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An information and early warning system designed for sahelian pastoral systems: the example of SIPSA implementation in Senegal

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Abstract: Pastoral systems play a predominant part in the economy of Sahelean countries by contributing to the food security of rural as well as urban households. But this breeding system based on managing natural routes cannot yet successfully adapt itself to the current context characterised since the 1970's by great agricultural - ecological and institutional changes. The endogenous evolution of these systems needs to be supported to better meet these changes and the implementation of adapted policies is needed to avoid crises and conflicts. Some research work has been carried out by various organisms on this major

economics. The one led by LEAD (Livestock, Environment And Development Initiative) has contributed to the understanding of the biological phenomena involved in breeding - environment interactions. The renewed understanding of breeding - environment interactions, the dynamics of current initiatives and new pastoralism diagnosis and evaluation tools laid the foundations of SIPSA (Information System on Pastoralism in the Sahel) that was launched in 2002 to promote the taking into account of pastoralism-environment interactions in extensive livestock breeding policies and practices in Sahelean arid zone. This information and early warning system is today displayed in six Sahelean countries and has, in the future, to put an end to the lack of indicators and information specific to pastoral systems to make it possible for breeders and political makers to better manage spaces, resources and societies. This paper describes the implementation of this decision making help system in Senegal by a national coordination committee (CNC), hard data to indicators and information products co-built with different actors.

Keywords: pastoralism, Information System, Drought, Indicators, Food security

Introduction

60 % of the planet pasture lands or nearly half of exploitable lands are concerned by pastoral systems. These livestock breeding develop area pastures which, because of difficult climate conditions would otherwise be uninhabited. In arid zones, decisive means of subsistence are thus provided to 100 million individuals (Blackburn *et al.*, 1997).

In Sub-Saherian Africa, livestock breeding was accused of being an important resource dilapidation factor. Because of the increase in pressures and various difficulties (climate: Isohyets moving southwards, land: agriculture rise) actors (livestock breeders and political decision-makers) show increasing needs in technical help, building up facilities and information to enable them maintain the animal output-resource sustainable use balance (According to Pastoralism and Arid Zones, Virtual Center, FAO).

In Senegal, ruminant breeding makes up a business which gives occupation to 30 % of the population. It represents about 30 % of the Agricultural GDP and 37 % of the national GDP (between 1994 & 2000). Pastoral breeding concerns 32 % of the cattle (of the national total estimated at 3,073,000 heads) and 35 % of the small ruminants (of the 8,330,000 head national total) (Fall *et al.*, 1999).

Ferlo is a sylvo-pastoral bent natural region. This space takes up the western north zone of the country (Figure 1) and is located on horseback between three regions (Saint-Louis, Louga and Matam).

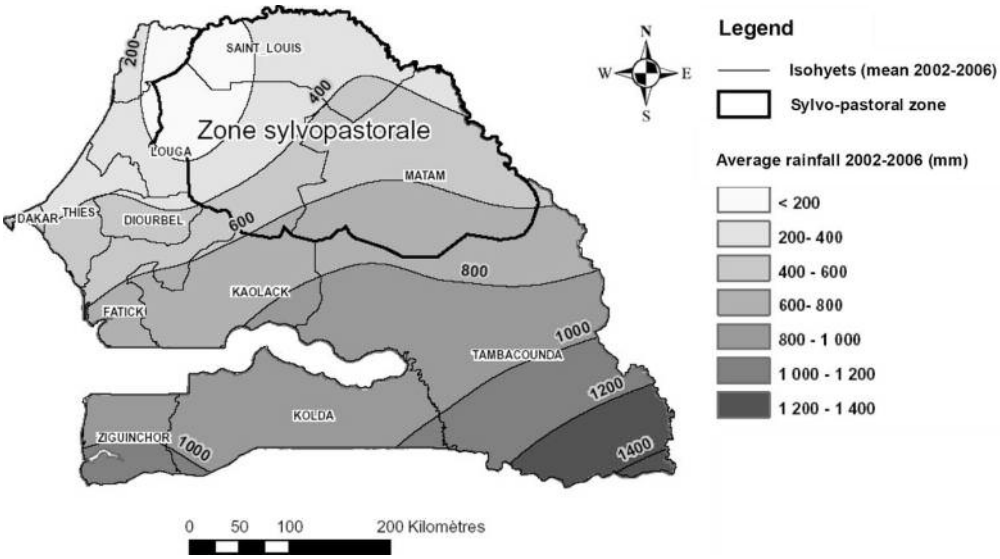


Figure 1 - Average rainfall between 2002 & 2006

Climate conditions vary from the Sahel-Saharean type sub-desert climate in the north to the Sahel Senegalese type dry tropical climate in the south. The Ferlo Zone is characterised by a rainfall varying between 700 and 200 mm per annum (Fig 1). The rainy season starts in July and goes on until September, the rain distribution is very irregular and there is a high inter year variability. Drought episodes have always existed, but Ferlo has been confronted with a climate gradual dryness since the nineteen seventies.

