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LA RECHERCHE AGRONOMIQUE
POUR LE DÉVELOPPEMENT

Information system on pastoralism in the Sahel

Atlas of trends in pastoral systems in the Sahel
1970-2012



Preamble:

Pastoral livestock farming has a key economic role in West African countries. This activity—involving high livestock species diversity—contributes to ensuring food and nutritional security for rural and urban households. Pastoral livestock farming is naturally extensive and therefore closely dependent on environmental conditions. Interactions with the environment are intimate, numerous and ambivalent. Mobile livestock farming systems represent the main agricultural activity, which involves sustainable use of natural fragile and sparse resources in Sahelian dryland areas. Despite this essential role, pastoral systems face many challenges, especially with respect to the marginalization of pastoral communities and increased competition with other user groups, particularly crop farmers for access to natural resources (grazings, watering points, etc.). In this setting, livestock farmers and policymakers require specific information and indicators to manage trends and changes in this sector—which is economically crucial for Sahelian countries. Information systems on food security and current early warning systems are focused especially on agricultural production and do not meet specific pastoralism needs. With the aim of addressing these needs, in 2002 the Livestock, Environment and Development (LEAD) initiative launched an action research project, funded by the French Ministry of Foreign Affairs (MAE), to design and set up an information system for pastoralism in the Sahel (SIPSA). This decision-support system concerns pastoralism activities in six CILSS countries (Burkina Faso, Mali, Mauritania, Niger, Senegal and Chad). It was coordinated and managed by the Pôle Pastoralisme et Zones Sèches (PPZS – consisting of CIRAD, CSE, ISRA and UCAD) and the AGRHYMET Regional Centre (ARC) of CILSS.

This atlas summarizes available information on transformations in pastoral systems in the Sahel, collected through SIPSA or other initiatives. Based on an analysis of information needs carried out within the framework of SIPSA, the atlas analyses the overall trends in pastoral livestock farming and the prevailing setting. Considering the economic impacts of climatic conditions, a prospective analysis of different economic sectors in Sahelian countries is essential. This atlas serves this purpose, providing an excellent tool to facilitate decisionmaking based on legitimate foundations, while enhancing governance of the Sahelian pastoral livestock farming sector.

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An information system on pastoralism in the Sahel, what are the challenges?

P. Gerber, I. Touré, A. Ickowicz, I. Garba, B. Toutain

Pastoralism is the main activity in Sahelian countries that involves sustainable use of irregular and fragile natural vegetation. This type of livestock farming can adapt to major seasonal and interannual variations in plant biomass and water resources flexibly and quickly. In these countries, livestock farming accounts for around 40% of the agricultural GDP (ECOWAS 2008), and pastoral systems generate 50% of all meat and 70% of all milk produced (De Haan et al. 1999).

Rapid environmental changes are currently affecting these production systems. Major socioeconomic, agroecological and institutional changes, such as population growth, climate change, market globalization, changes in animal products, decentralization and divestiture of States are having a profound impact on the setting in which pastoral societies function. Changes in these systems should be followed so as to be able to effectively deal with them, and specific policies should be drawn up to prevent future crises and conflicts.

Social and environmental problems that prevail in the Sahel and some West African countries were aggravated by the onset of droughts in 1974, 1984 and 1990. Complex ecological, climatic and anthropogenic factors underlie these problems. Increases in herds and cropland extension have modified the relationship between agropastoral and pastoral systems. Conflicts concerning natural resources and herd mobility have increased in number and severity. A decline in cropland fertility and pastoral resource degradation have been noted throughout the Sahel. These trends are detrimental to the resilience of rangeland ecosystems and the societies that depend on them.

Many studies have focused on this major issue over the last two decades (De Haan et al. 1999, Steinfeld et al. 2006). Studies carried out by the Livestock, Environment and Development (LEAD) initiative led to the development of a toolbox that can be used to identify and structure technical, institutional and political aspects of livestock farming/environment interactions, thus facilitating their consideration when drawing up, implementing and assessing agricultural policies¹.

Moreover, the Permanent Inter-State Committee for Drought Control in the Sahel (CILSS), through the AGHYMET Regional Centre, has developed early warning tools

(SIAP, PRVS, Modèle Biomasse et expérience APELZP) that have enhanced rangeland monitoring through the use of satellite imaging and taking herd management patterns into account in vulnerability analyses. However, despite the scientific references compiled and the tools developed, information and early warning systems are still lacking relevant historical data and specific indicators necessary to analyse long-term trends and prevent crises that affect Sahelian pastoral systems.

In this setting, a prototype of an information system for pastoralism in the Sahel (SIPSA) was proposed (Ickowicz et al. 2005). This initiative is funded by the French Ministry of Foreign Affairs (MAE) and FAO and coordinated by the Pôle Pastoralisme et Zones Sèches (PPZS) (consisting of CIRAD, CSE, ISRA, UCAD) and AGRHYMET².

The overall aim of SIPSA is to develop a system for the collection, validation and analysis of data required for long-term monitoring and early warning. SIPSA aims to provide a decision-support tool to predict, manage and monitor pastoralism trends and environmental interactions in the Sahelian region, especially in six CILSS countries (Burkina Faso, Mali, Mauritania, Niger, Senegal and Chad). SIPSA was developed through an action research approach in collaboration with the concerned stakeholders. It generates indicators and information tailored to pastoral systems and can contribute to public policy planning processes and to the development of strategies designed to meet the specific needs of stakeholders in the private sector.

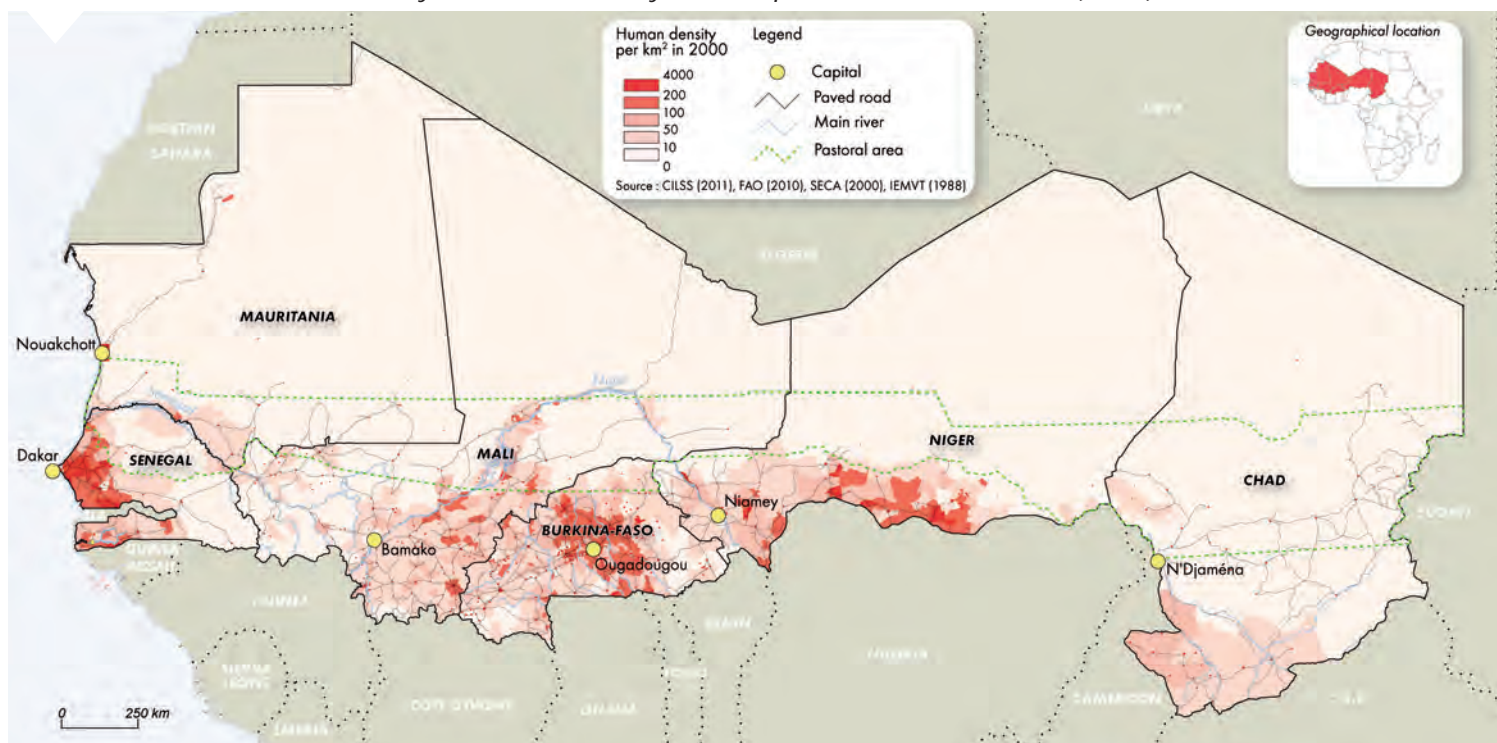
SIPSA has the following specific objectives:

1. to supply relevant and updated information on the status and trends of Sahelian pastoral systems;
2. to develop information products to fulfil the needs of different stakeholders and partners at different decisionmaking levels;
3. to facilitate the circulation and dissemination of the final products, and;
4. to promote decisionmaking for the different stakeholders in terms of pastoral policy formulation and implementation.

1. <http://www.fao.org/ag/againfo/programmes/en/lead/toolbox/Index.htm>

2. <http://www.fao.org/agriculture/lead/themes0/drylands/information0/les-composantes-du-sipsa/en/>

Location of countries concerned by the Information system for pastoralism in the Sahel (SIPSA)



The SIPSA geographical area covers pastoral systems in the Sahelian region, including Burkina Faso, Mali, Mauritania, Niger, Senegal and Chad, corresponding to the limits of the atlas of the pastoral potential in the Sahel (CTA-CIRAD-IEMVT 1985-1991).

Opening session of the Regional SIPSA Workshop in Niamey (June 2008)



Organization and specific decision-support tools for Sahelian pastoral livestock farming

A. Ickowicz, A. Wane, I. Touré, I. Garba

List of SIPSA indicators

Themes	Indicators
1. Vegetation	Late rainy season biomass ;
2. Land-use	Percentage of pastoral area ;
3. Meteorological situation	Historical rainfall patterns per zone
4. Hydrological situation	Potential flow rate – groundwater and river water
5. Sanitary situation (human and animal)	Number of disease hotspots – vaccination rate ;
6. Cattle movements (transhumance)	Attractiveness and emissivity of zones ;
7. Demographic data (human and animal)	Population and density
8. Infrastructures	Equipment per habitat type index
9. Markets (livestock and cereals)	Trade term trends (cereals/livestock)
10. Residue and livestock feed	Quantity and price
11. Household resources	Mean on-farm consumption duration; Percentage of livestock farmers with other activities ;
12. Rangeland grazing rights information source	Texts translated into national languages ;
13. Administration/partners	Participation of local communities in support structures via local organizations ;
14. Economic contribution of livestock farming	Herd offtake rate

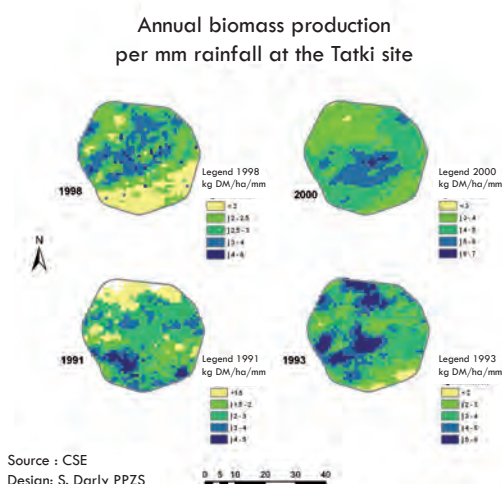
From a methodological standpoint, SIPSA proposes a conceptual model to simulate pastoral lifestyles (Ickowicz et al., 2005, Ancy et al., 2009). This model was first developed with information on the pastoral setting at Ferlo and with available Senegalese data, and subsequently tested with partners in the Sahelian subregion. It is based on a review of existing information and early warning systems and also on the results of socioeconomic surveys carried out in pastoral areas hinged on the rural-oriented concepts developed by A. Sen (1981) and further supplemented by J. Swift (1989). SIPSA model indicators are classified according to 14 livestock farming system themes. From an organizational standpoint, the SIPSA network consists of a regional technical committee (CTR) and six national coordination committees (CNC) in each member country.

The single and composite thematic indicators proposed by SIPSA on national and regional scales fulfil two crisis detection and long-term monitoring functions. The by-products provide information on the state of pastoral areas and trends, with the aim of facilitating interpretation, decisionmaking and enhancing intervention targeting.

The main function of SIPSA enables operators to characterize a crisis in a given pastoral system and specify its location from a combination of indicators of rainfall, forage biomass and livestock and cereal trade terms on different time scales. These crisis situation status and location indicators are calculated on the basis of the following data:

- rainfall: real-time monitoring of 10-day cumulative rainfall relative to a mean curve plotted over 30 years;
- trade terms: cereal/livestock price ratio patterns;
- biomass deficit indicators: by rangeland area, or by the TLU ratio of a sedentary herd, or by a relevant territorial unit, expressed in kg DM/ha of biomass.

Tests of SIPSA indicators on different scales



SIPSA alert bulletins



The second SIPSA long-term monitoring function serves to query and analyse historical data in order to gain insight into pastoral system dynamics so as to be able to draw up development policies tailored to extensive livestock farming:

- priority zones for the development of hydraulic, sanitary and livestock market infrastructures: priority development index dependent on the potential (biomass, herds);
- priority zones for degraded rangeland rehabilitation: Rangeland trend index, Rangeland productivity index;
- priority zones for bushfire control: Bushfire occurrence or risk index.

Since the first SIPSA indicators were developed and tested in Senegal, other indicators have been tested and adapted by network member countries and included in the SIPSA bulletins published by CNC in Niger and Chad.

On a regional scale, a certain number of biophysical short- and long-term indicators associated with rangeland production (DMP, NDVI), the vegetation status (FDV), surface water bodies (SWB) or bushfire sites, have been developed by the regional technical coordination team from SPOT Vegetation and MODIS satellite images. These indicators were tested and validated by AGRHYMET and are currently being used in regional programmes such as AMESD.

Educational training modules have been developed for pastoralism stakeholders on the basis of lessons learnt from the implementation of SIPSA. These modules contextualize the challenges involved in livestock farming systems and analyse the methodological tools developed. They also present technical and scientific knowledge that can explain, for discussion purposes, the functioning of pastoral systems, while jointly building a shared foresight vision of the livestock farming sector. The training modules are designed for different target groups such as livestock farmer and interprofessional livestock farming organization representatives, NGO and development project coordinators, livestock farming senior staff and technicians, specialized ministerial service leaders, researchers and students.

Training session with livestock farmers from Thiel in 2003



© I. Touré (2003)

Examples of a French SIPSA training module



This atlas only deals with the long-term monitoring function since the early warning function is covered through other media (bulletins, radio, etc.). It combines a regional analysis and specific natural studies derived from national coordination committee (CNC) summaries. The regional part presents different environmental monitoring data obtained via satellite imaging estimates and field measurements. These indicators can be used to analyse major trends over the last four decades. The consideration of pastoralism and livestock farming in national regulations is also studied, along with transhumance patterns in the subregion. The national section of the Atlas involves analysis of themes specific to the four countries with typical Sahelian characteristics, i.e. Mali, Niger, Senegal and Chad.

Pastoralism and regulatory zoning

A.T. Diop, N.A. Diop, I. Niang, I. Atté, B. Toutain, M. Hamadoum

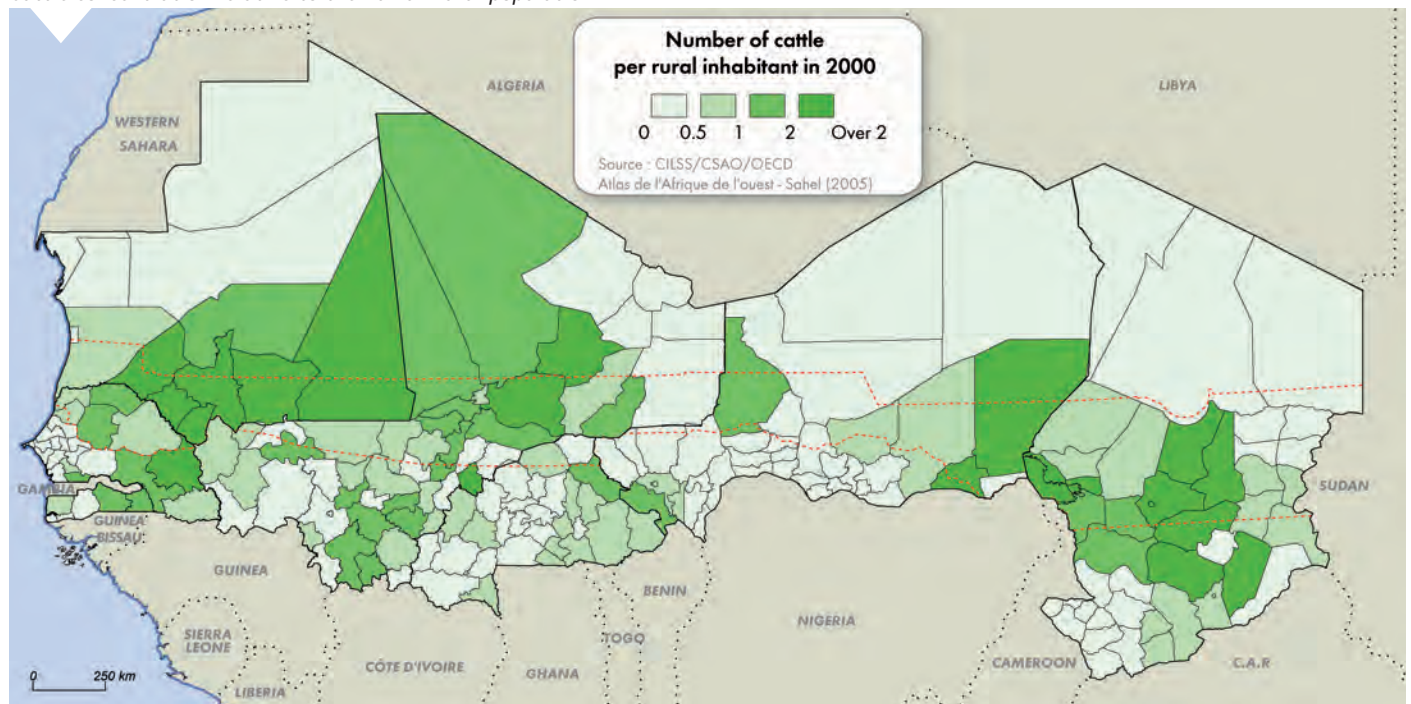
A transhumance corridor, Arly National Park, Burkina Faso



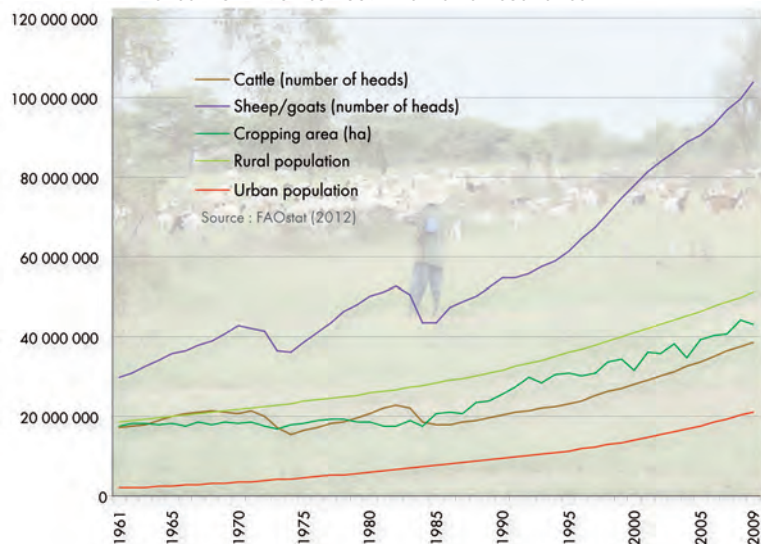
© B. Toutain (2010)

Land-use has increased over the last 50 years in the Sahelian region. The human population increased 3.6 fold from 1960 to 2010, leading to the emergence of urban centres and to a rise in the sale of meat, milk, leather and hides, but hampering the access of cattle herds to rangelands, watering places, etc. Various mining resources are also being tapped in previously grazed areas to meet urban and industrial needs. In SIPSA countries, cropland has increased by 2.5-fold to fulfil the needs of growing populations and due to the development of export crops, to the detriment of protected areas, which have decreased by 13%. In parallel, livestock farming activities are thriving, with a 2.5-fold increase in herd numbers (expressed in TLU) between 1961 and 2009—this growth involves all livestock farming systems (pastoral and agropastoral).

