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Exploring agroecology: a contextual analysis of Fatick, Senegal

Fatick Department and DYTAEL (Dynamic for a local agroecological transition)

Marc Piraux, Juliette Lairez, Elodie Richomme, Modou Gueye Fall, Mame Cheikh Anta Sall, Jean Michel Sourisseau, and Jean Daniel Cesaro

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This document presents a summary of the context of Fatick Department, which corresponds to the area of intervention of DYTAEL (Dynamic for a local agroecological transition), the Agroecological Living Landscape within the project.

The document looks at the various components of the diagnosis (geography, ecology, economy, social and political issues) in order to draw out elements for the current state of agroecological principles and practices in the ALL. We make conclusions on the preliminary transition pathways being considered in it and our main entry points for testing agroecological innovations.

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Executive summary

In Senegal, food sovereignty and security are top priorities, but rainfed mixed-farming systems are under pressure. Agriculture contributes 15–20% to gross domestic product (GDP), but rainfed farming has low productivity because of limited access to inputs, rainfall irregularity, and a high amount of soil degradation. Environmental degradation hampers Senegal's sensitive ecosystem and makes it more vulnerable to climate change. Two challenges have emerged: on the one hand, developing sustainable practices, drought-tolerant crops, and climate-smart techniques; on the other hand, diversifying agriculture and adding value enhance food security, youth employment, rural livelihoods, and economic growth.

Regarding the agroecological transition, a multistakeholder network called "Dynamique pour une Transition Agroécologique au Sénégal" (DyTAES) was set up in 2019, bringing together NGOs, farmers' organizations, research institutions, and local elected representatives. Its main objective was to promote agroecological transition in Senegal through research, advocacy, awareness-raising, experience-sharing, and support for areas in transition. Local Agroecological Transition Initiatives (DYTAELs) have been set up, including one in Fatick Department, created in April 2022, to promote greater ownership of this dynamic and the territorialization of agroecology.

> "Environmental degradation hampers Senegal's sensitive ecosystem and makes it more vulnerable to climate change.

The Agroecological Living Landscape of Fatick is linked to this DYTAEL at the department level (a territorial authority in the political structure of the state) in Fatick, in the southeast of the groundnut basin. The department is representative of the problems encountered in this region, characterized predominantly by a Sudano-Sahelian climate, with a long dry season. It is highly specialized in agriculture, with an economy that is struggling to diversify, with unfulfilled strategies (through fishing, table salt, and tourism), small-scale structures, and limited development of industry.

Millet, groundnuts, and livestock are key products of the department, with diversification through several cash crops, notably watermelon and market gardening. The fragility of access to productive plots and the vulnerability of associated ecosystems are worrying factors for the sustainability of local food systems. The causes of this general degradation of natural resources are well known: soil nutrient mining, bush fires, overexploitation of woody forest products, overgrazing, and excessive tree pruning. These causes are also institutional and political. Fatick Department is considered highly food and nutritionally insecure, with only 19.1 % of households being secure (CECNA, 2014). The department is highly heterogeneous in terms of production, level of degradation of resources, population density, and access to infrastructure, which vary greatly from one commune to another. The demographic increase represents a major challenge for the department in terms of expanding the consumer market for goods and services as well as satisfying social demand (for health, education, employment, social protection, etc.). The current state of agroecological principles in the ALL shows a wide range of results, with the AE strategies developed by farmers (very gendered) in the department being more by default, because of limited access to external inputs, rather than by choice. Some municipalities are more "committed" than others because of the strength of local collective action. If some initiatives exist, the level of transition to AE is not up to the challenges discussed above. Preserving natural resources and restoring them are a major challenge for the whole department (e.g., fertility of soils in tree parks). Improving productivity at the territorial scale and diversifying and increasing the value of local food systems to make rainfed agriculture attractive represent a path of transition that should be supported.

In a political context favorable to citizen participation, many initiatives are being developed despite the lack of resources and the unsuitability of public aid programs. That is the case of the DYTAEL. Fatick stakeholders are motivated to exchange knowledge and promote the recognition of agroecological practices in agricultural livelihoods and local businesses and value chains. Collaboration and sharing of experiences in the ALL can contribute to the growth and success of agroecology initiatives in Fatick. However, these local dynamics alone will not be able to promote the scaling-up of agroecology. Therefore, public support to farmers is also needed.

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Description of the Agroecological Living Landscape

In Senegal, as in the rest of West Africa, a political movement in favor of agroecology has emerged in recent years, positioning this approach as a relevant response to various challenges, such as the increasing degradation of soil and water resources, the need to achieve food and nutritional security, and the rising cost of inputs. Agroecology invites us to rethink the way we produce, market, and consume, particularly in the context of climate change. Agroecology also has the potential to play a decisive role in the professional integration of young people.

With this in mind, a multistakeholder network called Dynamique pour une Transition Agroécologique au Sénégal (DyTAES) was set up in 2019, bringing together NGOs, farmers' organizations, research institutions, and local elected representatives. Its main objective was to promote agroecological transition in Senegal through research, advocacy, awareness-raising, experience-sharing, and support for areas in transition. DyTAES engages officials and technical public services for proposing agroecology initiatives. The network has contributed to the integration of agroecology into national public policies, notably through the Plan Sénégal Émergent, the current Senegalese government's flagship program.

Local Agroecological Transition Initiatives (DYTAELs) have been set up. The DYTAEL of Fatick Department was created in April 2022 to promote greater ownership of this dynamic at the local level. The Fatick DYTAEL is part of a process involving a large number of organizations collaborating in a joint action plan. Several meetings in 2022 and 2023 were held to co-construct a working plan for local actions aimed at expanding local knowledge and practices in agroecological transition. In the Initiative on Agroecology project, we have therefore decided that our ALL should correspond to the DYTAEL of Fatick Department. It is a real and active living landscape in the sense that it is supported by a local multistakeholder organization, operating at different levels and with a broad vision of AE, from technical issues to public action.

The general objective of the ALL DYTAEL is to promote agroecological practices for agri-environmental and socioeconomic resilience on family farms in Fatick Department. The specific objectives follow:

- Raising awareness among the administrative and political authorities and the local population of the need to adopt agroecological practices.
- Building the capacity of DYTAEL member producer organizations in agroecology.
- Promoting agroecological products through visits and fairs.
- Encouraging new attitudes of citizens and stakeholders to protect the environment.

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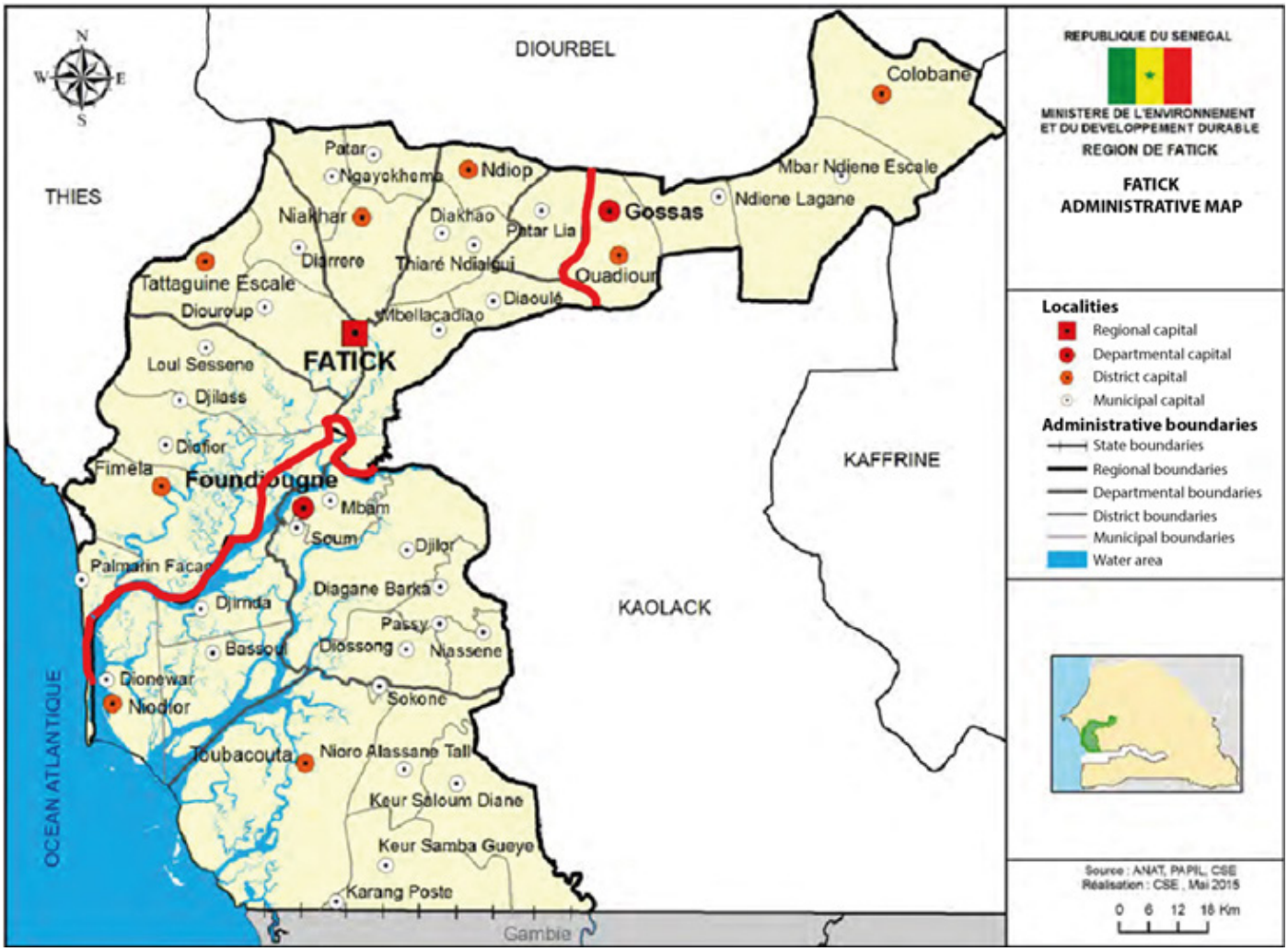
Osana Bonilla-Findji / CCAFS

Fatick stakeholders are motivated to exchange knowledge and promote the recognition of agroecological practices in agricultural livelihoods and local business and value chains. The long experience of Fatick Department with agroecological practices highlights its commitment to sustainable agriculture. Collaboration and sharing of experiences can contribute to the growth and success of agroecology initiatives in Fatick.

