environmental processes, thereby enhancing local competitive advantage. These actions foster an inter-community network for conserving biodiversity [11, 12]. It should be noted that the development of measures for the conservation of biodiversity is a major driver of environmental economy and community development. As reported, for example, by Mori [13], high tree diversity is shown to enhance productivity, emphasizing the importance of biodiversity conservation for sustainable production. Indeed, as an economic model based on solidarity, cooperation, social and environmental sustainability, SSE can play a crucial role in preserving and promoting biodiversity [14-16].

Natural parks, often considered as jewels of biodiversity, play a crucial role in preserving ecosystems, especially flora and fauna. In addition, the local produce from local farms bears witness to the intimate interconnection between man and nature [5]. Biodiversity, as the backdrop to these two elements, is the key to their mutual success. Natural parks are considered a home to a wide variety of plants and animal species that contribute to the biological richness of these protected areas.

Local farms, particularly cooperatives, influence biodiversity by shaping the landscape and preserving traditional varieties. The relationship between biodiversity and local production cooperatives is complex and multidimensional, highlighting the interdependence between ecosystem health and the sustainability of farming practices [5]. Local produce cooperatives, as organizations of local producers, also play a role in conserving biodiversity by promoting environmentally friendly production methods, which will strengthen the position of SSE for people living around natural parks. Furthermore, by promoting methods such as agro-ecology, agro-forestry and crop rotation, these cooperatives minimize the use of harmful chemicals, preserve soil quality and promote the harmonious coexistence of agriculture and local biodiversity [17, 18]. By promoting the cultivation of products specific to a region, cooperatives help to preserve local know-how and diversify farmers' sources of income [19]. They also promote the conservation of plant and animal species closely associated with traditional cultural and culinary practices. This complex and interdependent relationship highlights the importance of reconciling the conservation of natural parks, the promotion of biodiversity and the enhancement of local products. This requires a holistic approach that integrates environmental sustainability, the preservation of agricultural traditions and consumer awareness of the importance of these symbiotic relationships.

In this context, our aim in the present work is to explore the relationship between the wealth of flora and fauna and the development of local products with SSE in the BNP. Firstly, we determined the historical evolution of the flora and fauna wealth of this park. Secondly, we studied two main sectors that link biodiversity wealth to the development and strengthening of SSE (local cooperatives and rural tourism).

2. MATERIALS AND METHODS

To achieve the stated goal, we initiated the process by identifying the study area, proceeded with studying the floristic and faunal diversity of the BNP, and then examined the activities of local cooperatives and rural tourism circuits in the BNP.

2.1 Study area

Located in the heart of Tangier-Tetouan-Al Hoceima region of Morocco, BNP occupies a special place on the Numidian sandstone ridge of Rif. Covering around 105,470 hectares, the park is spanning over three provinces: Chefchaouen, Tetouan and Larache (Figure 1).

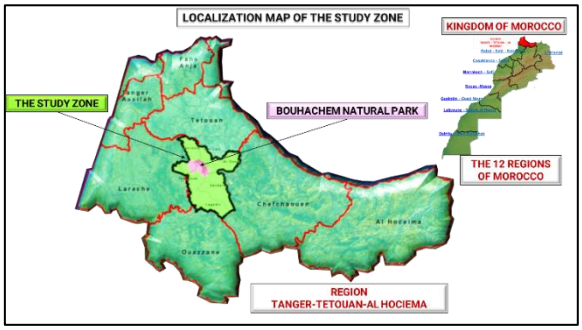

Figure 1. Location of the Bouhachem Natural Park in the Tangier-Tetouan-Al Hoceima region (Northern Morocco)

It is a site of biological and ecological interest (SBEI). Cultural diversity and a traditional agricultural economy organized around agricultural cooperatives are important features of the area [20, 21].

2.2 Floristic and faunistic diversity of Bouhachem Natural Park

For our study area, we compared the current situation with the state of the flora and fauna as described in the bibliography (previous works related to BNP). For this purpose, we carried out 20 field trips between April 2018 and October 2019.

In terms of floristic diversity, our approach is based on the analysis of current vegetation using three indicators that structure field observation and diagnosis. These indicators are: adjacent plant groups, vegetation zonation and plant distribution. To accomplish this analysis, our sampling method involves surveying the study area and selecting sites based on routes that best represent the floristic diversity in BNP. We have designated 20 routes. Through field expeditions, we have conducted floristic inventories along each route, identifying species based on their occurrence. The synthesis and compilation of observations from routes have focused on floristic and phytosociological surveys.

In terms of faunal diversity, we were particularly interested in vertebrates. Amphibians were surveyed at waterholes. Reptiles were observed in the morning on sunny edges. Birds were inventoried by direct observation of individuals and by looking for signs of presence such as feathers and droppings. Similarly, mammals were inventoried by direct observation of individuals and by looking for signs of presence such as tracks and droppings. It should be noted that these various surveys do not claim to be an exhaustive inventory of the vertebrate species exist in BNP. They do, however, provide a fairly significant assessment of the biological interest of the park under study.

It should be noted that the approach applied in this study does not consider quantifiable variables, such as the frequency and weight of each species, and therefore does not include a statistical analysis. However, this approach has the advantage of being simple and allows for a good comparison of biodiversity in the BNP.

2.3 Social and solidarity economy in Bouhachem Natural Park

In this study of SSE in BNP, we have focused on two sectors of activity linked to its natural wealth: rural tourism and local cooperatives.

With regard to rural tourism, we diagnosed and evaluated eight itineraries already identified during the studies carried out by the Tangier-Tetouan-Al Hoceima Regional Council. The aim of this evaluation was to select the circuits that met a number of criteria: natural wealth, social and solidarity economy assets, including the significant presence of cooperatives, and architectural, culinary and cultural assets. The aim of this evaluation is to highlight the tourist routes most likely to promote rural tourism in BNP.

As for the local cooperatives in the BNP, an investigative questionnaire was used to collect information on these cooperatives, namely: location, state of activity, sector of activity. The questionnaire data was collected through interviews. The diagnosis included a study of the products, premises, equipment and problems encountered by the

cooperatives. In order to carry out the study, an initial meeting was held with the members of BNP Group, who provided us with a list of cooperatives in the six municipalities of the park. We then carried out eight field trips to collect information.

