The crop-livestock integration trajectory
in Jahjouka, Larache Province, northern Morocco

Hills and valley below the village of Jahjouka

The crop-livestock integration trajectory
Larache Province, northern Morocco

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Authors' note

This booklet was produced as part of the **Change-UP** project, which focuses on the adaptation of Mediterranean agriculture to global changes. The booklet presents both the approach and the findings of the characterisation of the territorial trajectory of Jahjouka.
This study is the result of work conducted between January and June 2024 involving researchers from CIRAD and the Faculté Polydisciplinaire de Larache, farmers and local institutions. We would like to thank all participants in the activities that took place in the village of Jahjouka for their hospitality, engaging discussions and active participation. This booklet presents some of the findings and is intended for these participants, as well as for research and development project leaders in the territory.
We would also like to thank Walid El Harrak for the translation into Darija, an Arabic dialect spoken in northern Morocco.

Contents

Characterising adaptation

The Mediterranean region is one of the most vulnerable areas in the world to the effects of climate change[1]. Rethinking agricultural adaptation in this changing context is crucial. Most of the literature on adaptation tends to focus on responses to predicted future impacts, seeking widely applicable solutions. However, for solutions that are tailored to local realities, we suggest approaching **adaptation as a process specific to each individual territory**, taking account of its past experiences and the lessons learned from them[2].

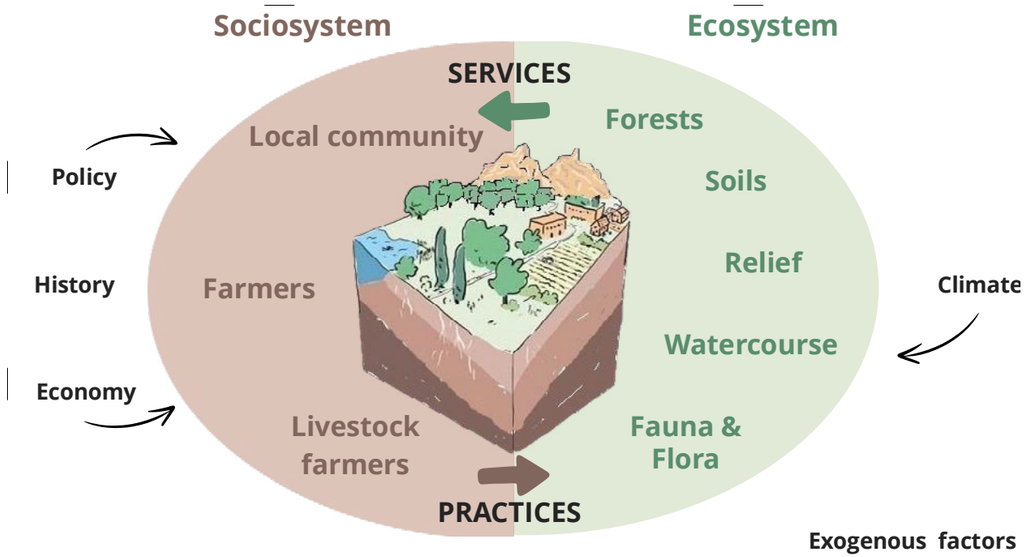
A territory in Morocco was chosen to **localise and contextualise the research on adaptation**. In this territory, we focused on agricultural practices, the people living there, the biodiversity with which they interact, and the administrations that govern them. In short, we examined the entire **socio-ecosystem** of this territory[3] (Figure 1).

To consider the **future adaptation** of the territory, we looked at the events and changes it has experienced and to which it has adapted. These **dynamics** and their interactions form the trajectory of the territory.

[1] IPCC 2023

[2] Tschakert & Dietrich 2010

[3] Resilience Alliance 2010



Adapted from a diagram by Julien Blanco (2015, p. 56), inspired by Ostrom (2009) and a drawing by Flore Vigneron (2021).

