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*Livestock sector development in
Asia and sub-Saharan Africa*

A comparison of
livelihoods impacts



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Summary

Africa Sustainable Livestock 2050 (ASL2050) aims to understand how Africa's changing livestock sector will affect public health, environment and livelihoods. ASL2050 has produced six papers comparing livestock sector development in Asia and Sub-Saharan Africa. These broad overviews sharpen our understanding, highlight contrasts and similarities, test hypotheses, and inform the decision-making process.

Comparing livestock sector development in Asia and Sub-Saharan Africa:

1. Framework for comparative analysis
2. Comparative analysis of the drivers of livestock sector development
3. Comparison of sector growth and transformation
4. Comparative analysis of public health impacts
5. Comparison of livelihoods impacts
6. Comparison of environmental impacts

This paper presents a comparative review of the contribution of the livestock sector on people's livelihoods in Asia and Sub-Saharan Africa (SSA).

- Both in Asia and SSA, economies have grown over the past decades with growth of non-agricultural GDP usually being higher than that of agricultural GDP indicating that in addition to growth, economies have, to a larger or lesser extent, also undergone structural change.
- In Asia, productivity growth in agriculture was accompanied by growth of the rural non-farm economy, resulting in a major decline in rural poverty and reduced reliance on agriculture as source of livelihoods. In most of SSA, agricultural productivity growth and rural transformation have been much less pronounced, agriculture still accounts for roughly two thirds of household incomes and levels of rural poverty generally remain high.
- Smallholder agriculture is pervasive in Asia as well as in SSA and in both regions the majority of rural households keep some form of livestock. Asian smallholder livestock keepers tend to market higher shares of their livestock production than their African counterparts. In SSA, non-monetized livestock products and services (savings, insurance, dung, traction) continue to be of vital importance, mostly within the context of mixed crop-livestock farming.
- Based on observed differences in technical efficiency among farms within similar locations in SSA, large yield gaps exist for livestock production. However, the 'business environment' in which farmers are operating in SSA deprives them of economic incentives to invest in inputs and the institutional structures in SSA, particularly the public sector component, are still way short even now of the Asian standard when the green revolution struck. Under these conditions, many smallholder livestock keepers will continue to produce mainly for home consumption.
- In Asia, contract farming is increasingly applied in poultry and pig production. The benefits of these contracts appear to be mixed. On the one hand, the terms of the contract can leave the producer liable for losses and efficiency gains appear to be largely appropriated by the processor. On the other hand, producers are quite open to contracts because their biggest risk is an uncertain price, so locking in a price and a market in advance is a major advantage.
- In Asia, agro-enterprises increasingly dominate the agribusiness sector along selected livestock value chains and in some industries oligopoly power undermines competition. Furthermore, independent producers may have difficulties penetrating formal markets because of an oligopsonistic formal market structure dominated by large integrators.
- SSA is only beginning its demographic transition and, given the low degree of economic diversification and competitiveness, smallholder agriculture will remain fundamental for

absorbing much of Africa's burgeoning young labour force. Strengthening family farms rather than large-scale corporate agriculture should thus be a priority, since these farms employ the overwhelming majority of agricultural workers, represent the greatest potential for production and employment, and generate the bulk of rural income.

Key words: livestock, livelihoods, employment, Asia, Sub-Saharan Africa

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1. Introduction

In the past ten years, the African continent has been one of the fastest-growing economic regions of the world. The rate of *per capita* income growth in Africa is comparable or greater to that of the Asian Tiger and Latin Puma markets and they have been nicknamed the 'lion markets' (Steinfeld and Chilonda, 2006). As GDP and consumer purchasing power grow, so will the demand for livestock products, including meat, milk, eggs. In response, producers will significantly invest in and expand livestock production and respective value chains. These investments will result in an increased supply of animal source foods aimed at satisfying consumer demand. However, if uncontrolled, the anticipated expansion of livestock production is likely to also have negative effects on public health, the environment and livelihoods, as experience elsewhere, for instance in Asia, has shown. Understanding long-term changes in livestock systems and their likely impacts on society is thus of paramount importance to formulate and implement policies that ensure sustainable livestock production.

This paper aims to contribute to the better understanding of possible development trajectories of livestock production in sub-Saharan Africa (SSA) and their effects on people's livelihoods by reviewing past livestock sector development in Asia. Livestock support livelihoods by increasing and stabilizing the availability of food, both from animals and crops, and by providing income. Furthermore, the livestock sector generates employment along its associated value chains. The impacts of livestock and animal source food (ASF) on nutrition is not covered in this paper, which focuses on the direct and indirect impacts of livestock sector development on household incomes in Asia and SSA.

2. Agriculture and the rural economy

General trends in economic development, population growth and urbanization in South, East and Southeast Asia as well as in the sub-regions of SSA have been presented in Brief 1. Growth of non-agricultural GDP has usually been above that of agricultural GDP, indicating that in addition to growth, economies are also, to a larger or lesser extent, undergoing structural change.

In Asia, economic growth and transition have also affected the rural economy. Although agriculture still remains important for rural livelihoods, employment (self- and wage-employment) in agriculture is declining. In those Asian countries for which data were available for 1999/2001 and 2009/2011, agricultural employment decreased by 6 to 26 per cent over the first decade of the new millennium (Table 1). Despite these declines, in 2010, agriculture still accounted for around 50 percent of employment in South Asia while for East and Southeast Asia the figure was slightly below 40 per cent.

The expansion of the rural non-farm economy has contributed to a reduction in rural poverty exceeding the rate of reduction of employment in agriculture. For countries for which data is available for the decade 2001/03 and 2011/13, rural poverty (based on national poverty lines) was reduced by 25 to 75 per cent from its original level and, in 2011/13, stood at around 30 per cent in South Asian countries, 20 per cent in Southeast Asian countries and 10 per cent in East Asian countries (Table 2). Although these figures should still be regarded as too high, particularly given growing rural-urban inequalities in the sub-regions, they testify to improving living conditions in rural areas.