The difficulties encountered by pastoralism in this country can be explained by:

- an increase in the surfaces occupied by agriculture to the detriment of pastoral spaces: according to Weicker, 1993, within the space of 25 years (1954 - 1979) the proportion of cultivated surfaces more than tripled, mainly in the south of the sylvo-pastoral zone.
- a livestock increase in the sylvo-pastoral zone in the neighbouring countries part of the livestock of which transhumes in Senegal, leading to an available resource fall.
- a rainfall fall and a rainfall variability increase since the droughts of the nineteen seventies which causes a fall and some irregularity of the

biomass and water resources.

- the fact that public expenditures for agriculture do not exceed 4.8% of the investment total whereas only animal breeding contributes to 3.7% of the national GDP for the period 1994 - 2000 (Castaneda, 2005).

The LEAD (Livestock, Environment and Development) programme is an international initiative dating from the beginning of the nineteen nineties which analyses the interactions between animal breeding and the environment so as to protect and improve the use of natural resources while fighting against poverty. It is based within the FAO (Food and Agricultural Organisation). It intervenes in four hot spots: (i) livestock breeding and deforestation, (ii) heavy grazing in semi-arid environment, (iii) involution of agriculture-animal breeding mixed systems, (iv) excess of nutriments (http://www.virtualcentre.org). Those components are organized to meet a series of operational objectives aiming at improving knowledge and facilitating and organizing interventions on livestock breeding - environment interactions.

This finds expression in the working out and setting up of a series of research/development projects and information tool development. The LEAD PESAH (Pastoralism and Environment in the Sahel) makes up one of the initiative pilot projects. It fits into the part concerning heavy grazing in semi-arid environment. The main objective is to promote the taking into account of pastoralism - environment interactions in the policies and practices of extensive animal breeding in Saharan arid zone.

The appearance of droughts in the Sahel at the end of the nineteen seventies was at the origin of the design of information systems based on climate variables aiming at meeting food aid needs or forecasting Climate risks on agricultural outputs. The most important part of the Early Warning System (EWS) is concentrated on rainfall surveillance and plant production and little attention was paid to specific pastoral livestock breeding determinants, in particular animal and pastor mobility.

Working out an Information System on Pastoralism in the Sahel (SIPSA) aims at filling the gap existing in the CILSS[1] zone. It is based on the definition of risk indicators to allow the pastoral sector to adapt itself and react to the drought easily.

This is not a mere EWS, for the objective is at the same time to create a long term information system and an early warning system specific to pastoral zones. So, it is a system which would allow surveillance on these spaces to the carried out and important decision help to be supplied to the various actors occupying these zones.

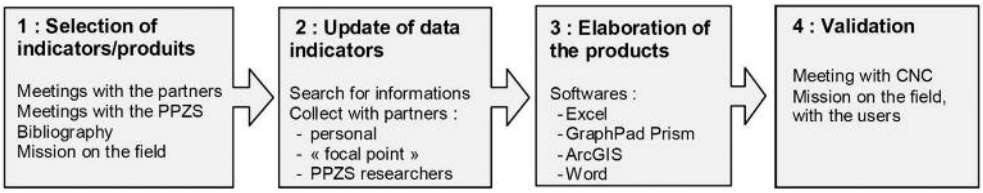


Figure 2 - Main development stages of the indicators

Materials and methods

Figure 2 provides a summary of the main stages in the working out process of the indicators for SIPSA. It is important to point out that the preliminary items of this work were identified:

- The data needed to crate the information/early warning products have to be available and accessible (for the social-economic variables as well as for the biophysics variables. This finds expression in partners participating actively in the concept thought about information-early warning products and putting the data needed to create those tools at their disposal.
- The creation of information-early warning products is required to meet two criteria essentially:
  - Easy understanding. It is required from each product to be adapted to the public it has been designed for. The choice made at this level will be described in the next paragraph (selecting 'three publics': breeders and producer organisation; Technical departments and government bodies).
  - Sustainability: the design of the products must take the sustainability of the system into account. It is important to consider that the research work makes up a specific contribution to the scientific help which the PPZS[2] provides to Senegal's SIPSA CNC. This system should in the long term be able to manage itself under the control and coordination of the CNC. As a result, the product creation methodology has to be accepted and validated by the CNC. Within only such a context, the services involved will be able to appropriate the SIPSA and guarantee its sustainability.

A reduced number of indicators was analysed, for the objective was to create finished products able to constitute an example of products directly exploitable for the SIPSA. The selection was carried out on the basis of three criteria:

- In function of the information recipients (livestock breeders, technical

services and government bodies)
- In function of the importance of the information provided (Need to classify the indicators/products according to their importance)
- In function of the needed data availability/accessibility.

The choice of these indicators was made through constant exchanges with PPZS researchers and with Senegalese member institutions of CNS. Several disciplinary areas were mobilized by the PPZS to conduct this analysis (in particular: geography, sociology, economics and zootechnic).

