



## **The manure value chain in the North of Senegal. What social, economic and environmental sustainability?**

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### **Abstract**

In northern Senegal, due to the recent surge in the price of chemical inputs and the need to diversify the methods of fertilization and amendment of plots of agrobusinesses, manure has become in a few years the black gold of the region. The manure value chain is a relatively young sector; thus, it has not yet been the subject of research, despite its potential for expansion and impact on the territory. This study aims to assess its sustainability in social, economic and environmental terms, by considering and comparing different governance mechanisms in the value chain. Through semi-directive interviews with stakeholders all along the value chain, we identified three different sub-value chains based on what kind of stakeholder take the lead in manure processing. This can be made by specialized processors, manure producers (pastoralists), or consumers (agrobusinesses). The three sub-value chains have different impacts in terms of sustainability, depending mainly on job creation, the appropriation of added value, and rangeland degradation coming from manure grabbing. In any case, and depending on the governance mechanisms put in place to regulate the transactions, manure seems to have great potential for poverty reduction and crop soil fertilization. Indeed, it not only helps to strengthen the structure and fertility of soils; but also, its use for energy purposes allows more than 80 households to cook and reduce their expenses. Other rural households in the area use the sale, collection or transport of manure to supplement their income. Nonetheless, the manure value chain may have negative impact on family farming. Peasants struggle to obtain manure due to competition with manure collectors. Also, agribusinesses have diversified their manure supply strategies by switching to compost production, thus reducing the share of added value that other stakeholders – be they pastoralists or specialized processors – achieve to grab from the processing activity.

### **Introduction: a growing interest for manure**

In northern Senegal, due to the recent surge in the price of chemical inputs and the need to diversify the methods of fertilizing and improving the plots cultivated by industrialists in the area, manure has become the region's black gold in just a few years. The methods of valorization are varied, as are the different supply chains (Belmin et al., 2022). Whether we are talking about raw manure or manure valorized into compost, the actors involved in the sector are multiple. The study area focuses on the Municipality of Mbane to the east of the Guiers Lake. This municipality has been prone, for several decades, to tensions over the resources it contains, due to its proximity to the lake. Irrigated and industrial agriculture is encroaching on pastoral territories and the removal of manure linked to the manure trade raises questions about the future of fertility in the bush and in pastures (Bourgoin et al. 2019).

This study aims to understand the value chain from the point of view of the actors who make it up, starting with the producers of manure, namely the livestock farmers. Whether from an economic, social or environmental point of view, this first study on the subject also aims to look further into the future, by understanding the sustainability of the governance mechanisms put in place within the value chain.

### **Methods: value chain approach and qualitative survey**

The method used in this work is based on an analytical framework in terms of value chain (VC), that allows to understand the governance mechanisms and analyze the linkages, interdependences and unbalances between different stages of the life cycle of a product (Gereffi et al., 2005). Nowadays, literature has been focusing more and more on VC sustainability from multiple points of view. Several methods have been developed with this aim, such as FAO's Sustainability Assessment of Food and Agriculture Systems Guidelines (SAFA) (Scialabba, 2014), the Framework for Assessing the Sustainability of Natural Resource Management (MESMIS) (Lopez-Ridaura et al., 2002), the Value Chain Analysis for Development (VCA4D) (Fabre et al., 2012) and the Bellagio Sustainability Assessment and Measurement Principles (STAMP) (Pinter et al., 2011). Methods and studies mainly consider VC sustainability from a social, economic and environmental point of view (Duteurtre et al., 2020; Malak-Rawlikowska et al., 2019; Munasinghe et al., 2017; Muñoz López et al., 2020; Pacheco et al., 2017). Thus, starting for the existing frameworks, we built a set of social, economic and environmental indicators.

To collect information in the field, we conducted semi-directed interviews with all the actors involved in the manure value chain. These actors include: manure producers, i.e. local pastoralist households, who can be at the same time collectors and processors on a small scale; medium and large-scale collectors; manure processors into compost and/or digesta; consumers, i.e. agribusinesses. The study area is the Municipality of Mbane; however, the study also considers the regional scale, which represents the manure collection basin, and national, when the different national programs and policies come into play. The information collected was used to trace the value chain and its sub-chains (see governance mechanisms) and then compare them in terms of sustainability. By sustainability we mean the positive impact of the value chain on the area and we adopted the point of view of pastoralist households since they are the local inhabitants.