3. RESULTS AND DISCUSSION

3.1 Floristic and faunistic diversity of Bouhachem Natural Park

3.1.1 Floristic diversity and its evolution

The natural habitats in the study area have been classified into eight groups, namely: non-hygrophilous woods; riparian and hygrophilous woods; matorrals and pre-drills; rocky environments; herbaceous environments; wetlands; halophiles environments; and finally cultivated land and post-cultivated wasteland. In the present study, however, we will limit ourselves to non-hygrophilous woodlands, which are the most dominant group in BNP (Figure 2).

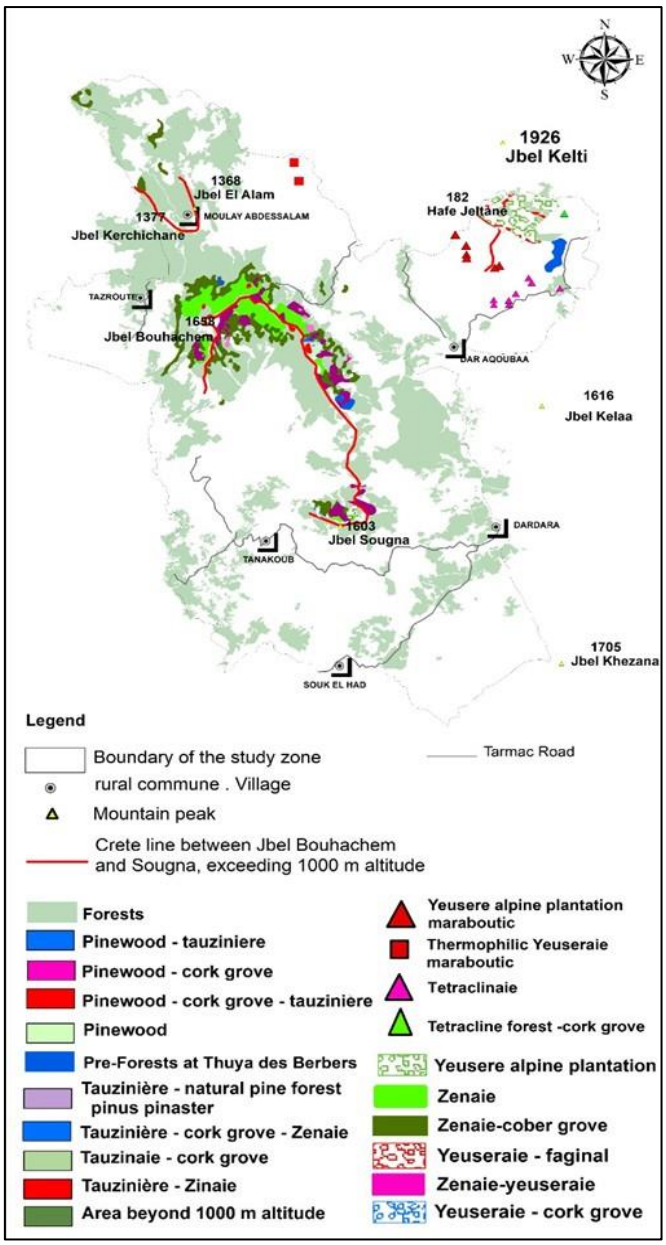

Figure 2. Floristic distribution of natural habitats in Bouhachem Natural Park

- Forest oleastraies

In Rif, this is the climatic formation of the thermo-Mediterranean zone, on marly or clayey soils [22]. It is found on both calcareous and acidic substrates.

Our study, carried out between 2018 and 2019, has shown that all the oleaster trees observed in the study area, although they correspond to the description given by Benabid [22], have become denser and the tree layer has become lighter and less closed. The density of lianas such as *Clematis cirrhosa*, *Dioscorea communis*, *Smilax aspera*, *Aristolochia baetica* and *Rosa sempervirens*, which previously formed an almost impenetrable habitat, has decreased significantly. The same can be said of the tree layer, which has become denser but still consists exclusively of *Olea europea subsp. oleaster*, accompanied by either *Quercus coccifera*, *Ceratonia siliqua*, *Phillyrea latifolia* or *Pistacia lentiscus*.

- Tetraclinae

The result of our research on these forest formations has shown that the tree layer is mainly composed of *Tetraclinis articulata*. This species is accompanied by three other species, namely *Quercus coccifera*, *Chamaerops humilis* and *Ceratonia siliqua*. In addition to these species, we noted the presence of *Olea europea subsp. oleaster*, *Phillyrea latifolia* and *Pistacia lentiscus*. The last three species are common in these environments. The observations we made in the study area correspond to the description made by Benabid and Fennane [23], but their shrub and herbaceous layers are often very degraded by overgrazing. In this respect, it should be noted that in the study area, Tetraclinae can only be found in nine maraboutic sites and cemeteries, representing a total area of about 104 ha, i.e., 0.1% of the territory.

- Yeuseraie

For this forest environment, we have identified three associations present in the study area, described below:

- *Smilaci mauritanicae - Quercetum rotundifoliae*: a dense formation with a tree layer dominated by *Quercus ilex subsp. Ballota*, with an undergrowth characterized by lianas such as *Clematis flammula*, *Clematis cirrhosa*, *Dioscorea communis* and *Smilax aspera*;

- The species that characterize this holm oak forest are *Arbutus unedo*, *Quercus coccifera*, *Olea europea subsp. Oleaster*, *Phillyrea latifolia*, *Chamaerops humilis* and *Calicotome intermedia*;

- *Paonio maroccanae - Quercetum rotundifoliae*: an association dominated by the holm oak. Characteristic species of this association are *Paeonia mascula subsp., Coriacea sp.* and *Daphne laureola*.

It should also be noted that we were able to identify other species characteristic of higher phytosociological units, such as *Ptilostemon riphaeus*, *Bupleurum montanum* and *Festuca triflora*. The plant species that make up this Yeuseraie and that we have recorded correspond to those mentioned by Benabid [22]. Once again, this formation often has a relatively degraded undergrowth due to delimbing and overgrazing.