Cattle concentration relative to the human rural population

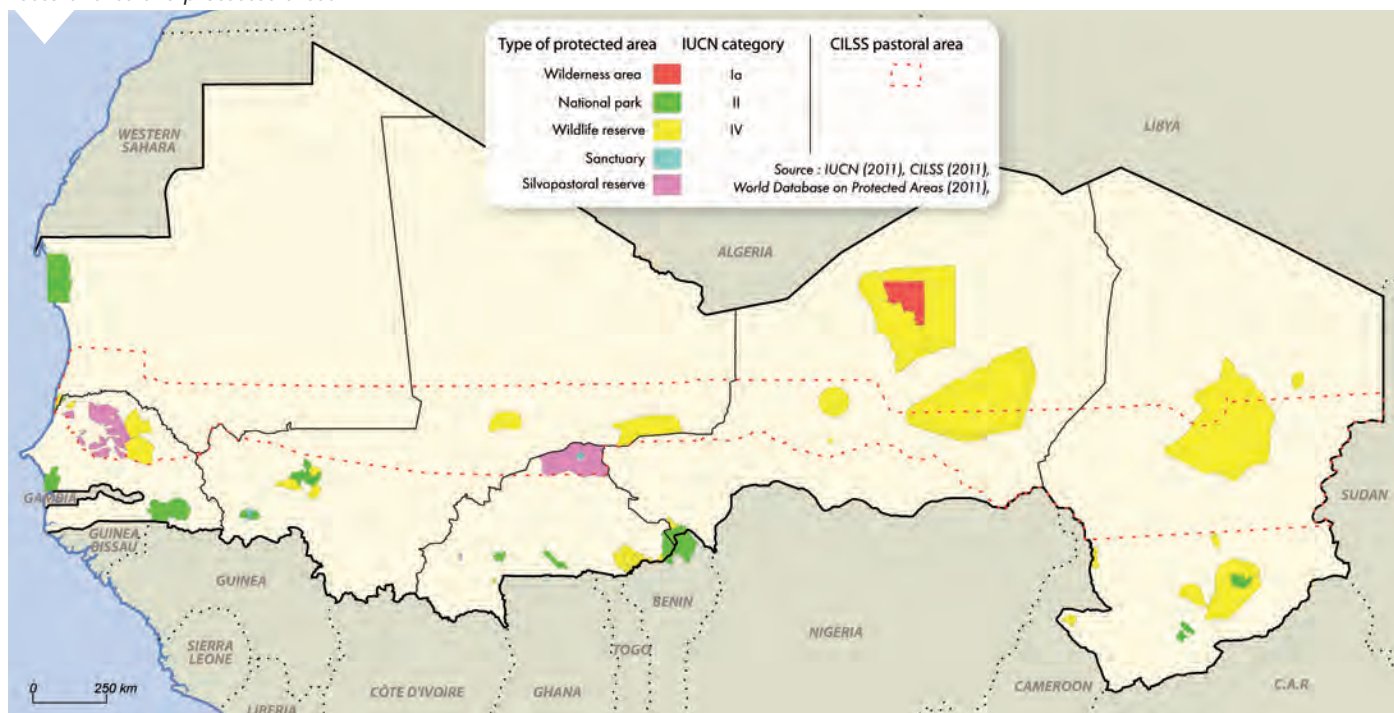


Trends from 1961 to 2009 in all SIPSA countries



Production systems have also changed. Some livestock farmers thus drive their herds to different areas for part of the year to avoid conflicts, whereas others have started growing crops, while also maintaining their cattle herds. In response to these changes, land-use competition has increased, leading to land disputes or even violent and sometimes deadly conflicts. This social and spatial restructuring, combined with increased population pressure, has resulted in a decline in wildlife biotopes and the loss of certain species since the early 20th century in the Sahel. Protected areas have been delineated to ensure their preservation and stall wildlife and plant resource degradation.

Pastoral area and protected areas



They cover a 166 668 km² area, or 13.5% of the overall pastoral area (1 230 410 km²). Depending on their status, the presence of livestock is relatively tolerated in a still poorly managed cohabitation. In silvopastoral or wildlife reserves, wild animal development has generally stopped, leading to the decline and even disappearance of some endemic species. Wilderness areas and national parks still have substantial animal and plant diversity. However, due to climate change, these areas—prohibited for livestock herds—are being visited to an increasing extent by herds in search of better feeding conditions. To limit the impact of these visits and reduce conflicts in local areas, different regulatory and legislative initiatives have been taken on national and subregional scales. Regulations and pastoral codes were recently adopted (2000) and applied with limited success, e.g. the pastoralism orientation law in Burkina Faso, the pastoral charter in Mali, the pastoral code in Mauritania and the pastoral code in Niger. Zoosanitary agreements and conventions on cattle marketing and transborder transhumance committing Member States of subregional and regional institutions (ALG, CILSS, WAEMU and ECOWAS) have been ratified, but major efforts remain in the effective application of these initiatives.

Pastoralism regulations

	Senegal	Mauritania	Mali	Burkina Faso	Niger	Chad	
ECOWAS							Subregion
CEMAC							
CILSS							
Pastoral code	2004	2000		2002	2010	2007	Law
Pastoral charter			2001				
Protected area	1950			1970			Zoning
Home area					1997		
Pastoral unit	1993						
Transhumance regulation	1980		2010	1989 2000	1987	1959	Mobility
Bilateral transhumance agreements							
Decision A/DEC.5/10/98	1998		1998	1998	1998		

Legend

- Regional affiliation (Purple)
- Regulation and year of adoption (Green)
- Draft regulation and start date (Yellow)
- Absence of regulation (White)
- Countries under the agreement (Red line with dots)

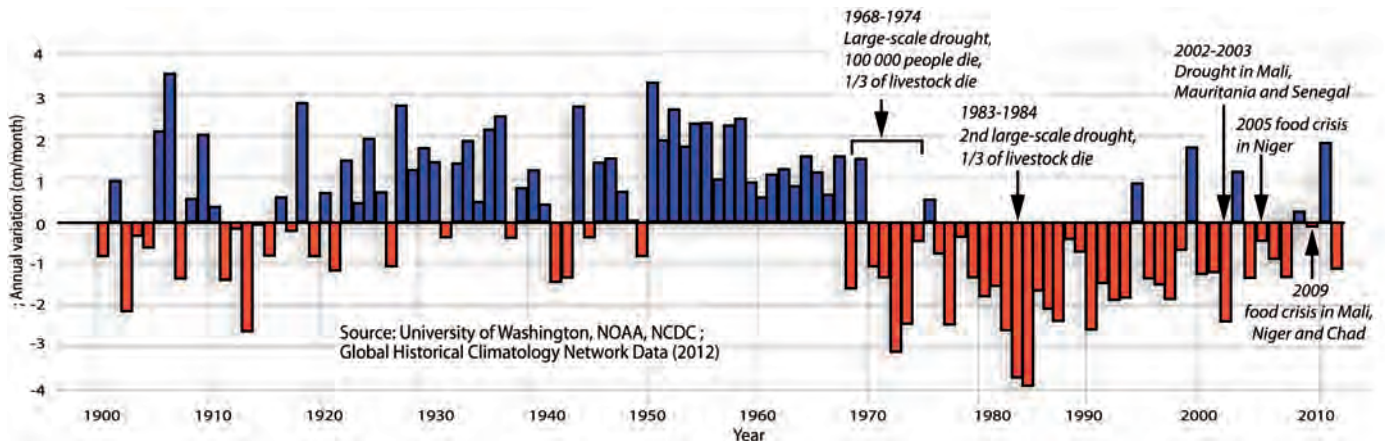
For further information:

http://www.cilss.bf/IMG/pdf/elevage_en_AOcs5.pdf

Historical rainfall patterns

I. Garba, I. Touré, A. Ickowicz, JD. Cesaro

Annual variations in the Sahel rainfall index between 1900 and 2010



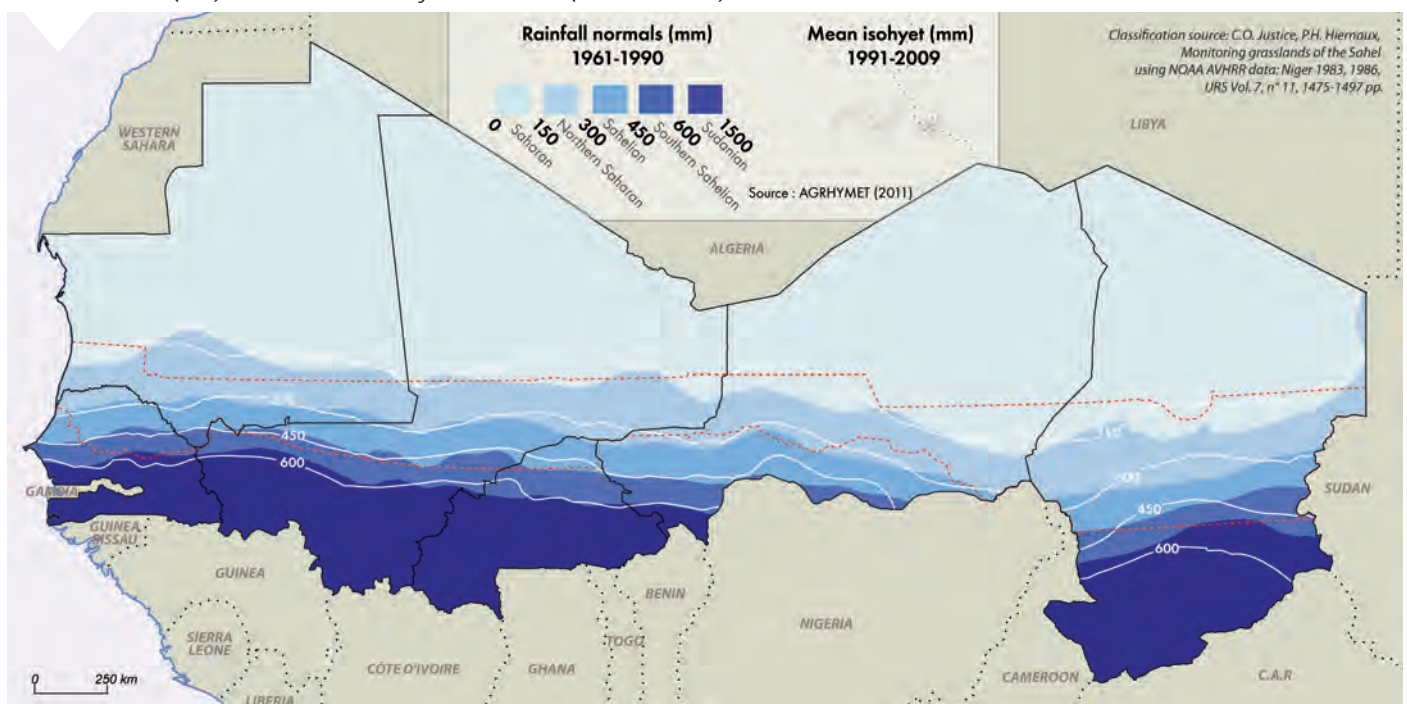
The Sahel is located in the climatic transition area between the Saharan zone in the north and the Sudanian zone in the south. It extends from the Atlantic Ocean to the Red Sea. The average annual rainfall in this biogeographical region ranges from 150 to 600 mm (Hiernaux et al., 2006). It is subdivided into three subzones: northern Sahelian, typical Sahelian and southern Sahelian.

Over the last four decades, the Sahel has undergone several deficit rainfall periods, resulting in major droughts (1968-1974, 1983-1984, 2002-2003, 2005, 2009), which have had a serious impact on human and animal populations. The spatiotemporal distribution of rainfall

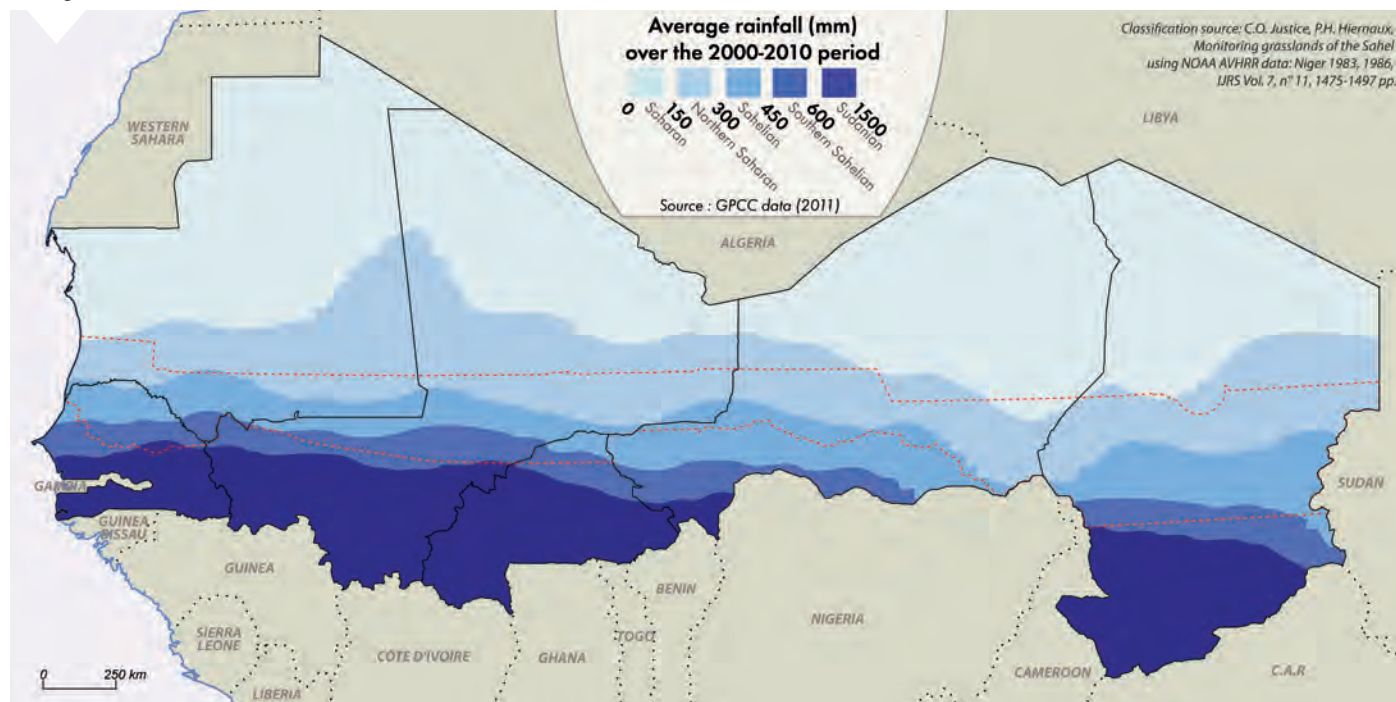
and its redistribution on the soil surface via runoff are key factors that determine the diversity of the plant cover and its interannual production. The rainfall datasets used in our analyses were compiled with measured data (AGRHYMET databases), but some were estimated from satellite data (NOAA, NCDC, GPCC).

Annual rainfall variations in the Sahelian region between 1900 and 2010 showed a sawtooth pattern, with an alternation of humid and dry periods. The 1900-1950 period was marked by an alternation of 3-4 humid years followed by a dry year. From 1951 to 1969, a steady series of humid years occurred.

Rainfall normals (mm) 1961-1990 and isohyets 1991-2009 (measured data)



Average rainfall (mm) from 2000 to 2010 (estimated data)



A series of dry years occurred from 1970 to 1993. However, the 1994 to 2011 period was marked by an alternation of one humid year followed by 3 to 4 dry years.

A comparison of rainfall normals for the 1961-1990 period (WMO) relative to the mean for the 1991-2009 period highlights a return of rainfall in the northern zones, as confirmed by a northward shift in the 150, 300 and 450 mm isohyets. This trend was more marked in the northern regions of Niger and Chad. Conversely, the 600 mm isohyet remained stable from Senegal to Niger, whereas it shifted southward in Chad. An analysis of the estimated average rainfall for the 2000-2010 period showed the following zonal distribution:

Rangeland pond at Barkédji



© I. Touré (2005)

- The Sahel-Saharan transition zone, with under 150 mm annual rainfall, is suitable for the growth of short-cycle plants and sparse perennial grasses that are grazed by herds (mainly camels and goats) managed by nomadic herders during their movements between available watering places.
- The northern Sahelian subzone (150-300 mm) has barely 2% woody plant cover, with biomass production of up to 400 kg DM/ha (Boudet, 1977). This zone is currently utilized by nomadic herders and transhumant livestock farmers.
- The typical Sahelian subzone (300-450 mm) is characterized by a broad range of diverse vegetation growing in the different main geomorphological units. On sandy soil, there is barely 5% woody plant cover. Average annual grassy biomass production ranges from 500 to 2000 kg DM/ha over a north-south gradient.
- The southern Sahelian subzone has more rainfall (450-600 mm), with woody plant cover ranging from 5 to 30% over a north-south gradient.