Document research was also a basic point in this work. Various documentary centres were also visited: the Agropolis libraries in Montpellier, the PPZS documents and those supplied by member institutions of CNC in Senegal. This bibliography research made it possible to be aware of the complexity of the indicator working out/selection work during the first phase of the LEAD project. Using this knowledge, it became possible to specify and direct the debates with the researchers, professionals and actors to succeed in selecting a reduced number of indicators.

To design the products, it became necessary to update the data bases. The objective was both to complete the data base created in the course of the first phase of the project and to stimulate the participation of CNC member institutions.

Each piece of information needed referred to a body, an institution. The organisation and 'professionalism' of those services were not homogenous; consequently, in function of the knowledge acquired on their operation, different methods were formulated to recover information. Some method examples will be introduced in the part 'Results'.

Once the data had been collected, a gap was noted in several cases between the request formulated during meetings with the partners and the data supplied by those same partners. In particular, often the information was not updated or contained errors. As a result, requests made had to be readapted and in some cases, the design of the product absolutely needed to be modified. To pass through those stages the services committed were directly contacted. In several cases, it became necessary to use the 'focal point'[3] help express an official request.

Once the data collected, some harmonization work with the information already present in the SIPSA data base and more recent information was performed. The information arrived in different formats: word document, excel or more rarely in the form of 'GIS[4]'. All the documents were studied and the useful and relevant information were classified in excel documents.

The data collected were then used to create the products. The objective was

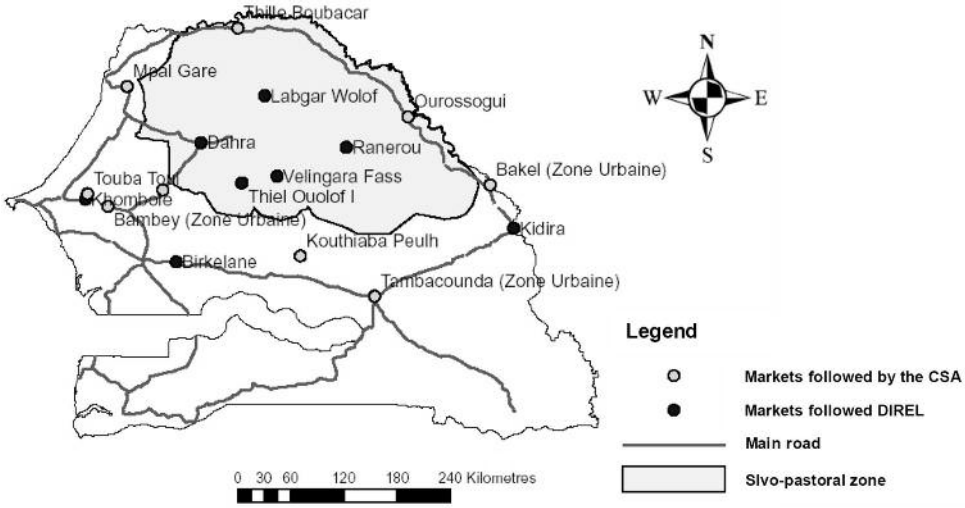


Figure 3 - Market Locating MAP followed by the CSA and the DIREL

at the beginning to cross social-economic variables with biophysics variables. The stage proceeded in two steps:

- Building the indicator. The methodology applied to link the different variables to produce a synthetic variable (indicator) was specific to each piece of information treated. In the part 'results' three indicators (one for each public) are described.
- Updating the indicator values regularly. This work, to be carried out by CNC member institutions, consisted in collecting and organising data (data base processing software).

The biophysics variables are sufficient and available. On the other hand, there is no body busy collecting/managing social-economic information related to the pastoral activity. Some internal PPZS documents were available, but the information was very specific and dealt with very localized aspects. As it is very important to have at one's disposal some crucial data on that matter, the gathering of information limited to the prices of livestock and cereals has been organised.

Meetings arranged with the 'focal point', the CSA[5] and the person in charge of the 'Animal Production' division of the DIREL[6] (Livestock service) led to a choice made on a sample of 17 markets. The objective was to get prices representative for the sylvo-pastoral zone. The DIREL undertook to collect the livestock prices in accordance with an analysis grid worked out in meetings on

the basis of the approach applied by the Livestock SIM in Niger.

The choice of the markets (Figure 3) was made on the basis of two criteria:

- Transect east-west depending on the difficulty of access to the zone: it is possible to note on the map that the main roads (tarred) are concentrated in the west of the country. Moving eastwards as far as the border, the only means of communication consist of not always practicable tracks.
- Transect north-south depending on the importance of the crops. Moving from the south to the north, crops are less and less present in function of the rainfall.

It can be seen on the figure 3 map that some sylvo pastoral zone internal markets are not followed by the CSA. So, the DIREL understood to collect the livestock and cereal precise in these sites.

Results

A total number of nine products were worked out during the study. Table 1 shows the public some of these products were designed for. Five examples of worked out products will be introduced in this part.