- Cocciferae

In our study area, these woods are found almost exclusively in maraboutic sites and cover about 84 ha (76 ha of Cocciferae, 8 ha of sub-gera-cocciferous woods), i.e., 0.01% of the area. The potential area of coppice in the study area is about 16,000 ha [22], which means that more than 99% of these formations have been destroyed. The last of these formations remain only in a few maraboutic sites, cemeteries or areas far from the *douars (Douar* in Moroccan dialect refers to a small rural village), where they are generally in a good state of

preservation.

- Suberaie

We were able to identify two associations within the study area. These are:

- *Myrto communis - Quercetum suberis*: a formation containing lianas such as *Aristolochia baetica*, *Clematis cirrhosa* and *Smilax aspera*. The tree layer is dominated by *Quercus suber*. *Myrtus communis* is the dominant species in this association.

- *Teucrio afrae - Quercetum suberis*: a relatively open association dominated by cork oak. A few species, such as *Teucrium afrum subsp. afrum*, are the most characteristic of this formation. The formations present in the study area correspond exactly to those described by Benabid [22]. However, the potential area covered by the suberaies is about 57,000 ha, which means that more than 71% of it has been destroyed. In spite of this sharp decline and the frequency of anthropogenic impact (cutting, deforestation, overgrazing, etc.), they still occupy large areas compared to the other formations studied.

- Zenaie

In the case of the Zea oak woods, we have identified two associations within the study area, described as follows:

- *Cytiso triflori - Quercetum canariensis*: a deciduous formation dominated by *Quercus canariensis* which, when well developed, includes a number of species such as *Clinopodium vulgare*, *Rubus ulmifolius*, *Daphne laureola*, *Stellaria holostea* and *Ranunculus ficaria*;

- *Violo munbyanae - Quercetum pyrenaicae* (sub-association *Quercetosum canariense*): a deciduous formation dominated by the Zeus oak. When it is well developed, it presents a series of species such as *Lamium flexuosum*, *Daveaua anthemoides*, *Calamintha baborensis*, *Bunium alpinum* and *Ranunculus ficaria*.

Contrary to the descriptions of Benabid [22], almost all the zenaies in the study area are immature formations, with trees rarely exceeding 20 m in height. In the study area, the zenaies cover a total area of approximately 3,260 ha, i.e., barely 4% of the study area.

It should also be noted that, among the Mediterranean forest formations, the zenaies are considered to be one of the most seriously degraded [24]. The zenaies of Rif were overexploited during the Spanish protectorate [22, 23, 25] and climatic stands have become very rare [22].

It should be noted that some of the stands are still in decline as a result of felling and pruning, but others are mature and have good forest dynamics.

- Faginaie

In the case of faginea oak woods, we found that the *Trifolio ochroleucae - Quercetum faginae* in the study area takes the form of a formation dominated in the tree layer by *Quercus faginea* and accompanied by *Quercus ilex* subsp. *Ballota*. In these oak woods, we have noticed different species such as *Acer granatensis, Juniperus oxycedrus, Viburnum tinus, Rubus ulmifolius* and *Daphne laureola*.

These mixed formations based on *Quercus faginea*, which we observed in the study area, correspond more or less to the description given by Benabid [22]. The areas covered by zenaies and faginaies in Morocco are of the order of 17,000 ha [23], but details of faginaies are not known. In the study area, faginaies cover a total area of about 40 ha, including 34 ha of mixed woodland with holm oak. However, the potential area of faginaies in the study area is about 190 ha, which means that more than 79% of it has been destroyed. The last remaining faggot groves in the study area are in a deplorable state of conservation and there is little hope that they can be maintained in the short or medium term if current anthropogenic pressures continue.

- Tauzinae

In the case of Tauzin oak woods, we found two associations within the study area, described as follows:

- *Cytiso triflori - Quercetum canariensis* (sub-association *Quercetosum pyrenaicae*): a deciduous formation completely dominated by the *Quercus pyrenaica*, both in the tree and shrub layers;

- *Violo munbyanae - Quercetum pyrenaicae* (*Quercetosum pyrenaicae* sub-association): a dense deciduous formation dominated by *Quercus pyrenaica*, often accompanied by *Quercus suber* and *Quercus ilex* subsp. *ballota*. The association is characterized by the presence of *Stellaria holostea*, *Festuca paniculata* subsp. *baetica*, *Geum sylvaticum* and *Deschampsia flexuosa* in the undergrowth.

Our observations of the Tauzin oak woods in the study area correspond exactly to the description given by Benabid [22]. It should also be noted that the Tauzin oak woods in the study area cover an area of approximately 490 ha, i.e., 0.5% of the study area.

- Cedraie

In the case of the Atlas cedar groves, we have identified two associations within the study area. They are described as follows:

- *Luzulo forsteri - Cedretum atlanticae* (sub-association with *Quercus pyrenaica*): a cedar grove characterized by an abundance of *Quercus canariensis* and Quercus pyrenaica.

- *Berberido hispanicae - Cedretum atlanticae* (*Geranietosum* sub-association): a cedar grove characterized by the presence of *Berberis hispanica*, *Bupleurum spinosum*, *Conopodium glaberrimum* and *Festuca rifana*.

Our observations of the cedar groves in the study area correspond exactly to the description made by Benabid [22]. In the study area, cedar stands cover a total area of approximately 48 ha, i.e., less than 0.1% of the study area. However, the potential area of cedar groves in the study area was approximately 285 ha [22], which means that more than 80% of it has been destroyed. In particular, the cedar grove that should have covered the crests of Jbel Sougna has completely disappeared, as have several groves on the crests of Jbel Bouhachem. The cedar forests in the study area have all suffered significant anthropogenic damage, in particular deforestation, felling and overgrazing. Those that remain are located on rocky outcrops that are difficult to access and are generally in poor condition. They probably owe their survival on Jbel Bouhachem only to these hard-to-reach rocky areas, while those on Jbel Kelti continue to show significant signs of regression, with some showing no regeneration at all. The threats to these environments are considered very serious if the current damage continues.

- Natural Maghreb pine forests

Pinewoods do not form individual phytosociological associations, but are integrated into associations of other tree species [22], which are found in the study area: suberaies, zenaies and tauzinaies. The stands are rarely pure, but more often associated with different oak species, especially *Quercus suber, Quercus pyrenaica* or *Quercus canariense*.

