

Sikasso and Koulikoro - Haut Niger Landscape, Mali

LandScale Baseline Assessment

2023-06-22

About this Report

Between October 2021 and April 2023, SNV undertook a landscape baseline assessment using version 0.2 of the LandScale assessment framework and guidelines. This report describes the key results of the assessment.. It was validated by the LandScale Team.

The Sikasso and Koulikoro landscape is located in Haut Niger, in the Southern part of Mali, and covers approximately 100,000 square kilometers. The local population consists mainly of farmers and herders. This assessment covers four pillars: natural ecosystems, human well-being, governance and production.

To assess the natural ecosystems pillar, SNV's assessment team mainly used remote sensing imagery, analyzing 11 Landsat images from 3 different years (2000, 2010 and 2020) and statistics from the Ministry of Agriculture and the Ministry of the Environment. The maps and statistics the assessment team obtained provided an overview of the land use and land cover characteristics, patterns and temporal variations between 2000 and 2020.

Indicators related to human well-being were assessed using census reports and other statistics from the national statistical bureau (INSAT). For the production pillar, the assessment team used statistics provided by the cotton company of Mali, CMDT, and conducted a literature review.

Citation

Netherlands Development Organization (SNV) 2023.

LandScale Baseline Assessment for Southern Mali (Sikasso and Koulikoro) - Haut Niger Landscape.

Acknowledgments

This evaluation was funded by the Dutch Fund for Climate and Development (DFCD).

The assessment team consisted of SNV members (Maimouna Karim Sanogo and Harko Koster) and external consultants (N'dji Jacque Dembele and Bilaly Tamboora). Mali government agencies in charge of agriculture, water and forests, the environment, sustainable development, hydraulics, health, and territorial communities provided the necessary data and documentation. The assessment was reviewed by the following local reviewers: Mamadou Goumane, Souleymane Traore, Salifou Poudiougou, Lamine Sanvane, Mamah Diarra, Abdoul Dadri Toure.

LandScale team conducted training and validated each step of the assessment, including this report.



