



## Livestock Production and Household Income Patterns in Rural Senegal

S. Kazybayeva, J. Otte, and D. Roland-Holst

### Summary

The livestock sector is considered to have significant potential to contribute to poverty reduction in Senegal. Despite the growing importance of non-agricultural activities, livestock production remains one of the major activities of rural populations, which suggests that improvements in the sector can truly boost the incomes of rural poor majorities. However, the formulation and implementation of policies aimed at increasing revenues from livestock keeping requires a better understanding of the determinants of the roles and income flows from livestock. This analysis of sources of household income and the role of livestock is based on data drawn from ESAM I of 1994 – 1995. Estimates of revenues from livestock, degree of commercialization, and livestock products sold are broken down by geographic region in order to provide a more detailed picture of the relationship between geographic location, livestock species kept, the role of the latter, and poverty. The results of the analysis highlight the major role of geographic location as determinant of source and level of revenue obtained from livestock. Livestock are relatively more important sources of income in poorer households compared to their wealthier counterparts, but still only constitute around 10 percent of household income, largely due to the low productivity of traditionally managed livestock systems and low incentives for commercialization of livestock and livestock products.

## 1. Introduction and Methods

This paper aims to examine structure of household income and to elucidate the role of livestock for the rural population in Senegal and its potential for poverty reduction. A better understanding of importance of various income sources as well as factors influencing returns from livestock keeping are important for guiding evidence-based for pro-poor policy making.

During the last decade Senegalese authorities conducted two national representative income/expenditure surveys: Enquête Sénégalaise après des ménages, ESAM I in 1994-1995, and ESAM II in 2001-2002. This analysis of sources of household income and the role of livestock is based on data drawn from ESAM I of 1994-1995 since this survey dataset includes information on agricultural activities and sources of income, while the more recent ESAM II does not contain information about these components.

The questionnaire of the ESAM I includes three main sections: household characteristics, daily expenditures and household activities. The survey covered 3,300 households, of which 1,920 were urban and 1,320 rural. Sample selection used two-stage stratified random sampling. At the first stage, sectors of enumeration (SE) are selected using the 1990 Master Sample. Within every selected SE, census districts (CD) were selected so that the total number of CDs in each SE was proportional to the number of households in each area. At the second stage, households were selected with equal probability within each CD, and the selection resulted in 15 households in urban areas and 24 households in rural areas.

The survey data is stratified by the 10 main regions and by rural and urban sub-populations. For better identification of household income determinants related to the livestock production, the majority of the analysis is conducted on the rural stratum of the survey.

