UNESCO biosphere reserves and agroecological initiatives: what convergence for what sustainable development?
The case of the 'Arganeraie' biosphere reserve in Morocco

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Résumé
Les réserves de biosphère de l'UNESCO sont des territoires qui s'engagent à concilier la conservation de la biodiversité, les usages anthropiques des ressources et l'implication des acteurs dans un même projet afin de parvenir à un développement durable. Dans ce contexte, certains acteurs mènent des actions agroécologiques dans la Réserve de biosphère de l’Arganeraie au Maroc, ce qui soulève des questions sur la nature de la relation entre cette RBA et ces initiatives. Comment ces initiatives contribuent-elles au développement durable promu par la réserve ? Comment la reconnaissance de l’UNESCO est-elle mobilisée par les acteurs de ces initiatives ? Pour répondre à ces questions, une approche territoriale a été mise en œuvre à travers une analyse de contenu consistant en une étude précise de la structure du corpus textuel issu de notre interview d’un discours réalisé lors de visites d’initiatives agro écologiques effectuées dans le cadre du projet européen Erasmus+ Edu BioMed intitulé : “Développement de compétences pour l'éducation et la recherche appliquée dans les réserves de biosphère méditerranéennes de l’UNESCO ” ( EduBioMed ). Les analyses effectuées sur le corpus sont les nuages de mots, l’analyse en composantes principales et le MDS (Multidimensional Scaling). Cette étude montre que les initiatives agro-écologiques respectent les Objectifs de Développement Durable (ODD), qui sont au service des initiatives, mais ne s’alignent pas sur le système territorial de la RBA et le développement durable promu par cette dernière. Les acteurs impliqués dans ces initiatives considèrent que la reconnaissance de l’EBR concerne le patrimoine matériel et immatériel associé à l’arganier. Enfin, il n’y a pas encore de co-construction régionale entre les promoteurs d’initiatives et les acteurs locaux pour concilier l’utilisation durable des ressources et la conservation de l’écosystème de l’EBR.

Mots clés : Agroécologie, RBA, label, UNESCO, développement durable.

Abstract
UNESCO’s Biosphere Reserves are territories committed to harmonizing biodiversity conservation, anthropogenic resource usage, and stakeholder involvement within a unified project aimed at achieving sustainable development. In this vein, certain actors undertake agro-ecological activities in the Argan Biosphere Reserve in Morocco, which brings up questions regarding the nature of the relationship between this BR and these initiatives. How do these initiatives contribute to the sustainable development advocated by the reserve? How is the UNESCO recognition leveraged by the actors of these initiatives?

To answer these questions, a territorial approach was implemented through a content analysis, entailing a detailed study of the text corpus structure derived from our interview discourse conducted during visits to agro-ecological initiatives carried out under the European project Erasmus+ Edu BioMed titled: "Skills Development for Education and Applied Research in UNESCO’s Mediterranean Biosphere Reserves” (EduBioMed). The analyses performed on the corpus include word clouds, principal component analysis, and Multidimensional Scaling (MDS). This study shows that the agro-ecological initiatives adhere to the Sustainable Development Goals (SDGs), which serve the initiatives, but do not align with the territorial system of the BR and the sustainable development advocated by it. The actors involved in these initiatives perceive the BR recognition as pertaining to the tangible and intangible heritage associated with the Argan tree. Lastly, there has not yet been regional co-construction between the initiative promoters and local actors to reconcile the sustainable use of resources and conservation of the BR ecosystem.

Key words: Agroecology, RBA, label, UNESCO, sustainable development.
1. Introduction

The Arganeraie Biosphere Reserve (ABR) (Figure 1) embodies a wealth of diverse local Amazigh knowledge along with a distinct tangible and intangible heritage. Garnering recognition at the international level by the United Nations Educational, Scientific and Cultural Organization (UNESCO), it is a part of the World Network of Biosphere Reserves (WNBR). The ABR is dedicated to harmonizing biodiversity conservation, anthropogenic resource utilization, and stakeholder engagement within a unified territorial project, aiming towards achieving sustainable development.

Figure 1. Map of the Arganeraie Biosphere Reserve

Agroecology emerged as a movement within the Arganeraie Biosphere Reserve (RBA) since the 2000s, encapsulating various models including organic agriculture, conservation agriculture, and agroforestry. One of its goals is to address the calls for environmental preservation alongside the evolving "consumer + actor" dynamics, as discussed by Lakhli (2017) and Benhsain (2021). It intends to foster agricultural activities while aiming for environmental equilibrium by minimizing adverse effects and maximizing positive impacts on the environment. Numerous studies recognize it as a catalyst for sustainable territorial development (Tassin, FAO, 2011; Centrone, 2018).