For further information:

http://jisao.washington.edu/data_sets/sahel/

Monitoring biomass production

I. Garba, A. Ickowicz, I. Touré, B. Toutain, JD. Cesaro

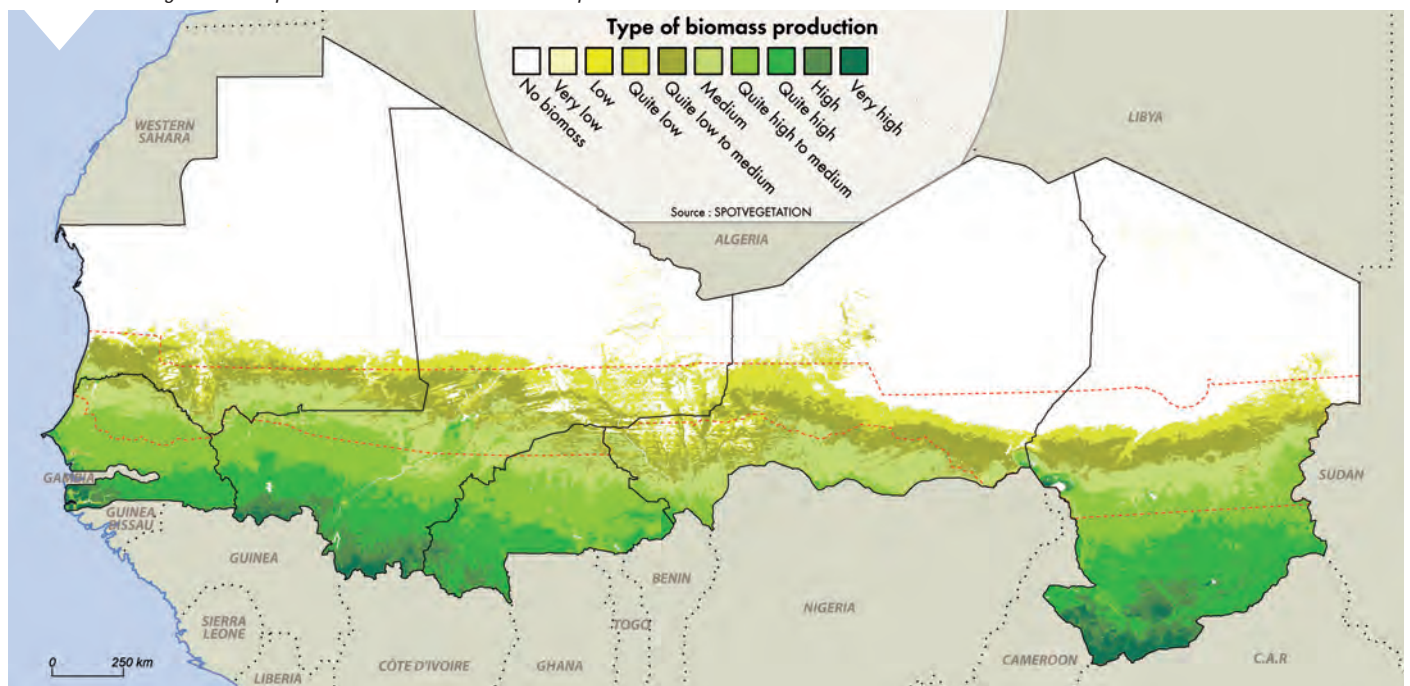
Fodder availability, in quantitative and qualitative terms, is a crucial factor with respect to pastoralism in the Sahel. Rainfall intensity during the rainy season and its spatial distribution determine the potential quantity of fodder available during the subsequent long dry season. Depending on the situation, livestock farmers may advance or delay their transhumance movements. Host pastoral areas risk a high inflow of animals, thus increasing the risk of epizootic disease onset, conflicts with local crop farmers, overgrazing and environmental degradation.

Measuring biomass at Ferlo



© A. Ickowicz (2001)

Estimated average biomass production over the 1998-2010 period



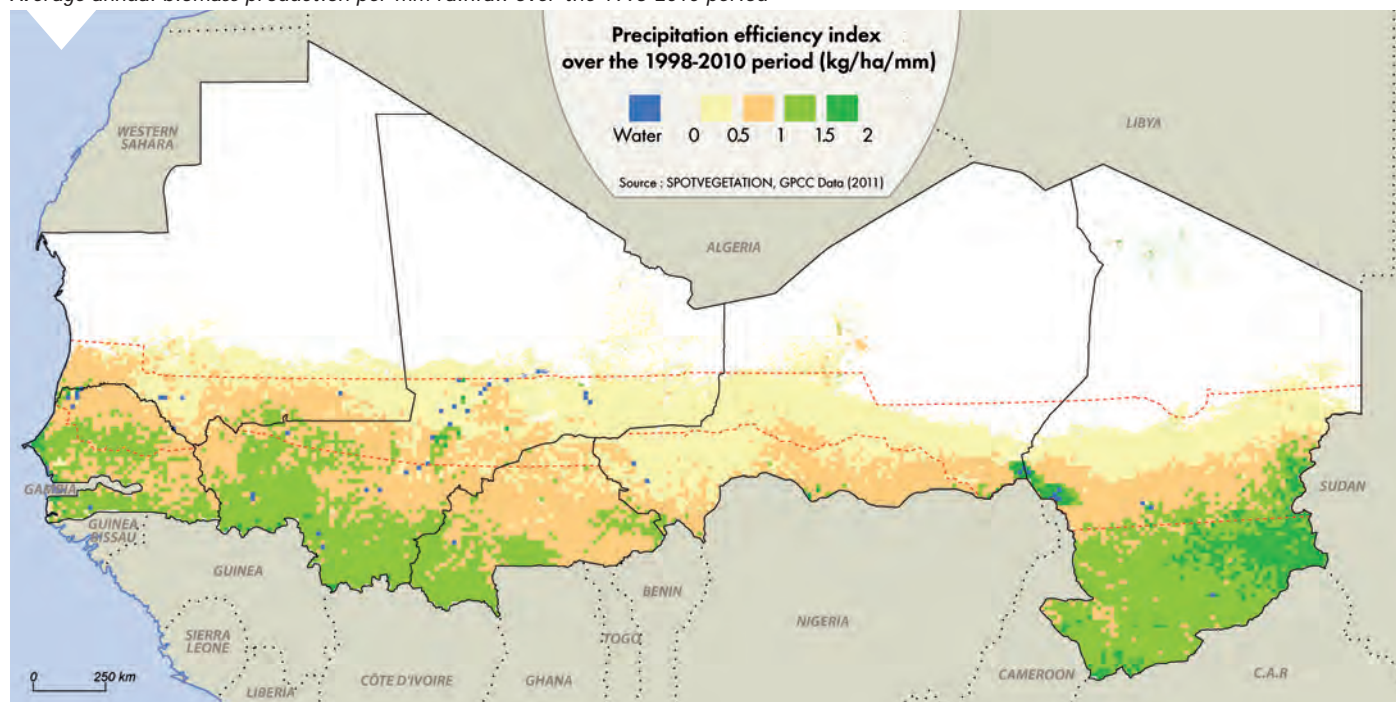
Rangeland around Mbeulekhé in July (Senegal)



© I. Touré (2008)

On a regional level, the biomass production assessment system must be enhanced, while boosting awareness and locating places with fodder deficits within Sahelian pastoral areas. Considering the geographical scope of the concerned pastoral area, SPOTVEGETATION derivatives (B. Smets et al., 2010) are suitable for estimating biomass production since they are designed to assess the biomass production potential and then compare it with a reference average calculated on the basis of a 1998-2010 time series. The annual dry matter quantity is calculated from the cumulated 10-day data for the rainy season (May-October). The result obtained represents the fodder biomass production available during the agropastoral season.

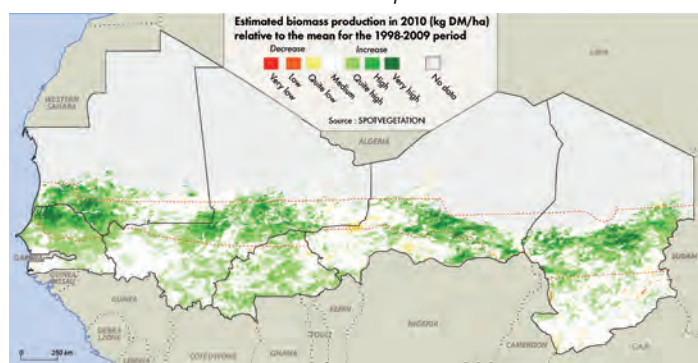
Average annual biomass production per mm rainfall over the 1998-2010 period



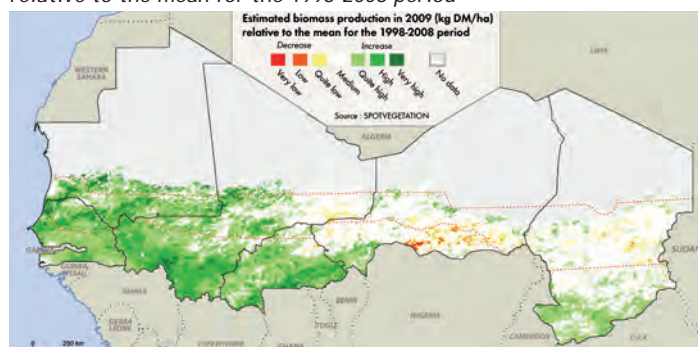
Despite some regional differences, the estimated biomass productions for 1998, 2000 and 2006 were lower than average, whereas that of 1999, 2007 and 2010 were higher. 2010 was a very good year for biomass production throughout the Sahelian belt, except in the northern part of Ouallam department in Niger. By comparison, production in 2009 was lower in the pastoral area of Niger and Chad, whereas it was very high in Burkina Faso, Senegal and Mauritania.

Rainfall is a key factor with respect to vegetation growth in the Sahelian region (Penning de Vries, 1982). The precipitation efficiency index (PEI) can be used to differentiate zones with high and low biomass production potential under the same rainfall conditions. Production variations are very closely correlated with the soil capability and grazing intensity. An analysis of this index, calculated on the basis of the 10-year mean, revealed a PEI of between 0 and 1 throughout most of the pastoral area, but the value was over 1 at the eastern tip of the pastoral area of Chad (Ouaddaï, Wadi Fira and Sila regions) and in the Senegalese silvopastoral area (Louga and Matam regions).

Estimated biomass production in 2010 relative to the mean for the 1998-2009 period



Estimated biomass production in 2009 relative to the mean for the 1998-2008 period



After the grass cover has disappeared at Niassanté (Senegal) in March



For further information:

<http://www.geoland2.eu/portal/service/ShowServiceInfo.do?serviceId=CF804180&categoryId=CA80C981>

Monitoring bushfires in the Sahel

I. Garba, I. Touré, A. Ickowicz, JD. Cesaro, B. Toutain

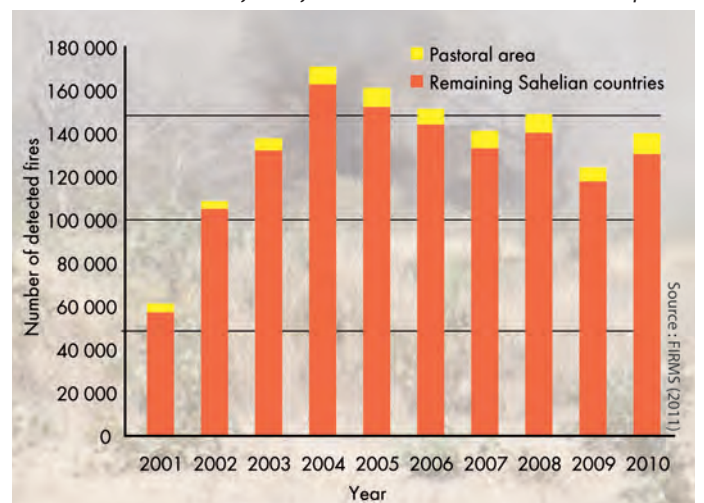
The intensity and frequency of bushfires has a marked impact on Sahelian agrosystem dynamics. Depending on the agroecological area and season, these fires are considered as a scourge, or as an agricultural management tool (agricultural land clearing, stubble burning, elimination of crop pests by harvest residue burning), or as a natural resource management strategy (stimulation of grass regeneration, house protection, or even as a cropping practice). Fires may also ignite due to negligence under certain climatic conditions or as a result of arson. Despite the above-mentioned advantages, bushfires have negative impacts on natural resources: a decline in biodiversity, loss of organic matter and nitrogen, depletion of fodder reserves, soil degradation, a decrease in crop and rangeland productivity. In order to better assess and prevent these different impacts on Sahelian pastoral production systems, satellite imaging data validated by the technical services can be used to develop indicators on the basis of spatiotemporal analyses, for the purpose of generating early warning information and determining the long-term trends. These data supplied by MODIS have been scientifically validated by AGRHYMET, in collaboration with CSE in Dakar. They should, however, be compared with statistical data recorded in the field by water and forestry services in order to gain greater insight into the interannual variability patterns.

Example of a bushfire in Mali

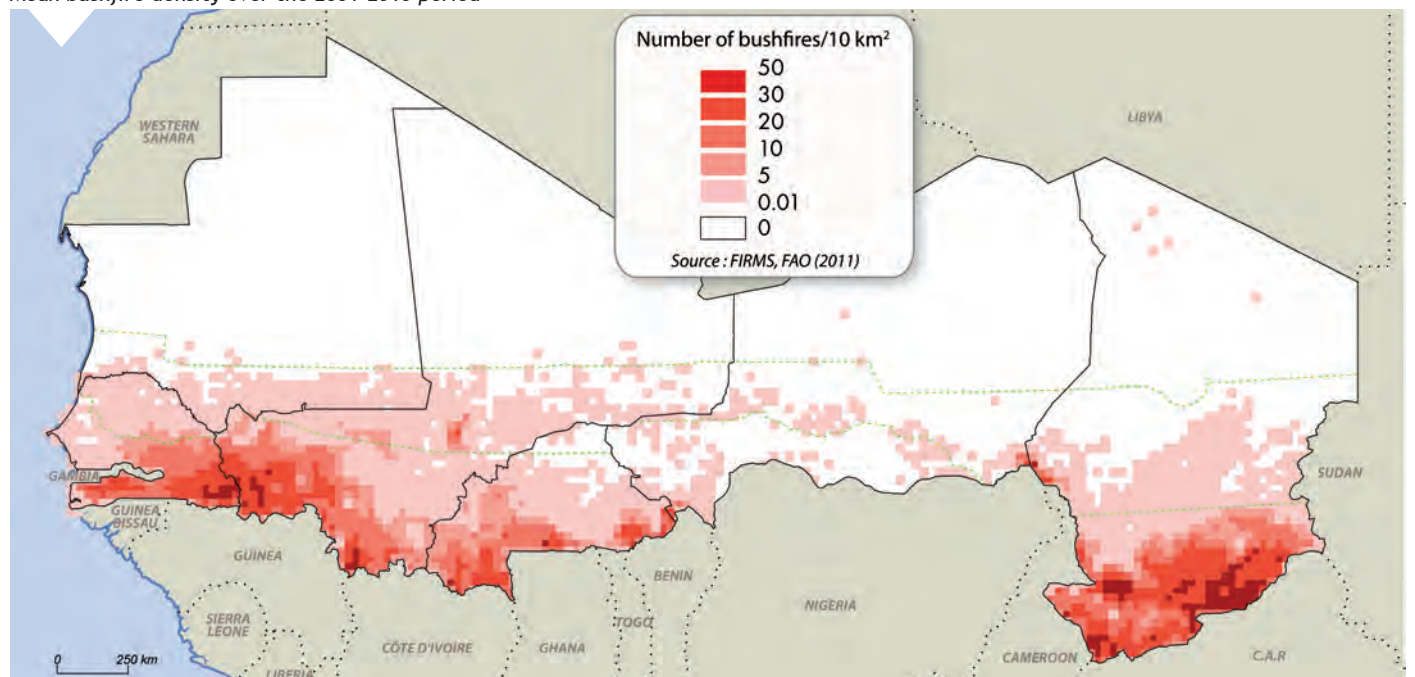


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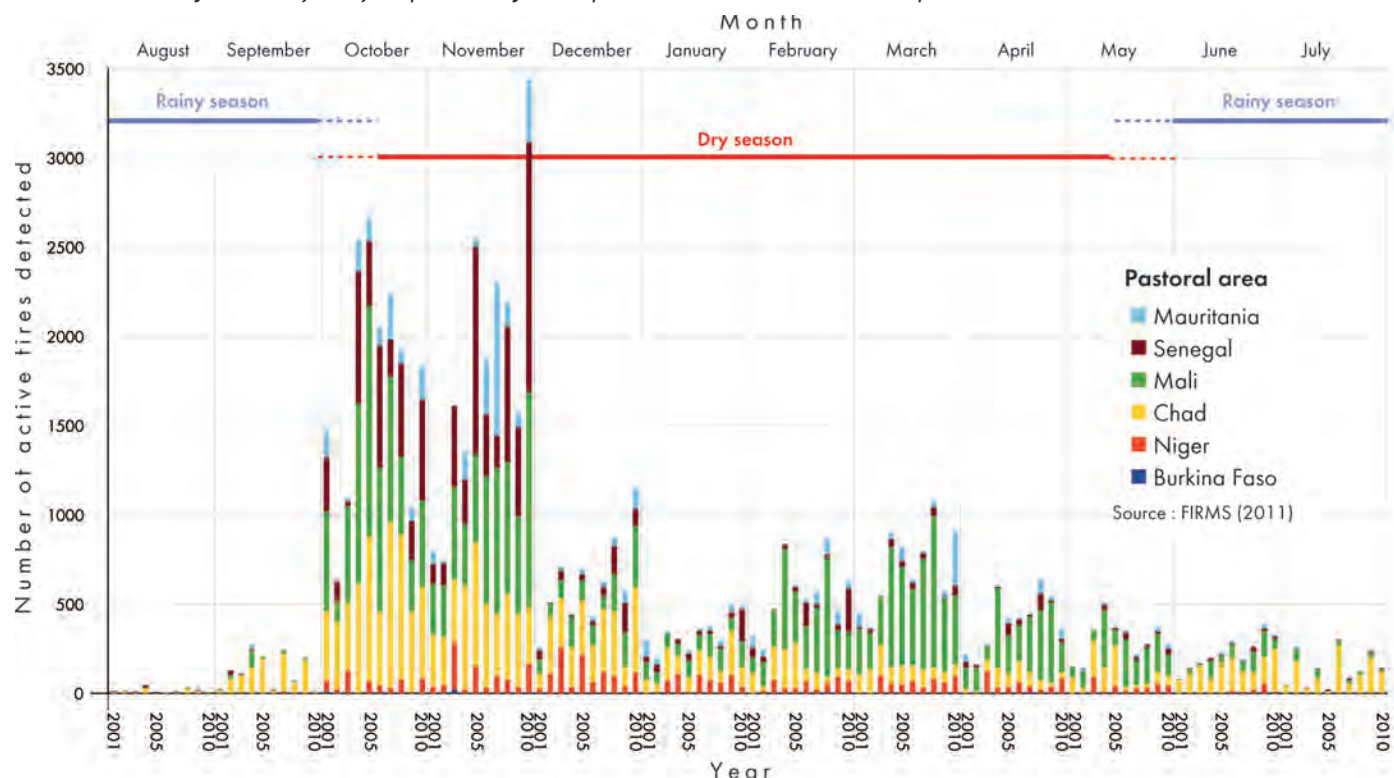
Cumulated number of bushfires detected over the 2001-2010 period



Mean bushfire density over the 2001-2010 period



Cumulated monthly number of bushfires per country in the pastoral area over the 2001-2010 period



Active bushfires detected in the Sahel and West Africa over the last 10 years are generally distributed over a north-south gradient. The highest densities are noted in Senegal, Mali and Chad, in the vicinity of humid areas (Senegal River Delta, Inner Niger River Delta and Lake Chad), and in savanna areas, where bushfires serve as a pastoral management tool. The northern Burkina Faso silvopastoral reserve and the Niger pastoral area are less affected due to the lower biomass production.