Location of the ALL

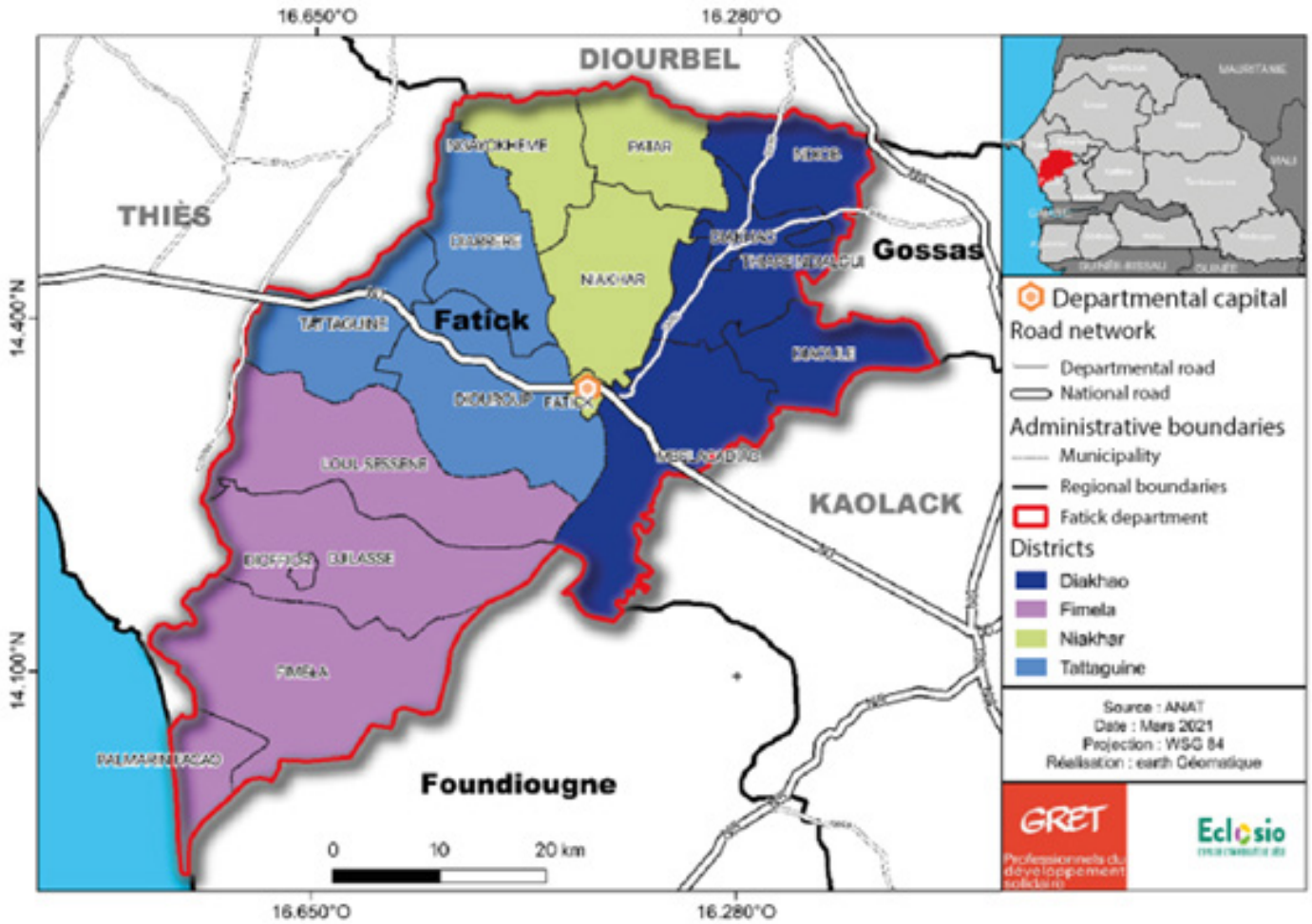
The ALL of Fatick is located in Fatick Department, which occupies the central zone of the Fatick region, which itself comprises three departments (along with Foundiougne and Gossas) (**Figure 1**). This region is bordered to the north and northeast by the regions of Thiès, Diourbel, and Louga; to the south by the Republic of The Gambia; to the east by the Kaolack region; and to the west by the Atlantic Ocean.

Figure 1. The region of Fatick and its three departments (CSE, 2015).



Fatick Department was created by law 2002-02 of 15 February 2002 on the reform of territorial administration. It covers an area of 2,646 km² (33.34% of the regional area). Under the 2013 reform, Fatick has four arrondissements (districts) – Ndiob, Fimela, Niakhar, and Tattaguine – and 17 *collectivités territoriales* (territorial communities), three urban communes (municipalities), and 14 rural communes (**Figure 2**).

Figure 2. Fatick Department and its four arrondissements (districts) (CSE, 2015).

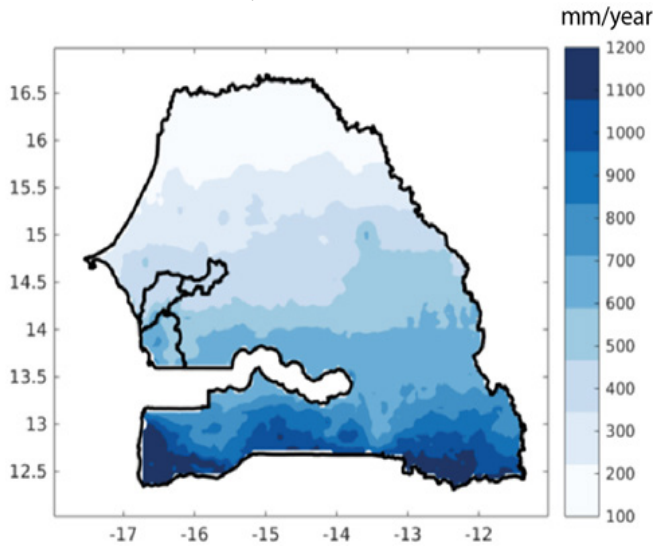


Environmental context

The department forms a transition zone between, on the one hand, the artificial landscapes typical of the groundnut basin in the north, with a predominance of rainfed cropping areas, and, on the other hand, the natural formations associated with the Saloum Delta Biosphere Reserve in the south. The latter, however, is essentially confined to the department of Foundiougne.

The climate is predominantly Sudano-Sahelian, with a long dry season from October to June and a rainy season from June to October. The climate is hot (24 to 35 °C) with a marked increase in average temperature in recent years (PAS-PNA, 2019 and dry (low rainfall and high evaporation). Each year during eight months, it is subject to the Harmattan effect, a dying branch of the continental trade winds. A rainfall gradient is recorded from north to south (see **Figure 3**), from 400 mm in the north to 500 mm in the south of the department.

Figure 3. Isohyets in Fatick Department (Bacci et al., 2013 in Piraux et al., 2022).

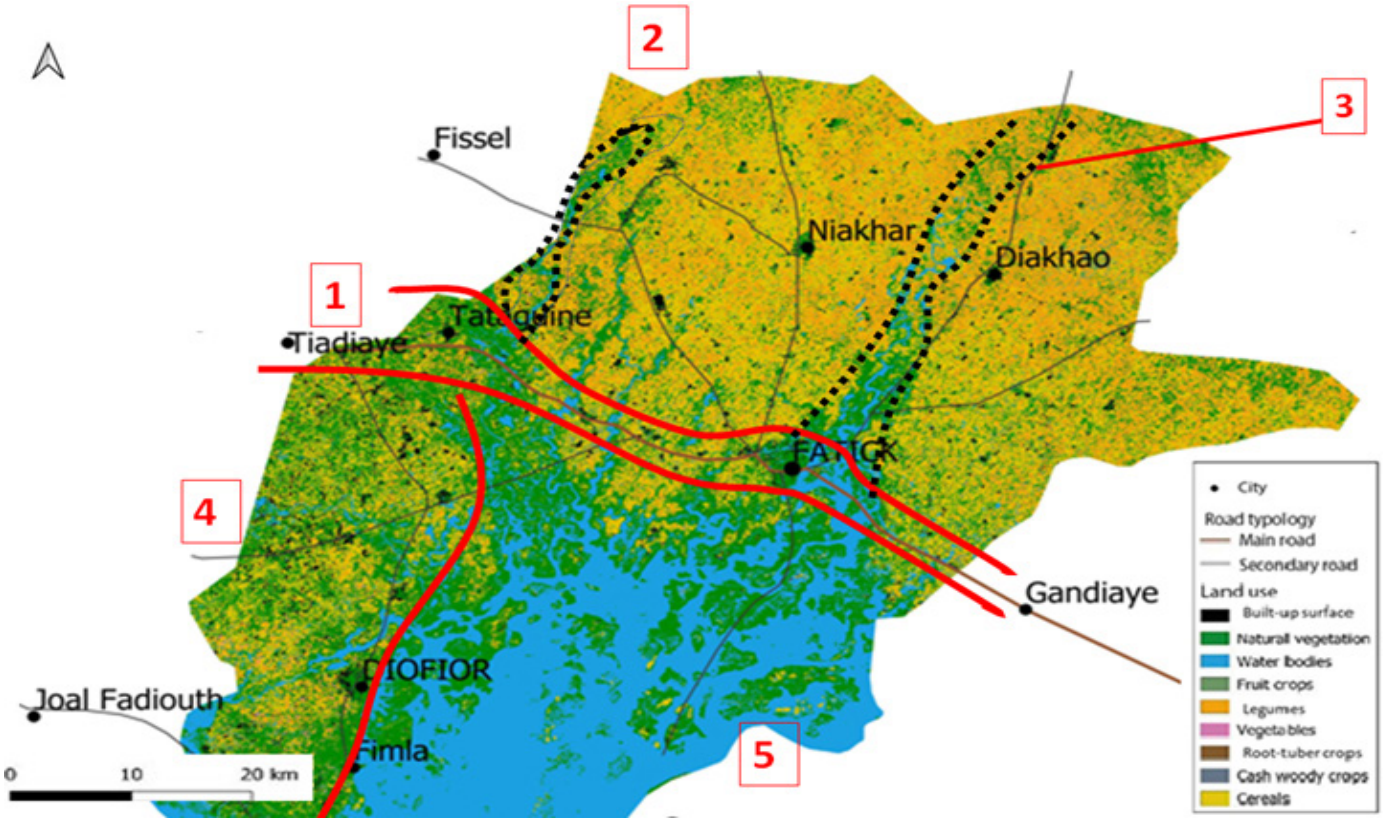


Groundwater resources are characterized by saline aquifers, particularly in the Maastrichtian and Palaeocene aquifers (from 200 to 450 m) and the Paleocene aquifer (from 60 to 150 m), as the Eocene is not very productive in the region. The Continental Terminal water-table (from 30 to 70 m deep) has water of excellent quality for drinking and irrigation (CSE, 2015).

