

Livestock Dilemma, Pastoralism and Decentralization in the Sahel: A SAM Approach in a Rural Commune in Mali

Daniel P. Kaboré
Centre d'Analyse des Politiques Economiques et Sociales (CAPES),Ouagadougou, Burkina Faso

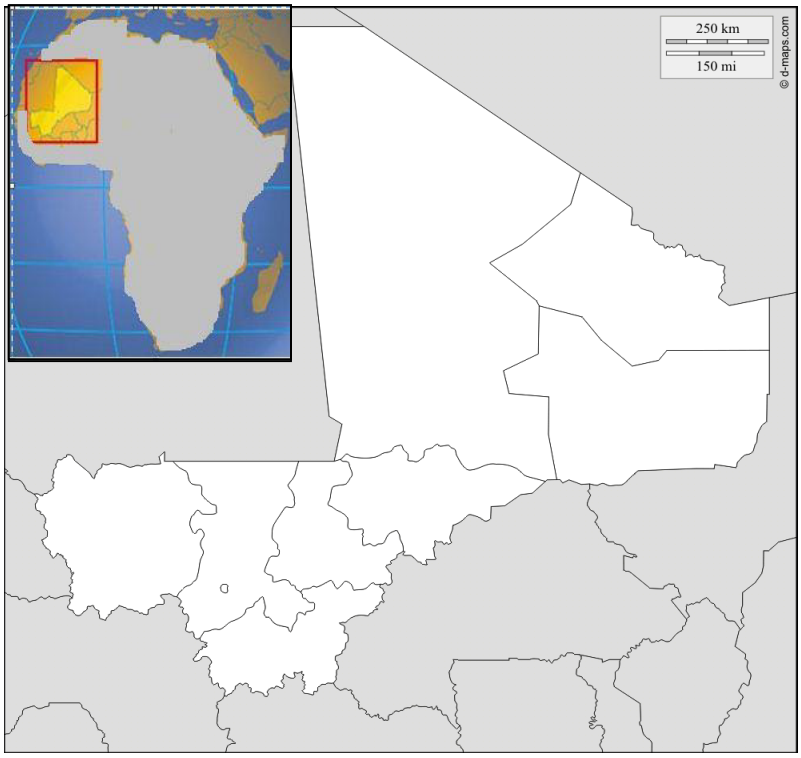
Abstract
This paper examines the effects of hypothetical policies on the livestock activity and on pastoralists in the Madiama rural commune in Mali, using a SAM model. The results showed that family labor is the most rewarding factor for livestock activities which benefit far more of an exogenous unitary money injection in the economy than cropping ones. Pastoralists appeared to be the best channels to implement communal policies. However, since animal rearing in the current system is land-demanding, the Madiama commune is in a dilemma: promoting livestock activities will end up with generating or exacerbating conflicts between pastoralists and farmers. Given that the decentralization process is irreversible, it is recommended that the communal authorities be wary of the need to build consensus between stakeholders for a sustainable management of natural resources. Livestock activities as well as the pastoralists should be strongly included in the process of this consensus building. Communal authorities should get rid of (or ban) misconceptions and preconceived ideas on the livestock activities and pastoralists' way of life in natural resource management.
Keywords: transhumant pastoralists, SAM model, decentralization, Madiama, misconception, Mali

II. Context of the study

2.1. Presentation of Mali

Mali is a landlocked country in West Africa (see Map 1) that depends on gold mining and agricultural exports for revenue; it is among the 25 poorest countries in the world and the poverty headcount ratio is 43.6% nationally. The economic activity is largely confined to the Niger River watershed, while approximately 65% of its land area is desert or semi-desert. About 10% of the population is nomadic and about 80% of the labor force is engaged in farming and fishing; industrial activity is concentrated on processing farm commodities. Eighty percent of the population is engaged in agriculture, which constitutes 45% of the country's GDP. Crop and pasture lands account for 64% of the country's area. Agriculture is dominated by the subsistence farming of millet, rice, sorghum, and corn and the rearing of cows, sheep, and goats. Livestock rearing constitutes 10.8% of GDP and is among the country's top three exports (after gold and cotton) (http://www.ruralpovertyportal.org/country/statistics/tags/mali accessed on May 18, 2016).

The Sahara Desert covers nearly two-thirds of Mali, and 90% of the population resides in the more fertile southern zone below it. Ranking 179th out of 188in 2014 in the United Nations Human Development Index (UNDP, 2015), the country relies economically on traditional agriculture and fisheries that are both highly vulnerable to climate change. This vulnerability is aggravated by resource scarcity and the landlocked position of the country. Food insecurity is chronic in most rural areas and the situation worsens with the insecurity (kidnapping and insurgency since 2006) as manifested through massive population displacement, and the disruption in traditional activities like farming, livestock production and tourism.