Table 1 - Products worked out during the investigation

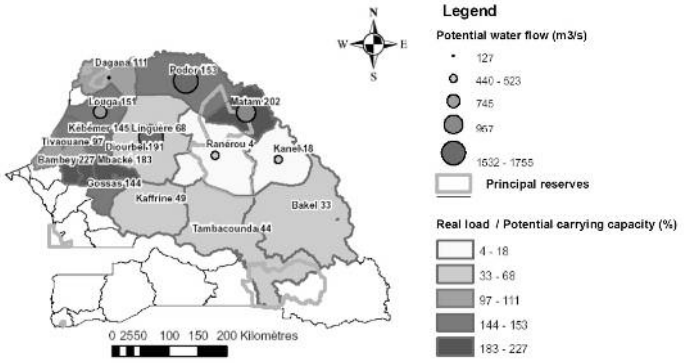
		PUBLICS		
		■	■	□
PRODUCTS	1. Livestock accommodation potentials			x
	2. Sylvo-pastoral zone drilling operation	x		
	3. Evolution of the 2002-2006 average rainfall on the 1991-2000 average			x
	4. Water flow and biomass of sylvo-pastoral rural communities		x	x
	5. Presence of veterinary stations and diseases firesides numbers		x	x

Legend

■ Stockbreeders, Organization of Producers
■ Technical Departments
□ Government bodies

1. Livestock accommodation potentials

Representation of the load capacity, the drilling potential available water flow and the classified reserves zones.



Format of the source data

potential water flow (table Excel by PPZS), load capacity (Excel tables, by CSE[7] and DIREL)

Scale

Department

Year, data series

water flow (2003), load capacity (2002-2006)

Covered zones

Sylvo-pastoral zone and departments interested by transhumances.

Data processing sequence

1. Drilling potential water flow

We have potential water flow value of each rural community; we add these values to represent it on the department level. The size and the colour of points are proportional to the quantity of potential available water flow (the classes correspond to Jenks's threshold).

2. Carrying Capacity

We have the biomass in kg DM/ha (by CSE). We represent the mean (years 2002-2006) in each department. We calculate then the potential carrying capacity in TLU per department by considering that the animals graze 365 days (6.25 kg DM/day/TLU) and that 30 % of the biomass is available (CSE, Yves Prévost, 1990). Thus we calculate the potential carrying capacity per each department. Then we report the real load (DIREL data) to the potential carrying capacity and we express this ratio as a percentage.

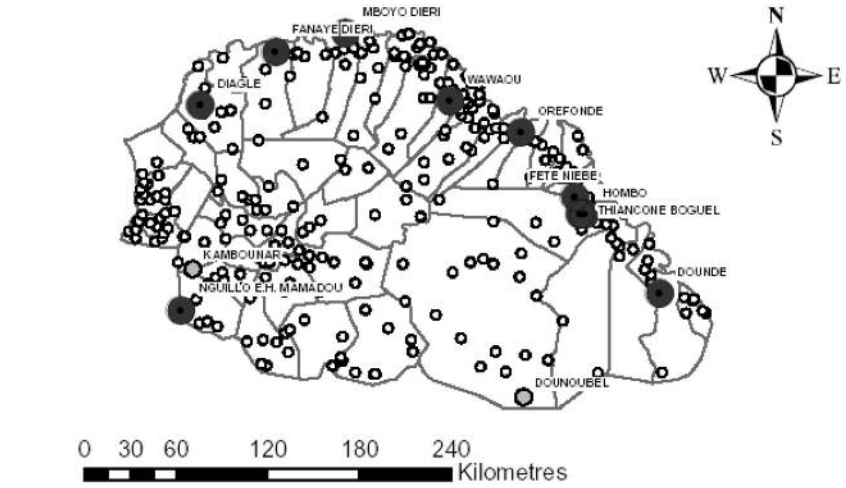
Product description

This chart represents the relation between the real load and the potential carrying capacity on the level of the departments considered (mean between 2002-2006 in relation to the estimated TLU and the available biomass). A percentage higher than 100% means that the number of TLU is too important compared to available dry matter (5 classes, Jenks's thresholds). The points size and the colour are proportionally greater and darker to the quantity of drilling potential available flow. (the classes correspond to the Jenks's thresholds).

Use perspectives

The association of three information (flow, reserves and capacity load) makes possible to identify the departments which could be attractive for the cattle. This chart is intended especially for the government bodies: it should make possible to whip up a reflexion on the state and the statute of unquestionable zones. We can note, for example, that the departments of Ranérou and Kanel are interested by a skimpy concentration of cattle and does not have a very important potential flow. An important part of the department of Ranérou is classified reserve. All these considerations could question the administration on the interest to improve the hydraulic infrastructure and to change the statute (reserve) of certain zones in the interest to relieve congestion of other department which has an excessive TLU load
(example: Matam = 202 %).