The land use map (**Figure 4**) of the 2020 rainy season shows the importance of cereal crops and groundnuts in the north-central part of the department with more than 50% of the land being agricultural area (**Table 1**), but also a large share of submerged area in the south of the department, which is usually dedicated to rice production or is unsuitable for cultivation. Fruit crops are also scattered throughout the region. Horticultural crops are poorly developed, except in Tataguine District and near Diofor in the south of the department. In Diouroup District in particular, fruit crops have a significant presence.

To characterize this great diversity, **Figure 4** shows the zoning of the department.

Figure 4. Land use and zoning of the Fatick Department in 2020 (Piraux and Diéye, 2022).



A central zone (zone 1), more urbanized than the rest of the department, is crossed by communication routes of regional and national importance, dominated by the RN 1, which links the 2 major urban centers of Mbour (at the East) and Kaolack (at the West). This corridor is poised to host structuring infrastructures of various kinds: transport (train, freeway) and energy (oil, gas). It is also home to numerous agricultural marketing centers. The northern part (zone 2) of the department is characteristic of the artificial landscapes of the groundnut basin: high density, low rainfall, significant degradation of resources (water, soil, tree cover, etc.), traditional cultivation of millet, groundnuts and cowpeas and livestock farming, with diversification into a few cash crops, notably watermelon and fruit. The ancient fossil valleys allow diversification into market gardening (zone 3). The southern zone (zone 4), on the other hand, is linked to the Sine Saloum delta, and is less populated, more touristic, with more trees and mangrove areas. The more fertile soils and slightly higher rainfall enable the development of fruit crops. The area, rich in project dynamics, is experiencing strong land speculation and is subject to significant immigration. More acute salinity problems constrain farming activities in zone 5, but salt is also an important source of income.

Table 1: Land allocation during 2020 rainy season.

Type of use	Area (ha)	% of total	% of agricultural area
Building	5,329.70	2.76	
Natural vegetation	78,163.08	40.41	
Fruit crops	4,723.54	2.44	4.30
Pulses	45,556.34	23.55	41.45
Market gardening	286.29	0.15	0.26
Forest crops	25.06	0.01	0.02
Cereals	59,323.45	30.67	53.97

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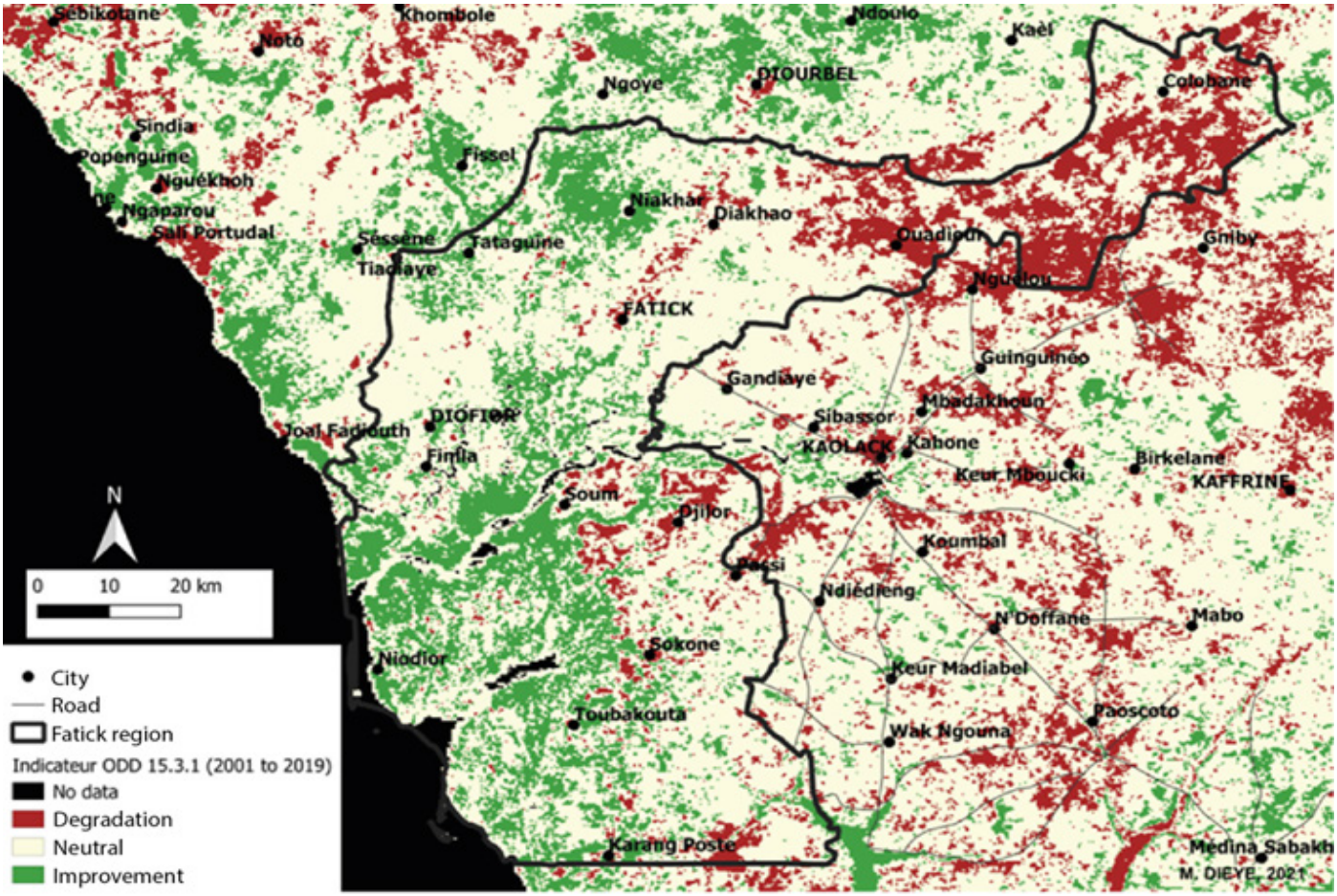
The region's natural resources are exposed to several different types of degradation: chemical (salinization of land, declining soil fertility, decreased organic matter content), biological (decreased vegetation cover, adverse effects of fire, habitat loss, declining biodiversity), physical (land compaction, sealing, and crusting), and those linked to water or wind erosion (bank erosion, loss of topsoil through wind erosion, gullying) (CSE, 2015; PIAD, 2020). The major constraint to agriculture is the presence of "tannes" (saline depressions), which cover almost a third of the department's territory. These salty (0.5 to 3 g/L) soils, rich in fluoride (2 mg/L), are unsuitable for cultivation and not very suitable for livestock farming.

The causes of this general degradation of natural resources are as follows: soil nutrient mining because of low nutrient inputs compared to exportation of grain/forage, bush fires, overexploitation of woody forest products, overgrazing, and excessive tree pruning. The causes are also institutional and political: (i) the inadequacy of certain development policies or laws, (ii) the weak capacity of local authorities, (iii) the inadequacy of natural resource management methods, (iv) the lack of synergy and difficulty in coordinating different interventions, (v) the weak intervention capacity of technical services, etc. (Piraux et al., 2022; CSE, 2015; PIAD, 2020).

Although land degradation is high, the map in **Figure 5** shows that land degradation in Fatick Department is stable over time (indicators covering vegetation productivity, land cover, and soil organic carbon) or even decreasing, except in a corridor between Fatick and Diakhao. Further analysis should help to better understand the origins of this situation.

Figure 5. Land degradation indicators for Fatick Department in 2019 from MODIS data (Dièye, 2022).



The majority of the department's timber and wildlife resources are situated in the southern region, where opportunities for hunting and hunting tourism, as well as the use of non-timber forest products, are abundant. Additionally, the presence of a vast mangrove ecosystem further enhances the area's potential. The department is also home to two classified forests, encompassing a total of 902 hectares (ANSD, 2021).

To guarantee the preservation of these resources, the department, in collaboration with its partners, undertakes conservation, monitoring, forest management, and information/awareness-raising actions. The Eaux et Forêts department has a staff of 11 responsible for forest and mangrove management. Numerous planting projects are underway. In addition to the Eaux et Forêts department, natural resource management in the department involves several other players, mainly NGOs (World Vision, CARITAS, ENDA Pronat, Wetlands, CAREM). They are implementing a range of initiatives, including saline land reclamation, assisted natural regeneration, and the creation of village bushfire control committees. In 2016, the department had 27 committees, but they are sorely lacking in operating resources. They are also engaged in drawing up local agreements (at the municipality level) to negotiate land use between the various stakeholders, especially between farmers and livestock breeders, including transhumant ones.

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Economic context

Key farming systems/major agricultural commodities and livestock

Farmers in Fatick Department are involved in rainfed agriculture and livestock farming, and some households (two/thirds of those surveyed) also engage in non-agricultural activities. For the 302 households surveyed in the baseline of the FAIR Sahel Project in the groundnut basin, on average, households were composed of 11.4 members in Diouroup, 10.0 in Ndiop, and 13.5 in Tattaguine. A third of the women surveyed have individual fields. On the other hand, the number of young people surveyed with individual fields was lower, representing only 18% of the sample.