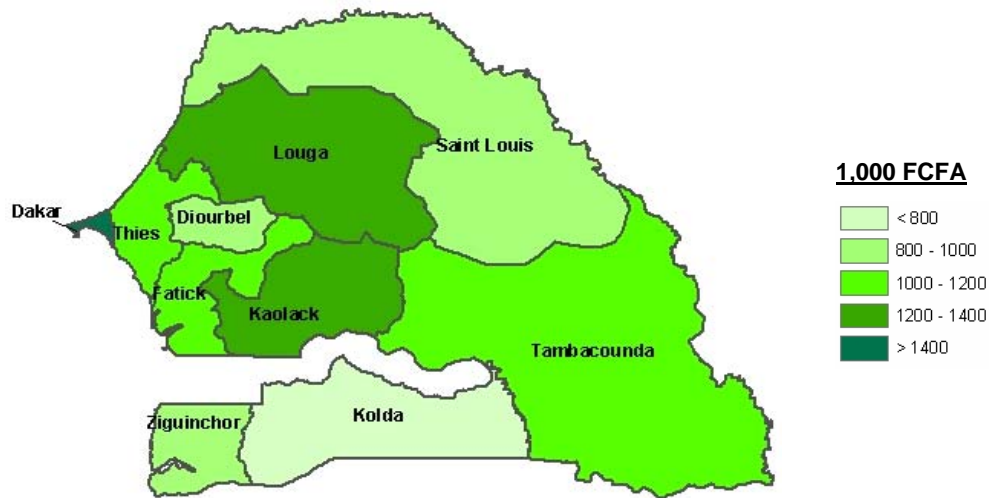
## 2. Results

It is widely recognised that geographical location plays a crucial role for a household's livelihood choice. In developing countries, where lack of adequate infrastructure and basic services remains a chronic problem affecting, foremost, the rural population, location is an even more prominent factor determining income sources and levels. Therefore, estimates of income and its sources, the prevalence of livestock keeping and the commercialization of livestock and derived products are made by region to provide better insight into the relationship between livestock activities, geographical location, and poverty in Senegal.

## Total Household Incomes

Looking at average household incomes by region, it is evident that a regional breakdown is essential for poverty analysis. The inequality between regions is very high, the average annual household income of 1,940,286 CFA<sup>1</sup> in the wealthiest region, Dakar, being about three times that in the poorest region, Kolda, where the average annual household income is 655,252 CFA. It is worth noting that compared to Dakar all other regions reveal a huge gap of average incomes (Figure 1 and Table 1).

**Figure 1:** Average annual income per household by region.



A breakdown of average incomes by urban and rural sub-sample illustrates, first of all, that rural incomes are far below of the aggregate averages in the different regions of the country. The national average income per household is about double the average income of the rural households. Rural households are best off in the area close to Dakar, while in more remote areas (e.g. Kolda, Ziguinchor) their income status is considerably lower.

<sup>1</sup> Average exchange rate in 1994: 1USD= 555,2 CFA, IMF (1999)

**Table 1:** Average household income by region.

Region	Annual average income for whole sample, FCFA <sup>1</sup>	Annual average income for rural sub-sample, FCFA
Kolda	655.252	494.098
Dakar	1.940.286	1.684.035
Ziguinchor	971.047	528.328
Diourbel	856.300	626.331
Saint-Louis	955.601	693.275
Tambacounda	1.028.614	678.593
Kaolack	1.232.184	809.746
Thies	1.087.984	491.317
Louga	1.343.405	1.082.322
Fatick	1.192.428	685.079
<b>Total</b>	<b>1.343.455</b>	<b>689.534</b>

Distribution of income by quintiles reveals a very high inequality by groups of population both in the total and rural sample. In the total sample the average income of the richest quintile is 47 times that of the poorest quintile while in the rural sample this ratio is around 41, suggesting that inequality is considerably higher in the urban sample.

**Table 2:** Average household income by quintiles.

Quintile	Annual average income for whole sample, FCFA	Annual average income for rural sub-sample, FCFA
poorest	95.842	98.821
2	340.782	332.558
3	750.597	732.160
4	1.616.139	1.537.223
richest	4.548.070	4.091.285
<b>Total</b>	<b>1.343.455</b>	<b>689.534</b>

## Sources of Rural Income and the Role of Agriculture

The importance of farming activities for rural households might best be understood by looking at the occupation of household heads. From this perspective, it is evident that agriculture and livestock keeping remain a principal occupation for the majority of rural households with 68 percent of household heads declaring that farming is their principal occupation, leaving all other activities far behind (Table 3). Thus, despite the widespread evidence of an increasing share of non-farm activities in most of rural economies, including West African countries, agriculture still remains as a sector in which the majority of the rural population has a stake, thereby having significant potential for the poor to improve their income levels.

**Table 3:** Main occupation of household head.

Occupation	Percentage
Non-agricultural self-employment	13.0
Farming (crops, livestock, fishery)	<b>67.7</b>
Senior level official	1.5
Skilled work	0.6
Unskilled work	1.9
Wage employment	0.5
Unemployment	2.4
Inactive	10.4
Not specified	2.1
<b>Total</b>	<b>100</b>

The most striking figure in Table 3 is the extremely low share of wage employees reaching only 0.5 percent. Reference to very thin labour markets, in particular in rural Africa, including Senegal, can be found in a number of studies (see for example, Binswanger et al, 1989, Sahn and Sarris, 1994). Field studies even provide evidence of labour shortage in farm production, and some authors argue that underdevelopment of labour markets is a critical issue for agricultural development (Binns, 1999). Even though rural labour exchange exists, it often takes a form of reciprocal movements within and between families based on social relationships.