An analysis of these data revealed a marked increase, within Sahelian and West African countries, of bushfires detected between 2001 and 2005, and a slight decrease between 2005 and 2010. However, the pastoral area per-se was less impacted by bushfires,

even though around 8000 fire outbreaks were detected yearly. A seasonal variation was noted in the cumulated monthly number of bushfires detected per country in the pastoral area, with a peak between October and November. Most fires detected occurred in Mali, Senegal and Chad, and to a lesser extent in Mauritania. With respect to the agrosilvopastoral calendar, bushfires detected during the first two 10-day periods of October in the Sahel could be considered as early and therefore less detrimental than the others. This analysis did not, however, reveal cases of arson, but fires detected during the dry season (March-April) in the pastoral area were in the vicinity of humid areas (Inner Niger Delta, Lake Chad), often associated with agricultural practices.

Creation of a firebreak in Senegal



© PAFF (2004)

The results of this study of bushfire frequencies associated with standing biomass, their location and the identification of two periods favourable for fires, could be used to improve forecasting of risk areas. This information could also be used to develop infrastructures and facilities (firebreaks, available watering places) to ensure the protection of pastoral resources.

For further information:

The Fire Information for Resource Management System (FIRMS) <http://firefly.geog.umd.edu/firms/>

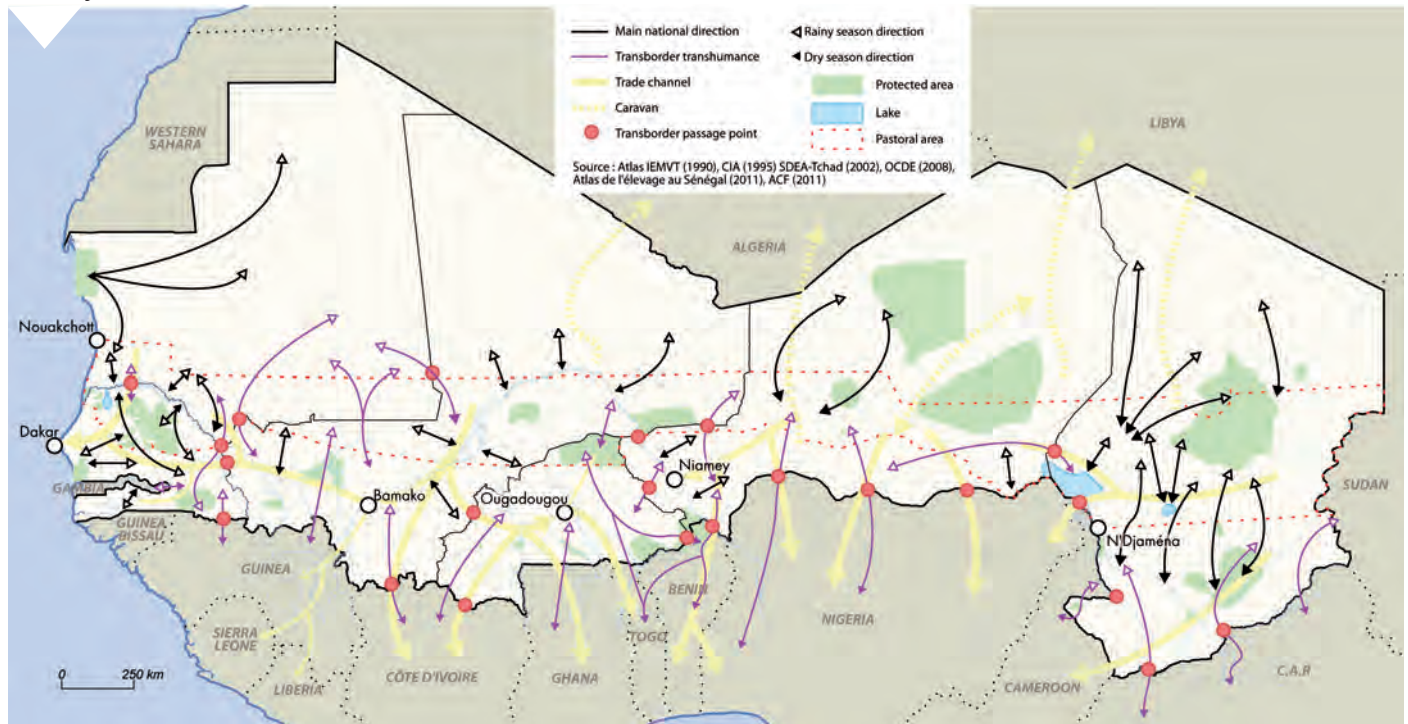
Transhumance patterns

A. T. Diop, J.D. Cesaro, I. Touré, A. Ickowicz, B. Toutain

Transhumance is the seasonal movement of livestock herds supervised by herders. In Sahelian countries, transhumance is an adaptation strategy geared towards optimizing livestock access to water and grazings of sufficient quality to ensure the herds' annual production. This practice concerns 70-90% of Sahelian cattle herds. At the end of the rainy season, livestock farmers leave their home area and drive their herds towards areas that are more likely to fulfil their herds' nutritional needs. One family may split up to follow several different transhumance trails, depending on the family's assets, size and composition, and the use (or not) of salaried labourers.

The distance covered during these movements may change from one season to the next depending on the climatic conditions and the pastoral resource availability and distribution in the host areas. Over the last three decades, these movements have become longer and more dispersed, especially southward. This trend could be explained by herd increases, environmental aridification, the expansion of agricultural areas in transhumance corridors and the diversity of transborder cattle markets, thus forcing herders to find alternative transhumance routes. It is also essential to take the specific features of each country into account, along with the question of shared management of the area and the incurred conflicts.

Summary of recent national and transborder herd movements and commercial cattle trade channels



Seeking trade channels in Niger



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In Senegal, cattle movements are often limited to the silvopastoral area in the north, whereas small ruminant herds are being driven further and further southward. In Mali, despite successive droughts, livestock farmers are still moving their herds while also creating settled camps for their families. In Niger, where large-scale transhumance is practiced, sedentary livestock farmers develop localized strategies to move their herds between pastoral enclaves, whereas transhumant herders are driving their herds longer distances over the years. In Chad, the southern limit of camel herd movements has descended from the 13th parallel to the 9th parallel in 20 years. Some transhumant cattle herds are now being driven as far south as the Central African Republic.

Transhumant livestock farmers generally prefer to follow routes that will enable them to reach the host area as quickly as possible and which offer suitable conditions for feeding their livestock on the way. Transhumance movements thus involve a series of steps that are carefully selected on the basis of information collected from informers and based on their personal herding experience. In choosing transhumance routes, livestock farmers seek information on the presence and quality of grazings, on herd watering places and harvest residue in cropping areas, on trade terms practiced in livestock markets and on the presence of defence and security forces. Improvements in telephone and radio networks in pastoral areas have also considerably modified livestock farmers practices over the last 10 years, enabling them to determine distances from available resources in host areas, trade terms and transborder passage points. These decisions are also dictated by information corresponding to the security and livestock health situation conveyed by the livestock farmers' network. The routes selected may change according to updated information during transhumance movements.

A transhumant herder's camp near Bouteyni (Senegal)



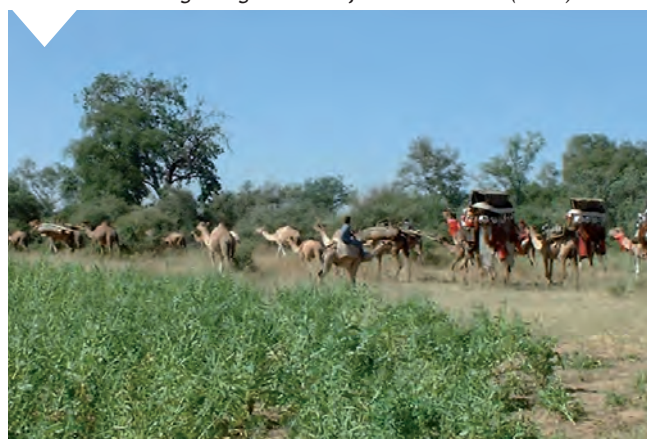
© J.D. Cesaro (2009)

A transhumance boundary marker in the northern Tahoua region (Niger)



© I. Touré (2008)

Caravan wandering along a sesame field at Salamat (Chad)



© Projet Almy Behaim (2008)

International transhumance certificate (ECOWAS)



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Protected areas are being visited to an increasing extent by transhumant herds, despite regulations in force in the concerned countries. Niokolo Koba National Park (Senegal), transborder W National Park (Benin, Burkina Faso, Niger), Zakouma National Park (Chad), and others, are periodically crossed by livestock herds. Many livestock farmers also drive their herds outside of their home countries. Transborder flows are increasing, for instance, from Mauritania towards Senegal and Mali, or between Niger and Benin, Nigeria and Togo. In 1998, the Economic Community of West African States (ECOWAS) adopted decision A/DEC.5/10/98 to provide a framework and facilitate transborder transhumance, which was locally reinforced by agreements between countries (Mauritania-Senegal-Mali, Niger-Burkina Faso). Fifteen years later, these regulations are still hard to apply in the field and livestock farmers continue to encounter problems when crossing borders.

For further information:

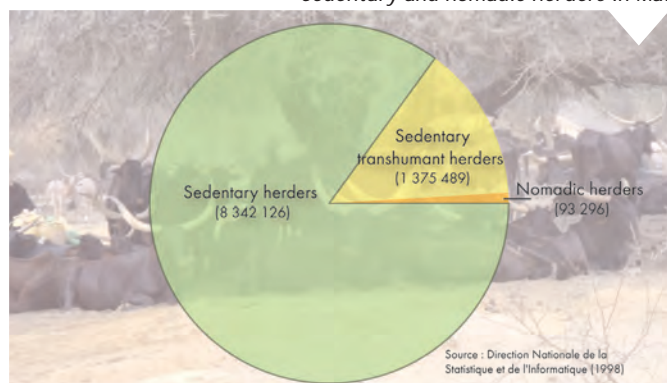
<http://pubs.iied.org/pdfs/G02236.pdf>
 Mali, caractériser les transhumances p.16
 Tchad, suivre les transhumances p.30

Characterizing transhumances

F. Ham, N.A Sow, T. Métais

In Mali, transhumant and nomadic herding concerns around 70-80% of the national livestock herds (15% of livestock farmers). These cyclical seasonal movements occur in conventional rangelands according to five periods: rainy season, end of the cereal crop season, cold dry season, hot dry season and the lean season. Movements vary from year to year depending on the availability of pastoral resources (water, grazings and saltlands). Due to this variability, it is essential that the technical services determine the 'conventional' movement patterns, which give rise to the formation of preferential season-dependent herd concentration areas. The cartographic analyses conducted by Action Against Hunger and partners in Mali, Niger and Mauritania are geared towards locating the most vulnerable areas. Two map correction and validation workshops were held in Bamako and Niamey involving experts, NGOs, associations and government representatives. Spatiotemporal complementarity is a key feature of pastoral livestock farming and for understanding conventional herd movements, and adaptation strategies are essential for efficient management of these areas.

Sedentary and nomadic herders in Mali

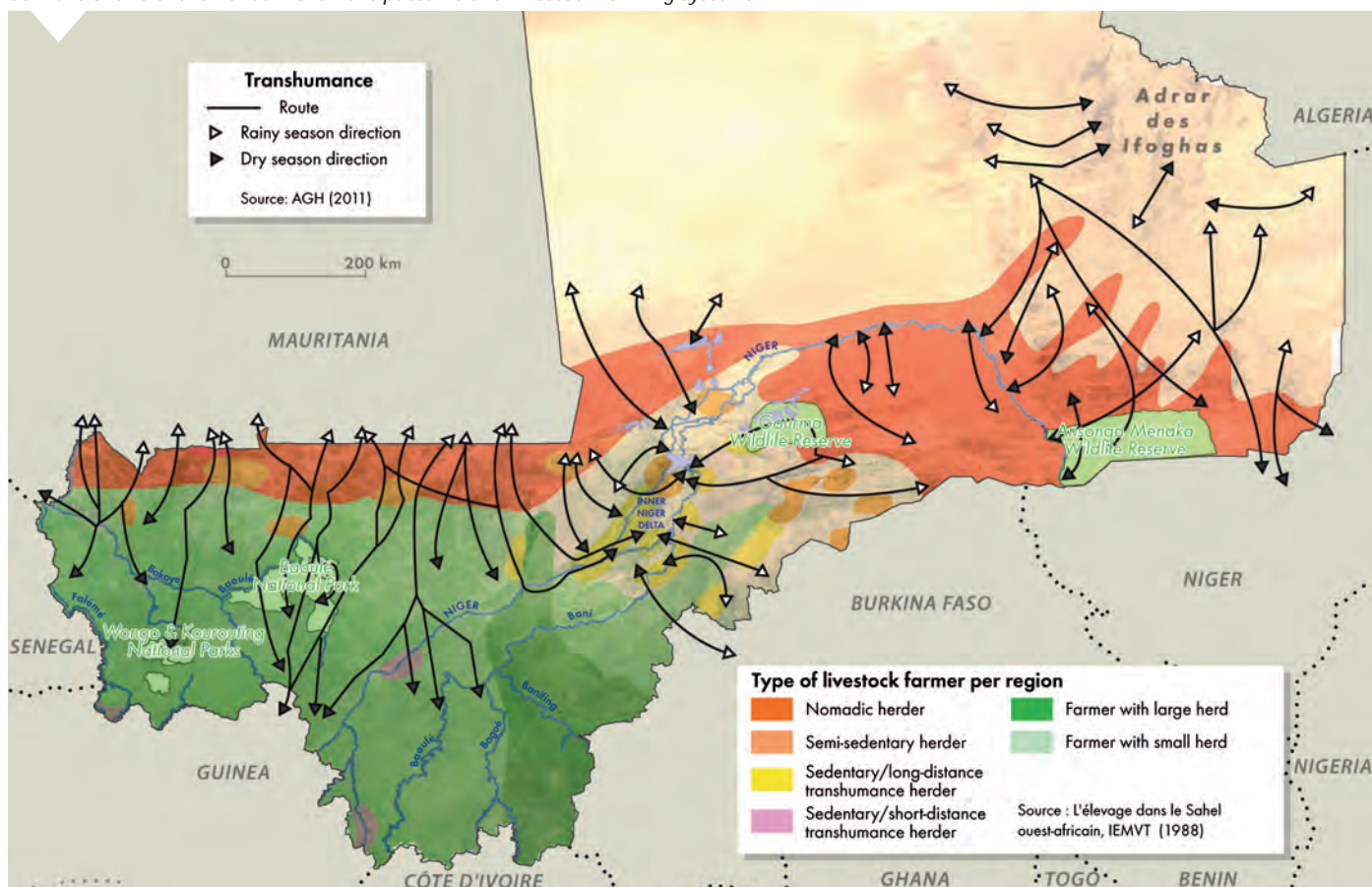


Transhumance workshop in Bamako in 2010

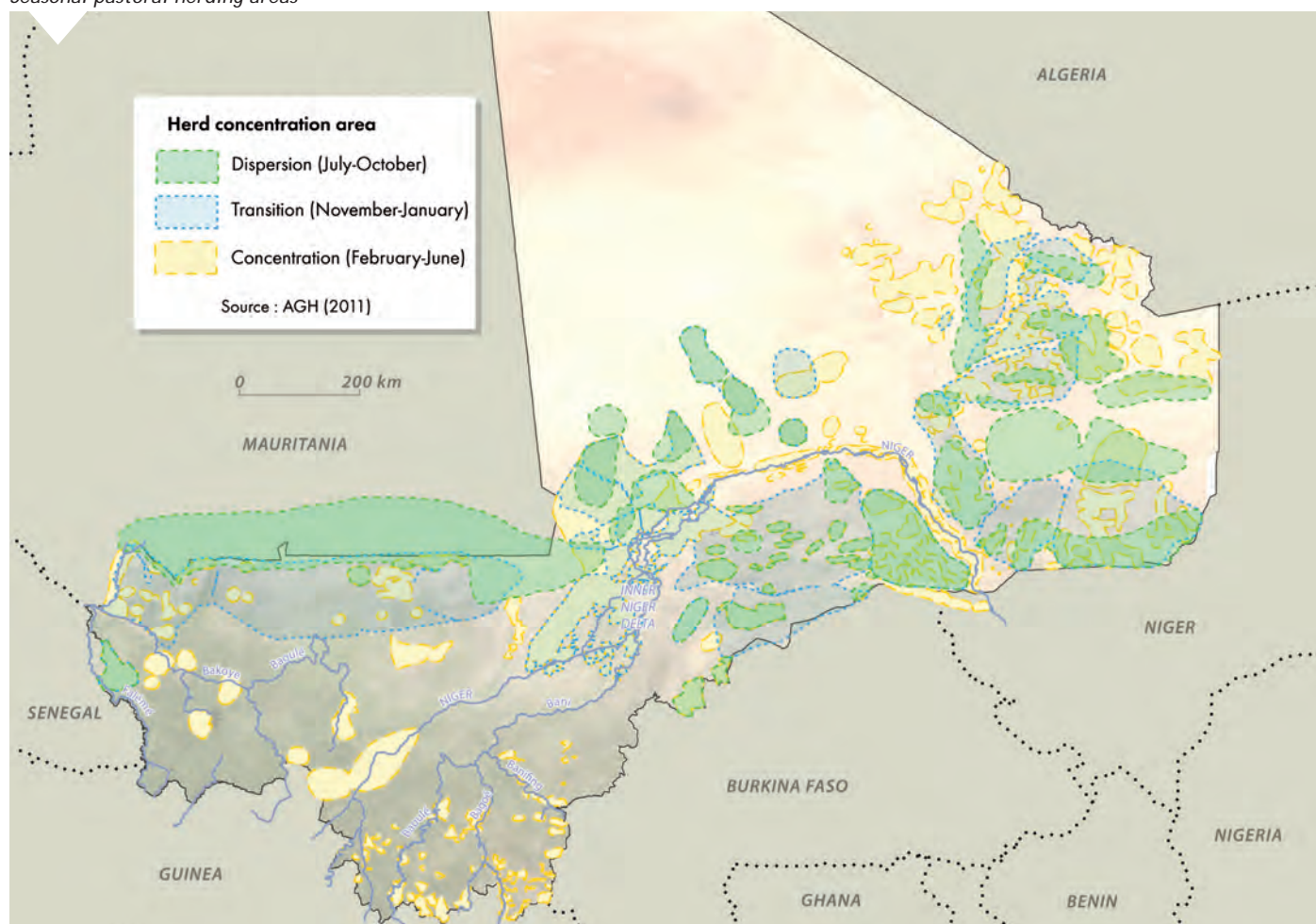


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Conventional transhumance movement patterns and livestock farming systems



Seasonal pastoral herding areas



The above map indicates that conventional transhumant herd movements in Mali are mainly in a north-south direction. Some transhumances move towards specific sites, such as the Inner Niger Delta, or the Adrar des Ifoghas mountain range. The seasonal pastoral herding areas shown on this map are the result of these movements in the early 2000s and dependent on three main seasons (rainy season, cold dry season, hot

dry season). This cartography provides a basis for further studies that could be subsequently undertaken on a finer scale. The map could thus be streamlined on a national scale, while avoiding excessive information and detail.