Map 1: Mali in West Africa

Medium-term macroeconomic prospects are good and the economy should advance with GDP growth of 5.4% in 2015 and 5.1% in 2016, once again driven by agriculture and the services sector, as well as by the large-scale return of technical and financial partners (http://www.africaneconomicoutlook.org/en/country-notes/west-africa/mali/accessed on May 18, 2016).

2.2. The inner delta of Niger River in Mali

In Mali, the soil natural resource has been degraded the past few decades as is true in other Sahelian countries. In particular, soil fertility has declined (Jones-Casey& Knox, 2011) due to continuous cultivation without fallow or adequate organic and/or inorganic fertilizer application, and crop production expansion into more marginal land. This shift is due to demographics, stakeholder transition from fishing and pastoralists to sedentary farmers, and more integration of livestock with crop production. The management focus is on reducing risk, thereby being able to maintain or expand their cattle herds.

There are four main categories of stakeholders in the Madiama commune, which form a gradient from sedentary crop producers to transhumant pastoralists:

- Farmers: their main activity is crop production, and this activity requires use of more-and-more land to meet family economic needs; many members of this group are former fishermen;
- Agro-pastoralists: their main focus is crop production, but they integrate livestock into the farming enterprise;
- Sedentary pastoralists: their main activity is livestock production, but they have become sedentary and integrate some crop production into the farming enterprise;
- Transhumant pastoralists: their economic activity is livestock production, and they migrate within and outside of the commune in search of water and pasture for their animals.

Stakeholder shifts among the above groups has increased the overall demand for crop and pasture land, thereby increasing conflict among the different groups (Jones-Casey& Knox, 2011 *op.cit*). This has been aggravated by increased human population (2, 97% per year) and environmental changes associated with climate change (Swedish Government, 2013). These conflicts, both inter- and intra-communal, influence all members of the commune as the land/natural resource base shrinks on a per capita basis. These conflicts revolve around access to land, particularly to specific rights to cultivate and graze land, and access to water (Moore, 1990).

III. Misconceptions on livestock, pastoralists and their way of life

More than five hundred million people (over thirty million are in Africa) live in arid or semi-arid areas in the world, some of which entirely rely on their animals for living. They opportunistically access available natural resources by nomadic movement of herds in response to climate and other constraints to make use of available grazing and

water (Bassett & Koné, 2011). However, post-colonial governments have neglected the need to develop policies to meet pastoralist needs, with the intent to end pastoralism. Rural development efforts have largely assumed negative effects of the pastoralists' life and their impact on natural resources (Kandagor, 2005), and that their activities overstretch land resources due to focus on herd size maximization (Abubakar (2005)). Some government policies advocated the moving from pastoralism to sedentarization as a more sustainable natural resource management scheme. Most post-colonial governments have force tranhumant pastoralists to adopt a sedentary life style to prevent over-grazing (Nori *et al.* 2008, p. 5). Abubakar (2005, *op. cit*.) explained the negative consequences in Nigeria of implementing ill-conceived policies based upon this misconception.

At the local level, prevailing conflicts are attributed to the livestock activity and pastoralism; communal authorities are often prone to make decisions based on the misconception about this activity and the associated way of life while a consensus is needed for local development through the decentralization process. Are the transhumant pastoralists and their livestock activity so harmful to the sustainability of natural resources that they should be forced to give up their activity and way of life, and thereby be an alienated group, which could undermine the rural development process? The present paper aims to answer this central question using results from the Madiama commune SAM model.