Contents

Executive

Summary

The Landscape

Landscape Partners & Stakeholders

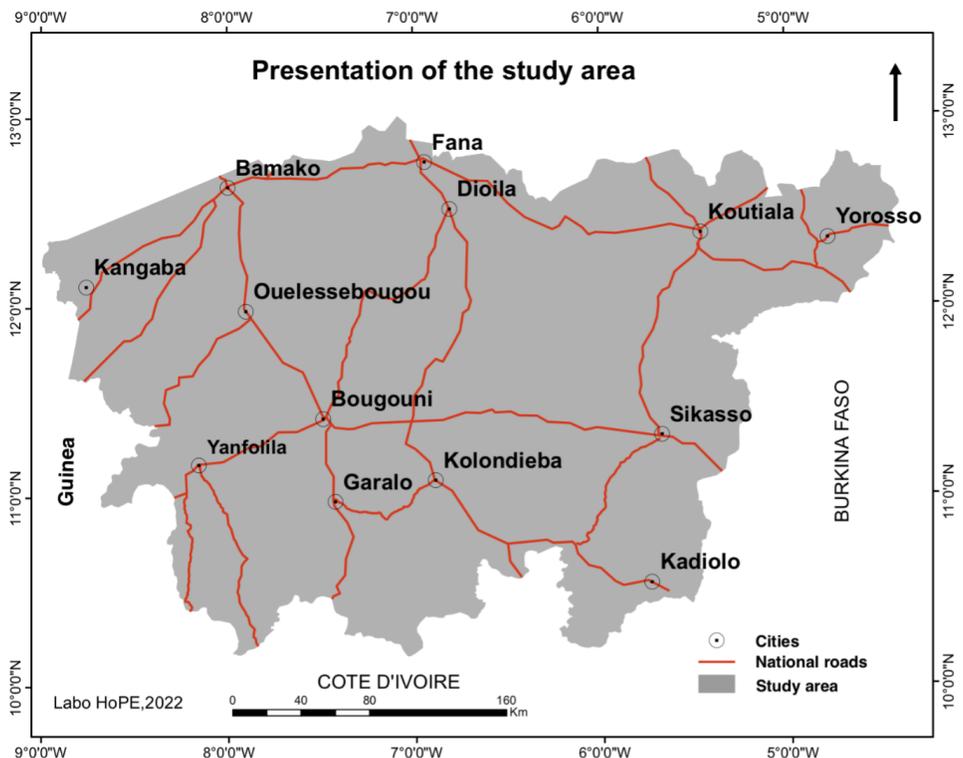
Featured Results

Conclusion

The Sikasso and Koulikoro Landscape in Mali is drained by the Niger River and its main tributary, the Bani River. This area is also known as the Upper Niger River. The climate is tropical and humid, with annual rainfall ranging from 900 mm to 1,200 mm. This landscape is a vital biodiversity reserve for Mali. The area also contributes to the national economy through agriculture, forestry, and gold mining. Agriculture includes commercial crops like cotton as well as subsistence farming based on maize, sorghum, millet, beans, and peanuts. In addition to rainfed agriculture, there are many scattered small, irrigated fruit orchards, mainly oranges, lemons and mangoes. This landscape is one of the core providers of potatoes and products from subsistence farming to the national economy. In addition, wooden savanna and reserve forests along the rivers provide wood, firewood, and charcoal to the local communities.

The population has been growing very fast, up to 3% per year, exerting pressure on natural resources. Agricultural land is expanding exponentially, whereas the forests and wooded savanna areas are shrinking. Although agricultural lands have been expanding, social well-being remains low and local communities need more income. Actions are required to improve the management of natural ecosystems and restoration by local communities, to build an efficient landscape governance system and to provide basic facilities benefitting the local population.

Fig 1. Landscape boundary



Mali-Sud is the Southern part of the Republic of Mali, located between 9°01'22" and 4°12'53" West, 10°10'50", 12°41'56" North. This area is part of the Sudanian climatic zone of West Africa and is characterized by two main seasons: a rainy season from May to October and a dry season from November to April. The annual rainfall varies from 900 mm in the Northern edge of the area to 1,200 mm in the South. The mean temperature is around 26°C but can reach 45°C in the hottest month in April and 14°C during the coldest month in December. This landscape is drained by the Niger River, the third biggest river in Africa and its tributary, the Bani River and constitutes the upper valley of the Niger and Bani Rivers. The vegetation is of the African savanna type, characterized by scattered trees, shrubs and relic forests along rivers. The bioclimatic characteristics of the region offer opportunities for agriculture and herding, which are the main activities in the landscape.

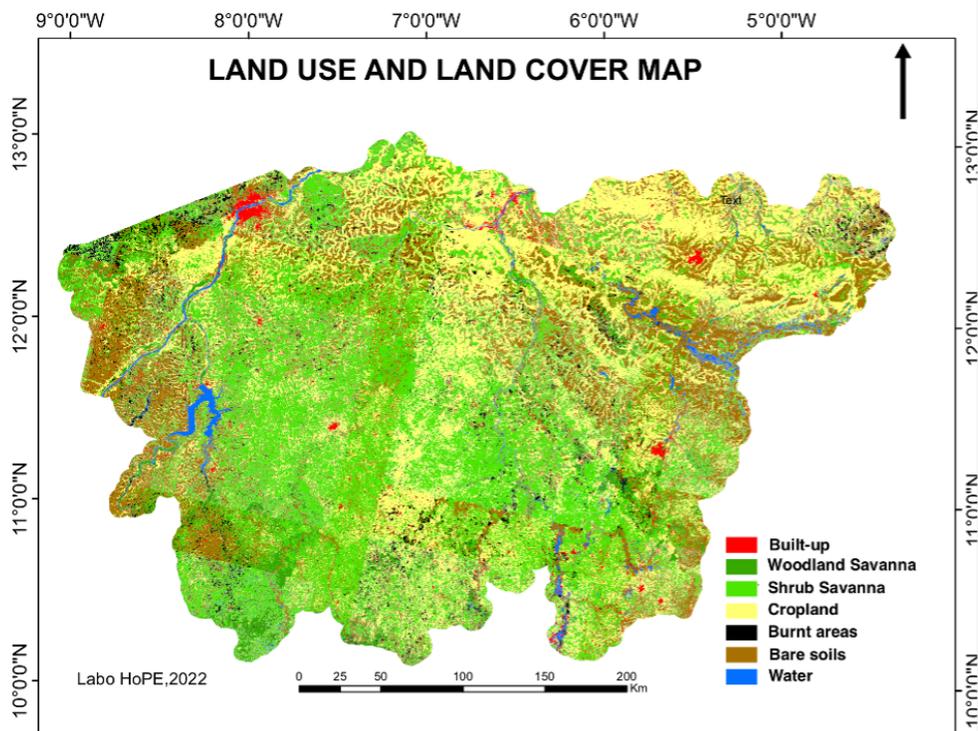
Agricultural crops include cotton, sorghum, millet, corn, peanuts, beans, yams, sweet potatoes and rice. These products are grown during the rainy season. During the dry season, the region's population practices shifting agriculture. They grow potatoes, cabbage and tomatoes and rear cattle, sheep, goats, donkeys, horses and poultry.