Figure 1. The socio-ecosystem and its interactions

Sheep grazing *hmimar* durum wheat (technique known as "*déprimage*")

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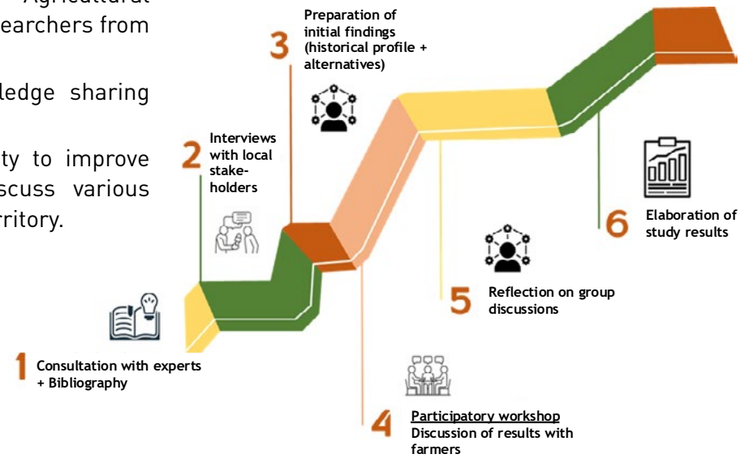
The steps of the deliberative process

The work presented in this booklet mobilised farmers from Jahjouka, researchers from the universities of Tétouan, Martil and Larache, representatives of the Larache Chamber of Agriculture and the Office de Mise en Valeur Agricole du Loukkos (Loukkos Agricultural Development Office), as well as researchers from CIRAD and IAM-M.

This graph represents the knowledge sharing process.

The workshop was the opportunity to improve the historical profile and to discuss various alternatives for the future of the territory.



The village of Jahjouka, at the heart of the study

Agriculture in the village is rain-fed and primarily subsistence-oriented. The **main crops** are grains (durum wheat, bread wheat, barley) and legumes.

Farmers raise **livestock**, mainly sheep and a few cattle. These animals represent a form of capital that can be easily mobilised.

Arboriculture also plays an important role in the agricultural activities of the farmers (olive trees, figs, etc.).

The complementarity of these activities has shaped the agricultural landscape of Jahjouka, which leads to the key question of the study...

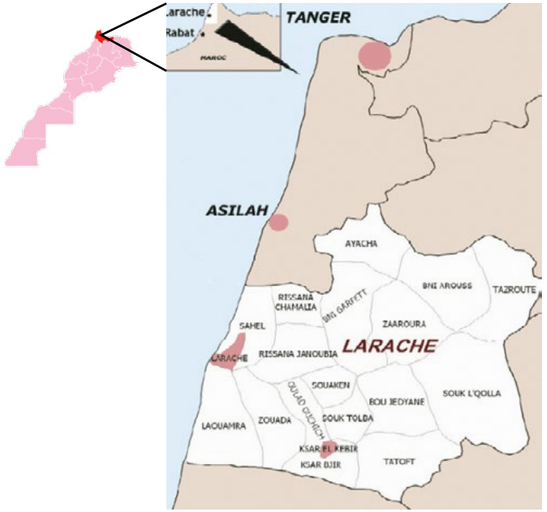


Figure 2. The village of Jahjouka, Larache province

How has crop-livestock integration evolved in Jahjouka since Morocco's independence in 1956?

Identifying the social, economic and ecological dynamics

To answer the key question of the study, we consider the territory of Jahjouka as a socio-ecosystem. We developed its historical profile, a representation of the trajectory of the territory.

We identified the **changes and events** that have occurred at different scales (individual, territorial, national) and the impacts these "disturbances" have had at the Jahjouka village level, the focal scale of the study.

We established the timeline of these disturbances in order to connect them to other changes and to highlight potential sequences of events that have shaped the evolution of the socio-ecosystem in question. In doing so, we characterised several **successive phases** of its evolution.

This characterisation is qualitative and interpretative.