Table 1 (Self-)employment in agriculture (%) in 1999/2001 and 2009/2011 in selected Asian countries

Sub-region	Country	1999/2001	2009/11	% Change
South	Bangladesh	62	48	-23
	India	na	51	
	Pakistan	48	45	-6
	Sri Lanka	45 ¹	33	
East	China	50	37	-26
	Mongolia	na	34	
Southeast	Cambodia	na	56	
	Indonesia	44	39	-11
	Malaysia	17	13	-24
	Philippines	38	34	-11
	Thailand	48	39	-19

¹ 1989/1991

Source: FAOSTAT (Employment Indicators)

Table 2 Rural poverty headcount (national poverty lines) in selected Asian countries in 2001/03 and 2011/2013

Sub-region	Country	2001/03	2011/13	% change
South	Afghanistan	na	38	
	India	50 ¹	26	-48
	Pakistan	na	36	
	Sri Lanka	25	8	-69
East	China	na	9	
	Mongolia	na	40	
Southeast	Cambodia	54	22	-59
	Indonesia	21	15	-27
	Lao PDR	38	29	-24
	Malaysia	14	3	-75
	Thailand	40	16	-61

¹ 1993

Source: World Development Indicators, WB

In SSA, overall economic growth has been considerably lower than in Asia, particularly in *per capita* terms, and agriculture continues to provide more employment than any other sector. In East African countries for which data is available, agriculture still provided more than half of all employment - in some countries around 75 per cent – in 2009/11 (Table 3). In West African countries, around 50 percent of the population are (self-)employed in agriculture while in Southern Africa this proportion is much lower. (No comparable employment statistics are available for Central African countries). In two of the five countries for which two data points are available, the share of employment in agriculture has actually increased in the decade 1999/2001 to 2009/2011.

Table 3 (Self-)employment in agriculture (%) in 1999/2001 and 2009/2011 in selected countries in SSA

Sub-region	Country	1999/2001	2009/11	% change
Western	Guinea	na	74	
	Ghana	na	42	
	Liberia	na	47	
	Nigeria	na	55	
	Senegal	na	46	
Eastern	Rwanda	87 ¹	75 ²	-14
	Uganda	69 ³	74	7
	Zambia	na	56 ²	
	Zimbabwe	na	66	
Southern	Botswana	20	26	30
	Namibia	31	27 ²	-13
	RSA	16	5	-69

¹ 2002; ² 2012; ³ 2003

Source: FAOSTAT (Employment Indicators)

With the exception of Southern Africa, rural poverty rates in SSA are considerably higher than those in Asia, e.g. above 50 percent in Central African countries, and only few countries have achieved reductions in rural poverty exceeding 10 percent over the decade 2001/03 – 2011/13 (Table 4). In two of the eight countries for which two data points are available, rural poverty has even increased over the decade.

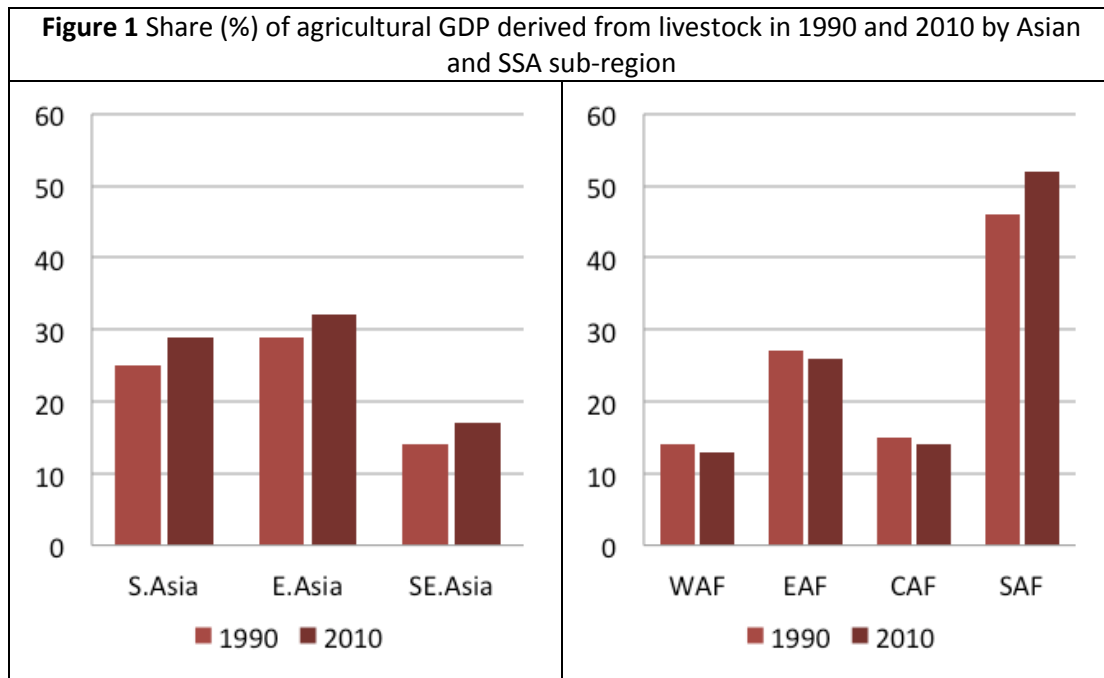
Table 4 Rural poverty headcount (national poverty lines) in selected countries in SSA in 2001/03 and 2011/2013

Sub-region	Country	2001/03	2011/13	% change
Western	Burkina F.	66	48 ¹	-27
	Ghana	na	38	
	Guinea	60	65	8
	Nigeria	57	na	
	Sierra Leone	79	76	-4
Eastern	Mozambique	55	na	
	Tanzania	na	33	
	Uganda	43	22	-49
	Zimbabwe	na	84	
Central	Cameroon	52	57 ¹	10
	Chad	58	53	-9
	DRC	na	65	
	Rep. Congo	na	75	
Southern	Botswana	45	24 ²	-47
	Namibia	49	37 ²	-24

¹ 2014; ² 2009

Source: World Development Indicators, WB

Within agriculture, the share of agricultural GDP contributed by livestock has grown in all three Asian sub-regions over the period 1990 to 2010 while in SSA, with the exception of Southern Africa, the shares have slightly declined (Fig. 1). In Western and Central Africa livestock only contribute slightly more than 10 per cent of agricultural GDP, while in Eastern African this share is lower than in South and East Asia.



Source: elaborated from FAOSTAT (Value of Production)

3. Livestock keeping and livelihoods

Both in Asia and SSA, most of the 'poor' live and work in rural areas. Of these, a majority depend for their livelihoods on farming or supplying farm labour. In both continents, most farming households cultivate less than 2 ha of land, own less than 2 Tropical Livestock Unit (TLU) and practice mixed crop-livestock farming (Otte *et al.*, 2012). Despite this generally small farm size and lack of specialization most meat and milk in the developing world comes from mixed smallholder farms, which also produce close to 50 percent of the global cereal output (Herrero *et al.*, 2012). In addition to the direct provision of food and income, livestock provide services, some of which are not monetized and thus omitted in income and / or GDP estimates.

3.1 Livestock keeping and livestock-derived income of rural households

As shown in Table 5, livestock are kept by a majority of rural households both in Asian as well as in SSA countries and the proportion of households keeping livestock is not markedly different between the total rural sample and lower income (bottom quintile) households.