### **Results: a young and varied value chain**

The manure value chain is relatively young. Before manure transporters set up, farmers and pastoralists used to exchange manure and crop residues, through the installation of animal pens as "common pastures" in the crop fields after the harvest. Some of these exchanges have persisted over time and the common pasture remains a widespread practice. Since the 2000's, as a result of the structural adjustment plans and several State programs to boost private investments, some huge agri-businesses were set up in the area, like the Indian *SenegIndia*. This led to the emergence of the first manure transporter, who travelled along the Senegal river valley to collect manure and sell it to those agri-businesses. From the 2010's, new methods of using manure were developed – that are composting and biomethanization – and some firms processing the manure into compost appeared. This raised awareness on the economic value of manure and led to its monetization. More manure transporters appeared, travelling up and down the silvopastoral area and collecting manure from pastoralist households, thus increasing the pressure on the resources of the rangelands. Nowadays, some agri-businesses are setting up internal compost platforms, so that they can buy raw manure and process it by themselves, thus bypassing intermediaries and contributing to a more vertical integration of the VC.

#### ***Three different sub-value chains***

By identifying VC actors and activities, we distinguished three sub-VC (see Figure 1). The first one, that we call "producers-processors", involves pastoralist households who have set up small biomethanization platforms on their site, thank to loans granted by the *Building Successful Business* firm. This firm covers the installation costs and recover them over time through the supply of digesta (the by-products coming from processed manure). It then sells this digesta to the agri-businesses. Pastoralist households benefit from the payment of the digesta (once

all the grants are recovered) and the production of biogas resulting from the process of biomethanization. The second sub-VC, called “consumers-processors”, links households and agri-businesses via simple transporters. Indeed, the supplied agri-businesses have on-site compost platforms and prefer to buy cheaper raw manure. In this sub-VC, some household members (especially women and youth) collect manure from the bush and bring it to collection points that were previously agreed with transporters. In the third sub-VC, that we call “big processor”, there is one firm (*Éléphant Vert*) which collect manure from pastoralist households and process it into compost to be sold to agri-businesses.