IV. Data and methods

4.1. Research site, sample and data collection

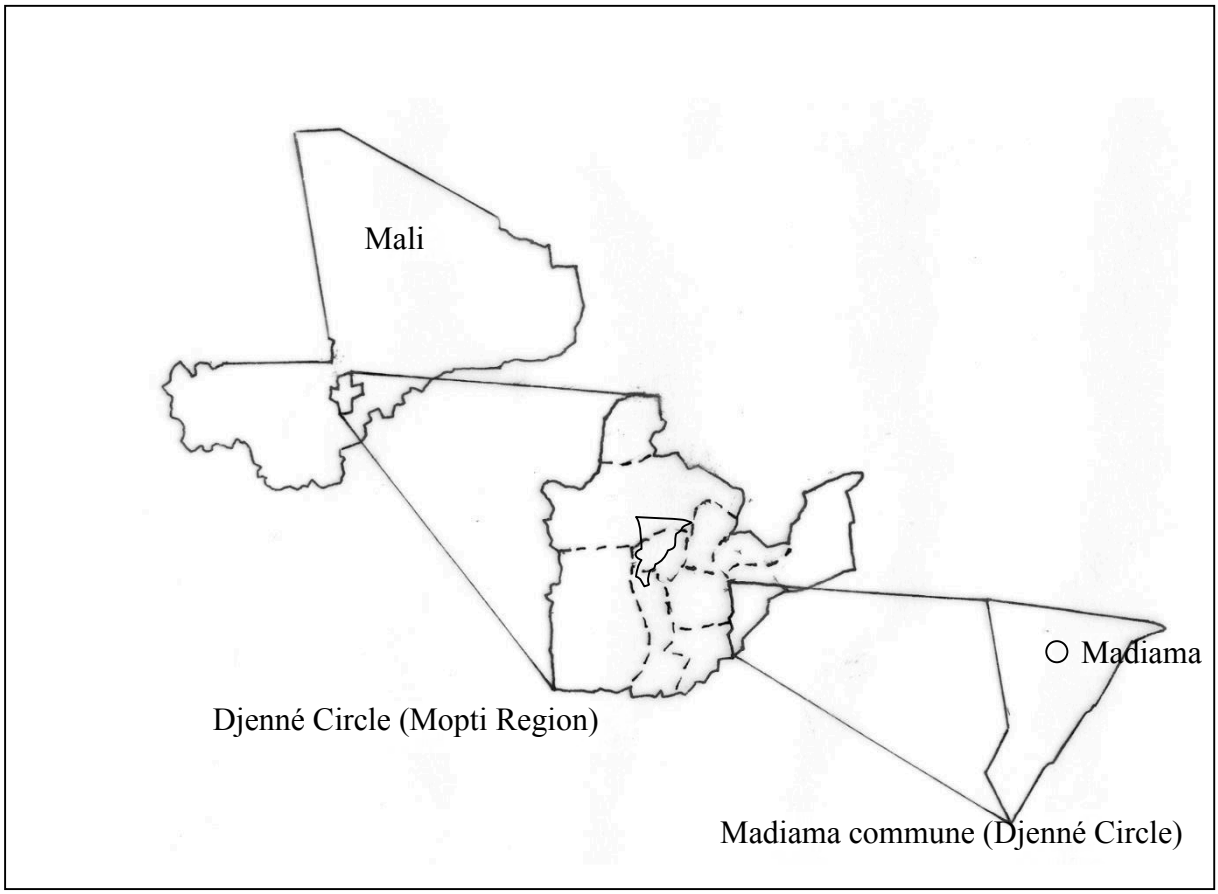
In the decentralization process, the commune is deemed to be the most relevant unit of investigation and Madiama commune located in the inner delta of the Niger River of Mali, close to Djenné in the 5th Region (Mopti) (Map 2) was selected for the research due to its representativeness of the region in terms of population pressure, diversity of the activities and natural resources endowment as well as their progressive degradation.

The commune of Madiama is about 25 kilometers south-east from Djenné and 120 kilometers from Mopti, the capital of the 5th region of Mali.

It is located in the extreme northern part of the North-Sudanian bio-climatic area, almost in the South-Sahelian area. This area is characterized by the sequence of a rainy season (4-5 months) and a dry season. The cropping season is about 80-90 days with 40 rainfall days. The analysis of most recent climatic data revealed a long-term tendency to aridity (Leisinger & Schmitt (1996)). The climatic characteristics of the commune are influenced by the ecological features of the inland delta. Three agro-ecological zones can be delineated in the commune from East to West: the lower Bobo Plateau, the Mid Bani-Niger and the Delta. The Delta is made of floodable plains that can be cropped only under water control; seasonally flooded soils represent 74% of this agro-ecological zone. The Mid Bani-Niger is characterized by high humidity and slightly sandy soils. The last agro-ecological i.e. the lower Bobo Plateau exhibits more apparent relief and lateritic soils. The presence of three types of soils i.e. plain hydromorphic soils of the Delta, the sandy soils in the Mid Bani-Niger and the rocky soils on the Bandiagara Plateau, suggests three cropping management patterns (see Badini & Doumbia (2002)). The commune comprises 10 villages for a total land area of about 170 square kilometer Badini & Doumbia (2002). Madiama which is the largest village and located in the central part of the commune serves as the capital (see Map 1 for location) and counts for 30 % of the total population and 22% of the households living in the commune.

The ethnic groups include (i) a majority of Markas (50.6%) and Fulanis (42.1%) and (ii) others e.g. Bambaras (3.6%), Bozos (2.4%), Dogons (0.8%) and Sonraï (0.4%).

Five out of the 10 villages in the commune were selected to represent the different identities: Madiama, the headquarters of the commune; Nerokoro, a pastoralist village; Promani, a village of sedentary and transhumant pastoralists and farmers; Tombonkan, a farmers' village; and Tatia-Nouna, a village of farmers and agro-pastoralists. The list of the households in the commune was obtained for each village from data available in government offices. The household sample was randomly selected from the village household list. For each household, its belonging to one of the four main household groups was determined by consensus at a meeting with all villagers; the household sample then was randomly selected for a total of 120, which represented about 10% of the households in the commune.