Information on the number and proportion of rural households deriving income from different activities by region is provided in Table 4. The vast majority of households are involved in crop and livestock activities. The share of households engaged in crop production reaches 95 percent in the region of Kaolack, which is a main location of Senegal's groundnut agriculture. Livestock

production is carried out by approximately every second rural household (55 percent), with 73 percent of the rural population in Louga, a zone where traditional pastoralists are mainly concentrated (in the north of Louga) engaged in livestock keeping. This region is also characterised by the lowest proportion of wage-income earners which in turn indicates an underdevelopment of labour markets.

Non-agricultural businesses are predominantly found in coastal regions close to Dakar where the more wealthy population lives. In pastoral and agro-pastoral zones the share of households having non-agricultural enterprises is less but still remains important for about 53 percent of rural households. Wage income is not very common in the rural areas: only 11 percent of households get salaries. In some regions this figure is even lower, for example, in the south Kolda region it only reaches 1.5 percent. More than 94 percent of households receive various forms of transfers.

**Table 4:** Share (%) of rural households receiving incomes from different sources by region.

Region	Crops	Livestock	Hunting	Non-agr Ent	Wage	Property	Cooperatives	Transfers	Other
Kolda	88.7	51.2	21.4	47.6	1.2	8.3	5.4	97.0	18.5
Dakar	45.5	40.9	22.7	86.4	54.6	9.1	0.0	100.0	36.4
Ziguinchor	68.4	33.7	23.2	36.8	21.1	4.2	3.2	88.4	19.0
Diourbel	59.2	59.2	4.9	52.8	14.1	4.9	1.4	96.5	25.4
Saint-Louis	27.7	22.6	5.0	39.0	10.1	0.0	0.6	96.2	13.2
Tambacounda	72.6	62.1	4.2	46.3	8.4	3.2	1.1	99.0	5.3
Kaolack	95.8	68.3	6.6	62.3	9.6	6.0	0.0	88.6	22.8
Thies	79.7	61.5	12.5	53.1	13.5	2.1	6.3	93.8	21.9
Louga	71.7	73.2	0.0	72.5	5.8	0.7	0.7	100.0	23.2
Fatick	79.2	64.2	9.2	60.0	15.0	0.8	1.7	91.7	25.0
<b>Total</b>	<b>71.5</b>	<b>55.2</b>	<b>9.9</b>	<b>53.4</b>	<b>11.3</b>	<b>3.5</b>	<b>2.4</b>	<b>94.7</b>	<b>20.1</b>

In order to examine reliance on various sources by income groups, households are disaggregated by quintiles. Results shown in Table 5 indicate that the share of households earning from livestock is significantly lower for the poorest quintile (48 percent) while the second lowest quintile is the most involved to both agricultural and livestock and production (78 and 60

percent, respectively). Number of households earning from livestock is slightly declines towards higher income groups and averages at 58 percent in the richest quintile.

**Table 5:** Share (%) of rural households receiving income from different activities by income quintiles.

Quintile	Crops	Livestock	Hunting	Non-agr	Wage	Property	Cooper-atives	Transfers	Other
poorest	65.4	48.2	11.7	24.6	7.8	1.0	2.9	92.4	12.7
2	77.7	60.0	11.4	57.1	9.7	3.7	2.3	95.7	21.1
3	75.0	59.3	8.5	78.0	15.7	5.9	2.9	95.3	29.2
4	70.9	58.8	4.9	82.4	13.9	6.1	0.6	96.9	24.9
richest	72.9	57.6	5.1	89.8	28.8	6.8	1.7	98.3	25.4
<b>Total</b>	<b>71.5</b>	<b>55.2</b>	<b>9.9</b>	<b>53.4</b>	<b>11.3</b>	<b>3.5</b>	<b>2.4</b>	<b>94.7</b>	<b>20.1</b>

The above results show that households in all income groups (about 94 percent of households) receive transfers. It should also be noted that the share of households receiving transfers is slightly higher in richer groups. A similar pattern is observed for non-agricultural business and wage work: better-off households are more involved to these activities while relatively small share of poor households is able to run off-farm business or get salary.