We found that the undergrowth was generally poor, but there was active regeneration of young pines or the three oaks mentioned above. Several species that characterize the undergrowth of the various oak woods in the area are present

in these pinewoods, including *Arbutus unedo, Erica arborea, Erica australis, Cistus populifolius* and *Cytisus triflorus*.

Our observations of the pine forests in the study area correspond to the description given by Benabid [22]. In the study area, natural Maghrebian Pinus pinaster pinewoods cover a total area of about 113 ha, i.e., 0.1% of the study area, including 64 ha. These plantations are composed of eucalyptus and pines, namely *Pinus pinea, Pinus pinaster, Pinus halepensis, Pinus radiata* and *Pinus canariensis*. These forests are sometimes mixed with cork oak forests. They are generally very poor botanically, especially when the plantations are dense, because the pines and eucalyptus tend to modify the chemical conditions of the soil (acidification, release of toxic substances from the roots, thickening of the litter) and make it unfavorable to the flora. However, species such as *Cistus monspeliensis* and *Erica arborea* can be found in the undergrowth.

3.1.2 Faunal diversity

The richness and diversity of the fauna is one of the main assets of BNP. In this study, we have limited ourselves to vertebrates, especially mammals, birds, amphibians and reptiles, which are the dominant groups in BNP.

- Mammals

The study area is characterized by a rich fauna, with thirty-two mammal species: 19 recorded within the boundaries of the study area and 2 in its immediate vicinity, giving a total of 21 known species for the region as a whole. It should be noted that two mammal species have now disappeared (*Panthera pardus* and *Hyaena hyaena*). Eleven interesting endemic, rare or threatened species are present: *Crocidura russula, Suncus etruscus, Hypsugo savii, Nyctalus leisleri, Nyctalus lasiopterus, Macaca sylvanus, Hystrix cristata, Lutra lutra, Genetta genetta, Herpestes ichneumon, Felis silvestris lybica*.

In this study we will describe two mammal species: the European otter (*Lutra lutra*) and the magot (*Macaca sylvanus*).

- European otter (*Lutra lutra*)

Otters are carnivorous mammals belonging to the subfamily Lutrinae. This species is a high indicator of environmental quality: It needs good quality water to live.

The otter was widely distributed in Morocco, where it was found in all aquatic environments such as lakes and permanent watercourses [26]. According to Broyer et al. [27], this species was classified as not endangered. However, human activities have significantly reduced its range [28], which is now restricted to a few aquatic habitats in the Rif and the two Atlas Mountains [29]. This situation has led to the otter becoming a vulnerable and threatened species. Our previous research [30] has allowed us to detect the species in the three main wadis, but the largest populations are found in Wadi Laou. The estimate refers to four population centers or five if we consider that Ali Thelat dam is a barrier that separates Wadi Laou populations into two centers. In the absence of local bibliographic data, further research is planned to estimate the size of the population.

- Magot (*Macaca sylvanus*)

The magot is native to Morocco. It can be found in several Moroccan atlases where the climate is temperate, i.e., with wide variations in conditions: hot dry summers, and cold snowy winters. The magot is currently an endangered species. In our study area, we were able to identify three main population groups:

- One population is isolated on Jbel Sougna, where a single group was observed on the southern slopes of the massif;

- At least nine groups have been identified on Jbels Bouhachem and Alam;

- At least six groups have been identified on Jbel Kelti, but the boundaries of the study area cross the territory of several populations, making it difficult to count them.

It should be noted that this species is threatened by uncontrolled tourist development, which could prove disastrous, so it is necessary to control tourist groups and train guides to respect the tranquility of the walks.

- Bird

The study area is home to at least 123 bird species, some of which have not been seen recently and need to be confirmed. The number is obviously far from complete, especially if we consider all the migratory species that pass through the site. A total of 71 breeding species were identified during this study. Bouhachem's park data sheet lists 99 breeding species in or near the park [31], but does not cite them, making it impossible to analyze or compare the data.

Thirty-two interesting, endemic, rare or endangered species can be found: *Ciconia ciconia, Milvus milvus, Elanus caeruleus, Accipiter gentilis, Aquila fasciata, Aquila chrysaetos, Aquila rapax, Neophron percnopterus, Gyps fulvus, Circus aeruginosus, Falco biarmicus, Falco peregrinus, Falco subbuteo, Turnix sylvaticus, Columba oenas, Bubo ascalaphus, Coracias garrulus, Picus vaillantii, Dendrocopos major, Tchagra senegalus, Sylvia communis, Sylvia undata, Phylloscopus collybita, Ficedula hypoleuca, Sialia sialis, Monticola saxatilis, Oenanthe seebohmi, Phoenicurus moussieri, Turdus merula, Turdus viscivorus, Sitta europaea, Certhia brachydactyla, Cinclus cinclus, Aquila rapax, Milvus milvus, Neophron percnopterus*.

Of the species mentioned in Bouhachem's park sheet and not seen during this study, one, the *Aquila rapax*, has definitely disappeared. As for the *Milvus milvus* and the *Neophron percnopterus*, their presence is becoming increasingly doubtful.

- Amphibians and reptiles

Seventeen reptile species are known within the boundaries of the site and twelve in its immediate vicinity, making a total of twenty-nine species for the region as a whole. This site is interesting for its richness in amphibians (nine out of the eleven Moroccan species) and for its humid, temperate bioclimate, which makes it possible to observe reptiles that are rare in Morocco and restricted to the extreme north of the country. Sixteen interesting, endemic, rare or endangered species can be found: *Pleurodeles waltl, Salamandra salamandra, Alytes obstetricans, Discoglossus pictus, Testudo graeca, Emys orbicularis, Saurodactylus brosseti, Chamaeleo chamaeleon, Timon tangitanus, Psammodromus microdactylus, Chalcides colosii, Chalcides polylepis, Blanus mettetali, Trogonophis wiegmanni elegans, Macroprotodon cucullatus, Natrix natrix*.

3.2 Social and solidarity economy in Bouhachem Natural Park

The potential of BNP in terms of biodiversity is a major asset that is highly conducive to the development and promotion of the SSE sector [20]. In fact, the activities that link this wealth of biodiversity to the development and strengthening of SSE in BNP mainly concern two sectors: local cooperatives and rural tourism.