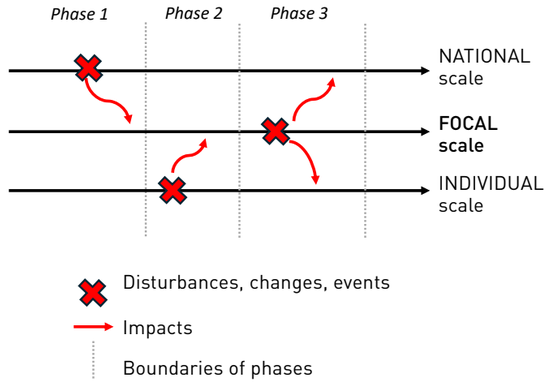


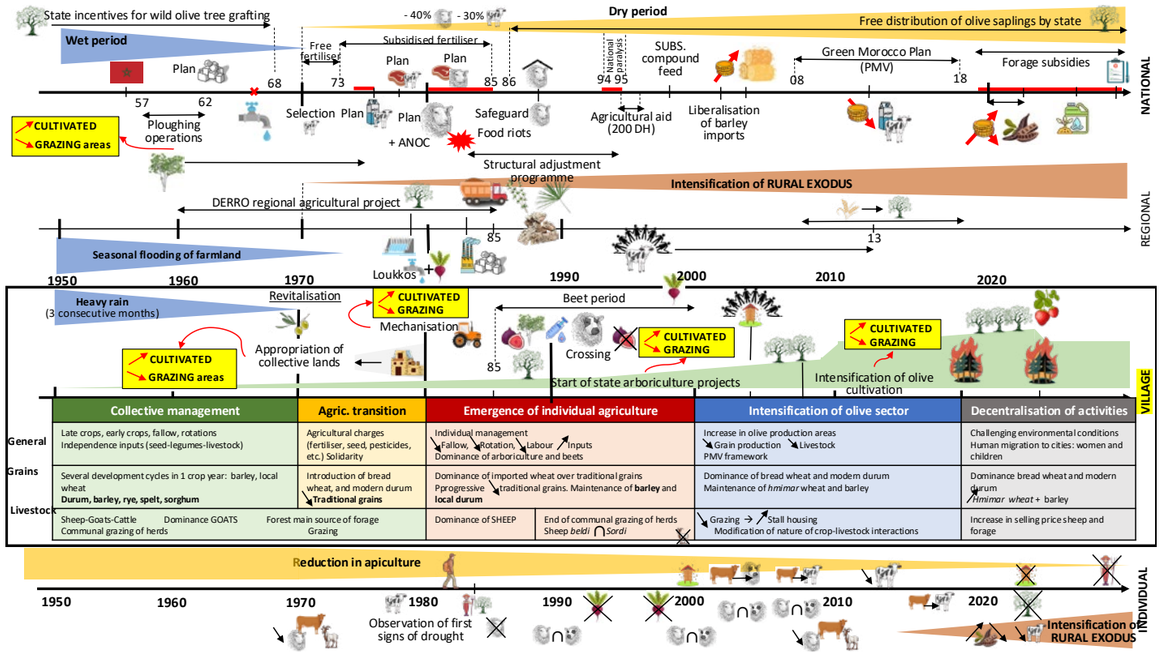
Figure 3. Organisation of historical profile

The historical profile of Jahjouka

The following figure presents the historical profile, an illustrated summary of the socio-ecological dynamics that have shaped the evolution of the village of Jahjouka. The historical profile is structured according to four levels: national, regional, village territory and individual. It is aimed at understanding the evolution of crop-livestock integration from the end of the protectorate (1956) to the present day.

The focal scale of the analysis is the **territory of Jahjouka**. This level details the socio-ecological dynamics specific to the village. Five successive periods are identified: collective management of agricultural activities (1959-1970), agricultural transition (1970-1980), individual farming and mechanisation (1980-2000), intensification of olive cultivation (2000-2018), and decentralisation of household activities (2018-2024).

An A3 version of the profile with its key can be found in the appendix to the booklet.



National scale

1956: Independence of Morocco.
1963: Sugar plan, development of national sugar production in the form of cane and beet.
1967: Launch of million irrigated hectares.

1967, 1974-1975, 1980-1985, 2019-2024: Droughts.
1970: Dissemination of pure genetic material of cattle through selection of best breeders.
1956 to 1975: Development of eucalyptus plantations.
1975: Imports of heifers and crossing, subsidies provided by state and loans granted.
1956-1975: Appropriation by Ministry of Water and Forests of development of eucalyptus plantations.
1978: Cattle meat plan.
1980: Sheep plan, definition of "breed homeland areas", territorial organisation of sheep farming + creation of National Sheep and Goat Association (ANOC) in charge of genetic improvement of sheep.
1981: Demonstrations linked to increase in price of bread.

1981: Sheep meat plan.
1980-1985: 40% reduction in sheep numbers and 30% in cattle numbers at national level, further to droughts.

1987: Subsidies for purchase of sheep farming buildings and equipment.
1987: Creation of programme to safeguard livestock for areas affected by agricultural disasters and drought years.

2004: Increase in fodder prices.

2013: Fall in milk prices.

2020-2022: Fluctuation in carob prices.

2023: Distribution of fertilisers.

2024: Establishment of medical coverage.

Regional scale

1960-1985: Economic and rural development project for the Western Rif , plantation of olive trees.