Even though a majority of households is involved in farming, the overall contribution of agriculture and livestock keeping to household income remains relatively low compared to the large number of households engaged in these activities. The following Tables 6 and 7 present the proportion of income rural households derive from the different sources by region and by income quintile.

The average contribution of livestock to total income varies by region and ranges from 2 to 12 percent with a national average of 9 percent. The latter is considerably lower than the proportion of households engaged in livestock keeping. In pastoral zones such as the region of Tambacounda, income from livestock reaches 12 percent. Similar values are observed both in pastoral areas such as Louga (11 percent) and in areas where livestock is not a dominating activity, but which are closer to large markets (Thies and Fatick). The lowest share of income derived from livestock is found in the rural zone of Dakar region (2 percent), where households rely more on non-farm activities. Other sources of income such as income from crops, non-farm business, and transfers make the largest contribution to total household income in all regions.

**Table 6:** Average contribution (%) of different income sources to total household income by region<sup>1</sup>.

Quintile	Crops	Livestock	Hunting	Non-agr	Wage	Property <sup>2</sup>	Cooper-atives	Transfers	Other <sup>3</sup>
Kolda	37	6	4	27	0	2	1	21	2
Dakar	3	2	0	39	21	1	0	31	2
Ziguinchor	24	5	7	18	16	1	0	25	4
Diourbel	14	10	0	25	5	0	0	38	7
Saint-Louis	10	10	5	21	6	0	0	46	2
Tambacounda	24	12	0	22	1	0	0	40	0
Kaolack	37	9	0	33	3	0	0	16	1
Thies	20	11	1	24	5	0	1	36	2
Louga	12	11	0	30	2	0	0	41	5
Fatick	26	11	0	27	6	0	0	29	2
<b>Total</b>	<b>23</b>	<b>9</b>	<b>2</b>	<b>26</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>32</b>	<b>3</b>

1 Average shares are calculated across the rural sample

2 Includes interests, dividends, and rent income

3 Includes incomes from sold assets, heritage, games of chance, and other

Table 7 displays similar estimates of the contribution of various sources of income by quintiles. According to the survey data agriculture and livestock tend to be more important for the first two quintiles. Their income shares both from livestock and agriculture are highest than respective income shares of wealthier households. Moving to higher income groups one notices declining share of livestock income and an increasing share of income from other activities: the share of income from livestock is about 11-12 percent for the first two quintiles, while for richest group it only reaches 4 percent. Non-agricultural enterprises contribute only 7 percent of income to the poorest households, while for better-off households this share increases to 59 percent. A similar pattern is observed for wage income which accounts for only 4 percent of total income in the poorest quintiles but reaches 9 percent in the richest group. It is evident, that well-off households have better access to resources, first of all financial, and thus have more opportunities compared to poorer population groups to establish a business or to get salaried jobs.

**Table 7:** Average contribution (%) of different income sources to total household income by income quintiles.

Quintile	Crops	Livestock	Hunting	Non-agr enterprise	Wage	Property	Cooper-atives	Transfers	Other
poorest	25	12	3	9	4	0	0	43	2
2	25	11	2	24	3	1	0	31	2
3	23	7	0	34	5	1	0	26	4
4	15	5	0	46	6	1	0	24	3
richest	9	4	0	59	9	1	0	15	3
<b>Total</b>	<b>23</b>	<b>9</b>	<b>2</b>	<b>26</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>32</b>	<b>3</b>

## The Distribution and Returns to Livestock Keeping

Livestock keeping is a basic activity for pastoralists and agro-pastoralists in West Africa. In Senegal traditional (pastoral) production systems prevail in the north, east, and south east-regions of the country while agro-pastoral livestock production dominates in the coastal regions and the south-west. The latter includes the Cassamanka basin which is the centre of groundnut agriculture, the dominating crop in Senegalese agriculture. The share of households keeping livestock varies from 90 percent in pastoral areas (Louga, Tambacounda) to 67 - 68 percent in rural areas around Dakar and Diourbel (see Table 8).