Source: Kaboré (2008)

Map 2: **Study area location**

The survey was conducted on this sample of 43 farmers, 33 agro-pastoralists, 23 sedentary pastoralists, and 21 pastoralists. Two types of data were collected. The first set of data was related to household characteristics, production and consumption, factors (labor, equipment, land) and remittances; the origin and the source of exchanged factors were also recorded. The second group of collected data focused on micro-enterprise activities in the commune that generate income, such as food processing, handicrafts, retail trade, and livestock and cereal trading.

4.2. Methods and analysis tools

The methodological tool used to address the above objectives is the Social Accounting Matrix (SAM).

4.2.1. The SAM model

The SAM was used to better capture the linkages between the large diversity of stakeholders in the Niger River delta region of Mali. This tool provides a better understanding of such linkages and the results are likely to give a good guidance to the communal authorities for sound decisions, appropriate to complete and improve household farm information.

It is a square matrix whose columns and rows represent the receipts and expenditures of economic agents. The cell located at the intersection of a column and a row represents the payment of this column to the agent on this line.

Let $\mathbf{T}_{ij}$ be the matrix of transactions; t_{ij} is the payment from column j to row i. According to the accounting principle of double-entry, total receipts (income) of each actor must be equal to its expenditures; this means that for the whole matrix, the sum of each line must be equal to the sum of the corresponding column, that is:

$yi = \sum_i ti, j = \sum_j tj, i$ **(1)** where yi is the sum of receipts and expenditures. The matrix of the coefficients $\mathbf{A_{ij}}$ is obtained by dividing the cell in each column of T by the sum of the corresponding column

$a_{ij} = \frac{t_{ij}}{y_j}$ with $\sum_j aij = 1$; it also follows that, in matrix format **y** **Ay** **(2)**

From **(2)**, it can be written $y_i = \sum_{j=1} a_{ij} y_j$ +x*i* **(3)** i,j=1,….n, or in vector form $y = Ay + x$; x is a vector of final demand $y = Ay + x \Rightarrow (I - A)y = x$ **(4)** where I is a nxn identy matrix.

If $(I-A)^{-1}$ exists, then $y = (I - A)^{-1} x$ **(5);** $(I-A)^{-1}$ is the multiplier coefficients matrix. For a final demand of x, $y = (I - A)^{-1} x$ enables to calculate the effects on the other sectors of the economy; the higher the coefficient between two sectors, the stronger the relationship is between them.

Being an enlargement of the model (I-O), the SAM includes socio-economic structures in the analysis and to measure policy effects. Changes in the final demand are the starting point of the simulations using the SAM model after excluding the exogenous accounts. It is then possible, among others, to calculate the effects of policies on the level of activities, income (from activities and factors), to follow the policy effects across the whole economy. However, it is to be noted that policies related to price changes cannot be accounted for by the SAM because it is only a photograph of the situation for a given level of prices. SAM multipliers are able to provide the possible effects of an exogenous injection on different accounts which follow paths through the whole economy (Thorbecke, 2000, Round, 2003). The effects can be decomposed into (i) direct, within-accounts, own, transfer or intra-group effects, (ii) indirect, open-loop, spillover or extra-group effects and (iii) between-account, closed loop, circular or inter-group effects. Table 1 presents the Madiama SAM accounts, a 71x71 matrix[1].

Table 1: Madiama SAM accounts

ACTIVITIES	COMMODITIES	FACTORS	DECISION MAKING UNITS
Millet	Millet	FamilyLaborFarmers	Farmers
Sorghum	Sorghum	FamilyLaborAGP	Agro-pastoralists (AGP)
Rice	Rice	FamilyLaborSedP	Sedentary Pastoralists (SedP)
Other Cereals	Other Cereals	FamilyLaborTrans	Transhumant pastoralists(Trans)
Vegetables	Vegetables	HiredLaborFarmers	Mosque
Legumes	Legumes	HiredLaborAGP	Central Government
Small ruminants	Small ruminants	HiredLaborSedP	Tax
Large ruminants	Large ruminants	HiredLaborTrans	Capital
Poultry	Poultry	LandFarmers	Rest of the world
Milk	Milk	LandAGP	
Fish	Fish	LandSedP	
Millet M	Millet M	LandTrans	
Sorghum M	Sorghum M	CapitalFarm	
Rice M	Rice M	CapitalAGP	
Other Cereals M	Other Cereals M	CapitalSedP	
Small ruminants M	Small ruminants M	CapitalTransh	
Large ruminants M	Large ruminantsM		
PoultryM	PoultryM		
Milk M	MilkM		
FishSmoking	FishSmoking		
Retail trade	Retail trade		
Textiles	Textiles		
NR&foodProcess	NR&foodProcess		

M: relates to micro-enterprise activity/commodity
NR&foodProcess: Natural resource and food processing

After a given effect of an injection on any account of the SAM, we investigate the decomposition of such an effect on the four groups of households in the Madiama commune through the analysis of direct, the open-loop (indirect) and closed-loop (circular) effects. The decomposition is done by partitioning the Social Accounting Matrix into endogenous and exogenous accounts; the endogenous accounts can be written in the following form (see Kaboré, 2008 for the algebra of the multiplier decomposition).