1979: Construction of Oued El Makhazine dam.

1980: Creation of Loukkous irrigation scheme.
1980: Distribution of beet seedlings by company.

1983: Installation of sugar plant in Ksar-El-Kbir.

1980-1990: Harvesting of cork oak, thyme and dwarf palms.

1996-2013: Creation of cooperative/collection point for cow's milk.

2008-2018: Policy to convert grains to arboriculture (olive, carob, fig trees, etc.).

Individual scale

1970, 2004, 2010, 2013, 2022: Reduction in herds.

1982: Rural exodus.

1984: Beginning of olive plantations.

1993, 1999: End of beet activity.

2000: Beginning of apiculture activity.

2000, 2006, 2009: Crossing local sheep breed with *Sordi.*

2009, 2016: Replacement by/introduction of imported cows.

2020-2022: Beginning and end of carob plantations.

2024: Abandonment of farmer status.

Village scale

1970, 1980, 1990, 2008: Increase in cultivated areas at expense of grazing areas.

1970: Appropriation of lands through grafting of wild olive trees or crops.

1970: Construction of private homes on collective lands.
1990: Development of arboriculture projects in village.

1980: Arrival of first tractors in village and mechanisation of work.

1995: Beginning of livestock vaccination campaigns.

1990: Crossing of *Sordi* in village.

1995: Loss of fig trees during droughts.

2004: Functioning of apiculture cooperative.

2018, 2022: Forest fires.

Expansion of olive cultivation areas.

Successive phases of the crop-livestock integration trajectory

1950-1970: Collective management of land and livestock

Following independence (1956), agriculture in the village was subsistence-oriented. A portion of the village land was collective and used mainly for grazing. One person from the village was designated to take livestock to graze on these lands or in the forest.

The farmers produced a variety of grains, including durum wheat, barley, rye, spelt and sorghum. A common technique known as *"déprimage"* consisted in allowing livestock to graze several times on the *hmimar** wheat and barley, at intervals sufficient for the crops to regrow between each grazing period. Farmers would then prevent animals from entering the fields, leaving the grain crops to reach the heading stage ready for harvesting. This technique accounted for a significant proportion of livestock feed. The herd included goats, sheep and cattle, with goats being predominant.

At the same time, agriculture began to be mechanised at the national level with the "Ploughing Operations" from 1957 to 1962, particularly in the large grain producing areas, where more than 1 000 tractors were imported[4]. The village of Jahjouka was not included in this mechanised farming policy. In 1962, the Moroccan government launched its sugar agricultural plan, supporting the production of beets and sugarcane to reduce its dependency on imports[5&6]. This policy would later have an impact on the Jahjouka territory.

1970-1980: Agricultural transition

The agriculture of the 1970s was completely transformed by the introduction of fertilisers at the national level and by improved access to seeds

* "Red" wheat, a local durum wheat variety

[4] Clerc, 1961

[5&6] Bouquerel, 1969 ; Redani *et al.*, 2015

Sordi sheep

© Juliette Lafont

in the souks. The village farmers were supported in this change by the provision of free fertilisers by the state from 1970 to 1973, followed by subsidies until 1985[7]. Farmers saw the introduction of new grain species and varieties, such as modern durum wheat and bread wheat, coexisting with traditional grains.

In the early 1970s, the inhabitants of the village launched a process to appropriate collective lands. They began grafting olive trees or building private houses. Cultivated areas thus began to encroach on grazing land, and some farmers began to reduce their herds.

1980-2000: Individual farming and mechanisation

The introduction of tractors in 1980 marked the mechanisation of agriculture in the village, leading to a more individualised approach to managing production. The ability to plough larger areas removed the limitations imposed by the availability of labour.

Modern grain varieties gradually became predominant, transforming dietary habits such as the consumption of bread. *Hmimar** wheat, a traditional variety, and barley were maintained due to their importance in livestock feed. The livestock system evolved, through the establishment of biannual vaccination campaigns (conducted by a state-paid veterinarian). The *Sordi** sheep breed, originating from the Atlas Mountains, was introduced to the souks around the village from 1990 onwards. It spread within the village through crossing with the local *Bni Hesen** breed. Goats, which caused damage to olive trees, steadily declined in number and disappeared by 2000.

At the regional level, the construction of the sugar factory in 1983 in Ksar-El-Kbir, as part of the national sugar plan of the 1960s, encouraged farmers to shift towards beet production until 2000. This activity was abandoned due to declining profitability caused by the droughts of 1994-1995 and rising transportation costs.