The survey also reveals that livestock also supports the livelihoods of the urban population with of average 29 percent of urban households keeping some kind of livestock. The share of urban livestock keepers varies significantly between regions from a low 19 percent in Dakar to a high 66 percent in urban areas of the Louga region.

It is worth noting that there is a quite significant difference between the number of households relying on income from livestock (Table 4) and the number of households keeping livestock (Table 8), 84 and 55 percent accordingly. The former data are based on the reported sources of income, while the latter are based on data of actual livestock numbers per household. The only reason explaining this difference might be that a part of households did not always include home production consumption of livestock products to their income, and thus underreported income from livestock.

**Table 8:** Livestock keeping by region.

Region	Rural		Urban	
	Share of hh, %	Freq	Share of hh, %	Freq
Kolda	85	143	43	13
Dakar	67	16	<b>19</b>	204
Ziguinchor	81	78	41	49
Diourbel	68	97	40	36
Saint-Louis	85	140	61	92
Tambacounda	90	86	50	15
Kaolack	89	149	34	51
Thies	83	160	39	81
Louga	90	129	<b>66</b>	2
Fatick	88	106	52	31
<b>Total</b>	<b>84</b>	<b>1,104</b>	<b>29</b>	<b>574</b>

Similarly to livestock keeping in rural areas, the proportion of urban households keeping livestock increases when moving from the coast to remote zones in the east and the south-east (Saint-Louis, Louga, and Tambacounda).

Ruminants are the traditional livestock for the majority of sub-Saharan countries, and, in particular, in arid and semi-arid zones of Western Africa. In Senegal cattle and small ruminants are the major species as in the neighbouring countries. The average number of animals per household is shown in Table 9 and Figure 2. Livestock are particularly important in traditional pastoral zones of Saint-Louis and Tambacounda regions, where cattle herd size averages 10 and 8 animals respectively, which is twice the national average of cattle per household (5 cattle). Number of sheep and goats per household in these areas is also significantly higher than the average number in other zones. Poultry distribution also shows regional variation, but generally average flock size is larger in areas close to urban centres.

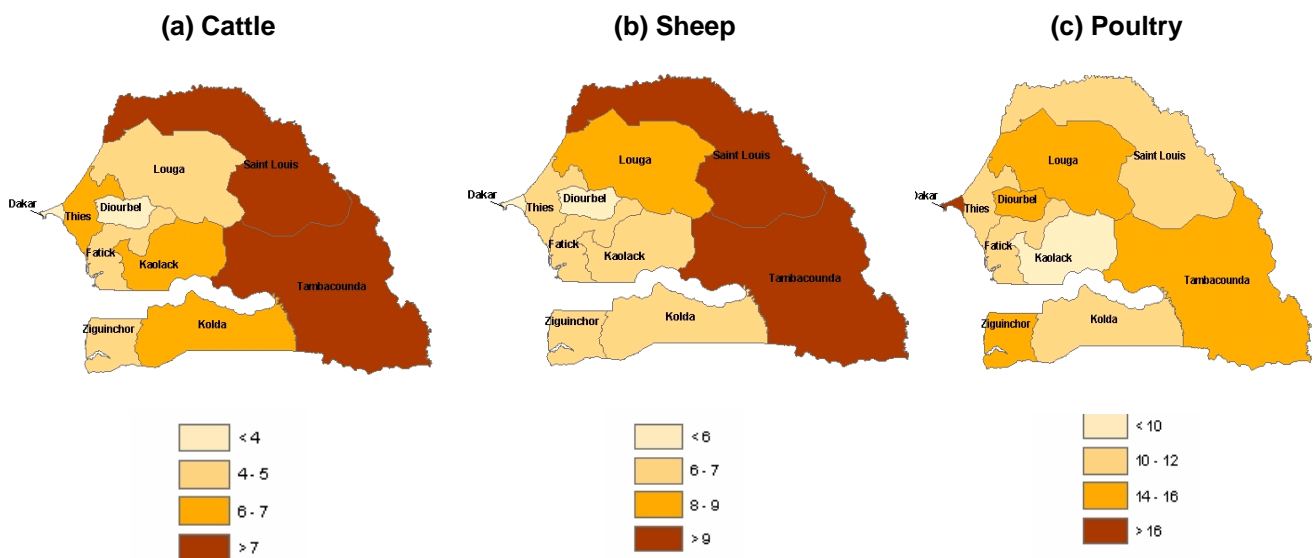
**Table 9:** Average number of animals per household.