Farmers are growing a variety of cereal and legume crops mainly for self-consumption, as well as cash crops such as groundnuts for the market. The most common crops are groundnuts, millet, and cowpeas. Farming is market-oriented for certain crops (such as groundnuts) and self-consumption for cereals. **Table 2** shows the department's estimated cropped area and production for 2019. Millet is the main food crop, followed by groundnuts. The overall commercialization rate (all crops considered at the household level) is 25%, but it is only 3% when focusing on cereal crops. Cowpeas are intended for both subsistence and sale.

Table 2: Estimated area and production for 2019 in Fatick Department (ANSD, 2021).

Crop	Area (ha)	Production (t)
Millet	95,000	85,500
Groundnut	49,800	78,000
Sorghum	4,812	3,368
Rice	2,852	4,284
Cowpea	2,567	3,240
Cassava	2,500	32,500
Maize	1,470	1,911
Watermelon	1,150	19,950

The areas under different crops fluctuate significantly from year to year, as shown in **Figure 6** (area) and **Figure 7** (cereal area and production). However, major trends are emerging for certain crops. Rice and cowpea production, for example, are declining, while others are steadily increasing. Agricultural diversification is on the increase. This is the case for horticultural production (mainly okra and onion, but also tomato and chili) as well as watermelon (up by more than 200% in 4 years). The latter in particular is the focus of numerous local initiatives, but is highly dependent on rainfall conditions, particularly at the end of the crop cycle. Market gardening activities are particularly attractive to young people, but the need for training in techniques and water management is high.

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Figure 6. Changes in the area (ha) under various crops over the years in Fatick Department (Piraux et al., 2022).

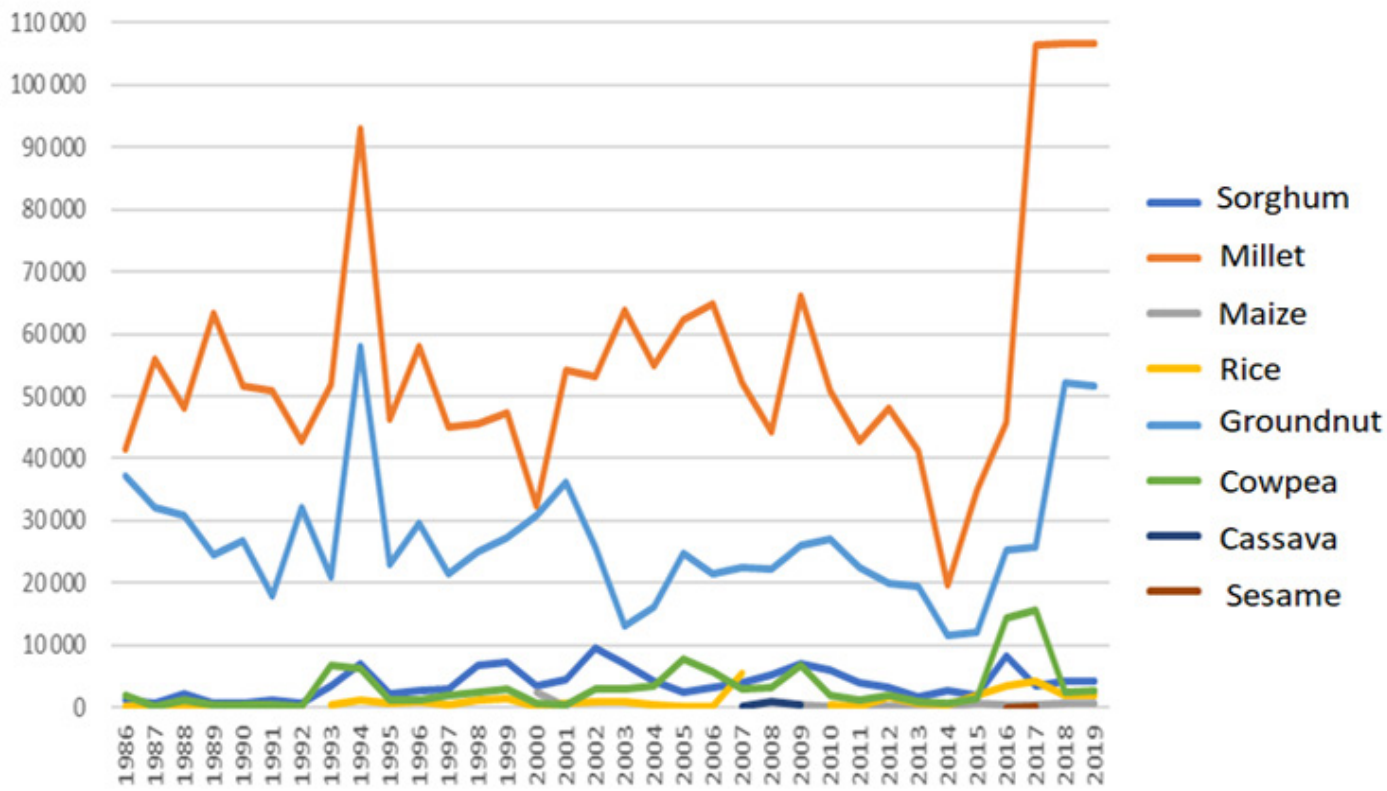
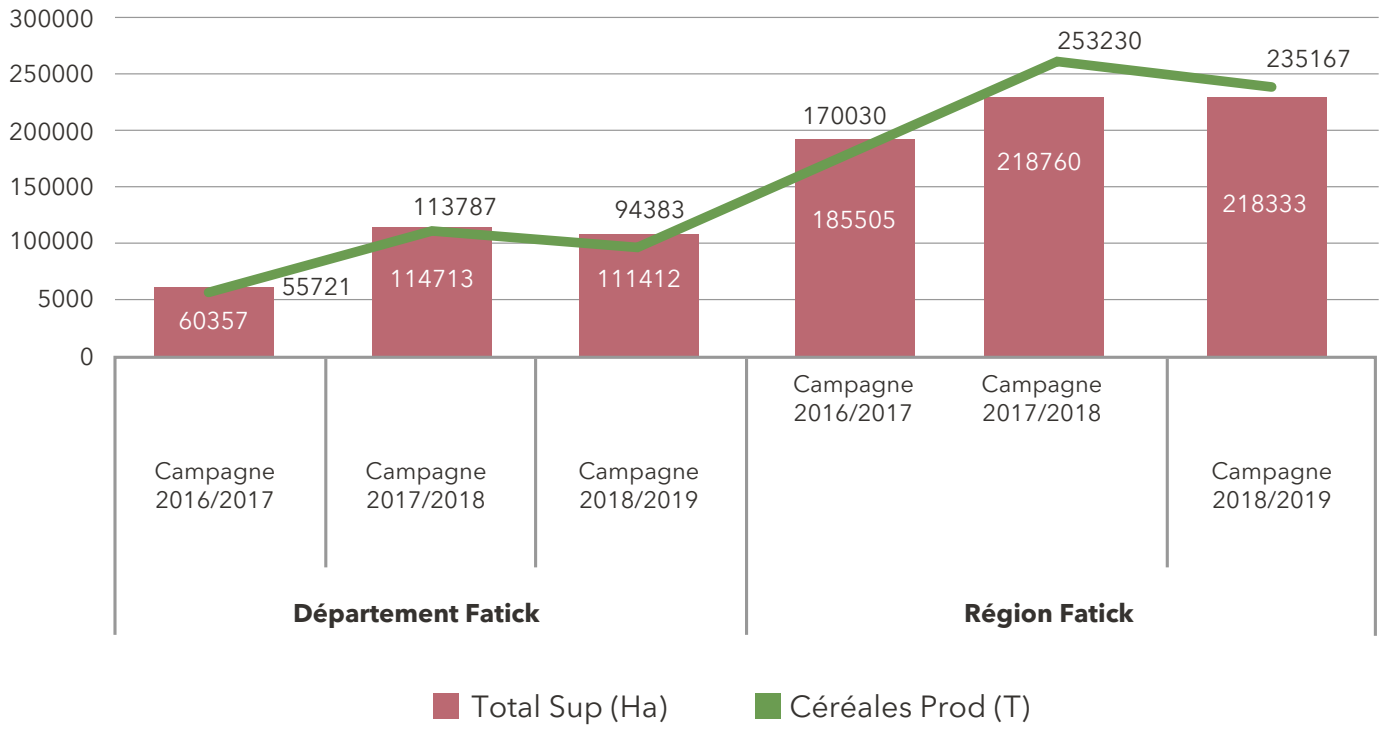


Figure 7. Area sown and cereal production (millet, sorghum, maize and rice) in Fatick (DYTAEL, 2022).



Agriculture mostly uses family labor, often accompanied by occasional hired labor for tasks such as hoeing and weeding (Fair Sahel baseline). Seeds for rainfed crops are mainly farmers' own production. From 16% to 31% of the households surveyed in the baseline of the FAIR Sahel Project (from a survey of 302 households in three communes in Fatick Department) do not use any fertilizer, depending on the municipality, and from 10% to 32% use only organic fertilizer. A majority of the households surveyed (55%) do not use pesticides to manage pests even when they have experienced attacks.

Livestock farming is an important activity in the department. The main livestock species are sheep, followed by goats, cattle, horses, donkeys, and pigs (see **Table 3**). Livestock numbers have been growing steadily for many years.

Table 3: Number of heads of livestock for Fatick Department in 2019.