Table 5 Proportion of livestock keeping rural households (%) and contribution of livestock to household income (%) for the total rural sample and for the bottom expenditure quintile, in selected countries of Asia and SSA

Country	Proportion of livestock keeping HHs (%)		Livestock's contribution to total HH income (%)	
	Total rural sample	Bottom quintile	Total rural sample	Bottom quintile
Asia				
Bangladesh 2010	75	70	3	2
Cambodia 2009	67	68	11	11
India 2012	57	60	26	24
Mongolia 2014	70	76	64	64
Nepal 2011	94	88	16	14
Pakistan 2014	40	50	38	40
Viet Nam 2010	58	65	11	11
SSA				
Ethiopia 2016	87	85	27	27
Malawi 2013	57	51	28	32
Mali 2014	72	75	23	19
Nigeria 2013	62	77	16	18
Tanzania 2013	62	62	28	30
Uganda 2014	67	68	25	30

Source: Provisional data from the RuLIS – Rural Livelihoods Information System (FAO), based on various national household surveys

The contribution of livestock to total rural household income varies considerably between countries from as low as 3 percent in Bangladesh to as high as 64 percent in Mongolia. This variation reflects both the relative importance of non-farm income for rural households as well as the relative importance of livestock in prevailing agricultural systems. Livelihoods impacts of livestock sector development will thus strongly depend on the existing structure of rural economies. As with livestock ownership, the proportion of income from livestock is very similar between the total rural sample and the sample of lower income households.

For South Asia, Staal *et al.* (2009) estimate that over 600 million livestock keepers are poor (< USD 2/day), most of them living in India, while in sub-Saharan Africa over 300 million livestock keepers are poor, mostly concentrated in East and West Africa, with fewer in Southern and Central Africa (Table 6). Although most pastoralists are considered poor, the vast majority (>85 percent) of poor livestock keepers are farmers practicing mixed crop-livestock production.

Table 6 Estimated number (million) of livestock keepers living on less than USD 2/day in South Asia and SSA

Sub-region	(Semi-)Arid	Mixed	Other	Total
South Asia	1.9	635.0	6.6	643.5
SSA	36.1	264.0	9.0	309.2

Source: Staal *et al.*, 2009

3.2 Marketed livestock production

As can be seen from Table 7, in most countries of Asia and SSA, a majority of rural households sells agricultural produce, again without marked differences between the overall sample and the bottom income quintile. With respect to livestock-derived ASF, with the exception of Mongolia and Viet Nam, most is kept for home consumption, and the share sold is particularly

low in countries in SSA (less than 20 per cent). In some countries (e.g. Nepal, Niger) it appears that bottom quintile households sell a slightly above average proportion of their livestock products, possibly reflecting a stronger need to purchase staples.

Table 7 Market participation of rural households and proportion of livestock production sold (%) for the total rural sample and the bottom expenditure quintile, in selected countries of Asia and SSA

Country	Proportion of households selling agricultural products (%)		Proportion of livestock production sold ¹ (%)	
	Total rural sample	Bottom quintile	Total rural sample	Bottom quintile
Asia				
Bangladesh 2010	64	56	29	32
Cambodia 2009	na	na	7	6
India 2012*	30	25	na	na
Mongolia 2014**	67	73	73	71
Nepal 2011	58	51	36	48
Viet Nam 2010	48	55	63	62
SSA				
Ethiopia 2016	93	92	18	21
Malawi 2013	67	62	6	7
Mali 2014	38	36	5	6
Niger 2014	48	49	19	33
Nigeria 2013	74	76	7	7
Tanzania 2013	76	75	na	na
Uganda 2014	67	54	11	13

¹ Across all households

* Only sales, no own consumption

** The survey asks for production sold and home consumed but the majority of households did not report any home consumption. The values in the table are from those households that reported both.

Source: Provisional data from the RuLIS – Rural Livelihoods Information System (FAO), based on various national household surveys

3.3 Non-marketed livestock products and services

Dung and traction, although at time marketed, are usually a non-monetized livestock inputs into household farming systems. Savings / asset accumulation and insurance represent another category of non-monetized services provided by livestock in traditional smallholder settings.

Dung / manure: Crop yields are increased by the use of manure as fertilizer and increases in crop production can in turn contribute to improved livelihoods and better nutrition. Many soils contain insufficient nutrients to sustain efficient crop production, and complementary relationships between crops and livestock can be exploited through nutrient recycling, with animals feeding on crop residues and returning manure to the soil. This results in increased production from both crops and livestock. In addition to providing nutrients to the soil, the organic material contained in manure also improves soil texture. This benefit of manure is well recognized by farmers and in high-potential areas of Kenya, for example, the market value of manure has been found to be about five times the value of the equivalent nutrients in fertilizer (Lekasi *et al.*, 1998).

Overall, manure has been shown to increase yields to similar levels as chemical fertilizers do. McIntire, Bourzat and Pingali (1992) estimated yield increases ranging from 15 to 86 kg of grain per tonne of manure. In Uganda, for example, Pender *et al.* (2004) found that

households with fewer livestock had lower crop production. In Tanzania, Lewlamira *et al.* (2010) observed substantial increases in crop yields after application of cattle manure. Bayer and Kapunda (2006) and Kayigema and Rugege (2014) also report greatly improved crop yields (>95 per cent) as one of the consequences of dairy cow distribution and application of manure in Tanzania and Rwanda respectively. In densely populated areas of Kenya, only farms with cattle were found to have positive soil-nutrient balances, (Shephard and Soule, 1998).

Only 35 and 29 per cent of cultivating households in SSA (data from 6 countries) use inorganic and organic fertilizers respectively (Sheahan and Barrett, 2014) and the use of fertilizers, except perhaps in Malawi and Niger, appears far too low to maintain soil fertility (Binswanger-Mkhize and Savastano, 2014). As can be seen from Table 8, livestock keeping agricultural households are much more likely to apply organic fertilizer than those that do not keep livestock, thereby probably benefitting from higher crop yields.

Table 8 Share (%) of rural agricultural households using organic fertilizer

Country	Proportion using organic fertilizer	
	Non-livestock keepers	Livestock keepers
Asia		
Viet Nam 2010	4	47
SSA		
Ethiopia 2016	30	66
Malawi 2013	20	33
Mali 2014	27	54
Nigeria 2016	10	34
Tanzania 2013	9	33
Uganda 2014	5	13

Source: Provisional data from the RuLIS – Rural Livelihoods Information System (FAO), based on various national household surveys