Region	Horses	Cattle	Sheep	Goats	Asses	Pigs	Chicken	Other poultry
Kolda	2	6	3	3	1	1	5	5
Dakar	0		2	3	3	n/o <sup>1</sup>	5	15
Ziguinchor	1	5	3	4	3	4	7	8
Diourbel	1	3	2	3	1	n/o	4	12
Saint-Louis	2	10	5	7	2	n/o	8	4
Tambacounda	2	8	7	5	2	n/o	6	9
Kaolack	2	6	3	3	1	n/o	4	3
Thies	2	6	3	4	1	4	6	4
Louga	2	4	4	5	2	n/o	5	9
Fatick	1	5	3	3	1	3	4	6
<b>Total</b>	<b>2</b>	<b>6</b>	<b>4</b>	<b>4</b>	<b>2</b>	<b>3</b>	<b>6</b>	<b>7</b>

<sup>1</sup> no observations

Ethnicity is very important for understanding of a nature of livestock keeping in Senegal: traditional pastoralists presenting the majority of livestock keepers in the country belong to the Peul ethnic group, one of the poorest ethnic groups in Senegal. For Peul, livestock are associated with a social status rather than with the financial benefits they might generate, an appreciation that is important for understanding livestock production and consumption patterns of pastoralists.

**Figure 2:** Livestock per household by region.

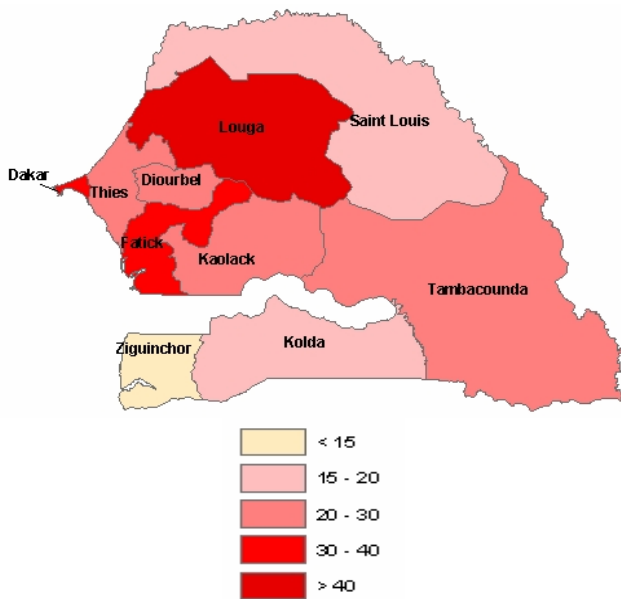


The low returns from livestock keeping, despite the latter representing quite such a significant occupation for a large share of the rural population, reflects, on the one hand, the low production level in the sector, and on another hand, weak links of livestock producers to markets.

