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CASE STUDY

Kırsakal Eymür Carbon Sink Area Project in Orta District (Turkey)

Project full title: Enhancing Technical and Vocational Skills for Implementing Nature-Based Solutions (NbS) to Combat Land Degradation
Project acronym: NbS4LD
Project number: 2025-1-TR01-KA220-VET-000357096
Project activity: WP2 Developing Educational Resources on NbS for Combating Land Degradation

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1. INTRODUCTION

This case study has been analysed The General Directorate of Combating Desertification and Erosion (GDCDE). GDCDE is a Turkish central organization, operating under the Ministry of Environment, Urbanization and Climate Change.GDCDE carry out wide range of actions at national level in order to combat desertification, land degradation, erosion as well mitigate the consequences of natural disasters such as flood and landslides.GDCDE is also a national focal point organization to United Nations Convention to Combat Desertification (UNCCD), one of the internationally recognized environmental convention. GDCDE, in close cooperation with relevant institutions, fulfill the national and international obligations within the framework of the strategy and action plan to combat desertification for the period of 2024-2030. Over dacede, GDCDE has realized hundreds of projects aiming to combat desertification, land degradation and mitigate the natural disasters such as floods and landslides. Furthermore, GDCDE has very close cooperation with UNCCD, particularly under the Land Degradation Neutrality Target Setting Programme (LDN TSP). Türkiye is one of the advanced country in the progress of LDN TSP and sharing its expertise and experiences with other countries.

The Kırsakal Eymür Carbon Sink Area Project is located in Kırsakal Village, Orta District, Çankırı Province, Türkiye, within a Central Anatolian agricultural watershed. Implemented on approximately 40.93 ha of state treasury land along the Devrez Stream, the project addressed degraded land conditions, limited vegetation cover, and moderate erosion risks. The project was developed in 2024 to enhance carbon sequestration and restore ecosystem functions through nature-based solutions. Activities included soil preparation, planting of medicinal and aromatic plants and income-generating species, fencing, and maintenance measures. The intervention increased vegetation cover, improved soil quality and water retention, reduced erosion, and supported biodiversity and carbon storage. It also created opportunities for local livelihoods, beekeeping, and ecotourism. Institutional cooperation between public authorities, local stakeholders, and producers supported implementation and long-term management.

The project provides a replicable model combining ecosystem restoration, climate benefits, and rural development.

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[Project area before and after the intervention - Author: M. Çetin, 2024]

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[Project area before the intervention (on the left) and after (on the right) - Author: M. Çetin, 2024)

[As-built sketch showing the project area and its main features - Author: M. Çetin]

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[Outcome-based nature-based solutions illustrating project implementation, carbon sink management, and resulting ecosystem service benefits - Author: M. Çetin, 2025).

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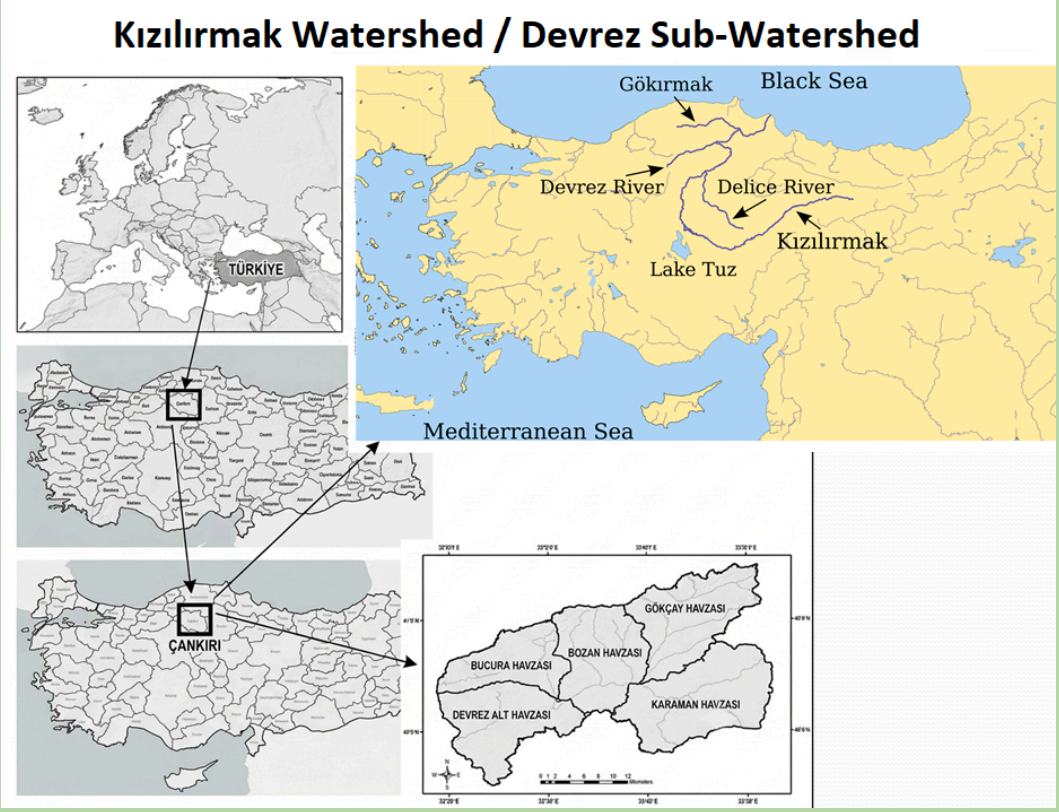
2. CONTEXT