$S = \begin{bmatrix} A & 0 & E \\ V & 0 & 0 \\ 0 & Y & H \end{bmatrix}$ where S is the matrix of the SAM coefficients related to endogenous accounts; A the matrix of

[1] Due to lack of space, the Madiama SAM cannot be presented here but can be obtained on request from the author.

coefficients for production activities, V the matrix of value-added coefficients (factors), Y the matrix of value-added distribution coefficients, E the matrix of expenditure coefficients and H the matrix of household distribution. The algebraic manipulation comes up with M_1, M_2 and M_3 as follows:

* $$M_1 = \begin{bmatrix} (I-A)^{-1} & 0 & 0 \\ 0 & I & 0 \\ 0 & 0 & (I-H)^{-1} \end{bmatrix}$$ **(A)** which is the direct, within-account, own or intra-group multipliers; it captures the effects of one group of accounts on itself through direct transfers; they are different from the closed-loop nature of the system. In other words, effects transmitted to or from other accounts are excluded;

* $$M_2 = \begin{bmatrix} I & (I-A)^{-1}E(I-H)^{-1}Y & (I-A)^{-1}E \\ V & I & V(I-A)^{-1}E \\ (I-H)^{-1}YV & (I-H)^{-1}Y & I \end{bmatrix}$$

(B) the matrix of extra-group, open loop or spillover multipliers which reports the effects of an injection going through all sectors except the originating one; $(I-A)^{-1}E$ measures the open-loop effects of a transfer from government to households' income in terms of commodity demand;

$$M_3 = \begin{bmatrix} [I-(I-A)^{-1}E(I-H)^{-1}YV]^{-1} & 0 & 0 \\ 0 & [I-V(I-A)^{-1}E(I-H)^{-1}Y]^{-1} & 0 \\ 0 & 0 & [I-(I-H)^{-1}YV(I-A)^{-1}E]^{-1} \end{bmatrix}$$

(C) known as inter-group, between-block, circular or closed loop multipliers The closed-loop multipliers are a class of particularly interesting multipliers since they isolate a measure of the overall interdependence between sectors, factors and decision-making units in the economy.

In total, they capture the entire and complex linkages through the whole economy given an injection on an account: for example, given an exogenous injection on an activity in the form of an increase in demand, there will be a closed-loop effect on value-added, proceeding to impact distribution among decision making units (transfers), households' incomes, consumption sectors and from there gets back to activities. We particularly examine the effects of such an injection on a sensitive variable, namely households' incomes given the poverty prevalence which needs to be alleviated.

V. Results and discussion

5.1. The importance of livestock in the Madiama commune

SAM multipliers show that livestock activities have the greatest absorption effects, that is, they record the highest overall increase in the nominal income when there is an injection of one monetary unit in the economy: 15.3295 for large ruminants and 3.5460 for small ruminants against 4.7588 and 3.63331 for rice and millet respectively. This confirms the pivotal position of livestock (large ruminants in particular) in the local economy.

On the other hand, Figure 1 shows for the main activities the payments to family labor--the most rewarding factor: livestock activities reward better than cropping activities across all household groups. More specifically, we notice that they are more rewarding for sedentary pastoralists and agro-pastoralists. This result confirms the importance of the livestock activity in the area.