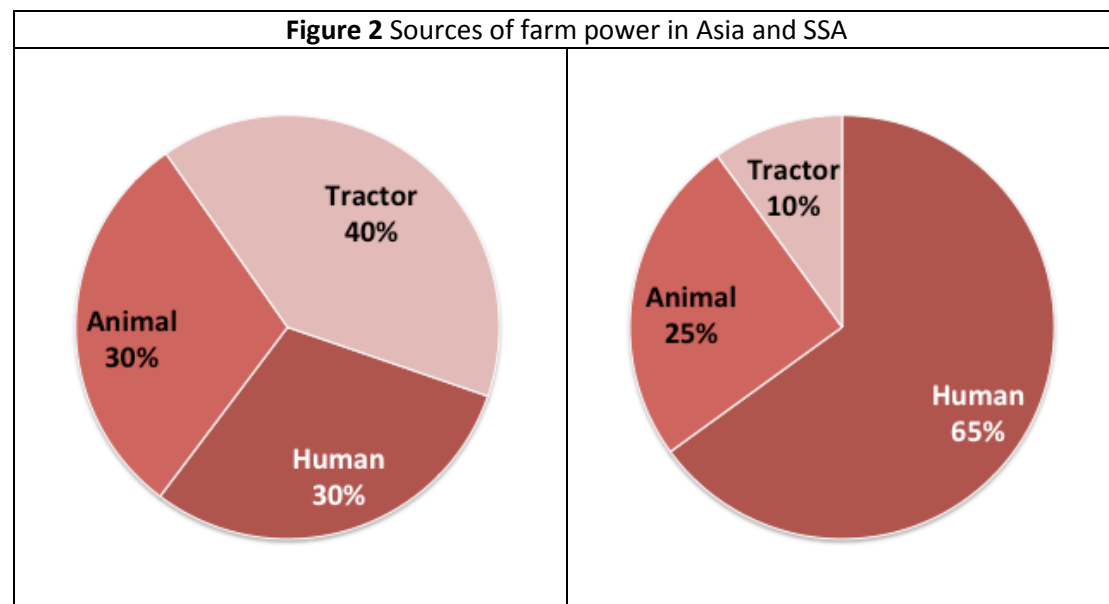
In densely populated areas of SSA, soil organic carbon levels have reached very low levels (Powlson *et al.*, 2011; Vanlauwe *et al.*, 2011). Nitrogen use efficiency on cereals tends to be strongly inversely related to soil organic carbon (Marennya and Barrett, 2009; Vanlauwe *et al.*, 2011) and loss of active carbon in soils is a leading explanation for why farmers in many areas complain of having to apply greater doses of nitrogen-based fertilizer in order to maintain their yields over time (Sileshi *et al.*, 2011).

In many areas manure is also used as a source of fuel, saving fuel wood and oil, and lowering dependency on external fuel supplies. Manure can be converted into biogas through anaerobic digestion with the manure produced by one cow over one year providing the energy equivalent of over 200 litres of petrol.

Animal traction: It has been estimated that, globally, livestock provide animal traction to almost a quarter of the total area under crop production (Devendra, 2010). Animal traction is particularly important for food security in smallholder farming systems and is expanding in SSA while being widespread and persistent in Asia (FAO, 2010).

In Sub-Saharan Africa, animal power accounts for 25 per cent of total farm energy while in Asia it accounts for 30 per cent (WB, 2014) (Fig. 2). The major differences between the two regions with regards to farm power lies in the low adoption rate of tractors in SSA and the high share of human labour (65 per cent) in the provision of farm power. However, there are sub-regional differences with manual power being dominant in Central Africa, draught animals being used to a greater extent in Western and Eastern Africa and a relatively high use of tractors in Southern Africa (Clarke and Bishop, 2002). Cultivation with animal power or tractors often produces little or no improvement in crop yields compared with hand

cultivation, but it allows a larger area to be cultivated per household or unit of labour.



Source: World Bank, 2014

Although small-sized farms are a prominent feature in both SSA and Asia, the use of ‘tractors’ is much more widespread in Asia. In Bangladesh for example, where 80 percent of farms are smaller than 0.6 ha, 80 percent of land preparation is done by 2-wheel power tillers, mainly imported from China (Ahmed, 2013). A similar situation exists in Sri Lanka, also a smallholder dominant country where also 80 percent of land preparation is done using 2-wheel power tillers (Biggs *et al.*, 2011).

The large difference in mechanization between small-scale farmers in Asia and SSA may partly be explained by the difference in crops being grown. In Asia, irrigated rice and other cereals, which are considered as “plough positive”, are very common while in SSA rural staples such as cassava and yam are “plow-negative” as land preparation typically requires the construction of mounds by hand (Ngeleza *et al.*, 2014). Furthermore, the nature of irrigated farming, with multiple cropping systems, increases pressure for rapid land preparation and reduced turnaround time between crops.

Insurance, risk spreading and savings: Two challenges for rural smallholders are risk and vulnerability. In response to these, smallholders have developed multiple strategies for (*ex-ante*) risk management and (*ex-post*) coping with shocks. The former involves diversification into livestock, which is a common strategy among a wide spectrum of rural households (Freeman *et al.*, 2007; Pell *et al.*, 2010). The latter involves ‘consumption smoothing’, e.g. through the distress selling of livestock (Vandamme *et al.*, 2010). Poor people thus reduce their vulnerability through livestock by transferring risks to their animals. As agricultural risks increase, the insurance value of livestock increases. For example, Ayalew (2000, cited in Moll, 2005) estimated the insurance benefits of goats in the Ethiopian highlands to be about 8 percent of their value, while Moll (2005) suggests a value of up to 20 percent for situations where risks are severe.

In rural settings, livestock also serve as financial instruments because of the persistent absence of credit and financial markets in rural areas of developing countries (Pell *et al.*, 2010). Livestock are substitutable asset that can be sold in order to invest in land or small businesses and non-farm income can be used to build up herds and obtain the necessary inputs. Evidence of this savings function is that households purchase livestock when income exceeds consumption expenditure requirements, and sell them only in times of cash need

(e.g. Moll and Dietvorst, 1999). Poultry serve as current savings to meet households' small cash needs, such as for the purchase of medicines when a family member falls ill; small ruminants and pigs provide medium-term savings to meet slightly larger expenses, such as school fees and books; and large animals serve as long-term savings ("banks on hooves") to cover major investment needs, such as extending the house (Devendra and Chantalakhana, 2002).

Through flexible uses of livestock and diversification of income sources, small farms' incomes are much less variable from year to year if they produce crops and livestock than if they produce crops alone (Sandford, 1988, cited in Bradford, 1999).

4. Employment in livestock production and value chains

Livestock production is not only a source of livelihood for farming households, but also offers income opportunities to non-farm households through wage employment by farmers or through engagement in activities along livestock value chains. Contract farming, a business model under which farmers use their facilities and labour to produce a specified livestock commodity under a time bound agreement following predetermined production practices for a larger, often corporate and vertically integrated agribusiness can be regarded as a special form of (short-term) employment of farm households.

4.1 Contract farming

Contract farming is increasingly applied in Asia, particularly in the poultry but also in the pig sector. Contract farmers would probably fall within the higher income quintile, as obtaining a contract with an integrator requires land and a shed built to the specifications of the integrator. Delgado *et al.* (2008) compared average profits per kg of meat for independent and contract broiler and pig farmers in India, the Philippines and Thailand (Table 9).