[7] Khrouz, 1992

Karim wheat (modern variety) and beans under olive trees

From 1990 onwards, the state encouraged arboriculture (fig, olive and eucalyptus trees) in plots surrounding homes. The orchard landscape was predominantly composed of fig trees until their numbers sharply declined in 1995 due to severe droughts. The increase in arboriculture amplified the expansion of cultivated areas at the expense of pastures.

2000-2018: Intensification of olive cultivation

Jahjouka adapted to the directives of the Green Morocco Plan, aimed at organising agriculture into sectors, including olive oil. With olive trees distributed free of charge by state programmes, olive cultivation expanded at the expense of pastures and grain crops. National policies encouraged the conversion of these lands in marginal areas such as the Rif mountains. This procedure was presented as a climate change adaptation measure.

In terms of livestock farming, there was a decline in grazing practices in favour of stall housing, but the system today remains a hybrid one. This shift was linked to the reduction in land available for grazing and to the gradual disappearance of herding in this area from 2000. At the national level, the fall in the price of cow's milk in 2013 led some farmers in the village to reduce the size of their cattle herds, while others replaced them with sheep. This shift resulted in the closure of the Tatoft dairy cooperative, which had been in operation since 1996. Alongside sheep and cattle farming, apiculture in the village was marked by a continued decline in the quantity and quality of honey produced, due to the use of pesticides and to droughts, according to the farmers.

View of Jahjouka from the mountain and burnt forest remains

From 2018: Decentralisation of household activities

Since 2018, Morocco has suffered an unbroken series of droughts, plunging the territory into a situation of severe water stress. Two wildfires have ravaged the forests surrounding the village, destroying essential resources for farmers, such as the eucalyptus forest that was vital for apiculture. The fires destroyed hives as well as grafted olive trees, and some farmers lost livestock. In response, the women of the village have sought work in the berry companies along the coast. These events have intensified the rural exodus, with young people leaving for the city to supplement household agricultural income.

Where grains are concerned, modern varieties remain dominant. However, farmers who depend on livestock are increasing the share of *hmimar* wheat and barley grown in response to droughts and rising fodder prices, as these crops produce a large amount of straw for livestock.

In the livestock sector, the selling price for sheep rises seasonally, especially during religious holidays, prompting some farmers to consider increasing their production at these times if they have the financial resources to offset the increase in fodder prices.

Cross-cutting analysis of adaptation in the territory

The historical approach highlights the adaptation of Jahjouka territory and its agricultural households.

The farmers have **maintained local grain varieties**, such as *hmimar* wheat and barley, in spite of national policies encouraging the adoption of modern, high-yielding varieties. This choice appears to be motivated by the dependence of livestock on local varieties in a mixed crop-livestock context marked by rising fodder prices linked to droughts. Another reason is the higher resilience of these varieties to environmental conditions.

Farmers have **transformed their livestock system** from being mostly goats until 1970 to a mixed sheep and cattle system from 2000 onwards. This shift is due to a decrease in the labour available to tend goats grazing in forests and to the introduction from 1990 of the Sordi sheep breed, which has a higher economic value. It is particularly consumed for Eid al-Adha, and its high productivity (meat and litter size) helps to offset rising livestock farming costs.

Agricultural households have **adapted the way in which they work** and generate income. At the time of independence, family members worked together to complete the different agricultural tasks (livestock farming, ploughing, harvesting, etc.). The development of the coastal cities and their associated activities has resulted in rural exodus across the region since 1970. The decentralisation of activities is a response to rising inflation and provides opportunities for income diversification in a context where climate change is increasingly impacting agriculture and making harvests less predictable.

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Mule used for agricultural work and transport, grazing hmimar wheat (local)

The crop-livestock integration trajectory in Jahjouka, Larache Province, northern Morocco

This booklet describes the evolution of crop-livestock integration in a village in northern Morocco from the 1960s to the present day. Conducted as part of the Change-UP research project, the characterisation of the territorial trajectory of Jahjouka with local actors helps has clarified what adaptation entails.

This booklet is the result of fieldwork conducted by Juliette Lafont over nearly two months between the towns of Larache, Ksar-El-Kbir and Jahjouka.

Juliette Lafont is an agricultural engineer. She focuses on the role of local knowledge and representations in understanding socio-ecosystems and their evolution in a context of global change.

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