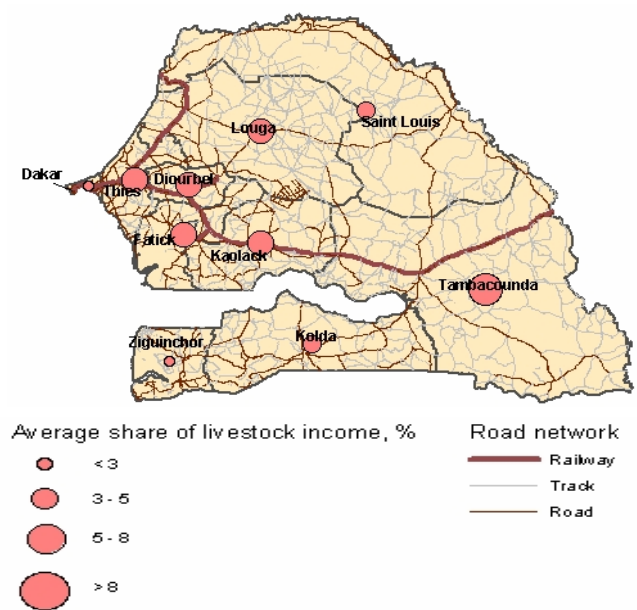
Numerous studies have shown the productivity of agriculture in Africa to be very low. Traditional livestock production systems, which the majority of the smallholders practice, are characterised by high mortality risks and low reproductive efficiency (Otte and Chilonda, 2002). Bovines raised in the humid and sub-humid grasslands produce an average of 13.8 kilograms of beef per year in Africa, compared to 34.1 kilograms in Central and South America and 85.5 kilograms per year in the OECD countries (Seré and Steinfeld, 1995). Annual milk offtake per animal (cow milk, whole, fresh) in Senegal averaged at 310 kg (in West Africa only 214 kg), while in South Asia the corresponding value is 933 kg, and in the world average is 2,194 kg (FAOSTAT, 2004).

Weak market links constitute another significant impediment of livestock income growth in Senegal. Examination of household patterns in marketing of their production provides useful information for policy guidance. Regional disaggregation of the data on livestock sales reveals quite clear distinctions of market behaviour in different localities. The proportion of production which is sold is higher in the rural areas close to Dakar (32 percent) with the maximum of 42 percent in Louga. In the remote pastoral zones of Kolda and Sant-Lois the proportion of produce sold is among the lowest – 18 and 20 percent. Overall, commercialization of livestock in Senegal is relatively low, only averaging 27 percent of total production (Figure 4).

**Figure 4: Livestock commercialization (%)**



**Figure 5: Road network**



There are both 'economic' and social reasons to explain the very low participation of livestock producers in the market. Among the 'economic' reasons, high transaction costs play the dominant role. Remoteness of traditional livestock keeping areas from the large market centres plays a crucial role (see Figure 5). These large markets are concentrated in Dakar and regional centres in proximity to Dakar such as Thies and Fatick. For other regions, transaction costs for livestock sellers are much higher due to underdeveloped infrastructure, high transport costs and monopsonies of intermediaries. The meat market chains involve, at least, 3 intermediaries. The first is a Peul trader (Dioula) collecting livestock in the local markets. He transports animals to the urban markets and contracts another trader (Téfanké), who intermediates to a large-scale butcher "chevillard" (Gning, 2003). Lack of information about prices on the market is another strong limitation for many of producers in remote areas who usually just have to accept prices offered by traders.

As a result of the above the returns from livestock to their holders are very small, and evidently incentives for selling animals are very weak (except some urgent needs for family reasons). Deficiency of cash in rural areas pushes households towards operating through in-kind payments or barter exchange. Thus a vicious circle is created: limited cash sources prevent households to participate in the market and receiving money, and the lack of pecuniary income restricts households to barter operations. Moreover, in the absence of rural financial institutions animals often serve households as quasi-savings and a form of investments.

Social traditions of Peul populations, who are the major livestock keeping group in Senegal, in part also explains the low participation of households in marketing of livestock. Animals, especially cattle, are considered as an important attribute of wealth and higher social status, and are often exchanged on social occasions. However, as some studies show, pastoralists are not *per se* adverse to market participation (Gning, 2003).