In addition to agriculture and livestock farming, forest products are another important resource in the landscape, providing both timber and firewood as the main source of energy for local communities.

The Mali-Sud landscape area is also well known for its mining activities. Two types of mining activity coexist in the region: mobile artisanal gold mining, which takes the population from site to site as alluvial gold is discovered, and industrial gold mining, carried out mainly by large foreign companies, in Syama, Morila or Nampala for instance.

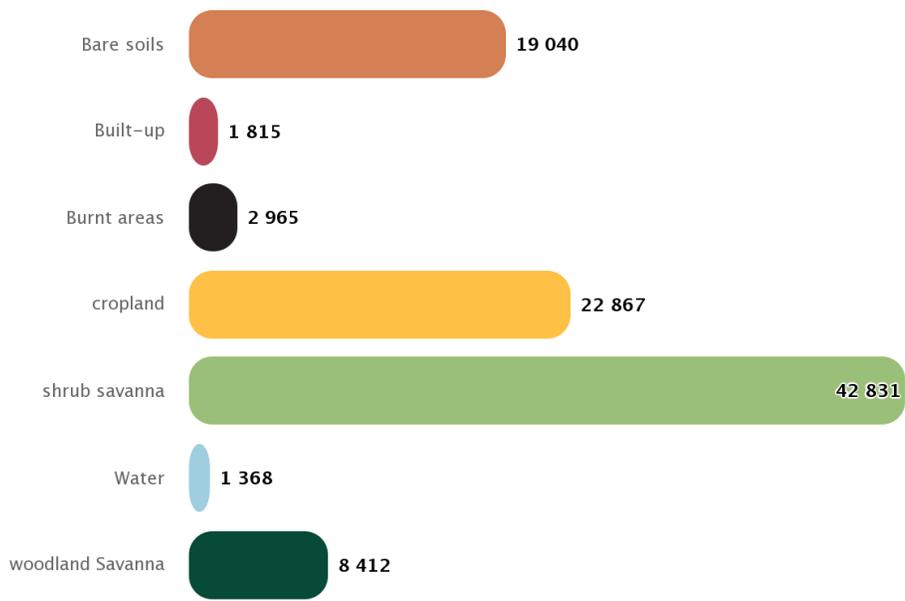
Tourism was also an important source of income for local people and municipalities. Hotels and restaurants were very active before Mali's multi-sector crisis, which reduced the number of international tourists visiting the country. Local communities visit tourist sites such as the Farako waterfalls, the Missrikoro caves, the Tata of Sikasso, and many others.

Fig 2. Landscape land cover map, 2022



Seasonal variations in rainfall are the main threat to the region's economic activities. Over the past 50 years, precipitation has fluctuated between a maximum of 1,200 mm in 1973 and a minimum of 550 mm in 1984. All rainfall data for the area show that precipitation has increased since 2000. However, the temporal distribution of rainfall poses problems for agriculture, leading to poor crop growth and famine. Famine in the region is also exacerbated by the influxes of locusts and migratory birds, impacting natural vegetation and crops. The climatic threats are aggravated by soil fertility loss and erosion causing a decrease of productivity and crop yield. Many formerly cultivated soils are now uncultivated. In addition, the forest area is shrinking. The pressure of population growth and market growth is visible in the landscape, as the need for cultivated land and firewood has increased. Social challenges and trends reveal the dislocation of many social structures. Large African families are disappearing in favor of small families owning individual plots of land. This dislocation is caused by conflicts over land and management of farm income. Local governance is characterized by problems of mismanagement, corruption, weak enforcement of laws and regulations, and incivility.

Fig 3. Land-use present in the landscape, in km²



Natural Ecosystems



The landscape's natural ecosystems are made up of shrub savannas (43%) and wooded savannas (8.5%). These land uses cover 42,831 km² and 8,412 km² respectively (see Figure 3). Wooded savanna is found mainly in forests protected for conservation purposes and in forests along major watercourses.

The assessment results show that only 4.03% of the landscape are protected, representing 400,046.58 ha protected over a total landscape area 9,931,400 ha.