2. Sylvo-pastoral zone drilling operation



Format of the source data
Excel tables, by 'Service de l'Hydraulique'

Scale
Rural community

Year, data series
8 May 2007 (weekly informations)

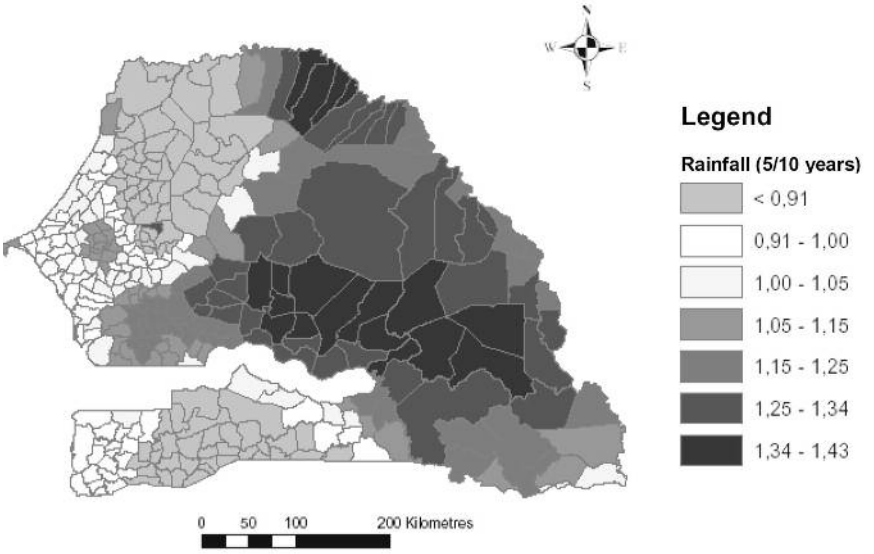
Covered zones
Sylvo-pastoral zone: Ferlo, Senegal

Data processing sequence
On the chart we represent all the drillings of the sylvo-pastoral zone. Referring to the information present in the tables, we allot a code to each drilling (0 = normal operation, 1 = average operation and 2=broken down) in order to carry out a classification.

Product description
The tables present information about drillings with a faulty operation: about the broken down origin, the closing date and the scheduled actions. Referring to this information we considered three possible situations for each drilling: normal operation, average operation (the flow is reduced: damage to the engine) and broken down drilling (the damage is serious and causes the stop of pumping)

Use perspectives
The informations transmitted through this chart are useful for the Producers' Organizations and for the stockbreeders. They enable to make decisions according to the trajectories of displacement.

3. Evolution of the 2002-2006 average rainfall on the 1991-2000 average



Format of the source data
Excel tables (data of 'Services Météorologie Sénégal')

Scale
Rural community

Year, data series
Since 1991 until 2006

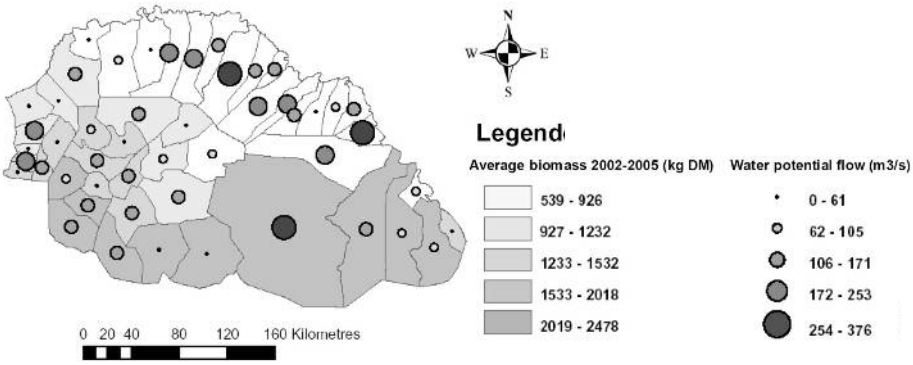
Covered zones
Senegal, all rural communities

Data processing sequence
We had the rainfall data of the weather stations. We gathered the stations which presented the same values (function 'spline' of arcGIS), on the basis of 100 mm rain value. We calculated the average value of pixel for each rural community (statistical function, arcGIS)

Product description
This product gives an indication on the pluviometry change (mean in mm between 2002 and 2006 referring to the mean in mm between 1991 and 2000). It appears as a chart with a layer 'vector' (polygon: rural communities). The darkest colour means that the quantity of rain between 2002-2006 was 1,34-1,43 times more important than between 1991 and 2000. The first value (<0.91) indicates that the mean quantity of rain between 2002 and 2006 was lower than the mean between 1991 and 2000.

Use perspectives
This chart can be useful for the 'technical departments' and the 'government bodies' to analyze the changes of pluviometry. In addition, we had a chart which compares the mean of the years 1996-2000 with the mean 1991-2000. For the elaboration of this chart we kept the same denominator (mean between 1991-2000) and the same classes in the legend. Consequently it is possible to compare the two charts.