	Number of heads
Sheep	159,918
Goats	106,665
Cattle	92,622
Equines	27,507
Donkeys	11,711
Pigs	265

According to the baseline of the Fair Sahel Project, approximately one-third of the households raise cattle (with an average of 13 heads for those who raise them), mostly left to graze freely in the village's grazing areas, in their own fields after the harvest, or sometimes in neighbouring fields. Cattle breeding is characterized by the existence of two traditional techniques: pastoral breeding based on transhumance and sedentary breeding carried out on farms. Adding value to livestock products is an important lever for livestock development in the area. However, production varies greatly from year to year in the department. Dairy processing units in the region include the GIE des femmes de Djilor dairy, the Djilor cheese dairy, the Colobane cheese dairy, and the Fatick commune milk collection center with Kirene. Only statistics for the Fatick commune milk collection center with Kirene are available: it collected 60,424 liters in 2019 (and 54,000 liters in 2018). The livestock sector's potential is considerable, as hardy breeds are well adapted, agricultural by-products are widely available, and livestock breeders are keenly interested in genetic improvement programs. However, the major constraint to livestock farming in Fatick remains the permanent reduction in pastoral space caused by salinization of the land. In response to the concern about transhumance, management plans in the form of consensual local agreements have been drawn up, but their implementation is not easy. Two other constraints can be cited: (i) the inadequacy and obsolescence of breeding and processing infrastructure (barns, slaughterhouses and slaughter areas, vaccination pens, storage warehouses), except for milk, and (ii) the recurrence of disease outbreaks due to low vaccination coverage rates.

Commercialization

The sale of agricultural products is facilitated by the presence of many permanent and weekly markets in the department: 19 in 2019, of which 11 are permanent markets and 8 are weekly markets. The department is located between the two major urban centers of Mbour and Kaolack. By linking these two centers, the road infrastructure, dominated by Route Nationale No. 1 (RN1), forms the backbone of the department. Two secondary roads are also important: Fatick-Niakhar-Bambey and Fatick-Diakhao-Gossas. These are meeting places for those involved in the agricultural sector, and they all have a more or less sustained commercial dynamic. Some collection points enable producers to sell their products, but the quality of the roads and the isolation of the area lead to a high loss rate, depending on the product, and farmers have few opportunities to negotiate with the intermediaries who collect the products. The government regulates the price of groundnuts (selling prices are set by decree each year), but the price is not always respected by commercial operators, at the expense of household income.

Land tenure situation

In Fatick Department, land is inherited and passed down from father to son. The unequal demographic distribution combined with a concentration of production areas means that access to land is becoming increasingly difficult throughout the department, without any formalities for securing land undertaken at the institutional level. Land tenure insecurity in the department is a complex problem that has a significant impact on the lives of the inhabitants. The problem is linked to several factors, such as urbanization and land conflicts due to the coexistence of multiple land tenure systems, including customary and private ownership. The superimposition of these systems creates frequent disputes, particularly when property rights are not clearly defined, reinforced by the lack of adequate or poorly applied land regulations. In the baseline of the Fair Sahel Project, each farm had from three to five plots per household of less than 2 ha on average and 50% of the plots listed had size of less than 1 ha. Most of the plots were owned by male heads of the household, even if few plots were found to be owned by women and young people, but with more difficult access than men.

> "Land tenure insecurity in the department is a complex problem that has a significant impact on the lives of the inhabitants.

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Key factors affecting agricultural productivity

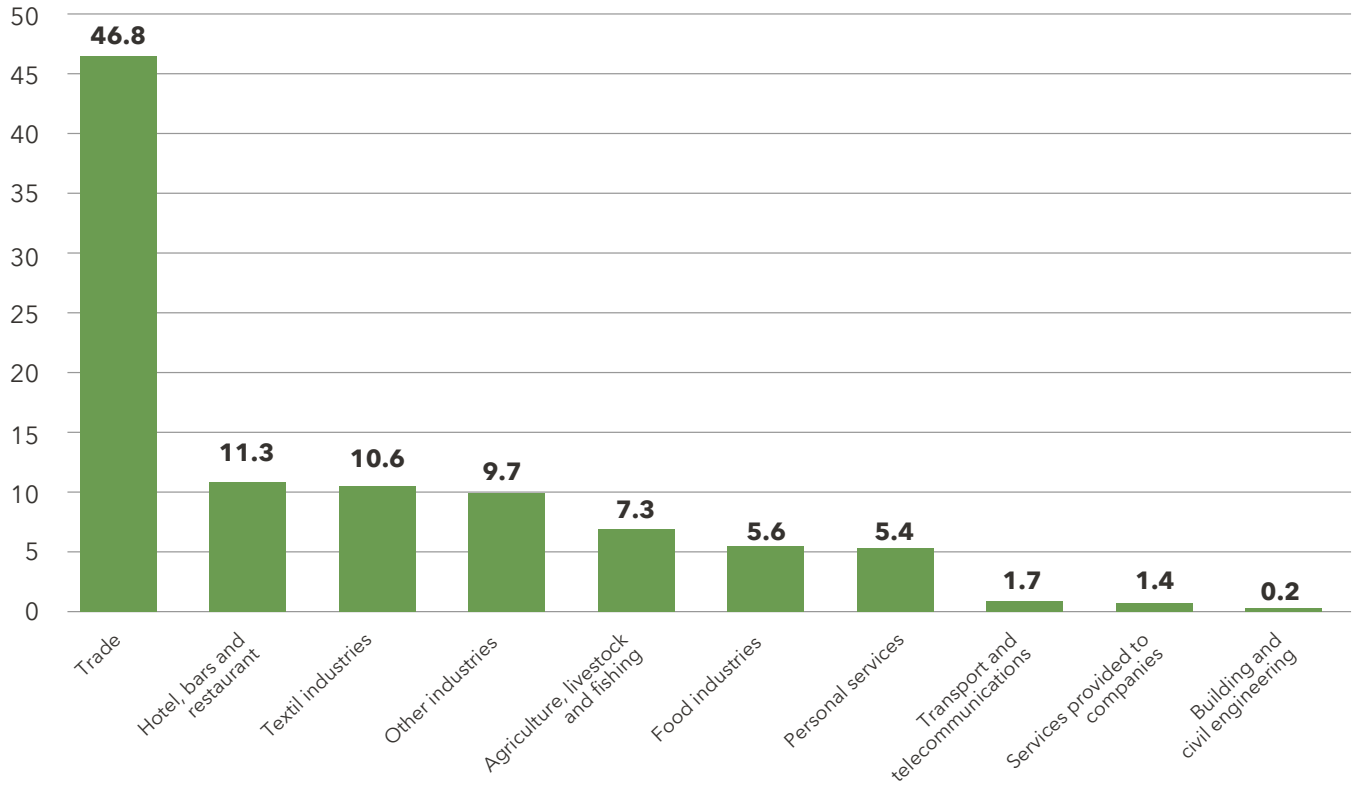
In brief, the department's agricultural assets are the availability of a large workforce (77% of the population is made up of young people under the age of 35); local expertise in traditional crops; diversity and suitability of soils for millet and groundnut cultivation; various forms of support from development partners; the presence of dynamic, fairly well-structured producers' organizations; the drive to diversify into market gardening; and the existence of markets.

As we said before, a high share of households surveyed in the baseline of the FAIR Sahel Project do not use any fertilizer or pesticide to manage pests even when they have experienced attacks. However, the ERASAN report (2015) showed that almost one person in two was food and nutritionally insecure, with a rate of 48% in Fatick Department (a rate considered high). The weight of the constraints on agriculture is well known and is having a major negative impact on production: difficulties in accessing inputs, particularly organic ones; outdated farming equipment; land degradation (wind erosion, water erosion, poor soil, and salinization); increasing salinization of water; rainfall deficit; low access to formal credit; low level of education in French; low access to public or project/NGO advice (peer-to-peer exchanges predominating); relatively low participation of farmers in producers' organizations; insufficient water resources and poor control, even if efforts have been made in this area in recent years; absence of processing units; and strong land pressure and difficulties for women in accessing land. For this last point, attempts have been made to bring women together to gain easier access to plots of land for market gardening, but access to land remains limited.

The key role of agriculture in the department's economy and region's economy

Labor force participation in the labor market is low (56.5%) (ANSD, EHCVM 2018/2019), although the share of employed workers in each economic activity is hard to estimate. In any case, the region's economy is dominated by agriculture, livestock, and fishing, despite the aspirations of young people to be offered other employment opportunities (according to the household survey of Fair Sahel). **Figure 8** (year 2016) shows that more than 85% of the working population is employed in agriculture, a rate that remains stable. Trade is the most dynamic activity, accounting for 59% of sales and 46.8% of the workforce. Other sectors, such as hotels, bars, and restaurants, which are linked to tourism, are of particular interest to the region's economic development. Despite these trends, economic diversification remains limited, especially in the industrial sector, which remains very weak in the department. The few industries that have been set up in the region are processing industries for fish, agricultural products, and salt.

Figure 8. Weight of different sectors (in percentage) in employment in the Fatick region for 2016 (ANSD, 2021).



The production of salt is constantly increasing. The Fatick region has considerable potential for salt production, given the proportion of its land covered in tannins. Its exploitation generates income for various stakeholders involved in transportation, iodization, packaging, infrastructure development, etc. This sector mainly recruits a female workforce estimated at more than 6,000 people, two-thirds of whom are organized in GIEs (economic interest groups). Recent investments (2021) include a table salt refining unit with an annual capacity of 150,000 tons, which provided 200 direct jobs and some 15,000 indirect jobs.

In 2019, however, most of the jobs created were in the construction sector (58.6%), followed by accommodation and catering (18.7%). The weight of informal employment remains high (89.7% in the department) and is due to the extremely low number of contracts signed. As a result, workers in informal enterprises do not benefit from social protection, and the proportion of enterprises registered with pension or social security (CSS) institutions is very low.

The Fatick region also offers significant tourism potential. As the cradle of the Serer culture, it abounds in cultural activities and is home to the last capital of the Sine kingdom (Diakhao), as well as several sites classified as historical monuments. Fatick also offers a rich array of tourist attractions, including numerous waterways, *bolongs* (the Saloum islands), and the Saloum Delta National Park, a renowned tourist and natural site. Tourism thus plays a key role in the region's economic fabric. The number of tourist arrivals increased from 2018 (18,564) to 2019 (20,385), a 9.81% increase. In 2019, the tourism infrastructure included 56 hospitality establishments with 562 rooms and 1,059 beds. The COVID-19 crisis obviously halted this dynamic, which is gradually picking up again. Ecotourism is also developing in the region. Despite this, the sector suffers from several problems: a lack of hotel and tourism training and support centers; a proliferation of irregular guides and establishments; and a lack of internal promotion of tourism, particularly for the enhancement of historical heritage. All too often, Fatick serves only as a stopover on the way to the Sine-Saloum delta. Related to this sector, the craft industry plays an important role in the region's economic and social development, with 4,843 artisans (including 1,282 related to art) registered with the Chamber of Trades in the department. The craft village in Fatick City plays an important role in promoting and selling craft products.