Communities



The population of the landscape is 3,854,755 inhabitants (INSAT, 2011a), with an average density of 39 inhabitants per km². Analysis shows the importance of the young population (54%) compared to the adult population (42%) and the elderly (4%). 57% of the population is in need of healthcare (under 14 and elderly). The working population is predominantly rural. The urban population represents only 11.2%. The main ethnic groups are the Bambaras, Sénoufos, Miniankas, Bwas, Dogons and Samos.

Production

The Sikasso and Koulikoro Landscape in Mali is crisscrossed by the Niger River and its main tributary, the Bani River. This area is also known as the Upper Niger River. The climate is tropical and humid, with annual rainfall ranging from 900 mm to 1,200 mm. This landscape is a vital biodiversity reserve for Mali. The area also contributes to the national economy through agriculture, forest, and gold mining. Agriculture includes commercial crops like cotton as well as subsistence farming based on maize, sorghum, millet, beans, and peanuts. In addition to rainfed agriculture, there are many scattered small, irrigated fruits orchards, mainly oranges, lemons and mangoes. This landscape is one of the core providers of potatoes and garden farming products to the national economy. In addition, wooden savanna and reserve forests along the rivers provide wood, firewood, and charcoal to the local communities.



3,490,569
tons

The population has been growing very fast, up to a 3% per year, exerting pressure on natural resources. Agricultural land is expanding exponentially, whereas the forests and wooded savanna areas are shrinking. Although agricultural lands have been expanding, social well-being remains problematic and local communities need more income. Actions are required to improve the management of natural ecosystems and restoration by local communities, to build an efficient landscape governance system and to provide basic facilities benefitting the local population.

Agricultural production is divided between cash crops, such as cotton, and the food crops that feed the population. The main crops used to feed the local population are maize, millet, sorghum, rice, peanuts and beans. Surplus production is sold on local markets. Cotton is sold to the CMDT cotton company. Cultivated land represents 2,286,700 hectares, or 23% of the total area. Cotton occupies 584,850 hectares in 2019, sorghum 206,578 hectares. Millet covers 240,381 hectares, while corn covers 740,032 hectares. Thus, cotton occupies 26% of cultivated land, corn 32%, millet 11%, sorghum 9% and rice 5%. The remaining 17% is divided between less productive crops such as groundnuts, fonio and beans. Together, these agricultural activities produced 3,490,569 tons of crops. Livestock farming is also important. An estimated 10,091,536 chickens, 1,549,000 cows, 1,162,180 goats, 970,644 sheep, 72,104 donkeys, 10,299 pigs and 2,030 horses live in the landscape.

The Dutch Climate and Development Fund has been set up to mobilize private investment for sustainable development, including climate change mitigation and adaptation measures. This initiative is in line with climate change adaptation policy, which emphasizes the necessary contribution of the private sector to the fight against climate change through the Nationally Determined Contribution (NDC). Such initiatives, when synergized with the activities of other players in the study area, have the potential to foster effective economic development.

There is no formal partnership between SNV and other organizations or structures through the DFCD fund in the landscape. However, many development activities are carried out by the State's technical services in various development sectors (agriculture, water and forestry, health, local authorities, etc.) and take climate change adaptation and mitigation into account. In addition, through various climate resilience projects/programs, international and national NGOs are working primarily on strengthening the technical and organizational capacities of communities in the landscape.

This landscape assessment could be the subject of a multi-stakeholder partnership for resilient economic development.

During this baseline landscape assessment process, the assessment team selected a total of 49 metrics, covering 29 indicators, divided between 4 pillars. Some metrics could not be properly assessed due to lack of information and data. Of the 29 indicators, 13 were actually assessed. This section highlights the key findings related to these 13 indicators.

The 29 indicators selected are the following:

○ CORE
 ○ LANDSCAPE-DEPENDENT
 ○ OPTIONAL
 ○ CUSTOM INDICATOR
 ✓ RESULT AVAILABLE



Ecosystems

Conserve and restore natural ecosystems

- Effective conservation and protection of natural ecosystems ✓

- Natural ecosystem conversion ✓

- Natural ecosystem degradation ✓

- Ecosystem restoration ✓

Protect and restore biodiversity

- Threats to species ✓

- Biodiversity habitat conversion ✓

- Biodiversity habitat protection ✓

Maintain and enhance ecosystem services

- Water quantity ✓

- Water quality ✓

- Agriculture, forestry & other land use (AFOLU) sector GHG sources and sinks ✓



Human Well-Being

Improve standard of living, especially for vulnerable and/or marginalized groups

- Household income & assets ✓

- Health & nutrition ✓

- Education ✓

- Water, sanitation & hygiene ✓

- Basic infrastructure ✓

Respect, protect, and fulfill human rights

- Women's rights ✓

- Indigenous peoples' and other marginalized groups' right ✓

- Forced labor ✓

- Workers' rights ✓

- Other human rights ✓

○ CORE
 ○ LANDSCAPE-DEPENDENT
 ○ OPTIONAL
 ○ CUSTOM INDICATOR
 ✓ RESULT AVAILABLE



Governance

Recognize and protect rights to land and resources, and reduce related conflicts

Land tenure ✓

Land conflicts ✓

Promote transparency, participation, inclusion, and coordination in landscape policy, planning, and management

Land-use plan adoption & enforcement ✓

Coordination of government agencies in land-use policy, planning & management ✓

Stakeholder participation and inclusion in land-use policy, planning, and management ✓

Illegality and corruption related to land and resources ✓

Climate change vulnerability and adaptation ✓



Production

Promote regenerative, agricultural, agroforestry, and tree production systems

Agricultural, agroforestry & tree plantation productivity ✓

Input use efficiency in agricultural, agroforestry & tree production systems ✓

Validated Result: Effective conservation and protection of natural ecosystems

Analysis of data obtained from the Director of Freshwater and Forest Resources determined that around 400,048 hectares were effectively protected as “forests classées” covering 4% of the total landscape.

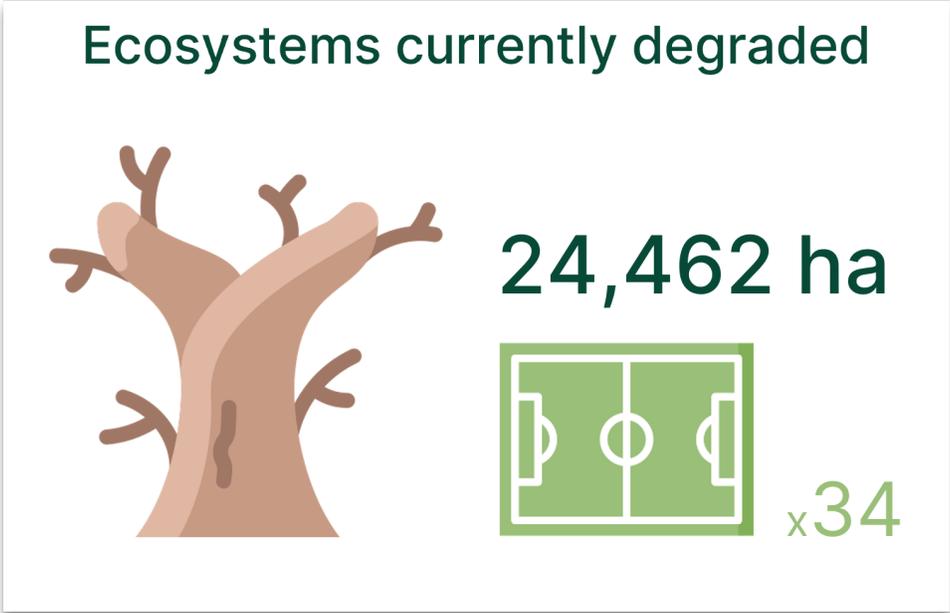
Validated Result: Natural ecosystem conversion

The land use and land cover map shows that between 2000 and 2022, about 1,810,900 hectares were converted from agricultural land to bare soils and from wooded savanna and shrubland to cropland. That accounts for 18% of the area. That represents 9,545 hectares per year, or an annual conversion rate of 0.9%.

Validated Result: Natural ecosystem degradation

Between 2000 and 2022, 24,462 hectares were degraded, equivalent to 0.25% of the landscape or 1,223 hectares degraded per year (see Figure 4). No landscape restoration actions were observed in the landscape during the observation period.

Fig 1. Fig 4. Area of ecosystems currently degraded



Validated Result: Biodiversity habitat protection

The landscape assessment team was unable to locate information on threatened species and natural ecosystems. However, the assessment determined that 242,183 hectares, equivalent to 0.024% of the landscape's important biodiversity areas have been designated and managed for long-term protection. In the landscape, there do not appear to be any important biodiversity area subject to conservation through other effective conservation measures (OECMs).