The United Nations (UN) posits that sustainable development should encapsulate ongoing progress across economic, social, and ecological spectrums. Such development is assessed by the accumulated impact of dynamics within territories (Sedjari, 1996; Pažout & Eisenberg, 2021) where actors operate under constantly evolving parameters (Sultanbaev, 2022). These dynamics foster responsible initiatives within territories (Berns et al., 2009; Berger-Douce, 2015; Ledezma, 2023).

The crux of examining the relationship between these "responsible" agroecological initiatives and the RBA lies in understanding how these initiatives contribute to the sustainable development advocated by the reserve. Additionally, it's pertinent to observe how the UNESCO recognition, seen as a tool to heighten the allure of classified sites (Cheng et al., 2023), is leveraged by the actors of these initiatives.

Agroecology, transcending a mere fusion of agronomy and ecology, is an innovative endeavor situated within environmental, economic, social, and political sciences. It advocates for a systemic understanding of the interdependence between production, transformation, and consumption (Doré et al., 2006; Meynard, 2017), striving for a balance between agricultural and environmental practices.

The beneficial environmental effects of agroecology form the foundation of numerous contributions across three multilateral environmental agreements: the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), and the United Nations Convention to Combat Desertification (UNCCD). It's also regarded as a conduit to harmonize agricultural production with the conservation of natural resources like soil, water, and biodiversity over time. This in turn enables the economic resilience of small farmers and fosters a socio-ecological system at a territorial level.

The socio-ecological system concept adopts a "humans-in-nature" approach (Benoît, 2011), centered on the interlink between socio-economic and ecological systems, indispensable in deliberations on the evolution of agro-ecological practices (Duru et al., 2015; Barnes et al., 2022). These practices might pave a new way for Moroccan agriculture, which constitutes 13% of the national GDP as per the 2019 report (Louali, 2019). They respond to the pressing requisites of resilient agriculture amidst climate change, especially in fragile and protected territories, thereby addressing challenges faced by African and global agriculture by enhancing ecological productivity.

In this frame, the Argan Biosphere Reserve (ABR) stands as one of these protected territories in Morocco, internationally recognized by UNESCO since December 8, 1998. Several agro-ecological initiatives have sprouted in this reserve since 2000, including those under the purview of this study; namely, "From the Earth to the Plate" - a project enlightening and educating schoolchildren of Arbâa Sahel Commune in Tiznit on balanced diets, "The Agro-ecological Transition in the Massif of Siroua," the "Agrarian Communities and Their

These agroecological initiatives within the RBA employ a systemic approach, aiming for sustainable development via environmental advancements like soil fertility, water conservation, agro-biodiversity, agricultural pollution mitigation, and alleviation of pressure on agro-systems. They also aim for economic enhancements through market product valorization and profit margin augmentation, along with social improvements via local resource valorization and food security.

The pivotal inquiry here is to what extent do agroecological initiatives contribute to the sustainable territorial development promoted in the RBA, and how does the international recognition from UNESCO benefit them?

2. Materials and Methods

To address the aforementioned issue, a study was undertaken employing a territorial approach. This was executed through textual analysis of documents published by the stakeholders of the initiatives, as well as analysis of open-ended interviews conducted during visits to the agroecological initiatives with the project leaders of the three initiatives. This research was conducted under the ambit of the European Erasmus+ Edu BioMed project titled: "Skills development for education and applied research in UNESCO Mediterranean biosphere reserves (EduBioMed)."

The agroecological initiatives examined operate on a production model predicated on organic and ecological polyculture. However, this model does not preclude nematode infestations, prompting the initiative actors to adopt preventive measures as well as natural remedial treatments in cases of damage. These initiatives engage multiple actors across various scales (Table 1), with principal activities encompassing land cultivation, water procurement, supply of plants, seeds and equipment, marketing of products generated within the initiative, and training.

These agroecological initiatives are situated in the rural domain of the GBA (Figure 2), a territory rich in plant and animal biodiversity. Yet, it grapples with excessive anthropogenic pressure (Ezaidi et al., 2022), resource overexploitation, and deforestation among other issues. These challenges pose a roadblock to development (Vivien, 2003; Ta & Campbell, 2023), particularly impeding the advancement of the RBA which primarily consists of rural zones. These rural areas rank among the impoverished regions in Morocco (Aboutayeb, 2014), confronting myriad socio-economic dilemmas including rural exodus, scant employment opportunities, and lower agricultural yield. The presence of agroecological initiatives within the ASR necessitates a balance between agricultural production and biodiversity preservation for sustainable territorial development of the reserve, thereby highlighting the requirement for sound governance.

