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Farming systems diversity, does it matter for the poor?

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Abstract

The growing markets and rapid growth in demand for livestock products has been termed the livestock revolution. It is driven by rising income, urbanisation, and changing consumer preferences particularly among a growing middle class. Expanding domestic and export markets for livestock and rapidly growing demands create growth opportunities for livestock producers in the developing world. Globally there is a geographic shift in livestock production from the developed to developing countries. However, recent trends in the developing world like the lengthening of livestock food chains, vertically integrated livestock food chains, and increasing market concentration in the sector can marginalise smallholder producers and other poor people who depend on livestock for their livelihoods. The livestock revolution therefore has so far seemed to bypass the livestock sector in the least developed countries where the bulk of the poor live. Moreover, the increased production of livestock is also expected to come from the same or declining resource base. In many cases, this may lead to degradation of land, water, and animal genetic resources in both intensive and extensive livestock systems.

This study examines the distribution of livestock systems (intensive versus extensive) over time and across countries and relates this to economic variables, production systems variables and environmental variables in order to enhance the understanding of relevant characteristics and trends in livestock systems at a global level. Additionally the relation between livestock systems, livestock productivity and poverty levels were studied in more detail at a regional scale for Africa.

Keywords: Farming systems, global changes, livestock production, poverty, trends

Introduction

The livestock sector in the developing world continues to experience rapid structural changes. The growing markets and rapid growth in demand for livestock products has been termed the livestock revolution. It is driven by rising income, urbanization, and changing consumer preferences particularly among a growing middle class (Delgado et al., 1999). Globally there is a geographic shift in livestock production from the developed to developing countries. At the same time there are trends in the developing world like the vertically integrated livestock food chains, and increasing market concentration in the sector in response to consumers' demands for safer food and higher quality livestock products (FAO, 2005). The rapidly changing context of the livestock sector has significant social equity and environmental consequences. The increased production of livestock is also expected to come from the same or declining resource base. In

many cases, this may lead to degradation of land, water, and animal genetic resources in both intensive and extensive livestock systems (FAO, 2005; World Bank, 2005).

Expanding domestic and export markets for livestock and rapidly growing demands create growth opportunities for livestock producers in the developing world. The emergence of large-scale vertically integrated and concentrated industrial-type livestock operations can displace smallholders and other poor people that depend on livestock, threatening their livelihoods (Delgado, 2005). The livestock revolution provides tremendous opportunities to poverty reduction, as an estimated 42% percent of the poor worldwide are being dependent on livestock as part of their livelihoods (Thornton et al., 2002). However, there are major challenges in ensuring that livestock growth opportunities benefit poor people.

It is increasingly clear that the changing context of the World agriculture will shape the future growth opportunities in the livestock sector. But to be able to respond to this rapidly changing context, it is therefore necessary to understand the likely changes in the livestock sector and what the future may hold as a basis for making current decisions and investments in science, technology and development. The objective of this study is to determine the distribution of livestock systems (intensive versus extensive) over time and across countries and relates this to economic variables, production systems variables and environmental variables in order to enhance the understanding of relevant characteristics and trends in livestock systems at a global level. Additionally the relation between livestock systems, livestock productivity and poverty levels were studied in more detail at a regional scale for Africa.

Methods

Several analyses were applied to examine the distribution of livestock systems over time and across countries and relate this to economic variables, farming systems and environmental indicators. First at global level, country groups (typologies) were determined based on the share of livestock to agriculture and per capita GDP as an indicator of the country's wealth status. The average GDP share of livestock for all countries (39%) was used as a benchmark for the classification of countries into two groups with relatively high (above average) and low (below average) livestock GDP share out of agriculture respectively. These two groups were further sub-divided in the classes poor, middle-income and rich, with cut-off values of 3000 and 10000 US$ based on the distribution of GDP per capita in 170 countries.

For each of these groups as well as at a global an regional scale, multiple stepwise regressions were performed of poverty levels (proportion of poor livestock keepers as defined by the World Bank rural poverty rates against farming diversity and an array of environmental, socio-economic, farming system variables. To assess changes over the last two decades, the analyses for two time periods; 1990-1995 vs. 2000-2005 were carried out.

Additionally the relation between livestock systems, livestock productivity and poverty levels were examined in more detail at a regional scale for Africa.

Results

The first results of the country typologies indicate there is a positive correlation between livestock share in agriculture and income per capita, i.e. the contribution of livestock in agricultural production is less for poor countries than for rich countries. From the countries with an income per capita below 3000 US$/year 61% are in Sub-Saharan Africa.

The intensity of land use differs between rich and poor countries (Table 1). Cluster A and B with the poorest countries, together occupy about 26 percent of the total agricultural land and each employ about 50 percent of their population in agriculture. While the rich countries in Clusters E and F also have a considerable share of their land under agriculture, they employ only about 5 percent of their total population in agriculture. Furthermore the table shows that clusters with high share of livestock always use a relative high amount of agricultural land, illustrating the pressure from the livestock sector in these countries on the available land. The level of

technological innovation in rich countries is much higher than in the poorest countries. Stagnating investment in technological development is an important reason for the differences in agricultural development (InterAcademy Counci, 2004).