2.1 LOCATION

Country: Turkey. Region: Central Anatolia Region. Province: Çankırı Province. Site: Kırsakal Village, Orta District (Kırsakal Eymür Carbon Sink Area Project). Approximate GPS Coordinates: Latitude 40.60° N – Longitude 33.11° E.



[The location of the Devrez Stream sub-watershed, which is a sub-basin of the Kızılırmak watershed, one of the major river watersheds of Türkiye - Author: M. Çetin, 2025)]

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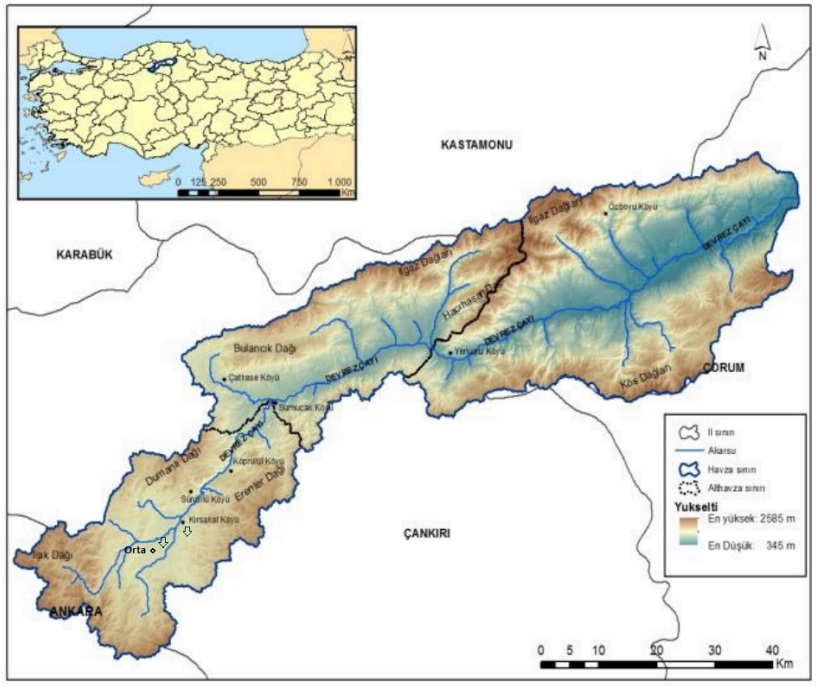

[Topographic map of the Devrez watershed - Source: Project Team, 2024]

[Condition of the project area according to the water erosion map of Türkiye - Source: DEMIS, 2021]

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2.3 LANDSCAPE TYPE

Agricultural watershed.

2.4 LAND DEGRADATION CHALLENGE

Deforestation. Poor land management. Intensive agriculture and irrigation.