Figure 2. Location of the agroecological initiatives studied
### Table 1. The stakeholders of the initiative 1 and 2

<table>
<thead>
<tr>
<th>Initiative 1</th>
<th>From the land to the plate - awareness and education of a balanced diet for schoolchildren of Arbâa Sahel</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>Local</td>
</tr>
<tr>
<td>Arbâa Sahel</td>
<td>Dar Talib and Taliba Arbaa Sahel Association</td>
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<td></td>
<td>Arbaa Sahel territorial commune</td>
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<td></td>
<td>Tamounte Association</td>
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<tr>
<th>Initiative 2</th>
<th>Agro-ecological transition in the Siroua massif ACCTILG project and IDM</th>
</tr>
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<tbody>
<tr>
<td>City</td>
<td>Local</td>
</tr>
<tr>
<td>Assais</td>
<td>Farmers of the village Tamsksite, territorial commune Askouen, Assais,</td>
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<tr>
<td></td>
<td>Taliouine and Taroudant</td>
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<tr>
<td></td>
<td>The Atlas Assaghirn cooperative</td>
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</tbody>
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### 3. Results and Discussion

Effective governance of a biosphere reserve necessitates a foundation in deliberation and synergy, primarily hinged on information sharing, consultation ("opinion expression"), and collaboration ("joint construction"). These principles should be applied both during and post the establishment of the protected area, aligning with the distinct challenges posed by the territory (Wang, 2023). However, the present management of the RBA by the High Commission for Water and Forests and the Fight against Desertification is solely confined to disseminating information regarding the rules to adhere to. It lacks a participatory and inclusive approach engaging local actors, particularly those dedicated to responsible practices, including existing agroecological initiatives. Moreover, there’s a lack of mobilization of their potential which could contribute to the development of baskets of goods and localized services (Pecqueur, 2001) that are both responsible and ecological in nature.

Although operational methodologies vary among different agroecological initiatives, a commonality lies in their adherence to the following four principles of agroecology (Figure 3).

The underlying political principles emphasize supporting collective action at the local level, advocating for public policies favorable to agroecology, institutional change, and the adoption of a committed political stance. Socio-economic principles focus on ensuring social equity among all stakeholders, financial independence, and initiative autonomy to avoid reliance on monoculture while exploring alternative markets. These principles are reinforced through market access, strengthening networks, and enhancing local human resources.

Methodological principles entail adopting a participatory approach within the initiatives, by engaging
farmers through a pragmatic approach, empowering stakeholders to control development processes, and facilitating a multidirectional knowledge transfer. The initiatives also follow a bottom-up approach, adopting flexible long-term development strategies.

Agroecological principles advocate for soil maintenance to boost biodiversity for optimum plant production, managing organic matter, reducing energy losses through microclimate management, rationalizing water use, controlling erosion, recycling biomass, and managing ecological relationships to enable biological synergies among the elements of agrobiodiversity.

The focal activity of the studied agroecological initiatives centers around healthy food production and aligning with certain Sustainable Development Goals (SDGs), such as promoting the consumption of non-intensive, sustainable agricultural products (SDG 12), alleviating poverty (SDG 1) through agricultural job creation (SDG 2), facilitating women's inclusion in the socio-economic spectrum (SDG 5), and reducing inequalities (SDG 10). These initiatives also promote healthy living and well-being (MDG 3), alongside fostering shared, sustainable economic growth (MDG 8) and encouraging innovation (MDG 9) in seed production, recycling, and waste reuse. Notably, agro-ecological initiatives are hinged on a range of partnerships (SDG 17) and can be part of the solutions to climate change (SDG 13), even though this goal isn't explicitly included among the agro-ecological objectives.

Despite their geographical location, the initiative benefits from the SDGs, albeit with a distinctive sustainable development approach compared to that promoted by the RBA. The latter, in line with the Man and the Biosphere Program (MAB) Strategy 2015-2025, adheres to the 2030 Agenda, primarily focusing on forest environment preservation, combating desertification, and biodiversity loss within the RBA.

It's crucial to highlight that the Sustainable Development Goals (SDGs) achieved via the agroecological initiatives are not seamlessly integrated within the RBA's territorial framework, nor entirely aligned with the strategic directives of the MAB 2015-2025, especially concerning sustainable resource utilization and ecosystem preservation. This disparity arises from a divergence between the "individual sustainable development" pursued by these initiatives and the "collective sustainable development" envisioned by the RBA.

"Individual sustainable development" entails employing sustainable practices on a narrower or individualized scale, as demonstrated by the referred agroecological initiatives. Although these initiatives embody a sustainable development paradigm, their impact predominantly serves the individuals or specific initiatives involved, failing to assimilate fully into the RBA’s broader territorial framework.

Contrarily, "collective sustainable development" is a broader, more inclusive approach aimed at fulfilling Sustainable Development Goals (SDGs) within a defined territorial domain, necessitating a collaborative engagement among diverse stakeholders within the territory towards long-term sustainable development objectives.