4. Water flow and biomass of sylvo-pastoral rural communities



Format of the source data
Excel tables, data of 'Service de l'Hydraulique' and CSE

Scale
Rural community

Year, data series
Biomass: 2002-2003-2005. Drilling potential water flow: 2003

Covered zones
Sylvo-pastoral zone: Ferlo, Senegal

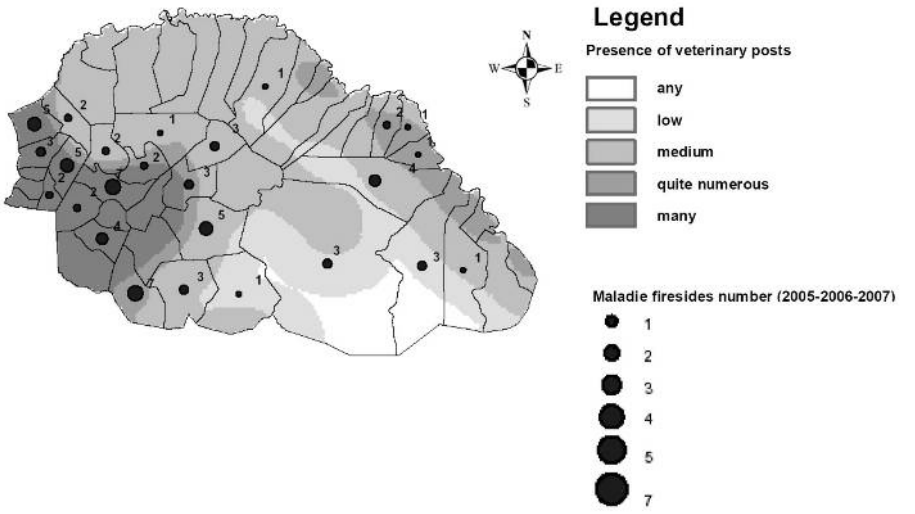
Data processing sequence
1. For the biomass average
We had the raster images on the biomass recorded each year after the wintering. Using the statistical functions of arcGIS we calculated the mean of the biomass (calculation carried out starting from the values of the biomass of each pixel) for each rural community of the years 2002-2003 and 2005.
2. For the drillings potential water flow
We had the values per rural community.

Product description
In this product two layers of information overlap: drillings water potential flow (m3/s) and biomass mean (kg DM). With each point a value or a range of values (m3/second) corresponds. The point of smaller size has the lowest flow (127 m3/second). The biggest point represents a flow of 1532-1755 m3/second. Five classes are used to represent the quantity of biomass by rural community. The colour representing biomass is degraded (from the clearest: small quantity of biomass to darkest: strong quantity of biomass). The classes of the two layers were created on the basis of natural Jenks's thresholds.

Use perspectives
This chart can be used by the 'technical departments' and the 'government bodies' to appreciate the resources present in each rural community and to identify imbalances (example: large quantity of biomass, but low drillings water potential flow). The interest is to think about the possible interventions (example: creation of drillings) to manage the cattle concentration related to the availability of resources.

5. Presence of veterinary posts and diseases firesides numbers

Diseases firesides number (addition of firesides in 2005, 2006, 2007) and public veterinaries' presence in the sylvo-pastoral zone



Format of the source data

Word documents for the number of diseases firesides, Excel table for veterinary (DIREL data)

Scale

The rural community for the public veterinaries' presence and GPS coordinates for diseases firesides

Year, data series

Diseases firesides number: 2005-2006-2007, Public veterinaries: 2004

Covered zones

Sylvo-pastoral zone: Ferlo, Senegal

Data processing sequence

1. For the diseases firesides

We gather diseases firesides (coordinates GPS) for each rural community and we add them over three years (2005-2006-2007)

2. For the public veterinaries' presence

Every veterinary is represented by a point. We calculate the density of these points, while considering a presence ray of 50 km. The density of each raster cell at exit is calculated by adding the values of all core surfaces which overlap the raster cell center (Density core function, based on the quadratic function of core described by Silverman, 1986, p. 76).

Product description

This product jointly gives an indication about the public veterinary services cover degree and about the diseases firesides presence. It appears as a chart with a raster layer representing the cover density of the public veterinaries. The darkest colour corresponds to an important concentration, in a radius of 50 km, of public veterinaries. The white colour represents the absence of agents.

Use perspectives

This chart can be useful to identify the existing relations between presence of public veterinaries animal diseases firesides. It is interesting to note that the more covered zones do not forcing record a minor presence of diseases firesides. This chart can suggest a more specific analysis in certain zones to check the effectiveness of the means set up (public veterinaries) to prevent the diseases firesides.