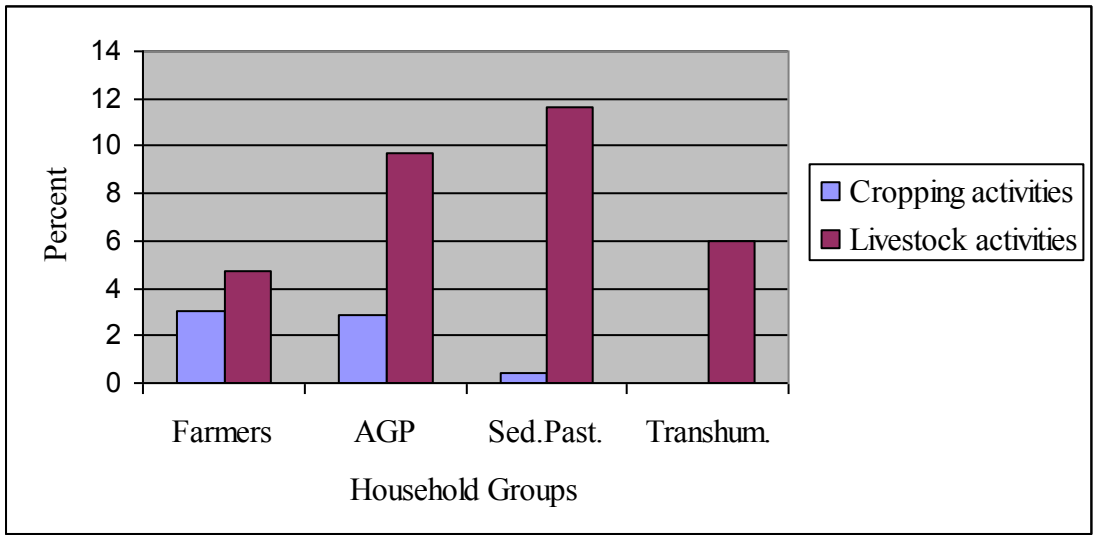


Figure 1: Payment to family labor by main activity and household group
Source: Kaboré (2008)

As it can be seen, livestock activities benefit far more from an exogenous unitary money inflow in the economy than the cropping activities of the Madiama commune by absorption effect. This means that the way livestock activities are currently conducted, they are likely to develop or exacerbate existing conflicts. Despite their high absorption capacity, livestock activities require more land for pasture and for transhumance while land is more and more devoted to cropping; this means that any policy that aims to promote the current livestock activities in the economy could end up with more conflicts since it primarily benefits to the most land-consuming livestock sector.

5.2. Decomposed effects of injections

SAM multipliers are decomposed into direct (intra-group), extra-group (open-loop) and closed-loop effects. Such decomposition enables to highlight the effects of an injection on each household group and therefore the importance of their reaction to communal policies.

5.2.1. Direct, transfer, own or intra-groups effects

Referring to equation **(A),** we focus on $(I-H)^{-1}$ which captures the effects of an exogenous increase on transfers between households. If the government increases households' income exogenously, $(I-H)^{-1}$ reflects the subsequent effects on direct transfers between households. An exogenous transfer of 1 billion of FCFA[1] to agro-pastoralists induces not only one of the largest effects on the income of this group 1,500,000 FCFA but also for the other three groups: 700,000 FCFA for farmers, 3,000,000 FCFA for sedentary pastoralists and 700,000 FCFA for transhumants (Table 2). A transfer to any other group performs less in terms of overall effects. The agro-pastoralist group is the best channel for overall income redistribution (6,000,000 FCFA), while the sedentary pastoralists category is the poorest one (1,000,000 FCFA).

Table 2: Between households direct effects of an exogenous injection, Madiama commune

	Farmers	**Agro-pastoralists**	**Sedentary pastoralists**	**Transhumant pastoralists**
Farmers	0.0015	0.0007	0.0000	0.0001
Agro-pastoralists	0.0000	0.0015	0.0000	0.0001
Sedentary pastoralists	0.0007	0.0030	0.0000	0.0001
Transhumant pastoralists	0.0007	0.0007	0.0000	0.0000
TOTAL	**0.0030**	**0.0060**	**0.0001**	**0.0004**

Source: Kaboré (2008)

5.2.2. Open loop effects

In the case above, we dealt with the direct effects of exogenous injections in a set of accounts, alone, not including possible other further effects on the other segments of the economy. In the current sections, we examine effects traveling around and ending up in the other sectors. Focusing on the component $(I-A)^{-1}E$ of equation **(B)**

[1] FCFA=franc de la Communauté Financière Africaine (500 FCFA= 1US dollar)

above which measures the open-loop effects of a transfer from government to households' income in terms of commodity demand (expenditures), one can notice that a unitary increase of exogenous demand induces households' expenditures of 0.76 for transhumant pastoralists, 0.68 for the other groups (Table 3). This clearly shows that the transhumants are overall, more reactive in terms of consumption, to a policy that increases household income. Farmers and agro-pastoralists tend to increase their crop consumption expenditures. The pattern indicates that a greater number of animals (large ruminants in particular) are expected, following an increase in the household income. This in turn could increase conflicts between farmers and pastoralists in the area since the livestock system is extensive and therefore more space-consuming.

Table 3: Open loop effects of an exogenous injection on households' income on activities, Madiama Communue, 1999.