Supportive infrastructure

Access to electricity is relatively low (e.g., 47% of the households surveyed in Diouroup, 27% in Tattaguine, and 19% in Ndiob; Fair Sahel Baseline), while access to water is higher (83% of the households surveyed in Ndiob, 75% in Diouroup, and 60% in Tattaguine). **Figure 9** shows that the north of the department has more communes with no access to electricity than the south. Access to water, on the other hand, follows an opposite trend (**Figure 10**).

Figure 9. Rate of non-access to electricity by commune in Fatick Department in 2016 (ANSD, 2021; Piraux et al., 2022).

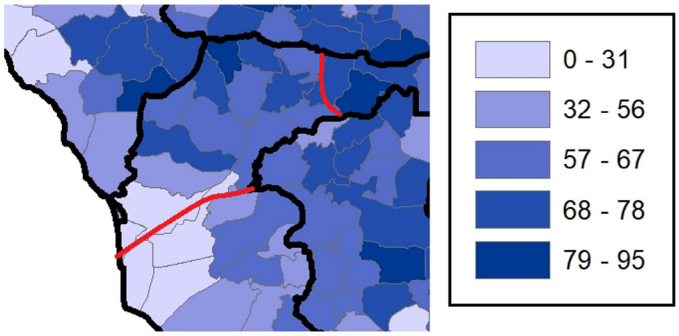
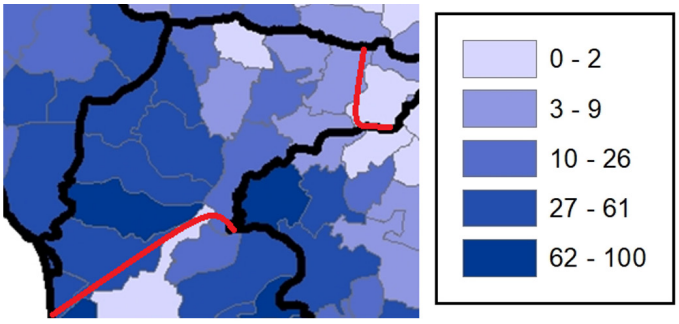


Figure 10. Rate of non-access to electricity by commune in Fatick Department in 2016 (ANSD, 2021; Piraux et al., 2022).



Road infrastructure is dominated by National Route No. 1 (RN1), which crosses the region from north to south. This major route, which spans the region, accounts for 43% of the region's paved roads.

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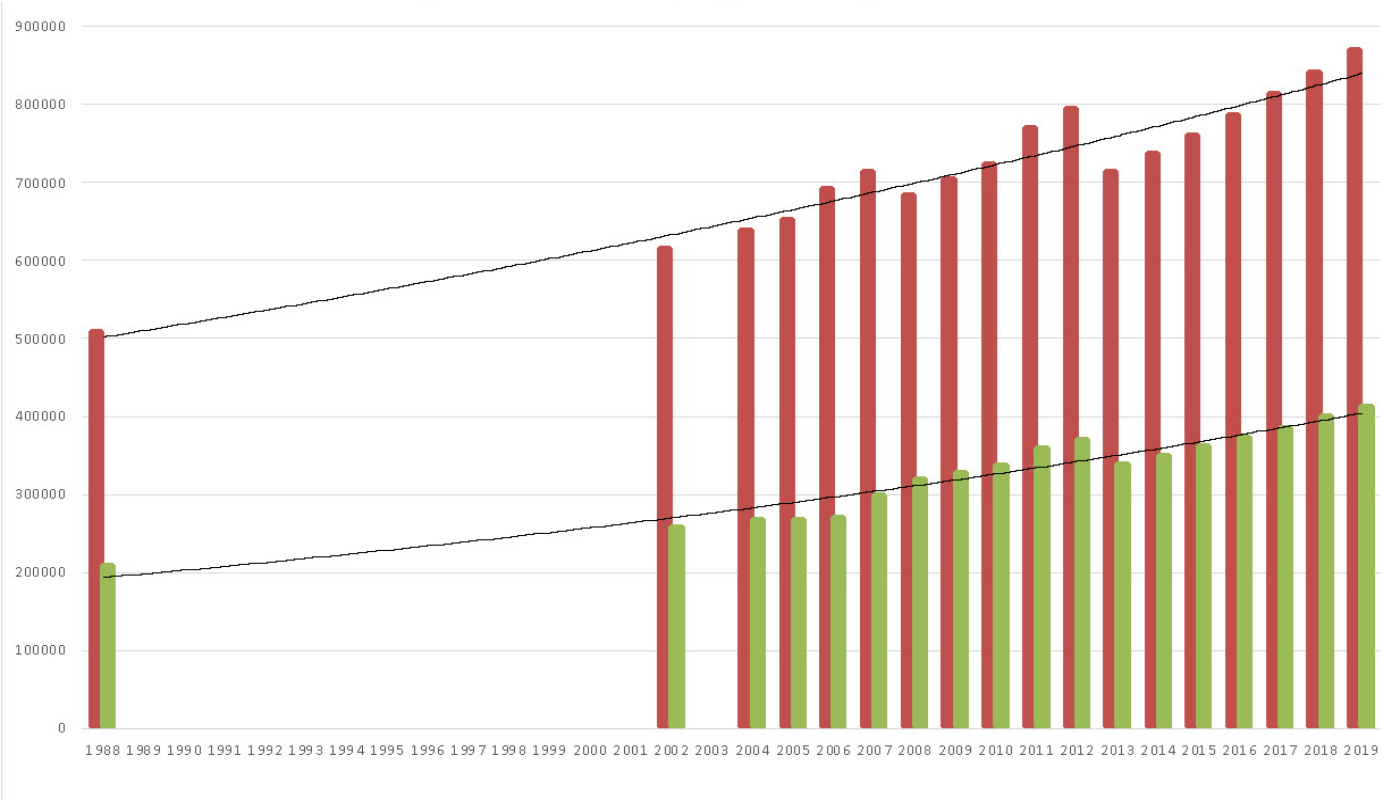
Social context

The department is characterized by its ethnic diversity and the variety of its customs and traditions. At the regional level, a majority of the population is Serer (55.1%), followed by Wolof (29.9%), Pular (9.2%), and Socé and Bambara (5.8%).

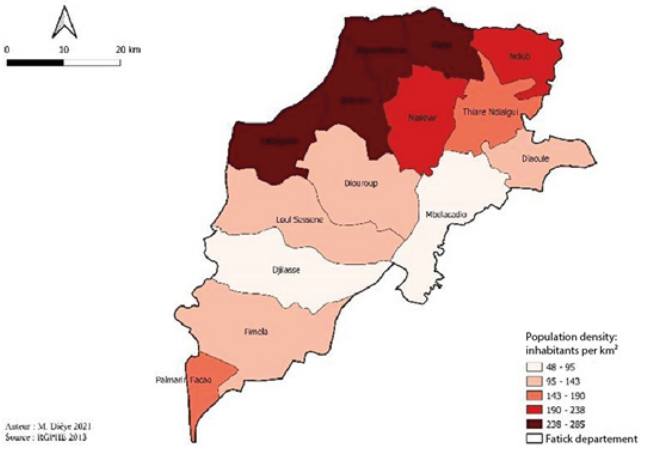
Within the region, Fatick Department is the most densely populated, with an estimated population of 413,300 in 2019. The proportion of rural dwellers is at 87% and remains stable over time. Fatick is the second least urbanized region in Senegal, with an urbanization rate of 15.5%. The department's population is growing faster than the region as a whole (see **Figure 11**). The population has doubled in 30 years because of a high total fertility rate of 5.4. The annual growth rate, estimated at 3.45%, is thus higher than the national average (5.50%).

Figure 11. Population trends in the region (red) and department (green) of Fatick (ANSD, 2021).



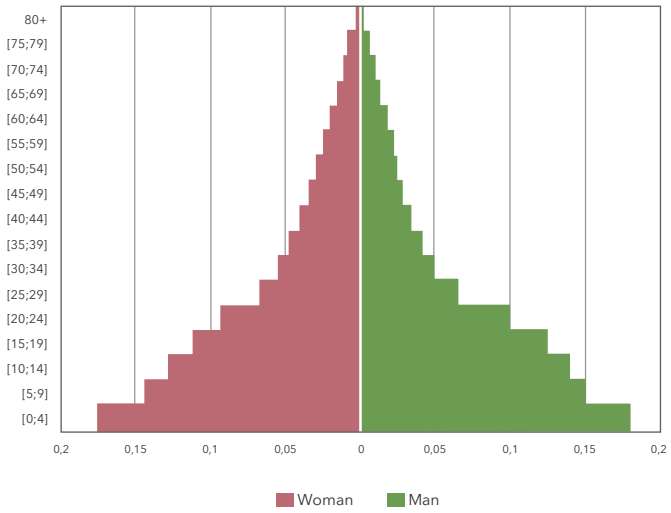
Average population density has risen from 101.0 to 156.2 inhabitants/km² in 15 years. However, this figure conceals considerable internal diversity. The geographical distribution of the population is highly uneven, with a higher concentration in the north of the department (see **Figure 12**, for 2013).

Figure 12. Population density by commune within Fatick Department (Dièye, 2022).



The age pyramid (**Figure 13**) illustrates the extreme youthfulness of the population, with children under 15 representing 49.3% of the population and over-65s only 4%.

Figure 13. Age pyramid for the Fatick region in 2019 (ANSD, 2021).



Source: *ANSD - RGPHAE Demographic projection 2019*

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This demographic increase represents a major challenge for the department in terms of expanding the consumer market for goods and services as well as satisfying social demand (health, education, employment, social protection, etc.). The strong demographic pressure in the north, where ecological conditions are less favorable, calls for specific action in this area.

Table 4 shows the main characteristics of access to education in the department for 2019. A total of 53.7% of the population of the Fatick region is literate (68.4% for men and 43.1% for women). The department has seen an overall increase in indices in recent years, whether in terms of the number of schools, pupil numbers, or school staff.