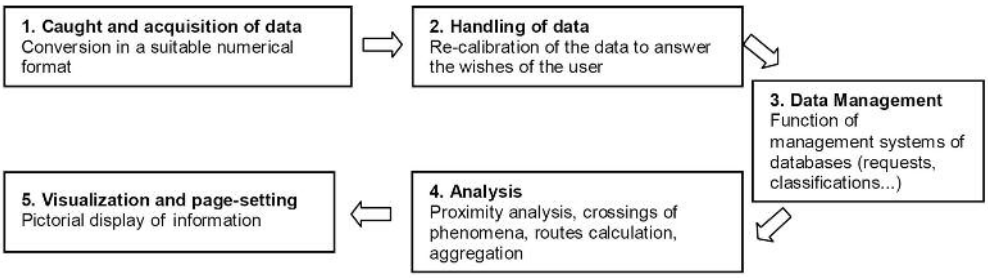


Figure 4 - Elaboration stages of a GIS chart

Discussion

The objective of this study was to contribute to the analysis, synthesis and validation of indicators and variables contained in the SIPSA database on the Ferlo sylvo-pastoral zone (Senegal).

The databases created during the LEAD project first phase were integrated with the new data collected. So, the analyses carried out made it possible to produce a certain number of information products. However, the objective of the study was partially achieved, for crossing biophysics variables with social economic variables could not be performed according to the desired conditions.

The discussion deals with:

1) The limits linked to the accuracy of the worked out products,
2) The practical use value of those products, considering the objectives of the SIPSA project and the need to have efficient information support / means.

The geographic information system (GIS) that was achieved consists of 5 stages necessary to work out the cartography products (Figure 4). The accuracy of the map worked out is a function of those stages. Stages 1, 2 and 3 made it possible to adapt the information collected to the analyses carried out. Stages 4 and 5 enabled the products to be created by treating the variables and transforming them into visual codes. The combination of the different variables essentially includes two types of operations. The problem can simply be to superimpose the information on the map or to standardize a variable in relation with another. The choice is made in function of the information to be represented and in function of the data measurement units (Poidevin, 1999). These choices were carried out after consulting the PPZS researchers and the CNC members.

The major difficulties encountered in stage 1 were linked to the preliminary processing of data that were not supplied in formats directly operable by using the ArcGis software. The data exploited had already been statically by processed the different CNC member services. In the analyses carried out the non reliable data were eliminated. As an example, concerning the chart related to the load capacity: the numbers of livestock heads present in each rural community were available. This was an approximation worked out by considering the number of heads in the department and 'distributing' it by rural community in function of the number of inhabitants (also the result of an approximation). Such an approximation does not take into account one of the main components of the pastoral breeding: mobility (in times of transhumance's, the number of livestock heads very much). It was therefore deemed preferable to represent the carrying capacity at he 'department' level: the information is less detailed but more reliable.

Stages (2) and (3) were death with through personal thought/analysis work and with the PPZS team researcher. They can therefore be subject to criticism, for there are several possible methods. In the part 'Result' and in the appendix, the process used for each product is described.

Stage 4 was the result of an agreement reached with the PPZS researchers and the CNC member during the evaluation meetings. The various analyses made should therefore meet the expectations and requirements of the recipients the different products were intended for. Some criticism can be expressed about the scale used: In several cases, it would have been desirable to have more accurate information at the scales of the rural community or town. It would have been possible to create products which would have allowed the least accessible zones for the pastoral animal breeding to be identified in detail. As an example for the product concerning the operation of drillings, it would have been ideal to have other data in relation with the zones covered by each brigade: remoteness, a long distance away from the road, mans of transport of the technicians etc… for minor damages in a zone difficult to access to can turn out to be very serious as repairing them may be delayed.

As far as stage 5 was concerned, the most complex analysis when working out a map is discretization (a process aiming at transforming a rough statically series into a tidy series divided into classes, Poidevin, 1999). Statically indicators were used to apply this cutting out: position indicators (mean, mode and median) and dispersion indicators (variance and standard deviation). It seems important however to point out that this act was highly subjective on the part of the cartographer who, when classifying the information, chose which 'message' to transmit through the chart representation.

The existing data concerning social aspects and the pastoral economy are available only for some sites studied by the PPZS. The information, therefore, remains very localised and specific and cannot be exploited by the SIPSA system. Efforts were made to involve CNC member services in the collection of economic information during the study (cereal and livestock prices) but the result was not conclusive. The information which came up during the study was very broken up and poor. It did not enable products to be worked out. A following up protocol of some livestock and cereal market indicators was worked out to collect data around and within the sylvo-pastoral zone.

Economic data, however, are strictly essential for the part 'early warning' of the SIPSA system. As a matter of fact, the economic information makes it possible to quickly identify a given situation, which in the case of a crisis rapidly influences the markets. For example, during a drought, the livestock is sold in bulk and, consequently, its price goes down and at the same time, cereal harvests are bad and grain prices go up. Once the crisis over, the opposite effect takes place but families with limited available funds encounter difficulties at this stage in reforming their livestock (according to Toulmin, 1995).

Without a highly efficient information system on livestock and cereal prices state intervention could be delayed or not programmed thus running the risk of endangering human and livestock lives.

The worked out products take on an interesting practical use only if the information transmission context is organised and highly efficient. Three types of difficulties are analysed: involvement of animal breeders and producers organisations (OP[8]) in the working out and validation process of the products, the 'Focal Point' and to a minor degree, CNC lack of means and information transmission and interpretation.