2.5 BASELINE DATA

Land condition	• Site: the project area is located in Kırsakal village, Eymür locality, on a nearly flat terrain along the banks of the Devrez Stream. • Soil: a total of four soil profiles were opened within the project area. Soil samples were collected from one profile at depths of 0–30 cm, 30–60 cm, and 60–90 cm, and analyzed at the Biotar Organic Agriculture Forestry Chemistry Industry and Trade Inc. Soil Analysis Laboratory. According to the MTA 1:500,000 scale geological map, the project site consists of undifferentiated limestone of sedimentary origin dating to the Upper Miocene–Pliocene period. • Vegetation cover: the project site is currently idle and largely bare. Apart from limited riparian vegetation along the stream, there is no vegetation cover forming canopy closure.. • Erosion status: the soil has an average pH of 6.40, medium texture, non-saline properties, moderate lime content, and is rich in organic matter. Moderate erosion is present.
Environmental context	• Climate: the climate type is classified as semi-arid, and the vegetation type is steppe. • Hydrology: the Devrez River, located within the Kızılırmak main basin, originates from the foothills of Dumanlı Mountain (1840 m) and Erenler Mountain (1817 m), forming the Devrez sub-basin system. This region has significant potential for establishing carbon sink areas. The study area lies within the “Middle Kırsakal micro-catchment” of the Kızılırmak Basin. The Devrez Stream flows from southwest to northeast for approximately 140 km through a narrow valley, shaping the geomorphological structure of the region. This natural geography provides suitable conditions for afforestation and vegetation activities and enables the development of sustainable solutions aimed at increasing carbon sequestration capacity. • Biodiversity: the valley through which the river flows is a strategic area that supports both the conservation of natural ecosystems and the establishment of new carbon sink areas.

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	• Ecological pressures: no significant ecological pressures have been identified.
Socioeconomic context	• Population: the population density is low. • Livelihoods: livestock farming, primarily cattle breeding. • Land management: state treasury land. • Resource dependency: no significant dependency factors affecting the project area.
Policy and governance	• Institutional framework: prior to the intervention, stakeholder participation was limited and institutional coordination was modest. Existing mechanisms for local engagement were present but not fully developed.

3. INTERVENTION

3.1 TIMEFRAME

The project was prepared in 2024 and implemented in 2024. Maintenance work is continuing in 2025-2026.

3.2 TYPE OF INTERVENTION

Afforestation.

3.3 IMPLEMETING ORGANISATIONS

The project was initiated upon the request of the Governorship of Orta District in Çankırı, aiming to develop thyme cultivation and enhance the region's potential ecotourism destination. Following preliminary feasibility and site assessment studies, the General Directorate prepared the project. Based on the approved design, an implementation tender was conducted. After the procurement process, the General Directorate coordinated the implementation activities and ensured institutional cooperation among the contractor, the District Governorship, the Municipality, the Village Headmanship, and the District Directorate of Agriculture.

3.4 FUNDING SOURCES

Budget of GDCDE.

3.5 IMPLEMENTATION ACTIONS AND MEASURES

Project planning and preparation were completed in 2024, including site assessments, technical design, and the preparation of the project documentation required for implementation.

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Investment activities in 2024 included land preparation through subsoil tillage with a triple ripper and topsoil cultivation using a disc harrow and rotovator to improve soil conditions for planting. Additional expenditures covered seedling procurement and planting, installation of wire fencing to protect the site, and supporting infrastructure and materials such as signs, gates, information boards, fertilizer/leonardite applications, and transportation services.

Maintenance activities in spring 2025 focused on ensuring the successful establishment of the planted vegetation. These activities included supplementary seedling planting to replace losses, weed control to reduce competition for water and nutrients, and routine monitoring of seedling survival and site conditions to support long-term project objectives.

4. IMPACT

4.1 ENVIRONMENTAL IMPACT

☑ Improved soil health or reduced soil erosion. ☑ Increased vegetation cover or habitat restoration. ☑ Improved water quality or water availability. ☑ Increased carbon sequestration or storage.

Before the project, the implementation area within the agricultural basin was unused, with weak vegetation and poor soil health. The risk of erosion and the low water retention capacity were limiting ecosystem services. After the project activities, vegetation increased through planting and the introduction of medicinal and aromatic plant species. Soil organic structure and water retention capacity improved, and the risk of erosion decreased. The increase in plant diversity also supported biodiversity. In addition, perennial species contributed to higher carbon sequestration, strengthening the area's capacity to provide ecosystem services.

4.2 COMMUNITY IMPACT

☑ Improved food security. ☑ Strengthened community resilience. ☑ Increased local capacity or skills.

Within the scope of the project, abandoned agricultural land has been brought into the production of medicinal and aromatic plants, creating a new and diversified source of livelihood for the local community. With the support of the District Governorate and the cooperation of the cooperative, the number of producers participating in production has been increasing. The involvement of women in production, processing, and marketing processes is expected to strengthen social inclusion and gender equality. The cooperative-based structure also facilitates access to markets and has created a model at the local level in terms of economic sustainability.