Table 4: Main characteristics of the education sector for Fatick Department in 2019 (ANSD, 2021).

2019	Pre-school	Elementary	Secondary
School-age population	7,634	80,380	46,967
Number of schools	157	347	98
Number of employees	397	2 400	1 851
Increase in establishments from 2018 to 2019 (in %)	12.6	3.3	3.2
GER (gross enrollment ratio)	12.4	84.9	59.3

The education sector faces other major difficulties, such as a lack of training for teaching and administrative staff; a shortage of teaching staff, especially at the elementary level; poor infrastructure, especially at the pre-school level; and poorly functioning management committees and councils.

The department has 164 health facilities. Although access to health posts in the region is more satisfactory than at the national level, Fatick lags behind the standards set by the World Health Organization (WHO) in terms of the ratio of health infrastructure to population (**Table 5**). The recent construction of the regional hospital has changed the health landscape in the department.

Table 5: Health indicators for Fatick Department in 2004 and 2019.

Indicator	2004	2019	WHO standards
Hbts/hospital	642,291	870,359	150,000
Hbts/health center	107,050	108,795	50,000
Hbts/health post	9,175	8,289	10,000
Hbts/health unit	2,327	4,605	
Hbts/doctor	49,407	29,012	9,000
Hbts/nurse	7,738	5,615	
Hbts/midwife	91,756	8,792	

The department, therefore, still faces several health challenges. In addition to backlogs in infrastructure and personnel, it suffers from a lack of specialties (radiology, surgery, pediatrics, gynecology, geriatrics) and qualified personnel (midwives, nurses, etc.), as well as outdated ambulances.

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In terms of public hygiene, the department suffers from a shortage of agents and a lack of ongoing training for them.

The poverty index, estimated at 49.2 in 2018, shows that almost half the population lives below the poverty line. The Gini coefficient of 0.285 for the same year reflects very strong inequality within the department (the index is 0.351 at the national level). Average household consumption expenditure was 408,979 FCFA in 2019, while the national average was 507,350 FCFA (ANSD, EHCVM, 2019).

The survey of 302 households in Diouroup, Ndiob, and Tattaguine (FAIR, 2022) shows that a real training deficit exists, as more than 90% of the farm heads have only an elementary level or less. Many young people migrate to the city, as in most rural areas of Senegal, but we have no precise numbers on this.

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Political context

In Senegal, the department is an administrative division that forms part of the country's political and administrative structure. Each department is made up of several arrondissements, which are in turn subdivided into communes and villages. The department combines both the state's deconcentration bodies, organized by a prefect and sub-prefects, the representatives of the public authority in the territory, and the decentralization bodies, since, with the new laws on decentralization in 2013, the department has become a territorial authority. A departmental council elected for a four-year term is responsible for implementing specific actions and local development projects, albeit with resources considered insufficient by these same bodies (Timera et al., 2023). Indeed, the departments have limited powers in relation to the central state. Their role is mainly linked to local governance and the administration of day-to-day services (local administration, security and policing, and social services such as education, health, and child protection).

Power relations in the ALL and local participation in policy-making decisions

Fatick is administered by a local governance structure that includes a prefect, sub-prefects, and local elected representatives associated with two local authorities (the department and the communes). Mayors and municipal councilors have strong power in terms of local development and resource management. As Senegal is a multi-party democratic republic with a pluralist political system, local elections are held regularly, giving citizens the opportunity to choose their representatives. Municipal elections particularly enable local communities to participate in politics by electing their mayors and councilors.

> "Mayors and municipal councilors have strong power in terms of local development and resource management.

These elected representatives are responsible for managing local affairs, deciding on municipal budgets, and making decisions that directly affect the daily lives of residents. Town council meetings are usually open to the public, allowing citizens to follow the debates and voice their concerns.

Power relations within Fatick Department are influenced by the stronghold of Senegalese President Macky Sall's political family, which has become a center of political power. Macky Sall is originally from Fatick, and his presence there has strengthened the region's political influence. This means that local people and elected officials in Fatick often

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have significant influence nationally (the mayor of Fatick, for example, is the President's chief of staff). In addition, as in many regions of Senegal, traditional power plays an important role in Fatick. Customary and religious leaders have a considerable influence on local life, particularly in terms of conflict resolution, community decision-making, and the transmission of cultural norms.

As part of participatory governance, local authorities in Fatick sometimes organize public consultations to discuss development projects, local policies, or issues of public interest. This allows the citizens to express themselves, ask questions, and contribute to decisions. Although progress has been made over the years regarding the participation of women in local leadership, challenges remain regarding women's access to local leadership positions, given their low representation, gender stereotypes, and local culture. Although women have been elected to local leadership positions in Fatick, progress toward gender parity in local politics remains a challenge. Local media, such as radio stations and local newspapers, provide information about local government activities, thus enabling citizens to stay informed and participate in an informed way in public debates. Civil society organizations, such as NGOs, community associations, and citizens' groups, play an active role in the political decision-making process in Fatick. They often work in partnership with local authorities to promote sustainable development, human rights, and other local concerns. As such, the DYTAEL is becoming a key player in the AE transition, given its dynamism and its ability to bring together stakeholders from the public and private sectors in a single governance instance.

Government support for the agricultural sector focuses primarily on subsidies for agricultural inputs and equipment. The Departmental Rural Development Services are under-resourced (Timera et al., 2023). Their missions of monitoring and coordinating agricultural development activities at the departmental level are therefore diminished. In terms of subsidies, an envelope of 2,213,880,000 FCFA was mobilized through the agricultural ministry as part of the funding for the 2019–2020 agricultural program. Fatick Department received a total of 1,672 tons of seed, 2,135 tons of mineral fertilizer, no plant protection products (although it had received 40 bags of 25 kg of powder PYRICAL 5 G the previous year), 400 seed drills, and 2 tractors. Seeds and mineral fertilizer remain the mainstay of government support. Support is nevertheless provided by several NGOs, notably in the field of agroecology.

Current state of agroecological principles in the ALL

Fatick Department is characterized by diversified production systems with, on average, more than three different crops cultivated according to a survey realized by the Fair Sahel Project (Sall et al., 2022) in three towns of Fatick Department (Diouroup, Ndiob, and Tattaguine). Trees play a major role and livestock are present within almost every farm surveyed – be it one horse or a cattle herd – and two-thirds of the households surveyed are also involved in non-agricultural activities. Synergy among trees, crops, livestock, and humans is quite developed: crops and trees are used to feed the livestock and the humans, and then trees and manure/compost are used to fertilize the soil. Indeed, compost and manure are commonly used as organic fertilizer. The Fair Sahel survey (Sall et al., 2022) reported that such organic fertilizer represents 90% of the soil management practices declared by the farmers. To manage soil fertility, groundnut, a leguminous crop, is grown by the vast majority of farmers. Moreover, although more than half of all households claim

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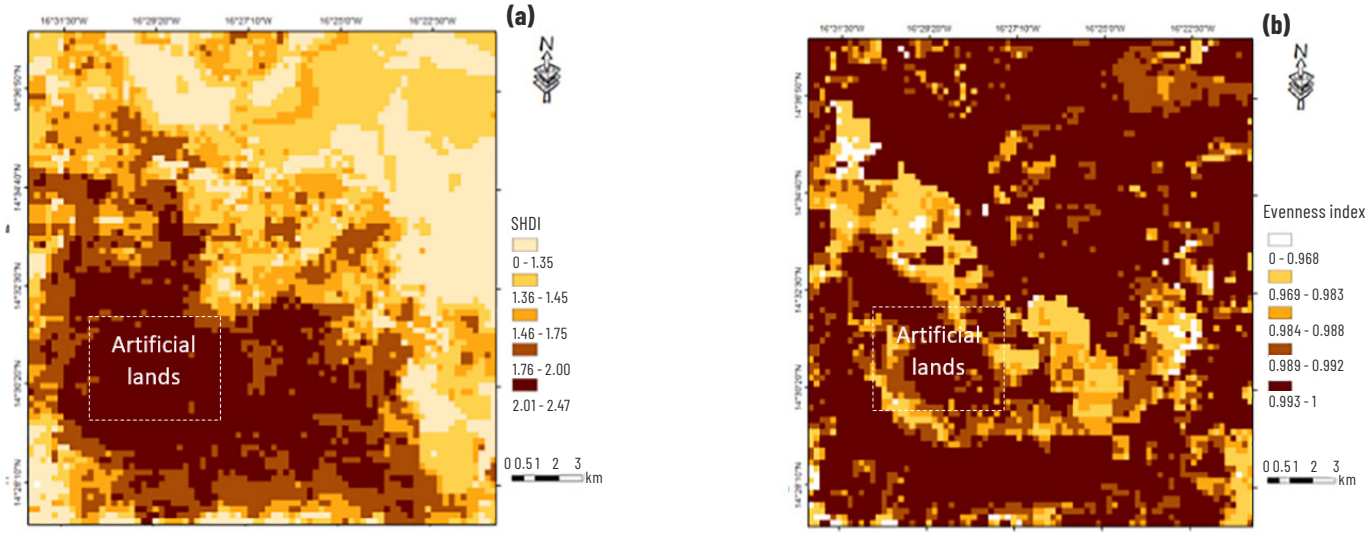
to be affected by pests and diseases, they generally do not apply chemical products and mainly use crop rotation as a method of pest control.

Trees are of major importance in the production systems of Fatick. The tree species that is the most encountered in the area is *Faidherbia albida*, a leguminous tree with inverted phenology that has great importance in soil fertilization by improving the mineral (nitrogen and phosphorus) and organic carbon balance of the soil. It has been recorded that this species represents 42% of the trees around Ngayokheme in Fatick Department (Ndao et al., 2022). The positive impact of this tree species is particularly true for cereals such as pearl millet. A study by Leroux et al. (2020) found that the most positive impact of *F. albida* on pearl millet was attained when its woody cover was 30% to 40% in the production area. However, in many areas of Fatick Department, especially in the north and east, such cover by *F. albida* is not attained and has even decreased partly because of the climate and partly because of human land use.