Table 11 illustrates the patterns of commercialization by income groups. It appears that the poorest households participate much less in marketing of the livestock, i.e. are more subsistence-oriented compared to better-off households. Higher incomes grant more opportunities for livestock keepers and allow them to get more access to transports, services, so make producers closer to markets: the ratio of sold animals increased up to 35 percent in the richest group. It is evident, that all above mentioned market access constraints hit firstly the poor, who are mostly depending on livestock, and thus limit effectiveness of policy measures improving productivity in the sector.

**Table 11:** Proportion (%) of livestock (production) marketed by income quintiles.

Quintiles	Proportion marketed
poorest	21
2	30
3	28
4	30
richest	34
<b>Total</b>	<b>27</b>

Livestock keeping is a traditional activity for the majority of the rural poor and, as this analysis reveals, the poor depend more on income from livestock. The multifunctional role of livestock for household well-being as a means of production, means of payment and savings is difficult to over-emphasize. Given high risks of crop production in Sahel, the very limited opportunities of the poor in the labour market and their lack of financial resources to establish their own business; livestock are one of the most promising ways for poverty reduction in the country. Overcoming existing barriers for the poor to improve livestock productivity, which remains extremely low, should be a strategic aim for improving well-being of rural populations. Furthermore, linking gains in agricultural productivity of small farmers to the improvement of access to markets seems to be a necessary precondition for making livestock policies effectively work for the poor.

### 3. Conclusions

- Geographical factors are very important for understanding the root causes of poverty in rural areas. The average household income in the country varies considerably by regions and urban/rural location.
- Agriculture (crops and livestock) remains the most important activity of rural households averaging at 68 percent of household heads occupied in the sector. Non-farm business is second to agricultural activities but still remains relatively low. Wage occupation is reported for only a minute share of household heads of the rural sample.
- The proportion of households keeping livestock varies by region with the highest proportion in traditional pastoral zones and lowers in areas close to Dakar. Livestock keeping is also quite prevalent in urban areas, especially in remote regions where about 66 percent of households keep some kind of livestock.

- Income from livestock activities is more important for the first two quintiles. Meanwhile, the share of livestock income remains below compared to other income sources. Increasing income status allows engagement in other activities such as non-farm business, and wage work.
- The wage income is less important in Senegal compared to other economies due to very poorly functioning of labour markets. Another reason for low income from wage employment in the total income is that the formal (modern) sector in the country is very insignificant and its share is continuing to decline over the last years.
- Low share of livestock income reflects first, low productivity of livestock in traditional agriculture. However the 'monetary' return from livestock does not fully reflect the importance of livestock keeping for rural populations as a number of non-monetary functions are not included in the analysis.
- Commercialization of livestock is relatively low - only at 20 percent in average. The poorest quintiles are less involved in markets and have lower rates of commercialization of livestock products. Addressing constraints (financial, transportation, lack of information) limiting them to earn income from their principal activity is an important issue for poverty reduction in rural Senegal.
- Linking gains in productivity on small farms to the improvement of access to markets should be an essential element of pro-poor livestock policies.

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**Saule Kazybayeva and Joachim Otte**

Pro-Poor Livestock Policy Facility  
Food and Agriculture Organization - Animal Production and Health Division  
Viale delle Terme di Caracalla 00153 Rome, Italy  
Tel: +39 06 57053634 Fax: +39 06 57055749  
Email: [Joachim.Otte@fao.org](mailto:Joachim.Otte@fao.org)  
PPLPI website at: <http://www.fao.org/ag/pplpi.html>

**David Roland-Holst**

Rural Development Research Consortium  
223 Giannini Hall University of California Berkeley, CA 94720 - 3310 USA  
Tel: +1 (510) 642 – 4823 Fax: +1 (510) 524 – 4591  
E-mail: [dwrh@rdrc.net](mailto:dwrh@rdrc.net)