Table 9 Average profit (USD cents) per kg output of broiler and pig live weight in India, Thailand and the Philippines of independent and contract farmers by farm size

Product	Country	Family labour costed	Small		Large	
			Indep.	Contract	Indep.	Contract
Broilers	India	No	11.3	0.9	9.4	2.7
		Yes	10.6	0.0	9.3	2.6
	Philippines	No	3.1	7.8	2.1	7.7
		Yes	2.6	7.7	2.1	7.7
	Thailand	No	1.7	3.1	5.8	2.7
	Pigs	Philippines	No	51.5	4.0	38.2
Yes			51.2	4.0	38.2	4.5
Thailand		No	27.7	26.8	35.8	4.0

Source: Adapted from Delgado *et al.*, 2008

With the exception of broiler production in the Philippines and small-scale broiler production in Thailand, independent farmers appear to have higher profits per unit output, at times considerable. For the Philippines, Costales *et al.* (2007) point at the cost advantage of larger contract farms over small ones and at their ability to access inputs at privileged prices linked to subsidies. Any efficiency surplus thus appears to be largely appropriated by the processor and the main advantage of contract farming lies in lower risk and reduced capital outlay. Furthermore, independent producers may have difficulties penetrating formal markets because of an oligopsonistic formal market structure dominated by large integrators (e.g. Paopongsakorn, 2012; Rola *et al.*, 2003).

Box 1 Contract broiler farming in Thailand

Contract broiler raisers in the Northeast of Thailand can earn as little as 1 700 baht a month per worker (approx. USD 43), after deducting the costs of production and debt repayment. This is below the minimum wage of 2 720 baht for 20 working days (app. USD 68).

Moreover, broiler farmers are committed for many years because of their bank loan (five to ten years), while companies sign only year-to-year contracts. More burdensome than the low income is the overwhelming debt problem. In a group of 19 farmers raising chickens on contract interviewed in October 2004, the average debt per household was around 241 034 baht (approx. USD 6 025), which was more than ten times the national average for farming households already considered as heavily indebted. The debt makes it almost impossible for the farmers to quit the venture and creates a strong dependency on the contracting agribusiness companies.

With the bird flu crisis, some farmers received no chicks for more than six months and thus increased their indebtedness. The fluctuating gaps between the production cycles give companies a flexible source of supply, transferring the risk of the market's variations to the farmers.

"Our job is to raise the chickens that belong to the company. We build the farm and we simply do what they tell us to do." But the company does not provide any of the obligations under a typical employment contract such as minimum wages, sick leave or severance pay.

Source: Delforge, 2007.

Contracts thus appear to be a mixed blessing. On the one hand, the terms of the contract can leave the producer liable for losses, can lock in a lower than fair price for production, and can make the overall market much less transparent, by turning exchanges on an open market into proprietary commercial information. On the other hand, producers are quite open to contracts because their biggest risk is an uncertain price, so locking in a price and a market in advance is a major advantage. Contracts offer a tool with important potential, which however can only work with mediation to ensure that the stronger party does not abuse the weaker one (Murphy, 2006).

4.2 On-farm wage employment

Although the rural non-agricultural economy has increased in importance around the developing world in terms of the share of rural household income it provides, agriculture remains central to rural economies and provides wage employment to large numbers of households. Based on household survey data from seven countries in SSA, some 20 to 40 per cent of agricultural households make use of hired labour (Zeza *et al.*, 2007). Given the large number of agricultural households, this results in 18 per cent of rural households in SSA obtaining income from agricultural wage employment (as opposed to 15 per cent from non-farm wage employment) (Davis *et al.*, 2017). Table 10 presents information on the proportion of livestock keeping and non-livestock keeping households hiring labour in Asia and SSA countries. It appears that, generally, livestock keeping households are more likely to hire labour. This may be due to a variety of factors associated with livestock ownership, e.g. higher wealth, higher cropping intensity and/or additional labour requirements for livestock tending.

Table 10 Share (%) of rural agricultural households hiring labour

Country	Proportion hiring labour for crops and livestock	
	Non livestock keepers	Livestock keepers
Asia		
Bangladesh 2010	33	46
Cambodia 2009	0	45
India 2012	43	38
Mongolia 2014	2	11
Nepal 2011	25	44
Pakistan 2014	34	46
Viet Nam 2010	3	48
SSA		
Ethiopia 2016	21	37
Malawi 2013	25	46
Mali 2014	66	67
Nigeria 2016	61	65
Tanzania 2013	36	47
Uganda 2014	36	50

Source: Provisional data from the RuLIS – Rural Livelihoods Information System (FAO), based on various national household surveys

With respect to livestock keepers, studies on the effect of dairy cow ownership on hired farm labour suggest that farms with dairy cows generate significantly more employment (app. 1 hired labourer per 2.5 cows) and also pay higher wages than farms without dairy cows (Muriuki *et al.*, 2001; Nicholson *et al.*, 2004).

Agricultural wage employment has often been negatively perceived as a refuge sector for the rural poor. However, it is debatable whether rural non-agricultural wage employment is truly so distinguishable from agricultural wage activities. Although agricultural wages tend to be lower than non-agricultural wages and the poor and unskilled tend to participate disproportionately in agricultural wage activities, Winters *et al.* (2008) find that a significant number of agricultural workers should be considered high wage, and similarly a significant amount of non-agricultural work is low wage.

Across much of Asia, rural wages are have been rising since the start of the millennium due to a slow-down in the growth of the rural labour force and the growth of manufacturing that attracts workers from rural areas (Wiggins and Keats, 2014). African countries generally have less income from agricultural wage labour than those in Asia (5 vs. 15–25 per cent). This is an important difference, as some of the expected beneficial effects of increasing food prices for the rural poor have been hypothesized to materialize via higher agricultural wages (Ivanic and Martin, 2008).

As structural change (slowly) unfolds in SSA, more rural households are diversifying into non-farm income activities, which increases the opportunity cost for family farm labour (Diao *et al.*, 2014). Thus, population growth will not necessarily transform resource rich African economies into labour-abundant, low labour cost economies (Nin-Pratt and McBride, 2014) and Diao *et al.* (2016) suggest that there is a scarcity of rural labour in many African countries.

4.3 Value chain employment generation

Globally up to 1.3 billion people are employed in different livestock product value chains (Herrero *et al.*, 2009). Trading and processing jobs in the livestock sector are known to especially high in the informal sectors of countries in Asia and Africa. For the Kenyan dairy sector for example, USAID (2014) has estimated the overall employment and employment

growth between 2003 and 2013. Most (90 percent) employment in the dairy sector is informal (Table 11). For every on-farm job, another 1.25 jobs are generated in the processing and service sectors.