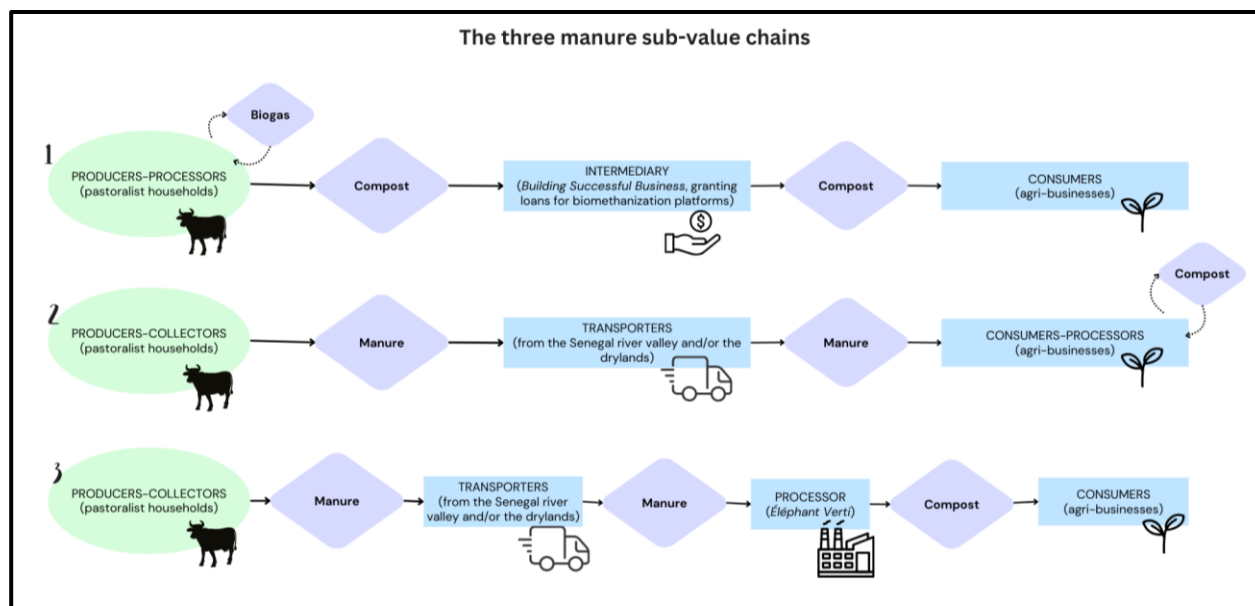


Figure 1 – The three manure sub-value chains: actors and products

***The social, economic and environmental sustainability of the three sub-value chains***

We compared the impacts of these three sub-VC on the area using a set of social, economic and environmental sustainability indicators. Based on the qualitative and quantitative data collected, we assigned plus (+) or minus (-) to each of the indicators according to the sub-VC, which made it possible to obtain an overall sustainability score for each of the sub-sectors (see Table 1).

Table 1 – Scores of social, economic and environmental sustainability of the three manure sub-value chains

Indicators	Sub-value chain 1 “producers-processors”	Sub-value chain 2 “consumers-processors”	Sub-value chain 3 “big processor”
<b>Social</b>			
Number of workers	+	++	++
Numer of jobs under contract	++	--	--
Access to accident coverage	+	--	-
Sub-total social sustainability	4	-2	-1
<b>Economic</b>			
Gross added value	+	0	++
Price payed to pastoralist households	++	--	-
% of added value to pastoralist households	++	+	-
Accessibility to a method of manure valorization	--	++	++
Sub-total economic sustainability	3	1	2
<b>Environmental</b>			
Distance traveled for collecting manure	++	--	-
Preferred collection area	++	-	0
Quantity of water used for composting	-	--	-
Sub-total environmental sustainability	3	-5	-2
<b>Total</b>	<b>10</b>	<b>-6</b>	<b>-1</b>

The scores show that it is sub-VC 1 (“producers-processors”) that presents the best social, economic and environmental impacts in favor of pastoralist households. Indeed, households are not only producers but also processors, thus grabbing a higher share of the added value coming from manure. This comes down to discussing the balance of power between actors: here households’ negotiating power is the strongest, which results in higher manure price. In sub-VC 2 (“consumers-processors”), it is the downstream actors who are favored in the balance of power: the monopolization of the processing activity, which resulted in the set-up of their own composting platform, leads to a vertical integration of processing and even transport intermediaries. Also, these giants are the sole buyers of some transporters and are therefore in an oligopoly position. In sub-VC 3 (“big processors”), the balance of power is exercised by the intermediaries, which creates a certain balance within the sub-VC. This sub-VC presents a high gross added value, however the percentage of added value which returns to pastoralist households is very low.

**Discussion and conclusions: need to regulate the governance of the manure value chain**

Through this work, we have noticed that the uses of raw manure are numerous and deployed on the study area. Whether through its uses in industrial or family agriculture, manure helps to strengthen the structure and fertility of soils. On the other hand, its use for energy purposes allows more than 80 households in the Northern zone to cook and supplement their income by selling processed manure. Other rural households in the zone use the sale, collection or transport of manure to supplement their income. At the same time, small crop producers struggle to obtain manure due to competition with manure collectors. We have also seen how agribusinesses have diversified their manure supply strategies by switching to compost production. This new production activity tends to threaten

the activities of processors specializing in compost production in the zone. In general, it seems that interest in this black gold tends to increase in the coming years. Approaching the sector from a sustainability perspective would make it possible to perpetuate everyone's activities by changing practices.

In order to strengthen the basis for thinking about the sustainability of the manure sector and anticipate its potential impacts, other studies should be conducted to explore and deepen the three aspects of sustainability addressed – social, economic and environmental.

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