3.2.1 Diagnosis of tourist circuits in Bouhachem Natural Park

The results obtained have allowed us to identify a number of tourist itineraries that cross the territory of the Park. These routes are designed to showcase the cultural, natural and gastronomic treasures of the regions through which they pass. In fact, from the eight itineraries studied (Figure 3), we have been able to identify 5 main routes that can be grouped into 3 categories of tourist itineraries, namely Nature Trails, Cultural Trails and Agri-tourism Trails.

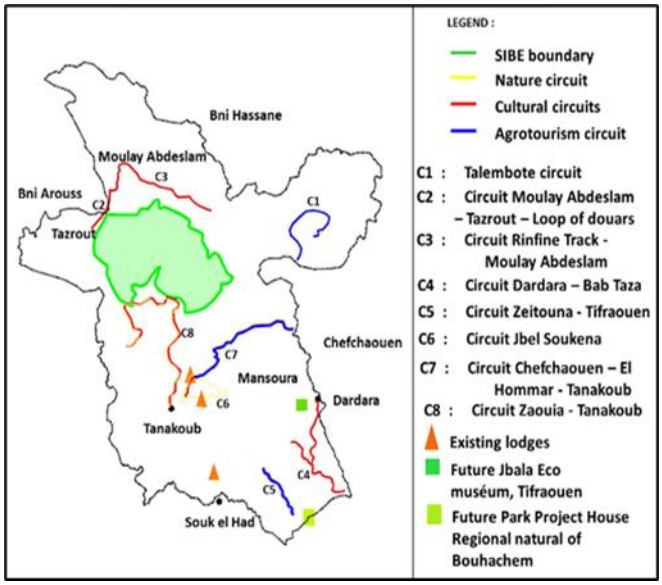

Figure 3. Eight tourist circuits identified during the studies carried out by the Tangier-Tetouan-Al Hoceima Regional Council

As shown in Figures 4-8, we have identified 5 main circuits out of the 8 already identified in the studies carried out by the Tangier-Tetouan-Al Hoceima Regional Council:

- Circuit of Derdara-Bab Taza (Figure 4):

Douar of Beni Achir is at the center of this route. There are two routes to douar Beni Achir: a 12km route from Dardara and a 5km route from the Chefchaouen-Ouezzane road via Bni Yeften. One of the strong points of this route is that Beni Achir douar has preserved a certain cultural potential: craft activities (basket weaving, weaving, etc.), folklore (dance, song and fantasy) and traditional houses. Another asset with a higher value for this tour is that this douar is located on the edge of BNP, with a very rich natural environment. This is Jbel Taza, with its rich variety of flora and fauna.

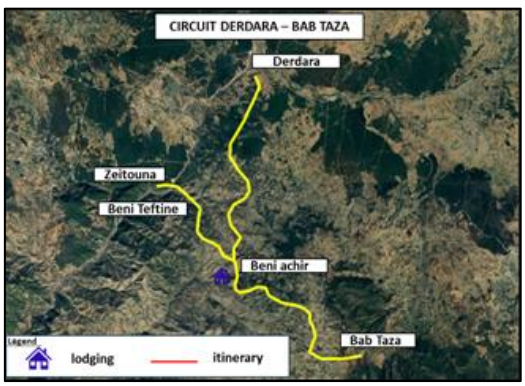

Figure 4. Tourist circuit of Derdara - Bab Taza

- Circuit of Zeitouna-Tifraouen (Figure 5):

The route passes through a well-preserved agricultural landscape (olive groves with mills and presses), which bears witness to the area's vocation. The douars of Arhenkadi and Tifraouen have remarkable habitations (in good condition) with traditional houses. This heritage is enhanced by the presence of a certain folklore and craftsmanship: basket weavers, blacksmiths, stonemasons, etc.

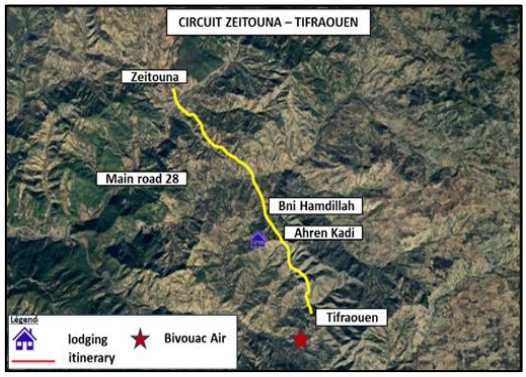

Figure 5. Tourist circuit of Zeitouna - Tifraouen

- Circuit of Jbel Soukena (Figure 6):

The vegetation on the flanks of the Jbel is fairly well developed (rock roses, pine and oak woods, etc.) and provides a pleasant atmosphere (shade, coolness, clearings). On the north-western side, there is a large landslide. Still on the same slope, a seguia provides water and follows an interesting route that divides the site of the collapse and a pine forest.

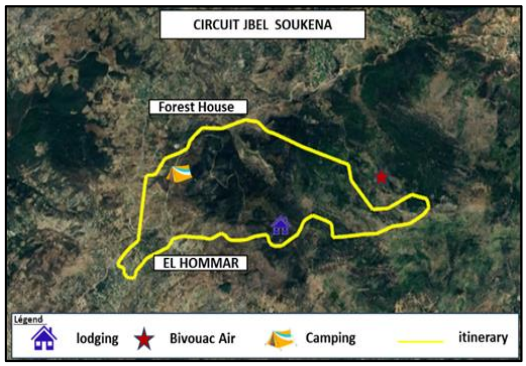

Figure 6. Tourist circuit of Jbel Soukena

- Circuit of Chefchaeuen-El Homar/Tanakoub (Figure 7):

It offers some remarkable views, particularly at El Kouaoura (view of Soukena and Jbel Bouhachem) and on the descent to the Amlay forest (view of Chefchaouen city).