Table 11 Kenya dairy employment estimates, 2012

	Formal / semi-formal	Informal	Total
On farm	40 000	960 000	1 000 000
Processing	135 000	365 000	500 000
Services	60 000	690 000	750 000
Total	235 000	2 015 000	2 250 000

Source: USAID, 2014

Over the period 2003 to 2013, dairy employment has grown at approximately 10.3 percent per year, which is over twice the growth rate in GDP over that period. It is forecast that demand for milk will grow at 7.5 percent per year in urban areas between 2012 and 2022. As urban demand tends to also include a growing preference for pasteurized milk and additional processing and packaging options, value added is expected to grow in the urban sector even more rapidly than volume (USAID, 2014).

The livestock sector GDP and income multipliers, that measure changes in GDP and household income due to a unitary change in the livestock sector, indicate that investments in livestock have positive spillover effects both for the economy as a whole and for the individual households both in Asia and SSA.

Table 12 GDP and income multipliers of livestock production Asian and SSA countries

Region / country	Year	GDP multiplier	Income multiplier
Asia			
China	2007	2.80	2.19
India	2007/08	2.04	1.63
Pakistan	2007/08	2.88	2.85
Viet Nam	2007	1.26	1.04
SSA			
Burkina Faso	2005	2.68	2.48
Ethiopia	2011	2.74	2.53
Kenya	2013	2.11	1.93
Uganda	2013	3.03	2.71

Source: authors' calculation based on available Social Accounting Matrix (SAM)

5. Discussion

Agriculture and the rural economy: Mean landholding sizes of mixed crop-livestock farmers in Asia and SSA are in the order of 1 ha or less and mean herd/flock size normally lies between 1 and 2 TLU. To make a living under these generally marginal conditions, rural households tend to diversify their income sources between farm and non-farm activities, and between family-owned enterprises and wage labour (Otte *et al.*, 2012). Within the farm, households rarely specialize in one particular crop or livestock species, preferring to take advantage of the different, often complementary, roles each species can play, and to spread risks. This rationale appears to apply across wealth categories, as no consistent differences in livestock species owned can be identified among wealth categories within any country (ibid).

For most households in the bottom quartile, even a doubling of livestock income would have little impact on their absolute level of income (Udo *et al.*, 2011). Significant direct impacts on household incomes through improved livestock production are likely to be felt only by market-oriented households for which livestock already constitute an important share of household income (e.g. Garcia *et al.*, 2006), while other households (keeping livestock primarily for subsistence) are more likely to benefit indirectly through enhanced food security and nutrition. A pragmatic aspect of rural development is that increased smallholder market participation and productivity growth must go hand-in-hand with increased migration of smallholders out of agriculture (Barrett, 2008). In order to largely sustain a household through livestock production, family farms have to be of a minimum size to generate sufficient marketable surplus and production cost must be below prevailing market prices.

Shifting to non-farm activities is a possible avenue for rural households to increase their income. Haggblade (2005) describes two stylized movements into the rural non-farm economy (RNFE): one characterized by “pull” factors, in which rising farm productivity and farm incomes stimulate a diverse and vibrant non-farm sector, attracting labour from agriculture through enhanced income and welfare gains, and another movement dominated by “push” factors in which “falling agricultural labour productivity, low opportunity cost of labour, and declining household purchasing power induce diversification into low-return, labour-intensive nonfarm activities.

In much of Asia, problems of diminishing returns to agriculture at high levels of rural population density were relieved or avoided through exploitation of irrigation potential as well as through competitive outward-looking non-farm sectors that greatly rewarded personal investment in education and migration. Labour was essentially “pulled” out of rural areas into urban-based employment (Jayne *et al.*, 2014a). In SSA, off-farm income shares are in the range of 20–40 per cent and slightly higher for households with the smallest farms. A high proportion of off-farm income features low entry-barrier, low-return informal employment, suggesting that unskilled rural labour is being pushed rather than being pulled out of agriculture (*idem*). The comparatively low level of development of the RNFE in SSA is illustrated by the fact that non-agricultural activities, despite being ubiquitous, still account on average for only about one third of total household earnings (vs. two thirds in non-African countries) (Davis *et al.*, 2017).

Yield gaps: Smallholder farming systems in Sub-Saharan Africa have been shown to have sizeable yield gaps based on observed differences in technical efficiency among farms within similar locations (Henderson *et al.*, 2016). Expressed as potential percentage increases in outputs, the average site-based yield gaps ranged from 28 to 167 percent for livestock products and from 16 to 209 percent for crop products. There thus appears there is scope to generate reasonably large increases in output without major changes in existing practices and levels of input use.

However, as Udo *et al.* (2011) observe, in terms of ‘returns’, there is a livestock ladder with the smallest benefits accruing from village poultry and the largest benefits provided by dairy cattle. Poultry and small ruminants, the most widely owned livestock species, are mostly an appreciated secondary or tertiary activity and the potential of small animal systems to substantially increase incomes of poor rural households by closing yield gaps appears to be low. With regards to situations where livestock make larger contributions to livelihoods, smallholders will only change their livestock production practices if they fit farming household priorities and resources (Udo *et al.*, 2011) and if ‘intensification’ leading to yield increases actually improves net farm income and return to labour. This has often not been the case and many countries have seen the emergence of a two-track agricultural sector: a small one profiting from new commercial opportunities, and a big one characterized by stagnation and poverty (Garrity *et al.*, 2012). In a number of countries, farm sizes have declined to levels that

cannot sustain the minimum production needs and satisfy the livelihood needs of farm households. In their study of smallholder food security in SSA, Frelat *et al.* (2016) conclude that targeting poverty through improving market access and off-farm opportunities is a better strategy to increase food security than focusing on agricultural production and closing yield gaps.