Most of the products created are intended for 'technical departments' and to the 'government body' for the public 'animal breeders and Producers organisations'. Only one product could be designed. As well, during the first SIPES phase, the products intended for animal breeders and producers' organisations were not numerous. This system limit is important for this public should be the system main actor. This weakness can be explained by several causes: the non involvement of the animal breeder representatives during the evaluation meetings with the CNC and the low statistics accuracy on information adapted to this public (for an animal breeder, a piece of information is interesting only if it is very localised).

The historical analysis of government policies since Senegal became independent shows that animal breeder professional organisations, if promoted

in several ways, had a very limited role in the working out of policies designed to help animal breeding. There are two reasons for this weakness: on the one hand, the Producers organizations are a convergence and compromise space between the local, national (state, CNC) and international (money lenders, projects, NGO) actor strategies. On the other hand they suffer from an 'overpolitisation' of the rural society which limits the birth of independent organisations. As a result, information and access to resources became centralised contrarily to collective action logic (Castaneda, 2005). The non participation of animal breeder representatives within the CNC could be linked to these economics. On the one hand the OP encounter cooperation difficulties between them and on the other hand the 'focal point' refuses to be confronted with this complexity.

It became possible, on the occasion of meetings arranged with the 'focal point' to establish that there were difficulties in coordinating the project. The SIPSA project suffers from a motivation and dynamism lack beginning within the CNC and spreading to the partners. The lack of motivation and means the departments linked to DIREL suffer from are also determined by the withdrawal from and non-consideration of the animal breeding sector by the government. The many political problems and the problems linked to the data collection make the system future effectiveness questionable. Considering that the PPZS support is one-off and limited in time it appears legitimate to question SIPSA lastingness.

The use of the products will be effective once the information vectors are effective. This work is currently in progress. A training course within the PPZS was centred around that subject made it possible to contact rural radios, essential actors to transmit information as far as the furthest zones from communication means. It will be important to also involve rural radios in the process of product creation so as to enable them to understand the applied methodology and feel really involved in the system.

A web interface is also in the process of being worked out on the SIPSA; for the recipients the products are intended for, it will make it possible to directly visualize the information conveyed through the GIS charts and the graphs; and for the system managers, it will enable them to update the databases from an internet station.

After the meetings held with the different CNC members, it was possible to establish that each service periodically publishes (or are supposed to publish) a news bulletin on the livestock health state, rainfall, cereal markets… It was also established that several services are not constant in this information work and others stopped publishing many years ago. This is an aspect to be taken into account to ensure some lastness to the project.

The information media which will be worked out for the SIPSA will not have to suffer from these difficulties Interpreting information in terms of warning level is not obvious. Turkana LEWS (Livestock Early Warning System) shows four warning levels associated with the information supplied by the different indicators. A possible crisis (drought, locust invasion…) is therefore classified according to this grid and the intervention is managed in function of the recorded seriousness. Such a system could reasonably be equally associated with SIPSA. In this case, the grid should be adapted to the three publics identified (animal breeders and OP, technical departments and government body) for a crisis perception is different for each level.

Conclusion

Pastoral zones need to be studied and administered with specific instruments.

The majority of Early Warning System is not adapted to the pastoral zones. Turkana LEWS is an exeption in Africa: it includes information on markets, capital and changes of the strategies of life. It is managed by the pastoral zone local government, whereas the majority of EWS are national. Therefore it is really adapted to the coverage area, a typically pastoral zone. The indicators used in this system are divided into two great groups: the availability of resources (endowments) and accessibility with these resources (entitlements).

The development of a pastoralism and environment information system in the Sahel aims at filling the existing lack (about pastoral information system) in the West Africa zone. One of the main objectives of the second phase of LEAD-SIPSA is to provide specific and updated information in order to favour decision making at the level of animal breeders as well as what concerns the formulation and implementation of pastoral policies. The implementation of this objective rested on the activities of the national committees of coordination at the level of the six countries of the network.

The case of Senegal, treated in this paper, shows all the process of co-working out of information products in the form of charts, statistics graphs, designed in a different way for three types of publics: animal breeders and OP, technical department and government body.

It is revealing for both the high efficiency of such information but also of the problems linked its acquisition and diffusion. If in a first stage, the CNC members validated a certain number of products, in a second phase, it was absolutely necessary to have them tested and approved by the recipients (animal breeders and OP) on the field before their diffusion by the most accessible means of

communication (rural or community based radios, TV, press…) To ensure the durability and effectiveness of these information products, a short-term study is essential to measure their real impact on the different user decision-making.

Notes

[1] CILSS - Comité permanent inter états de lutte contre la sécheresse
[2] PPZS - Pole Pastoral Zones Sèches
[3] focal point - the official coordinator of the SIPSA project
[4] GIS - Geographic Information System
[5] CSA - Commissariat pour la Sécurité Alimentaire
[6] DIREL - Direction de l'Elevage
[7] CSE - Centre de Suivi Ecologique
[8] OP - Organisation des Producteurs

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