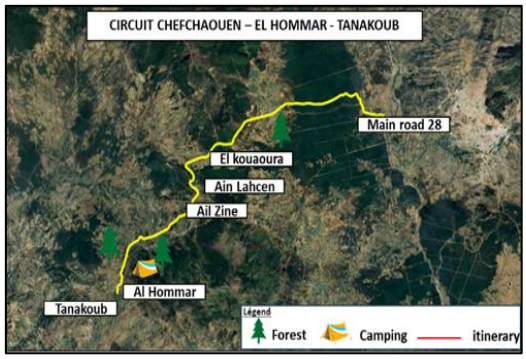

Figure 7. Tourist circuit of Chefchaeuen - El Homar/Tanakoub

- Circuit of Zaouia-Tanakoub (Figure 8):

The douars of Maaza, Adrou, Afertane and Taghlimine have the great advantage of being on the edge of Bouhachem SIBE forest massif, the richest area of the park in terms of landscape, i.e., its fauna and flora. It should be noted that ecotourism circuits are a good way to stimulate rural tourism in the study area.

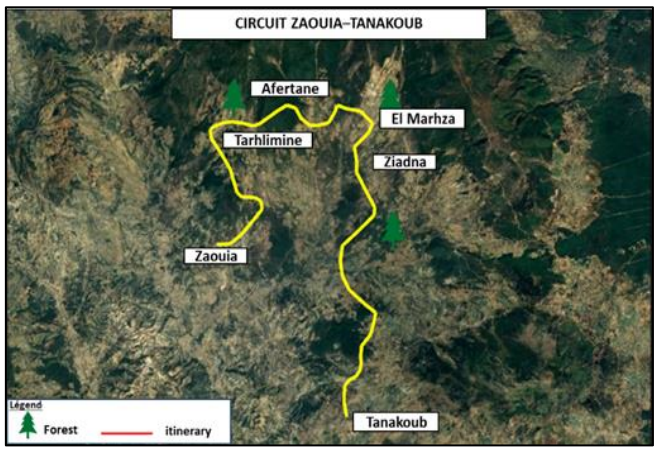

Figure 8. Tourist circuit of Zaouia - Tanakoub

Tourist circuits that cross the territory of a park can showcase the cultural, natural and gastronomic treasures of the regions through which they pass. The development of specific itineraries for itinerant tourism has received little attention, but there are emerging trends in this area. Personalized options and themed itineraries are becoming more important, as is the existence of a network structure [32]. Cross-border tourism management is important for sustainable development in Natural parks and the creation of a network of tourist routes can support this [33]. The conservation and use of cultural heritage resources in mountain areas can be improved by establishing links between heritage sites and by creating a network of cultural landscape tourism corridors [34]. The design and management of tourist circuits are key aspects to be considered and future research should focus on route planning and management. Overall, the development of tourist routes through park areas can contribute to local development and promote sustainable tourism.

3.2.2 Diagnosis of cooperatives in Bouhachem Natural Park

A total of 67 cooperatives were identified in BNP. The number of cooperatives varies considerably depending on the municipality (Figure 9). According to the results, only 47 cooperatives are active in the study area, which means that 30% of the cooperatives are not operational. The distribution of cooperatives across the 6 rural communes shows that the commune of Tazrout has more than 52% of the cooperatives within the BNP.

This can be explained by the fact that this commune is very rich in flora, in this case aromatic and medicinal plants. These are the basis for essential oils and beekeeping products. This municipality is followed by the municipality of Laghdir, which is home to 8 cooperatives whose main activity is based on olive products. In fact, these sectors (beekeeping, aromatic and medicinal plants and olive products) are the most important of all the cooperatives in BNP (Figure 10). In fact, other works show the importance of the use of plants in the BNP [35, 36].

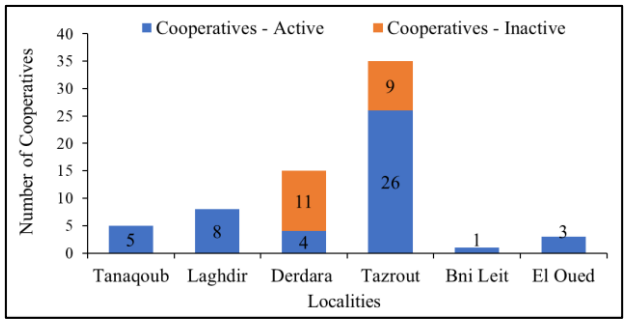

Figure 9. Number of cooperatives (active and inactive) in the different localities of the Bouhachem commune

The diagnostic study of the cooperatives in the BNP showed a strong link between their activities and the natural wealth available. This study allowed us to group these cooperatives according to their activities, the results of which are presented in Figure 10. Half of the cooperatives in the study area are involved in beekeeping (53%). The development of this activity is one of the key factors in maintaining the floral biodiversity of BNP, thanks to the role played by bees in pollination. It should be noted that the number of olive-growing cooperatives is increasing, thanks to the support of the government through the plan of "Green Morocco" and the "Green Generation" program managed by the decentralized administrations under the Ministry of Agriculture.

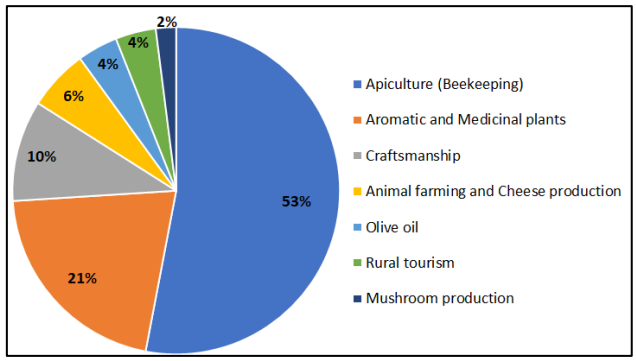

Figure 10. Cooperatives by sector of activity in the Bouhachem Natural Park

It should be noted that some rural cooperatives combine several activities, such as beekeeping and aromatic and medicinal plants. Overall, cooperatives that develop local products linked to biodiversity contribute to the conservation of ecosystems by promoting sustainable production practices, involving local communities and fostering collaborative conservation efforts [37-39]. Indeed, to enhance local competitiveness and promote production systems that respect natural environmental processes, local cooperatives in nature parks are changing traditional agricultural strategies. These initiatives facilitate an inter-community network for the conservation of biodiversity.