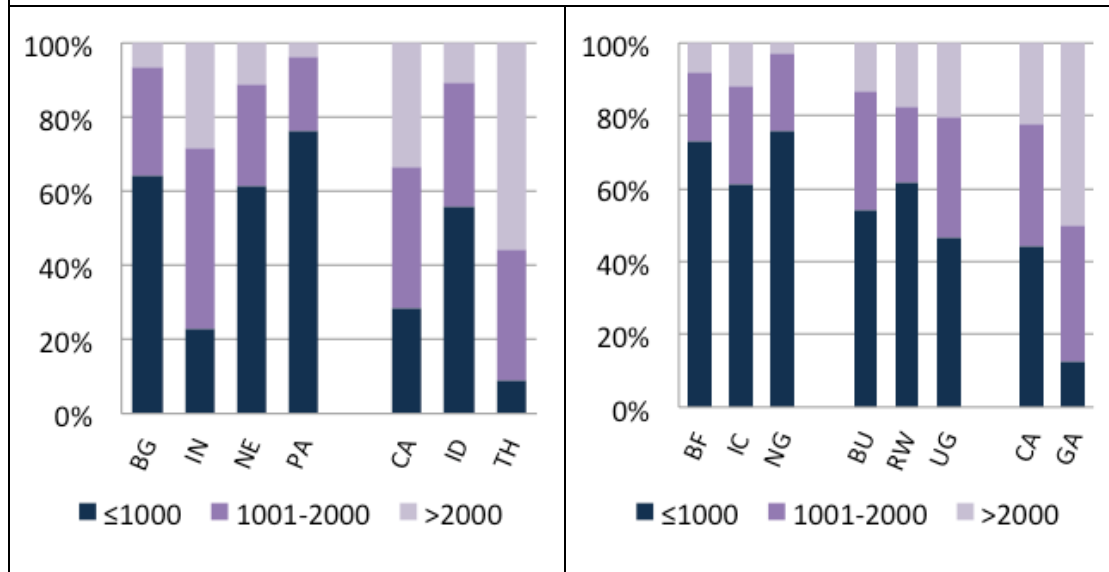
Market access and value chains: Growth of aggregate demand for ASFs will not by itself increase incomes among rural households as in the absence of more inclusive and efficient markets, many smallholder livestock keepers will continue to produce mainly for home consumption. However, the view of some development economists (e.g. Humphrey, 2005; Reardon and Timmer, 2005; Barrett, 2008) that unless smallholder producers are able to improve production processes to meet modern market standards, they risk being excluded from expanding domestic food market opportunities seems overly pessimistic. Experience suggests that smallholders may capture significant shares of domestic markets for specific products by adopting appropriate practices and technologies.

Even in most Asian economies agrifood supply chains are still far from the paradigm of high-tech, highly integrated systems of high-income countries as the demand for agricultural and livestock products depends mainly on the domestic population's income levels, habits and attitudes. For ASF markets, Aho (2010) presents an analysis of the relationships among per capita incomes, consumer preferences, and demand for various types of livestock product based on the extent of processing involved. Only the top income decile – with annual *per capita* incomes well above USD 20 000 – is a viable market for high-value processed and convenience cold chain products, while the 60 percent of consumers in the lower three income quintiles normally purchase ASFs in live-animal and wet markets, and only occasionally acquire partially processed cold chain products.

Hammond *et al.* (2007) have estimated the aggregate value and shares of food markets for different income groups for a number of countries. Their estimates for South and Southeast Asian countries as well as for Western, Eastern and Central African countries are presented in Fig. 3 (and Annex Tables A.1 and A.2).

With exception of Thailand, people with annual incomes below PPP USD 2 000 represent at least 50 per cent of the food market value. These figures show that although a subset of domestic consumers in Asian countries demands high-end livestock products, they are still a minority, representing mainly the urban upper-middle class. The needs of these comparatively affluent consumers can be met by high-end commercial, to a large extent corporate, livestock producers with supply chains ending in urban centres, or by imports from developed countries. The far larger proportion of consumers has much lower purchasing power, more traditional preferences regarding how food is prepared and sold for household consumption, and largely resides in rural areas.

Figure 3 Food market share (%) by income class (PPP USD) for selected countries in South and Southeast Asia and WAF, EAF, and CAF, normalized to the year 2002



From left to right: Bangladesh, India, Nepal, Pakistan, Cambodia, Indonesia, Thailand, Burkina Faso, Ivory Coast, Nigeria, Burundi, Rwanda, Uganda, Cameroon, Gabon
 Source: Hammond *et al.*, 2007

In the continuum of market types and supply chains, Ramsay and Morgan (2009) identify the two extremes that producers of livestock products face: the *local market*; and the *industrial inputs market*, where primary livestock products are transformed into processed products for final household consumption. However, in between, there is a wide range of intermediate markets, with increasingly formal market transactions as they proceed from the local market to the industrial inputs market system. Thus, even if smallholders may not comply with stringent standards set by suppliers operating at the high end of ASF value chains, there would appear to be sufficient opportunities to supply lower-end or intermediate market segments. In fact, Delgado *et al.* (2003) conclude that smallholders have a chance and are actually more competitive for low-end local markets than are large-scale farmers, and that the low-end has expanded enough in recent years to allow them to expand production rapidly.

However, despite the large size and diversity of food markets, smallholders are threatened in both rural and urban areas. Although the traditional or local market is a captive market for household producers, larger commercial businesses established in cities can easily develop distribution networks to towns and villages as diversification and/or expansion strategy.

Agribusiness: Agribusiness provides inputs to the farm sector, and it links the farm sector to consumers through the handling, processing, transportation, marketing, and distribution of food and other agricultural products. Thus, there are strong synergies between agribusiness and the performance of agriculture for development (WB, 2008). However, agro-enterprises increasingly dominate the agribusiness sector along selected livestock value chains and market forces alone do not guarantee competitiveness, nor do they guarantee smallholder participation, both essential to ensure that agricultural growth leads to socially desirable outcomes.

Domination of markets by few players can undermine competition as oligopoly power can be used to set prices independently of demand. The role of Archer Daniels Midland (ADM) in fixing prices for feed additives is an example of the potential for abuse. The cartel involved ADM, Ajinomoto Co. Inc., Kyowa Hakko Kogyo Co. Ltd., Sewon Corp. and Cheil Jedang Corp., charging feed buyers rigged prices for feed additives. The cartel operated globally, with the companies agreeing in advance not to compete with each other in given markets, as well as

agreeing on what price to charge. In 1996, the U.S. Department of Justice fined ADM an antitrust fine of USD 100 million for their part in the cartel. In 2006, the European Court of Justice upheld a European Commission Euro 43.9 million fine against ADM for their role in the price-fixing and market-allocating cartel. The famous tag-line from the case, attributed to ADM executives, was: *"The competitor is our friend and the customer is our enemy."* (Murphy, 2006).

Typically, a firm with market power is not just able to influence price, but also the standards, laws and policies that govern the market in which the firm operates. Large processors and retailers set 'private' standards with an eye to their consumers and food safety concerns, rather than to farmers' preoccupations or sustainable resource use. Thus, if a company is one of the major buyers of a product, many producers may lose their market. Firms may also influence legislators to 'tighten' national food safety standards to closer align with their own, thereby converting prevailing 'informal' market systems into 'illegal' systems. An example of exclusionary standards would be the imposition that only pasteurized milk can be sold to end consumers (even if the general practice of consumer is to boil milk before consumption). In many countries this would force a large share of participants out of the milk market. In fact, vilification of informal markets through advertising is one of the strategies used by firms to extend their consumer share.