Validated Result: Water quantity

Water quantity was estimated using the discharge of the Upper Niger River itself and of the Bani River at the Koulikoro and Douna stations. The average discharge was 1,330 m³/s for the Upper Niger River and 423 m³/s for the Bani River. These discharge rates are average values. Discharge rates of both rivers vary considerably depending on rainfall. The effect of the dam on water flow was also assessed. There are many small dams in the landscape, but the main dam affecting the Niger River is the Selingué dam located on the Sankarani River. The dam's input is 79.5 million m³/year. At the same time, the ratio of water withdrawals (outgoing cubic meters) is 40 million m³/year. The average number of flow interruptions is 150 days/year, corresponding to the dry season from December to April.

Validated Result: Water quality

Water quality in the river course is measured by the presence of solids suspended in the water and chemical pollutants. This landscape assessment determined that the average suspended solids were 27 mg/l. The assessment team was not able to assess chemical pollutants due to data deficiency.

Validated Result: Agriculture, forestry & other land use (AFOLU) sector GHG sources and sinks

The terrestrial carbon sequestration rate for the landscape is 12.4 tCO₂e/ha/year, while the average GHG emissions rate is about 265 tCO₂e/year, with extremes between degraded areas (103 tCO₂e/year) and forested areas (427 tCO₂e/year).

Validated Result: Household income & assets

The results presented in this section are based on national figures. The assessment team could not access any landscape-specific data about household income and assets.

The incidence (rate) of poverty in Mali, i.e. the proportion of the Malian population without access to the XOF 263,694 necessary to meet their basic needs, is estimated at 42.3% in 2019 compared with 43.8% in 2018. Poverty is widespread in country rural areas, where more than half the population is poor (52.0%).

Male-headed households contain more poor people than female-headed households (43.7% against 10.0%). The investment effort required to eradicate poverty, measured by its depth, i.e. the average collective deficit of expenditure of the poor in relation to the poverty line for the whole population, is estimated at 687.25 billion CFA francs. The percentage of the population living below the local poverty line is very high. There is a disparity between men and women. More men live below the poverty line (52%) than women (43.7%).

Validated Result: Health & nutrition

The percentage of undernourished children is calculated on the basis of the cumulative data for both genders divided by two. The average rate of undernourished children is 16.15%, 18.8% for boys and 13.5% for girls. The data show a predominance of undernourished boys. The 2028 demographic and health survey report shows that the child mortality rate is relatively low, 0.7% for girls and 0.6% for boys.

Validated Result: Education

6.23% of school-age girls and 6.09% of school-age boys do not attend school. The overall percentage of adult males and females who have completed their education is 26.2%. More men (34.55%) than women (17.85%) have studied.

Validated Result: Water, sanitation & hygiene

27.25% of households don't have access to drinking water within a 15-minute walk from their home (see Figure 5). Significant differences exist between the two regions (38.3% in Koulikoro and 16.2% in Sikasso). There is a lack of official data on sanitation facilities in the landscape.

Fig 2. Fig 5. Access to safe drinking water



Validated Result: Basic infrastructure

The overall percentage of households without electricity in the landscape is 14.95%. This percentage breaks down as follows: Koulikoro (17.5%), Sikasso (12.4%). The overall percentage of households whose roof, walls and floor are mainly made of rudimentary materials is 70.18%: Koulikoro 68.06% and Sikasso 72.30% (INSTAT 2009).

63.65% of households based in the landscape use manure, wood, charcoal or coal as a fuel for cooking or heating. This percentage varies between the 2 main regions of the landscape, Koulikoro region (72.9%) and Sikasso region (54.4%). Within each of these region, the percentage also gets higher near forest areas

Validated Result: Agricultural, agroforestry & tress plantation productivity

The average yield was analyzed for the main crops listed in Figure 8. Corn and rice have the highest yields per hectare, at 2862 kg/ha and 2168 kg/ha respectively, followed by cotton at 1016 kg/ha. Millet and sorghum have the lowest yields, at 843 kg/ha and 976 kg/ha respectively.

The average productivity of pasture-raised animals by type was measured using the livestock unit per hectare. The average result is 0.113 animals/ha, but the results differ from animal to animal: cows 0.30 animal/ha, goats 0.21 animal/ha, sheep 0.18 animal/ha, donkeys 0.012 animal/ha, pigs 0.002 animal/ha and horses 0.0003 animal/ha (see Figure 8).

Forest productivity depends on water availability. Therefore, the productivity of forest plantations was measured using three categories of precipitation ranges. Forest productivity was calculated as follows: 1.5 m³/ha for rainfall ranging from 800 mm to 1200 mm, 1.65 m³/ha for rainfall ranging from 1200 mm to 1600 mm, 0.750 m³/ha for rainfall ranging from 400 mm to 800 mm.