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4.3 INSTITUTIONAL IMPACT

☑ Increased community participation in decision-making. ☑ Capacity building for institutions or communities.

The project contributed to concrete improvements in the project process, policy implementation, institutional coordination, and local participation mechanisms. Although the land was abandoned within the agricultural basin, it has regained value through the project activities, and its production potential has been realized. With the support of the District Governorate, cooperatives and local people actively participated in the process, and awareness and interest in medicinal and aromatic plants have increased significantly. These developments have not only revitalized existing production activities but have also created a model that serves as an example for other investment initiatives in the region.

4.4 SUSTAINABILITY OF THE RESULTS

☑ Integration into policies or development plans. ☒ Local technical capacity for maintenance. ☑ Integration into policies or development plans. ☑ Local technical capacity for maintenance.

Sustainability aspects:

1) Financial Sustainability. The cooperative-based production model ensures that income generated from medicinal and aromatic plants remains within the local economy, supporting the continuity of value-added activities related to production, processing, and marketing. This contributes to the long-term economic viability of the project and strengthens local livelihoods.

2) Institutional Sustainability. Support from the District Governorate, ownership by local authorities, and the organization of producers under a cooperative structure contribute to the continuity of decision-making and implementation processes. These institutional arrangements enhance local capacity and support the long-term management of project activities.

3) Ecological Sustainability. Ecological sustainability is promoted through active land management, biodiversity-supporting planting schemes, and low-input production methods. As a result, the project contributes not only to short-term environmental improvements but also to the development of a self-sustaining model for ecosystem restoration and local development.

4) Among the additional benefits generated by the project, the cultivation of medicinal and aromatic plants has increased plant diversity within the agricultural landscape, thereby supporting local biodiversity, particularly pollinator populations. The use of perennial and locally adapted species has also improved soil organic matter content, contributing to carbon sequestration and enhancing resilience to climate change at the local level. Beyond the project boundaries, increased biodiversity has enhanced the area's suitability for beekeeping activities and created opportunities for nature-based and ecotourism initiatives.

Potential Trade-offs:

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1) Ecological Trade-offs

- Biodiversity balance: The introduction of managed plant species may locally reduce the diversity of naturally occurring vegetation.
- Afforestation and water balance: Site conditions may increase vulnerability to frost and drought, potentially affecting vegetation establishment and growth.
- Landscape management and natural habitats: Land-use changes may reduce habitat availability for certain local, endemic, or insufficiently documented species.

2) Economic Trade-offs

- Carbon sequestration versus agricultural production: If project outcomes do not meet expectations, local confidence in similar land-use initiatives may decline.
- Income-generating species versus ecosystem integrity: Species such as jujube, hawthorn, and pear provide economic benefits; however, increasing emphasis on production-oriented species may alter natural ecosystem composition and potentially affect biodiversity.

3) Socio-Cultural Trade-offs

- New production systems and knowledge requirements: The cultivation of medicinal and aromatic plants creates income opportunities but also requires additional technical knowledge, training, and maintenance efforts from producers.
- Market dependency: Increased reliance on medicinal and aromatic plant markets may expose producers to fluctuations in demand and prices.
- Ecotourism development and visitor pressure: Growing visitor interest may increase pressure on local resources and require appropriate management measures.

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5. CONCLUSION

- **Community relevance:** mostly
  The intervention addressed underutilized treasury land that was not suitable for agriculture or grazing, increasing its value and creating local economic and environmental benefits.

- **Technical effectiveness:** mostly
  The project enhanced species diversity and ecosystem functions through the use of medicinal and aromatic plants and other species selected according to local ecological conditions and beekeeping activities.

- **Economic efficiency:** fully
  The cultivation of thyme and other income-generating species provides additional income opportunities and is considered economically viable under local market conditions.

- **Institutional support:** partially
  The intervention was supported through cooperation between the Ministry and the District Governorate, although broader institutional involvement remained limited.

- **Innovation:** mostly
  The project introduced a diversified planting approach by combining medicinal, aromatic, and income-generating species adapted to local environmental conditions.

- **Replication & Scaling Potential:** mostly
  The intervention follows nature-based solutions principles and can be adapted and replicated in similar rural landscapes with comparable ecological and socioeconomic conditions.

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