4. CONCLUSION

The study we carried out in the BNP showed that the plant formations that make up the park had deteriorated considerably compared to previous work carried out in the BNP. The same can be said about the fauna, where some

species have disappeared. Nevertheless, the diagnosis conducted on the BNP, closely tied to the abundance of flora and fauna, implies a level of diversity rather than providing an exact value. This approach is geared towards raising awareness and enhancing observation and understanding of the various components of the floristic diversity within the BNP. To better understand the state of biodiversity evolution within the BNP, it is necessary to conduct quantitative studies with statistical analyses on representative taxa diversity in BNP. This particularly concerns Zenaie and Cedraie for the floristic aspect and otters for the faunal aspect. It must be said that the degradation of BNP is mainly due to the misuse of the park's natural resources. However, with the establishment of citizens' cooperatives that take into account the development of the park's biodiversity, the park will be able to regain its former status. This model ensures the integration of profitable socio-economic activities within the park while preserving, or even improving, its biodiversity. Beekeeping is an interesting example to explore in depth, linked to the pollination provided by bees, which helps to maintain, stabilize and even restore biodiversity. This is particularly true in the case of BNP regarding the number of beekeeping cooperatives, which make up 53% of the total cooperatives operating in the park. We acknowledge the limitations of the study and propose future research directions. It is necessary to establish the activities that may positively impact biodiversity, such as beekeeping and growing aromatic and medicinal plants, and those that may negatively impact it, such as animal farming and forest wood exploitation.

Indeed, the relationship between biodiversity and local produce cooperatives in BNP is a crucial alliance for agricultural sustainability. As key players in local food production, these cooperatives are responsible for promoting environmentally friendly practices, preserving the diversity of flora and fauna, and raising consumer awareness of the importance of biodiversity. Close cooperation between agricultural stakeholders, local authorities and consumers in the management of natural parks is essential if we are to build a future in which biodiversity and local production cooperatives thrive together.

It is important to recognize that certain farming practices, even within cooperatives, can have a negative impact on biodiversity. For example, uncontrolled crop expansion or excessive use of natural resources can lead to the degradation of the local ecosystem. Therefore, the introduction of environmental standards and certification within cooperatives is crucial to ensure that their activities respect biodiversity.

The development of natural parks can also benefit from the involvement of SSE actors in local governance. Cooperatives and associations often provide a democratic structure that gives local communities a voice in making decisions about park management and its development. This promotes a participatory and inclusive approach that takes into account the needs of local people while conserving biodiversity and ecosystems.

ACKNOWLEDGMENT

The authors are grateful to Dr. Sidati Maalaynine for the English improvement.

REFERENCES

[1] Mathevet, R., Thompson, J., Delanoë, O., Cheylan, M., Gil-Fourrier, C., Bonnin, M. (2010). Ecological solidarity: A new concept for integrated management of national parks and territories. Natures Sciences Societes, 18(4): 424-433. https://doi.org/10.1051/nss/2011006

[2] Dagnino, A. (2007). Le Parc naturel régional expérimental de Bouhachem Région du Rif, Maroc. Forêt méDiterranéEnne, 28(1): 59-66.

[3] Alami, N. (2011). Creating the Bouhachem Nature Park with a participatory approach (Morocco). Forêt Méditerranéenne, 32(4): 437-438.

[4] Di Minin, E., Soutullo, A., Bartesaghi, L., Rios, M., Szephegyi, M.N., Moilanen, A. (2017). Integrating biodiversity, ecosystem services and socio-economic data to identify priority areas and landowners for conservation actions at the national scale. Biological Conservation, 206: 56-64. https://doi.org/10.1016/j.biocon.2016.11.037

[5] Ater, M., Hmimsa, Y. (2013). Agrodiversité des agroécosystèmes traditionnels du pays Jbala (Rif, Maroc) et produits de terroirs. Indications Géographiques, Dynamiques Socio-Économiques et Patrimoine bio-Culturel en Turquie et Dans les Pays Méditerranéens, 197: 208.

[6] Villalba-Eguiluz, U., Egia-Olaizola, A., Pérez de Mendiguren, J.C. (2020). Convergences between the social and solidarity economy and sustainable development goals: Case study in the Basque country. Sustainability, 12(13): 5435. https://doi.org/10.3390/su12135435

[7] Coria, J., Calfucura, E. (2012). Ecotourism and the development of indigenous communities: The good, the bad, and the ugly. Ecological Economics, 73: 47-55. https://doi.org/10.1016/j.ecolecon.2011.10.024

[8] Tsaur, S.H., Lin, Y.C., Lin, J.H. (2006). Evaluating ecotourism sustainability from the integrated perspective of resource, community and tourism. Tourism Management, 27(4): 640-653. https://doi.org/10.1016/j.tourman.2005.02.006

[9] Hidayat, M.S., Yasin, A., Sulistiowati, R., Regina, D., Nugrahanti, T.P. (2023). Green economy initiatives in enhancing social solidarity in the tourism sector in coastal areas. International Journal of Science and Society, 5(1): 232-243. https://doi.org/10.54783/ijsoc.v5i1.652

[10] Kiper, T. (2013). Role of ecotourism in sustainable development. In Advances in Landscape Architecture. InTech. https://doi.org/10.5772/55749

[11] Herity, J., Melanson, R., Richards, T., et al. (2018). Global business practices for mainstreaming biodiversity. Biodiversity, 19(3-4): 198-205. https://doi.org/10.1080/14888386.2018.1504693

[12] Karlsson-Vinkhuyzen, S., Kok, M.T.J., Visseren-Hamakers, I.J., Termeer, C.J.A.M. (2017). Mainstreaming biodiversity in economic sectors: An analytical framework. Biological Conservation, 210: 145-156. https://doi.org/10.1016/j.biocon.2017.03.029

[13] Mori, A.S. (2018). Environmental controls on the causes and functional consequences of tree species diversity. Journal of Ecology, 106(1): 113-125. https://doi.org/10.1111/1365-2745.12851