Fig 3. Fig 6. Percentage of cropland by crop

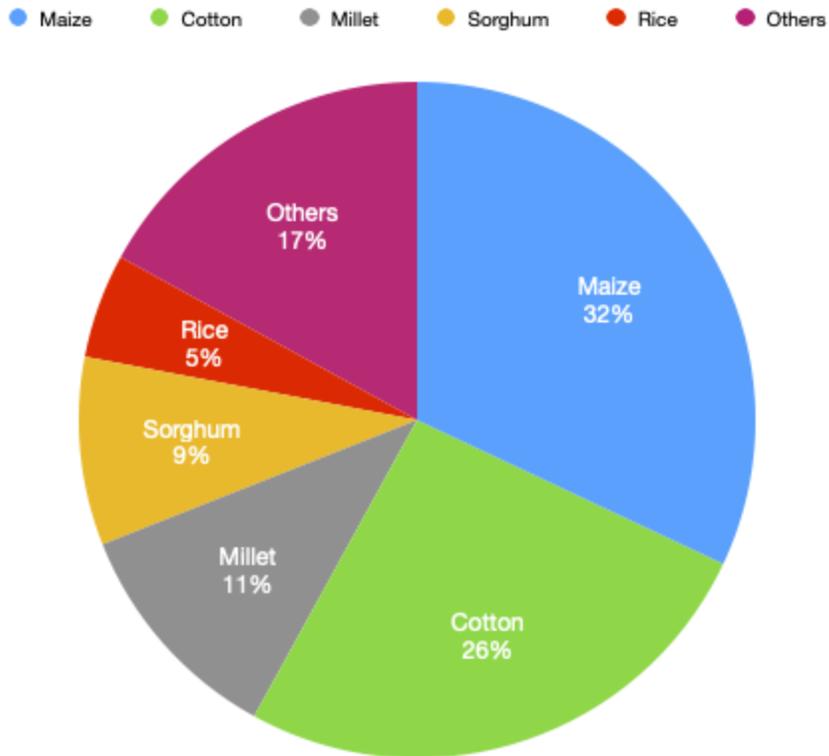


Fig 4. Fig 7. Productivity by crop (kg/ha)

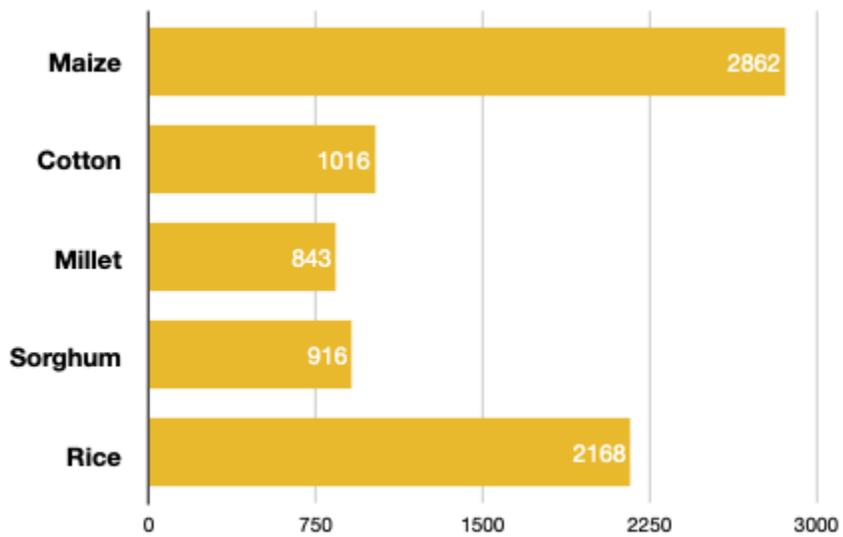
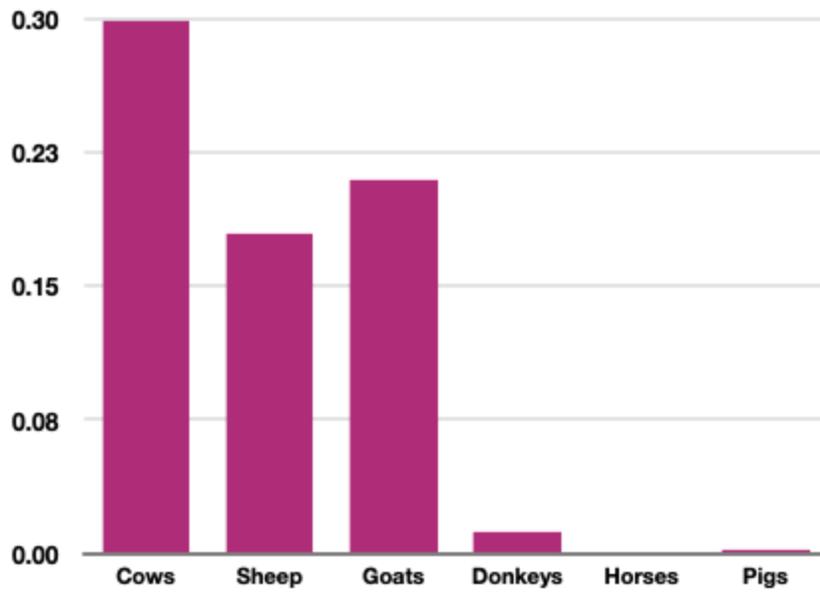