Based on this map, seasonal herd movements at any given time throughout the year can be characterized in exceptional detail. This makes it possible to predict a potential vulnerability of transhumant herds, depending on the season, and to determine if a pastoral crisis is about to occur on a local scale. A pastoral vulnerability map drawn up in this way highlights herd concentration areas and areas that have been abandoned depending on the availability of pastoral resources. This makes it possible to foresee areas requiring assistance according to the herd locations

Transhumant herd concentration around Gao



For further information:

Ham F., Metais T., Hoorelbeke P., Fillol E., Crahay P. 2011 - ACF. One horn of the cow: an innovative GIS-based surveillance and early warning system pastoral areas of Sahel.

Trade terms in 2010

A. Wane, JD. Cesaro, I. Touré, N. A. Sow

Pastoral households in the Sahel are subjected to climatic, economic, sanitary, social and political disturbances, all of which have an impact on their production potential and consumption patterns.

In 2010, a food and nutrition crisis severely affected Sahelian pastoral communities. This problem was mainly associated with a shortage of rainfall during the 2009 rainy season and with impacts in terms of biomass production and insufficient filling of temporary and permanent streams. Pastoral communities in northern Mali were also affected by this multidimensional crisis. From a commercial standpoint, trade commodity prices tended to rise. This price ratio changed for various reasons in the livestock farming sector as a function of the geographical areas and the specific consumption habits of livestock farming populations. They were gradually dependent on relative values between livestock and cereals, especially between cattle and cereals (Dupire, 1962; Baier, 1980; Bonfiglioli, 1988), and finally between goats and millet, particularly in Mali (Wane, 2010).

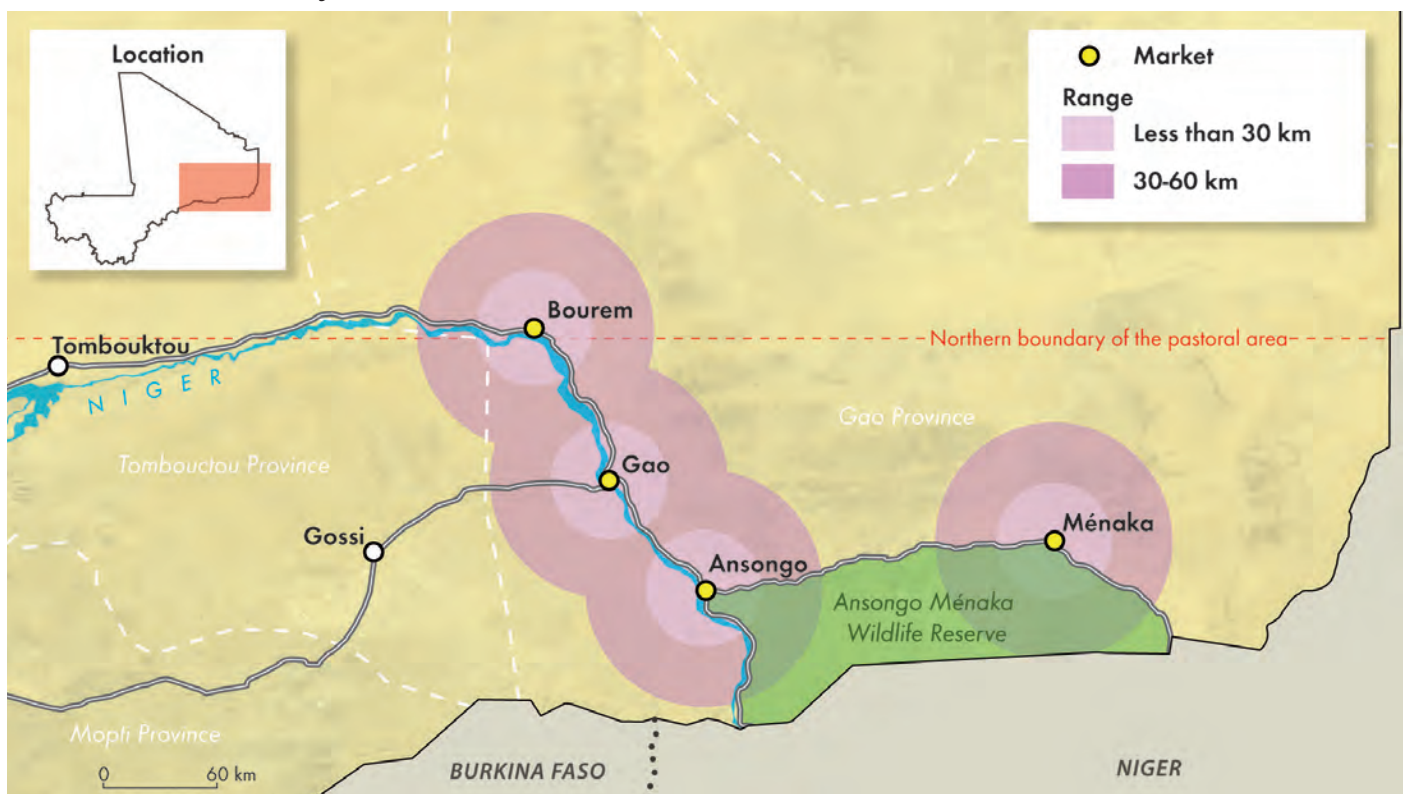
Nowadays, in addition to the effects of climatic events, speculations, the transmission of higher commodity prices, price volatility, and the impact of the substitution of local products by imported products have undermined the stability of trade terms (David-Benz et al., 2010).

Gao market, a trade centre

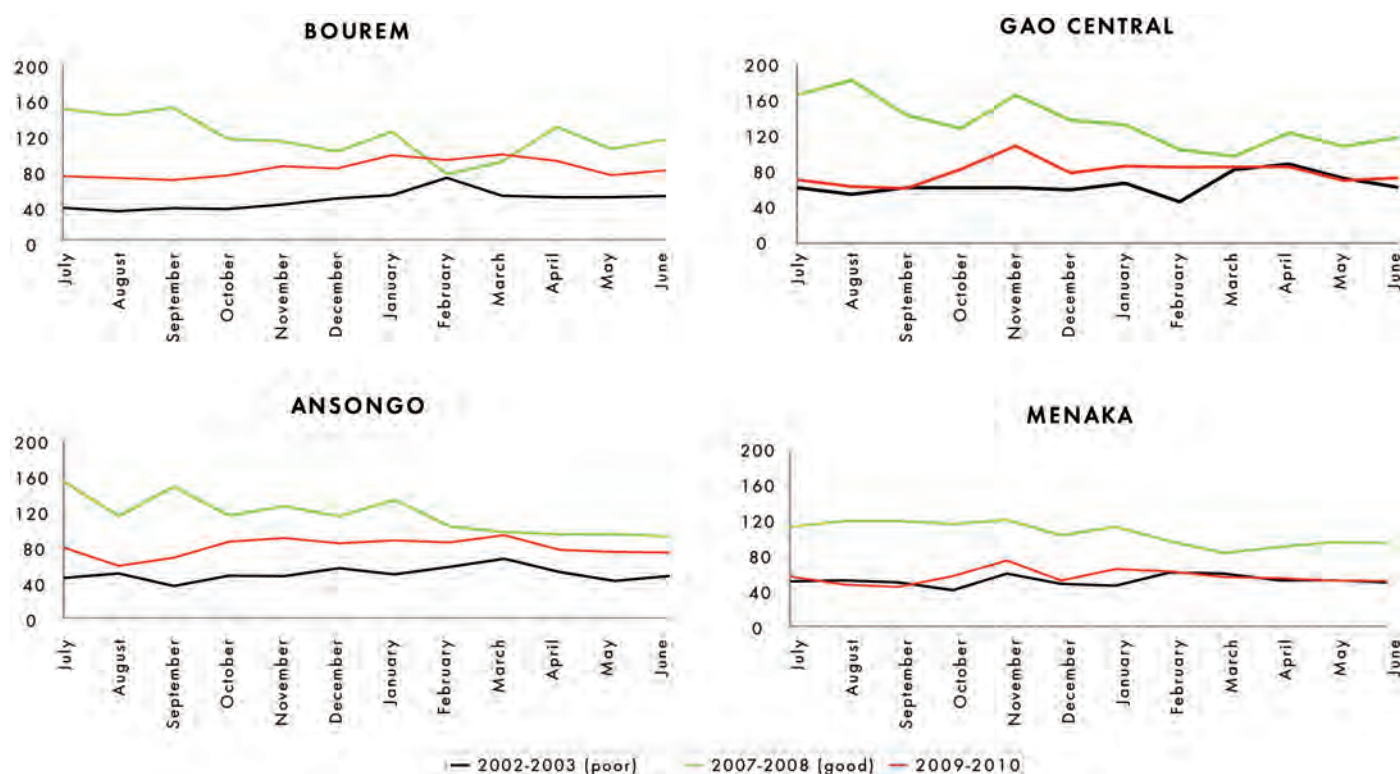


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Location of markets surveyed in 2010



Trade terms in 2010 on all four markets relative to a good and poor year



In northern Mali, in 2010, goat-millet trade terms shed light on the potential degradation of peoples' livelihoods. Relative prices were first evaluated, and then assessments by experts (econometric forecasts) and stakeholders (assessment of the 'good' or 'poor' quality of a farm year) were combined to characterize the 2010 farm year relative to situations noted over the previous decade. The aim was to produce an operational tool that could be used by national and multilateral agencies responsible for administering and managing international aid.

Relative goat-millet values on four reference markets in

Ansongo market near Niger



northern Mali served as pastoral livelihood deterioration indicators. Millet price instability is associated with market dynamics, irrespective of the product trends and seasonality. Market instability and unpredictable stakeholder behaviour (speculation, stock retention, spatial margins, temporal arbitration of holders, etc.) could structurally explain the observed price differences. The relative price instability concerning goats is still dependent on the marketing effort, which is mainly associated with herders' decisions.

Comparatively, goat-millet trade terms for the July 2009-June 2010 consumption year in the reference markets were markedly below those of a good year, i.e. favourable for pastoral communities. The situations at Central Gao and Ménaka markets were similar to those of the poorest year of the last decade—even though there was a slight improvement after the harvests. This was followed by degradation as early as February 2010 for Ménaka and March 2010 for Central Gao. The situation was less problematic at Ansongo and Bourem, but there was still some concern.

For further information:

Wane A. (2010), *Evaluation de la situation alimentaire et nutritionnelle des ménages pastoraux du Burkina Faso et du Mali*, Rapport d'étude PAM/CIRAD, 83 p.

Livestock markets

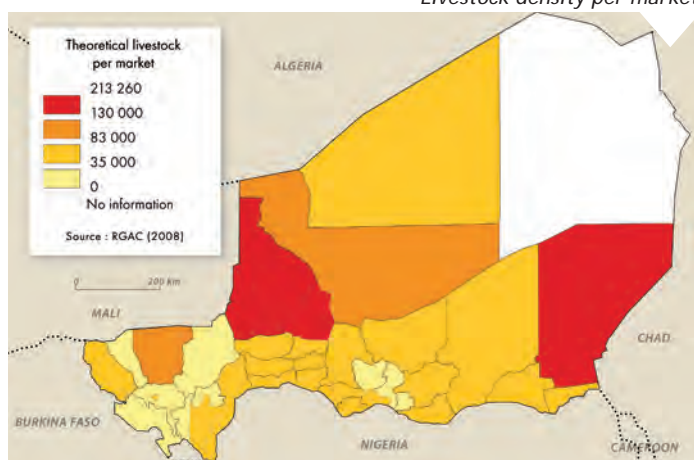
I. Atté, M. Saley, S. Yahaya, S. Djibo, I. Touré

Tahoua market in Niger



© I. Touré (2008)

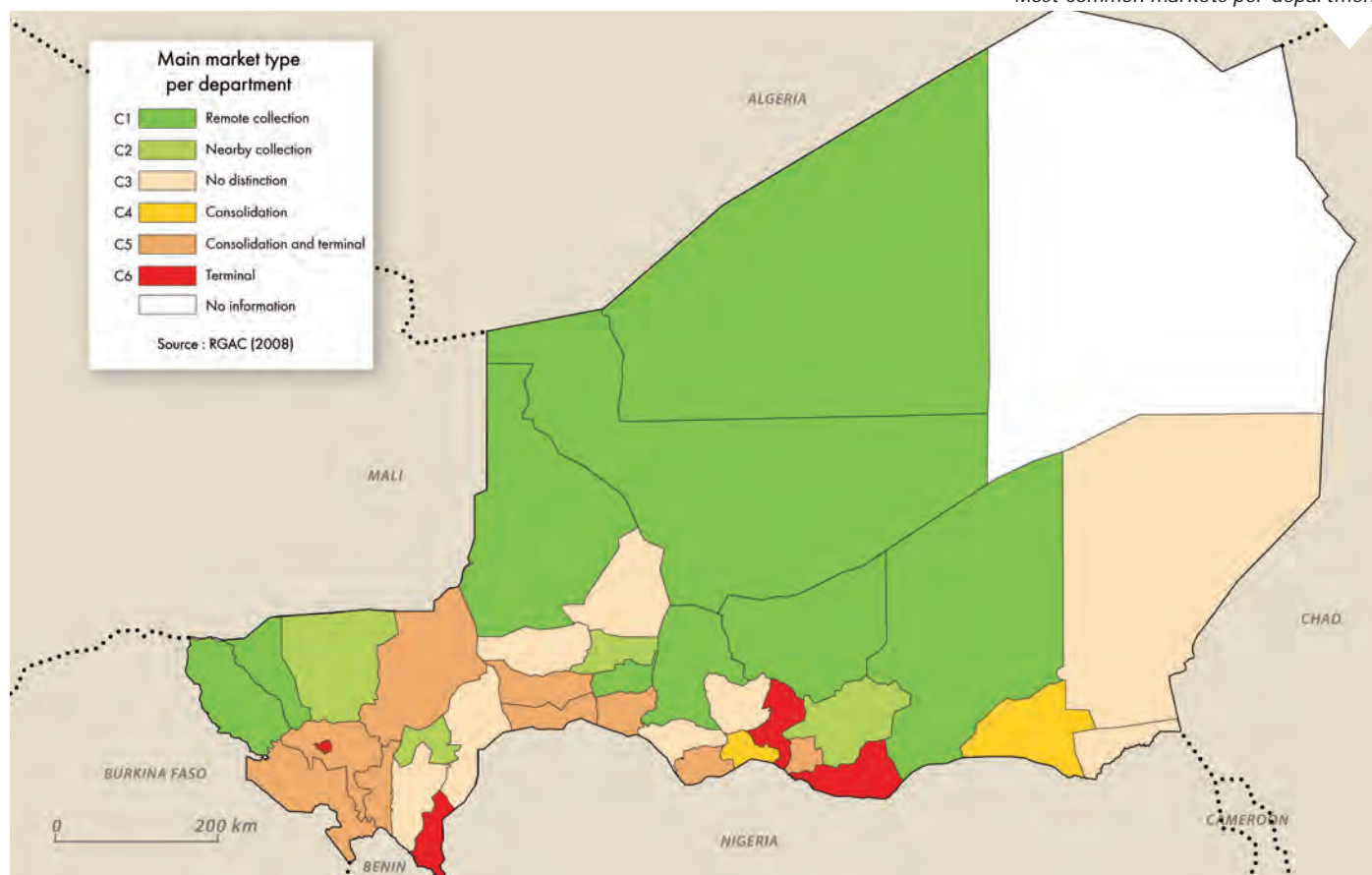
Livestock density per market

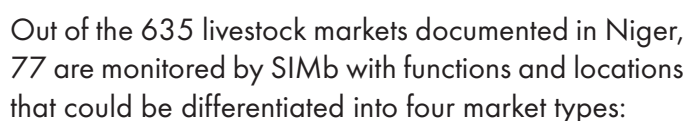


In Niger, pastoral livestock farming is based on highly vulnerable production systems. The droughts of the 1970s, 80s and 90s, and the food and pastoral crises of 2005, 2010 and 2011 had a serious impact on herd growth patterns. Moreover, the insufficiency of the pastoral crisis prevention mechanism, which was supposed to support and supplement traditional systems, exposed livestock farmers in Niger to even greater recurrent food insecurity.