The primary variance between these approaches appears to stem from the scale and integration level of the initiatives. Individual sustainable development endeavors focus on more localized actions, whereas the RBA’s collective sustainable development strategy aspires for a holistic, collaborative engagement on a territorial scale to realize sustainability objectives.

Agroecology requires a collective endeavor wherein public authorities and all relevant stakeholders harness genetic innovation potential by intensifying the selection of lesser-known species. Genetic innovation comprises mechanisms or actions aimed at advancing both plant and animal genetics, supporting the overarching agroecological objectives. This pursuit of innovation extends to agronomic realms through extensive rotation cycles adoption and tailored technical pathways for minor crops, fostering a sustainable agricultural model.

Technological innovation plays a pivotal role, emerging through the establishment of new market avenues for lesser-known species and the evolution of market standards to recognize the environmental value inherent in diversified sectors. Coordinated efforts are essential to enable inter-actor coordination within the agroecological value chain, as outlined by Meynard (Meynard, 2017). The activated support levers contribute to a coherent, collaborative framework aimed at promoting agroecological practices.

In a UNESCO Biosphere Reserve context, agroecology should resonate with local terrains by nurturing a sense of belonging and affirming the territorial identity. This harmonization not only bolsters the regional ecological framework but also leverages the innovation opportunities offered by UNESCO's Man and Biosphere (MAB) program (Benhsain & Boujrouf, 2023). Through this integrated approach, agroecology transforms into a holistic endeavor, aligning genetic, agronomic, and technological advancements with territorial ethos, thereby nurturing a sustainable, eco-conscious agricultural landscape.
Regarding communication, the UNESCO MAB is viewed as an innovative label providing media coverage (Florent, 2011; Stoll-Kleemann & O’Riordan, 2023) and prestige through its international recognition by UNESCO. This recognition is perceived as a tool to enhance the attractiveness of classified territories (ICOMOS, 1999; Saidi and Fagnoni, 2018). However, these advantages are not exploited by the studied agroecological initiatives, which see UNESCO recognition only regarding the argan tree as an international instrument for preserving this tangible and intangible heritage, indicating a lack of UNESCO recognition awareness among the initiatives' actors.

Notably, textual analysis clouds created from the communication tools employed by the studied agroecological initiatives show that the most frequently appearing words are "strengthen" and "rural" (Figure 4), with both words scoring 18 following an analysis of occurrence. However, words relating to argan and forest are entirely absent.

**Figure 4.** Textual analysis of the communication tools put in place by the agroecological initiatives studied

The same outcome emerged from the interview with stakeholders of the initiatives when asked about their relationship with the Argan Biosphere Reserve. They outlined how they educate students about the argan tree and its environment. However, their efforts toward conservation or effective sustainable management of the area are lacking (Figure 5).

**Figure 5.** ACP analysis discourses of the three initiatives studied

The communication tools deployed by the agroecological initiatives fail to leverage the UNESCO designation or the emblematic representation of the RBA — the Argan, which has transitioned from being a social bond, a household nutritional hub, and a vessel of beliefs and myths (Soufiani & al., 2023), to a territorial brand symbol of a 2,560,000-hectare reserve. This reserve remains untapped by the initiatives, highlighting the misalignment between the said UNESCO recognition and the symbolic value of the argan tree as perceived by the actors within these initiatives.

**4. Conclusion**

Unlike intensive agriculture, which drastically shifts traditional practices through inputs, agroecology adheres to a systemic approach. This encompasses the functionality of the agroecosystem, agricultural management, and a circular economy wherein waste from one production serves as a resource for another. The focus of the studied agroecological initiatives lies in land development, water supply, product marketing, and training, all while adhering to political, socio-economic, methodological, and agroecological principles.

These initiatives contribute to the SDGs by promoting sustainable agricultural consumption (SDG12), alleviating extreme poverty (SDG1), enhancing health and well-being (SDG3), and offering solutions to climate change (SDG13), although these aren't direct objectives of agroecology. However, these SDGs primarily serve the initiatives, without assimilating into the ASR's territorial framework. The employment of innovation levers from UNESCO's MAB program, and the embodiment of conservation as an agroecology model are notably absent in these initiatives, alongside a scarce mention of terms related to argan and forest.

The benefits derived from UNESCO recognition are largely overlooked by these initiatives, narrowing down to recognizing argan as heritage. A territorial co-construction among these initiatives and other RBA actors, for a model in sync with UNESCO's MAB program that champions sustainable resource use and environmental preservation, is pivotal for embedding agroecology within the RBA's sustainable territorial development.
Références

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**Books:**


**Publication des organisations…:**