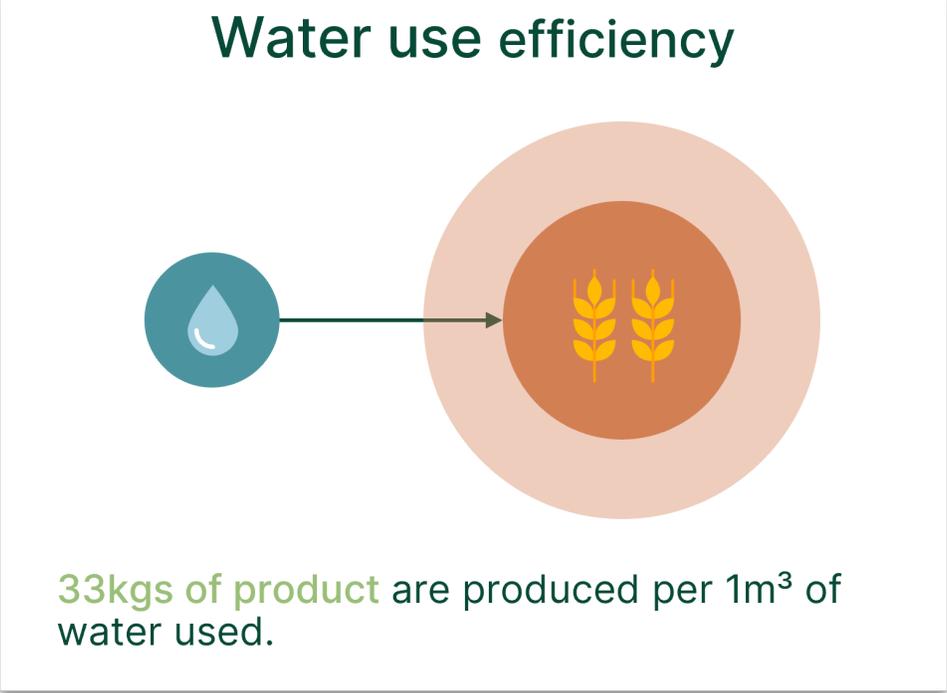
Fig 5. Fig 8. Livestock productivity (animal/ha)



Validated Result: Water use efficiency

Data show that water is not used in a very efficient way. About 70% of water (rainfall and water discharge in river) are lost every year. An average of 33 kilograms of crops are produced per cubic meter of water used.

Fig 6. Fig 9. Water use efficiency



Conclusion



This LandScale assessment highlights several key aspects of natural ecosystems, social well-being, governance and production in the Upper Niger landscape. This wide landscape in which resources are essential faces critical challenges. Land and related resources (forest, agricultural land, land conversion etc.) are under a lot of pressure, suffering from a complete lack of land use planning and an increasing demand from a growing population which also challenges the landscapes' governance systems. Because of land erosion, agricultural lands are converted to bare soils, shrub savannas are converted into agricultural land and wooden savanna is degraded into shrub savanna. The land degradation rate is high, and the changes are happening rapidly.

In total, not all indicators were analyzed, but the 13 that were analyzed helped us understand the current environmental conditions of the landscape. These indicators have highlighted the state of increasing degradation of natural resources, which is accentuated by climate change's impacts.

Overcoming these challenges at the landscape level will require the involvement of all actors, particularly those in the private sector.

Appendices



- Validated Metric Results
- Landscape Overview
- Data Evaluation
- Stakeholder Engagement

Endnotes



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