	Farmers	**AgroPast**	**SedPast**	**Transhum**
Millet	0.105580	0.062198	0.025482	0.011848
Sorghum	0.015243	0.014799	0.002496	0.001838
Rice	0.147315	0.099500	0.018396	0.004529
Other Cereals	0.000025	0.000012	0.000006	0.000021
Vegetables	0.016240	0.020103	0.004172	0.003816
Legumes	0.015424	0.001143	0.000000	0.000000
Small ruminants	0.028740	0.092550	0.036211	0.031523
Large ruminants	0.230499	0.294104	0.453704	0.550211
Poultry	0.000414	0.000612	0.000201	0.000110
Milk	0.010519	0.000564	0.029463	0.075036
Fish	0.013386	0.002573	0.000208	0.000174
Total	**0.675667**	**0.680932**	**0.677820**	**0.761107**

Totals for selected activities only; they are therefore slightly different from totals including all activities
Source: adapted from Kaboré (2008)

5.2.3. Closed-loop effects

Table 4 presents selected closed-loop effects of an exogenous injection on activities, based on $[I-(I-A)^{-1}E(I-H)^{-1}YV]^{-1}$ from equation **(C)**. They are highest for (large ruminants) in the whole economy; the effects sum up to over 15.328952 against 4.644047 for rice and 3.599120 for millet, confirming the high absorption capacity of those sectors. Individually taken, milk is the most responsive to an external injection: an exogenous injection of 1billion in the milk sector induces the highest inter-group effects by 2.798017 billion. This effect is of 2.5316 billion for millet, 2.531674 for sorghum, and 2.622760 for large ruminants.

Table 4: Selected activity closed loop effects of an exogenous injection on activities, Madiama Commune, 1999

Activities	Millet	Sorghum	Rice	Vegetables	Legumes	Small ruminants	Large ruminants	Poultry	Milk	Fish	**Total***
Millet	1.148741	0.147546	0.139678	0.146153	0.175648	0.135509	0.120922	0.148003	0.100408	0.174898	3.599120
Sorghum	0.025893	1.026520	0.024816	0.027577	0.028199	0.025193	0.020987	0.026565	0.016460	0.029946	1.467837
Rice	0.208736	0.210095	1.198056	0.211110	0.244801	0.189384	0.160987	0.207182	0.121099	0.247168	4.644047
Vegetables	0.032224	0.033280	0.031013	1.035309	0.033185	0.032938	0.027433	0.033868	0.022637	0.036531	1.596661
Legumes	0.013095	0.012262	0.011928	0.010418	1.019840	0.008472	0.008253	0.011302	0.005632	0.017005	1.198305
Small ruminants	0.121962	0.128235	0.118254	0.143563	0.102962	1.143952	0.122123	0.137970	0.116081	0.128679	3.429390
Large ruminants	0.721092	0.700427	0.661040	0.725441	0.675218	0.843166	1.872996	0.816618	1.077206	0.745266	15.328952
Poultry	0.000949	0.000980	0.000912	0.001052	0.000933	0.001008	0.000850	1.001016	0.000730	0.001053	1.017875
Milk	0.034265	0.030449	0.029427	0.028726	0.033852	0.042561	0.054787	0.040772	1.087918	0.033866	1.720940
Fish	0.012820	0.012272	0.011824	0.011005	0.018180	0.009238	0.008571	0.011536	0.006040	1.016243	1.202638
Total	**2.531674**	**2.510113**	**2.423285**	**2.554150**	**2.545394**	**2.661628**	**2.622760**	**2.664924**	**2.798017**	**2.658806**	

** Totals are for selected activities only; they are therefore different from totals including all activities*
Source: adapted from Kaboré (2008)

Focusing on $[I-(I-H)^{-1}YV(I-A)^{-1}E]^{-1}$ from equation **(C)**, Table 5 shows the closed loop effect of an injection on household income distribution (governmental or NGOs transfers to households for instance); they are the highest when income transfer occurs to the transhumants: 1.6916 against a total effect of around 1.42-1.44 for the three other groups; transferring income to transhumant pastoralists induces a larger impact on all other households than doing so to any other group, although any such a policy will tend to benefit less to transhumants as a separate group (only 0.2728) (Table 5). Such a result implies that the transhumant group is likely to better spread good impacts of this policy all over the commune; although counter-intuitive given the misconception of the way of life of this group, this result is due to the ability of transhumants to opportunistically move from one place to the other in order to use natural resources and be in contact with the other groups.

If from the net transfer effects standpoint, transhumants are the second best channel for income

redistribution, they are the best with respect to the closed-loop effects multiplier.

Table 5: Closed-loop effects of an exogenous injection on household income distribution pattern, Madiama Commune

Household category	Farmers	Agro-Pastoralists	Sedentary Pastoralists	Transhumants
Farmers	0.3962	0.3565	0.3071	0.3401
AGP	0.5305	0.5455	0.4817	0.5480
SP	0.3425	0.3744	0.4313	0.5308
ST	0.1551	0.1703	0.2117	0.2728
TOTAL	**1.4243**	**1.4467**	**1.4319**	**1.6916**

Source: Kaboré (2008)

VI. Conclusion and recommendations

The objective of this paper was to analyze the effects of hypothetical policies on the livestock sector in the Madiama commune as well as the pastoralists' reaction to decisions made by the authorities of the commune.
The main findings in this paper can be summarized as follows:

- Family labor is the most rewarded factor for the agro-pastoralists, confirming that this household group's ability to operate more efficiently through feed-lot activity for instance. It clearly appears that any policy promoting family labor that is making, more efficient the use of family labor by new technologies for example, is likely to be in favor of the agro-pastoralists.