Following the 1984 drought, the Ministry of Livestock Farming set up an information system on livestock markets (SIMb) whereby the livestock price was considered to be a good indicator of livestock farmers' purchasing power and could be compared to those of the main cereal crops. Since 1998, SIMb has been an integral part of the national food crisis prevention and management system, which generally aims to contribute to the sustainable improvement of food security in Niger and to enhancing the efficiency of national food security policies through greater market transparency and fuller insight into agropastoral product trade patterns.

Most common markets per department





- Since 1999, Nigeria has been the top destination of livestock herds from Niger. Livestock farmers from Niger markedly destock their livestock due to the highly incentive prices and the fact that the export situation continued to improve until 2011. An analysis of a chronological series of livestock statements over the 2010-2011 season highlighted the importance of consolidation and export markets, accounting for 46% and 28% of the total cattle supply volume.

The SIMb results show that the livestock supply (all species combined) is much more pronounced at the borders with Mali and Chad in the departments of Tchintabaraden, Abalak, N'guigmi, Tchirozérine and Ouallam, and with 6% of all markets surveyed in Niger.

Foreign export traders, which are confined to consolidation and export markets, are currently present on collection markets. The Côte d'Ivoire crisis has added to the substantial market of livestock from Mali.

The Recensement Général de l'Agriculture et du Cheptel (RGAC; agriculture and livestock census) classified them in seven categories, three of which are distinct (collection, consolidation, terminal, accounting for 56.53%) and four have a double or triple function (collection and consolidation, collection and terminal, consolidation and terminal, collection and consolidation and terminal, representing 43.46%).

For further information:
SIM bétail, Ministère des Ressources Animales, B.P.
12091 Niamey NIGER Tel: (+227) 73 72 96
E-mail: sscdsimb@intnet.ne

The 2007 census

I. Atté, M. Saley, S. Yahaya, S. Djibo, I. Touré

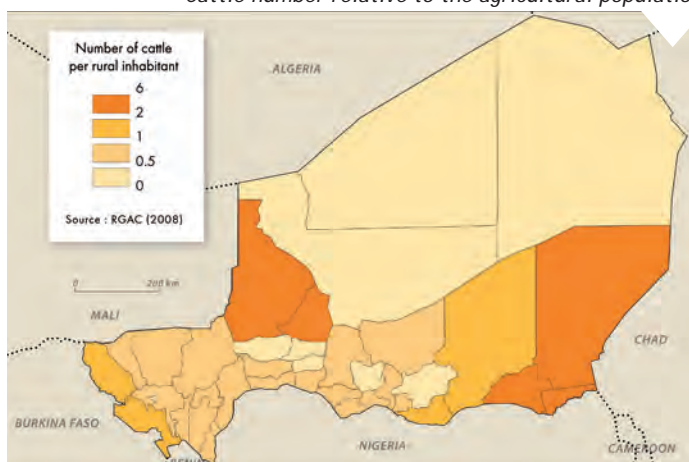
Livestock farming is considered as a lever that could boost the economy of Niger, with a recognized role in the rural development strategy (RDS) adopted by the Government of Niger on 14 November 2003. Since 2001, the Ministry of Livestock Farming, with the support of the European Union and FAO, has been involved in a large-scale agriculture and livestock census programme (RGAC) with the aim of compiling a reliable and updated statistical system. Four regions account for 77% of the total livestock population; Zinder (25%), Tahoua (20.6%), Maradi (16.41%) and Tillabéry (15%). Note that there is a predominance of sheep and goats (65.82% of the national herd) relative to other livestock species, especially cattle. Sedentary herds prevail, i.e. 66% of the national population, with a higher proportion of goats (42%). Sheep, cattle and camels represent 28%, 23% and 5%, respectively, of the national population. The proportion of breeding females ranges from 46% to 56% depending on the species. Nomadic herds represent 18% of the total population, mainly consisting of sheep (35%), goats (32%), camels (20%) and cattle (19%). This livestock farming system is mainly practiced in three regions: Tahoua (35%), Zinder (29%) and Agadez (21%).

Bororo cattle on the edge of a pond near Tagayen, Niger

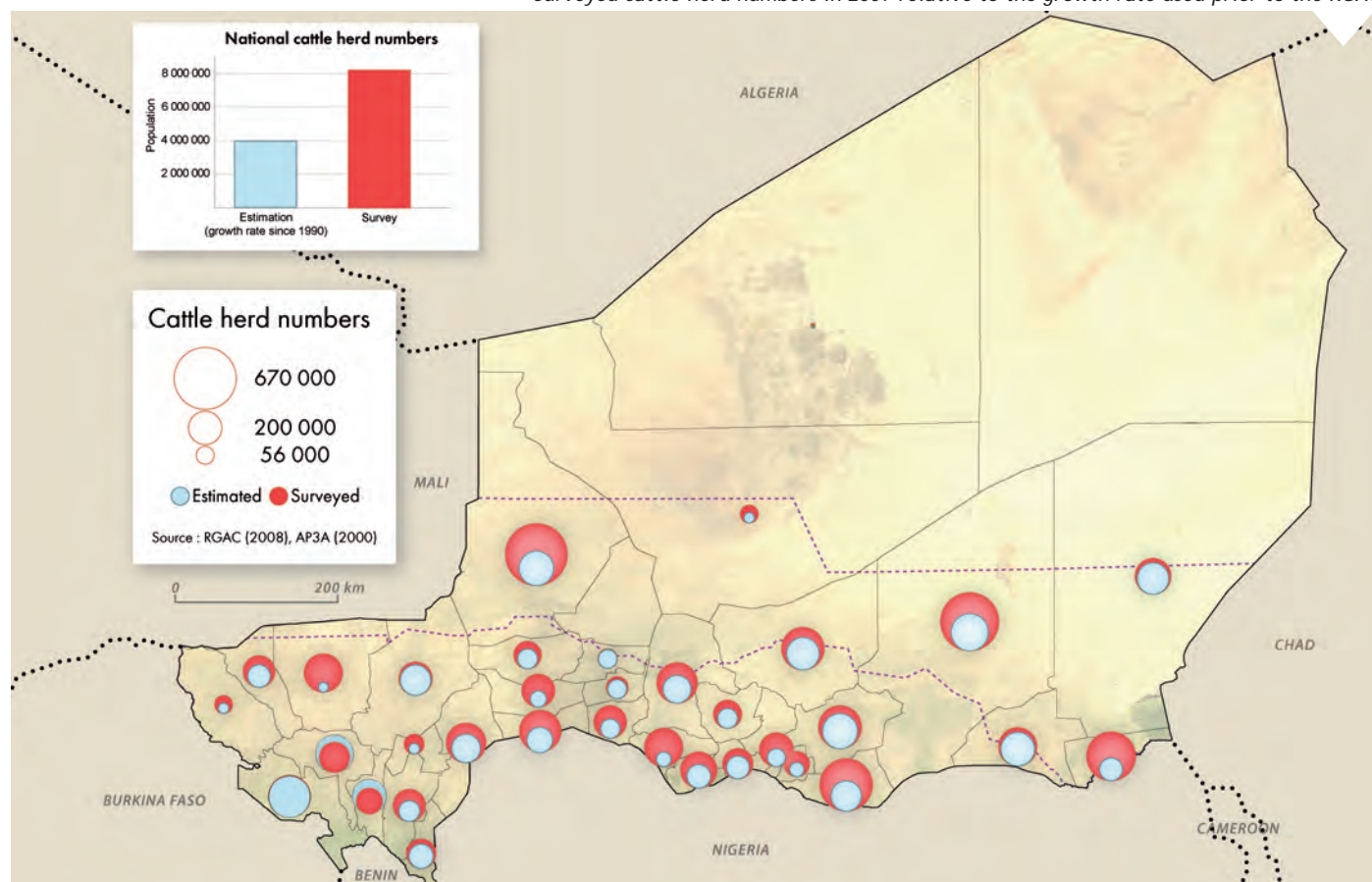


© I. Touré (2008)

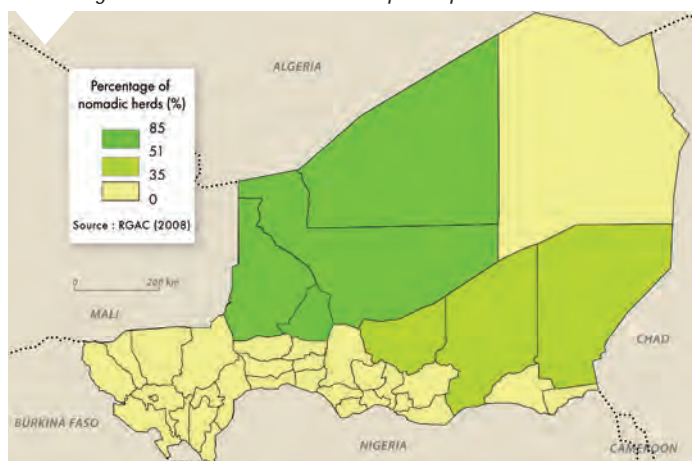
Cattle number relative to the agricultural population



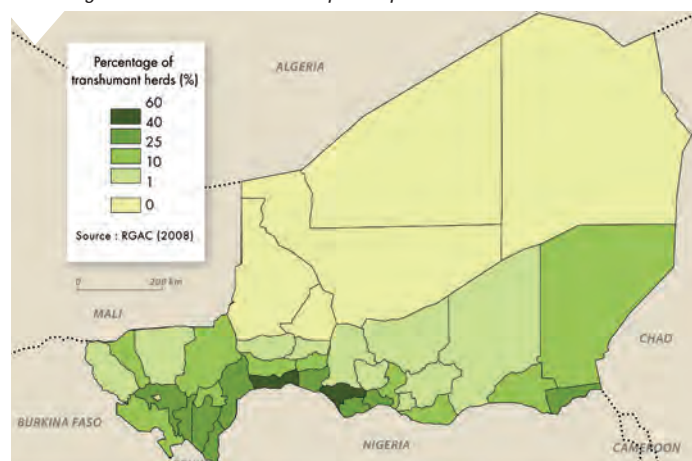
Surveyed cattle herd numbers in 2007 relative to the growth rate used prior to the RGAC



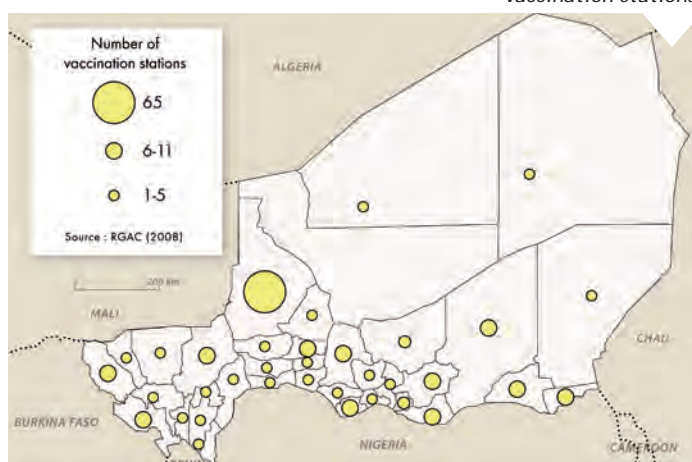
Percentage of nomadic livestock herds per department



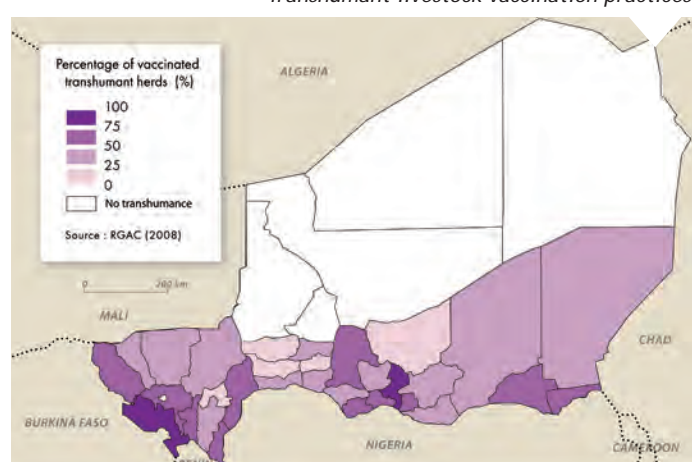
Percentage of transhumant herds per department



Vaccination stations



Transhumant livestock vaccination practices



The RGAC survey also generated data on three livestock farming systems: sedentary, nomadic and transhumant. Although the herd size declined as compared to the estimations, the number of herd owners increased. A southward shift in the hub of the livestock farming was also noted, with 60% of the cattle herds being hosted in the agropastoral area. This new distribution was perceived after the 1984 drought and confirmed in 2008.

The RGAC dataset represented a change from the former dataset which was very imprecise. However, information on annual herd production in terms of the number of animals used or potentially used by herders is still insufficient. This complex and hard to solve problem concerns all Sahelian countries. The livestock farming technical service figures estimated on the basis of constant annual growth rates overlook external events that may have a marked impact on herd dynamics and production (droughts, epizootic diseases, etc.).

The results of these surveys concerning the herd productivity in comparison with the 2005 survey data were used to build a uniform dataset for the 1970-2011 period. The demographic parameters obtained were

used in a dynamic projection model to obtain a more accurate annual growth rate.

There were more transhumance movements within the country, i.e. 56% of the total transhumant livestock herd, than transborder transhumance movements. Herds that were herded into other countries mainly crossed into Nigeria (79%), followed by Burkina Faso (7.5%), Benin (4.5%), Chad (3.8%) and Mali (3.6%). The RGAC revealed that vaccination practices were less common than herd deworming campaigns. Overall, in sedentary farming areas, 52% of cattle farmers, 32% of sheep farmers and 23% of goat farmers vaccinated their animals. However, the proportion of nomadic herders practicing vaccinations was only 11%, as compared to 48% for transhumant herders. These low rates were due to the poor distribution, low numbers or nonexistence of herd vaccination stations and corridors in some areas.

For further information:

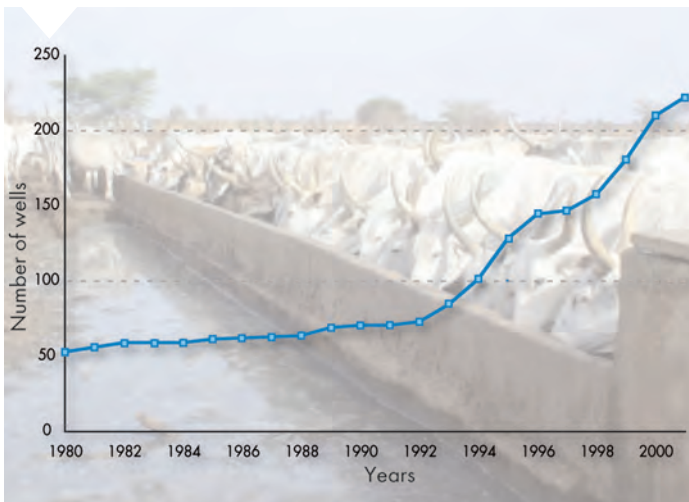
Recensement général de l'agriculture et du cheptel (RGAC) Niger 2008, 9 volumes

<http://www.stat-niger.org/NigerInfo/rgac/indexe.html>

Wells in Ferlo

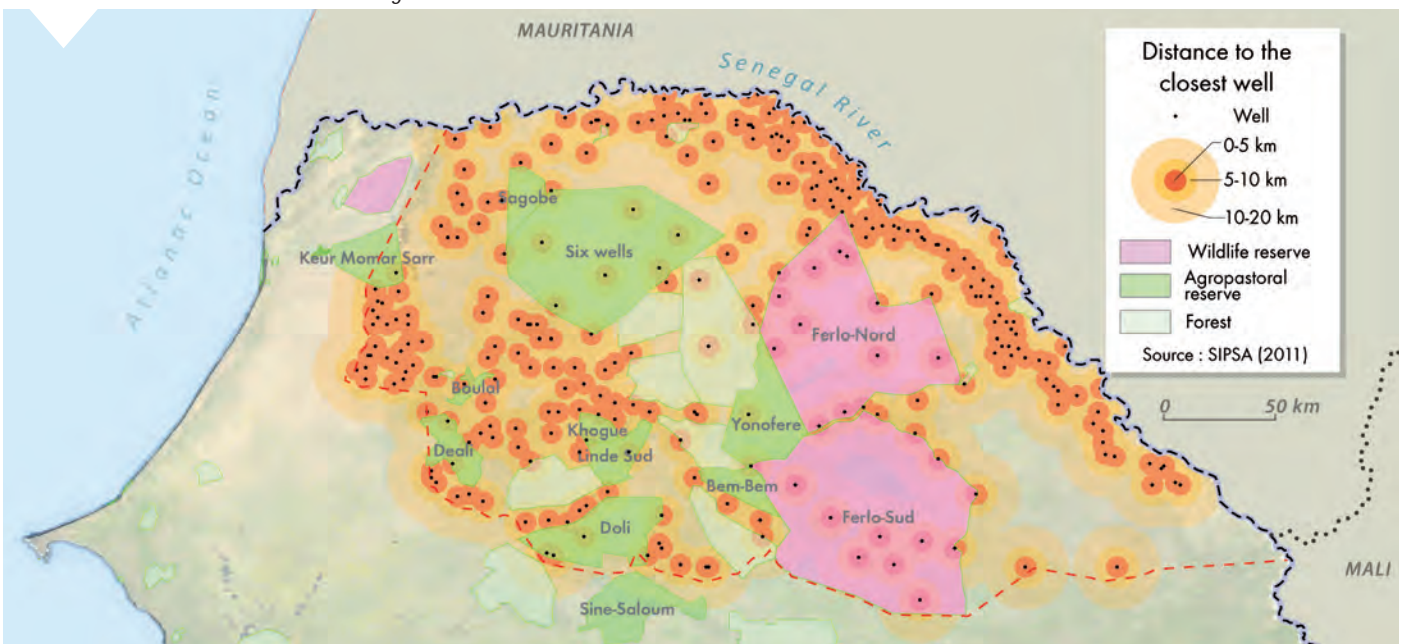
I. Touré, AT. Diop, A. Wane, JD. Cesaro, I. Niang

Trends in the number of drilled wells in the Ferlo region between 1980 and 2001



Ferlo is a traditional pastoral area that extends over an area of around 70 000 km² in northern Senegal. In this geographical area with a high natural fodder potential and visited half the year by Peul herders, transhumance takes place between the Senegal River Valley (Waalo) in the dry season and floodlands (Jeeri) in the rainy season (Barral et al., 1983; Touré. et al., 1996). A pastoral hydraulic policy was put in force by the colonial administration in the 1950s (Touré, 2010) to enhance fodder resource use in the area, while settling mobile herders that were hard to administratively control. This development programme led to a major restructuring of the area and the pastoral practices of herders, who gradually settled close to rangelands that had become 'opened' throughout the year in the vicinity of permanent wells.