Smallholder business environment: According to Houmy *et al.* (2013), the business environment in which farmers are operating in SSA deprives them of economic incentives to invest in inputs, including farm machinery. Social, political, economic, regulatory, tax, cultural, legal, and technological factors are contributing to this poor business environment. Comparing the institutional landscapes in Asia and SSA, Mellor (2014) notes that *"the institutional structures, particularly the central public sector component is still way short even now of the Asian standard when the green revolution struck."* Likewise, when the green revolution struck, essentially all Asian countries had specialized national systems for extending credit to the small commercial farmers while most African countries are still left with little credit coverage for the small commercial farmer to finance the high cash costs of agricultural intensification (*idem*).

This unfavourable business environment for smallholders in SSA is further compromised by increased investment in land by relatively wealthy urban-based individuals. Continued rapid alienation of land to medium- and large-scale investors is likely to exacerbate localized land scarcity and to restrict the potential of smallholder-led development (Jayne *et al.*, 2014b)

Outlook / Conclusions: SSA is only beginning its demographic transition, and in 2015, 63 percent of its rural population was under 25 years of age. Roughly 122 million young people will enter the labour force between 2010 and 2020, with slightly more than half of them from rural areas, putting immense pressure on the generation of employment opportunities (Jayne *et al.*, 2014a). So far, much of SSA's economic growth has come from extractive industries and the continent has not developed a noteworthy manufacturing sector (Connolly, 2014). As a result, labour has tended to move more into services, in particular trade. Given the low productivity in services and the prominence of the informal service sector, this current pattern of structural transformation will not yield sustainable income growth for the majority of people nor will it lead to economic development (<http://reports.weforum.org/africa-competitiveness-report-2015/chapter-2-1-transforming-africas-agriculture-to-improve-competitiveness/>).

Against the above background, agriculture (including livestock, fisheries and forestry), beyond its role in food provision, must be recognized as a strategic economic sector for employment generation, whether farm or non-farm (upstream and downstream) (Losch, 2012). Strengthening family farms rather than large-scale corporate agriculture should thus be a

priority, since these farms employ the overwhelming majority of agricultural workers, represent the greatest potential for production and employment, and generate the bulk of rural income.

The key growth potential in agricultural trade and markets, particularly for livestock products, lies in the expanding domestic and regional markets within Africa, where demand in some areas already far exceeds supply. In contrast to the relatively bleak development prospects for remote areas, the rapid expansion of urban residents' demand for high(er)-value foods represents enormous income potential for farmers in peri-urban areas and the middle countryside. It is in the latter where agriculture can probably play the greater role in poverty reduction, because the largest share of the poor, mostly mixed crop-livestock farmers, reside in the middle countryside. There is ample scope for increasing the productivity of mixed farming through better crop-livestock integration. Increasing the output of mixed farming systems is probably the most environmentally benign form of increasing agricultural production, because mixed systems are at least partially closed (Thomas *et al.*, 2002) and intensification of the livestock component of mixed farming can reduce the number of animals and the emissions per unit of animal product. Intensification of market-oriented mixed smallholder farming systems could, therefore, simultaneously enhance agricultural sustainability and contribute to poverty reduction. Thus, enhancing domestic markets, improving infrastructure, removing barriers and reducing transactions costs, is the greatest opportunity to stimulate both the required intensification and diversification of farming systems. But designing interventions that work requires understanding how farmers navigate both formal and informal, global and local markets — their strategies, interests, expectations and limitations, and how they make choices in the dynamic context of a restructuring agrifood sector (Vorley *et al.*, 2012).

In addition to its direct benefits, bottom-up agricultural growth also has powerful leverage effects on the rest of the economy, especially in the early stages of economic transformation, when consumption linkages prevail (Irz *et al.*, 2001; Hazell and Diao, 2005). This does not mean that development efforts should focus exclusively on agriculture, but that policy-makers and donors should be more aware of the pro-poor bias of agricultural growth and should not discount agriculture as obsolete when considering how and where to invest development resources. Policy-makers and donors should pay more attention to the complementarities and synergies among different investment options rather than regarding these options as mutually exclusive.

Agricultural development requires coordinated interventions across sectors, and policy priority must be given to providing an enabling rural environment for commercial activities (Burke *et al.*, 2007). Such an enabling environment requires mechanisms for overcoming the entry barriers to high-return activities, and institutional arrangements that reduce transaction costs and risks. A key challenge to the development of agriculture in areas dominated by smallholder farmers is the establishment of coordination systems involving combinations of government agencies, civil society, farmers' and other professional organizations, and agribusiness firms. Historical evidence shows that the most essential public expenditures for supporting agriculture do not necessarily lie in the agriculture sector itself, but for policy-making, regulation and provision of services that the private sector will not provide (Foster *et al.*, 2001).

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Annexes

Table A.1 Food market size (billion PPP USD) and share (%) by annual per capita income class (PPP USD) for selected countries in South and Southeast Asia normalized to the year 2002

	Annual <i>per capita</i> income class PPP USD (Int\$) 2002							
	<1001		1001-2000		2001-3000		>3000	
	Int\$	%	Int\$	%	Int\$	%	Int\$	%
S. Asia								
Bangladesh	37.7	64	17.0	29	2.9	5	1.0	2
India	222.5	23	468.9	49	158.7	16	114.9	12
Nepal	7.1	61	3.2	28	0.6	5	0.7	6
Pakistan	37.6	76	10.0	20	1.4	3	0.4	1
Sri Lanka	4.2	32	5.6	43	2.1	16	1.2	9
SE Asia								
Cambodia	2.8	28	3.8	39	1.7	17	1.6	16
Indonesia	61.6	56	37.3	34	8.6	8	3.1	3
Thailand	4.0	9	15.3	35	9.9	23	14.4	33

Source: Hammond *et al.*, 2007

Table A.2 Food market size (billion PPP USD) and share (%) by annual per capita income class (PPP USD) for selected countries in each of the SSA sub-regions normalized to the year 2002

	Annual <i>per capita</i> income class PPP USD (Int\$) 2002							
	<1001		1001-2000		2001-3000		>3000	
	Int\$	%	Int\$	%	Int\$	%	Int\$	%
Western								
Burkina F.	2.7	74	0.7	18	0.2	5	0.1	4
Cote d'Ivoire	4.1	61	1.8	27	0.4	6	0.4	6
Nigeria	28.5	76	8.0	21	0.9	2	0.2	0
Sierra Leone	1.3	51	0.9	35	0.3	10	0.1	3
Eastern								
Burundi	2.0	53	1.2	31	0.2	7	0.3	9
Malawi	3.5	72	0.9	18	0.2	4	0.3	6
Rwanda	2.1	62	0.7	20	0.2	6	0.4	12
Uganda	6.2	46	4.4	33	1.6	12	1.1	8
Central								
Cameroon	3.0	44	2.3	34	0.8	11	0.7	10
Gabon	0.1	16	0.3	37	0.2	22	0.2	25
Southern								
RSA	5.3	14	7.1	19	4.9	13	20.5	54

Source: Hammond *et al.*, 2007



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