Livestock activities (small and large ruminants) would benefit far more of an exogenous unitary money injection in the economy than cropping ones. Since they require more land for pasture, this means that any policy that aims to promote livestock activities in the economy could end up with more conflicts since it primarily benefits to the land-consuming livestock sector. An exogenous transfer of 1 billion of FCFA to agro-pastoralists is expected to induce not only one of the largest direct effects on the income of this group but also for the other three groups. However, in terms of open-loop effects and closed-loop effects, transhumants are (i) more reactive in terms of commodity consumption to a policy that increases households' income and (ii) benefit less from an income injection despite an overall larger impact.

In total, we are in a dilemma: on the one hand, (i) livestock activities are the most family-labor rewarding and (ii) pastroralists seem to be the best channels for communal policies implementation. Moreover, we know that livestock activity requires more and more land for pasture and water through transhumance, which gives rise to conflicts between stakeholders. This needs negotiation between stakeholders and with the communal authorities to make decisions for a sustainable management.

On the other hand, the decentralization process is irreversible and local development should be promoted based on the participation of all stakeholders. Communal authorities should therefore be wary of the need to build consensus between stakeholders for a sustainable of natural resources. Livestock activities as well as the pastoralists should be strongly included in the process of this consensus building. They should get rid of (or ban) misconceptions and preconceived ideas on the livestock activities and pastoralists' way of life in natural resource management scheme.

Acknowledgments

The author wishes to thank the former SANREM/USAID project which funded the author's Ph.D research; this paper used data and results from this research to answer the research question.

References

1. Abubakar A. S. (2005): "The fallacy of the cattle complex theory and its implications on the development of the pastoral *Fulani* of Nigeria" Securities & Exchange Commission (SEC), Tower 421, Constitution Avenue Central Area, P. M. B 315, Garki – Abuja, Nigeria
2. Badini. O. & Doumbia O. (2002): "*Caractérisation des sols de la commune de Madiama"*. Working Paper Nr. 004. SANREM CRSP. Washington State University, Pullman, USA
3. Bassett, T.J & Koné, M (2006) : Grazing lands and opportunistic models: the political ecology of herd mobility in northern Côte d'Ivoire, Department of Geography, University of Illinois, Urbana-Champaign
4. http://www.africaneconomicoutlook.org/en/country-notes/west-africa/mali/ accessed on May 18 2016
5. http://www.ruralpovertyportal.org/country/statistics/tags/mali accessed on May 18 2016
6. Jones-Casey, K. & Knox A.. (2011): "Farmer-Herder Conflicts in Mali." Focus on Land in Africa. World Resources Institute and Landesa, Rural Development Institute.
7. Kaboré D.P. (2008) : Conflicts over Land in the Niger River Delta Region of Mali:Exploring the usefulness of SAM and CGE models to study Participatory Natural Resource Management in Agricultural and Pastoral Systems, University of Groningen, The Netherlands

8. Kandagor R.D. (2005) Rethinking pastoralism and African development: the case study from the Horn of Africa, Department of History, Egerton University, Njoro-Kenya.
9. Leisinger K.M & Schmitt K. (1996) : Survivre au Sahel. un défi pour l'écologie et la politique de développement, ISNAR, The Netherlands
10. Moore, K.(2005): The Madiama commune in Conflict, social capital and managing natural resources: a West African case study, CABI Publishing, Wallingford, UK
11. Nori M., Taylor M. & Sensi A. (2008) **:** Droits pastoraux, modes de vie et adaptation au changement climatique. IIED, Dossier n°148
12. Round, J.I. (2003):Social Accounting Matrices and SAM-based Multiplier Analysis, Chapter 14 in F Bourguignon, and L A Pereira da Silva (editors) Techniques and Tools for Evaluating the Poverty Impact of Economic Policies, World Bank and Oxford University Press.
13. Swedish Government (2013):Mali Environmental and Climate Change Policy Brief, SLU, GÖtebergs Universitet, Chalmers, Sweden
14. Thorbecke, E. (2000): The Use Of Social Accounting Matrices In Modeling, Paper Prepared for the 26th General Conference of The International Association for Research in Income and Wealth Cracow, Poland, 27 August to 2 September 2000
15. UNDP (2015): Report on Human Development: work for human development, 1 UN Plaza, New York, NY 10017, USA