Drilled well distributions in the Ferlo region in 2001

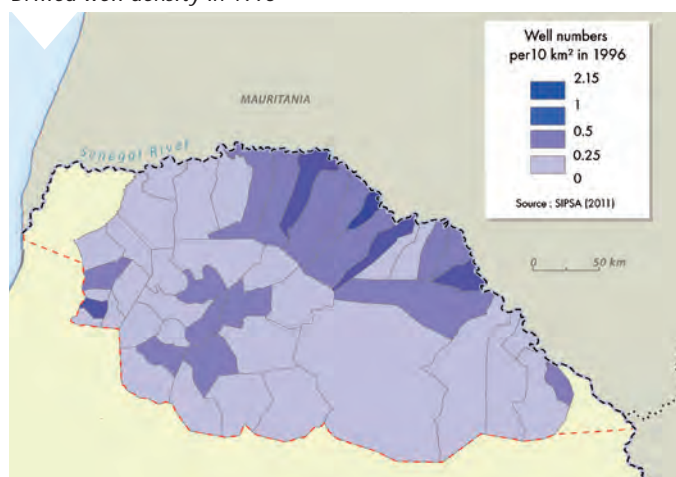


Scene around the Niassanté well

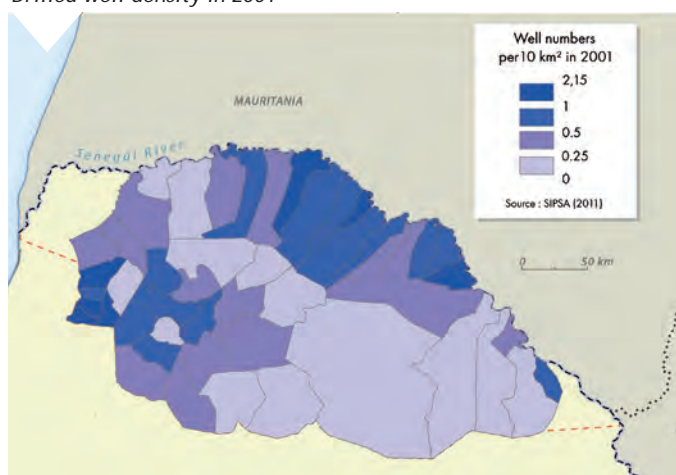


The Senegalese government continued to apply this policy after the two large-scale droughts in the 1970s and 1980s. The number of motorized wells more than doubled between 1990 and 2000 throughout the Ferlo region. New wells were built mainly along the Senegal River in Jeeri. The others are located in the southwestern Ferlo region, in the vicinity of the groundnut cropping belt. Few wells were built in the central southern Ferlo region. This 'diagonal void' could be explained by the aim to limit new development initiatives in order to protect the northern and southern Ferlo wildlife reserves and preserve pastoral resources required for the many transhumant herds that graze there during the dry season.

Drilled well density in 1996



Drilled well density in 2001



Inner tube and cistern used for transporting water



© I. Touré (2002)



© PAF (2010)

Drilled well density maps in 2001 showed high heterogeneity between rural communities. The eastern and southwestern regions benefited from more intensive hydraulic facility development. There was greater pressure on facilities in the northwestern region and in a few communities in the centre. This analysis also highlighted transhumance 'emitter' and 'receptor' types of rural communities. Drilled wells are operational year round but tapped to a greater extent from the onset of the dry season to the end of the lean period.

Financial management of these wells is complicated by the many transhumant herd departures and arrivals. Transhumant herders pay more than local sedentary livestock farmers (on the grounds that they should participate in well management and maintenance). The emergence of drilled wells in Ferlo region gave a monetary value to water. Paying for water is still not fully accepted and gives rise to many conflicts (Diop et al., 2003).

Since the 1990s, Senegal delegated well management to well users' associations (ASUFOR) and their control has become a challenge within communities. Once yearly, the number of heads of cattle and carts of each well user is 'counted', or at least declared. These units, multiplied by the per-head price (e.g. FCFA100/month/cow, FCFA30/month/small ruminant, and FCFA600/100 l inner tube water volume) gives the monthly fixed fee due per user. Surveys of livestock farmers mention an overall herd watering price at the well (FCFA2 000 to 24 000), often based on a livestock census. There is a fixed price for water consumption per family (90% of livestock farmers pay between FCFA200 and 5 000 per month, with a median value of FCFA1 000). Based on experience, the project to support livestock farming in silvopastoral areas recommends charging for extracted water volumes calculated via installed water counters. In light of the deficiencies noted in community management of these drilled wells, the political option is to hereafter assign the well maintenance task to private operators. The operator would have a well maintenance monopoly while also being obliged to assist ASUFOR.

For further information:

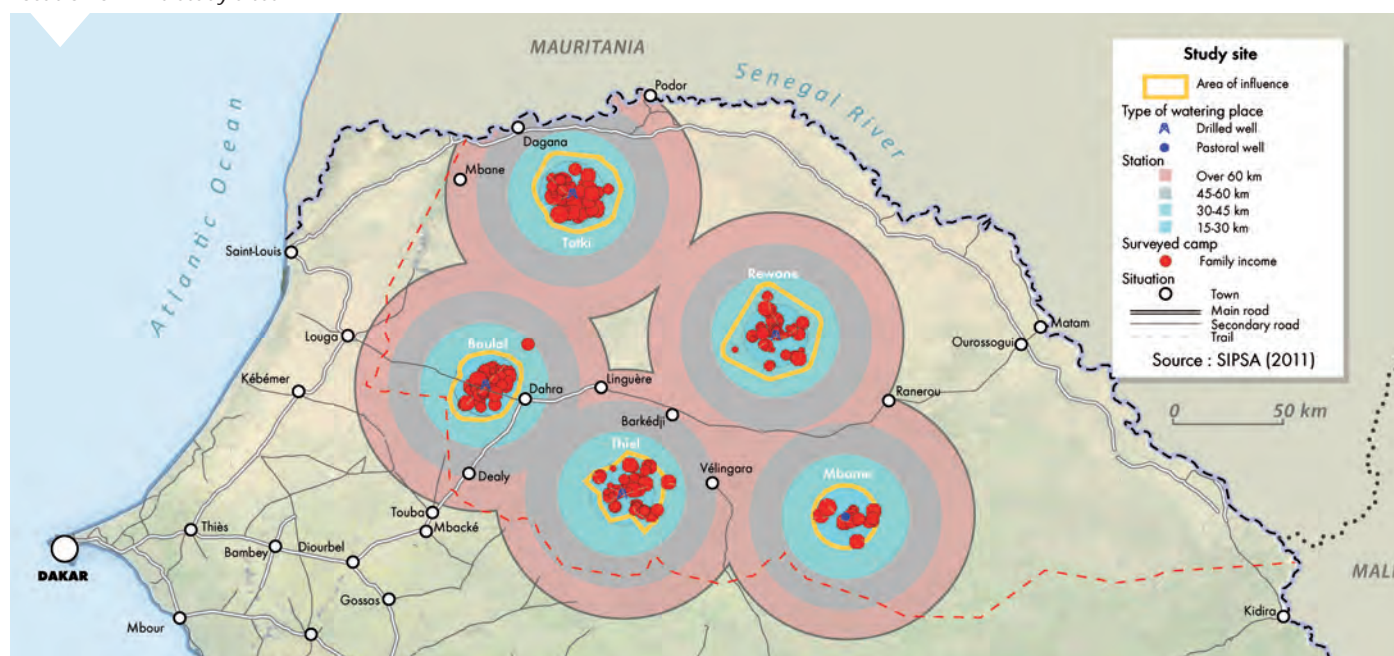
Ancey V., Wane A., Müller A., André D., Leclerc G., 2008. Payer l'eau au Ferlo. Stratégies pastorales de gestion communautaire de l'eau. Revue Autrepart, IRD. p. 51-67

Pastoral income

A. Wane, I. Niang, I. Touré, JD. Cesaro

In addition to being a livelihood, Sahelian pastoralism is an activity involving production, consumption and marketing of goods and services in a global change setting (climatic, economic, sociopolitical). Between 2005 and 2006, PPZS conducted household surveys starting from a statistically representative sample of the ecological and economic diversity in the Ferlo region. This study quantified income derived from this activity at weekly markets. This was representative of pastoral revenues overall derived from sales of livestock (97.9%; cattle, sheep, goats), dairy products (0.5%; fresh milk, clotted milk and butter), donkeys and horses (0.8%) and other commodities (0.8%, millet, gum arabic, gathered products).

Location of PPZS study sites



These results gave a preliminary indication of the mean income disparity within and between pastoral sites. The Gini index was thus calculated to determine inequality levels between 0 (extreme case of completely egalitarian societies) and 1 (extreme case of completely inegalitarian societies). The overall Gini index for five sites representative of the ecological and economic diversity within the Ferlo region was estimated at 0.528 (Senegal has an index of 0.413) but there were sharp differences between the different studied sites associated with their isolation. Pastoral sites in the northern part of the area, which is more arid (200 mm rainfall), had a higher index of 0.50, so it was relatively inegalitarian, whereas the two located in the south (550 mm) were under this threshold, so they were more egalitarian. This inequality between sites was fourfold greater than in the communities.

Milk, consumed or sold, a pastoral livelihood support



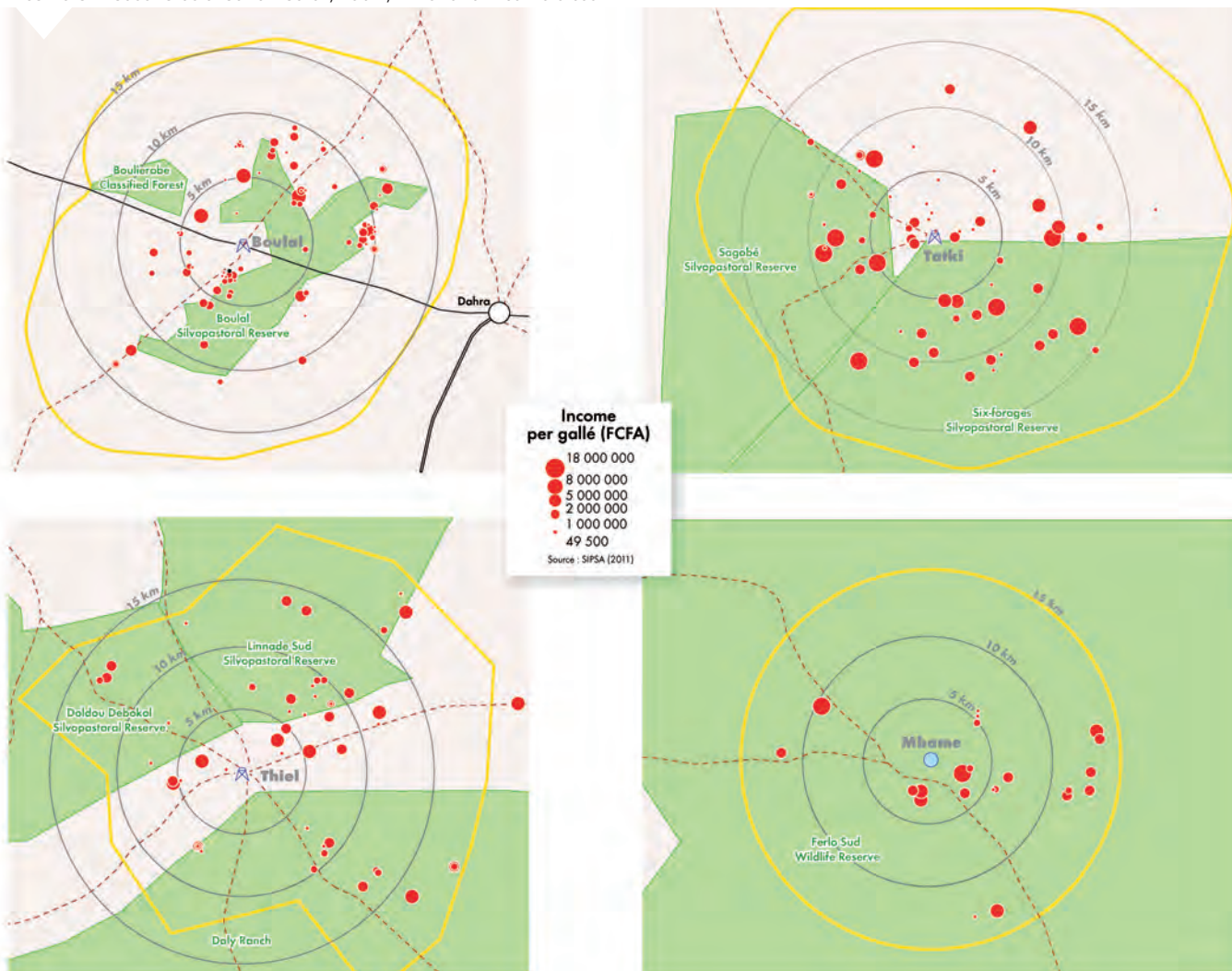
© C. Corniaux (2009)

Owning several carts is a sign of wealth



© JD. Cesaro (2009)

Income of households around Boulal, Tatki, Thiel and Mbame sites



Spatialization of the results per camp revealed high heterogeneity in revenues at sites with drilled wells (Tatki, Thiel, Rewane and Boulal) with a certain degree of homogeneity noted at the site with a pastoral well (Mbame) due to the income diversification potential.

The very high annual sales (FCFA4.2-18.5 million) were concentrated at Mbame (39%) and Tatki (23%), while low incomes (under FCFA2 million) were mainly noted around pastoral drilled wells at Rewane (76%), Boulal

(63%) and Thiel (61%). Livestock marketing accounted for over 96% of the overall sales per site. Donkey and horse sales were greater at Mbame where, due to the scattered nature of the population and the absence of basic infrastructures, these animals are used to carry herders' to markets and watering places. However, the sales data did not provide sufficient information on the marketing potential of Ferlo herders, who have a unique relationship with the market. Indeed, they are active in these markets, but this does not influence their production decisionmaking, except during specific periods when there is a very high market demand (e.g. during Aid-El-Kébir or Tabaski festivities).

Influential local people at a weekly market in Ferlo



For further information:

Wane A., Touré I., Ancey V., 2009. *Pastoralisme et Recours aux marchés - Cas du Sahel sénégalais (Ferlo), Cahiers de l'Agriculture, Volume 19, Numéro 1, 14-20, janvier-février 2010, Étude originale*
http://www.jle.com/fr/revues/agro_biotech/agr/som-maire.phtml?cle_parution=3257&type=text.html

Herd watering facility projects

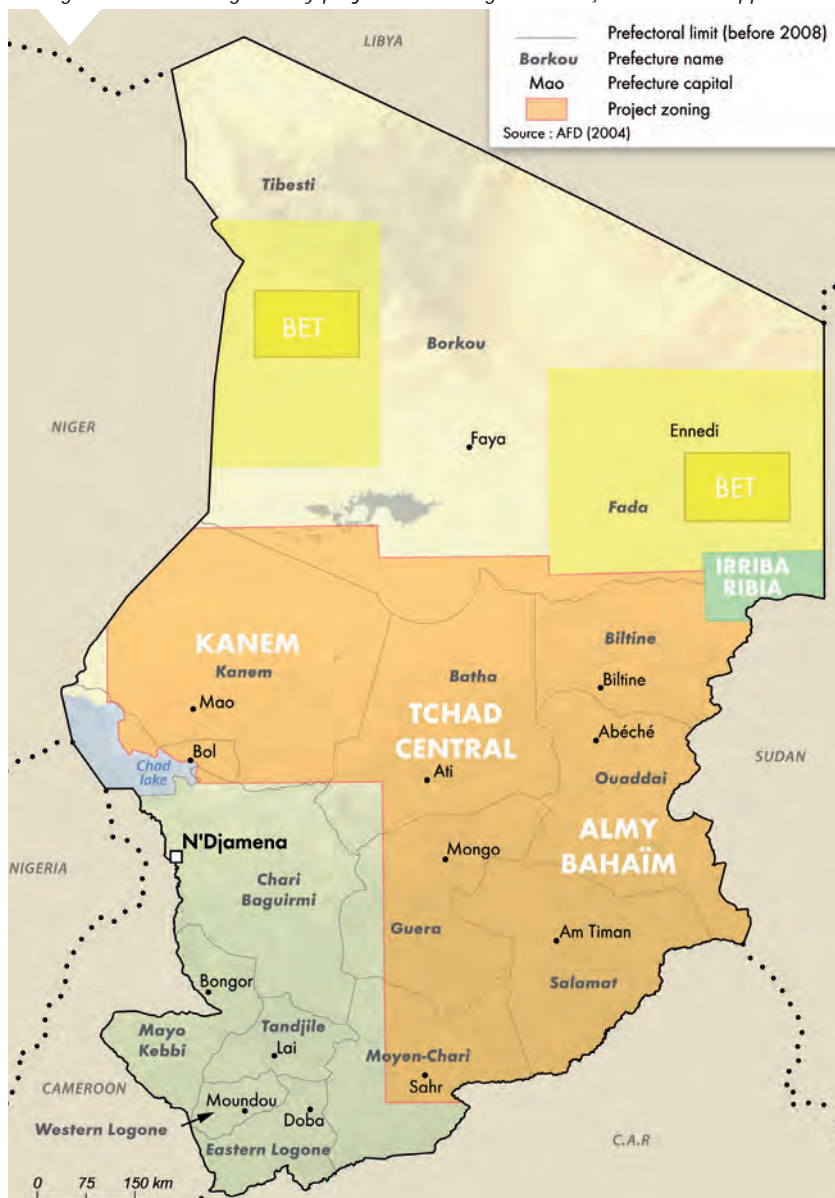
Y. Kamis, O.M. Saleh, , JD. Cesaro, A. Ickowicz

Water is an essential resource for livestock survival and production. In Chad, livestock farming is mainly pastoral, which is a key factor in the preservation of transhumant herd movements.

Heavy livestock losses occurred during large-scale droughts, whereas herders' mobility and adaptation strategies enabled them to limit the losses (10-20% mortality) as compared to sedentary livestock farmers (50-100%). Hence, to preserve and stimulate the development of pastoral herding, in the 1980s the Chadian government initiated a major programme for the development of herd watering facilities. From 1983 to 2010, around 30 pastoral hydraulic projects were set up in different Chadian regions. Two-thirds of them

were combined with the development of transhumance routes. French development assistance accounted for around 60% of the investments, whereas Saudi Arabian and Kuwaiti funds accounted for 20%. The remaining funding was obtained from different international organizations. Projects funded by the Agence Française de Développement (AFD) and implemented by one or several research agency consortiums (ANTEA, IRAM, AVSF, CIRAD, etc.) aimed to preserve herd mobility to ensure sustainable pastoral resource use (water and grazings). They developed an approach based on pastoral mobility, which was designed on the basis of previous lessons and experience, highlighting the social and environmental risks that could hamper management of watering facilities and pastoralism.