Table 1: Characteristic variables by clusters (average 2000-2005)[†]

	Cluster A Poor with low livestock contribution	**Cluster B** Poor with high livestock contribution	**Cluster C** Middle-income with low livestock contribution	**Cluster D** Middle-income with high livestock contribution	**Cluster E** Rich with low livestock contribution	**Cluster F** Rich with high livestock contribution
GDP per capita (USD)	1,369.19	1,637.69	5,487.56	6,195.57	17,540.25	22,827.33
	(631.62)	(576.02)	(1,647.57)	(1,858.03)	(5,170.14)	(9,765.54)
Share of livestock in	20	54	26	51	25	64
agriculture GDP (%)	(11)	(33)	(22)	(12)	(8)	(21)
Share of agriculture in total	30.89	23.87	13.85	10.58	4.97	2.75
GDP (%)	(13.55)	(13.36)	(6.29)	(6.95)	(2.37)	(2.32)
Employment in agriculture (%	53.42	46.00	27.70	18.89	7.90	5.82
of total population)	(27.16)	(6.82)	(13.82)	(11.38)	(4.84)	(4.48)
Total agricultural land (km^2)	9,251,120	3,741,740	9,360,140	10,700,000	1,956,010	13,500,000
In percentage	19.1	7.7	19.3	22.1	4.0	27.8
Total agricultural land over total surface area (%)	39.2	44.1	44.5	51.6	27.1	38.9
Cattle density (number of head	41.75	33.38	32.46	37.21	30.27	64.27
per sq. km of agricultural land)	(50.39)	(27.14)	(24.73)	(27.30)	(27.30)	(55.50)

Note: numbers in parenthesis are standard deviations unless otherwise indicated

Table 2 shows that the contribution of agriculture to GDP declined between 1990-1995 and 2000-2005 for all clusters. Also the average share of livestock in agriculture has slightly decreased (varying between 2 and 7.5% for various clusters) between the two periods. Poor countries have intensified their livestock production, i.e. the animal numbers per land area have increased, without having a neither greater livestock contribution to agricultural GDP or agricultural contribution to the overall economy. The middle-income countries expanded their agricultural area considerably and show therefore somehow expected declining animal densities and share of livestock contribution to agricultural GDP. Also the share of agriculture to the overall economy is however decreasing. Additional data, not shown in the table, indicate that cattle meat productivity (kg/animal) has decreased drastically over this period, varying from 2% (for cluster E) to 13% (for cluster B). These two trends might point to unsustainable agricultural practices.

Table 2: Characteristic variables by clusters (average 1990-1995)

	Cluster A	**Cluster B**	**Cluster C**	**Cluster D**	**Cluster E**	**Cluster F**
GDP per capita (USD)	1,521.27	1,624.75	4,891.07	6,379.50	17,594.67	19,801.48
	(682.97)	(583.23)	(1,286.17)	(1,626.41)	(5,181.41)	(5,838.09)
Share of livestock in	22	57	27	55	33	64
agriculture GDP (%)	(11)	(18)	(8)	(14)	(6)	(15)
Share of agriculture in total	33.94	28.02	16.69	12.00	4.85	4.02
GDP (%)	(11.70)	(12.94)	(7.58)	(6.81)	(2.98)	(2.78)
Employment in agriculture (%	57.84	23.50	25.62	20.80	9.75	6.31
of total population)	(23.17)	(19.38)	(16.11)	(11.51)	(6.02)	(3.83)
Total agricultural land (km^2)	13,400,000	4,144,590	2,177,920	6,836,805	4,046,485	12,200,000
In percentage	31.3	9.7	5.1	16.0	9.5	28.5
Cattle density (number of head	38.50	27.90	35.74	41.10	29.60	70.10
per sq. km of agricultural land)	(46.19)	(23.67)	(25.52)	(26.70)	(38.08)	(55.54)

Note: numbers in parenthesis are standard deviations unless otherwise indicated

Results of the multiple stepwise regressions showed that no significant relationships were found between farming system diversity and poverty levels ($R2 < 0.5$, $p > 0.05$) at global and regional

[†] Data in table 1 and 2 are derived from: United Nations, Food and Agriculture Organization (FAO) (Various years). FAOSTAT & World Development Indicator (2006). World Bank.

scale and for the country clusters. One clear factor is the very high variability in the proportional distribution of farming systems within poor countries.

Table 3: Summary numbers per farming system in Africa (Source: Thornton et al. 2002)

	Livestock only	Mixed irrigated	Mixed rainfed	Other
Area	12,541,554	80,474	5,764,089	4,310,752
Total number of people	52,178,968	6,429,093	410,608,313	93,576,313
Total number of poor	43,588,085	3,744,702	314,690,322	70,059,145
Total number of poor livestock keepers	20,977,629	735,488	121,773,739	11,023,592
Total number of cattle	887,642	30,078	1,334,780	154,377

As mentioned before, a large part of the poorest countries can be found in Africa. The percentage of poor farmers compared to the total population is high, ranging from 36% in South Africa to 91% in country Mali, Nigeria and Zambia. In Africa 74% of the total population and 57% of all rural poor live in areas with mixed crop-livestock systems. However, the percentage of poor farmers compared to the total population varies from 58% for mixed rainfed crop-livestock systems to 83% in pastoral systems, indicating that the population in the pastoral areas is relative poorer than in the mixed systems.

Conclusions

The identification of key issues in livestock system changes and their associated social and environmental consequences will result in an enhanced understanding of the major trends in global and regional livestock systems, which can be used to guide priority setting of the livestock research and development agenda to reduce poverty. This study examined some basic global data sets and additional analyses will need to be carried out to study the variety of farming systems and their relation and role to the prevalence of poverty.

But also at a country level, livestock keepers' poverty levels are not related to a certain prevalence of livestock production systems in the country. The percentage of poor farmers compared to the total population is high in pastoral systems as well as mixed crop-livestock systems. As a consequence poverty alleviation should focus on a range of interventions options that focus on income rearing activities and sustainable development specified for several types of land use and livelihood systems. In the face of global change and the rapidly changing context of the livestock sector there are major challenges in ensuring that poor people benefit as well from these growth opportunities.

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