[14] Widerberg, O., Boran, I., Chan, S., et al. (2023). Finding synergies and trade-offs when linking biodiversity and climate change through cooperative initiatives. Global Policy, 14(1): 157-161. https://doi.org/10.1111/1758-5899.13158
[15] Feyeh, F. (2022). Local cooperatives´ contribution to realising a green economy in nature parks in luxembourg. Parks, 28(2): 65-72. https://doi.org/10.2305/IUCN.CH.2022.PARKS-28-2FF.en
[16] Marcano, A.I.P., Acevedo-Duque, Á., Mora, B.S.R. (2021). Sustainability as a principle of corporate responsibility towards natural ecosystems. Revista de Filosofia (Venezuela), 38(99): 190-210. https://doi.org/10.5281/zenodo.5644368
[17] Udawatta, R.P., Gantzer, C.J., Jose, S. (2017). Agroforestry practices and soil ecosystem services. In Soil Health and Intensification of Agroecosystems, pp: 305-333. https://doi.org/10.1016/B978-0-12-805317-1.00014-2
[18] Leite, A.E., Batalha, M.O. (2016). Sustainable agriculture and cooperatism: What possible links? Interciencia, 41(10): 660-667.
[19] Lucas, V., Gasselin, P., Van Der Ploeg, J.D. (2019). Local inter-farm cooperation: A hidden potential for the agroecological transition in northern agricultures. Agroecology and Sustainable Food Systems, 43(2): 145-179. https://doi.org/10.1080/21683565.2018.1509168
[20] M'Barki, R., Schmitz, S. (2023). Les coopératives au Maroc, entre bricolage et développement rural: le cas des regroupements de fromage de chèvre de Chefchaouen. Belgeo. Revue belge de géographie, (1).
[21] Cheddadi, R., Nourelbait, M., Bouaissa, O., Tabel, J., Rhoujjati, A., López-Sáez, J.A., Alba-Sánchez, F., Khater, C., Ballouche, A., Dezileau, L., Lamb, H. (2015). A history of human impact on Moroccan mountain landscapes. African Archaeological Review, 32(2), 233–248. https://doi.org/10.1007/s10437-015-9186-7
[22] Benabid, A. (1984). Etude phytoécologique des peuplements forestiers et préforestiers du Rif centro-occidental (Maroc). Rabat (Morocco) Inst. Scientifique.
[23] Benabid, A., Fennane, M. (1994). Connaissances sur la végétation du Maroc: Phytogéographie, phytosociologie et séries de végétation. Lazaroa, 14: 21-97.
[24] Quézel, P., Médail, F. (2003). Écologie et biogéographie des forêts méditerranéennes. Environmental Series Elsevier, 571.
[25] Taïqui, L., Cantarino, C.M. (1997). Elements historiques d'analyse écologique des paysages montagneux du Rif Occidental (Maroc). Mediterránea. Serie de Estudios Biológicos, Época II(16): 23-35.
[26] Panouse, J.B., Ennouchi, E., Galand, L. (1957). Les mammiferes du Maroc: Primates, carnivores, pinnipedes, artiodactyles. Société des Sciences Naturelles et Physiques du Maroc.
[27] Broyer, J., Aulagnier, S., Destre, R. (1988). La loutre Lutra lutra angustifrons Lataste, 1885 au Maroc. Mammalia, 52(3): 361-370. https://doi.org/10.1515/mamm-1988-0306
[28] Delibes, M., Calzada, J., Clavero, M., Fernández, N., Gutiérrez-Expósito, C., Revilla, E., Román, J. (2012). The near threatened Eurasian otter Lutra lutra in Morocco: No sign of recovery. Oryx, 46(2): 249-252. https://doi.org/10.1017/S0030605311001517
[29] Aulagnier, S., Cuzin, F., Thévenot, M. (2017). Mammifères sauvages du Maroc: peuplement, répartition, écologie. Société Française Pour L'étude et la Protection des mammifÈres.
[30] Alami, N., TAheri, A. (2020). Confirmation de la présence de la loutre Lutra lutra angustifrons Lataste, 1885 (Mammalia, Carnivora, Mustelidae) dans le Parc Naturel de Bouhachem (Nord-Ouest du Maroc). Bulletin de L'Institut Scientifique, Rabat, Section Science de la vie, 42: 23-24.
[31] AEFCS. (1996). Plan Directeur des Aires Protégées du Maroc. Rapport inédit. Administration des Eaux et Forêts et de la Conservation des Sols.
[32] Vada, S., Dupre, K., Zhang, Y. (2023). Route tourism: A narrative literature review. Current Issues in Tourism, 26(6): 879-889. https://doi.org/10.1080/13683500.2022.2151420
[33] Dunets, A.N., Gerasymchuk, N.A., Kurikov, V.M., Noeva, E.E., Kuznetsova, M.Y., Shichiyakh, R.A. (2020). Tourism management in border destinations: Regional aspects of sustainable development of protected natural areas. Entrepreneurship and Sustainability Issues, 7(4): 3253-3268. https://doi.org/10.9770/jesi.2020.7.4(45)
[34] Huang, Y., Shen, S., Hu, W., Li, Y., Li, G. (2023). Construction of cultural heritage tourism corridor for the dissemination of historical culture: A case study of typical mountainous multi-ethnic area in China. Land, 12(1): 138. https://doi.org/10.3390/land12010138
[35] Bachar, M., ElYacoubi, H., Zidane, L., Rochdi, A. (2021). Ethnomedicinal and traditional phytotherapeutic plants used in Bouhachem Natural Regional Park (Rif of Morocco): Case of Bni-Leit and Al-Oued districts. Journal of Pharmacy and Pharmacognosy Research, 9(3): 284-312.
[36] Bachar, M., Zidane, L., Rochdi, A. (2016). Plantes Médicinales et Phytothérapie Traditionnelle utilisées au niveau du Parc Naturel Régional de Bouhachem «Rif du Maroc»-cas de la commune rurale de Tazroute. Journal of Materials and Environmental Science, 7(11): 4175-4204.
[37] Bullock, J.M., Aronson, J., Newton, A. C., Pywell, R.F., Rey-Benayas, J.M. (2011). Restoration of ecosystem services and biodiversity: Conflicts and opportunities. Trends in Ecology & Evolution, 26(10): 541-549.
[38] Freitas, C.T., Lopes, P.F.M., Campos-Silva, J.V., Noble, M.M., Dyball, R., Peres, C.A. (2020). Co-management of culturally important species: A tool to promote biodiversity conservation and human well-being. People and Nature, 2(1): 61-81. https://doi.org/10.1002/pan3.10064
[39] Singh, M., Sinha, A.K., Singh, P. (2014). Maintaining the biodiversity of informal protected areas: A collaborative conservational approach. International Journal of Conservation Science, 5(1): 107-116.