Zoning of herd watering facility projects of the Agence Française de Développement



A pastoral well in northern Batha



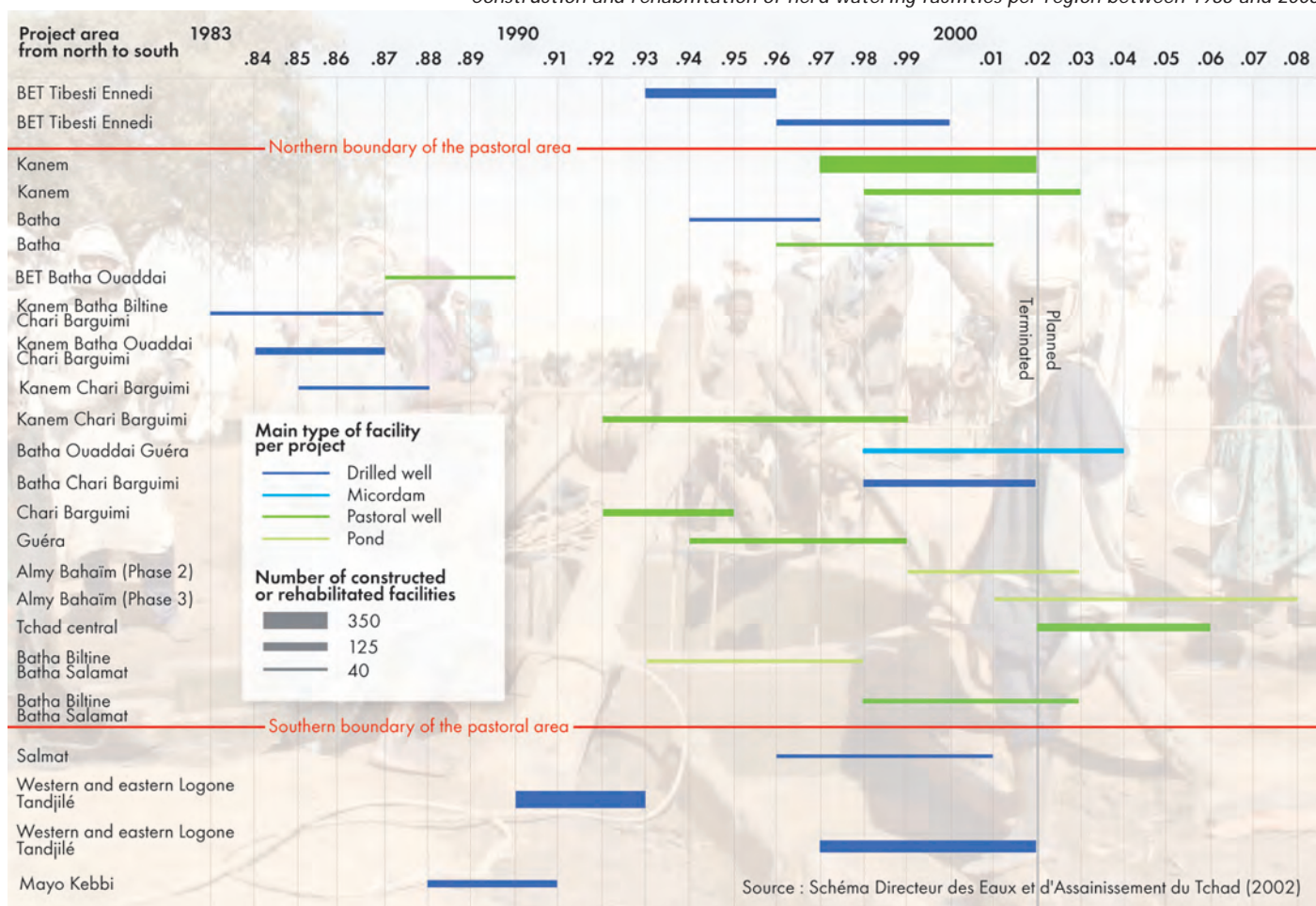
© Almy Bahaim project (2008)

Construction of a pond in Ouaddai region



© Almy Bahaim project (2008)

Construction and rehabilitation of herd watering facilities per region between 1983 and 2008



© Almy Bahaim project (2008)

These projects were implemented in original ways, i.e. accounting for the management of pastoral and agropastoral areas, defining a strategy tailored to each specific area, analysing and preserving mobile systems, strengthening existing capacities with respect to social management of herd watering facilities and conflict mediation. The following herd watering facilities were built over a 28 year period:

- 1 350 wells for pastoral and mixed (village community and pastoral) uses;
- 1 222 drilled wells, half of which are located in Saharan and Sahelian areas;
- Around 300 specially adapted ponds; around 20 dams.

In addition, over 1 000 km of transhumance trails and herd resting areas—sources of conflict—were marked in order to clearly outline pastoral rangelands threatened by other activities or development projects.

These markers were made of masonry, reinforced concrete, galvanized tubing and temporary materials (wooden stakes, or painted markings on trees). These

newly constructed watering facilities enabled access to certain grazing areas that were previously not grazed due to a lack of water, the enhancement of other areas, while reducing pressure on areas that were previously overgrazed. The early southward movement of transhumant herds during some years was slowed down and, in turn, conflicts associated with crop damage were mitigated. Trail markers clearly reduced conflicts associated with transhumant movements. Overall, the approach based on herd mobility and monitoring of these projects involved setting up infrastructures along transhumance routes: watering points, markers along corridors and herd resting areas, strengthening of cooperation between users and conflict prevention.

Recent assessments highlighted the advantages of constructing and managing these herd watering facilities, but through a more integrated and multisectoral pastoral development approach.

For further information: Ickowicz A., Aminou B.K., Ancey V., Azoulay G., Benamour A., 2010. Note de synthèse. Interventions financées par l'AFD dans le secteur de l'hydraulique pastorale au Tchad sur la période 1994-2004. Rapport AFD-CIRAD, Montpellier. 19 p.

Essential transhumance management

Y. Kamis, O.M. Saleh, A. Ickowicz, I. Touré, JD. Cesaro, B. Toutain

Transhumance is both a livelihood and a production system. In Chad, transhumance takes place according to an almost invariable cyclical scheme, dictated by annual ecological and climatic conditions in an area within which several sectors are successively grazed during the year. These annual herd movements take place in succession as long as the rainfall, social and economic conditions remain relatively stable. The extent of herd movements is highly variable, generally running in a north-south direction at the onset of the dry season, and a south-north direction at the onset of the rainy season. Transhumant herd movements have so far involved effective use of pastoral resources to ensure sufficient herd production, while giving fresh impetus to and boosting the dynamism of different local markets.

Health and schooling coverage for transhumant camps is very poor. Despite efforts by the government and partners to provide an education for herders' children and facilitate access to health care, this segment of the population remains undereducated and vulnerable. In colonial times, there were attempts to set up mobile schools to educate herders' children. Since 1994, the Chadian government, with the help of UNICEF, the Swiss Cooperation and AFD, launched several programmes geared towards educating nomadic herders' children. Currently over 200 primary schools are located in villages in the vicinity of pastoral rangelands and home areas of transhumant herders. A primary school teacher training school was created. All of these efforts have, however, met with limited success.

Trends in the main transhumance routes from 1970 to nowadays



Camel caravan in central Chad



© Almy Bahaim project (2008)

Cattle herd near Salamat



© A. Ickowicz (2008)

Transhumance corridor

Muhral (transhumance routes) and facilities in the Almy Bahaim project

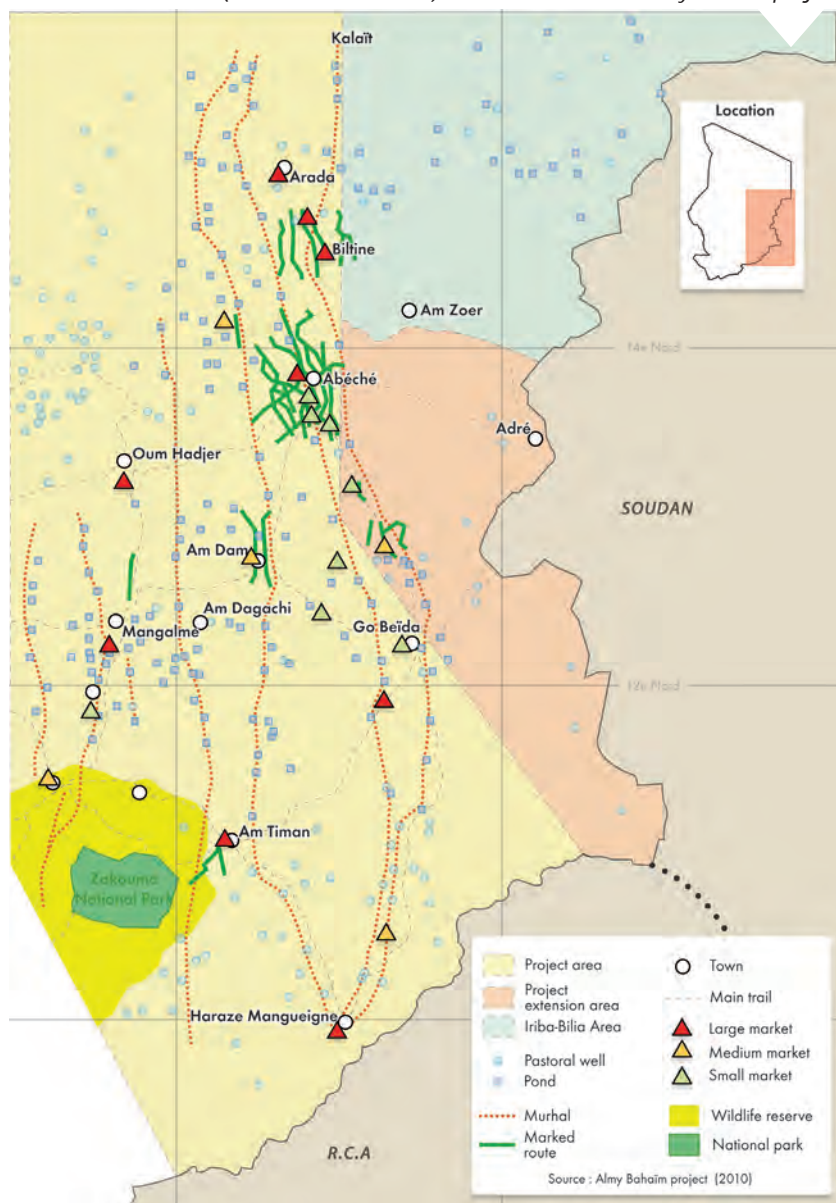


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Mongo community radio



© Almy Bahaim project (2008)



The development of mobile schools associated with large herders' groups, with specifically tailored programmes and schooling periods is essential. There is very little supervision of pastoral products. Apart from pastoral herd watering facilities, very few State and NGO interventions are focused on transhumant livestock farming. The sanitary coverage rate is under 20% and there is no industrial supervision of dairy and meat products in these production systems.

Since the 1980s, under the impact of droughts and increased human and animal populations, transhumance movements are increasingly in a southward direction and, since some farmers are beginning to plant crops in pastoral rangelands, there is an increased risk of incidents taking place on transhumance rangelands, including devastation of crops, violation of protected areas, livestock stealing, etc.

This situation has markedly boosted the transhumance challenges: social, legal preservation and land development issues. Several initiatives have attempted to ease conflicts between natural resource users. The Almy Bahaim project focused on placing markers along many transhumance corridors around large towns such as Abéché and Am Dam. The creation of local parity committees designed to prevent and manage conflicts concerning watering points, community radio stations to enhance information access and awareness, the management of conflictual pastoral trails and areas, discussions on pastoralism in forums and conferences have all set the stage for drawing up a preliminary draft of a pastoral code in Chad, which is currently being finalized.

For further information:

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Acronyms and Abbreviations

AGH: Action Against Hunger	NOAA: National Oceanic and Atmospheric Administration
AFD: Agence française de développement	NGO: Non-governmental organization
AGHYMET : Agro-Hydro-Meteorological Regional Centre	OECD: Organisation for Economic Cooperation and Development
ALG: Authority of Liptako-Gourma	P&E: Pastoralism & Environment
AMESD: African Monitoring of the Environment for Sustainable Development	PESah: Pastoralism and Environment in the Sahel
APEL-ZP: Animation pour la promotion de l'entraide aux initiatives locales en zone pastorale	PEI: Precipitation efficiency index
ASUFOR: Wellusers' associations	PPZS: Pôle Pastoralisme et Zones Sèches
AVSF: Agronomes et Vétérinaires Sans Frontières	PRVS: Procédure de Représentation de la Vulnérabilité Structurale
CEMAC: Central African Economic and Monetary Community	RGAC: Recensement général de l'agriculture et du cheptel.
CILSS: Permanent Inter-State Committee for Drought Control in the Sahel	RDS: Rural development strategy
CIRAD: Centre for International Cooperation in Agricultural Research for Development	SIMb: Information system on livestock markets
CNC: Comité National de Coordination	SIPSA: Information system for pastoralism in the Sahel
CSE: Centre de Suivi Ecologique	SISA: Information systems on food security
DM: Dry matter	SIVE: Information and environmental monitoring system
DMP: Dry matter productivity	SVN : Natural vegetation monitoring
ECOWAS: Economic Community of West African States	SWB: Small water bodies
ESEA: Ecole Supérieure d'Economie Appliquée (ex. ENEA)	TLU: Tropical livestock unit
EWS: Early warning system	UCAD: Université Cheikh Anta Diop de Dakar
FAO: Food and Agriculture Organization of the United Nations	UNDP: United Nations Development Programme
FCFA: African Financial Community Franc	VF: Vegetation front
FO: Farmers' organization	WAEMU: West African Economic and Monetary Union
FEWS: Famine Early Warning System (USAID)	WMO: World Meteorological Organization
GPCC: Global Precipitation Climatology Centre.	
IAP: Information and early warning system	
INSAH: Institut du Sahel (Bamako, CILSS)	
IRAM: Institut de recherches et d'applications des méthodes de développement	
ISRA: Institut Sénégalais de Recherches Agricoles	
LEAD: Livestock, Environment and Development	
MAE: French Ministry of Foreign Affairs	
MODIS : Moderate Resolution Imaging Spectroradiometer	
NCDC: National Climatic Data Center	
NDVI: Normalized difference vegetation index	

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Summary:

Over the last 30 years, Sahelian pastoral livestock farming has undergone major institutional, socioeconomic, climatic and agroecological changes, which have had a profound impact on the lifestyle of increasingly vulnerable rural people. For this atlas, SIPSA and partners collected and analysed information products which confirmed these trends, but also revealed the scarcity of historical data and specific indicators required to refine the analyses and characterize, foresee and manage pastoral crises. An analysis of the 1972-2012 period highlighted the overall trends.

Legislatively, pastoral livestock farming was recognized as being a production system by several Sahelian countries, but the regulatory frameworks differ between countries. The harmonization and application of laws controlling transborder transhumance and marketing of livestock are highly supported by umbrella livestock farmers' organizations and have become a subregional institutional and economic policy priority.

Climatically, following the interannual variations that took place over the last two decades, and despite the large-scale droughts (1968-1974, 1983-1984, 2002-2003, 2005, 2009), the current trend in the Sahelian pastoral area indicates a northward shift in the isohyets. Few bushfires were recorded from October to November. However, high bushfire densities were noted in the southern part of the pastoral area and in the vicinity of wetlands (Senegal River Delta, Inner Niger River Delta and Lake Chad).

Pastoral mobility (transhumance) has adapted to changes under the combined effects of greater herd sizes, increased drought frequency and the expansion of cropping areas, sometimes even extending across transhumance corridors. In addition to these factors, there are very many transborder livestock markets, which is forcing herders to create longer and dispersed alternative southward transhumance routes. Notwithstanding the number and diversity of existing equipment infrastructures that have emerged over the last 50 years, pastoral development is still hampered by the fact that development policies are poorly coordinated between stakeholders, and market access is complicated.

From a socioeconomic standpoint, pastoral farmers' households have diversified their activities while also developing endogenous nonmonetary mutual aid mechanisms to reduce the impacts of climatic, economic and sanitary shocks. An analysis of household incomes in the Senegalese pastoral area highlighted the average income inequality within and between pastoral sites, associated with their geographical location (markets, basic social infrastructures, etc.), and especially with the availability of water supply facilities (pastoral drilled or dug wells). Over the last decade, the trend towards increased use of new information and telecommunication technologies and motor vehicles has considerably enhanced herding management and mobility strategies in pastoral areas in Sahelian countries.

Information and early warning systems in the Sahel are generally hindered by the lack or absence of raw data and relevant historical data summaries, but also of specific indicators designed to characterize crises and trends affecting Sahelian pastoral systems—the lack of organization of the different stakeholders and beneficiaries (rural communities, farmers' organizations, etc.) in a consistent network; and the insufficient involvement/participation of local and national livestock farmers' structures in public policy negotiations.

For instance, few countries have statistical databases on exact herd numbers or on the monitoring of livestock markets located in pastoral areas. Differences noted between annual growth rates and the results of the 2007 general agriculture and herd census carried out in Niger confirmed the lack of accuracy of the data used in most countries. The latest pastoral crises in Mali, Niger and Chad revealed the malfunctioning of the policymaking and decisionmaking system, the shortage of specific pastoralism data and information and the fact that the impacts of the substitution of imported products by local products on trade indicators currently used in early warning systems are not taken into account.

In order to be able to make effective use of all available data and specific indicators, it is necessary to support a reliable information system so as to reduce information asymmetry in decisionmaking processes and enhance the security of pastoral production systems integrated with other agricultural production systems. Such a field-tested information system should be based on an integrated approach to pastoral socioecological systems. It should also be relevant and sustainable via its information updating and processing, while also being tailored to the situation facing public administrations that have to cope with resource depletion and dispersed expertise.

With the resurgence of climatic, food and nutritional crises in the Sahel, institutions responsible for managing early warning systems should take advantage of SIPSA to put in question their achievements and discuss the use of information generated by these systems for decision-support purposes. They also have access to elements for analysing sustainable development policies concerning pastoral societies in the Sahel, as well as research orientations and responsibilities.

Keywords:

Desertification, Natural resource management, Information systems, Pastoralism, Livestock farming policies.

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