Trees also have many uses other than soil fertilizing. Trees are traditionally used to feed cattle and humans; for medicine, firewood, and construction; to fight against erosion, etc. Trees such as baobab are important for food sovereignty and livelihood. The closer to the inhabitants, the more diversified the tree park becomes. Therefore, humans are proven to have a positive impact on species diversity. The anthropic impact on trees is also seen in their evenness. Areas with the highest number of different tree species are also where they are less even in their spatial distribution. Even if the areas surrounding the residential areas are among the most diversified in terms of tree species, a few species dominate in number of individuals, thus showing a selection by humans of the tree species with the most cultural importance near their house (see **Figure 14**).

Figure 14. The Shannon diversity index (modified) (a) and Pielou's evenness index (modified) (b) (Ndao et al., 2022).



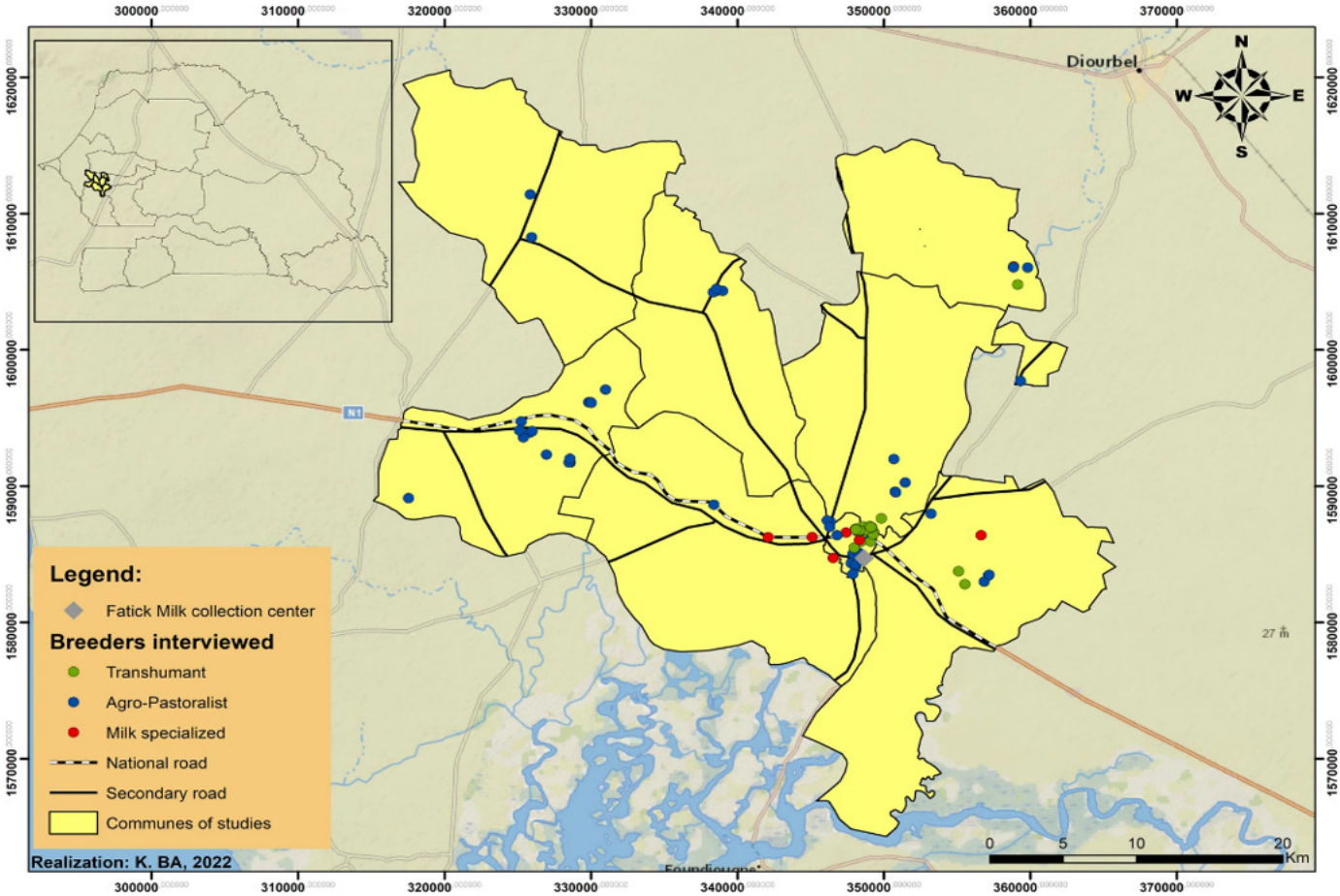
Crop diversity is quite variable and is influenced by the intended use of crops (self-consumption or sale) and by gender. A study carried out in two villages surrounding Niakhar (Labeyrie et al., 2023) on the seed provisioning network of farmers showed a variety of sourcing depending on the use of the seeds. Seeds destined for growing crops for food production are sourced through a variety of channels (market, peers, legacy), whereas seeds destined for other uses are sourced through only one channel – different depending on the type of seed. Furthermore, women usually have less latitude when sourcing seeds than men and prefer buying seeds from other women.

A difference in the type of cattle raised depending on the gender also exists: women are more prone to raising small ruminants, and men, large ruminants. Livestock are often a means of diversification to produce meat and dairy – traditionally produced by men and then processed and sold by men. Dairy cattle, especially, have recently been focused on and crossbred with exotic cattle such as Montbéliarde and Holstein in order to produce more milk. However, the temporal irregularity of milk production hinders the development of milk collection centers and dairy processors in Fatick. This irregularity is caused by the seasonality of production, with twice as much milk collected in January than in July (Hanabakize et al., 2022), but also by the growing difficulties in accessing pasture lands for cattle (because of soil salinization and drought).

> "Livestock are often a means of diversification to produce meat and dairy – traditionally produced by men and then processed and sold by men.

Regarding animal health and welfare, in Fatick Department, a majority of the herders are either transhumant or agro-pastoralists, and only a few are specialized in milk production with intensified production systems. Thus, cattle are mainly raised outdoors either through transhumance, with a small part of the herd stationary for milk production near milk collection centers or relatively stationary (roaming, attached, etc.) (see **Figure 15**). Furthermore, herds are often composed of a combination of many species.

Figure 15. Location of interviewees by category of livestock farmer and local milk collection center in the Fatick region of Senegal (Hanabakize et al., 2022).



The frequent interactions among animals from different herds increase the transmission of diseases. For example, in a study by Gahn et al. (2022), bluetongue virus was revealed to have a seroprevalence of 72.6% in small ruminants nationally. Nevertheless, the prevalence of different cattle diseases is variable. Indeed, brucellosis prevalence in dairy herds of Niakhar is less than 0.04%, whereas it is 2.0% in Dakar (Musallam et al., 2019).

The use of chemicals is globally low but variable depending on the level of education, access to shared knowledge on AE practices, level of finances of the household, and a town's dynamic. Thus, in the Fair Sahel survey (Sall et al., 2022), the reported use of chemical fertilizer varied from 68% to 84% of the households. Chemical fertilizer is often used in addition to organic fertilizer. Furthermore, it has been shown that, in the pearl millet–groundnut system, chemical fertilization is more efficient when combined with manure (Tounkara et al., 2020). Yet, in some places, the exclusive use of chemicals is important (49% of the households of Tattaguine). The use of chemicals for pest control is less predominant, with pest control being mainly done through crop rotation. The FAIR survey (Sall et al., 2022) found that 50% of the farmers in Fatick already implemented at least three agroecological practices, which is significantly higher than in the other departments (20% in the other departments). Half of the farmers surveyed did not discuss the problems they were dealing with in their farming activities, barely 20% received advice on inputs, and less than 5% had contact with ANCAR, the public farm advisory center.

In terms of participation, producers' organizations (POs) are almost everywhere in the department, with generally at least one household member belonging to a PO (Sall et al., 2022). Women's organizations are also present in Fatick. In addition to POs, several NGOs and research projects involve farmers in agricultural activities linked to agroecology (Fair Sahel Project, ENDA Pronat, Agrisud, etc.). These organizations and project participants, especially POs, are a strong means of sharing and co-creation of knowledge for farmers. The Fair Sahel Project showed that the level of adoption of agroecological practices (such as crop diversification, fairness, or use of chemicals) was correlated with the degree of involvement of farmers in producer organizations and their level of education.

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Concluding remarks

The agroecological strategies developed by farmers in Fatick Department is more by default rather than by choice. Apart from a few atypical cases that are quite committed to organic farming, the majority of those using minimal external inputs or maximizing resource optimization are doing so because of financial constraints such as limited cash flow or insufficient capital (land, assets). Women who face greater resource constraints tend to adopt more agroecological practices than men. However, some municipalities are more committed to agroecology than others because of the strength of local collective action, and young people appear more concerned about agroecology, but face insufficient support from the government and agricultural programs.

Some progress has been made with practices that have already been implemented, but considerable room for improvement still exists. The level of implementation of agroecology today is not up to the challenges that the department is facing. Preserving natural resources and restoring resources (with the integration among trees, livestock, and agriculture) are a major challenge for the whole area (e.g., fertility of soils in the tree park). Improving yield and productivity at a territorial scale and diversifying and increasing the value of the local food system to make rainfed agriculture attractive represent a path of transition that should be favored. Indeed, the department is expected to double its population within the next 30 years, with demographic forecasts predicting an average annual increase of 3.4% per year until 2035 (ANAT, 2020). The estimated population of the department will therefore be 707,900 in 2035. This obviously raises complex concerns in terms of development if we want to avoid emigration by young rural people and feed cities.

On the other hand, climate change will make it more difficult to achieve these objectives of food security, poverty reduction, and resource preservation, which is why we need to innovate to improve the resilience of the farming systems.

Reinforcing technical, social, organizational, and institutional innovations is the path that DYTAEL is taking with its action plan, and which we are accompanying by doing the following:

- Supporting the emergence of local AE projects (linked production and restoration) through local initiatives with consolidated food chains.
- Recognizing DYTAEL by local stakeholders for dialogue and its legitimacy in the AE transition.
- Supporting decision-makers and stakeholders in drawing up and implementing public policy to ensure the success of AE, with local authorities being aware of the challenges for the future of Fatick and the implications for Senegal.

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